

Following Olive Footprints (*Olea europaea* L.)

**Cultivation and Culture, Folklore and History,
Traditions and Uses**



THIS BOOK IS A JOINT PUBLICATION OF:

- Association of Agricultural Research Institutions
in the Near East and North Africa (AARINENA)
- International Olive Council (IOC)
- International Society for Horticultural Science (ISHS)



ISHS

Scripta Horticulturae No. 13

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AARINENA

Association of Agricultural Research
Institutions in the Near East and North Africa



IOC

International Olive Council
Consejo Oleícola Internacional
Conseil Oleicole International
Consiglio Oleicolo Internazionale
المجلس الدولي للزيتون



ISHS

International Society for Horticultural Science
Société Internationale de la Science Horticole

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- International Olive Council (IOC) www.internationaloliveoil.org
- International Society for Horticultural Science (ISHS) www.ishs.org

This book is also number 13 in the series known as Scripta Horticulturae of ISHS (ISSN 1813-9205)

Following Olive Footprints (*Olea europaea* L.)

**Cultivation and Culture, Folklore and History,
Traditions and Uses**

Editor in Chief

Mohamed EL-KHOLY

*Independent Free Lance Olive Researcher, Grower and Intl. Consultant,
AARINENA Olive Network Focal Point
Cairo, Egypt
elkoly49@yahoo.com*

Co-Edited by

Damiano AVANZATO

*Chair ISHS Section Nuts and Mediterranean Climate Fruits and Intl. Consultant
Rome, Italy*

Juan M. CABALLERO

*IFAPA, Centro Alameda del Obispo, Former Chief of Olive Growing Dept., Intl. Consultant
Huelva Albina, 2 - 14012 Córdoba, Spain*

Kostas S. CHARTZOULAKIS

*NAGREF, Institute for Olive Tree and Subtropical Plants,
Agrokipio, 731 00, Chania, Crete, Greece*

Facundo VITA SERMAN

*Estación Experimental Agropecuaria, INTA-San Juan,
San Juan, Argentina*

and

Enzo PERRI

*CRA-OLI, Research Center for Olive Growing and Olive Oil Industry
C.da Li Rocchi, 87036, Rende (CS), Italy*



ISSN 1813-9205

ISBN 978 90 6605 734 0

Joint Publication by the Following None-Profit Organizations

AARINENA

IOC

ISHS (*Scripta Horticulturae* N. 13)

Organizations Executives

AARINENA: Ibrahim Hamdan

IOC: Jean-Louis Barjol

ISHS: Jozef Van Assche

Corresponding Authors

The corresponding author for the manuscript of each country chapter is indicated by her/his electronic mail address (email). In a very few cases, there shall be more than one corresponding author.

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Statements by the Editorial Board

1. Prior to the 20th century, popular medicine was far more common and advanced than treatment by a medical professional. Using olive oil for enhancing good health and as a remedy for many illnesses has been transferred over centuries from one generation to the next, especially in the Mediterranean basin. Science and research have been constantly proving its magical effects on health. However the prescriptions mentioned in the book manuscript under "Popular Medicinal and Cosmetic Uses" should be used in or after consultation with a physician.
2. The dates and places where olive cultivation started may differ in different chapters according to the scientific and archaeological information available in each country.

Book formatting and layout, design of front and back cover, numbering of pages within a miniature olive tree and all standardized maps (based on authors' data) except those on page 66, 137, 209 and 233 by

Mohamed El-Kholy

English proofreading and editing by

Kelly Harrison and Salma El-Kholy

Following Olive Footprints

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Cultivation and Culture, Folklore and History,
Traditions and Uses

Authors

Abdeen, Malek	Cordeiro, Antonio M.	Matias, César
Abu-Zinada, Ismail A.	Costa, Linda J.	Mondragão-Rodrigues, Francisco
Adakalic, Mirjana	Cremona, Matty	Moutier, Nathalie
Aftab, Mohammad	D'Alessandro, Dario	Muzzalupo, Innocenzo
Akparov, Zeynal	Darovec, Darko	Nusir, Jeehan
Al-Ashhab, Mohammed	Darweesh, Munzer	Oplanić, Milan
Aldalas, Mansour	de Oliveira, Adelson Francisco	Özkaya, Mücahit Taha
Al-Ibrahim, Anwar	de Oliveira, Dili Luiza	Padilla R., José Saúl
Al-Khalifah, Nasser S.	Dosba, Francoise	Perales C., Miguel Ángel
Al-Shdiefat, Saleh M.	Durlu-Özkaya, Fügen	Peres, Cidalia
Al-Shoul, Othman	El-Kholy, Mohamed	Perri, Enzo
Askari, Ejaz	Farrugia, Natasha	Rousseaux, M. Cecilia
Alves, Marcelo	Fichet Lagos, Thomas	Santos, Francisco L.
Arjona, Concepción	González G., Ernesto	Searles, Peter
Askerova, Rena	Granados Medina, Ruby J.	Selles van Schouwen, Gabriel
Avagyan, Alvina	Gregoriou, Costas	Sergeeva, Vera
Avanzato, Damiano	Grijalva C., Raúl Leonel	Shibata, Hideaki
Ayoub, Salam J.	Hrimat, Nader	Sladonja, Barbara
Bandelj, Dunja	Harutyunyan, Margarita	Takeuchi, Shinji
Baumann, Hermann	Hovhannisyan, Marina	Tapia Contreras, Francisco
Bejanyan, Berenik	Isaac, Jad	Taylor, Judith M.
Benincasa, Cinzia	Jabi, Fares F.	Theuma, Nadia
Biondi, Antonio	Jafary, Hossein	Trentacoste, Eduardo
Bonello, Mary-Anne	Kastelic, Emilija	Trigui, Ahmed
Borg, Jeanette	Khadari, Bouchaib	Tunalioglu, Renan
Boulouha, Belkassem	Krapac, Marin	Ulaş, Mehmet
Boynudelik, Mahmut	Ksantini, Mohieddine	Valenčič, Vasilij
Bueno, Luis	Kullaj, Endrit	Villamil, José
Caballero, Juan M.	Ladux, José Luis	Vita Serman, Facundo
Chalak, Lamis	Lavee, Shimon	Yahia, Elhadi
Chartzoulakis, Kostas S.	Lazovic, Biljana	Yu, Ning
Cólica, Juan	Mahmoud, Abid	Zeinanloo, Ali Asghar
Conde, Paula	Mammadov, Afig	Zhivondov, Argir



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INTRODUCTION

BY THE CO-SPONSORING AND CO-PUBLISHING ORGANIZATIONS

AARINENA - IOC - ISHS

Olive trees are deeply rooted not only in the soils in the Mediterranean basin but also in its civilizations for thousands of years. They are the most frequently grown of all fruit trees in this part of the world as far as cultivated areas and production are concerned. Without any doubt, these magnificent blessed trees, which are praised in the holy books of the three monotheistic religions and others, have left profound traces everywhere they have grown for centuries. They played a vital role in conserving the environment and in nutrition, economy, habits, traditions and the day-to-day life of the Mediterranean people. Some of these people migrated to the new world centuries ago and took with them olive trees to remind them of home. They withstood separation from their loved ones but they could not bear it to be separated from the olive tree. There in their new countries, the olive tree struck roots and set a new footing, taking with it many folkloric customs and manifestations.

Oliviculture is presently surfing on the cutting edge of scientific discussion due to recent technological innovations in olive growing and to the health benefits associated with the consumption of olive oil. It is a fascinating theme that combines agricultural history, cultural heritage, folk traditions and scientific knowledge, and attracts the attention of scientists and the general public.

AARINENA and ISHS have been working together for a few years on different subjects. Through the ISHS participation in the AARINENA 11th General Conference in Damascus, Syria in October 2008 the dream of this book was born. Two years later it started to become a reality, through planning at the International Horticulture Congress (IHC-2010) organized by ISHS in Lisbon, Portugal in August 2010 with AARINENA effective participation. IOC is the only intergovernmental organization in the world able to bring together olive oil and table olive producing and consuming stakeholders. It joined efforts with the two organizations to co-sponsor and co-publish this book. Not less than 24 of the 41 countries featured in this book take part in IOC deliberations and account for 98% of the world olive production, of which 23% is the share of AARINENA member countries. These countries have adopted IOC marketing standards for application in their international trade. IOC considers the other countries presented in this book as natural partners and members of the global olive family and hopes they will join the organization to strengthen its global activities and to serve them more within its mandate.

This book will open a new horizon of cooperation between AARINENA, IOC and ISHS and we all congratulate the authors and editors whose names appear on the first and third page of the book. We acknowledge their commitment in working so hard for so long to produce this veritable encyclopedia of the olive tree. We extend our special thanks to the Editor in Chief Mohamed El-Kholy, who has worked so hard with persistence to ensure that the book is taking its current shape and to Damiano Avanzato the Chair of the ISHS Section Nuts and Mediterranean Fruits who has been the prime mover of the book initiative. The editorial team was able to collect and edit a large number of diversified contributions that lead the readers along the olive route

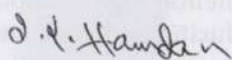
from its birth in the Mediterranean basin to remote destinations as far as South Africa, Australia, Latin America and Pakistan, Japan and China in East Asia.

The valuable information contained herein deserves fast and effective dissemination. AARINENA has published the Olive GAP Manual for West Asia North Africa Region in cooperation with FAO, and again under the leadership of Mohamed El-Kholy and Costas Gregoriou, and through its Olive Network this new book will reach different stakeholders in the WANA Region. IOC within its mandate and multiple projects will foster knowledge sharing and promotion of olive products with this book. By incorporating this book in its important *Scripta Horticulturae* series ISHS will make sure that it reaches its members and the horticultural scientific arena and be presented in each of its numerous conferences, symposiums and congresses.

The book addresses a variety of olive-related topics that depicts the multifaceted knowledge accumulated along innumerable generations of people who built their lives around olive trees. Therefore this is a book focused on people, weaving agriculture knowledge and innovations with genetic resources and folk traditions across a diversity of cultures and geographic locations.

The various chapters are well illustrated and written in a clear and accurate language that is accessible to the general public interested in olives but also relevant to scientists and olive experts. They will find valuable and unique information here.

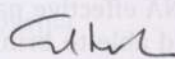
It combines tradition with modernity and opens new opportunities for olive trees to undergo faster economic and social development around the world. We are sure readers will be fascinated when they rediscover the world olive heritage and recognize the effort of those who have preserved the olive trees and carried on their valuable legacy to the forthcoming generations.



Ibrahim Hamdan
Executive Secretary
AARINENA



Jean-Louis Barjol
Executive Director
IOC



António A. Monteiro
President of
ISHS



FOREWORD

By Kelly M. Harrison

International Agricultural Development Consultant

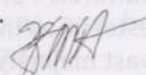
I was asked by the Editor in Chief, my friend and colleague Mohamed El-Kholy, to read and help with final editing for English proofreading of this wonderful compendium of olive production techniques, processing and uses around the world since the dawn of civilization. I was totally fascinated with the long history and diversity of olive cultivars and the myriad uses of olive oil and table olives in different cultures. For many millennia people in the Mediterranean basin held the olive in holy esteem, as indicated by numerous references in religious texts and ceremonies. Yet the vast majority of world citizens are only now beginning to understand the importance of olives and olive oil in a healthy and delicious diet; and in cosmetics and nutrition. While olive oil is not a medicine or a drug, it does have health-promoting attributes and, when regularly consumed, can help to prevent innumerable diseases. This book reveals the long history and more recent adaptations in cultivation of the olive tree in a wide range of countries. Indeed, it reflects the rapid expansion of oliviculture on all continents, while highlighting the rapid expansion into new production areas. It will find readers among olive scientists as well as those with little knowledge of the industry.

This book presents informative material about olive production history and usage along with the current status of olives in 41 countries on every continent. Over more than 7,000 years the olive has been man's companion, first in the Mediterranean basin and now around the globe. Common proverbs about the olive tree and its fruit abound in almost every country with a long history of cultivation. Some of the most interesting are: "Who plants an olive makes a fortune", "I'm suffering the black of the olives", meaning to show the heavy burden of life, "I don't have even a drop of oil to tint my eyes", implying one's poverty. Some olive proverbs were enshrined in popular ballads like the "The olive of tears", a ballad about wives watching their emigrant husbands travelling by boat to the Corfu Island, the first station of their trip. In olden times it was believed that burning the leafy twigs in the chimney near Christmas time inside a living room removes bad spirits from the house.

But even today most people around the globe have yet to learn about the wonders of olives and olive oil. I was one of them. I grew up on a farm in the northern part of Texas, USA. In the 1950's olives were only produced in one State - California in very small quantities, if at all. At that time most of us knew little more about the amazing olive and olive oil than what we had seen in the Bible. Our preferred cooking oils were animal fat and hydrogenated vegetable oil, used in our predominant diet of fried potatoes, chicken, beef and pork. That diet is now recognized as extremely harmful to human health. There was no recognition at all of the many other benefits of olive oil. Table olives were available, mainly green and stuffed with pimento. They were used as a kind of curious garnish in a few culinary presentations or with sandwiches. My own reaction after tasting green stuffed olives was repulsion: it was way too bitter for my sensitive young taste. After traveling in most of the countries around the Mediterranean Sea and living for extended periods in Jordan and Egypt I have become a huge partisan of olive products, consuming table olives and/or olive oil at every single meal. The positive impact on my health has been amazing.

It seems inevitable that more and more citizens of the world will discover the benefits of olive products. And given the onslaught of global warming, the increasing scarcity of water in many countries, the relatively low water requirements of the olive tree and the rapid increase in demand for olive products, we can expect even more rapid growth in olive production and trade in the coming decades.

This compendium of information about olive growing in 41 countries may well be a primer for growers, processors, marketers or consumers who will inevitably seek to know more about the history of olive trees and their remarkable products, their culinary uses and healthy attributes as well as current cultivation practices in different parts of the world and their impact on economy and environment.



ACKNOWLEDGMENTS

By the Editor in Chief

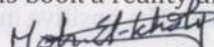
A few months after we started this book, some 21 months ago in October 2010, I started addressing all contributors as the "Big Family of Following Olive Footprints". My motive for that was that we had reached over 100 persons in addition to a huge number of unknown soldiers, whose contribution with images has been so valuable to this book; and like most families, our days were not always full of joy and understanding. We had our hard times. I must apologize to some members of this big family who were annoyed that I had to rush their work, never stopped asking for additional information or different images in a way that might have been overbearing at times. So I sincerely thank all authors and photographers, whose names are declared under images' captions, as well as my colleagues and dear friends Damiano, Juan, Kostas, Facundo and Enzo, members of the editorial board for the excellent and hard work you have all done with a team spirit.

It is not me who is going to acknowledge your efforts and memorable work, but rather your readers who, I believe, will enjoy and appreciate this book. From day one I had the vision that this book should serve the olive industry in a different way; as a documentary and have chosen the pivotal theme to be "Olives and People". As some of you wrote to me "at the beginning we could not understand, but it is your persistence that made us finally comprehend".

Now that we understand one another so clearly and have made a great team, I hope that you are all geared up for our forthcoming book following this one, the topic of which is already discussed and of course it will be on olives. Without exception, all of you have shown great passion in what we have together done. That is what made this a unique volume highlighting the olive story from more than 7,000 years ago. A hearty thank you to all of you, my dearest ones of the "Big Family of Following Olive Footprints".

This acknowledgement would not be complete without thanking my family for standing beside me, never complaining about the time I have stolen from them; my mother the lady of 84 who lives all by herself and whom I have not seen for months, although she is just 7 km from where this book has been compiled; my wife and children and my grandchildren who have grown up in this period without me noticing it.

Thank you again in person to all who have managed to make this book a reality and to our readers I hope you will enjoy this book written with passion.


June 2012



INTRODUCTION

Albania (Fig. 1) is located on the south-western part of the Balkan Peninsula, along the eastern coast of the Adriatic and Ionian Seas between 42° 39' and 39° 38' N latitudes and 21° 4' and 19° 16' E longitudes. It has a surface of 28,748 km². Strategically placed in the Mediterranean basin, Albania has a variety of ecological niches due to the convergence of Mediterranean and Continental climates, the isolation and protection from the predominantly mountainous relief (average altitude is 704 m with a great hypsometry, heights up to 2,700 m), topographic contrasts and many valleys and rivers crossing the territory (Kullaj, 2008). The annual average temperature ranges from 17 to 6° C for the maritime area and 10.5-11° C for the north-eastern area of the country. Sunlight lasts from 2,100 to 2,700 hours per year. The annual average rainfall is 1,430 mm with 70% occurring during the autumn-winter season. The vegetation is multifarious, with 35% of the country's surface covered by woods and bushes.

Agricultural land covers 696,000 ha (nearly 24% of the total area), while 1,027,000 ha are forest (36%) and 446,000 ha are pasture (15%).

The land used for agriculture is often quite sloping, with only about 44% having a slope of less than 5%. Moreover, the average agricultural land per capita is very small at 0.2 ha; the smallest in Europe, even though agricultural land more than doubled from 1950 to 1990 due to drainage of marshland, terracing and cultivation of forest and pasture land, and establishment of new irrigation schemes (Kullaj, 2005).

Climate and soil conditions are favourable for growing various agricultural plants, and agriculture is a very important sector of the Albanian economy. The implementation



Fig. 1
Olive growing and potential areas
in Albania



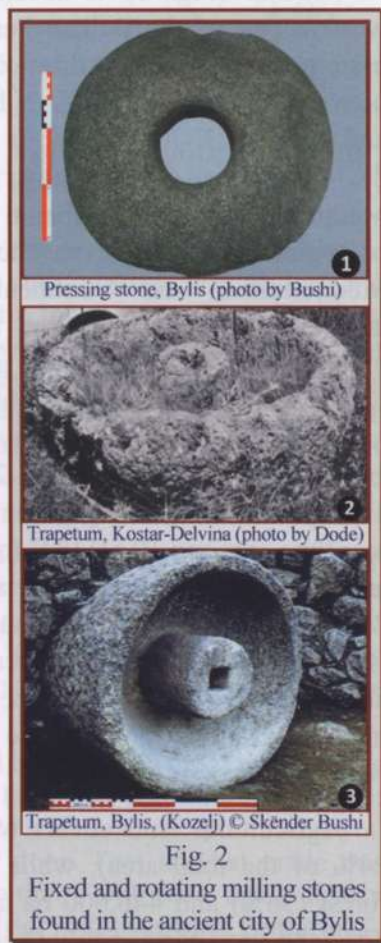
of liberalization and privatization policies has led to the rapid break-up of 550 state and collective farms, and the privatization of 94% of farmland by 1994, resulting in 470,000 privately owned farms by 1996 with a total of 560,000 ha. As a result, agriculture is constrained by uniform, small-scale farms and large segments of fragmented land, with a current average farm size of 1.3 ha (and even smaller than 0.8 ha in mountainous areas) (Kullaj, 2007). Five million olive trees constitute the present richest asset that Albanian agriculture has inherited from the communist regime.

OLIVE CULTIVATION HISTORY

The history of olive growing in Albania resembles an evolution toward a major source of income for rural communities similar to all countries of the Mediterranean basin. The present oliviculture in Albania is a mastery developed by predecessors, the famous Illyrians, who produced a famous olive oil known by many Roman scholars as *Oleum Liburnicum*. Strabon in his work "Geography" wrote "Warm and fruitful is this place, as it is full of olives and vineyards except for few regions of harsh climate".

Olive stones have been found in several archaeological excavations. Proof of olive processing dates back to the 6th century BC. In the Episcopal complex of the ancient city of Bylis an olive mill was discovered, consisting of a fixed stone, stoves for processing with hot water and a large quantity of pomace cake used for combustion in the mill. In another place in this city, one of the rotating grinding stones has been found. The same type of mill was used in Greece and Albania (Muçaj, pers. com.) (Fig. 2). Another millstone was found close to Kostar village in Delvina. This large stone of 1.72 m that was driven by animals dates approximately to the same period. Other archaeological olive mills have been discovered in the medieval village of Kamenica, dating back to between the 13th and 16th centuries (Meksi and Riza, 1974).

Continued developments of olive cultivation in Albania were experienced during the Byzantine period (5th-11th century AD), especially in the hilly and pre-mountainous areas, facilitated by the excellent road network built up by Romans (Egnatia Road), as well as the dissemination of Christianity that promoted the production of olive oil necessary for the sacred celebration "Santa Cena or Mensa



Eucharist” (Sotiri and Çakalli, 2001). There are historical records indicating olive oil was one of the main commodities traded through the Albanian Vlora harbor to Italy since the 5th century. Even centuries later, people of the southern Albanian region of Himarë were exporting olive oil to buy guns for the resistance against the Germans during World War II.

With the fall of the Roman Empire and subsequent wars with continuous military campaigns, olive growing was abandoned due to the large-scale devastation of plantations, especially in the coastal areas and deep valleys. Since those times, as an incentive to raise the interest in olive growing, Albanian farmers have always had the right to plant olives in state-owned lands. The rules of the time gave the right to own the trees but not the land. The Albanian government provided negligible incentives to olive growing following independence in 1912. Thus, the number of trees increased from 1.1 million in 1939 to nearly 1.5 million in 1945.

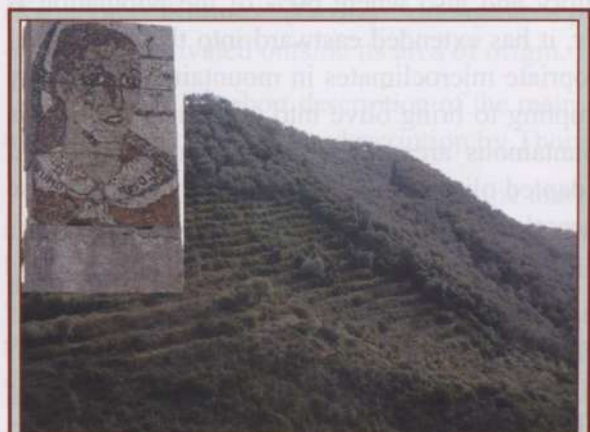


Fig. 3

Terraces in southern Riviera build up by volunteer work of youngsters symbolized by this lapidary mosaic dated 1970 showing a young girl, young plants and the writing “Defend – Learn – Work”

Through the implementation of centralized economic planning as well as “voluntary” work an army of students, volunteers and farm operators were involved under the scientific supervision of the Olive Tree Institute in Vlora to grow olive trees (Fig. 3). Many state olive farms were established in suitable regions. In addition to expansion of the olive area, the actions also included management issues related to old olive orchards. The olive nursery industry was developed and trees were even donated to China and exported to Vietnam.

However, despite the high level of human effort and financing, the development of the olive sector was slow due to poor organization, difficult terrain, and use of unskilled and underpaid workers and lack of marketing, all leading to low yields in the new olive plantations. However, within three decades (1960’s to 1990’s) the olive area almost tripled from 17,000 ha to 45,000 ha, with yields improving from 7 to 17 kg/tree on average. During this period the maximum recorded olive oil production was 5,048 tons in 1983. Olive oil consumption per capita was extremely low as it was consumed as a medicine. That is why the Albanian people are still willing to pay a premium price even today.



At the beginning of the 1990's, with the advent of market economy, a good part of olive plantations were abandoned due to inefficiency, population emigration and land clearance to open construction sites. Youth emigration left the olive orchards culturally unmanaged, with competition of various shrubs and vegetation while under the threat of bush fires. Sadly 10,000 ha of olive orchards were abandoned or destroyed, including the construction of hotels and houses in the Southern Riviera. However, from 1992 to 2008, a total of 2 million new trees were planted in small parcels on hilly terrain in an attempt to compensate for low yields and irregular bearing. There has been an overall yield improvement, even with alternate bearing (40,000 tons in 2006, 27,000 tons in 2007 and 56,000 tons in 2008). Nevertheless, more than 50% of the current olive trees do not receive human care; therefore the production is spontaneous and natural.

AREA UNDER OLIVE CULTIVATION

Olive in Albania is cultivated in the Mediterranean climate of the Western Coastal Plane, representing 36.2% of the territory and also where 60% of the population is concentrated (Fig. 1, page 1). However, it has extended eastward into the continental region through river valleys with appropriate microclimates in mountainous and hilly areas. There is proof of ancestors attempting to bring olive into upper marginal areas like Përmet, Tepelenë and to the mountainous areas of Elbasan, Berat, Krujë and Tirana. There are rare exemplars of adapted olive populations existing in all of these areas, having high economic, environmental, social and breeding value.

Within the current growing area, which is distributed in nine regions covering 17 districts, the most important ones are Vlora (36.1%), Fier (17.3%), Berat (16.4%), Tirana (11%) and Elbasan (7%). Olive trees occupy 41,000 ha or 5.9% of arable land distributed in about 118,000 small orchards of 0.25 to 2.5 ha, producing about 50,000 tons of olives and 6,000 tons of oil per year. Most orchards are located in hilly and mountainous areas, raising problems for timely harvesting, handling and processing.

In 2008, the government of Albania initiated an intensive program to develop the olive sector by planting 20 million additional olive trees within four years and another 30 million in the years to come. To encourage implementation, subsidies are offered at 50% of planting costs. Two large nurseries with mist propagation have been established and public agricultural lands are offered at 1 EUR/m². Furthermore, extra virgin oil production is subsidized by 100 Albanian Lek/liter (0.95 USD). So far, with these incentives about 10,000 ha or 250 to 300 thousand trees have been planted yearly.

OLIVE CULTIVARS

Around Medieval castles like Petrela, Preza, Kruja, and in millenary sites there is a great richness of oil and table olive populations, having coped with the soil and



climate conditions for millennia (Fig. 4). Testimonies to the 2,400-year-old city of Berat are its castle and olive trees.

In Albania, there are multiple genotypes for each site, with an interesting distribution of cultivars for oil and table use, indicating the adaptability to certain biotic and abiotic factors. Their selection for hundreds of years by olive growers has created the current range of high value oil and table cultivars.

The Albanian olive sector is dominated by six main cultivars originating in six important ancient production areas, including ‘Kalinjot’ (Vlora), ‘Kokërmadh Berati’ (Berati), ‘Mixan’ (Elbasani), ‘Ulliri Bardhë i Tiranës’ (Tirana), ‘Krypsi Krujës’ (Kruja) and ‘Kallmet’ (Lezha). Among these primary cultivars, ‘Kalinjot’ is the only one being cultivated outside its area of origin.

Following is a short description of the main features of the important autochthonous cultivars adapted from the description by Thomaj *et al.* (2003) and MBUMK (2009):

‘**Kalinjot**’ (Fig. 5), originated in the area of Vlora, Mallakastra and the Ionian coast, is by far the dominant cultivar and the only one being produced outside its area of origin. It occupies 48% of the total olive area in the country. It is dual purpose, has high oil content and medium resistance to drought, cold and frost (Kafazi, 1980; Kafazi and Muço, 1983; MBUMK, 2009). It is self-fertile, but benefits also from good pollinators like ‘Pulazeqin’. Ovary abortion is low (13%) and productivity is high but alternate. It has a medium to late ripening. Fruit weight is medium (3.6 g) and stone weight is large (0.5 g). Oil content is high (28%) and so is the quality of the oil, which is also aromatic. Due to its high flesh content of 86.4%, ‘Kalinjot’ is used for table olives too, another reason for its wide dissemination. Self-rooting from cuttings is high (96%). It is susceptible to peacock spot and olive fruit fly in advanced maturation stages.

‘**Ulliri Bardhë i Tiranës**’ (Fig. 6) is an oil cultivar widely spread in central Albania, mainly in Tirana, Durrës and Kruja and to a lesser extent in Lezha and Shkodra (14%). The cultivar is self-fertile and late ripening. Its fruit and stone are small to



Fig. 4
The author sitting on the trunk of an old olive tree in Petrela



Fig. 5
‘Kalinjot’
(Photo by Z. Tedeschini)



Fig. 6
‘Ulliri Bardhë i Tiranës’
(Photo © H. Ismaili)

medium (2.1 and 0.35 g respectively). Flesh ratio is 83%. Productivity is high but alternate. Oil content is 24% and its quality is high. It is 66% self-rooting from cuttings. It is attacked by the olive fruit fly in the late summer, with low rates of infestation. It shows tolerability to long droughts and long cold periods and performs well on poor and slightly acid soils and is tolerant to olive knot.

‘Kokërrmadhi i Beratit’ (Fig. 7) is an autochthonous cultivar of Berati area with limited extension to Lushnja. It is the best table cultivar in Albania, but also has good oil quality. Although self-incompatible, it can produce very well with good pollinators like ‘Unafka’. It is early to medium ripening with large fruit and stone (weight 6.7 and 0.71 g, respectively), and with a flesh ratio of 89.3%. It has medium but irregular productivity. Oil content is 18 to 21%. Self-rooting from cuttings is medium (61%) and is susceptible to peacock spot and olive fruit fly. Among its weaknesses are early fruit drop in large quantities and susceptibility to abiotic stress.



The first introductions of foreign cultivars in modern times, 1935-1941, were mostly Italian; ‘Frantoio’, ‘Leccino’, ‘Moraiolo’, ‘Coratina’, ‘Tagiasca’ for oil and ‘Ascolana tenera’, ‘Sant’ Agostino’, ‘Bella di Spagna’, ‘Cerignola’ and ‘Santa Caterina’ for table (Prifti, 1955). After World War II, with the establishment of the state farms, other cultivars were introduced in the 1950’s and 1970’s, for experimental orchards. In general, such introductions failed to adapt to the climate or were heavily affected by pests and diseases. Successful cultivars were ‘Mastoidis’ from Greece, ‘Picholine’ from France and ‘Memecik’ from Turkey. However, such cultivars were not disseminated for commercial production.

The Albanian Ministry of Agriculture, Food and Consumer Protection (MAFCP) has recommended new plantations of certain cultivars such as ‘Leccino’, ‘Frantoio’ and ‘Arbequina’ for oil production and ‘Kalamon’, ‘Conservolia’, ‘Manzanilla’, ‘Nocellara del Belice’ and ‘Chalkidiki’ for table.

IMPACT ON ECONOMY AND ENVIRONMENT

Oliviculture in Albania has had always significant share in the gross domestic product. For example it contributed with a sum of 24 million Frang Ar* between the two World Wars (*Albanian currency in gold used before World War II. In 1920, 1 sterling = 25 *Frang Ar*). During 1921-1938, the sector provided a total of about 3,777 tons of oil, 62,400 tons of olives and 21,234 tons of exported oilcake, all with an equivalent of about 30 million Frang ar. Today, the estimated share of this sector is 20 million EUR and it provides an income to 118,000 Albanian households. Hired labor reaches 1 million working days in production and harvesting, (MBUMK, 2009).



Taking advantage of the olive tree features, farmers living in pre-mountainous areas of the country have always attempted to cultivate it. In many areas, especially in the south of Albania, olive trees are grown outside the arable land, even beyond the poor hilly soils, on the rocks typical of land in the southern coastal area. This has given a high landscape value to massive bare hills and mountain foothills. A typical example is the “Crown of Tirana”; large plantations around the capital which half a century ago was bare land full of shrubs. In most such interventions, terraces were constructed to avoid erosion. Moreover, the plantation of large areas has also created rich biodiversity.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

In all traditional olive growing regions in Albania, cultural practices are labor intensive. Of particular interest is the cultivation of olives in the so-called “eyebrows” found in the villages of Himarë, Vuno and Pilur. In these villages, olives are grown on rocky land, planted directly between small crevices in the rocks, something very

rare for an agricultural plant. In these areas, traditional growers have built “eyebrows” with stones on the lower side of the slope to create small terraces (Fig. 8 and 9).

Then, they took soil from arable lands and filled the “eyebrows”. So each and every tree was cared like a little baby. Other cultural practices were applied to the “eyebrows” like fertilization with manure and later, green manure with leguminous crops. The latter is frequently applied and it is an important measure to avoid alternate bearing (according to Foto Toti and Dionis Çakalli, pers. com.).



Fig. 8
A stone eyebrow
around an olive tree



Fig. 9
Soil turned-down
inside an eyebrow

Another technique found in the coastal area uses *in-situ corral* manure. During the period January to May, olive trees are fenced with racks made with branches left from pruning or from shrub shoots, etc. forming a corral in which sheep are left during nights to enrich the soil with urine and manure, followed by down-turning the soil. This technique has proven to increase the trees’ productive capacity. Additionally, the consumption of fallen leaves by the animals reduces pest and disease pressure (according to D. Çakalli, pers. com. and Osmani, 2002).

Most olive orchards in Albania are located on sloped terrains and terraces, requiring an irrigation system that does not cause erosion. This was solved by





Fig. 10

Red arrows indicate concreted water channels,
Right details: channels and distribution chambers

bringing down the water, through the slope, using pipes and open channels (Fig. 10). Through a system of numerous distribution chambers, the water flows through smaller side furrows to four different locations on each terrace. Water is given to the trees in “trays” which are made by raising the soil around the trees. This was found to be an economic and environmentally friendly method implemented first in

the area of Lukova and later in the Crown of Tirana. In less sloped terrains, the network of channels is open, concave and faced with concrete. Water manholes are evenly distributed in the furrows; the latest going horizontally, crosswise to the slope. From the furrows water is delivered to each eyebrow (Osmani, 2002).

On the other hand, wrong practices include beating of twigs with a stick during harvest, and irrationally heavy pruning, according to the expression “the axe corrects the olive”, reflecting a conviction that olive trees withstand any level of pruning. Faulty post-harvest practices, in many parts of the country, include late harvest on the mistaken notion that this will improve the quantity of oil. This actually does not improve the quality or increase the quantity and even intensifies alternate bearing. Another persistently erroneous practice is collecting olive fruits into bags, causing oil loss and quality deterioration.

PROCESSING METHODS OF RAW OLIVES

An oil-producing method that is still being used in some areas is kneading the olive fruits with a stone mill, and then placing the paste in hessian bags, which in turn are placed one on top of the other under a wooden press. Two wooden screws are turned manually on that press to apply pressure on the olive paste bags, while boiling water is continuously poured on these bags so that a mixture of oil, water and fine sediments flow into a wooden trough located underneath the press. The oil will rise to the top being lighter and is skimmed with a big wooden spoon, while the water and residues are dumped on the fields (Fig. 11).

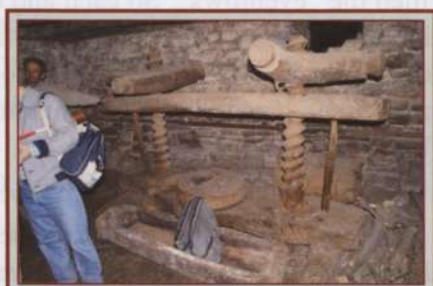


Fig. 11

An old olive press with wooden
screws (Photo by S. Muçaj)

Table olives are processed with several traditional methods. The most common is stacking ripe fruits in layers alternating with salt. Due to osmosis under this

condition, the salt removes moisture from the fruits, which are dried like dessert grapes, yet salted. This is a high quality and very tasty product. In the case of olive cultivars from central Albania, after de-stoning and washing several times, they are dry salted and dipped into olive oil. Under home conditions, to conserve olives during the summer, brine salted olives are drained and left to dry, then placed densely into a vase (fictile jar or butts) which is filled with vegetable oil, mostly sunflower. The oil takes the aroma and taste of olives, and is then used in preparation of salads together with olives. One method to reduce olive bitterness is to place them in water with ash.

TRADITIONS AND CULTURE

The olive's ancient heritage in Albania has given birth to many stories, songs, proverbs and sayings, honoring the venerable and economically important plant. Some of the wide spread sayings are "Who plants an olive makes a fortune", "I'm suffering the black of the olives", meaning to show the heavy burden of life, "I don't have even a drop of oil to tint my eyes", implying one's poverty.

The olive fruit itself is a symbol of beauty because in several folkloric songs, the olive fruit represents the eye of a beautiful girl. The shade of the olive tree has been a setting for celebrations, a place for the very popular dance of Southern Albania, inspiring the saying "dance under olive shadows" (P. Rama, pers. com.). Without written evidence, yet supported by many scholars, there is a legend telling that to counteract the large-scale devastation of plantations in the 15th and 16th centuries, Scanderbeg, the Albanian national hero who fought against Ottomans in the 15th century, decreed that every couple have to plant olive trees before marriage.

Many ancient olive trees were given symbolic names, like in Piqeras where one can find "the olive of Scanderbeg" and "the olive of tears". According to local inhabitants, their predecessors planted olives trees to commemorate the marriage of Scanderbeg, but only one of those is still surviving. "The olive of tears" was a ballad about wives watching their emigrant husbands travelling by boat to the first station of their trip, the Corfu Island. In the area of Tirana, olive twigs were placed in the veil of brides as a symbol of longevity, happiness and harmony for the young family (Osmani, 2002). In olden times, it was believed that burning the leafy twigs in the chimney inside a living room at Christmas time removes bad spirits from the house. On the other hand, olive is also considered as a symbol of luck. The first morning of January, wishing for a prosperous new year, the man of the house wakes up early to bring home the sheep that gave birth, along with an olive twig (P. Rama, pers. com.).

According to Albanian tradition, mistreating olives is seen as an intuition of future events especially of bad times. If an olive tree would have been damaged when soil was overturned, this was a sign of something bad happening like war epidemic, earthquake, etc. This was one of the reasons why people made strong walls to protect olive trees, even if that was not really justified (P. Rama, pers. com.).



Olive oil was selected among other oils for cleaning guns. In this case, the oil was obtained by crushing the fruits by foot wearing pattens, and they were using only the upper oil layer that comes out being the cleanest one. Olive oil for lighting the home was a significant innovation for civilization.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olive oil and fruits are not so commonly used in cooking, even in the olive-producing areas of the country. For a long time, due to its scarcity, oil was conserved to be used as a medicine rather than a common food. Below are some of few recipes.

➤ Olive Salad or Coast Salad:

Ingredients: (for 4-5 persons); 2 teacups full of olives, 1 average white piece of leek or 2 medium size onions, 2-3 tablespoons olive oil, half a lemon or 2-3 spoons of vinegar.

Method: Olives are rinsed with water, placed in a plate. Minced leek or boiled onions with finely minced parsley are sprinkled out in a circle. Finally olive oil, lemon juice or lemon slices are added. If the latest are not available, a little quantity of vinegar is used.

➤ Orange Salad (Fig. 12):

Ingredients: (for 4-5 persons); 4-5 average size orange fruits, 2-3 tablespoons olive oil, 1-2 spoons of sugar, 2 teacups full of olives and 2 medium size onions.

Method: Orange fruits are cut into small cubes (rind removal is optional) and are nicely placed on the plate. Sugar is also poured onto the oranges. Minced onions and other greens are added as desired along with olives. These are mixed with salt, pepper and olive oil.

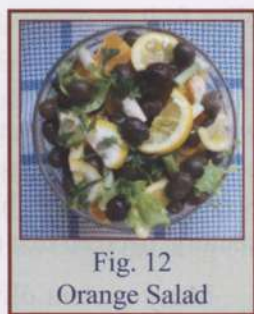


Fig. 12
Orange Salad

There are several traditional dishes for which olive oil is used exclusively, like *trahana* (fermented yogurt with flour), *tarator* (yogurt with cucumbers) and *fasule* (cooked beans).

POPULAR MEDICINAL AND COSMETIC USES

Albanian people have always regarded olive oil as a medicine and that is why they pay a higher price compared to other olive producing countries, although they are much poorer. Unless otherwise indicated, the following information was obtained from Dionis Çakalli through personal communication.

- Leaves have been used as a natural remedy for high blood pressure, pouring boiled water over 7-10 leaves.
- Olive oil produced by traditional methods (pressing with the feet) mixed with honey and lemons, has been used to cure liver and stomach illnesses.
- Massage with olive oil and placement of raw (unwashed) sheep's wool is used to cure pleurisy.
- Medieval soldiers greased their body with olive oil before combat.



- Olive oil has been used to soften and close hand lesions caused by cold or hard agricultural work.
- Massage of the scalp is a way to prevent hair loss.
- Several natural cures use olive oil as an ingredient (P. Rama, personal com.)
- Healthy or long-lived people, living in olive areas were considered as olive oil consumers (P. Rama, personal communication).

OLIVES IN TOURISM AND LANDSCAPING

The presence of olive orchards around ancient cities suggests that it can be used to promote agritourism as in the ancient cities of Berat, Elbasan, Tirana, Vlora, etc. Such old olive orchards, like permanent green knights, co-existing with the clean clear sky, sun and moon, are testimonies to the glorious story of Albanians, producers of life-bearing oil, curative and healing, an elixir of rare magic, which in Albania is found in its full form and flavor, as laid out in the table of Illyrian Gods¹.



Fig. 13

Old olive trees transplanted around Mother Theresa International Airport in Tirana to enhance image and add nobility



Fig. 14

Old olive trees hollowed out from their original place and prepared in large containers to be sold for landscaping

In the last decade, olive trees have been increasingly used as ornamentals in tourist resorts, large trade centers, airports (Fig. 13), parks, villas or even at traffic rings, to add a historic and pleasing touch. This has created both a legal and sometimes illegal market of old olive trees (Fig. 14). As part of a large program to plant 20 million olive trees, the government has ordered that all new tourist resorts in the Albanian Riviera should include the plantation of olive trees in their courtyards.

¹ Are objects of worship of the Illyrians, an Indo-European people in ancient history who maintained a polytheistic religion. Central to their beliefs was the concept that everything was "born" by Mother Earth, who was represented by the Goddess "Genusus". The name of the goddess is believed to have a relation with the Greek word of "Genesis", which is translated as "the beginning" of an object, or act.



OLIVE WOOD AND BY-PRODUCTS USES

In earlier times, when plows pulled by bulls were common, the implement was sometimes made with olive wood to increase the depth of tillage and ensure a longer working-life, relying on the hardness of olive wood. For such plows, yokes were made using fire-treated olive branches to create a curvature. Olive seeds were used to make rosaries for believers. During the 1980's olive wood was used to hold curtains and for chandeliers, which were also exported as souvenirs. Pomace cake is mainly used as fuel for lime furnaces. Although rarely, pruned branches are used as heat intensive firewood.

The artist Muhamet Trepçi has exhibited his olive wood creations at the National Museum of Rome. According to the author, these figures do not simply coincide with the annual growth rings, but are rather designed by lightening, which show the ability of olive trees to become photogenic (Fig. 15).

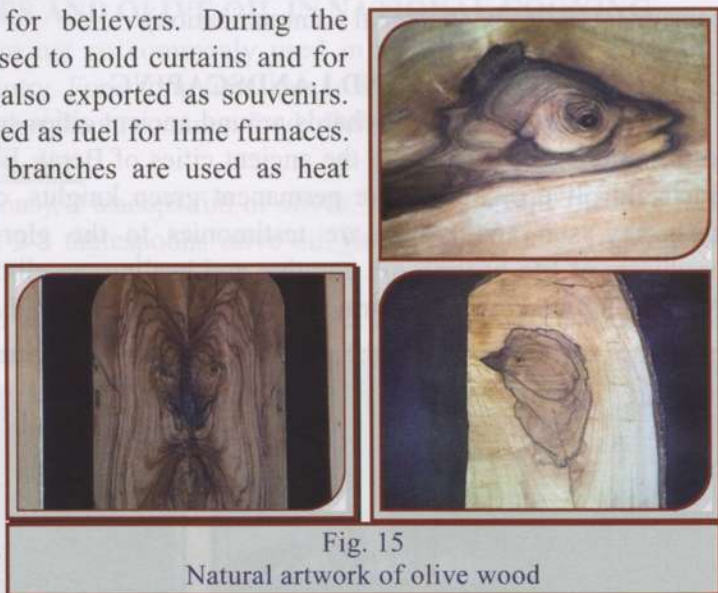


Fig. 15
Natural artwork of olive wood

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P. Searles¹ psearles@crilar-conicet.gob.ar, M.C. Rousseaux¹, J. Ladux²,
E. Trentacoste³, C. Arjona⁴, J. Cólica⁵, C. Matias⁶, L. Bueno⁷, F. Vita Serman⁷

¹CRILAR-CONICET, La Rioja

²Agencia de Extensión Rural, Instituto Nacional de Tecnología Agropecuaria
(INTA-Aimogasta), La Rioja

³Estación Experimental Agropecuaria, INTA-Junín, Mendoza

⁴Facultad de Ciencias Agrarias, Universidad Nacional de Cuyo, Mendoza,
Agencia de Extensión Rural, INTA-Andagalá, Catamarca

⁶Estación Experimental Agropecuaria, INTA-Catamarca, Catamarca

⁷Estación Experimental Agropecuaria, INTA-San Juan, San Juan



INTRODUCTION

Argentina is the 8th largest country in the world with an area of 2,766,890 km², extending from the tropics (21° S latitude) to the Sub-Antarctic tip (55° S latitude) of South America (Fig. 1). The Atlantic Ocean lies to the east along much of the country. To the west, the Andes Mountains provide a geographic barrier with Chile. The stretched length of the country (3,650 km) results in a tremendous range of climatic and edaphic conditions for agricultural production with a total of 330,000 km² of cultivated land (FAO). Annual crops represent the vast majority of the cultivated land surface (320,000 km²), and soybean accounts for about one-half of this area. Most of the soybean is produced in the Pampa Húmeda near Buenos Aires, the capital of the country, and its spread through neighboring provinces has become quite controversial. The perennial crops such as fruit trees and vineyards represent about 10,000 km² (i.e., one million ha) of cultivated land. Citrus production is important in the subtropical, humid areas in Northern Argentina (province of Tucumán), olive and grapes in the more arid Andes region at mid-latitudes (Catamarca, La Rioja, San Juan, and Mendoza), and apples and pears dominate the cooler Patagonian Region (Río Negro, Neuquén).



The variability of Argentina's climate is influenced by the latitudinal differences, and the moderating influence of the Atlantic and Pacific Oceans, from the humid subtropical climate to the north to the cold weather in the south or in high altitudes of the Cordillera. Average annual temperatures range from 24 to 11° C in Buenos Aires (sea level) and Córdoba (420 m), and 24 to 8° C in Mendoza (820 m). Rain falls throughout the year varies from 1,000 mm/year in Buenos Aires to less than 250 mm in Mendoza in the foothills of the Andes.

OLIVE CULTIVATION HISTORY

Olive production has a long history in Argentina. Most evidence suggests that cuttings were brought from Sevilla, Spain to South America as early as the 1520's. Cuttings probably reached Argentina from either Perú or Chile via one or more of the passes in the Andes Mountains. Even today, most of Argentina's production is located in the arid and semi-arid mountain valleys alongside the Andean range, stretching from Catamarca in the north to Mendoza in the south. It has been reported that King Carlos III of Spain ordered that all olive trees and grape vines in Argentina be felled in 1777 due to concerns about potential competition. During this period, grape vines were mostly cultivated by monasteries to provide wine for religious ceremonies. Legendary, it is said that all of the olive trees in Argentina were destroyed except for one small tree that was wrapped in a baby's blanket and saved from the Spanish forces. This tree can be seen today in Aimogasta in the province of La Rioja (Fig. 2). Nevertheless, other accounts disputed this claim and potentially more ancient trees such as the Huasán Centennial Olive Tree in Andagalá (province of Catamarca) have been identified.



Fig. 2
400 year-old olive tree in Aimogasta,
La Rioja. Declared a National
Historical Monument in 1980

Despite the efforts from Spain, a priest from the province of San Juan, Alonso Hernández, was quoted as saying, "there existed an appreciable amount of cultivated olive in 1706 in Pocito [San Juan] on rocky soils that provided refuge not only for olive trees, but for the first olive mills as well". Growers of small olive orchards of the 1700's and 1800's had to conquer the desert to obtain sufficient water for irrigation because rainfall was well below 250 mm in many areas. Olive production was often limited to oases that shifted as the rivers changed course from one year to the next, or in dry years with little rainfall. In the driest areas, natural springs were relied on to provide irrigation water. In the early 1800's, Argentina obtained independence from Spain, but civil warfare and unrest were rampant and communication was limited with the capital city of Buenos Aires. It was not until the

1870's when the railroad reached this region (Mendoza, San Juan, La Rioja, and Catamarca) that a true national market for olive oil and table olives became feasible.

In the late 1800's and early 1900's, immigration to Argentina from European countries, mainly Spain and Italy, led to a renewed interest in olive growing in the Andean region. Families with last names such as Tittarelli, Del Bono, Fábregas, and Rufrano brought new cultivars and installed olive presses that were considered advanced for that time. As the population of the country increased, demand for olive oil and table olives soared. Due to this demand and limited possibilities for importing oil during the Great Depression, the federal government initiated an "Olive Economic Region" that included all provinces with the appropriate agro-climatic conditions for growing olives (national law 11643). Although other vegetable oils continued to dominate the national production, government programs strongly stimulated olive production through the 1960's. These programs provided access to credit for small-holder growers, created experimental nurseries to evaluate cultivars, and provided technical assistance. Along these lines, the Ministry of Agriculture and Livestock organized the first National Olive Growing Conference in 1954, and the National Olive Corporation was active until 1970. During these decades, many small towns were transformed into important agro-industrial centers (Olivera, 2000). During the 1970's and 1980's, production lagged considerably due to competition with other vegetable oils such as sunflower and corn oil. It was not until the 1990's that tax deferment laws for the provinces of Catamarca, La Rioja, and San Juan provided a new impulse of economic activity and the birth of modern olive growing in Argentina.

AREA UNDER OLIVE CULTIVATION

As of 1990, the total area planted with olive trees was about 30,000 ha with most production being in the provinces of Mendoza (13,700 ha), Córdoba (5,000 ha) and San Juan (4,800 ha) (MAGPyA 2004, Ministry of Agriculture, Livestock, and Fisheries). Most of the farms at this time were smaller than 10 ha, with traditional planting density of 10x10 m, and were flood irrigated. The tax deferment laws brought in large investments that included bigger orchards of more than 100 ha applying higher plant density (e.g. 8x4 m) and using drip irrigation. Currently, there are about 110,000 ha under intensive cultivation. More than 90% of the total area cultivated with olive in Argentina is in the provinces that border the Andes mountains in the Central-west and North-west of Argentina: Catamarca (31,000 ha), La Rioja (30,000 ha), San Juan (20,000 ha) and Mendoza (19,000 ha). Small, traditional farms in the hilly areas of Córdoba continue with small-scale production (5,500 ha), while the provinces of Neuquén and Río Negro are just starting to explore the potential for high quality olive oil in Northern Patagonia. Lastly, the province of Buenos Aires contains some old farms with mixed production models (livestock and olive trees) and some new boutique olive orchards by small investors.



OLIVE CULTIVARS

‘Arauco’ is the only cultivar recognized from Argentina in the World Catalogue of Olive Varieties (International Olive Council, 2000). It is most likely that ‘Arauco’ was selected during colonial times from the progeny of cuttings sent initially from Spain, and is similar to ‘Azapa’ in Chile and ‘Sevillana’ in Perú. It is said that ‘Arauco’ means “water from the clay or earth”; a likely reference to the natural spring water that was used by the native people to irrigate olive trees in some parts of North-west Argentina. Today, ‘Arauco’ is found throughout Argentina and was the most cultivated cultivar until late 1990’s. ‘Arauco’ has vigorous growth, a long elliptically-shaped leaf, and very large asymmetric fruits (Fig. 3). Due to their size



Fig. 3
‘Arauco’

and high flesh/stone ratio, ‘Arauco’ fruits make excellent table olives and olive oil as well. For table consumption, they are processed either green when harvested towards the end of summer or as black olives in the fall. Green olives are most often processed using caustic soda to remove the bitter flavor, washed several times, and then fermented. The ‘Arauco’ oil is sometimes bitter and pungent due to high polyphenols, especially if the trees have received little irrigation, but it is excellent for blending with the oil of milder taste and less polyphenols. ‘Arauco’ is particularly sensitive to *Verticillium dahliae* and to *Pseudomonas savastanoi* pv. *savastanoi*, the causal agent of olive knot disease. It is also sensitive to frost damage.

Recent evidence from the province of Catamarca indicates that there is a wealth of undocumented genetic diversity in the small, traditional orchards located in the oases throughout the Andes Region (Cólica, 2008). Thus, while ‘Arauco’ is the most common Argentine cultivar, there are likely to be literally dozens of little known cultivars throughout the country. The National Institute of Agricultural Technology (*Instituto Nacional de Tecnología Agropecuaria*) is currently conducting prospecting studies to explore this diversity.

A number of foreign cultivars were introduced into Argentina from the 1930’s to the 1960’s during the first government-sponsored expansion of olive cultivation. Several germplasm collections (i.e. varietal gardens) from this period are still maintained. For example, Trentacoste and Puertas (2011) re-examined 73 introduced accessions (mainly Spanish and Italian), and four locals (three of which were related to ‘Arauco’) from an old collection in Mendoza, to determine which of the accessions might be viable for future commercial plantings. Information on the fatty acid profiles of many cultivars from a collection in Catamarca dates back to at least the 1960’s (Karman de Sutton *et al.*, 1965). In the 1990’s, the tax deferment laws

required thousands of hectares to be planted in a very short timeframe. This resulted in a massive importation of olive transplants before local nurseries could be set up. The most commonly imported cultivars for new commercial plantations were 'Arbequina', 'Picual', 'Empeltre', 'Aloreña', and 'Manzanilla' from Spain and 'Frantoio', 'Leccino', and 'Coratina' from Italy. 'Arbequina' is now the dominant oil cultivar in Argentina and 'Manzanilla' has replaced the native 'Arauco' in most provinces as the preferred table cultivar in commercial orchards because of its acceptance in the export market. However, some introduced cultivars have not succeeded. Considerable areas of 'Empeltre', 'Frantoio', and 'Leccino' have been removed due to lack of flowering as a result of too little winter chilling in the North-west of Argentina (Catamarca and La Rioja). Low oleic acid content in 'Arbequina' in the North-west is also a concern, but otherwise the cultivar has adapted well. Detailed studies of the adaptation of Mediterranean cultivars to the local agro-ecological conditions are greatly needed. This undertaking will be complicated by the wide range of climatic conditions found along the north-south latitudinal gradient in Argentina, but it should be a rewarding effort.

IMPACT ON ECONOMY AND ENVIRONMENT

Consumption of table olives and olive oil is fairly low in Argentina; about 400 g of table olives and 150 g of olive oil are consumed annually per capita. The low level of consumption is partially related to the high price of olive oil relative to vegetable oils. However, both table olives and olive oil are extremely important to the regional economy in the Central-west and North-west regions of the country. Due to the boom in area planted in the 1990's, production and exports have increased greatly in the last 10 years. Argentina is now one of the top five exporters of table olives in the world with up to 100,000 tons exported per year and well over 100 million USD sales. Although oil production represents a fairly small percentage of the world export market, exports accounted for about 70 million USD in 2009 (MAGPyA). Most of the exports go to other Latin American countries; predominantly Brazil, and North America.

The increase in production has created thousands of jobs regionally, in both the agro- and processing subsectors of the olive industry. In addition to large companies, small-holder growers have started to form cooperatives with the help of the provincial governments, allowing them to place their own products in the super markets (Fig. 4). Aside from securing higher level of income, these cooperatives allow the growers to have their fate in their own hands, rather than relying on middlemen. The success of small-holder growers also helps to maintain the social framework in



Fig. 4

A small cooperative and surrounding olive orchards in a North-western oasis

small villages located on marginal lands where jobs and opportunities are scarce.

The expansion of oliviculture has not come without some environmental cost. The water used for irrigation in the large orchards of more than 100 ha is almost exclusively ground water, with wells drilled down as deep as 400 m. In the desert provinces of La Rioja and Catamarca, irrigation water for olive orchards represents over 80% of provincial water use. The processing of table olives also adds to overall water use with untreated brine being channeled from large processing facilities into drainage ditches and then evaporated in the desert; contaminating natural ecosystems. Brine and caustic soda used in processing green olives by small-holder growers can also end up in local irrigation systems or are sometimes dumped illegally. Currently, research and efforts are conducted to minimize potential environmental damage. The maintenance of small olive orchards in and around urban areas may also help to limit erosion and desertification.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

A number of old cultural practices are still in use by small-holder growers. For example, most small orchards are planted at a density of 80-100 trees per ha with 10-12 m between trees within a row as well as between rows (Fig. 5). This practice was copied from Spain and Italy by immigrants to Argentina, and continues to date. Due to the very arid conditions in most of the Andes Mountains region, dry-farming is not possible. In Mendoza and San Juan, river water is diverted to irrigate even the very small orchards. More to the north-west in La Rioja, water from small mountain streams or natural springs is more likely to be used. The irrigation is primarily flood irrigation with low efficiency. However, the ground of each tree is often surrounded by a border of raised soil to concentrate the water around the tree trunk, rather than losing it in the inter-row space. This gives the impression that each tree is contained within a *taza* or cup (Fig. 5).



Fig. 5
A traditional flood-irrigated olive orchard with large, sprawling trees

The trees in small, traditional olive orchards are usually quite large. Trees 7-8 m high are commonly seen, and harvesting requires large wooden ladders that can be leaned against the tree canopies. Great care is needed to avoid falls during harvesting. Also, tree size often complicates pruning. Generally, the younger generation does the harvesting and older family members dedicate time to the irrigation and removing weeds, a practice that was done traditionally by plowing with a horse. Today, the horse has been replaced by modern tractors in most orchards.

While cultural practices are passed down from generation to generation by traditional farmers, there are some that could be improved. A common complaint is that ‘Arauco’ shows a high degree of alternating production. Partially this phenomenon may be attributed to poor pruning strategies. Following an “on” year when the trees should be pruned well to rejuvenate their vegetation, many growers leave them unpruned or with very little pruning, which may exacerbate alternating. Additionally, harvesting is often not started until after the Easter holiday. If Easter happens to be late in the fall season, the harvest will be late and alternating production may result. In Mendoza, olive is secondary to wine production and harvesting the grape crop often takes priority over olive, leading to very late harvests in some instances.

PROCESSING METHODS OF RAW OLIVES

The consumption of unprocessed olives in the Andes Mountains Region is very common. In the North-west of Argentina, the lack of rainfall in the autumn allows for traditional ‘Arauco’ olives to be dried naturally by the sun without the use of salt. Very ripe olives are collected, spread out on shade cloth, and allowed to dry for one month. Typically, each individual olive is gently squeezed between the thumb and forefinger every day to separate the skin from the pulp and to hasten drying. Each olive is also rotated slightly on a daily basis to obtain more uniform drying. The olives are eaten raw or stored in olive oil. In more recent times, dried olives have even been stored in freezers to prevent fungal damage. Olives are also dried in some areas using a combination of salt and the evaporative powers of the sun. Olives are basically sandwiched between layers of salt within a perforated bag until they are dehydrated.

Many small-holder growers preserve the customs of their Spanish and Italian grandparents by crushing or splitting green olives and extracting the bitter flavor with water. Black olives are ripened naturally and prepared in brine. The olives are usually removed from the brine and exposed to the air one day a week for the first 2-3 weeks of processing (Fig. 6). Artificially ripened black olives are fairly uncommon. In Mendoza, the standard salt in brine is often replaced by ashes from the desert bush *Allenrolfea vaginata* (known locally as *Jume*). The ashes of this species have an extremely high sodium/potassium ratio.



Fig. 6
Naturally black olives exposed for a day in the sun in preparation for table olives processing

Traditional methods of extracting olive oil include “mortar and pestle” and old-fashioned stone mills and disc presses. For home use or for local sales, some rural families still extract olive oil using large mortars made of extremely hard wood from *Prosopis* trees (known locally as *algorrobo*). The pestle may be of either wood or



Fig. 7
Traditional presses from 1950 are still used in a mill near Andagalá, Catamarca

continuous extraction systems using centrifuges are prevalent.

With the new era of the olive industry, many centrifugal extraction systems for olive oil have been introduced to the country; however some of the old presses are still preferred by traditional processors. The mills are well maintained and continue to operate after more than half a century (Fig. 7).

TRADITIONS AND CULTURE

There are at least half a dozen festivals associated with olive production in



Fig. 8
The wife of the Provincial Governor of La Rioja crowns the beauty queen of National Olive Day in the 1950's

Argentina. Among them, and the most well-known is the National Olive Day Festival in Aimogasta, La Rioja, that takes place on the 24th of May. This festival has been conducted since the early 1940's, and each year there is a parade, a speech by the provincial Governor, live music, and the coronation of a beauty queen to mark the end of the harvest season (Fig. 8). The following day is the celebration of the Day of the Revolution and coincides with the formation of the first independent

government in Argentina on May 25, 1810.

Cruz del Eje in the province of Córdoba also lays claim to a national olive festival in early February. The festival is opened with the blessing of the current year's crop, and a fireworks show. The music includes top-flight national folklore and rock artists such as Soledad and Alejandro Lerner. In the province of San Juan, the first olive festival occurred in 1967 in Angaco. Similar to Cruz del Eje, one of

the primary objectives of this festival is the blessing of the olive crop. In the province of Mendoza, there are at least two celebrations including the oddly named Chicken and Olive Festival in Junín in January and the Provincial Olive Festival in June. Even the province of Buenos Aires, where soybean is the king, has recently started an olive festival in the town of Coronel Dorrego (Fig. 9).



Fig. 9

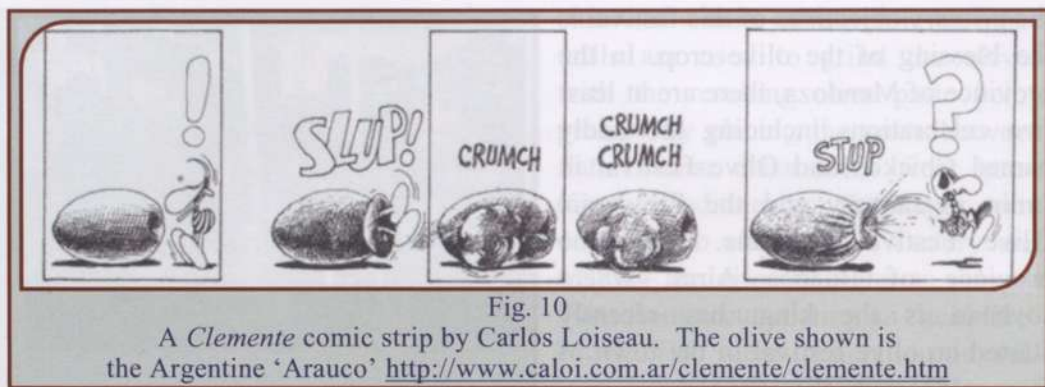
A small-holder grower selling his products at the olive festival in Coronel Dorrego (Province of Buenos Aires)

The province of Catamarca has also been annually hosting a large olive exhibition called “Expolivo”, since 2005. This expo is a huge 4-day event that includes technical talks by international experts, commercial stands, cooking classes, demonstrations of mechanical harvesters, and meetings between prospective buyers from around the globe and local companies. Attendance is now routinely topping 10,000 people per year.

Much of the music at these festivals is national folklore music. This music is extremely popular in the Central-west and North-west of Argentina along the Andes Mountains, and includes *Zambas*, *Cuecas*, and other styles. This music transmits the oral traditions of the region and includes references to olive trees as well as to vineyards and walnut orchards. In an olive-lined town *plaza* or square, it is rumored that the famous Argentine historian and poet, Felix Luna, met a young woman with the last name of Romero and fell in love with her. His emotion was captured in the song *Zamba de usted*, and the lyrics include the following lines: “*Por oír otra vez la tonadita de su voz, niña de los ojos color de olivo, me iré tras la zamba, Romero de amor...*”. These lines can be roughly translated as: “to hear the sound of your voice again, my darling with olive-colored eyes, I will come to you through this song, my Romero of love...”. Another song, *El regador* by the Fabianos, muses about the trials and tribulations of a young worker in charge of irrigating a vineyard that is surrounded by olive trees. The olive trees provide a perfect spot for the young man to wipe the sweat off of his brow.

Olives permeate the Argentine psyche to such an extent that they are regularly featured in the nationally-published comic strip *Clemente* by Carlos Caloi Loiseau. In this comic, Clemente (a duck-like figure) has a running battle with an olive that he is trying to eat. His relationship with the olive is so complex that the olive often threatens to kill itself rather than being eaten. In the comic shown in (Fig. 10) an olive turns the tables on Clemente and eats him whole; only to spit him out. Interestingly, the olive shown has the classical asymmetrical form of the Argentine ‘Arauco’.





OLIVES AND OLIVE OIL IN NATIONAL COOKING

Table olives are quite common in Argentine *empanadas* (Fig. 11). They are small meat pies with pastry dough that are either baked in the oven or deep-fried in vegetable oil. A typical empanada in the Central-west of Argentina contains ground beef, onions, boiled eggs, and chopped olives along with spices such as salt, pepper, and chili powder. Oregano is the most common herb that is added. Interestingly, although *empanadas* are quite common in North-west Argentina, they usually contain meat and small cubes of potato without olives. *Empanadas* are almost obligatory at any large gathering and rival *pizzas* as the most popular fast food in the country, leaving North American-style hamburgers far behind. *Pizzas* are almost always decorated with one 'Arauco' olive per slice. The olive can be green or natural black often depending on the *pizza* requested. Table olives are also important appetizers, and often accompany cheese, salami, and red wine before the main meal. On a sad note, those that are less fortunate may consume bread and olives to relieve hunger during times when money and jobs are scarce.



Fig. 11

A gourmet version of a traditional *empanada*, (Photo by Tammy Green) http://en.wikipedia.org/wiki/File:Empanada_Gourmet.jpg

Surprisingly, olive oil is not an important part of the Argentine diet. However, olive oil has long been bottled commercially in the Western part of the country, and has been used traditionally in most pasta dishes (e.g., *pesto*) due to the influence of Italian immigrants. Currently, olive oil is regaining national prominence because of its health-related benefits, and olive oil mixed with balsamic vinegar is a popular salad dressing. With the recent inclusion of Argentina as a member of the International Olive Council, it is likely that marketing campaigns will increase consumption over the long-term.

OLIVES AND TOURISM

The *Ruta de Olivo*, or Olive Road, starts in the south from the province of Mendoza along the historic highway 40, continues through San Juan and the west of La Rioja before turning east on national highway 60, and finally ends in the city of San Fernando del Valle de Catamarca on highway 38. This is a journey of several hundred kilometers across several valleys and over snow-capped mountain ranges, but is well worth the effort. There is an infinite number of small towns along the route with old colonial buildings and churches as well as traditional adobe dwellings. Olive orchards and vineyards play an important role in these communities and visits to local olive farms and bodegas can easily be arranged. In Aimogasta, La Rioja, the *Olivo Cuatricentenario*, a 400 year-old olive tree, is a popular tourist site. In Andagalá, Catamarca, the rival Huasán Centennial Olive Tree can be visited as well as an associated factory, which still uses traditional oil extraction methods (Fig. 7, page 20). Other places and activities of interest include national parks, ancient Incan ruins, and the internationally famous Dakar Rally in early January.

OLIVE BY-PRODUCTS USES

With the developments of olive industry, there is a great deal of interest in using the large quantities of olive pomace, the solid waste from olive mills, to generate electricity. Some table olive processors use olive stones from de-stoning in covering the dirt roads on their premises which is cheaper than pavement and more environment friendly (Fig. 12).



Fig. 12
Dirt road covered with olive stones

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Alvina Avagyan¹ alvinaav@mail.ru,
Derenik Bejanyan², Marina Hovhannisyan¹, Margarita Harutyunyan¹

¹Armenian State Agrarian University, Teryan Str.74, Yerevan

²Agronomist, Tavush marz



INTRODUCTION

The Republic of Armenia (Fig. 1) with an area of 29,743 km² is located in the verge of Southern Caucasus and Asia Minor. It occupies the North-east part of the Armenian Highlands, at the border of Caucasus and Western Asia. The territory of Armenia is situated between latitudes 35° 50' and 40° 15' N and longitude 43° 27' and 46° 37' E. Armenia is a landlocked country and the smallest of the three Southern Caucasus countries, with a population of around 3.2 million people (urban population is about 2 million and the rest live in rural areas).

Armenia is a typical mountainous country with a complex of different geographical features. The average altitude of the country's territory is 1,800 m above sea level. The highest peak is Mount Aragats (4,090 m above sea level) and the lowest point is the Valley of Debed River (380 m). Most of the territory (76.5%) has altitudes of 1,000-2,500 m above sea level, and only 10% of the country is located below 1,000 m. Such altitudinal variation results in a great diversity of climate, landscape, land type and ecosystem, distinguished by droughts and water shortage. Water resources in the country are quite limited. The largest lake is Lake Sevan; it's a natural source of drinking water for the region. Rivers are small and shallow. Armenia is characterized by mountainous continental climate, peculiar for its dryness. The usable agricultural lands make 71.3% of the country's total area, with arable lands making only 15.2%.

Armenia is a country of diverse climatic contradictions; the substantial changes can be observed even on small distances, because of the complex terrain. The country has almost all types of climate, from arid subtropical to cold high mountainous. The average annual precipitation amounts to 592 mm/year, however not uniformly distributed. Lowest precipitation of 200 to 250 mm/year is in the arid

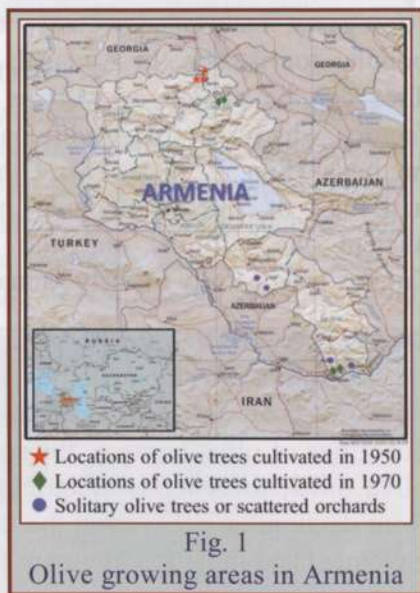


Fig. 1
Olive growing areas in Armenia



zones of the Ararat Valley and Meghri Region. Maximum precipitation is recorded in high mountainous areas at around 1,000 mm/year.

The Armenian Plateau is considered to be one of the places where agriculture has originated. The archaeologists have found many evidences which support this hypothesis. It is known that in era of Urartu (782 BC) the wine-making culture in Armenia was of high quality and reached large scale. The great diversity of wild relatives of plants, still growing in the country, is another evidence of being one of the most ancient agricultural centers. Nowadays, the agriculture in Armenia is one of the most important sectors in the national economy and societal welfare. Agriculture combined with food processing industries accounts for much of the country's employment and export earnings. The share of agriculture has accounted for 18.8% of the country's gross domestic product on average during the period 2005-2010, which creates favourable preconditions for the gradual increase of the level of the country's food security. The new market-based economy includes about 340,000 farm households with an average landholding of around 1.4 ha, which due to small sizes are susceptible to economic risks and external shocks.

OLIVE CULTIVATION HISTORY

Armenia has one of the oldest cultures. The name Armenia appeared for the first time in history in 521 BC. In 301 AD, Armenia adopted Christianity thus becoming the first country in the world to proclaim it as the state religion. The history of olive in Armenia, according to the Holy Bible refers to the time when Noah's Ark landed on Mount Ararat after the deluge. Noah after sailing with the ark for about 11 months, sent out a dove to see if it would find land, but it found no place to rest and returned to the ark. Seven days later, Noah sent the dove out again, yet this time it flew back carrying an olive branch, and it was a sign that the flood is subsiding.

Olive tree branch as a symbol of Jesus crucifixion is a part of spiritual Christian ceremonies. During the Easter celebration, Armenian clergy hold an olive tree branch, and pilgrims walk in a procession around the tomb, traditionally believed to be the site of the crucifixion and burial of Jesus Christ, in the Church of the Holy Sepulchre, in Jerusalem's Old City.

Olives have been cultivated in historical Armenia from immemorial times. The written references on that fact are found in ancient manuscripts (Fig. 2, 3) from the



Fig. 2
Old Matenadaran Manuscript



Fig. 3
Page from Matenadaran

well as the honored agronomist B.A.Vardanyan), after making the land irrigated. A large olive orchard was established at that time in the villages of Ptghavan, Haghtanak and Bagratashen, together with orchards of figs, pomegranate and persimmon. In 1970 the olive area in this particular region made up 185 ha, of which 25 ha consisted of isolated scattered trees or small groups of trees, while the remaining 160 ha were large orchards (Fig. 1, page 24).

AREA UNDER OLIVE CULTIVATION

With the beginning of commercial size orchards in 1949, olives were cultivated on the relatively low area located on the Debed riverside at 400-450 m above sea level, later on the orchards were gradually extended to higher zones reaching up to 500-600 m above sea level (Fig. 5). Climate and soil conditions were for olive cultivation, yet frost might have been of concern (Fig. 6). In particular, the sum of annual active temperatures (above 10° C) varies between 5,800° and 6,000° C, annual average temperature of 13,5° C, sunny days of 300 to 310 per year and the days with temperature below zero are about 260. The average annual precipitation in the olive growing areas amounts to 450-500 mm, of which 40-45% occurs in April-May. Generally summer and the first month of autumn are dry.

Currently the main area of olive cultivation in Bagratashen region is 65-70 ha. The region is located within the lowlands of Tavush Province (Fig. 7). Small groups of olive trees or just solitary ones can be found also in some other regions of the country, in particular in Lori and Syunik Marzes on southern slopes on altitudes varying from 800 to 850 m above sea level. In spite of frosts happening several times in the last decades olive trees are still growing and fructifying. However, the main limiting factors for olive cultivation in Armenia remains to be low temperature levels in winter time and low precipitation during the



Fig. 5
Olive trees on high altitude



Fig. 6
Common snow scenery in winter
(Photo by Damiano Avanzato)



Fig. 7
Maintaining abandoned trees in Tavush
(Photo by Damiano Avanzato)

vegetation growth cycles. For the given reasons, olive cultivation is recommended to be on irrigated land on eastern slopes higher than Debed River with preference cold resistant cultivars which ripen early. There, the climate is temperate with an average temperature in January of 0° to 8° C, and in July of 21° to 22° C, while annual rainfall is 500-600 mm.

Olive trees in Armenia are propagated by softwood cuttings under greenhouse conditions. The prevalent planting density is 330-400 trees/ha. On average 15-18 kg fruits/tree are harvested from 22-25 year old trees.

OLIVE CULTIVARS

About 38 olive cultivars have been introduced from Nikitsky Botanical Garden, Absheron Peninsula, Azerbaijan, as well as from Algeria, Greece and Spain to facilitate establishment of commercial orchards in Armenia through selection of the most suitable ones for local conditions. Results of 25-30 years experimental studies revealed that 'Ascolana', 'Nikitsky I', 'Nikitsky II', 'Nikitsky 3' and 'Ggrimi-172' cultivars brought in from Nikitski Botanical Garden are more cold-resistant compared to others and thus are the most suitable for local agro-ecological conditions. Among them 'Nikitski I', 'Nikitski II' and 'Ghrimski 172' are the most distributed. They have the following main characteristics:

'Nikitski I' has medium size fruits, rounded-oval shape with an average weight of 3.5-4.0 g. It is frost resistant, early ripening, used for oil production and canning.

'Nikitski II' fruits are large having a weight of 5.5-5.6 g, shape is longish-oval with conic top. It is frost resistant, late ripening, green fruits are used for marinade, and fully ripe fruits for canning and oil production.

'Ghrimski-172' fruits are large, round having a weight of 4.5-5.0 g. It is frost resistant, late ripening, large fruits are used for marinade, and fully ripe fruits for oil production.

In addition to the above mentioned cultivars, others such as 'Sevilano', 'Raco', 'Agostino' and 'Delemsen' are also cultivated. However, in spite of the high quality of their fruits, they have low resistant to cold and often suffer from winter frosts.

IMPACT ON ECONOMY

In 2010 a high yield of olives was harvested in Armenia for the first time in the past 50 years. The Mir Interstate Television and Radio Company reported that the olive orchards in the North-east of the country, which did not bear fruits for over 50 years, have finally given a crop. Nevertheless Armenia, being a net importer, has imported a total of 376.9 tons during the period 2006-2010 valued at 1,425,257 USD.

With the recent development, olive cultivation has the potential to develop into a commercial crop if the right cultivars and the right locations are rationally selected.



With the support of a local businessman, olive orchards have received more attention in terms of good crop management practices. The few olive growers, who applied such measures, harvested a total of nearly 20 tons of high quality olives, with palatability traits assessed by experts from Spain and Greece. Accordingly an order for olive export was placed from Spain and Greece, highly appreciating the taste of Armenian produced olives. This success story of potential new levels of production coupled with eager export markets will motivate growing more olive trees and possibly developing an olive oil industry.

METHOD OF EXTRACTING OLIVE OIL

To extract small amounts of olive oil, at home levels, stones are separated from the olive fruits pulp by hand; then it is ground into paste and placed inside a wooden container and left for a while for the oil to float on the surface. If the temperature is below zero, the contained paste can be kept outside, or otherwise it is refrigerated. When oil is needed for consumption, a piece from the frozen oil layer atop of the paste will be separated, washed and melted in a pan and thus it becomes ready for use.

OLIVE OIL IN RELIGION

Olive oil is a component of the anointing oil used in devotions of the Armenian Apostolic Church. Among Armenians, there are many legends related to olive, among which is the one telling about a blessed olive branch by Jesus Christ which was brought by Apostle Thaddeus to Armenia.

Once every seven years the most sacred and mysterious ceremony for Armenian people and Apostolic church takes place when in the Cathedral Church of Echmiadzin, Supreme Patriarch and Catholicos of all Armenians say the Mass for Holly Myrrh Blessing. Forty days before this event the Supreme Patriarch with his escort utters a prayer and reads some fragments of the Testament in front of a cauldron (a large metal pot) full of pure olive oil placed on the main altar of the church. During the ceremony, the old myrrh blessed by Gregory the Illuminator is mixed with the new one to keep the grace of God. The Supreme Patriarch and Catholicos of all Armenians fill the cauldron with more than 40 incenses, herbs, vegetative spices and flowers, as well as with linseed oil and wine. After two days boiling, the mass is filtered through the canvas and kept until the Day of Blessing.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olives have their special irreplaceable place in the delicious national cuisine. The culinary renaissance is now taking place throughout Armenia, where the food reflects a healthy combination of the ancient and the modern, through adding new recipes to traditional cooking. Since the origin of Armenian cuisine dates back to pagan times, Armenians still preserve old traditions of using olive oil in cooking,



making numerous fresh mixed vegetable salads with olives and decorating traditional dishes with olive fruits.

To prepare olive flavored pastry, the pulp of fully ripe olives is separated from stones, ground, mixed in different proportions with pastry and baked. A few recipes of Armenian salads with olives and olive oil are given below:

➤ **Vegetable salad with cabbage, carrot and olives** (Fig. 8):

Ingredients: 500 g cabbage, 2 small carrots, 150 g black olives, 2 tablespoons olive oil, salt and pepper.

Method: Chop cabbage, grate carrots, then add cut black olives, salt and add olive oil.

➤ **Salad with rice, corn and olives** (Fig. 9):

Ingredients: 100-150 g rice, lemon juice, olive oil, salt, green onion, coriander, pepper, 150 g black olives.

Method: Cook rice in salt water and strain; add cut green onion and coriander, black olives, juice of half of a lemon and two tablespoons of olive oil.

➤ **Salad with lettuce and olives:**

Ingredients: 150-200 g lettuce, lemon juice, olive oil, salt, green onion, coriander, parsley, 150 g black olives.

Method: Chop lettuce, parsley, coriander into small particles, and then add cut black olives, salt and two tablespoon of olive oil.

➤ **Armenian bulgur salad:**

Ingredients: 2 cups of coarse bulgur, 1½ cups of tomato sauce, ¾ cup of water, 1½ cups of diced tomatoes, 1 medium onion, olive oil as needed, 1 red chili pepper (optional), 1 bunch of chopped parsley, 1 tablespoon of pomegranate molasses, 1 lemon, juiced.

Method: Fry the chopped onion in a bit of olive oil and then add the bulgur; stir a bit, add tomato sauce, red pepper paste and water; bring to a simmer and boil gently for 20 to 30 minutes until the bulgur is soft and has absorbed most of the liquid. Set aside to cool, and then add lemon juice, a jiggle or two of olive oil, a tablespoon of pomegranate molasses, the chopped parsley, chopped tomatoes and chopped chili pepper, salting the mixture as required.

➤ **Olive Salad** also known as **Coast Salad**:

Ingredients for 4-5 persons: [2 full cups of olives, 1 average white piece of leek or 2 medium size onions, 2-3 tablespoons olive oil, half a lemon or 2-3 spoons of vinegar.



Fig. 8
Vegetable Salad with olive



Fig. 9
Salad with rice and olive

Method: Olives are rinsed with water, placed on a plate. Minced leek or boiled onions with finely minced parsley are sprinkled out in a circle. At the end olive oil, lemon juice or lemon slices are added. If the latest are not available, a little quantity of vinegar is used.

➤ **Armenian bean salad:**

Ingredients: 500 g dry great beans, 1 chicken stock cube, 4 tablespoons red wine vinegar, $\frac{3}{4}$ cup olive oil, 3 cloves garlic, 2 pressed green bell peppers, 2 large red onions, $\frac{1}{2}$ cup diced celery, $\frac{1}{2}$ cup pitted black olives, $1\frac{1}{2}$ teaspoons oregano, $\frac{1}{4}$ teaspoon garlic powder, salt and pepper to taste.

Method: Wash beans thoroughly, discarding any which float to the top, and soak overnight in cold water. The next day, bring beans to a boil in water and dissolve the stock cube in the water. Reduce heat and simmer for one hour or more until beans are tender (or cook in pressure cooker), then drain and cool under cold water. Chop one of the onions and one green pepper; place in a medium sized bowl with the beans. Combine all ingredients, mixing well. Slice the other onion and green pepper and garnish

POPULAR MEDICINAL AND COSMETIC USES

In traditional medicine, a mixture of olive oil and beeswax is used as an effective remedy for treatment of skin burns and ulcers. For treatment of stomach and ulcer chronic gastritis a mixture of 400 g of olive oil, 400 g of beeswax and 200 g of fresh butter is prepared. The beeswax is added to melting butter, and then the mixture is carefully filtered and blended with warmed olive oil. The final blend should be kept in a cool place until used, one table spoon taken three times a day for 15-20 days.

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INTRODUCTION

Mainland Australia (Fig. 1), with an area of 7.69 million km², is the earth's largest island but smallest continent. It stretches 3,700 km from north to south and 4,000 km from east to west, lies between latitudes 9° and 44° S, and longitudes 112° and 154° E.

For at least 40,000 years before European settlement Australia was inhabited by indigenous Australians, who belonged to one or more of roughly 250 language groups. After discovery by Dutch explorers in 1606, Australia's eastern half was claimed by Great Britain in 1770, and settled through penal transportation to the colony of New South Wales since 26 January 1788. The population grew steadily in subsequent decades as the continent was explored, and another five self-governing Crown Colonies were established. Australia is now a union of six states and various territories. New Zealand was not initially part of the colony, although when Britain annexed New Zealand in 1840 it was briefly a part of New South Wales. The inland territories are the Northern Territory and the Australian Capital Territory and the states are New South Wales, Queensland, South Australia, Victoria, Western Australia and Tasmania.



Tasmania is an island state 240 km south of the mainland, 315 km wide and 286 km long, with an area of 68,331 km² at latitude 41-43° S, it has a cool, temperate climate but its coastal areas, inland plains, and mountainous terrains produce many different micro climates supporting a myriad of bio-diverse enclaves. It has many inland lakes, rivers and streams, temperate rainforests and highland plateaus.

Australia's climate is significantly influenced by ocean currents, including the Indian Ocean Dipole and the El Niño-Southern Oscillation, which correlates with

periodic drought and the seasonal tropical low pressure system that produces cyclones in the North. Deserts cover a large percentage of the country, mostly in the Center and North-west. The continent is the lowest, flattest and driest one. Weather conditions differ both within and between states; for example, in New South Wales olives grow in both cool and dry, and warm and humid areas. Tasmania's cool winters and long, hot summers also present the ideal climate for many olive cultivars, as does South Australia's Mediterranean climate.

Australia is a major agricultural producer and exporter, with 135,996 farms covering 61% of the landmass. There is a mix of irrigation and dry-land farming, producing a large variety of primary products of both export and domestic consumption. The main agricultural products (cereals, oilseeds and grain legumes) are produced on a large scale for human and livestock consumption. Wheat has the greatest production in terms of economic value. Australia also produces a wide variety of fruit, nuts and vegetables, and has a large exporting wine industry.

OLIVE CULTIVATION HISTORY

Olives are not indigenous to Australia but have been grown since European settlement. The earliest documented introduction of the olive (*Olea europaea* L.) occurred on 28 December 1800, when London market gardener George Suttor arrived in Sydney with a consignment of plants, among them an olive, sent by Sir Joseph Banks. In 1805 another tree was also planted by John Macarthur on his 'Elizabeth Farm' in Parramatta near Sydney, and still exists. The Sydney Botanic Gardens became a major center for the distribution of olive hardwood cuttings from the 1820's onwards, prior to commercial nurseries.

European migrants found large areas of well-priced land with the perfect climate to grow olives, and all states except Tasmania saw plantings during the 1800's. It is interesting to note that the penal settlement on the tiny St. Helena Island in Moreton Bay had a commercial orchard of olive trees in the early 1800's. Being a self-funding settlement, the prisoners had to grow their own food and sell products to purchase other goods and equipment. One of their saleable products was olive oil, grown and processed in the island and sold to, of all places, Italy. South Australia and Victoria had most of the planting and in the 1830's South Australia led the charge of the olive industry. From 1830 to 1850 trees came from France, Rio de Janeiro and Sicily, including five cultivars from Marseilles. Those trees went on to produce oil which won honorable mention at the London Exhibition of 1851.

By 1873 there was an orchard of some 10,000 trees in the foothills of the Mount Lofty ranges and Michael Burr, in his book "Australian Olives", details how by 1875 there were over 3,000 trees in the parklands around Adelaide. Orchards continued to be planted around the Adelaide area in South Australia (SA) until suburban housing took over the land in the 1920's; and in 1911 the Stonyfell Olive



Oil Company won Gold Export Medals for its oil exported to Italy. After World War II the Southern European migrants also planted orchards in the northern suburbs and the Riverland area.



Fig. 2

An old olive tree in West Australia which has not been pruned for decades. It could be one of those planted in 1800's. Paul Miller, president of AOA is standing next to it (Photo by John Wholly)

From SA, olives spread across the border to Victoria with plantings at Dookie, Sunbury, Wangaratta and Longerenong Agricultural Collage near Horsham. In 1943 Jacob Friedman started planting what is still today the largest plantation in Australia, at the foot of the northern Grampains near Horsham.

Since the 1860's olives have been growing mainly for oil at the New Norcia Monastery, Western Australia. The monastery's oil won a silver medal at the Franco-British Exhibition of 1908. Parliament house in Perth also has some very old trees in its front

garden; some believe the oldest in Australia, and some others are scattered in many places of the State, however are isolated and forgotten with time passing (Fig. 2).

Olives have been considered as a commercial industry at various times in Australia's history. In 1883 a paper "Cultural Industries for Queensland" included the growing of olives in Queensland, primarily around Brisbane. The journal concluded that: "The olive has fruited well on the coast near Brisbane and gives good promise on the Darling Downs."

In the 1891 the New South Wales Department of Agriculture commenced the establishment of four experimental farms and farm schools, one of them in Wagga Wagga (initially called the Murrumbidgee Experimental Farm). The land chosen for the farm was not the best in the area and was thus suitable to demonstrate farming in adverse conditions. The initial development began in April 1893, with 16 ha of bushland and cleared woodland. Two years later by 1895 government statistics refer to another 3.2 ha of planted olives. An article on the 1897 Wagga Experimental Farm Open Day mentions an additional 4 ha being prepared for and olive orchard.

Interest in olive production continued into the early 1900's. However, over the following decades, there was a decline in expectations. In South Australia the extensive orchards in the eastern and southern suburbs were forced out by urban expansion or declined during World War I and the depression period. The main problem was the relatively high cost of harvest in Australia compared to the cheap

labor in the Mediterranean countries. Small pockets of orchards and some extraction plants continued to operate, and were expanded by some European settlers of the second wave after World War II. Plantings began to expand again from 1946, especially in South Australia and Victoria, and continued until 1958-59 when over 3,000 ha of olive orchards were grown in Australia. Examples of such development were recorded in many places. By 1956 there were 38,000 trees in the Horsham orchard. Olives were also planted at Mount Zero, Edenhope and Dimboola. Most were dry-farming plantings but a company at Robinvale planted 280 ha of irrigated trees and installed on-site processing equipment. Most of these trees were pulled out in the 1970's when European olive products were being imported at unbeatable prices. It is interesting to note that the current owners are looking at large-scale olive plantings on the same property. In Western Australia the number of olive trees peaked at 29,000 in 1968, some of which were used as windbreaks. However, poor management techniques and the tree's natural tendency to bear every second year limited the profitability of olive growing in Australia.

There has been a renaissance in the Australian olive industry since the early 1990's, primarily due to the increased popularity of Mediterranean cuisine and opportunities to replace over 100 million AUD of imported olive products. There is optimism from the Australian industry that this latest expansion will succeed, due to the advent of mechanized olive harvesting and subsequent increased ability to compete with Mediterranean producers.

AREA UNDER OLIVE CULTIVATION

Australia is just of the many non-traditional countries now growing olives. Interest in olives has increased significantly and Australian industry has expanded rapidly in recent years with most of the new plantations being of the intensive and super-high density systems (Fig. 3). However, the olive industry is highly fragmented and polarized, and is dominated by



Fig. 3
A high density large orchard
in WA of 494 trees/ha (6.75x3 m)
(Photo by Mohamed El-Kholi)

many smaller growers and producers at one end and a few larger commercial projects operating under the tax incentive scheme at the other. There are few co-operatives as most producers act independently within the market, although most are members of one of many olive associations across the country.

It is estimated that more than 11 million olive trees have been planted in Australia since 1990, grown on over 800 orchards covering more than 35,000 ha. Two regions account for over 70% of current olive production, North-central Victoria

and north of Perth in Western Australia. There are now nearly two million olive trees in Western Australia, grown with densities ranging from high to super high densities, and the industry is dominated by six large orchards of 100,000-260,000 trees, although most Western Australian orchards have 500-5,000 trees. A Victorian-based company manages some 2.5 million olive trees on 6,240 ha, making it the largest olive oil retailer to the domestic market. South Australia is the third largest olive producing state, representing 12% of the country's crop. South Australia's climate is ideally suited to olive production, with about 150 olive growers managing 4,000 ha. The state's olive crop in 2011 was estimated at 12,000 tons, of which 95% was used for oil production. Tasmania produces only a tiny proportion of the total Australian olive production but is renowned for its quality products. It is estimated that there are 120,000 olive trees in Tasmania covering 350 ha approximately, with a density of about 350 trees/ha. Grown cultivars are mostly for oil production ('Frantoio', 'Leccino', 'Picual', 'Nevadillo Blanco') in addition to 'Manzanillo'.

The future of a new small olive orchard (Fig. 4) is of great interest to Australians. It was established in October 2000, 100 km south-east of Alice Springs in the remote Oak Valley, on the southern fringe of the Great Victoria Desert in the Northern Territory of Australia. The orchard is located geographically at 23° 42' S and 133° 53' E. The temperature ranges from 6.5° C in the winter to 44.7° C in the summer and a minimum night temperature of -3° C in winter; annual rainfall varies between 1.25 and 75 mm. The orchard currently consists of 500 'Manzanillo' and 100 'Arbequina' trees and it produced first olive oil in 2007. The owners of the orchard, Robert and Mary Le Rossignol, who are aboriginal indigenous Australians, received a grant to help start their project, from the Indigenous Business Development Program (IBDP) of Northern Territory Government in 2006.

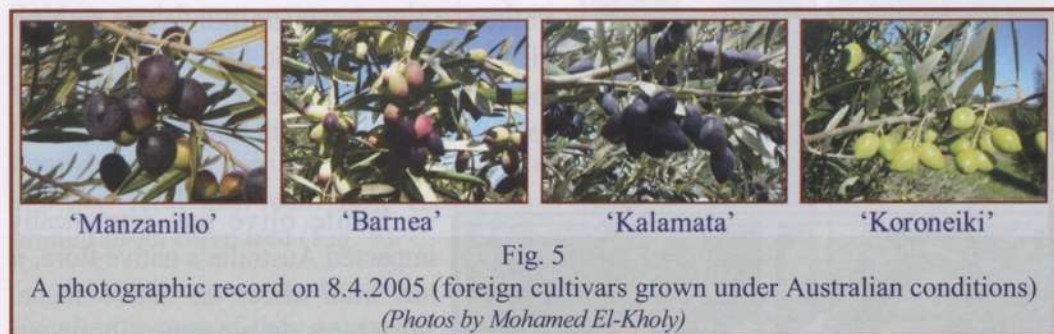


Fig. 4
The Le Rossignol family in their orchard within the harsh environment of Oak Valley

OLIVE CULTIVARS

The first olive oil cultivars introduced to Australia in 18th century were 'Macrocarpa', 'Amelau', 'Pleureur', 'Pigale', 'Dr Fiasch', 'Gros Redondou', 'Bouquettier', 'Correggiola', 'Bouteillan', 'Blanquette' and 'Cucco'. There are over 100 known cultivars of olives in Australia today, both classic Mediterranean cultivars and more recent hybrids. However, the most commercially used are the Israeli 'Barnea', at 41% of total plantings. This is followed by 'Frantoio' (26%), 'Picual' (15%) and 'Manzanillo' (6%). Scattered oil cultivars are 'Correggiola',

'Arbequina', 'Coratina', 'Koroneiki', 'Paragon' and 'Nevadillo Blanco'; and for table there is 'Kalamata' and 'Hardy's Mammoth'. 'Mission' and 'Manzanillo' are considered as dual purpose (Fig. 5).



New cultivars are regularly introduced and current ones, especially for oil production are continually being assessed for adaptability as well as satisfying market quality requirements. Assessment of 'Barnea' by growers has led to its many advantages for the modern orchard. It produces high quality fruit for the top end of the olive oil market. However, it has high vigour and very strong vertical plant growth, requiring regular pruning. After severe pruning, regrowth can go through a slow period, before normal rapid growth resumes. It can suffer from root rot in wet soils and it is more prone to anthracnose than other cultivars, as Australia's warm and humid weather is different than that hot and dry of Israel. The fruits are considered to be moderate to highly sensitive to chilling injuries and to frost damage before harvest.

IMPACT ON ECONOMY AND ENVIRONMENT

The renaissance of the Australian olive industry in the mid-1990's triggered a period of rapid growth. This saw the industry expand from a cottage industry in its "start-up" phase to what is now an "emerging" industry, with domestic and export retail sales of about 180 million AUD/year.

Over this time the quality of Australian olive oil has consistently improved, and production efficiencies increased. With high quality and affordable prices, Australian extra virgin olive oil is now widely accessible to consumers in Australia and international markets. The growth in the table olive sector has been slower, yet there is significant scope for further growth in expanding domestic and international markets. Australian table olive production over the last five years has varied from 2,000-3,200 tons; and 2010 figures accounted for only 0.15% of the world production.

Olive oil and table olive production in 2009 was estimated at 15,000 and 3,200 tons respectively according to Australian Olive Association (AOA) data. The oil figure was up dramatically from 2,500 tons in 2004, with annual oil production



increasing on average by 47% over the last four years. While the 2009 Australian production accounts for around 0.5% of the total world olive oil production, it is estimated that it accounts for around 1% of the extra virgin grade.

The 2009 Australian oil production valued at around 75 million AUD as bulk with an estimated 185 million AUD retail value, based on the May 2009 average supermarket price. The volume of exported Australian extra virgin olive oil increased significantly from 501 tons to 6,959 tons in 2009; up by an annual average of 85%.



Fig. 6

Birds damaging olive trees and fruits

Left and middle: Damaged fruits on trees and fallen on the ground cracked seeds in halves by “Parrot 28”

Right: The Australian King Parrot

(Photo to the right by Margaret Chidgey)



Fig. 7

Kangaroos in olive orchards

(Photo to the left by Robert Le Rossignol)

While olive has dramatically impacted Australia’s native flora, it has little effect on native fauna. Most birds do not generally favour the fruit because of its extreme bitterness before processing, but native cockatoos, corellas and galahs appear to be the main culprits in crop losses. Growers in some areas report birds eating and damaging olive fruits at harvest or while on trees, with a strong preference for particular cultivars. Certain birds like cockatoos and parrots also (Fig. 6) can cause considerable damage by snapping branches off young trees.

During times of drought when there is a shortage of grass, wallabies eat leaves and twigs from olive trees and can kill young trees. Kangaroos also cause occasional damage to trees, being strong and fast animals when they travel through orchards (Fig. 7).

Ground-dwelling wombats don’t generally damage trees but have been known to dig burrows under or near olive trees. Up to 20 m long with numerous connecting tunnels and entrances, the burrows can cause problems for heavy vehicles in the orchard. In Australia rabbits are a serious mammalian pest and invasive species. They were introduced in the 18th century with the first fleet, and became widespread after an outbreak by an 1859 release. Rabbits cause millions of dollars of damage to crops among which are olives. They chew the trunk bark

weakening the trees (Fig. 8). Young planted trees need to be protected against attack from rabbits by protective sleeves. Rabbits and hares may not only ring-bark young trees but could damage a 10-15 year old olive tree. For the first time in Australia, a bee's swarm of commercial honeybees was seen in 2002 building an exposed feral nest with wax combs on a branch of an olive tree (Fig. 9).

Some olive growers do not cut down old Eucalyptus trees if they are in the middle of an orchard (Fig. 10). Gum (Eucalyptus) trees are iconic in a host of landscapes, both indigenous and cultivated.

Feral olives (Fig. 11) have thrived in many parts of the country, particularly SA, where in some areas they have been declared weeds. Feral trees are the result of seeds germinating from cultivated olives in or near the orchards. They were initially kept in check by sheep, but spread unchecked as grazing retreated from Adelaide's rural fringe. Feral olives, which spread from abandoned orchards, after South Australia's original olive industry collapsed in the late 1800's, in fact created an "olive zone" in the Adelaide foothills.

South Australia alkaline sandy soils make it easier for transplants to take hold, with the spread of olives mainly due to birds and foxes, and feral olive infestations occur in all agricultural regions of South Australia. This feral olive pollution has been identified as having superior oil yield and quality characteristic however, and it is hoped that they may be used to develop unique cultivars which Australia can market to the world. On the downside, they are also causing significant environmental damage, destroying native bush-land and clogging waterways. Feral olives have negatively impacted local biodiversity, with reductions of more than 50% in native vegetation



Fig. 8
Damage caused
by rabbits



Fig. 9
Feral nest of
commercial bees
(Photo by Shane Ryan)



Fig. 10
Eucalyptus trees
mid olive rows in an orchard
(Photo by Mohamed El-Kholy)

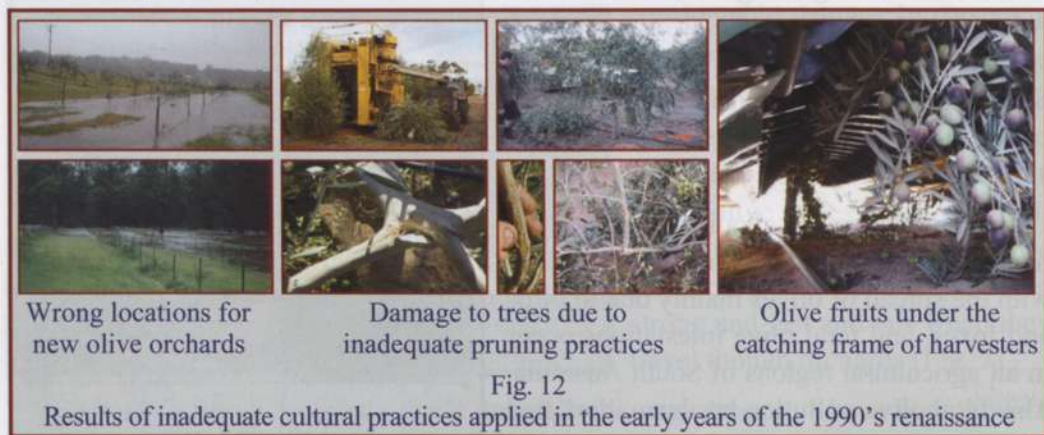


Fig. 11
Feral olive trees
(Photo by Gerri Nelligan)

species' richness and abundance in the Adelaide hills. Control of feral olives is difficult and expensive, entailing labor and equipment costs of 10-15,000 AUD/ha for manual removal, herbicide treatment and follow-up measures.

CULTURAL PRACTICES DEVELOPMENTS IN THE OLIVE RENAISSANCE

With the new Australian olive industry booming in the mid-1990's, driven mainly by nursery people, research and cultivars adaptability studies were lacking at that time. Thus some mistakes were experienced like recommending 'Manzanillo' for oil extraction, selecting cultivars not suitable for mechanical harvesting, or choosing improper locations, either from climate or even terrain points of view, such as growing olives in floodplains (Fig. 12, left). Misconceptions were common on irrigation scheduling and pruning techniques and many experts were invited to Australia from Europe, USA, Egypt and Argentina for training purposes. Irrigation in many cases was lacking, not due to limited water resources, but mainly because many new growers believed that olive trees, being drought resistant, require very little water. Consequently some orchards were water stressed. Pruning in many cases was done randomly; either too harsh in preparation for mechanical harvesting or too moderate, not allowing for a higher trunk to accommodate the catching frame of harvesting machines. The first type of pruning resulted in weakly established trees, known at that time as "lollypops". The second type resulted, years after, in damage to the trees and fruits during harvest, as well as low harvesting efficiency (Fig. 12, middle and right). All these unfortunate cases were the main drivers for rapid development of the Australian learning curve in olive production, reaching international standards within a decade.



Most Australian olive plantings have occurred in areas with a climate similar to that of traditional Mediterranean olive growing areas. However, other climatic areas were also planted with olives, such as the coastal zones, especially in the east and north-west of the country; and orchards are being established inland at altitudes of over 200 m on frost-free slopes. On the other hand some recent orchards have been

established in areas that receive predominantly summer rather than winter rainfall. For example, South-east Queensland has a subtropical climate of predominantly summer rainfall and relatively warm winters. Planting areas have been expanding despite limited knowledge of the adaptability of the available germplasm for the area or the prevailing climatic conditions.



Fig. 13

Procedure of treating bark wound caused by rabbits
(Photos by Shane Ryan and Moh. El-Kholy)



Fig. 14

Top: Winter weeds protecting soil from erosion
Bottom: Piles of carbon organic ash to improve
soil characteristics

(Photos by: Top: Moh. El-Kholy, Middle: Robert Moltoni)

minerals to improve the physical and chemical properties of the poor sandy soil (Fig. 14, bottom). Some other growers let sheep graze on the orchard floor to control weeds (Fig. 14, top); however they can cause severe damage by eating bark and chewing the foliage when their normal diet of grasses runs out.

PROCESSING METHODS OF RAW OLIVES

Australian table olive processors have a strong interest in using natural processing methods, including brine fermentation and salt/heat drying. Primary

Within just a few years from the booming of the new olive industry, cultural practices have improved considerably to cope with the requirements of mechanical harvesting and deal with domestic problems arising from the wilderness environments within which some of the new orchards have been established. Some growers use a method, which was introduced in 2001 by a visiting expert; to heal ring-barked wounds caused by rabbits. A bark strip taken from a healthy pruned branch of another tree is implanted (grafted) to cover the wound and connect living tissues together (Fig. 13).

Some of the good cultural practices that have been developed by growers include leaving winter weeds to grow to protect the soil from erosion and to control them along the row with herbicides. Some growers haul piles of carbon organic ash, which is rich in



processing involves soaking, fermentation, lye treatment or heating operations, followed by organoleptic enhancement and the addition of herbs, spices, vegetables, marinades and other flavoring agents to add value.

The new olive oil sector has been born with the emergence of state of the art technologies and equipment and all processors are using such facilities of the two-phase and three-phase continuous centrifugal systems.

Traditional stone mills for olive oil extraction were copied from Europe during the 1800's and were driven first by animals (Fig. 15, bottom), then by diesel engines and finally by electricity. In Australia there are a few cases where these old processing methods are still in use. An example of such cases in the historic 150-160 years old Benedictine monastery in New Norcia (132 km north of Perth, Western Australia). New Norcia is the only monastic town in Australia which was settled by Spanish Benedictine monks in the 1840's who built grand Spanish colonial buildings and planted olive orchards in the harsh West Australian bush. Benedictine monks have traditionally tended the olive orchard of the monastery for over 150 years. Some of the original machinery used to sort and press the olives are still operating; and because olive oil has been an important part of the monastery's history, more than 600 trees are harvested annually to extract their oil on the premises by the same old mill (Fig. 15, top). Father Don

Paulino (Fig. 15, middle) came to the Benedictine monastery in New Norcia at the age of seventeen; bringing with him practical skills that still contribute to the financial survival of the monastery. He baked the monastery's daily bread in a traditional wood-fired oven and helped produce New Norcia's olive oil. The olive crusher, which is now driven by an old diesel engine was previously outside the building and

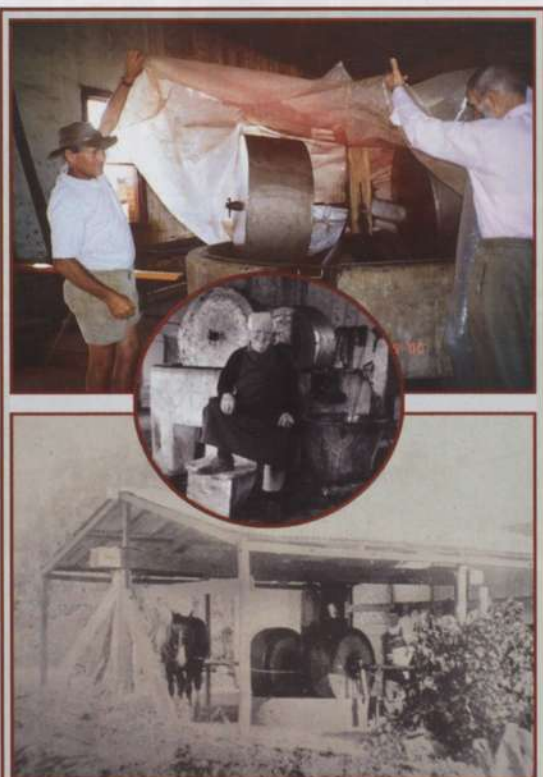


Fig. 15

Top: New Norcia old olive oil mill

Middle: Don Paulino

<http://www.nla.gov.au/apps/cdview/?pi=nla.pic-an23490789>

Bottom: Olive crusher under shed at Renmark, SA. It had a capacity for crushing two hundred-weight (nearly 100 kg) of fruit every half hour (Brown JH 1883, *The cultivation of the olives Text Book*)

was turned by a horse. In 2010 New Norcia's last Spanish monk and longest living monk, Don Paulino, passed away at the age of 99, most of which he spent on tending the olive orchard at New Norcia among other activities of the monastery. In the year of his death, the New Norcia olive oil won awards recognizing the heritage of the Spanish monks and their contribution to the olive oil industry in Australia.

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

Aboriginal culture is one of the world's longest surviving, and is complex and extraordinarily diverse; particularly regarding diet and cooking methods. Before the arrival of Europeans in 1788, indigenous Australians lived on the country's unique native flora and fauna. Hunting of kangaroo, wallaby and emu was common, consumed along with bogong moths, witchetty grubs, lizards and snakes. Bush berries, fruits and honeys were also used.

Aborigines generally did not boil water, so their cooking methods (and hence their menus) were different from those used by early settlers and modern consumers. They did not have pots or pans, although northern tribes were known to have used bailer shells. They did not make tea or coffee, jams, jellies, or chutneys, and made little use of flavorings. Food preparation techniques varied, including carcasses roasted directly on a camp fire. Migrants to Australia from other countries around the world have had a great influence on what today's Australians eat. European migrants knew olives would grow well here and considered olive oil as a healthy and necessary part of any diet, so the Italians introduced pasta dishes, *risotto* and *pizza*, while Greek migrants added *moussaka*, *feta* cheese, black olives and olive oil on salads to the menu; and migrants from the Middle East introduced *Tahini*, *Homos* (chickpeas with *Tahini*) and *Dokka* with olive oil. They recognize that, olive oil has a myriad of flavors and aromas to add to food.

More recently a new world of tastes has been introduced in a range of "bush tucker"² and bush-inspired olive oils. Infused with native plants, dried fruits, herbs, spices and seeds, they carry the distinctive taste and aroma of the Australian bush. Lemon Myrtle (*Backhousia citriodora*), for example, has intense lemon/lime flavors and aromas; Mountain Pepper-berry (*Tasmania lanceolata*) is hot like black pepper but aromatic; while Bush Herb infused olive oil captures the aroma of the Eucalyptus bush on a morning crisp: ideal for meat marinades or mashed potatoes.

Current culinary favourites featuring Australian olive oil include breads, dips, infusions, vinaigrettes, soups, salads, seafood, risotto, pasta, meat and even sweets – mango and almond cake, pineapple sorbet, chocolate mousse and biscuits, all made with extra virgin olive oil. Olive oil is also used in mainstream food production; green and black olive paste as a spread or salad dressing ingredients, olive dips and

² An Australian term for the herbs, spices, mushrooms, fruits, flowers, vegetables, animals, birds, reptiles and insects native to the country and eaten by the Aborigines for 40,000 years.



table olives (green or black, plain, herbed, stuffed, or sliced, and in bottles, cans or vacuum packaging). One South Australian company even produces chocolate coated olives.

The Eyre Peninsula olive grower has moved away from the usual savory flavors, soaking the olives in a sweet wine before coating them in chocolate. This soaking lowers the usual saltiness to a level where it is recognizable but not overpowering, creating a mild flavored olive which combines well with chocolate. He says, while nearly everyone loves chocolate, not everyone is too sure about combining it with olives, but the new product is being well received. The following are Australian recipes with olives and olive oil:

➤ **Olive and Macadamia Nut Dip** (Fig. 16):

Ingredients: 2½ tablespoons balsamic vinegar, 6 anchovy fillets, 2 garlic cloves, ¾ cup macadamia nuts, 2 teaspoons capers, drained, 4 hard-boiled egg yolks, 12 large pitted green olives and parsley.

Method: Put all into a food processor and process until a smooth paste.

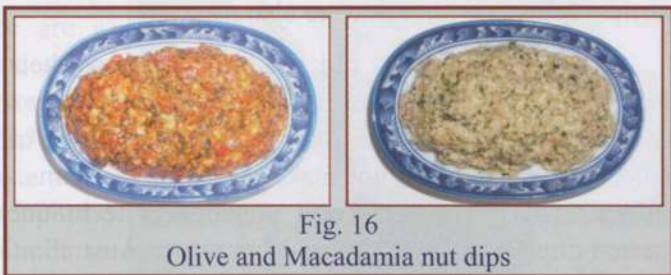


Fig. 16

Olive and Macadamia nut dips

➤ **Baked Fish with Macadamia and Green Olive Crust:**

Method: Combine the ricotta, macadamias, olives, salt and pepper and lemon rind in a small bowl. Set each piece of fish on top of the tomatoes in the roaster. Press some of the macadamia and olive mixture onto the top of each. Drizzle with a little extra olive oil. Transfer dish to the oven and bake for 15-20 minutes.

➤ **Gerri's Olive Oil Biscuits** (Fig. 17):

Ingredients: ½ cup olive oil, ½ cup white wine, ½ cup castor sugar, 1½ cups self-rising flour, ½-1 tablespoon caraway seeds, ¼ cup caramelized orange peel, finely chopped.

Method: Whisk olive oil, wine and castor sugar in a bowl; add peel and leave to soak for 30 minutes. Add flour and caraway seeds and mix to combine. Turn onto a lightly floured board and knead to smooth dough (adding more flour if necessary). Divide into three pieces, shaping each into a log 1" in diameter. Break off walnut-sized pieces and roll each into a rough lozenge or egg shape. Place on a baking paper-lined tray and bake at 180° C until golden. Cool on racks and (optional) dust with icing sugar.

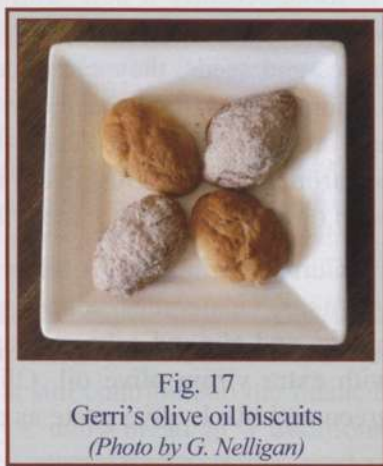


Fig. 17

Gerri's olive oil biscuits
(Photo by G. Nelligan)

➤ **Olive banana cake** (Fig. 18): This recipe is everyone's favourite – absolute simplicity, requiring a minimum of time, effort and equipment. It is a delicious example of olive oil's ease and versatility in kitchen.

Ingredients: 3 mashed (very) ripe bananas, $\frac{3}{4}$ cup raw sugar, $\frac{1}{2}$ cup good quality olive oil, 1 large egg, $\frac{1}{2}$ cup milk, 1 $\frac{1}{2}$ cups of SR flour (or plain + 2 teaspoon baking powder), $\frac{1}{2}$ teaspoon cinnamon and $\frac{1}{2}$ cup of roughly chopped walnuts.

Method: Preheat oven to 180° C. Spray a loaf tin with olive oil spray to grease. Place all ingredients except walnuts into a large bowl and mix together until well combined. Spoon into the tin and top with walnuts. Bake for 40-45 minutes, until golden brown and pulling away from sides of tin. Cool 5 minutes in tin, then turn out and finish cooling on a rack. For walnut fans, the chopped walnuts can be added to the mixture before baking and then top with extra walnut halves to decorate.



Fig. 18
Olive banana cake
(Photo by G. Nelligan)

It is quite interesting to know that in Australia around 1860 to the 1880's olive fruits were allowed to fall to the ground and were eaten by pigs and poultry, which were extremely fond of the fruit. Olive fed pigs, when made into bacon, had a peculiarly pleasant flavor imparted by eating olives.

POPULAR MEDICINAL AND COSMETIC USES

Olive oil used in medicinal and cosmetic products; for example, extra virgin olive oil makes the perfect simple solution for dry nails and cuticles, and for removing eye makeup. It is well known to have restorative properties; hence its increasing use in skincare such as facial and hand creams, body lotions and balms, soaps, face scrubs and cosmetics.

There is also an Australian range of products based on Squalane, derived from Squalene, originally discovered in Japan. Squalene, also found in olive oil, is a remarkable extract that penetrates skin to moisturize and smooth. Studies have shown it also has a stimulatory effect on the healing process, enhancing skin's natural ability to repair itself, while its antioxidant properties protect skin from further damage. Used in some of the world's most expensive beauty formulas, Squalane, a highly-refined extract promotes healthy and supple skin.



Fig. 19
Olive oil was bottled as a medicine (1950-1970)
(Courtesy Powerhouse Museum)

Medicinally, olive oil is used in hair preparations, on the scalp, and for constipation and stomach ulcers. The olive oil produced in pioneering days had only a minor market for medicine (Fig. 19). Today it is hard to believe that as recently as

1950-1970, the only available olive oil was purchased from chemists in small glass medicine bottles (Dose for adults: 1-2 tablespoons, children: 3 teaspoons)!

OLIVES IN FOLKLORE AND TOURISM

Some Australian olive growers, recognizing the deep history of the aboriginal culture, use some of the indigenous adages when they express how they feel about their orchard properties. Some of these adages are: "We don't own the land, the land owns us"; "The Land is my mother, my mother is the land"; "Land is the starting point to where it all began. It is like picking up a piece of dirt and saying this is where I started and this is where I will go"; "The land is our food, our culture, our spirit and identity"; "We don't have boundaries like fences, as farmers do. We have spiritual connections".

Anointing with olive oil has been used in religious ceremonies. The act of anointing with oil is seen throughout the Bible and is used for healing prayer and scent. Olive oil also represents the ministry of the Holy Spirit in the birth. Olive oil is blessed by the Priest and then applied by him to the child's forehead, breast, back, hands, feet, ears, mouth, in order to dedicate them to the service of Christ.

The godparent then covers the entire body of the infant with olive oil in order to express that, with Christ's help, the infant may be able to elude the grip of sin and evil. Olive oil is also used to anoint spiritual leaders and priests.

Cultural and tourism activities are now also adding value to the olive industry, with annual olive festivals celebrating the olive harvest. Featuring olives and olive oil, along with food and wine, market stalls, cooking demonstrations, live music, arts and children's activities, make a great day out among the olives for all the family. The annual Olive Festival held in Mildura, Victoria each November recognizes the local Greek community's contribution to the area; not just via olives but also new and successful methods of dried fruit production. The festival brings people together celebrating the first plantings of local olive trees in the 1890's, with Greek food, oil and olive tasting, demonstrations, music and dance. In nearly all States having olives, there are annual olive festivals that may last for 2-3 day, like that of West Australia (Fig. 20). Some of these



Fig. 20

West Australia 1st Olive Festival 2001
Top: The black olive in a folkloric show
Bottom: From right to left; the Priest, the Organizer and Moh. El-Kholy inaugurating the Olive Walk in Gingin
(Photo by Zeinab Seoudi)

musical and dance. In nearly all States having olives, there are annual olive festivals that may last for 2-3 day, like that of West Australia (Fig. 20). Some of these

festivals invite international experts to speak and join in the festival activities. Such events offer educational sessions celebrating all things about olives. They include oil tasting classes, cooking demonstrations, market stalls providing samples and sales of local olive products, as well as a wide range of other gourmet delights.

Inglewood in Queensland has set its sights on being the olive capital of Australia, with 350,000 olive trees planted. The region has a unique olive-themed center, featuring olive products and local olive businesses; and an annual olive festival during the March-May harvest season, when visitors can tour an olive orchard and explore the area.

A study currently underway is exploring olive tourism in Australia, and how olive orchard operators in emerging tourism destinations can capitalize on opportunities by expanding their operations to cater to visitors. The study aims to explore the factors that benefit and constrain the involvement of small businesses which may currently be peripheral to the local tourism industry, but which through innovation might become more integrated. More knowledge in this area would benefit growers and the industry as a whole, raising awareness among local and state governments of the economic potential of olive growing, and in turn leading to greater assistance and support for olive growers.

OLIVES IN ART AND LANDSCAPING

The olive tree is a symbol of joy, peace and happiness and as such makes excellent gift. An olive tree adoption makes a wonderful present for a wedding, birth of a child or for Christmas in Australia. One dozen olive trees were received by the Sydney Opera House in 1973, as gift from the Greek Government, in time for official opening. The Sydney Opera House was made a UNESCO World Heritage Site on 28 June 2007.

Australian artist Robert Owen has created a sculptural landscape that links Homebush Bay to the Olympic Games (Fig. 21). The Cyprus pines, olive trees and Australian eucalyptus reinforce the connection between Australian contemporary Olympic Games in 2000 and the original games held in 776 BC.

ACKNOWLEDGEMENTS

Thanks and appreciation to Mohamed El-Kholy for the useful discussions and comments on the draft manuscript, for the information and photographs he provided from his years visiting Australia as olive consultant between 2000 and 2006 and thanks to all who supplied photographs.



Fig. 21
Olive trees in the Olympic Park



INTRODUCTION

Azerbaijan is located between Russia from the north and Iran from the south and south-east, the Caspian Sea from the east, Armenia from the west, and Georgia from the north-west. Azerbaijan stretches over 86,600 km² within latitudes 38° 25' to 41° 55' N, and longitudes 44° 50' to 50° 51' E (Fig. 1).

Azerbaijan is located on the same parallel with the north of Greece, the south of Italy, Sardinia Island and central Spain. The northern range of the Great Caucasus Mountains significantly mitigates the flow of cold air coming from the north. Azerbaijan is a country of high mountains, with the Great Caucasus in the north, the Small Caucasus in the south-west, and Talish Mountains in the south-east. The wide Kura-Araz lowlands, which composes one fourth of the country, are located within these mountains. The country is also of broad plains and has 9 out of 11 climatic zones, commonly existing in different parts of the world. Geography maps the variations in height of land surface, and the fact that it is shaped into hills and valleys.

In Azerbaijan, up to 220 sunny days dominate during the year. The country has a very rich flora because of its climate diversity, relief and soil cover. Of the 6,000 plant species existing in the Caucasus 4,700 are found in Azerbaijan. The rainfall is not uniformly distributed over the territory, and annual amount fluctuates between 150-200 mm in Gobustan and the southern part of Absheron Peninsula, and 1,600-1,700 mm, and even more, in foothill areas of Talysh Mountain. However, annual precipitation for almost 65% of the country's territory is low (less than 400 mm); therefore certain crops are grown under irrigation. Taking all these conditions into account, the agricultural scenery is diverse with different crops such as cotton,



wheat, vegetables, melons, tea, tobacco, grapes, citrus and subtropical plants including olive. The total area of arable land in the country is 4,756,000 ha, with 2,915,000 ha growing tree crops, including 125,000 ha occupied by fruits and berries.

OLIVE CULTIVATION HISTORY

The olive growing in Azerbaijan has an ancient history. Ancient Greek geographers in their works, written before Christ, indicated the presence of olive trees in Azerbaijan, and confirmed its cultivation in Barda (close to the center of the country), as well as on the Kura River banks. Paleontologists, as a result of excavations in Absheron Peninsula in the west, revealed fossilized olive parts. Relevant studies have shown the presence of olive trees in Azerbaijan seven centuries BC. In the book "Geography" by the ancient Greek scientist Strabon (64/63 BC- ca. 24 AD) a high prevalence of olives in Azerbaijan was indicated and he noted that the banks of Kura River were planted with olive trees.

Moniuszko V.A. in his book "Olive and olive regions of the USSR" noted that Kamensky discovered old ancient roots of olive trees near the ancient ruined villages on Mugan plain, near Bilasuvar city.

Historian Musa Kalankatuklu of the 8th century AD in his book "History of Albania" noted the presence of olive trees in the vast areas of the Kura and Araz plains of Azerbaijan. He wrote, "There are great numbers of grain, grapes, oil, salt, silk and cotton, as well as olive trees on the fertile soils along the shores of Kura River." According to the reports of historians and travelers of the 7th-10th centuries, olive in Azerbaijan was grown in Shirvan, lowland regions of Garabag and in Absheron Peninsula. Some travelers during the same period described the old Azerbaijan city of Barda, indicating the existence of many olive trees in its vicinity. Azerbaijan author Yusif Ibn Ismayil Khoylu in 1311 wrote that olives were canned with table salt and were eaten up with hot food before and after meals.

Because the wood of chopped olive trees burns well, a great number of trees were destroyed by invaders from time to time. In the 13th century the Mongols spent winter months cutting and burning olive trees on the banks of the Kura and Araz rivers. However, small numbers of olive trees in that region survived this unfortunate destiny. From that period until the 17th century written sources on development of olive are very scarce. One of these sources is the book written in Spanish in 1604 "Historical and Geographical Treatise" by Oruj-bay Bayat, known as Don Juan in Europe, who was originally from Bayat tribe of Azeri Turks. The author wrote "So, getting in vessels we sailed (voyage started from Isfahan and continued to Gilan and the Caspian Sea) and within one day and one night we reached a small island. On this island lived fishermen who fished and hunted seals, dried their skins to make bags to preserve olive oil. Therefore, the cost of those skins was very high".



Starting from the 17th and 18th centuries olive trees have been widely cultivated in Azerbaijan. Olive orchards were established in Baku, Shamakhi, Guba, Zagatala, Ganja and other regions. New olive cultivars were introduced for this development.

Between 1848 and 1851, in Spasski-Avonomov's "Travel notes from Baku to St. Petersburg", he wrote "In some areas grow wild olive trees, fig, pomegranate, grape and mulberry together along with saffron which are unique resources of Absheron".

Ancient olive trees were also noted in Absheron Peninsula. At present, there are two 300-year-old olive trees in Nardarn villiage of Absheron, around the *Pir* (a sacred place). Among the inhabitants they are called *Baba Zeytun* (Grandfather Olive) (Fig. 2).



In spite of this old history, olive growing and development has started only in the 20th century. Because of its dry subtropical climate, some regions of Azerbaijan, especially Absheron, became the main base for olive cultivation in the former Soviet Union. Studying diversity of local ancient olive plants, new local cultivars were obtained and made available for wide utilization.

In 1946 and 1947, it was planned to establish olive plantations on 3,000 ha in Absheron Peninsula, and this has been achieved gradually with large olive orchards. Olive processing facilities were installed to serve these orchards. Food processing and conservation facilities in Baku and Khachmaz started canning table olives and processing olives for olive oil. In other regions of Azerbaijan like Mingachevir, Ganja and Tartar, olive plantations were also developed.

AREA UNDER OLIVE CULTIVATION

The present olive growing area is 1,870.4 ha, which does not include greenery areas in suburban places, on road sides or protective belts. New olive orchards have been established in 2010 on more than 15 ha.

In 1980, the area of olive plantations reached 2,100 ha. Till that time there were six large-scale farms in Absheron involved in olive growing. Five years later in 1985 olive production was tripled in comparison with that of 1975. In 1988 in Absheron region the total area of olive plantations reached a peak of 2,600 ha.

After Azerbaijan gained its independence in 1991, the development of olive growing slowed down and weakened, and olive plantations went through a period of negligence and decline because of the destruction of all administrative structures of the former Soviet system. However, as the country economy improved, more



attention was paid to the development of olive growing, especially in Absheron. Different companies and businessmen began to invest in this industry. At present, olive has been included in the list of strategically important plants. Olive plantations are widely distributed in the Absheron Peninsula, especially in Baku, Mashtaga, Zig, Kurdakhani, Hovsan, Buzovna, Shuvalan and Gala villages (Fig. 1, page 48 and Fig. 3).

In 2009, a total of 1,500 tons of olives were harvested (1,863 tons in 2010) all over the country, with an average production of 890 kg/ha.

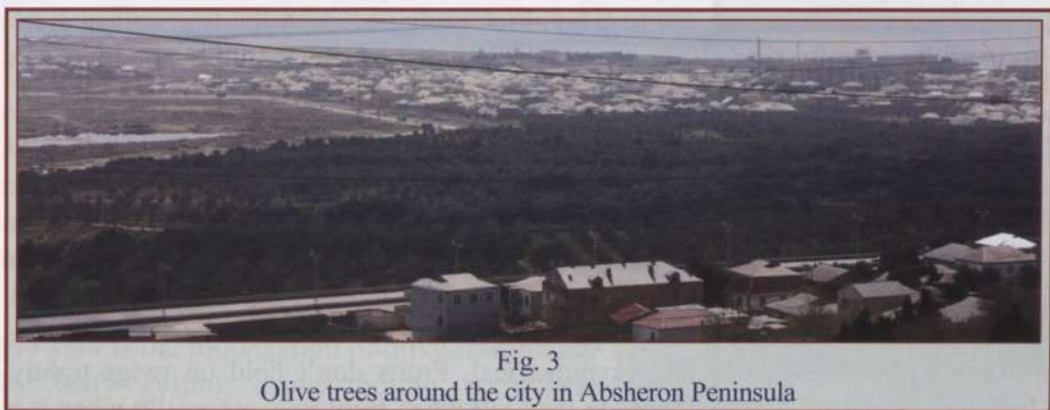


Fig. 3
Olive trees around the city in Absheron Peninsula

OLIVE CULTIVARS

Azerbaijan has its own local olive cultivars, and over the years hybrids were developed by Azerbaijani scientists using selection and other breeding methods. Among these cultivars are 'Zeytunu', 'Armudu Zeytun' (Pea-shaped olive), 'Gara Zeytun', 'Shirin Zeytun', 'Buzovna', 'Chamarkand', 'Baku', 'Absheron', 'Agbaba', 'El zeytunu', 'Garagoz', 'Nizami', 'Khazar', 'Surakhani' and others as well as the hybrids 'Absheron-1', 'Absheron-2', 'Absheron-5', 'Absheron-6'. Below is a description of some main cultivars and hybrids.



Fig. 4
'Azerbaijan Zeytunu'

'Azerbaijan Zeytunu' (Azerbaijan Olive) (Fig. 4). It covers up to 80% of olive growing area in Azerbaijan. It develops a large trunk crowned with a wide canopy, ball-shaped and somewhat compact. Branches are slightly raised up. Fully ripe fruits are black, short-oval in shape, and symmetrical. Fruit size is medium to large with a weight range of 6 to 9 g. Fruit skin is hard. Flesh makes up 87-89% of the fruit. Oil content on a dry weight basis of unripe fruits is 50-55% while at full ripening it is 68.1-70.2%. Stone is medium to large in size, with a weight of 0.6 to 1.2 g. Flowering occurs in late May and early June and fruits are late-ripening. The average productivity of trees at age 15-20 years is 35-37 kg/tree, however with recorded maximum of 45 kg/tree. Frost resistance can reach up to -16° C.





Fig. 5
'Gara Zeytun'

'Gara Zeytun' (Black olive) (Fig. 5). The tree is large with a ball-shaped canopy, and somewhat scattered. Fully ripe fruits are black, oval in shape and asymmetrical. Fruits hold on twigs tightly. Skin is thin, but hard. Flesh is light-pearl and makes up 86-87% of the fruit. Oil content on a dry weight basis in fully ripe olives is 68.0-71.8%. Olives are of medium and medium-large sizes with weight that ranges between 6.0 to 6.5 g. Flowering occurs in the first half of June.

Productivity of fully ripe olives can reach up to 40 kg/tree. Middle to middle-late ripening. Frost resistance is similar to 'Azerbaijan' olive variety.



Fig. 6
'Shirin Zeytun'

'Shirin Zeytun' (Sweet olive) (Fig 6). This cultivar is selected from old plantations in Baku districts by Azerbaijan Research Horticulture and Subtropical Plants Institute. The tree is large, having a canopy of a curved pyramidal shape, and is scattered. Fully ripe fruits are bright black, elongated-oval shape, and asymmetrical. Fruits don't hold on twigs tightly, therefore they fall when fully ripe, especially when it is windy. Skin is hard. Flesh makes up 87-89% of the fruit.

Oil content on a dry weight of fully ripe olives is 67.0-72.4%. Olives are medium size with weight that ranges between 5.0 and 6.5 g. Stone is large with a weight of 0.73 to 0.85 g. Flowering occurs in late May and early June. It is medium-late ripening, and less resistant to frost comparing to 'Azerbaijan Zeytunu'. Average productivity is 32 kg, however maximum can be 40-42 kg. The sweetness of this cultivar is due to its low content of bitter glycoside.

First purposeful scientific researches on olives and introduction of none-local olive cultivars to the country took place in the 1930's. First collection in the Perennial Plants Institute of Azerbaijan was set in the periods 1930-1932 and 1936-1937. More than 80 local cultivars and others of Italian, Spanish and Turkish origins were conserved in this collection. At the middle of the 20th century, the Spanish 'Pikvales' ('Picual') was only second to 'Azerbaijan' in number of trees planted. In 2006 several cultivars from Syria and Turkey were introduced to the Bine Experimental Station of Azerbaijan (Fig. 7), like 'Kaisi', 'Sorani', 'Memecik', 'Ayvalik', 'Gemlik', 'Geruk', etc.



Fig. 7
Olive collection

IMPACT ON ECONOMY AND ENVIRONMENT

The first commercial planting of olive orchards in the Absheron Peninsula started in 1951, when 150 ha of olive orchards were established. In 1958 the area extended to 360 ha. At that time a large olive depot was founded in Mashtaga Subtropical Plants state farm, and the olive processing facility was operated from this farm. In 1957, out of 44 tons of fruits, harvested from bearing orchards, 74 thousand tins (ranging in weight between 150 g to 1 kg) of canned green olives and 8 tons of dry pickled black olives were prepared. In subsequent years, the amount of harvested olives significantly increased reaching 380 tons in 1978.

Olive is a profitable crop from the economic aspect and contributes in the country's economy. It is calculated that the revenue from a 50-year-old olive tree is 80 New *Manats* (AZN) equivalent to 100 USD. From economic, social and ecological standpoints, this indicates how advantageous it is for Absheron, and for Azerbaijan in general, to expand the total area of olive plantations.

Another source of income for olive growers is the propagation of olive transplants by leafy cutting using rooting hormones, which also supports the national income through exports to neighboring countries. Furthermore, some small-holder growers pickle olives in their homes and sell it to the public in village markets (Fig. 8).

Recent development of olive processing in Azerbaijan has resulted in supplying domestic markets with different styles of table olives, like whole green olives or olives stuffed with garlic, red pepper, almond, thyme or lemon slices, as well as different grades of bottled olive oil. One of the unique products of the industry is preserved olive jam (Fig. 9), which is also prepared in homes.

In Absheron Peninsula winds often blow in different directions causing sharp soil erosion as well as atmospheric pollution by dust. To reduce these negative environmental impacts, large olive plantations are established in Absheron which on the other hand protect other neighboring plants. As an evergreen, and due to its long life, olive trees are also used as an ornamental plant in landscaping. When planted on road sides, parks and



Fig. 8

A woman grower selling her home pickled olives in a village market

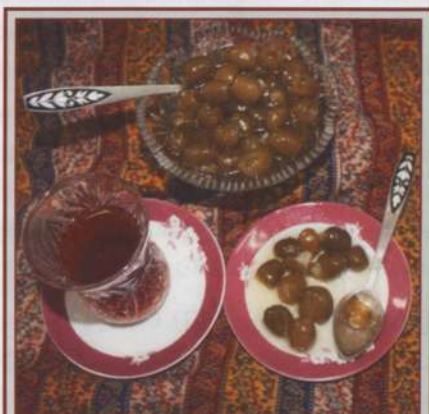


Fig. 9

Olive jam served on tea table

squares, their silvery-green leaves give mysterious beauty to Baku city as a background of its unique national architectural buildings (Fig. 10).

Azerbaijan is a crude oil country, where exploration activities have caused soil contamination in certain parts of Absheron over the years. Recently a remediation process of these soils has begun. Many hectares of contaminated areas in Surakhani, Balakhani, Bibiheybat and Gala districts of Absheron are becoming gradually clean and olive transplants are cultivated to provide green coverage and to help in reclaiming the soil fertility. Hundred thousands of olive trees have been planted during the last 2-3 years. This will positively affect the Absheron ecology in the near future.



Fig. 10
Maiden Tower, one of the most remarkable monuments in the country, and other old buildings amidst olive trees

PROCESSING METHODS OF RAW OLIVES

Processing table olives with an alkaline solution to remove their bitterness sometimes results in decayed fruits. Taking this into consideration, Azerbaijani scientists have proposed a simple method which is based on the knowledge that wild fruits growing in the mountains become sweet after frost. Therefore, to remove the bitter taste of olive fruits caused by glycoside oleuropein, first of all, scientists chill the fresh harvested olives (mainly black ripe) in low temperature, and then dry them at temperature between 30 and 40° C and humidity of 25-30%. It is determined that under such conditions olive loses its bitterness. Olives processed in such a way are canned and sterilized. Processing of olives in low temperature in comparison with that in alkaline solution treatment is cheaper, takes less time and is less polluting.

In home pickling, ripe black olives are pierced with a needle. Salt saturated water is prepared and the fruits are kept in this solution for 10-15 days after which they lose their bitterness, then they are bottled in olive oil. Stones of treated green table olives are removed and replaced by garlic cloves and preserved in lactic acid based solution inside jars to be consumed during winter time.

TRADITIONS AND CULTURE

A common saying states that “No good will comes from destroying olive, cornel, hackberry, Khan plant, gum tree, fig, grape, cypress; they are all sacred”. Another one is related to dreams interpretation; “The one who dreams of olives and olive trees, will achieve his/her objective”.

During the Renaissance era of Islam (ca. 750 to 1258 AD), considerable attention was dedicated for the expansion of the olive area as well as to its distribution which

resulted in varietal diversity and agro-ecology of olives in many regions of the world. It can be said that in all monotheistic and regional religions, olive has been specifically emphasized and considered as the most sacred of all plants. Because of the high significance of this tree and its fruit, God has highly appreciated it. In the chapters of Islam's Al-Qur'ān olive tree is mentioned among the most sacred fruit trees; olive, fig, grape, date and pomegranate and it is sworn by. In the chapter "An-Nur" (Light) olive is noted as a heavenly plant, and its oil is resembled by a shining light. In verse 35 of this chapter the Quran says "Allah is the light of heavens and the earth. The parable of His light is as (if there were) a niche and within it a lamp: the lamp is in a glass as it were a brilliant star, lit from a blessed tree, an olive, "neither of the east nor of the west", whose oil would almost glow forth (of itself), though no fire touched it. Light upon light! Allah guides to His light whom he wills. And Allah sets forth parables for mankind, and Allah is All-Knowers of everything"

According to a legend, in which many Azerbaijanis believe, when Prophet Muhammad (peace be upon him) died, rivers stopped flowing, spring water was frozen, the moon and the sun faded, all animals and birds were silent, all trees weeping and their leaves fell. Only the olive tree, keeping its green canopy, didn't lose leaves. Seeing this, the trees were angry at the heartless olive. However, the olive tree bitterly replied, "Sisters, you have only lost your hair, but my heart is broken from grief". From the Prophet Sunna he said, "Eat the olive oil and rub it on your body, because it is the fruit of the blessed tree".

The national poet Mammad Araz wrote in one of his poems the following:

Azerbaijani	English
<i>Dədəm Qorqud!</i>	My grandfather Korkut!
<i>İnsan didir bir-birini,</i>	Human torturing each other,
<i>İnsan yeyir bir-birini-</i>	Human eating each other-
<i>İnsan yeyir təbiəti</i>	Human eating the nature
<i>Yeyir fərqi nə varmadan,</i>	Eating regardless,
<i>Yeyir qurusuna, yaşına baxmadan.</i>	Regardless of the age of eating dried.
<i>Hardasan, qoşa-qoşa ağaclarım,</i>	Where are you, my one-by-one trees?
<i>Zeytunum, palıdım, narbəndim, ardasan?</i>	My olive, oak, elm, where are you?

POPULAR MEDICINAL AND COSMETIC USES

In Azerbaijan since ancient times, fruits, oil, leaves and seeds of olives have been used in medicine and cosmetology. Nerve disorders, fractures and sprains are cured with olive oil. In folk medicine olive oil is used to remove gallstones. Olive oil stored for a long time is said to positively affect sight when dropped in the eyes.

According to Ibn Sina (ca. 980-1037) the oil obtained from wild-type olives prevents graying of hair. It is also useful for the treatment of erysipelas, herpes and rubella. Ibn Sina, known by his Latinized name "Avicenna" was Islam's most



renowned philosopher-scientist, a court physician in Persia and he wrote “The Book of Healing” and “the Canon of Medicine”.

When olive oil is diluted with hot water and taken orally, it is possible to eliminate the harmful effects of toxicity. A mixture of olive oil with water is used for abdominal and muscle pain, and to cleanse intestinal worms. Olive oil heals symptoms of insect stings when massaged on the skin. In folk medicine, olive oil is used for constipation. Raw olive oil sediment helps restore a healthy look in scabies and skin ailments. Since ancient times, people used to rub their bodies with olive oil which is completely absorbed by the skin to make it supple, smooth and velvety. Traditionally, in cardiovascular diseases, it is common to add 1 tablespoon of olive oil to vegetable salads.

In addition to using olive oil in folk medicine, it is also common to use olive fruits, leaves and branches. For stomach ulcer, eating 12 pieces of pickled olives before the meal has a positive impact. It is claimed that systematic eating of table olives prevents gastrointestinal disease. Tea, brewed from 13 olive leaves is very helpful for high blood pressure (hypertension). It normalizes breathing, acting as a diuretic. It is believed that young leaves are more useful and efficient in preparing this syrup. Permanently drinking brewed olive leaves lowers the intensity of blood sugar in diabetes. Threshing young shoots of olive with leaves and placing them on wounds, takes out the bloody pus and heals. Ashes from burning olive wood is used for treatment of herpes. The liquid extracted from olive leaves is very useful in the cornea and eye cold diseases. Olive leaves are good for cystic diseases of teeth and strengthen them. Furthermore, to strengthen the gum, and prevent its bleeding olives are kept in salt water, and the solution is used to rinse out the mouth. Leaves of wild olives are useful for itching and convulsions. For splitting nails, it is very helpful to rub them with olive leaves.

If women add a few drops of olive oil to creams used for smoothing the face and hands, they will be even more effective. They use olive oil at home to strengthen nails and preserve the softness of hands by putting them in bathes of warm olive oil with added lemon drops.

In a traditional ancient Azerbaijan cosmetology a cream prepared from dates smashed in olive oil with warm egg yolk and camphor alcohol is often used for nourishment of hands and body as well as to soften knees, elbows and feet. A mixture of salt and olive oil is used to heal fire and sun burns. To relieve headache pain, a mixture of mashed mountain grapes with olive oil is applied on the head. A mixture prepared from olive oil and mashed garlic is applied to painful joints. This treatment is useful both for rheumatism, as well as for pain caused by muscle and nerve disorders.

OLIVE WOOD AND BY-PRODUCTS USES

In Azerbaijan, newly chopped olive branches with leaves are used as source for fire as they burn well and give a pleasant fragrance. Olive wood being hard, heavy and



homogeneous is widely used in handy crafts and carpentry, as well as in making expensive art products. It is easily hewed and polished. It is used in making handles for a variety of hand tools. Woodwork experts say that they have used certain pieces of olive wood which resemble ivory in its texture and coloration as inlays in marquetry art for decoration of wooden furniture.

Like ever before, the olive tree for Azerbaijanis is considered a sacred plant, and to source its blessing they make amulets and pendants from its wood as a belief that when children wear them on their neck, they will protect them from the evil eye (Fig. 11).

Stones of olive fruits burn well and do not emit carbon monoxide, because of the presence of oil in the seeds (12%) and in their lignified walls (5%). Motor oil obtained from the compression of seeds, is used for technical purposes. Olive pomace (which is the residue remaining from olive pressing) is used as a valuable feed for livestock for its high nutritious value. It is also used as high burning fuel.



Fig. 11
Amulets crafted from
olive wood

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Adelson Francisco de Oliveira¹ adelson@epamig.ufla.br,
Dili Luiza de Oliveira², **Marcelo Alves³**

¹*Agricultural Research Company of Minas Gerais - Lavras, Minas Gerais*

²*EPAMIG / FAPEMIG - Lavras, Minas Gerais*

³*Agricultural Research Company of Minas Gerais,
Belo Horizonte, Minas Gerais*



INTRODUCTION

Brazil (Fig. 1) with a population of 190.7 million inhabitants is the largest Latin America country and the fifth in the world in territorial extension with a total area of 8,514,215 km². It is situated between extreme points; in the north by latitude 5° 16' 20" and longitude 60° 12' 43", in the south by latitude 33° 45' 03" and longitude 53° 23' 48", in the east by latitude 07° 09' 28" and longitude 34° 47' 30" and in the west by latitude 07° 33' 13" and longitude 73° 59' 32". The climate in Brazil varies greatly among the different regions from Equatorial to Tropical and Subtropical. The southern one-half to two-thirds of the country has a semi-temperate climate, high rainfall, more fertile soil and produces most of Brazil's grains and oilseeds and export crops. The other part, located in the drought-ridden North-east Region and in the Amazon basin, lacks well-distributed rainfall, good soil, and adequate infrastructure.



Fig. 1
Indicative olive growing areas in Brazil

The variability in climate as well as in soils makes it possible to practice diversified and competitive farming systems. Therefore, Brazil is a large producer of grains and fruits, especially coffee, corn, soybean and orange. It is the largest world exporter of coffee, soybean and sugar cane. The harvested area is slightly over 9,000,000 ha of which 2,179,250 ha is dedicated for growing fruit trees, which produced a total of 41 and 42.6 million tons in 2009 and 2010 respectively. Orange takes the largest share of the total fruit area with 802,528 ha representing 36.8%, while banana comes second with 483,562 ha (22.2%) followed by coco with 284,951 ha (13%). The remaining area of 608,209 ha is used for many other fruits, chiefly grape, pineapple, papaya,



passion fruit and mango. The country also has one of the largest cattle herds in the world, which allows it to occupy a prominent place among the exporting countries of meat.

OLIVE CULTIVATION HISTORY

The olive tree was introduced in Brazil by the Portuguese around 1800, and was planted in many regions; in the Southern States of São Paulo, Paraná, Santa Catarina and Rio Grande do Sul and in the South-eastern parts in the States of Minas Gerais, Espírito Santo and Rio de Janeiro. Most of the olive orchards were established in the surroundings of churches and were planted by the parish vicars probably for religious ceremonies; mainly the Holy Week and Palm Sunday. The use of olive oil as a fuel in lighting ancient oil lamps was another purpose for planting olive trees (Pimentel Gomes, 1979).

In addition to olive trees planted by the *Padres* or by farmers on pretense of curiosity, some small olive orchards were planted during the colonial period. Around the city of São Paulo and other cities and towns, relatively large and highly productive olive orchards were established. However, they were cut down by royal order so that Portugal's olive oil could continue being sold in Brazil. That policy prevented the expansion of olive growing in the country during the colonial period. Many Brazilian farmers followed that policy, thus dedicated their lands to other agriculture activities. With time passing, they have forgotten how to grow and process olives. In addition, olive importers, many of them Portuguese, were able to persuade the Brazilians that it was not possible to successfully grow olives on Brazilian soils (Pimentel Gomes, 1979).

In spite of this repelling history, Brazilians have a strong relationship with olive through religion. In the city of Aparecida in São Paulo State, the largest sanctuary was built in honor of Patron Saint of Brazil, *Nossa Senhora Aparecida* (Fig. 2, left). The sanctuary's Basilica is the fourth most popular Marian shrine in the world. For blessing and religious rituals, olive oil is bottled in fancy packages showing the figure of our Lady of *Aparecida* which is represented by a short clay statue of the Virgin Mary, currently housed in the Basilica (Fig. 2, right).

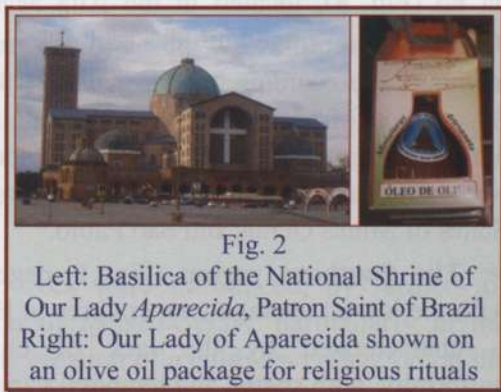


Fig. 2

Left: Basilica of the National Shrine of Our Lady *Aparecida*, Patron Saint of Brazil
Right: Our Lady of *Aparecida* shown on an olive oil package for religious rituals

AREA UNDER OLIVE CULTIVATION

Following the verification of regional soils and climate within Brazil, commercial plantations in the South and South-eastern regions of the country were established (Fig. 1, page 58), especially in the States of Minas Gerais and Rio Grande do Sul. An

area of about 505 ha has already been planted, predominated by 'Arbequina' covering 50% of the total area, followed by 20% of 'Grappolo', 10% of 'Maria da Fé' and 20% of other cultivars ('Arbosana', 'Koroneiki' and 'Ascolana').

Although planting in the forgoing areas was based on environmental research, it is imperative that establishing experimental field research trials in targeted regions should precede any future expansions.

The olive in Brazil is cultivated mainly in the following two regions:

➤ **The South-eastern Region** (Fig. 1, page 58), where Poços de Caldas Plateau and the Alta Mantiqueira micro-region are situated in the far south of Minas Gerais, presenting edaphoclimatic conditions favourable for growing species of temperate climate cultivars among which is olive. In Minas Gerais there are 67 municipalities (7.9% of the total) that are situated at over 1,000 m of altitude, while 10 municipalities (Bom Repouso, Datas, Diamantina, Gonçalves, Maria da Fé, Marmelópolis, Matutina, Munhoz, São Tomé das Letras and Senador Amaral) are at an altitude above 1,200 m. In these altitudes, olive growing is viable due to milder climate in winter, offering this type of agricultural venture the chance to become a socially and economically viable alternative. The municipality of Caldas, situated in the Poços de Caldas Plateau, represents a distinct agro-ecological region with average altitude higher than 1,000 m in rough mountainous terrains. Occurrence of winter frosts is common in such regions. In its agrarian aspect, it is characterized by a great majority of small-holder farms of family style exploitation (Antunes, 2002; Herter and Wrege, 2004). New olive orchards have been established in the municipality of Maria da Fé (Fig. 3), located in the Alta Mantiqueira region because it offers a similar profile, with average altitudes of 1,400 m, enabling different temperate climate species to grow. According to the Olive Growers Association of the Mantiqueira Region³, olive planting is spread in 40 municipalities occupying around 400 ha, encompassing the States of Minas Gerais and São Paulo.

➤ **The Southern region** (Fig. 1, page 58), with the lowest average temperatures in Brazil, is characterized by the lack of climatic uniformity, with spatial and temporal variations in temperature, partially impairing dormancy break in warm years. As the terrain is uneven with great differences in altitude, from the States of Paraná to Rio Grande do Sul, temperature variations among the several areas is a common feature. Therefore, there are microclimates which can be more or less favourable to olive cultivation. The region is made up of mountain ranges, having



Fig. 3
New orchard at Maria da Fé, State of
Minas Gerais, South-eastern Region

³ A growers association of 60 members, Mantiqueira Foothills, Minas Gerais.

an altitude of up to 1,400 m and by valleys and hills, having altitudes of 50 to 200 m (Oliveira *et al.*, 2006). The areas above 900 m present the greatest number of chill hours that may reach above 500. Such terrains extend in the region of Palmas and General Carneiro in Paraná, São Joaquim and Lages in Santa Catarina and Vacaria and São José dos Ausentes in Rio Grande do Sul. The regions of lowest altitude such as North-western Paraná with about 200 m of altitude and the Alto Vale of Uruguai in Rio Grande do Sul, with 70 to 100 m of altitude, possess less than 200 chill hours, a range recommended for less cold-demanding olive cultivars. There is little rain in the region during the harvest season, which is an advantage. The variation of temperature between day and night is wide and in some regions in Southern Brazil, is generally greater than 10° C, occurring mainly in the spring and fall. This fluctuation in



Fig. 4

Olive orchards at State Rio Grande do Sul

Left: Old orchard at Caçapava do Sul.

Right: New orchard at Cachoeirado do Sul

(Right photo by Thales Altoé)

temperature, typical to Mediterranean climate, is a prerequisite for successful olive growing. In that region, according to data of the Olive Growers Association of Rio Grande, olive plantings exist in 29 municipalities, covering 105 ha, in the States of Rio Grande do Sul and Paraná (Fig. 4).

OLIVE CULTIVARS

Recognizing Brazil's total dependence on olive product imports, research institutions in Brazil such as EMBRAPA, *Empresa Brasileira de Pesquisa Agropecuária* (Brazilian Agricultural Research Corporation) and EPAMIG *Empresa de Pesquisa Agropecuária de Minas Gerais* (Minas Gerais Agricultural Research Corporation), have heavily focused on olive production research in different regions of the country, obtaining promising results.

In 1945 the early specimens of olive trees were introduced, by farmers of Portuguese origin, into the Southern region of Minas Gerais, particularly in the municipality of Maria da Fé, causing later the creation of a cultivars collection on the Experimental Farm of Maria da Fé. This was followed by studies and evaluation for scientific and commercialization purposes. Breeding through spontaneous crosses resulted in new genotypes selected from seed populations. Over many years these cultivars were evaluated on the Experimental Farm of EPAMIG in the South of Minas Gerais, having stood out comparatively with others, under similar growing conditions (Oliveira *et al.*, 2010). Four new cultivars were registered under the names 'MGS ASC 315' (Fig. 5A, next page), 'MGS GRAP 541'

(Fig. 5B), ‘MGS GRAP 561’ and ‘MGS Mariense’ (Fig. 5C) according to relevant Brazilian laws. An interesting characteristic of these cultivars is their relatively high level of oleic acid, 75.19% for ‘MGS Mariense’, 87.13% for ‘MGS GRAP 541’, 84.07% for ‘MGS GRAP 561’ and 77.14% for ‘MGS ASC 315’.



IMPACT ON ECONOMY AND ENVIRONMENT

The Brazilian olive sector represents great economic value estimated on the retail market at USD 300 million, with average olive products of about 80,000 tons/year.

Nowadays, with its high consumption of olives and olive oil, Brazil is a market of great importance for international suppliers, because of the reduced restrictions on importation of olive products. Outside the EU, it ranks as the third largest importer of olives and the fifth of olive oil in the world, hence occupying an important position in the agenda of exporting countries (Mesquita *et al.*, 2006, Civantos, 2008). Argentina has been the major supplier to Brazil, providing nearly 80% of olive oil imports in the last ten years. The Brazilian market is not yet quality oriented. Argentina’s exporters take advantage of the MERCOSUR regional trade agreement (founded in 1991 by the Treaty of Asunción) between Argentina, Brazil, Paraguay and Uruguay. The purpose of this agreement is to promote free trade and movement of goods, people and currency (Mesquita *et al.*, 2006).

However, with such a vigorous home market, Brazil still has little commercial production of olive products (Garcia, 2008), mainly due to the adverse climatic conditions, related to the occurrence of cold winters and/or lack of agronomic techniques for establishing and maintaining oliviculture (Oliveira *et al.*, 2006).

Smallholder farming is considered the main propelling factor of commercial development in small and medium communities of the interior of Brazil; therefore diversification of agricultural production is crucial for this sector. In this context, and to widen the smallholder farmers’ productive matrix, aiming at improving livelihoods, it has been proven that the insertion of new agricultural alternatives, in a sustained manner, is of great value. Olive cultivation in monoculture or in a mixed system with traditional crops represents an alternative to smallholder farmers. Olive offers the farmer the potential of fruit processing for table consumption by simple inexpensive means, also the possibility of oil production, allowing value aggregation

to the product. On the other hand, the olive tree being of appreciable longevity, it contributes towards ecosystem conservation. It helps in preservation of agricultural regions, prevents cultivation shifting and allows for the integration with other agricultural activities such as livestock raising or intercropping.

OLIVE SOCIAL, TOURISTIC AND ARTISTIC ACTIVITIES

Brazilians, like other countries, are fascinated with the olive tree for its longevity, its health benefits and its importance in their religion. In addition to utilizing it as a surname for persons, it can be found on streets of some cities as an ornamental plant (Fig. 6). Olive trees can also be found on tourist routes of a religious nature, under the ever-watching eyes of the citizens, admiring it for its religious values and for protecting their surroundings from the dangers of urbanization in every part of the world.

The creative painter Marília Correia Ferreira, inspired by the theme *Oliveira*, manifested olive trees in her oil painting “Museum and Olive Trees”, of 2005 (Fig. 7). The beauty of the work pictures the historical presence of the olive tree in everyday life, and the landscape of some towns in the interior of Brazil.



Fig. 6
Ornamental olive tree on the
central square of Maria da Fé, Minas Gerais
(Photo by Marcelo Alves)



Fig. 7
“Museum and the olive trees”
Painting by Marília Correia
(Photo by Marcelo Alves)

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

Due to the high nutritional value and proven health benefits, olive oil and olives are popular products among the Brazilian people and can be purchased anywhere in the country. Olive oil is widely used in cooking in all regions of Brazil. In the past, olive oil was considered food of richer social classes, while today it is used by most consumers, due to improved standards of living and economic stability in Brazil.

Brazilian cuisine is widely diversified, as the population belongs to different ethnic origins, therefore olives and olive oil are frequently used in the preparation of

different dishes, from the simplest to the most sophisticated. Olives are used to complement main dishes, or as an accompaniment to beverages. Olive oil is used in salads as well as in meat-based dishes.

Among the simplest and most common dishes is

the breakfast toast with a lot of olive oil drizzled on it, and of course with a cup of good coffee (Fig. 8). A dessert consists of slices of an orange drizzled with olive oil and honey (Fig. 9).



Fig. 8
Olive oil drizzled on toast

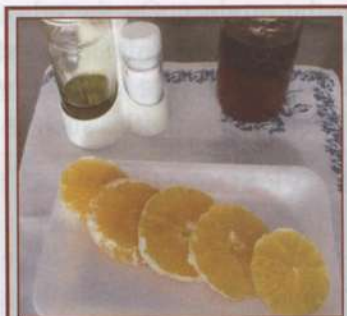


Fig. 9
Olive oil, honey and orange

OLIVE WOOD AND BY-PRODUCTS USES

Some Brazilian artists have utilized parts of the olive tree for their creations. This is the case of the artist Leonardo Bueno, creator of sculptures from olive tree trunks or with wood coming from pruning. He has created the work named *Esfera* (Sphere) (Fig. 10), symbolizing the olive tree with the magnitude of endless circumference. This work is on display in the *Casa da Cultura* (Culture House) in the town of Maria da Fé, Minas Gerais, Brazil.



Fig. 10
The *Esfera* by Leonardo Bueno
(Photo by Marcelo Alves)

Several olive wood products have been studied and/or used for commercial purposes by Brazilian businessmen, such as cosmetics and therapeutic products, utilizing active components contained in olive leaves and its tea as well as other derivatives (Fig. 11).



Olive cosmetics
(Photo by Marcelo Alves)



Fig. 11
Olive leaf extract



Olive soaps
(Photo by Marcelo Alves)

Components of many cosmetics available on the market (flavorings, wetting lotions, deodorants, shampoos, conditioners, face creams, and scent soaps) have olive products among their ingredients and are formulated with olive oil on its own, or mixed with olive leaf extracts. Such products acquire a high commercial appeal. Products, such as olive leaves for teas, ground leaves for use as seasonings, or liquors formulated from olive leaves are available on the market (Pacetta, 2007).

Following a naturalist tendency of the consuming market, especially among females, the indigenous population has commercialized handicrafts, jewels and adornments obtained from or motivated by different parts of the olive tree, such as earrings in the shape of olive leaves (Fig. 12), in gold-plated metal.



Fig. 12
Earrings replica
of olive leaves
(Photo by Cosmo Pacetta)

ACKNOWLEDGMENT

The authors thank FAPEMIG - Fundação de Amparo a Pesquisa do Estado de Minas Gerais, for financial support.

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INTRODUCTION

Bulgaria with a population of 7,148,785 inhabitants is a country situated in South-east Europe, in the eastern part of the Balkan Peninsula, bordered on the north by Romania, on the west by both Serbia and the FYROM (Former Yugoslav Republic of Macedonia), on the south by Greece and Turkey, and on the east by the Black Sea (Fig. 1). Geographical coordinates of extreme points are 44° 12' N, 22° 40' E to the north, 41° 14' N, 25° 17' E to the south, 42° 19' N, 22° 21' E to the west and 43° 32' N, 28° 36' E to the east. The river Danube is a natural border between Bulgaria and Romania. The territory of Bulgaria is 110,993 km², of which nearly 4,772,700 ha (43%) is cultivated.



The country has a temperate-continental climate with moderate features, which are a characteristic of Central Europe, with hot summers, long, cold winters and very distinct seasons. In general, the warmest areas are in the southern districts of the country, influenced by the nearby Mediterranean Sea. The cold winter winds are often humid, with snowfalls and an average air temperature of 0° C. Spring is cool and predominantly humid, while summer is warm and rainy at the beginning of the season, and then hot and dry afterwards, with an average air temperature of 23° C. Autumn is warm, sunny and windy. The average annual temperature is 10.5° C, the total number of sunny hours throughout the year is from 2,000 to 2,400 h. The annual precipitation in the lowlands varies within 500-800 mm and in the highlands reaches 1,000-1,400 mm.

The main factors which influence the foregoing specific climatic characteristics in Bulgaria are its topography and the Black Sea influence. The mountain range spreading in the central part of the country prevents the southern regions from direct flow of cold winds from the north. On the other hand, the mountains in Southern Bulgaria stop the warmer winds from the south.

Fruit crops cover an area of 24,269 ha, with sweet cherry orchards occupying 20% of that area, followed by plum orchards with 19%, while apple, peach and apricot plantations cover 13%, 11% and 6% respectively. The remaining 31% of the fruit-growing area in Bulgaria is planted with walnut, almond, pear, quince, sour cherry and soft fruit trees. The most popular typically subtropical fruit crop grown in the southern part of Bulgaria is fig, followed by paradise apple, pomegranate and kiwi. Less widely spread are laurel and pistachio. As to citrus fruits, lemon is the most widely grown, while tangerines and oranges are less cultivated. All citrus fruits are grown only in containers and they must be transferred to greenhouses or indoors during the winter. Fig, paradise apple and kiwi are grown in small plantations only.

OLIVE CULTIVATION HISTORY

Due to the prevailing climate characteristics, one cannot say that Bulgaria is a country having a rich history of olive production. If there were favourable climatic conditions for successful development of olive trees, then the Thracians, the ancient inhabitants of the Bulgarian lands, would probably have grown olives, handing down their skills to succeeding generations until the present day. The modest history of olive growing in Bulgaria includes only single trees grown in the southern part of the Black Sea coast and in some southern areas with limited Mediterranean influence, found near Svilendgrad, southern parts of the East Rhodope Mountains and in the region of Petrich and Sandanski. Even in those areas there are no old olive trees, as periodically there have been very cold winter periods when the temperatures fell down to -18° and -22° C when the existing trees were killed by frosts or suffered badly. After such periods some of the trees recovered from suckers, while determined farmers planted new nursery trees.

Nowadays, the oldest olive trees in Bulgaria are about 30 years of age. Several such trees can be found in Ivaylovgrad (in the region of the East Rhodope Mountains) and in the towns of Petrich and Sandanski (south-west micro-region).

In the former Agriculture Experimental Station of Southern Crops in the town of Sandanski, in the 70's and the 80's of the 20th century, experiments were carried out on olive trees imported from Greece. The aim of the study was to check the adaptive capacities of olives to the specific local climate. From unpublished data it was concluded that every 5th-6th year the experimental trees were destroyed by winter frosts. Later, the trees restored from suckers but whenever they started bearing fruit, they were again killed by frost.

AREA UNDER OLIVE CULTIVATION

Olive growing in Bulgaria is not economically significant. That is why statistical data about the planted areas, yields and olive fruit production show only the existence of small orchards and single trees grown by amateurs fond of making experiments.



Several olive trees were planted more than 20 years ago at the Experimental Station of Southern Crops in the town of Pomorie (Fig. 2), located at the Black Sea coast. They had been delivered by the Nikitsky Botanical Garden in the town of Yalta and they are still developing normally and bearing fruit regularly. There are some families in Ivaylovgrad, Krumovgrad and Kardzhali, as well as in the neighboring villages from the region of the East Rhodope Mountains, who grow olive trees in their yards and pick their fruit.

Olive tree planting became more popular in the town of Petrich after 1999, when the first 2,000 trees were imported from Greece and later more quantities came. However, not more than another 1,500 olive trees have been planted since 2000. At present olives are grown in Petrich by more than 500 families. At the beginning they obtained 10-15 kg of fruit per tree, but nowadays they harvest about 50 kg/tree.

The influence of the Mediterranean climate is felt more significantly in the region of Petrich and Sandanski, reaching to the north up to the valley of the Struma River and to the town of Kresna. The mountainous relief around Kresna is a natural barrier impeding the penetration of warm air to the north. A family from the town of Kresna grows 56 olive trees, from which they harvest 40-50 kg of fruit per tree. Amateurs from the same town grow single olive trees in their yards and they are also pleased with the yields. In 1985, in a cooperative farm in Kresna, an olive plantation was established on an area of 2 ha. In November 2009 new olive orchards started to be planted near the towns of Kardzhali and Krumovgrad. Experimental plantations of about 0.1 ha each have been established with the aim of finding the best suitable regions for growing olive trees. They are scattered in different micro localities down the valley of the Arda River and some other smaller rivers in the East Rhodope Mountains where the climate is transitory Mediterranean. In the last several years olive trees have also been planted in the house yards in the towns of Svilengrad, Plovdiv, Asenovgrad, Karlovo, etc. An olive tree is also growing in the park of the Fruit-Growing Institute in Plovdiv.



Fig. 2
20-year old olive tree
at the Experimental Station
(Photo by Ana Djeneva)

OLIVE CULTIVARS

Olive trees grown at the Experimental Station in the town of Pomorie are of Nikitskaya Rannaya cultivar originating from Nikitskaya Botanical garden in the town of Yalta, Ukraine. Their fruits ripen to black color with a mean weight of 4.5 g. In the region of the East Rhodopes the Spanish 'Picual' is planted, as it is more frost-resistant, it takes a shorter period before starting to bear fruit, is highly fertile and bears fruit regularly.

In the Bulgarian micro localities which are suitable for growing olive trees, the best cultivar to be grown is the Greek 'Chondrolia Chalkidikis' which originates from Chalkidiki Peninsula. It is expected that 'Angura' and 'Petro' Spanish cultivars imported to Bulgaria from Greece, will also adapt well. Cultivars and forms of unknown origins are also found.

IMPACT ON ECONOMY AND ENVIRONMENT

Bulgaria is a country importing processed and ready for consumption table olives and olive oil. They have been consumed since ancient times. In the period of communism olive oil was rarely used in Bulgarian cuisine, and small amounts of lower quality table olives were offered on the market once a year around Christmas time. Because of high consumer demand in shops, the sale was usually limited to 0.5 kg per customer. Since those times, there is a popular saying "to wait in a queue for olives". After the democratic changes in the country in 1990, a substantial



Fig. 3

Unpacked olives on retail

increase in the trade of olives and olive oil was observed. In the period 2004-2006 the sale of olives increased by 20%. At present, olive consumption is within 10-11 thousand tons annually, while in the last 2-3 years it has been rising by 15% annually, and this trend appears to be stable for the coming years. About 70% of the quantities are imported from Turkey and the rest from Greece, Spain with less from Italy. Almost 75% of table olives are sold unpacked in the shops (Fig. 3) but there is an increasing demand

for preserved olives packed in vacuum and in glass jars.

Table olives in metal tins are less preferred, as the content is not visible. The biggest amounts supplied and demanded, are of the low price class, varying between 1.5 and 2.5 EUR/kg (retail price). Although black olives are more preferred, an increasing demand for green olives has also been noticed. The most expensive olives reach a price of 8-10 EUR/kg, and they are usually of the large-sized fruit cultivars. Lately, the table olive assortment in Bulgaria has been enriched with more than 20 types offered on the market; olive pastes, brusquets with olives and even bread with olives has gained popularity. Delicatessens offer stuffed olives with different ingredients. The refined olive oil is sold in PET "polyethylene terephthalate" plastic bottles.

Until recently, the major occupation of the population in South-east Bulgaria and in the Eastern Rhodope Mountains was tobacco growing. Lately subsidizing of tobacco production has been strongly reduced, which highlights the economic insecurity of tobacco farmers. Considering climatic changes, olives could be a suitable alternative crop for former tobacco growing areas. In those regions new plots

have been planted with olive trees. It is expected that in several years Bulgarian olives will be offered on the domestic market. If the economic return proves to be satisfactory, it would be possible to have larger areas planted with olive trees in the southern parts of the country. This could lead to development of a new food processing industry for table olive and olive oil. Olive oil and olives have been imported to Bulgaria, ready for consumption. However in 2008, the first 513 tons of raw olives were imported for processing.

In 2009 the Agricultural College in the city of Plovdiv initiated a project, whose implementation will answer the questions concerning the most frost-resistant cultivars and the most suitable micro localities for olive growing in the East Rhodopes Mountains (Fig. 4).

In response to the increasing interest in olive growing in Bulgaria, an Association of Olive Producers was founded in Plovdiv on February 8, 2010. This association is a non-profit public organization and its aim is to provide regular consultancy services to present and future farmers willing to grow or to process olives.



Fig. 4
Young olive plantation in the
region of the East Rhodope Mountains
(Photo by Vasko Vasilev)

OLIVES AS COLOR REFERENCE

In Bulgaria olive fruits are sometimes used as a reference to the black color. When cherry fruits are very dark, people compare them to black olives. There are folk songs saying that the eyes of a young girl are “as black as olives”.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

In Bulgaria olives and olive oil are consumed mainly in salads, but lately both are being used in home cooking for preparing soups and main dishes. In most types of salads only a few olives are added, as the case with the typical Bulgarian *Shopska salad*. In another typical Bulgarian salad called *Velikdenska* (Easter salad), more olives are used. Olives are also served as a starter or as an ingredient in salads with onion.

Concerning soups with olives, the most popular one is the soup with leek and olives. As for the main dishes, olives with rice and stewed vegetables are typical of the Bulgarian cuisine. Following are recipes of these dishes:

➤ ***Shopska salad*** (Fig. 5, next page):

Ingredients for 2-3 dishes: 2 ripe tomatoes, 3-4 roasted red peppers, 1 cucumber, a small onion or a bunch of spring onions, chopped parsley, 150-200 g of white



cheese, 4-5 olives, 1 spoonful of vinegar or lemon juice, 1-2 table spoons of olive oil and salt to taste.

Method: The tomatoes and the peeled cucumber are cut into cubes, 2-3 cm in size. The roasted and peeled red peppers are cut into strips and the onion to thin semicircles (when spring onions are used, the pieces should be about 1 cm long). The finely chopped parsley, salt, vinegar and olive oil are all added into the salad, after which it is mixed. The white cheese is grated without mixing with the vegetables and the olives are arranged on the top.

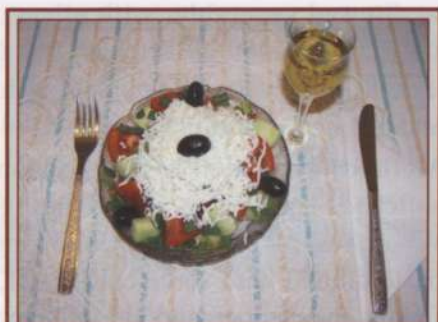


Fig. 5
Shopska salad

➤ **Velikdenska (Easter) salad** (Fig. 6):

Ingredients for 4 dishes: 2 lettuces, a bunch of spring onions, a bunch of radishes, half a bunch of parsley, 3 hard-boiled eggs, 50 g black olives, a spoonful of vinegar or lemon juice, 2 spoonful of olive oil and salt to taste.

Method: The washed lettuce is cut to strips a few mm in size. The spring onions are cut to pieces of 1 cm length. The radishes are cut to semicircles and the parsley is finely chopped. The vegetables are mixed and the dressing of vinegar, salt and olive oil is added. The boiled eggs are cut to quarters lengthwise and the pieces are arranged on top as a circle. Olives are then arranged on top for decoration.



Fig. 6
Velikdenska (Easter salad)
(Photo by Tsevetana Zhivondova)

➤ **Olives with rice** (Fig. 7): A vegetarian dish suitable for fasting and is served as a main course.

Ingredients: 200 g of olives, 1 onion, a cupful of olive or seed oil, 300 g of rice, half a teaspoonful of salt and half a teaspoonful of paprika.

Method: The onion is finely cut and stewed in the oil. The washed rice is added and it is fried until transparent. 900 ml hot water is poured into the pan, salt is added to taste, then the olives and the rice mixture is poured in a large baking dish. The dish is baked in a moderately hot oven for about 30 minutes until the rice is stewed. When served, each portion should contain at least 8-10 olives. The dish is sprinkled with ground black pepper.



Fig. 7
Olives with rice
(Photo by Tsevetana Zhivondova)

➤ **Stewed vegetables with olives:** Another vegetarian dish served as a main course.
Ingredients: 400 g of olives, 100 g of olive or seed oil, 300 g of onion or 300 g of leek, 10 g of wheat flour, 20 g of tomato paste, a lemon, 8-10 grains of each pepper and allspice and salt to taste.

Method: The onion is finely chopped and then stewed in oil and a little water until softened. The flour is stirred until golden yellow. A cupful of hot water is poured in. When it starts boiling, the following ingredients are consecutively added: the tomato paste diluted with some cold water, the olives, the peeled and cut lemon pieces, and finally the pepper and the allspice. Salt is added to taste and all ingredients are poured into a large baking dish. It is dusted with flour and baked in a moderately hot oven.

POPULAR MEDICINAL AND COSMETIC USES

According to folk medicine in Bulgaria, the regular consumption of olives and olive oil slows down the processes of ageing of the human organism and consumers are probably protected from a number of cardio-vascular and digestive diseases, and the risk of cancer. In Bulgaria olive oil is used as a remedy for treatment of burnt wounds, insect bites, stomach cleaning, against high blood pressure, kidney pain and as a laxative. In order to ease leg and foot fatigue, massages with olive oil and lemon juice are recommended. An extract from ground olive stones and an extract from olive leaves are used as a remedy for diabetes. The extract from olive leaves also helps to reduce high fever. It is said that olive stones swallowed whole are digested by the organism, balancing stomach acids.

ACKNOWLEDGEMENTS

Summarizing the data about olive growing in Bulgaria was realized with the kind assistance of colleagues from the Higher School – Agricultural College in the city of Plovdiv, colleagues from the Experimental Station of Southern Crops in Pomorie and colleagues from the Fruit-Growing Institute in Plovdiv.

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Francisco Tapia Contreras¹ fatapiac@inia.cl,
Gabriel Selles van Schouwen¹, Thomas Fichet Lagos²

¹Instituto de Investigaciones Agropecuarias (INIA), Casilla 58-D, Temuco

²University of Chile, Santiago



INTRODUCTION

Chile is located on the western side of South America (Fig. 1); it extends from 19° to 56° S latitude and from 67° to 70° W longitude, with a maximum width of 341 km and a minimum of 90 km in continental Chile. Its total surface is approximately 700,000 km². Chile is a long and narrow strip of land, with its natural limits being the Andes Range in the east, the Pacific Ocean in the west, the Atacama Desert in the north and the Patagonian ice fields and the Magellan Strait in the south. Its climate, Mediterranean-like in most of the country, is strongly influenced by the Pacific permanent anticyclone and by the cold Humboldt Current, which is considerably moderate in its temperature; being usually lower than 25° C in the desert coastal zone in the north of the country. Chile receives on average 357 mm of precipitation annually. The month with the driest weather is January, while the wettest is June. The inhabitants of Chile are mostly Caucasians, but they also include descendants of Aymara, Diaguita, Mapuche and Rapa Nui ancestry. The current population is about 16.5 million inhabitants.



Fig. 1
Olive growing areas in Chile
from the Arica-Parinacota to
Bio Bio regions

Mining is the principal economic activity of the country, followed by agricultural and farming production, which occupy 26,500,000 ha. Fruit and grape orchards alone cover 284,025 ha, of which a little more than 22,000 ha (7.7%) are planted with olives.

OLIVE CULTIVATION HISTORY

The first olive trees were introduced into Chile from the Mediterranean basin by the first Spanish colonizers in the 16th century, when Don Antonio de Ribera, the Procurator General of Perú, brought a number of cuttings from Seville, Spain to Perú. Three of those trees survived and were planted in Lima, Perú. Later, the trees originating from these cuttings began to produce fruits that were very desirable. The



fame of the new fruit spread rapidly, generating great interest in acquiring olive trees. To protect the original three trees, the Procurator General assigned a guard around them. However, according to a historical account of Garcilaso de la Vega (cited by Hidalgo, 1993), one olive tree mysteriously disappeared years after its planting. During the 16th century and later it was discovered in the Azapa Valley (which is now in Chile, Arica-Parinacota), where it remained for more than three years. Given the excellent growth conditions for olive in this location, which was much better than those of Lima, and possibly because it was not pruned, the tree rapidly began sprouting from its roots. Later, due to the insistence of Antonio de Ribera to recover that tree, it was finally returned to Lima. However, the sprouts remained in the Azapa Valley and the first Chilean cultivar originated over the next couple of centuries, probably due to selection by local producers for larger size fruit and stability in production. These developments led to the 'Azapa' cultivar which is also locally known as 'Sevillana de Azapa' (Fig. 2). This is a table olive cultivar although it can also be used for oil production.

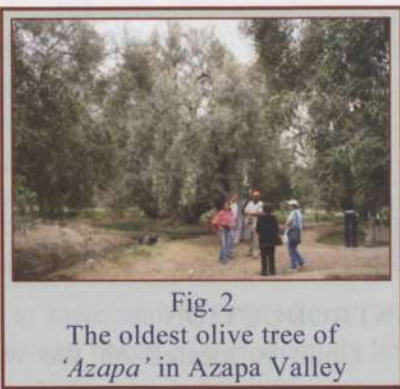


Fig. 2
The oldest olive tree of
'Azapa' in Azapa Valley

The next recorded introduction of olive cultivars in Chile was in 1903, when a private producer imported new cultivars from Italy, Greece and Spain ('Ascolana tenera', 'Liguria'; 'Kalamata' and 'Manzanilla de Sevilla' respectively), (Abascal, 1992). In the 1950's a government program promoted olive planting in new areas, including the Limarí Province, where a state propagation center was established. This center multiplied a number of olive cultivars and facilitated the extension of the olive area in Limarí and Huasco Provinces.

The first cultivars introduced exclusively for oil production arrived at the beginning of the 20th century. By 1997 a number of new cultivars, mostly for oil production, originating in different countries were imported. 'Arbequina', 'Picual', 'Arbosana', from Spain, 'Frantoio', 'Leccino', 'Coratina' from Italy, 'Koroneiki' from Greece and 'Barnea' from Israel were the principal ones introduced.

AREA UNDER OLIVE CULTIVATION

Olive production in Chile was initially concentrated between 18° and 29° S latitudes. Today this has extended to 38° S, at altitudes ranging from 5 m to 500 m above sea level. Although new plantations have been concentrated in higher latitudes, recent new orchards have also been planted at lower latitudes, particularly in the margins of the Atacama Desert.

The total area covered by olive plantations had increased by over 700%; from 3,071 ha in 1991, which was dominated by table cultivars to 22,244 ha in 2010. To



the contrary, it is now estimated that 89% of the new area is devoted to olive oil production. In comparison to 1997 only 30% of the plantations were oil cultivars. The production of olive oil reached 12,000 tons in 2010, a growth of 41%, compared with the production in 2009. It is expected that by the end of 2011 there should be more than 24,000 ha of olive plantations as a result of ongoing expansion projects. Currently the olive plantations in the regions of Maule and O'Higgins occupy more than a third of the total area cultivated with olive trees in Chile; with almost all plantations dedicated to oil production.

The expansion in the oil producing areas in Chile was driven by the growing world interest and demand for the consumption of extra virgin olive oil, due to its health benefits and the increase in purchasing power in many countries. The Chilean demand for this product has followed the world's trend reaching an annual per capita consumption of 0.45 liter. This represents an increase of 362% in the last seven years with a projection of per capita consumption reaching 1.0 liter and 1.5 liters by 2012 and 2015 respectively. The increase in the area planted with olives for oil production is not only to satisfy local needs, but also with the objective of exporting, which is supported by the high quality of the Chilean olive oil. To ensure efficient marketing, Chile has entered into a number of free trade agreements with many countries, mainly USA, Canada and Korea, and other economic communities of the world.

Currently there is a wave of innovation and expansion of oliviculture following new world techniques in olive growing. Since the end of the last century, new olive cultivars are being introduced and multiplied with the semi-woody cutting system. This new impulse is the result of a joint effort by the government of Chile and private enterprises. These new plantations have a greater density than traditional Chilean systems, which were of 100-250 trees/ha. Current plantation densities range from 333 to 1,666 olives/ha; the latter being of the super-high-density system planted on nearly 20,000 ha, with pruning and harvesting completely mechanized.

OLIVE CULTIVARS

Although olive cultivation, on a large scale, is relevantly new in Chile compared to the Mediterranean basin, there are two distinguished Chilean cultivars that were selected over the years since olive was introduced in the country. They are described below:

'Azapa' (Fig. 3), also known as 'Sevillana de Azapa', considered as the traditional and principal table olive cultivar in the country. Its fruit is of medium to large size with a weight of 8 g and a pulp/stone ratio of 9.6. When used for oil, the oil content does not exceed 12% on a fresh weight basis. As table olive, it is suitable for both green (Sevillian style) and black oxidized (California style). The fruit is asymmetric and the stone is difficult to separate from the pulp, thus it presents de-stoning



problems. It is tolerant to drought and salinity and grows satisfactorily in marginal soils; however it is susceptible to wind throw. The cultivar enters early into production with medium to high yield when mature and has a marked alternate bearing behavior. It has a medium rooting capability of semi-woody cuttings. Its pollination is apparently improved with ‘Liguria’ and ‘Empeltre’ as pollinizers. Although it flowers abundantly early in the season and last for a long period with a high level of pollen, yet its fruits maturation is late (Tapia, 2001). It is considered to be susceptible to verticillium wilt, and leaf spot (cercosporiosis). Grafted trees are affected sooner or later by a virus (Clara *et al.*, 1997), a disease known as “vericosis” (Herrera and Madariaga, 1999), which slowly reduces the productivity.

‘**Manzanilla Chilena**’ (Fig. 4), developed at the beginning of the 20th century probably from ‘Manzanilla de Sevilla’ by means of natural crossing in Chile, followed by propagation and selection from seeds. Their olives became popular with consumers, and due to their low alternate bearing they were preferred by producers for commercial plantations. It is a table cultivar of secondary importance appreciated for its good taste, used for green pitted and black oxidized olives. Fruits have an average weight of 5 g, a medium pulp/stone ratio of 6.2, are relatively easy in de-stoning. Its oil content is medium in the range of 12 to 14%. It is moderately sensitive to salinity and drought, susceptible to high soil moisture level and moderately precocious. It has a good rooting percentage with semi-woody cuttings (Tapia, 2001). Flowering period is medium to late, while fruit maturation is medium in the season. It is of medium productivity and alternates moderately. No disease or pest has been found that affects its production, except for the recent appearance of the Fresno white fly (*Siphoninus phillyreae*).



Fig. 4
‘Manzanilla Chilena’

Because expansion of the area planted with olives during the last two decades has been to the super-high-density system (Fig. 5), mostly targeting oil production, new suitable cultivars were imported from Italy, Spain and Greece. The most important, in terms of area cultivated, are ‘Arbequina’ covering almost 50% of the total area, followed by ‘Frantoio’ (18%), ‘Arbosana’ (7.8%), ‘Picual’ (7.6%), ‘Leccino’ (4.7%) and others such as ‘Kalamata’ and ‘Koroneiki’ (Tapia *et al.*, 2003).

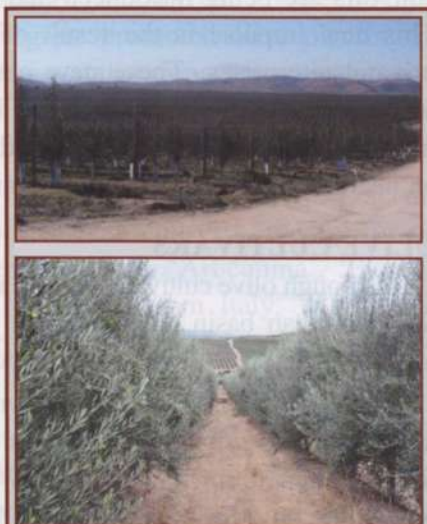


Fig. 5
Super-high-density orchards in Chile
Bottom: ‘Koroneiki’ trees

IMPACT ON ECONOMY AND ENVIRONMENT

Olive growing originated in Chile in areas of saline soils and scarcity of irrigation water, such as the valleys of Azapa, Copiapó and Huasco. In the valleys south of Huasco most new plantations, from 1997 on, are large commercial orchards planted by industrial enterprises; many of which are wine producers that expanded their operations to include olives. The present olive production is competing with other crops like grapes (especially wine grapes) and other fruit trees, which shows that oliviculture is no longer marginal, but to the contrary, it is receiving strong economic impulse with the development of modern olive orchards applying localized irrigation and mechanical pruning, using the latest technological processing infrastructure. Chileoliva is the association which groups more than 90% of extra virgin olive oil producers in Chile. This grade of olive oil reaches 95% of the country's production. With more than 22,000 ha, oliviculture has changed from artisanal agriculture to commercial production (some companies have more than 1,000 ha of olives), contributing a large share in the overall national production. This has allowed Chile to become the third largest producer in Latin America, after Argentina and Perú. It is projected that by 2015 Chile will have 35,000 ha planted with olives, producing 45,000 tons of extra virgin olive oil.

Associated with the increase in cultivated area, is the increase in exports of olive products in both quantity and the number of destination countries. There are currently more than 40 Chilean companies exporting olive oil all over the world. The exportation volume and value have increased considerably over the last decade to reach 3,000 tons valued at nearly 12.5 million USD.

In 2010 the main importer of Chilean extra virgin olive oil was the USA (37%), followed by Italy (33.3%), Spain (9%), Canada (7.7%) and Brazil (3.5%). The importation of olive oil to Chile (till October 2010) was 646 tons, coming from Argentina (40%), Italy (39%) and Spain (21%). Most of the imports from Argentina were by large supermarket chains for their house brands with private labels. However, olive oil imports have been declining considerably since 1995, as it is replaced by increasing national production. Up to the end of October, 2010, 77% of the Chilean production of extra virgin olive oil was sold on the local market.

The new olive plantations occupying previously used agricultural soils, are replacing other less profitable crops such as citrus, wheat and some vegetables. Irrigation is mostly the same that was used in former crops, thus olive growing has not produced a negative impact on water resources. On the contrary, there has been water saving, because all plantations started in the last 15 years are using localized irrigation; more than 95% is by drip irrigation and the rest either micro-jets or micro-sprinklers. On the other hand, new olive orchards have helped maintain a green cover and minimum soil tillage, reducing soil erosion. Furthermore, almost



30% of the Chilean olive oil orchards are using organic management which allows for recycling, improving soil health and producing natural and healthy food.

In the processing sector, all the oil-producing companies have two-phase oil extraction systems; the residues are used for compost production, which is re-used to improve soil characteristics. By law, the vegetation water, resulting as by-product from oil mills, is not allowed to be dumped in rivers, lakes or the ocean. Its volume must be reduced in evaporation ponds, or be used on dirt roads to reduce dust. It is also diluted and used for weed control, due to its high polyphenol content.

CULTURAL PRACTICES

Few old orchards still continue to use basin system for surface irrigation (Fig. 6).



Fig. 6
Basin irrigation in old orchards

This system has a few advantages; however it has many disadvantages including high water losses, the potential of exceeding the soil field capacity and spreading soil borne diseases and nematodes as well as facilitating weed growth. Other major disadvantages are the fluctuation of soil moisture over time and the difficulty in adjusting to the trees timely need for irrigation according to their physiological development stages. Pruning is done by some growers only to correct for damages to foliage, therefore requires more attention. Tillage is practiced 3-4 times/year to control weeds.

PROCESSING METHODS OF TABLE OLIVES

Slit olives is a traditional process used with olives that have black skin and pulp. Once harvested, three or four longitudinal slits are made down to the stone using a small serrated knife. The olives are then placed in aqueous solution, which is changed regularly until the bitterness is removed and they are ready for consumption. This preparation requires no additives, and the olives may be ready for consumption within one month after harvest.

TABLE OLIVES IN NATIONAL COOKING

Almost 60% of table olives consumed in Chile are black, while it is the country consuming the lowest percentage of green olives in the world (Castro, 2009). A large part of olive consumption is in foods such as *pizzas*, but olives are also included in traditional Chilean dishes such as corn pies (*pastel de choclo*), potato pies (*pastel de papa*) and *empanadas*. An *empanada* is a small sealed pie made of wheat flower, stuffed with *pino* consisting of finely chopped beef, onion, hard-boiled egg, raisins and olives (Fig. 7).



Fig. 7
Pastel de Choclo and empanada

OLIVE FESTIVALS

Olives are not native to Chile, thus they are not incorporated in the cultural tradition of the indigenous inhabitants. However, a few small towns have developed an economy based on oliviculture, such as Los Choros, which is located in the Southern extreme of the Atacama Desert in the Coquimbo region. In this place, where olives have been cultivated for more than 200 years, a traditional olive festival is celebrated in July every year (Fig. 8). During the festival recipes developed by local people, as well as wood carvings and other artwork using olives and its derivatives, are displayed. The festival also includes a competition for the largest Azapa olive. Therefore local growers exercise best management practices of their trees, since winning the trophy is a high recognition and also brings prestige during the following year.



Fig. 8
Olive festival in Los Choros



Fig. 9
Olive wood items from
north of the country

OLIVE WOOD AND BY-PRODUCTS USES

In the Azapa Valley, the origin area of Chile cultivated olives, local craftsmen make utensils, plates, salad bowls and other kitchen ware from olive wood, which is obtained from the trimming of old olive trees (Fig. 9).

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INTRODUCTION

China's vast 9.6 million km² of land spans three climate zones (temperate, subtropical and tropical), crosses five time zones, and consists of the mainland, islands, and territorial waters. With the overall slope of the terrain declining eastward, the major rivers tend to flow from west to east. The climate in China varies with the extensive territory and various topography from region to region. In general, the warm and humid air moving from south-east to north-west is blocked by the rising elevation of the land. Therefore most parts of China have a marked continental monsoon climate characterized by high temperature and abundant rainfall in summer while the winter is cold and dry.

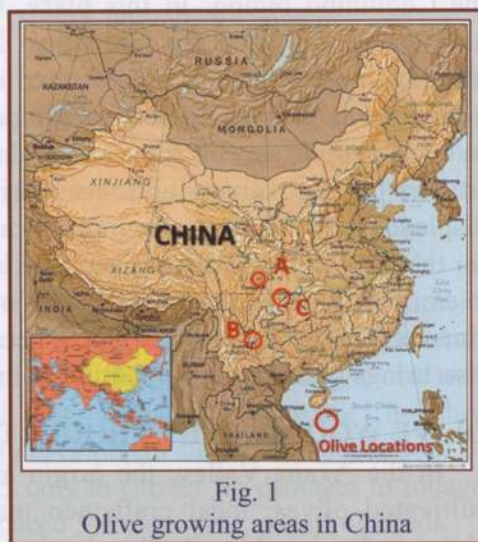


Fig. 1

Olive growing areas in China

China is a mountainous country with mountains and hills accounting for two third of the land area. In order to feed the nearly 1.4 billion people, the government takes strong measures to protect the 120,000,000 ha of cultivated land. From the 13,000,000 ha of fruit growing area in the mountains and hills, the share of apples, citrus fruits, and pears accounts for more than 60% of the annual fruit production. In less than half a century of olive cultivation history, by the end of 2010, there was only a total of 25,000 ha devoted to olive growing, distributed in three major regions (Fig. 1).

OLIVE CULTIVATION HISTORY

In the book titled "YOU ZAI ZU" by Yin Chengwu of the 9th century, a foreign species of tree was mentioned, "Qi Dun", which is the translation of the Arabic word *Zaitun* meaning "olive". It is said that during the first half of the 20th century, western missionaries and returning Chinese students from olive growing countries brought small numbers of olive transplants into China. Nowadays, Mengzi County, Yunnan Province and the City of Chongqing still retain one of those trees.

In the early 1960's, the Chinese government became involved in promoting olive cultivation. After World War II, agronomist Zou Bingwen (1893-1985), (Fig. 2)



recommended the introduction of olives when he was a consultant to the Ministry of Agriculture and the Ministry of Education in 1959. He was associated with programs of the Food and Agriculture Organization (FAO), and then he became the chief representative of China to this organization of the United Nations. His proposal was adopted by the Chinese Government in the 1960's, when following the visit of Prime Minister Mehmet Shehu of Albania, his government presented China with an official gift of nearly 10,000 olive transplants. In 1964, Premier Zhou Enlai (1898-1976) received the Albanian experts and in their presence he participated in olive tree planting in Kunming, Yunnan Province (Fig. 3). During the period from 1978 through 1987, the FAO played a significant role in sponsoring an olive development project in China with cultivars initially donated by Spain, France and Italy.



Fig. 2
Prof. Zou Bingwen



Fig. 3
Late Premier Zhou Enlai planting the Albanian gift of olive transplants in Kunming, Yunnan on March 3, 1964. He inspired students to join the effort because they would become beneficiaries

China's State Forestry Administration manages olive planning and research for development. The Chinese Academy of Forestry, along with the local research organizations, is responsible for implementation and technology transfer, while enterprises and farmers decide on their production schemes by themselves.

Ms. Xu Weiying (1916-2009) (Fig. 4), a senior researcher at the Chinese Academy of Forestry, should be recognized for her outstanding contribution



Fig. 4
Sr. Researcher Ms. Xu Weiying and some of her olive publications

among those who made unrelenting efforts for the development of the olive industry in China. From the sixties until her death, she worked tirelessly for this cause. During the period when there were scarce olive reading materials available in Chinese, the books she compiled and edited, together with the dissertations and reports she wrote, became mandatory reading for those who were to become involved with this new emerging olive industry.

AREA UNDER OLIVE CULTIVATION

China's economic reform which started in 1978 and was substantiated after 1992 has provided the necessary social and economic environment for olive cultivation and market development. Since the 1990's, the area cultivated with olive trees in subtropical Western China, mainly in Gansu, Sichuan, and Yunnan provinces (Fig. 1, page 80), has increased year after year to reach nearly 25,000 ha by the end of 2010. Of this area nearly 10-15% is operated by large communal enterprises, while the rest is done by farming families.

OLIVE CULTIVARS

China's olive introduction and production were developed under a cloud of controversy whether China could grow olives or not. Even in subtropical Western China, there is no ideal Mediterranean climate. The synchronization of rain and heat is of major challenge and concern.

The area where olive trees are planted spans from longitude 111° to 100°, east to west, and from latitude 33° to 25°, north to south. Along the Mediterranean coasts olive orchards are somewhat broad and continuous in characteristic scenery like forests, while in China, olive trees are scattered and grown well inland away from water surfaces on altitudes ranging from just less than 100 m to about 2,000 m above sea level. Complex local geographic landscape and varying climates cause phenological differences between north and south of more than 80 days. It is quite a difficult endeavor to find appropriate cultivars for the local conditions. However, in reality, certain cultivars perform quite well in relatively wide areas with diverse growing conditions. Following is a description of the behavior of few cultivars grown under Chinese conditions.

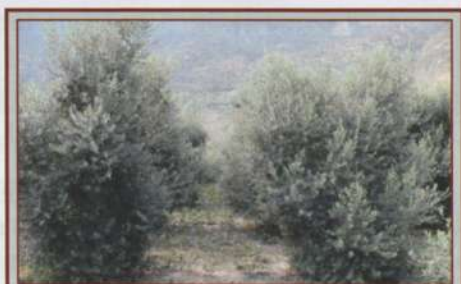


Fig. 5
'Leccino' planted in Wudu, Gansu, 1992

'Leccino' (Italian origin) (Fig. 5 and 6) showed better adaptability compared to others under same cultivation conditions. In the Dawangou olive orchard situated in Wudu, Gansu Region (Fig 1, A), 578 transplants of 15-month old of this cultivar were planted in a 6×5 m pattern. In the third year following planting, 144 trees flowered yielding 0.97 kg/tree. In the fifth year, 209 trees produced fruit, with a highest yield of 36.0 kg/tree, and an average of 16.5 kg/tree. 'Leccino' performance in this region is better than in Sichuan, and Yunnan Regions B and C respectively on Fig. 1, page 80.

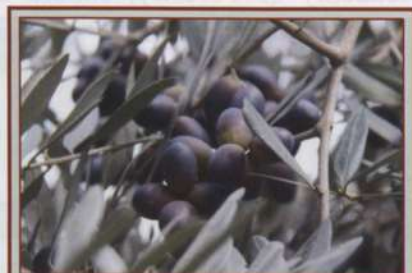


Fig. 6
'Leccino'

‘Picual’ (Spanish origin) (Fig. 7 and 8) performs better in Regions A and B (Fig. 1, page 80) with stronger growth potential. In addition, it does not show physiological disorders, flowers early, and carries high and stable yields. In the aforementioned olive orchard in Wudu, 107 ‘Picual’ trees yielded 1.6 kg/tree in the third year after planting, 11.1 kg in the sixth year, 18.7 kg in the seventh year, and 16.0 kg/tree in the eighth year. Oil content on fresh weight basis is between 19% and 23%.



Fig. 7
‘Picual’ planted in Wudu, Gansu, 2001

‘Frantoio’ (Italian origin) performs better in Regions B and C (Fig. 1, page 80) with high fruit set rate and stable yields. There are 12 ‘Frantoio’ trees in an olive test field managed by the Yunnan Forestry Research Institute. Eleven years after planting, under careful cultivation, they produced 35.8 kg/tree on average, with a single highest yield of 99 kg/tree. In March 1967, 17 trees were planted in an olive management agency in Bazhong, Sichuan. Between 1976 and 1979, the total yield of these trees reached 1,692 kg with an annual average of 423.1 kg, i.e. 24.9 kg/tree/year. However in 1977, the average harvest was 38.2 kg/tree. In an olive introductory test field in Jiufeng hill managed by the Hubei Forestry Research Institute, 13 trees produced an average of 20.7 kg after 11 years of growth, with the highest fruit yield of 85.5 kg/tree.



Fig. 8
‘Picual’

‘EZ-8’ (Fig. 9), a hybrid cultivar selected from a population of seed propagation. In Regions A, B, and C (Fig. 1, page 80), it showed good adaptability and early fruit bearing, despite its fairly non-vigorous growth. When self-pollinated, the fruit set rate reaches 2.3%, while it increases to reach between 4.7% and 8.2% when cross-pollinated with other cultivars in the vicinity. Fruit matures in about 160 days in Region A with an oil content of 18% to 21% on fresh weight basis, with good quality and mild taste.



Fig. 9
‘EZ-8’

‘JF-6’ (Fig. 10) is among the seedling population derived from hybrid seed multiplication method, and it is considered as a good cultivar since it was planted in all three regions where it proved to be quite adaptable to



Fig. 10
‘JF-6’

the varying conditions. It is resistant to many pests, diseases and to drought. Its growth rate and yields are not stable. The 'JF-6' fruit set rate when self-pollinated is only 0.4%. When pollinated with 'Crimean' (unknown cultivar introduced from the former Soviet Union) its fruit set rate could reach 6.1%. The oil content is between 19.6% and 21.1% on fresh weight basis, with flesh rate of 82.1%.

Moreover, other cultivars such as the Italian 'Coratina', Greek 'Koroneiki', Spanish 'Arbequina', and others introduced in the same regions also performed well.

IMPACT ON ECONOMY AND ENVIRONMENT

According to the latest census, China's population reached 1.341 billion. Based on 24,000,000 tons of annual edible vegetable oil consumption, the per capita is 18 kg. As living standards improve, people have become more health conscious and a growing number of consumers are willing to pay the extra price for olive oil, which is several times higher than ordinary cooking oils. The speed of the market change is clearly indicated by the olive oil import growth in the first decade of the present century by nearly 20 fold from approximately 1,000 tons to 20,000 tons.

In the foreseeable future, olive oil probably will not become a main ingredient in most Chinese kitchens; nevertheless it could be equivalent to a delicious dish, appetizer or small dessert. However, the Chinese government gives the development and production of olives an important position and provides support, especially where it has shown adaptability in the western mountains on marginal farmland. There, it has the potential to sustain resources, and improve ecological and economic conditions.

The enthusiasm of olive growers increases along with the effective economic return. This can be seen from the expressions shown on the faces of local government officials and growers (Fig. 11).

Although the development of the olive industry in China is a long bumpy road, yet there is great determination to follow through. In the west margin of olive growing region of Benzilan



Fig. 11

The head of Wudu, Gansu shakes hands with an enthusiastic olive grower (left); and chats with farmers at a mill yard (right) in Nov. 2009

(about 1,800 m above sea level), Diqing and Yunnan (B on Fig. 1, page 80), three olive trees grown around the house of a disabled Tibetan woman farmer yielded

about 30 liters, enough for her family's cooking oil for a year (Fig. 12). Such success stories may motivate farmers to grow olive to cover a portion of their household needs of edible oil.

PROCESSING METHODS OF RAW OLIVES

Olive production in China is mainly devoted to producing extra virgin olive oil. Before the start of 21st century, the hydraulic press (Fig. 13, left) method was used for olive oil extraction. This process took time and effort. Since 2003, old mills were modernized and new ones were built. Modern centrifugal extraction system units have been imported from Italy, Spain and Germany. By the end of 2010, China had a total of 12 oil mills in operation. Some of these mills produce high quality extra virgin olive oil (Fig. 13, right).

Harvesting is done entirely by hand picking since most orchards are located in mountainous areas (Fig. 14), where mechanization would not be suitable. The olives are then transported by conventional means using animals (Fig. 15) to small or medium size mills scattered throughout the region.

The production of table olives began back in the 1980's of last century. However, even after nearly 30 years and because of the moderate-scaled olive plantations, no industrial facilities were established. Only small amount of table olives has been produced on irregular small scale basis



Fig. 12
One of the three olive trees yielding 30 liters oil



Fig. 13
Left: Chinese press, installed in Wudu, Gansu in 1991
Right: Olive oil mill owner proud of her fresh virgin olive oil



Fig. 14
Hand picking of olive trees covering the steep slope of a mountain hill in Wudu, Gansu



Fig. 15
A farmer transporting his olives from the mountains behind him to a mill

(Fig. 16). Therefore it is common on the prestigious “Bar Street” next to the San Li Tun embassy district in Beijing that shops become frequently out of domestic olive stock for periods that can extend up to 6 months.

OLIVE OIL AND CHINESE CUISINE

Olive products are relatively new to Chinese consumers, not only because it is exotic, but also for being rich in cultural connotation different from domestic culture. Both factors coupled with the high price of olive oil might slow down the process of promoting the sale of olive products in China.

A survey carried out during the 2004 Athens Olympic Games in 10 communities in Beijing to assess promotion potential of olive oil showed unexpected results. More than 50% of the respondents had olive oil at home. Nearly 70% of all respondents did not know how to use it in their cooking; therefore many did not even open the package till and after the expiry date. Since then, it has been realized that cultural differences have great impact on product promotion. Even now a lot of phone inquiries are raised as to whether olive oil exceeding its shelf life could be consumed.

It is now believed that opening the Chinese market for olive products, specifically olive oil can be only achieved when it becomes integrated into the eating habits of the Chinese people. To this end, it is worth all efforts that like-minded people who believe in the health benefits of olive oil should work hand in hand to disseminate information through promotional and public awareness campaigns. The quite talented young chef, Mr. Li Bin, has written two cookbooks to teach readers on how to cook Chinese food with olive oil. These appear unique compared to the large quantity of books on Mediterranean cuisines, but it is a good start to find such books in the Chinese market. Below are two dishes he recommends.

➤ **Matsutake Sea Cucumber** (Fig. 17), which features strong mushroom fragrance and soft sea cucumber.
Ingredients: Dry sea cucumber, fresh Matsutake, basil, fragrant rice, and chopped black truffle. For dressing use soy sauce, oyster sauce, salt, sugar, scallion, ginger and olive oil.

Method: Brown the sea cucumber, sauté some cherry tomatoes, and wash and dry the Matsutake. Heat olive oil in a frying pan, stir in the chopped scallion and ginger; add some soup stock and bring to a boil; take out the scallion and ginger, then add the sea cucumber and the Matsutake back to the pan and cook through with the remaining ingredients.



Fig. 16
Processing of table olives



Fig. 17
Matsutake Sea Cucumber

➤ **Chinese-style Steak** (Fig. 18), which features thoroughly cooked steak with strong flavor.

Ingredients: Veal steak, cherry tomatoes, carrot leaves, beef bone shaft, celery, carrots, and onions. For dressing use Teriyaki sauce, oyster sauce, salt, sugar, pepper, parsley, scallion, ginger, and olive oil.

Method: Slice the beef bone shaft into smaller sections and bake until golden brown; cut the veal steak into a 5×8×1 cm size; sauté the cherry tomatoes in olive oil for later use. Melt a small quantity of butter in pan and add in the pepper, parsley, scallion, chopped celery, carrots, and onions to sauté; add some stock and the roasted bone and bring to a boil; simmer for three hours and sieve for later use. Melt some butter in a frying pan and sauté the veal steak on both sides; add the soup prepared earlier until the meat is cooked.



Fig. 18
Chinese-style Steak

In fact, many Chinese people, especially the young ones are open to new things. They, just like people in the Mediterranean areas, dip a piece of breakfast toast in olive oil and top a variety of salad with it. Also, being creative, they add extra virgin olive oil to their dressing at Mongolian BBQ restaurants, resulting in a different taste.

POPULAR MEDICINAL AND COSMETIC USES

Because olive oil is not a native commodity, it has not been included in the “China Pharmacopoeia”. Therefore, it could only be used in the food and chemical industry, and not in medicine. However, in recent decades, there are more and more medical folklores involving olive oil that are spreading among people. For example, extra virgin olive oil is quite effective in treating mild burns, constipation, gallbladder inflammation, high cholesterol, etc. It is also successful in easing skin itching for elderly people and reducing stretch marks for pregnant women.

The public has better awareness of olive oil usage in cosmetic products since it was one of the earlier endeavors. In China, olive oil consumption and promotion began with cosmetics. Twenty years ago, many cosmetic manufacturers started to replace the mineral oil in their high-grade products with olive oil. Now some mills are also joining in developing their own brand of product lines.

Chinese has a custom, called *Pao Jiu*. It involves adding certain Chinese herbs (such as Ginseng or Lucid Ganoderma) into liquor with high alcohol content to soak for a period of time (usually more than two months). Consuming a small quantity of this rich aromatic liquor before meals is thought to keep illnesses at bay and improve overall health. Some people would simply add olives to liquor instead; this is claimed to quell throat inflammation.

OLIVE BY-PRODUCTS USES

The development and utilization of olive by-products are extremely beneficial to China, especially considering that China is going through the early stages of building an olive industry.

As everyone knows, China's "tea culture" has a long history. "Foreign" olives, naturally, can hardly escape the fate of being tasted in a cup by the "tea fans." Of course, this is referring to the olive leaves (Fig. 19). For this reason, it is much easier to promote olive tea in China than olive oil and table olives. Many patrons enjoy the fragrance and slight bitter taste that are unique to olive tea.

The entrepreneurs, joined by some research entities, developed the olive leaf extract process after learning that olive leaves contain ingredients, such as polyphenols, flavonoids, oleuropein, etc. that could be widely used in cosmetic products, medicines and food supplements. Soon new products will be available.



Fig. 19
Olive green tea

OLIVE TREE ART

With less than a half century of olive experience in China, and with China open to the world for only 30 years, everybody in the field is still learning. People began to discover the beauty of olives, in addition to savoring their culinary flavors. Growers are also undertaking the challenge of seeking and innovating cultivation methods under local growing conditions, which are somewhat different from those applied effectively for centuries in the olive cradle within the Mediterranean basin. One example differentiating Chinese is the production of olive bonsai (Fig. 20). Spectators may only experience a tiny bit, while the producers enjoy the whole process of pursuing a particular modeling. In a way it represents an artistic conception best described by a Chinese proverb which says, "It could be only sensed, but not explained".



Fig. 20
Olive bonsai

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Dario D'Alessandro¹ dario1941@libero.it,

Ruby Jeanette Granados Medina²

¹Historical, Pescara, Italy – Cali

²Councilor for Economic Development of the Municipality of Villa de Leyva



INTRODUCTION

Colombia is located in North-western South America, bordered to the north-west by Panama, to the north by the Caribbean Sea, to the east by Venezuela and Brazil, to the south by Ecuador and Perú and to the west by Panama and the Pacific Ocean (Fig. 1). Including its Caribbean islands, it lies between latitudes 14° N and 5° S; longitudes 66° and 82° W and has a territory of 1,141,748 km² inhabited by 46 million people. Geographically, the country is dominated by the Andes Mountains crossing it almost entirely from north to south, and dividing the territory into three parallel chains; the Cordillera Oriental, the Cordillera Central and Cordillera Occidental, separated by plateaus and fertile valleys. Within the country there are four different climatic zones with the following characteristics:

- Warm at altitudes below 1,000 m above sea level which covers about 80% of the country's area where average temperature exceeds 24° C;
- Temperate or moderate at elevations from 1,000 to 2,000 m which covers about 10% of the country, where average temperatures range from 17 to 24° C;
- Cold at elevations between 2,000 and 3,000 m above sea level, covering about 8% of national lands, with temperatures ranging from 12 to 17° C;
- Desert zone located in the mountains, at more than 3,000 meters above sea level, with average temperatures below 12° C.

The rainfall pattern defines two dry periods, December to February and July to September, and two periods of rain, May to June and October to November. Rainfall is variable from mild to severe, with higher levels in the Pacific region and in the jungle lowlands to the east.

In Colombia 22.7% of the workforce is employed in agriculture generating just 11.5% of the gross domestic product. The leading sector of Colombian agriculture is coffee cultivation, making the country among the leading world producers. Other important crops are sugar cane, rice, bananas, tobacco and cotton and to a lesser

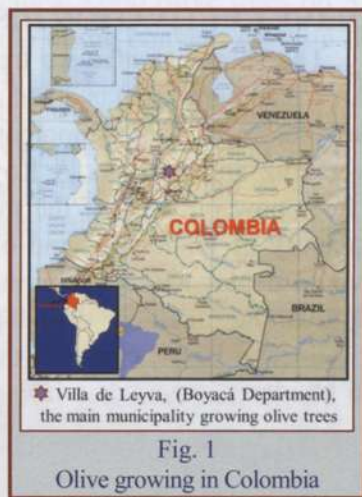


Fig. 1

Olive growing in Colombia

extent cereals: vegetables and a variety of tropical fruits and flowers.

Olives grow around the cities of Villa de Leyva, Sáchica and Sutamarchán, which are among the 123 municipalities of the Boyacá Department, part of the Ricaurte Province (Fig. 1, page 89). This zone is typical tropical, located between 5° 35' and 5° 39' N at an altitude from 2,150 to 2,250 m above sea level. The minimum annual average temperature is 7.1° C and the maximum 26.1° C. The average annual rainfall is 980 mm (García, 2010). The Colombian consumption of olive oil is very low at about 5,200 tons/year. Most of the olive oil consumed in Colombia is imported from Mediterranean countries and other South American producers.

OLIVE CULTIVATION HISTORY

The shipment of olive tree plants to the Antilles islands and *Tierra Firme* (the American continent) is dated as early as 1520 in the files of *Casa de Contratación* of Seville, Spain. More shipments continued from Spain to Latin America, as in 1531 to Veracruz and Mexico. A Royal Decree (*Cédula Real*) dated that year stated that “from now on each of the masters going to our *Indias*, must carry in his ship the quantity of grapevines and olives plants they consider appropriate, so that no one would depart without carrying some quantity”. Historical reviews report that olive cultivation failed in the tropical areas, the Antille Islands and the neighboring continental lands; but since the 30's of 16th century olive orchards started to succeed in Mexico City and then in some areas of Perú, Chile and Argentina.

The olive tree was introduced in Colombia in 1608 by the Dominican Missionaries that later founded the *Santo Ecce Homo* convent near Villa de Leyva, in the department of Boyacá, which is now a peaceful hotel run by the Dominican Fathers (Fig. 2). The name of the convent comes from a painting depicting Christ as *Ecce Homo* (Behold the Man) taken in Rome and brought here by a Spanish soldier of the time. In this land and especially in the fields surrounding the towns of Villa de Leyva, Sáchica and Sutamarchán, the cultivation of olive trees was constantly increasing although production was not reported until 1701 (Zamora, 1945, cited by Patiño, 1960).



Fig. 2

Left: Old tree in the convent of the Dominican fathers of Holy *Ecce Homo* in Villa de Leyva
Middle and right: Old trees before and after rejuvenation work for restoration
(Left photo by Heli Dario Forero). (Source of middle and right photos: García, F. 2010.
Acercamiento a la olivicultura en Boyacá. Cultura Científica 8-14)

In 1774 King Carlos III signed another *Cédula* aimed at promoting the trade between Spain and among its colonies. This *Cédula* also included the banning of new olive and grape plantations in the colonies, favouring the shipment of the related products from Spain. But the reason for the decline of olive cultivation in Colombia was more likely linked to its abandonment when the Crown ruled the expulsion of the Jesuits (1767) and the properties of convents and hospitals belonging to the Church were suspended.

A century later, olive trees reappeared in Colombia in the same places where they existed during the colonial period, thanks to D. José María Gutiérrez de Alba, a secret agent of Spain who, in 1875 established in Sáchica 5,000 olive trees on 32 ha. He also wanted to establish an Agricultural Institute at the convent of Villa de Leyva, that had been abandoned, but a disagreement with the President of the Republic, D. José Eusebio Otálora, ended the project (Martínez Carreño, 1940). Later on, between 1953 and 1965, the Colombia National Government gave a positive impulse to the development of olive growing setting up a plan of studies and experimentation in olive by introducing 43 different cultivars into the country, coming from the Mediterranean basin.

These cultivars were planted in the areas of Villa de Leyva, Sáchica and Sutamarchán in order to identify the best ones for the local agro-climatic conditions. An additional planting occurred in the 1990's, when 2,000 olives were planted on 10 ha in the same area (Fig. 3). Finally, in the early 2000's, olive production spread even more, especially in Villa de Leyva, where more than 6,500 olive trees were added to the old orchards and, currently, an area of 16 ha is developing into full bearing. In 2009, a survey concerning olive growing in Colombia was promoted and new plantations were established. The main purposes were to improve cultivation and scientific data collection to develop an intervention plan and subsequently a cooperation treaty between the cities of Villa de Leyva and Baena (Córdoba, Spain).



The most peculiar thing that makes olive growing in Colombia a special case is linked to the microclimate existing inside the triangle formed by Villa de Leyva, Sáchica and Sutarmachán cities, ascribable as atypically tropical with little temperature differences between the extreme values. As in other areas outside the parallels where olive normally grow, like central Mexico and northern Perú, the possibility of olive production here (5° 35' to 5° 39' N) is explained by the climate being affected by its elevation of around 2,200 m above sea level. The occurrence of flowering several times per year hinder the olive harvest, while the trees present their leaves growing vertically to get protection from the higher solar radiation they receive (García, 2010).



AREA UNDER OLIVE CULTIVATION

According to the above information the current olive growing area seems to be nearly 60 hectares. However, García (2010) reports that in Colombia 18,000 trees grow with a surface area of 75.8 ha. The trees are growing at 15 farms and planted from 4x5 m up to 10x10 m. The production is very low and highly variable (from 2 up to 6 kg/tree); therefore no significant statistical data can be provided except a rough estimation on the basis of the above productivity.

OLIVE CULTIVARS

The olive cultivars actually producing in Colombia are mostly from Spain and Portugal such as 'Borrenta', 'Picual', 'Cordovil' and 'Passareira' (locally named as 'Leyva de tronco Amarillo'). It could be possible to find some old Italian 'Frantoio' trees remaining from the government experiments that were conducted in the 1950's-1960's. Trees of 'Leyva de tronco verde oscuro' are used as rootstock for grafting propagation.

IMPACT ON ECONOMY AND ENVIRONMENT



Fig. 4
The invasive effect of *Tillandsia usneoides* on olive tree at Sáchica
(Photo Heli Dario Forero)

Lack of good olive production is thought to be due to the trees never stopping vegetative growth during the year, also to the presence of strong winds which negatively affect the sprouts' development, although it could be more linked to the presence of several flowerings during the year. Another problem is caused by the presence of the plants *Tillandsia recurvata* and/or *Tillandsia usneoides*, locally called *barbojas* or *barba de viejo* (Old's beard) (Fig. 4). These epiphyte species are a serious threat to young or weak olive trees because they are used to colonize and

grow up on olive branches until covering the whole plant, which results in reducing the normal photosynthetic activity. All these factors, together with the relatively unsuitable soil conditions, have made 12,000 to 19,000 olive trees unproductive (estimation data), thus discouraging olive growing. Actually, only 500-600 trees are fully bearing and the oil produced is strictly consumed inside the local community.

CULTURAL PRACTICES

New olive orchards have been established with modern technologies and at the same time old plantations in some cases have been successfully rejuvenated or their trees grafted with more desired cultivars (Fig. 5). Some of both old and new orchards suffer during the rainy season period with soil flooding negatively impacting the root system.



Fig. 5
Grafting with desired cultivars
(Photo by Heli Dario Forero)

However, recent progresses in cultural practices, like fertilization, soil management and pruning, have strongly improved olive growing. The harvesting period is usually in March, 230-240 days after the beginning of flowering, so it is somewhat late compared to the 170-240 days in areas in the Mediterranean Basin.

PROCESSING METHODS OF RAW OLIVES

The olive oil is still extracted using an old handcrafted press, made in Italy, as a home-made product (Fig. 6). In the past few years interest in olive and olive oil has increased, especially since 2008, while celebrating 400 years of olive growing in Villa de Leyva, Sáchica and Sutamarchán.



Fig. 6
Antique Italian press still used
(Photo by Heli Dario Forero)

OLIVE IN LANDSCAPING

The olive industry is too small to influence local uses and traditions; however some initiative occurred on September, 22th 2010, when with a formal act issued by Villa de Leyva's municipality adopted the olive tree as "Son and symbol of respect for the collectivity". Subsequently to this principal declaration there is the will of creating a special



Fig. 7

The renaissance of olive culture encourages the planting of olive trees in the *patio* of private houses and City Park
(Photo by Heli Dario Forero)

feature for olive trees during the annual "Feast of the trees", by proposing that every *patio* (the internal garden of a typical house) of the city must have an olive tree (Fig. 7, left). Olive trees are also proposed as ornamental trees for public parks (Fig. 7, right), roads and all over in the common spaces. The philosophy of this initiative is aimed toward the "renaissance" of olive growing and spreading the oliviculture, in each one of the economic and conservative aspects. The final target is to build up "The city of the olives" at 2,200 m above sea level, in the highlands of Boyacá.

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TRANSLATION

Nicola Simone, *Biologist, CRA-OLI, Città S. Angelo (Italy)*.





INTRODUCTION

Croatia is a Mediterranean country situated in South-eastern Europe between Hungary to the north, Slovenia to the west and Serbia, Bosnia and Herzegovina and Montenegro to the east (Fig. 1). Italy is Croatia's neighbour across the Adriatic Sea. Geographical coordinates of the extreme points are (46° 33' N, 16° 22' E) north, (42° 23' N, 16° 21' E) south, (45° 12' N, 19° 27' E) east and (45° 29' N, 13° 30' E) west. Total country land area is 56,594 km². Total utilised agricultural area in 2009 was 1,299,000 ha, representing 22.96% of total land area. The Adriatic Sea has a great influence on Croatian geopolitical, climate, economy and transport. On its coastline of 1,777 km, there are 1,246 islands, cliffs and reefs. This coastline is geographically divided on North and South Croatian Littorals. North Croatian Littoral consists of Istria and Kvarner area with islands, and South Croatian Littoral or Dalmatia with 926 islands, cliffs and reefs. Those two parts, especially Dalmatia and its islands, are mainly karsts regions with poor arable land area.



OLIVE CULTIVATION HISTORY

Croatia has favourable climatic and pedologic conditions, as well as tradition of Continental and Mediterranean fruit production. Fruit production represents about 4% of total agricultural output. Olive production comes in fourth place following apple, plum and mandarin. Olive production has a great potential and represents a markedly relevant agricultural activity on the coastal area and islands, where it is also very deeply incorporated in communities' livelihood and tradition.

The coastal Adriatic region of Croatia, where olive trees are mainly cultivated, covers an area of 19,600 km². Total agricultural land in this region is about 870,000 ha, which represents about 44.4% of total area.

Olive cultivation in this area of Croatia is as old as civilization itself, and has left its footprints with old trees that can be seen scattered, similar to other regions of the Mediterranean basin (Fig. 2). Settling on the Adriatic, Croats acquired a Roman

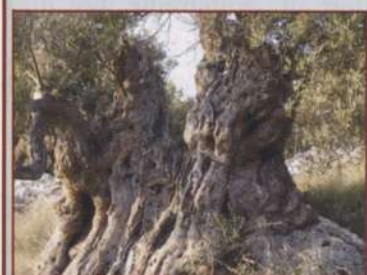
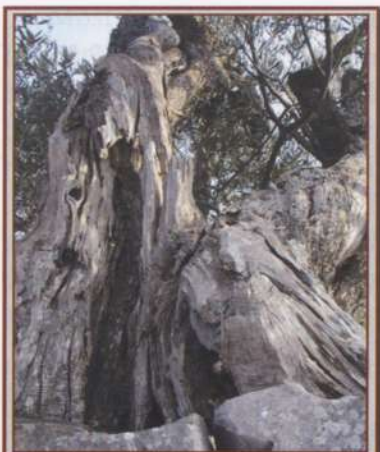


Fig. 2
Old olive trees
on Dalmatian islands,
(Photo by Frane Strikić)

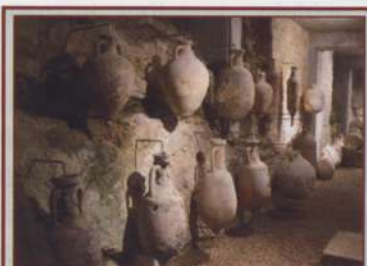


Fig. 3
Roman amphora in the
Archeological Museum of Pula

Mediterranean agricultural practice, among which is olive growing, that was stimulated even in medieval agriculture. Statutes of many coastal towns ordered olive planting, reaching its peak in productive areas at the end of 18th century. It is estimated that in that period 20 to 30 million olive trees were planted in this area. Since then, production and number of trees were constantly decreasing.

The first record of olive consumption in Croatia dates back to 2880 years ago (Maslina i Maslinovo Ulje, 2007), even before Greeks arrived to this part of the world. The evidence site is located in Vranjic, near Split, where in archaeological excavations olive endocarps were found recently, together with many other findings such as wooden objects, animal bones and shells. Besides the archaeological value, all these items represent rich gastronomic traditions of Croatian ancestors. All along the Croatian coast from Dubrovnik to Istria, many residential houses, called “villa rustica”, from the Roman period can be found, remains of which indicate that olive and grape processing was practiced at that time. Olive oil was kept and transported in ceramic pots called “amphora” in the Minoan era (Fig. 3). Croatia was also known as one of the most important sites for amphora production in antique Adriatic (Kovačić and Tassaux, 2000; Matijašić, 1998).

In addition to the importance of archaeological sites, written records of agricultural research and education activities in Istrian region, dating hundreds of years ago, give testimony to a long tradition of olive cultivation in Croatia. Some of those are instructions given by Predonzani (1820) in which he described how to cultivate olive trees and suggested technical agricultural solutions. In the Republic of Ragusa and Dalmatian Medieval Republic, there were enforced laws for agricultural organisation and governance. Oliviculture was important, applying rules of varietal selection and oil blending. In the book of Bulić (1921) 17 olive cultivars from Dalmatia and 12 from Ragusa area are mentioned. These historical evidences prove that olive growing was practiced in these territories for thousands of years, surviving all historical, social, political and natural constantly changing environments.

AREA UNDER OLIVE CULTIVATION

In 2010, olive plantations in Croatia had reached an area of 20,000 ha (2.3% of total agricultural land). This area is divided into three sub-regions; North Adriatic with about 6,000 ha, Middle Adriatic (North and Middle Dalmatia) with about 9,150 ha and South Adriatic (South Dalmatia) with about 4,400 ha. The estimated total number of trees is 3.8 million, of which about 1.3 million is in the North Adriatic sub-region, about 1.9 million in the middle Adriatic sub-region and about 0.6 million trees in the South Adriatic sub-region. In the year 2008, Croatia ranked 22nd in world olive production.

Olive orchards in Croatia are characterized by two distinct categories. The first one is relatively small in number; with single orchards of an average size larger than 10 ha. The second category is larger in number yet of smaller and fragmented holdings owned by rural families. In terms of planting density there are also two different systems. The first one is old with traditional low density of approximately 150 trees/ha; where low or even no fertilizers are applied with low labour input of about 400 hours/ha, all leading to lack of fertility and low yields of about 500 kg/ha. Therefore, the system is not commercially sustainable and is being abandoned. However, the positive outcomes of this system are of great natural value in terms of biological diversity, preserving traditional landscape, allowing efficient water management on slopes and less harmful impacts on the environment. The second system of production is intensive cultivation (over 250 trees/ha) with significant use of mineral fertilizers, soil management and mechanical harvesting, as well as implementing efficient irrigation. New technologies associated with this intensive system are quickly accepted and intensification is widely spreading in new plantations.

Lately, the economic importance of oliviculture in the world has increased. Croatia, following this trend during the last decade, increased the olive area; and development of this sector is evident. Several factors are serving this trend including increase of scientific knowledge, national, regional and local subsidies and introduction of modern oil mills and integration of olive production with the tourism industry. Olive is an ideal culture for complementary activities and diversification on agricultural holdings.

OLIVE CULTIVARS

Although the cultivation of olives in Croatia has a very long tradition, there is some uncertainty about the exact number of *Olea europaea* L. cultivars in the country. Morphological descriptions, as well as recent molecular characterization and studies of genetic relationships among local varieties, have been used for varietal identification. However, the data currently available is not entirely reliable, due to numerous synonyms and homonyms in designations, labelling mistakes and the uncertain identification methods so far applied.



Most Croatian olive cultivars are mainly used for oil production; while very few are suitable for table olive production. The prominent ones in Southern Dalmatia are:

‘Oblica’ (‘Orgula’) (Fig. 4), with a fruit size ranging from 2.5 to 14.5 g, (average 5 g), having a uniform round shape from which its name was derived. The oil content ranges between 18-21 %. It is self-sterile and the best pollinators are ‘Drobnica’, ‘Lastovka’, ‘Levantinka’, ‘Picholine’ and ‘Ascolana tenera’. Because of its size, it is also used for table olive processing (Strikić *et al.*, 2010).

‘Lastovka’ (Fig. 5), with a small size fruit (average weight 3 g) having an elliptic shape. Oil content of about 24% is relatively high. It gives a good yield every year with low alternation. Its pollinators are ‘Drobnica’ and ‘Pendolino’. It is sensitive to low temperatures and olive knot (*Pseudomonas savastanoi*) (Strikić *et al.*, 2010).

Prominent cultivars in the northern area of Istria are:

‘Buža’ (Fig. 6), the most important oil cultivar in the southern part of Istria, with a medium size fruit (average weight 3 g) having an oval shape. Olive oil content is medium at about 20%. Its best pollinators are ‘Leccino’ and ‘Pendolino’. It can be also used for table olive processing. In Flos Olei 2011 (a guide dealing on the international scale with world extra virgin olive oils), its oil won best extra virgin olive oil monovarietal - intense fruity.

‘Puntoža’ (‘Buža puntoža’) (Fig. 7), with medium sized fruits (average weight 3 g), it has an obvious nipple, and its name is derived from that shape. It gives a good yield every year with low alternation.

Over centuries, Mediterranean olive cultivars have been planted along the Croatian coast in scattered numbers. However, the first olive orchards were established on two locations in Istria, Larun (Poreč) and Radini (Umag) in 1978, in accordance with the Food and Agriculture Organization’s program for Yugoslavian olive sector development (FAO/YUG/76/002). The first planted cultivars in these intensive orchards were from different origins including Italy, Spain, Greece, Turkey, Tunisia and Syria. The most widely spread cultivar is the Italian ‘Leccino’, which is considered, at the present time, one of the leading olive cultivars in Croatia.



Fig. 4
‘Oblica’

(Photo by Frane Strikić)



Fig. 5
‘Lastovka’

(Photo by Frane Strikić)



Fig. 6
‘Buža’

(Photo by Danfranko Pribetić)



Fig. 7
‘Puntoža’ (‘Buža puntoža’)

(Photo by Danfranko Pribetić)

IMPACT ON ECONOMY AND ENVIRONMENT

Olives in Croatia cover 20,000 ha, representing about 28% of total area under fruit culture and about 2% of total agricultural land. However, in the coastal area of Croatia olive is a leading fruit crop and the olive sector is very important for the rural livelihood. In the last decade the number of olive trees has doubled thanks to subsidies to encourage olive planting which amount to 20,000 kuna/ha (~3,500 USD). The government provided other incentives to increase olive production, up to 50% of all capital investment. At the regional and local level olive nurseries were subsidized with a share of 50-70% and investors were encouraged with favorable loan conditions with interest rate of 2-5% and payment periods of up to 15 years.

Olive growing has many positive effects on the environment. Olive trees provide an additional value to the landscape especially on terraces. Olive residues (pomace) after the proper treatment can be used for organic fertilization, which is very important for poor agricultural soils in the Croatian olive growing area, especially on islands. However, discard of untreated olive pomace and vegetable water resulting from olive processing can have harmful and toxic effects on soil and underground water in the porous carst terrain. During recent years, thanks to international and national programs, these problems were publicly highlighted with producers and olive mill owners now more aware about managing residues from olive processing. Among the concerns of the Croatian government is how to encourage investment by local stakeholders and members of the olive production chain utilizing available knowledge and updated technologies to solve the relevant problems.

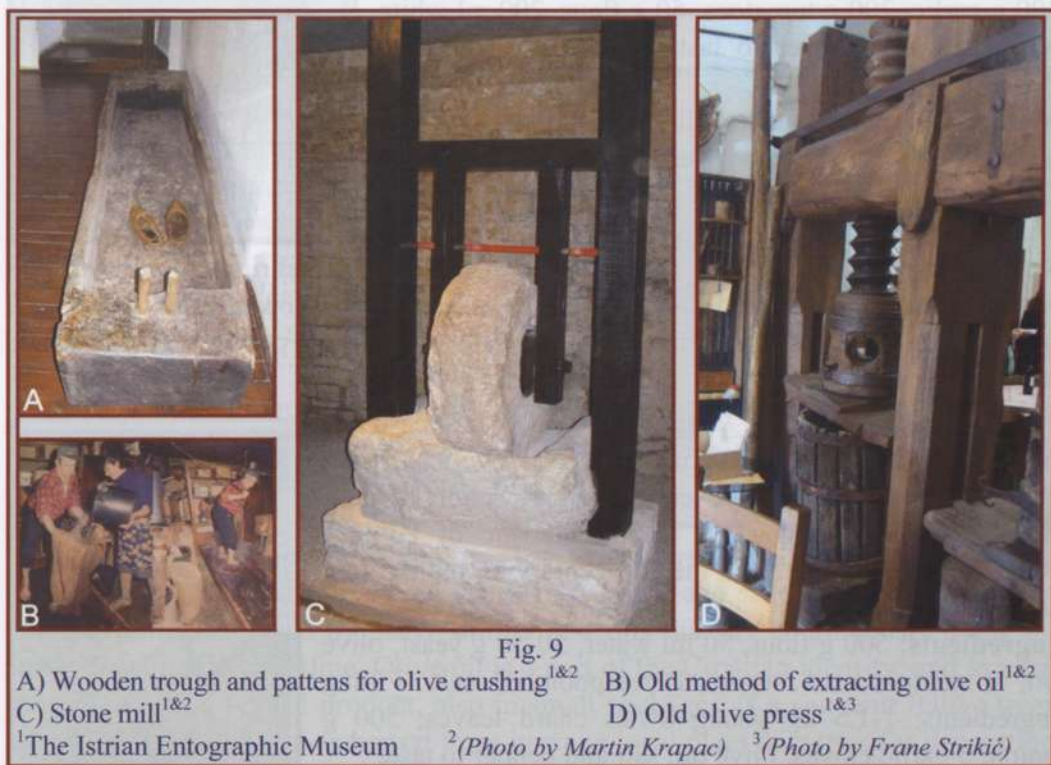
OLIVE OIL PRODUCTION METHODS



Fig. 8
A wealthy person
from olive growing
(Photo by Renco Kosinožić)

Olive processing is an ongoing ancient practice on Croatian Adriatic coast from ancient Greek and Roman times testified by archeological findings like the stone shrine of 1st century BC, exhibited at the Poreč Museum, showing a distinguished person who owed his fortune to olive growing (Fig. 8). Along the coast, especially in Dalmatian islands and in Western Istria, from the city of Dubrovnik in the south to Umag city in the north, Roman olive mills were situated, consisting of olive presses, workshops for amphora production and olive oil storage facilities. For processing small quantities of olive fruits, producers used foot pressing inside wooden troughs for crushing and hot water to extract oil (Fig. 9, A and B, next page). The most common methods for larger quantities of olives was crushing with stone mills, pressing in bags (Fig. 9, C and D, next page), separating in stone pots (Croatian: *kamenica*) and decanting oil from water inside large pots. For centuries human and animal power was mainly used for

milling and pressing, and after World War II it was replaced with hydraulic and motor engine presses. Afterwards, in the 1970's presses and mills became electrically operated, yet oil is still stored in stone pots. This type of processing and storage has negative impacts on the olive oil quality because of high oxidation potential.



OLIVES IN PROVERBS

“The olive tree is like a mother and vine is like a wife”. “It is a mother because it gives unconditionally even when it is neglected for years”. “Vine is planted for sons while olive is planted for grandsons”. “The yield in the olive orchard is determined with clippers”. “There are two wrong rains in Dalmatia, one falls when olive is blooming and ruins the inflorescence, and the other one does not come when it is really needed”.

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

Following are some traditional recipes from Istrian and Dalmatian homes, which date back for centuries, and lately are used as a required component of typical gastronomic cuisine for locals and tourists to enjoy:

➤ **Istrian Soup**, prepared with the following **ingredients**: 1 liter of red wine, 200 g of corn bread, 50 g sugar, 2 table spoons of olive oil, pepper to taste.

Method: Pour one spoon of olive oil in a ceramic pot *bukaleta*, add warm wine, sugar, remaining oil, pepper and roasted bread slices. Serve before the main course. It is recommended to use Istrian red wines; Borgonja or Teran.



➤ **Istrian brudet (fish stew)** (Fig. 11):

Ingredients: 300 g grouper fish, 300 g frogfish, 250 g conger, 200 g cleaned Adriatic calamari, 4 shrimps, 200 g black mussels, 100 ml olive oil, 200 g red onion, 300 g garlic, 200 g tomatoes, 50 g flour, 200 ml white wine, salt and pepper to taste, 200 g polenta (corn flour).

Method: Clean mussels' shells. Clean fish, cut to big pieces, mill in flour and briefly fry in hot olive oil. Stew onions in olive oil, add garlic, after a while add peeled tomatoes cut to slices. Stew until it softens.

Remove from the stove; add fishes, mussels, calamari and shrimps. Pour water to cover fish and put back on the fire. Pour in wine and cook on medium heat 15-20 minutes until fish is softened but not crumbled. Add salt and pepper. When finished serve with polenta.



Fig. 11
Istrian brudet
(Photo Marko Martinčić)

➤ **Soparnik of Poljička Republic** (Fig. 12) this pastry is protected according to Croatian law (NN 69/99, 151/03, 157/03) and UNESCO Convention for protection of non-material cultural heritage. It is characteristic of Poljička Republic, which dates from the 13th century on the territory of Dalmatia.

Ingredients: 500 g flour, 50 ml water, 30-50 g yeast, olive oil, 1 teaspoon of sugar, 1 teaspoon of salt. Filling ingredients: 1-1.5 kg young Swiss chard leaves; 500 g onion; 5 garlic cloves; olive oil; salt and pepper to taste.

Method: Knead the pastry from all ingredients and leave in a warm place. When doubled, mill the pastry and put it in a round plate, uplift edges and fill with filling. Stew onions in olive oil; add cut garlic and Swiss chard. Add salt and pepper. Fill in the pastry, add some drops of olive oil and leave on the chimney ember. When *Soparnik* is ready pour on a few more olive oil drops and serve on wooden tray.

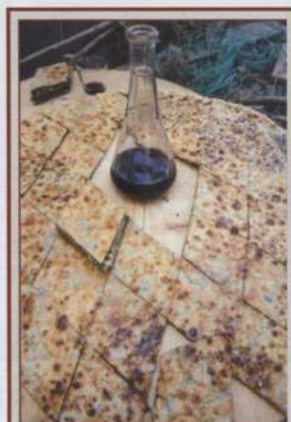


Fig. 12
Poljički soparnik

➤ **Lumblje** (traditional cake from the island of Korčula), prepared with the following **ingredients:** 3 kg flour, 800 g sugar, 200 g yeast, vanilla sugar, 20 g anise, 200 g roasted almonds and nuts, 150 millilitre olive oil, 150 millilitre of must, 200 millilitre of rum, 2 spoons of brandy, Muscat nuts, lemon and orange crust, salt and milk.

Method: Knead yeast with a little sugar, flour and milk, leave to rise. In the remaining flour, put other ingredients and mix, add the yeast. When mixed, slowly add must with sugar. Mix for 30 minutes. Cover the paste and leave in a warm place to rise. Separate on small pieces, *lumblje*. Put on dry cloth and leave to rise again. Bake in a hot oven at medium temperature. When cooked, smear it with olive oil (or must) and sprinkle on sugar. We can use glasses for obtaining equal round shapes.

POPULAR MEDICINAL USES

Olive oil is traditionally used for medical treatments of ear diseases, constipations, chilblains, small wounds and burns, damaged skin, muscle convulsions, as a mosquito repellent and for massages.

OLIVES AND TOURISM

A touristic activity, named “Roads of olive oil” has been established in Istria, and afterwards in all other coastal areas of Croatia. It was conceived as a targeted presentation of Istrian olive oil producers, oil mills, cellars and local taverns. Consumers are guided to coastal and rural areas with significant and high-quality olive oil production, where they can taste and buy locally produced olive oil. Olive trees are frequently used as



Fig. 14
Bonsai olive tree

ornamental elements in tourist centres. The first international festival dedicated to olive oil was organized in Poreč (Istria) 16 years ago, and owing to the great interest, it was followed by many similar festivals that are continuously going on along the Croatian coastline. Olive oil is a part of the Croatian identity, and as such it is offered as a typical product, also in small packages as a souvenir. Olive trees are also often cultivated as bonsai trees in some local plant nurseries for decoration purposes (Fig. 14). In addition, olive oil is used in production of souvenirs such as eco-soaps based on olive oil and some other cosmetic products.

ACKNOWLEDGEMENTS

This chapter was written in collaboration with colleagues from: *Institut za jadranske kulture i melioraciju krša* (Institute for Adriatic Crops and Carst Reclamation), Split; *Zavičajni muzej Poreštine* (Poreč Museum); *Etnografski muzej Istre* (Istrian Ethnographic Museum), Pazin; MIH d.o.o. Poreč.

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INTRODUCTION

Cyprus is an island country located in the north-eastern part of the Eastern Mediterranean. It lies between latitudes 34° and 36° N, and longitudes 32° and 35° E, and is the third largest Mediterranean island after Sicily and Sardinia (Fig. 1). From 1 May 2004 it became a member of the European Union. The total area is 9,251 km² with a population of 1.1 million. It has a maximum length of 225 km and a width of 94 km with a coastline stretching 782 km. Its position at the maritime crossroads of the Mediterranean became traditionally a convenient stepping stone between Europe, Middle East, Asia and Africa. Its geographical position is the main reason that the island was occupied at times by various conquerors who left their stamp on the Cyprus landscape. Tourism, financial services, shipping and agriculture are significant parts of the economy. The agricultural sector contributes 2.2% of gross domestic product and 21% of exports.

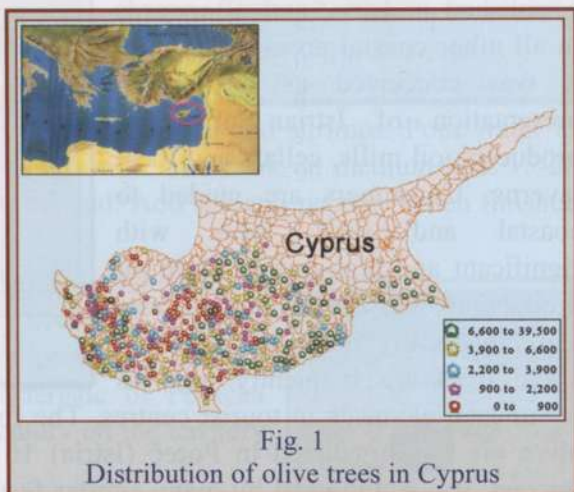


Fig. 1
Distribution of olive trees in Cyprus

Cyprus has a subtropical Mediterranean and Semi-arid climate (in the north-eastern part of the island) with very mild winters (on the coast) and warm to hot summers. Snow is possible only in the Troodos Mountains in the central part of the island. Rain mainly occurs in winter, with summer being generally dry. The average annual rainfall is about 500 mm/year (300 mm in the plains up to 1,100 mm in the mountains), the bulk of which falls between the months of November through April.

Of the land area, there is about 47% used in arable production and 25% is forest. Crop production can be separated into two main features; irrigated agriculture that includes mainly citrus, potatoes, vegetables, melons, deciduous fruit, table grapes and bananas; and rain fed or dry land agriculture that includes mainly cereals, fodders, olives, carobs, almonds and wine grapes.



OLIVE CULTIVATION HISTORY

Cyprus lies within the broad region of Eastern Mediterranean that appears certain to be the origin of the olive tree, therefore olive trees have been cultivated for thousands of years, and the fact that "Olive" appears as a name of locations (toponym) on the island more than 500 times is an indication of its importance in the lives of the Cypriot people. Wild olive trees are found in great numbers, especially in the southern Troodos range and there exists plentiful archaeological evidence related to the olive tree and its products dating from thousands of years BC (Fig. 2)

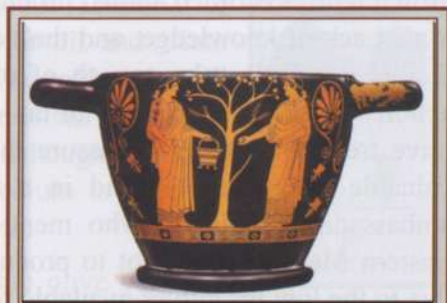


Fig. 2
Olive tree on an ancient pot

The introduction of olive trees in Cyprus can be traced back to Neolithic times. Olive pits were found in a number of sites at least as far back as the Neolithic period (6000-3000 BC) in Agios Epiktitos near Kyrenia, Salamis near Famagusta, Nicosia, Kalavassos, Larnaca and Lemba near Paphos. Findings related to the production of olive oil include mill mortars and millstones, press beds and weight stones, amphorae, separation vessels and settling vats (Fig. 3). Furthermore, abundant archaeological and botanical evidence shows that the olive tree started being

intensively cultivated on the island from the Late Bronze Age. Perforated monoliths found scattered mainly in the south, west of the Troodos range, are believed to have been used for the production of olive oil. A historically important remark was made by 1st century Greek geographer and writer, Strabon who characterized the island as *eveleon*, meaning that it was producing good and plentiful olive oil. The olive tree and its produce have for centuries played a significant role in the nutrition,



Fig. 3
An ancient mosaic depicting oliviculture

economy, religious ceremonies, habits and customs of the Cypriots. According to ancient Greek and Roman writings, the olive tree along with the carob tree and the grapevine, were the main characteristic of the rural areas in the Eastern Mediterranean basin. The trade in olive oil in ancient Cyprus was linked to the Sanctuary of the Goddess Dianna and Hera.

Records dating since the Medieval Age suggest that olive oil extraction and marketing was not as economically significant for export as other agricultural

products. Olive trees were plentiful and scattered all over the island, most of them grown wild. Recorded annual production during the late 15th century was a mere 82 tons. Lack of knowledge, and the heavy taxes imposed by the Venetian rulers were factors preventing the growth of proper cultivation and oil extraction. Corrective action was taken in 1507, with tax exemptions to anyone who practiced systematic olive tree cultivation, a measure that led to a threefold increase in production. A valuable reference is found in a report published in 1868 by the British vice ambassador, Sandwith, who mentioned that Cyprus was the only island in the Eastern Mediterranean not to produce enough olive oil for its needs. He attributed this to the low incentives available for the people to utilize the many wild olive trees and insisted on the need to promote olive tree cultivation.

A major expansion of olive cultivation occurred in the 1930's. Then between 1946 and 1958 olive trees increased by 40%; and since 1953 they continued to be the most numerous non-forest trees in the country. Today, olive trees are grown in compact orchards or, more often, mixed with other crops such as fruit trees, carobs and cereals. Trees are also found scattered on uncultivated land, steep slopes, rocky ground, or in residential areas.

AREA UNDER OLIVE CULTIVATION

Significant efforts for expansion of olive cultivation in Cyprus occurred after 1974, with more emphasis during the period 1990-2000 (Fig. 4), when many new commercial olive orchards were established on a scientific basis.



The area cultivated with olives (in altitudes from sea level up to 900 m), is about 14,500 ha (62% irrigated and 38% rain fed) with about 2.5-2.7 million productive trees distributed over the following agricultural districts: Nicosia 26.3%, Larnaca 24.2%, Limassol 15.3%, Pafos 19%, Pitsilia 7.3% and Famagusta 7.8%. There are no reliable data about Kerynia and Famagusta districts, because since 1974 they have been under occupation. The olive area represents 5.6% of the country's cropped area and contributes 2.7% of total agricultural output. About 20,000 families are engaged in olive growing.

OLIVE CULTIVARS

The autochthonous cultivar grown for centuries is 'Ladoelia' or "Local" and also 'Flasou' and 'Lythrodontas' for oil and 'Kato Drys' and 'Klirou 2' (Fig. 5), for dual-purpose. The cultivar is well adapted to the local climatic conditions and is resistant to drought and salinity. Its yield is medium and alternate, although there are clones that bear high yields. Its fruit has a medium to high oil content (22-25%) of high quality and intense aroma.



Since 1971 a number of foreign oil and table olive cultivars ('Koroneiki', 'Manzanillo', 'Picual' and 'Kalamata') were introduced to find more productive material with better quality fruit more suitable for processing than the "Local". However, local farmers prefer to grow the "Local", and only the Greek Koroneiki, among the introduced cultivars, is cultivated for oil production.

IMPACT ON ECONOMY AND ENVIRONMENT

Annual average olive oil production is about 6,000 to 8,000 tons and processed table olives 8,500 tons. However, owing to the biennial bearing of the trees and the cultivation of olives under rain-fed conditions, yields are extremely erratic and the production exhibits extreme fluctuations from year to year. Yet increased olive oil consumption, coupled with the limited marketing prospects of alternative products such as fruits, provides an additional incentive to farmers to expand olive cultivation.

Production barely satisfies local demand for olive oil; and during low production periods limited quantities of olive oil must be imported. Annual per capita consumption amounts to 3.5 kg of olive oil and 8 kg of table olives. In the five-year period 2001-2005 olives contributed 2.4% of total agricultural output. The Cyprus Olive Products Marketing Board was responsible for marketing olive products until July 2003 when the government abolished the law that gave the Board a marketing monopoly over olive oil and olives became a free trade item. The three most traditional tree crops; olive, carob and almond are important due to the fact that they constitute a part of the traditional environment of rural areas. In the past, a large number of existing olive trees (over 90%) were old and cultivated under rain fed conditions. In some areas they were planted mixed with carobs or cereals and forage crops; yields were relatively low with comparatively high production costs.

Realizing the need for higher productivity and lower production costs, from 1976 onwards olive growers started to establish new, intensive olive orchards using technologically improved production methods. These intensive orchards are established primarily in regions with limited quantities of good quality irrigation water, or in areas where the poor quality water (either of moderate salinity or having high sulfate), limits the possibility of economic use of other crops. In such regions, olive trees preserve the vulnerable lands from desertification.



Recently, olive cultivation is taking the form of monoculture in some ecologically fragile locations. Such locations are mainly the hilly and mountainous regions where olive cultivation may prevent devastation. Formerly there were other crops, mainly vines and deciduous fruit trees; however they were abandoned. Although there is a limitation to intensified production in these areas as mechanization is not an alternative in these rough terrains, olive growing remains the only viable alternative for conserving the environment.

Organic farming of olive is increasing every year. The total area under organic olive cultivation is nearly 576 ha with olive fruit production of 3 tons per hectare. There is also an Organization for Biological Olive Products. The Ministry of Agriculture, Natural Resources and Environment in cooperation with the Cyprus Olive Products Board, having realized the multidimensional role of olives in the rural development and environment, have included several provisions in their Programming Documents supporting the cultivation of olive trees in Cyprus. However, the historic heritage of olive trees, as a critical element of the island's unique and picturesque landscape, is under threat from human development. In the island's northern part alone, it is estimated that one tree is destroyed every hour to make way for roads, buildings and swimming pools. Sadly in 2005 alone, over 10,000 trees were lost forever. A small but dedicated group of volunteers known as the Olive Tree Project, works to save Cyprus olive trees by raising public awareness and by arranging to relocate trees out of the path of destruction.

OLD CULTURAL PRACTICES

The very ancient method for fruit harvesting was by applying uniformly an olive-cloth (*kanavitsa*) on the ground and hitting the branches with a stick (*tembles* or *vakles*) to shake the olives down. Then, the women picked the olives by hand, stored them in sacks for transport to the extraction plants. This harvesting method was effective but harmful to the tree. In addition the time between harvesting and processing was quite long, and the oil produced was of lower quality.

PROCESSING METHODS OF RAW OLIVES

Traditionally, the extraction of olive oil was done by a series of manual operations. After harvesting, the olives were selected, cleaned and crushed in stone mills using either human force (Fig. 6) or animals reducing the product to an oily paste. The paste was collected in folded cloths made of reeds and then subjected to manual pressing using screw presses. Olive oil was stored in large earthenware pots called *pitharia*, some of which are preserved in museums, while so many others can be seen in many different places all over the island

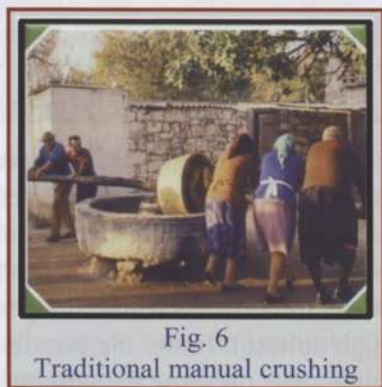


Fig. 6
Traditional manual crushing

such as gardens where they are used for decoration (Fig. 7, left). Later, water mills were used, and then replaced by steam mills, which were also replaced by mills driven with diesel engines (Fig. 7, right). During the last decades, modern olive oil processing units of the centrifugal type have



Fig. 7

Left: Olive storing *Pitharia* displayed at a Museum
Right: Classical olive mill

been used, resulting in improved oil quality and considerably reducing processing time. There are 38 oil mills in Cyprus, of which 29 are modern centrifugal type and nine use the classical pressing system.

Mavrolado, black oil, had a stronger taste and smell, and was also heavier than the normal olive oil. To produce *mavrolado*, the olives were picked while green unripe, cleaned and scalded for a short time in water in a copper cauldron until they were soft but not soggy. The olives were then strained and spread out to dry but not to shrivel. Oil producers crushed them before pressing, without adding water, and the oil that came out was left to settle in a tank for 40 days. The black oil, produced mainly in Paphos and the Karpasia, is produced in small quantities today, despite the appreciation felt for it by gourmands. The abundant use of oil was a sign of prosperity and generosity.



Fig. 8
Tsakistes

Processing, preservation and post-harvest handling of table olives are still performed in the traditional way, without using any modern technology. The main products are green and black table olives in brine, green and black olives preserved in vinegar, as well as cracked green olives and stuffed olives. However, a significant percentage of processing table olives is mainly for household consumption, done by women in rural areas. They prepare black olives in brine and specifically cracked green olives, *tsakistes* (Fig. 8),

which is the most characteristic Cypriot table olive. *Tsakkisti* is prepared as follows: green olives are crushed lightly with a stone and covered with water, which is changed twice a day, until the bitterness has gone. The olives are packed in jars full of brine adding lemon juice. Before serving, *tsakistes* are prepared with finely chopped garlic, crushed coriander seeds, olive oil, thin slices of lemon and lemon juice.

TRADITIONS AND CULTURE

Among Cypriots Christians olive oil is one of the three blessed products; wine, wheat and olive oil. It is believed that bread supports and strengthens the heart, wine lightens the spirit and the oil relaxes the body. Furthermore, for the blessing of water, they use an olive branch since they believe it is a symbol of new growth. On Palm Sunday, women take olive leaves to the church. The leaves remain in the church for 50 days until Pentecost, when they are hallowed and taken back home for the traditional *kapnisma* (literally smoking). Specifically, the olive leaves are kept in the *kapnistiri* (earthen-plated vessel) with cinder and used for the *kapnisma* of the houses and people. This practice is considered as apotrophic for the evil spirits, and it has survived to this day.

Wedding wreaths in the past were made of interweaved olive leaves in order to impute the strength and fertility of the evergreen tree to the new couple. The fumes of olive leaves that were previously blessed in the church are used to ward off the evil eye. This custom was and still is essential at weddings and on feast days.

The oil is also used in the baptism, as priests add drops of olive oil after they bless the water. Then, they mark the body of the baptized with this mixture. In churches and chapels the vigil lamps are lit using oil, usually olive oil, as the fuel feeding a floating wick. The vessel holding the oil is a cup, usually made of heat treated glass. Hanging lamps are the most common, consisting of a wall mounted bracket with three chains attached to a frame that holds the glass bowl containing the olive oil. The metal ware is generally plated in silver or gold. The hanging lamp from a bracket mounted over an icon is placed in front of the lower half of the icon. Another tradition using olive leaves is that on New Year's Day, young women throw olive leaves in the fire (*phoucou*) to see if someone loves them. Doing this, they normally say "*Ayie Vasili -Holy Vasili- show me if (name of the person) loves me*". If the leaf makes spitting sounds, they have found love. Cypriots used to call a stingy person *alathkiasto*; someone who grudged putting oil on his food.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olive oil is basic to many dishes in Cyprus. It has been used for thousands of years in cooking, and is known in the country as one of the cornerstones of the healthy Mediterranean diet. There are many delicious dishes containing olives and olive oil such as:

➤ *Xoriatiki Salata* (Fig. 9):

Ingredients: Tomatoes, cucumbers, onion, green peppers, extra virgin olive oil, olives, *feta* cheese, red wine vinegar and dried oregano.

Method: Chop the tomatoes, cucumber and pepper into medium pieces. Slice the onion and put in a bowl. Add the olives and the large cube of *feta* cheese. Pour the olive oil and vinegar on top. Sprinkle with the oregano.



➤ **The Olive Pies (*Eliopites*)** (Fig. 10):

Ingredients: 4 kg of flour, village flour is best or farina or plain flour can also be used, 4 sachets of easy bake yeast, dried mint to taste, 1 kg of pitted or un-pitted olives, pinch of salt, 350 ml olive oil according to taste (however the whole secret of the dish is in olive oil), medium bowl of chopped onions, water as needed, and extra flour as required for kneading.

Method: Put flour in a large bowl and add a pinch of salt and some olive oil. Rub in oil to the flour, mixing in the yeast. Mix in the olives and onions. Add water gradually, mixing by hand and knead together until the mixture is smooth and has a round shape. Leave the mixture in the bowl and glaze with olive oil. Cover with cling film and a tea towel and allow rising. When twice the size, shape mixture into a roasting dish or into balls and place them into baking sheets to cook after they have risen for the second time. Cook for about 30 minutes in a medium oven or until golden brown, as you would with bread.



Fig. 10
Eliopites, the olive pie

➤ **Stuffed Vegetables (*Yemista*)** for 5-6 persons (Fig. 11):

Ingredients: 5 or 6 tomatoes, 2-3 aubergines, 2-3 zucchini, 2-3 green peppers, 2 onions, dill, parsley, 1 cup of olive oil, salt, pepper, 450 g of rice, 1 tablespoon of concentrated tomato pulp diluted in 1 glass of water and 1 cup of grated cheese.

Method: Hollow out all vegetables and chop their contents (except for the green peppers). Place in a bowl and add the finely chopped onions, the dill, the parsley, the rice, salt and pepper. Salt the empty insides of the vegetables stuff and place them in a baking pan. Pour the tomato concentrate and over a cup of oil. Cook in a heated oven. Just before turning off the oven, sprinkle with the grated cheese and let it melt.

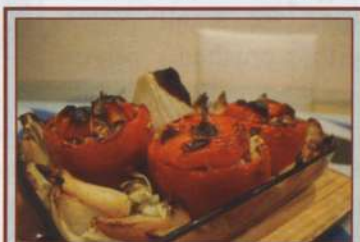


Fig. 11
Stuffed vegetables

➤ **Stifado** (Fig. 12) Beef with red wine, onions and spices (serves 4 people):

Ingredients: 1 kg stewing beef, cubed, 1 kg small onions, 2 bay leaves, 50 ml vinegar, 250 ml red wine, 100 ml olive oil + 1-2 tablespoon olive oil for frying, 3 cloves garlic, 3 cinnamon sticks, 6-7 peppercorns, 1 large tomato chopped, salt and freshly ground black pepper.

Method: Peel the onions and lightly fry in olive oil. Remove from pan then lightly fry the pieces of beef



Fig. 12
Stifado

until slightly brown. Return the onions to the pan with all the other ingredients and add enough water to cover. Cook on low heat (150° C) for 2-3 hours until the meat is very tender. When ready, the liquid should be almost completely absorbed. If necessary add more water during the cooking time. Taste after 2 hours and adjust seasoning to taste. Garnish with chopped parsley or oregano before serving. Serve with roasted or mashed potatoes.

➤ **Cyprus Meze** (Fig. 13). *Meze* means “little delicacies”: It can consist of up to 30 different small plates with dips, vegetables and a wide range of fish or meat. It is served in groups of 4 or 5 plates at a time and usually 5 to 10 different groups arrive at the table. Although in different taverns, different dishes are served, there is a kind of pattern in it. Olives, *taramosalata*, *humus* and yoghurt are followed by vegetables like eggplants or zucchini. Afterwards small meat or fish dishes are served before whole fish or grills arrive at the table. As the pattern remains the same, the dishes served depend on the specialty of the tavern as well as the season; but always there are small plates with crushed olives with olive oil, crushed olives with olive oil usually with coriander, garlic and fresh lemon, black olives with cheese and olive oil, pickled green olives and marinated green olives in olive oil and vinegar.



Fig. 13
Cyprus Meze

POPULAR MEDICINAL AND COSMETIC USES

In Cyprus, olive oil is used for several natural health remedies. The most common are swallowing one tablespoon for sore/tickly throats and coughs, and using it to clean out earwax from blocked ears (by placing a few drops of warm olive oil onto a tissue and letting it drip into the ear cavity while the head is tilted to the side. It is also used for general skincare and preventing and lessening the effects of aging on the face and body. Some people use olive oil as an alternative to hand or foot creams. In case of suffering from dry lips for any reason olive oil is applied as a lip balm. It is also used traditionally as a hair conditioner.

OLIVES AND TOURISM

All year round, olive and olive oil festivals, as well as olive days, are organized by municipalities or private olive companies, giving locals and tourists the opportunity to gain knowledge about both the olive tree and its products as well as



learning their deep rooted history. The “Olive Park” in Limassol along with the Olive Oil Museum *Oleastro*, (Fig. 14) are unique in the country. They feature equipment used in olive oil extraction in the past, like millstones, olive presses and various items related to the storage and uses of olive oil, as well as its history. The oldest and the largest olive tree in Cyprus can be seen in Xyliatos, a small village southwest of Nicosia.

OLIVE BY-PRODUCTS USES

Crude olive cake, or olive pomace as it is also known, is a by-product of the olive oil industry. Despite its high oil content (around 10%) and the scarcity of animal feedstuffs in the region, it is not fully utilized, and/or when used, is not utilized properly. A simple safe and low cost farm technique has been developed for long term storage of crude olive cake (50% dry matter), which is fed to different types of ruminant animals. Combining crude olive cake with poultry litter and/or other ingredients improves silage quality although it is not a prerequisite. When fed as part of the finished diet to moderately growing ewe lambs and goat kids or to dry mature ewes at maintenance level, the nutritional value of ensiled crude olive cake is significantly higher than that obtained *in vitro*. The use of a urea solution for upgrading the nutritional value of crude olive cake has very limited value.

Ensiled crude olive cake can be used in the manufacturing of urea blocks; and because of its binding properties, crude olive cake incorporation into urea blocks may facilitate the use of smaller quantities of binders even without molasses. Despite the high palatability of the ensiled crude olive cake, care should be taken that its inclusion is restricted to a level where the oil content of the total diet is below 5%.

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Fig. 14
Oleastro Museum





INTRODUCTION

Within a region of arid and hyper-arid desert characteristics, Egypt, with 80 million inhabitants, encapsulates an area of 1,001,450 km² on the North-eastern corner of Africa and the tip of Western Asia, with a coastline of 2,450 km (Fig. 1). The Asian and African parts of Egypt are marked by the 162.25 km Suez Canal, inaugurated in 1869; considered as the world's jugular vein of maritime shipping. With the exception of Libyan Sert Bay, its Northern Coast is located at the most southern latitude of the Mediterranean basin. Therefore, unlike its regional neighboring states to the north-east and to the west, Egypt suffers from rain scarcity, which does not exceed 150 mm at best, concentrated on its Mediterranean coastal strip. Currently, rainfall cannot be considered as a reliable source of sustainable irrigation because it occurs only during the winter season in the form of scattered showers.



Fig. 1

Olive growing areas in Egypt

In spite of such harsh weather conditions, Egypt's deep-rooted history is based on an agriculturally sustained economy; thanks to the regularity and richness of the annual Nile River flood, which allowed for the development of one of the world's greatest civilizations. Most archaeological sites, showing the majesty of the ancient Egyptian civilization of all different dynasties, were found either in close vicinity of the Nile River or within remote oases around naturally flowing artesian springs or water wells. Due to limited water resources, rural lands cover 3,800,000 ha. Fruit trees like citrus, peach, plum, dates, mango, banana, etc. occupy 478,700 ha, while olives cover 71,500 ha.

OLIVE CULTIVATION HISTORY

Ancient Egyptians believed that it was Isis, the Mother of the Universe, who taught humankind to extract oil from olives. Olive oil has been regarded as sacred



for thousands of years. Modern excavations of Egyptian tombs in Karanis have unearthed containers of olive oil. As the most valuable treasures were the only

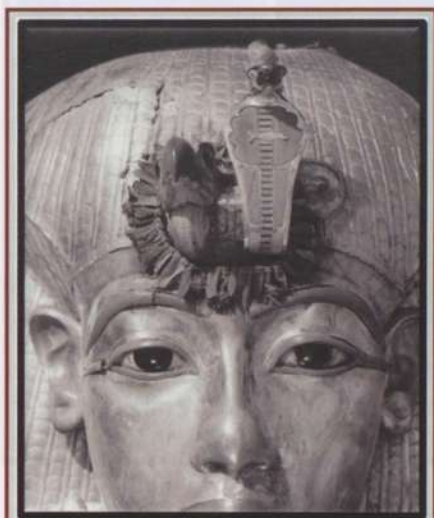


Fig. 2

Coffin face of Tutankhamen
honored with an olive garland
(Photo by Harry Burton) - Archives of
the Department of Egyptian Art,
© The Metropolitan Museum of Art

things permissible to be buried with Egyptians in their tombs, it indicates how precious olive oil was. Evidence for olive growing in ancient Egypt can be seen in many monuments; close to the Giza Pyramids, scenes of olive fruits and trees can be found on the tomb walls of King Teti, the founder of the late 6th dynasty of the old kingdom, who ruled from ca. 2345 to ca. 2333 BC. Ancient Papyrus manuscripts ca. 1550 BC, as well as temple engravings indicate olive tree cultivation and the use of olive oil in cooking, lighting, cosmetics, medicine and embalming. Tutankhamen, the famous Egyptian Pharaoh, who ruled from ca. 1333 to 1323 BC and noted for adorning his tomb in Luxor with luxurious items, wore a garland of olive branches as a symbol of honor (Fig. 2). It is believed that the olive branches were brought from Dakhla Oasis, 360 km to the east. Some of the well preserved

leaves found inside the sarcophagus were used by David J. Beerling *et al.* (1993) in a research entitled "Stomatal Density Responses of Egyptian *Olea europaea* L. Leaves to CO₂ Change Since 1327 BC". A hymn of Ramses III, who ruled from 1186 to 1155 BC, says to the Sun God Ra "I have planted many olive trees in gardens, in the city of Heliopohs; from these plants come a very pure oil to keep alight the lamps of your temples". Furthermore, discovered Egyptian mummies dating back to the 20th to the 25th dynasties (from ca. 1185 to ca. 656 BC) were found to be wearing olive wreaths.

Following the geographical expansion of the ancient Egyptian civilization, coupled with increased trade and relations with other civilizations within the Mediterranean Basin, olive growing thrived from the Ptolemaic period (323-30 BC) onwards. Over centuries, the olive crop played an important role in community subsistence and the payment of tithe to the Roman Empire after Egypt became a province following the defeat of Mark Anthony and Ptolemaic Queen Cleopatra VII by Octavian, resulting in the conquest of Egypt in 30 BC. During Egypt's old Kingdom, Siwa was believed to be the capital of an ancient kingdom and was part of the so called *Tehenu*, meaning the olive land, which might have extended as far east as Mareotis. In its limestone, "Mountain of the Dead" which was developed during the 26th Dynasty (672-525 BC) and the Ptolemaic period, full of rock-cut

tombs, is the tomb of Si-Ammon dating back to the 3rd century BC. On its wall, a painting shows the Sky Goddess “Nut” standing in front of an olive tree while holding a jar pouring what might be either water or olive oil flowing from Siwa as a symbol of prosperity (Fig. 3, left). Olive pressing flourished in the fortified Islamic town of Al-Qasr (Fig. 3, right) built by the Ayyubid kings of Egypt in Dakhla Oasis during the medieval times of the 12th century, probably on the remains of a Roman era settlement.



Fig. 3

Left: Sky Goddess “Nut” standing in front of olive tree pouring what might be olive oil or water
Right: 12th century Ayyubid olive mill and press

AREA UNDER OLIVE CULTIVATION

The Nile Valley and Delta were never suitable for olive growing because of the flood silt enriched heavy soils and poor drainage. Therefore, historical olive growing in Egypt was in areas characterized by light soils and water availability. Although there are no historical records of the area cultivated with olives in Ancient Egypt, it seems that this area has undergone progressive decline over centuries. This may be due to dryer climate, desertification, soil erosion, and conversion of some fresh water lakes to "salterns". It could also be due to trade exchange of valuable stones and metals from Egypt for olive oil, cedar wood and other goods from neighboring Mediterranean civilizations. In recent history, the olive area increased 19 fold from 3,800 ha in 1980 to 71,500 ha in 2010. Newly reclaimed desert lands of 35,500 ha have been cultivated using aquifer water and drip irrigation. Some orchards are of mega size over 1,000 ha (Fig. 4, left). The remaining 32,200 ha of the olive area expansion took place in most of the old historical regions mentioned below, where olives and dates have traditionally been considered as the backbone of the domestic economy (Fig. 4, right).



Fig. 4

Left: Large new olive orchard on a desert region located at latitude 27° N, 350 km south of the olive growing belt. Right: Inter-planting date palms and olives in Siwa Oasis Depression

The historical regions where olives have been grown traditionally for centuries in Egypt include the following important locations:

➤ Karanis and its surroundings within Fayium Depression on 29° 31' N where olive trees were irrigated by Nile water flowing through an elaborate system of locks and canals constructed under the pharaoh Amenemhat III, who ruled between ca. 1860 to ca. 1814 BC during the 12th dynasty. Excavations have revealed that olive trees thrived in the area and that olive oil was produced on a large scale. The oil was infused with flowers and herbs to produce both medicine and cosmetics.

➤ Extensively to the west of Lake Mareotis (Mariut or Maryut in recent history) on 30° 59' N located in the desert at the north-western fringe of the Nile Delta. Irrigation water was available from the Canopic Nile branch that channeled water from the 3rd century BC until the 5th century AD, as well as from shallow wells charged by seepage from the fresh water lake, which was charged from the same branch at that time.

➤ The Oases of Bahariya on 28° N, Farafra 27° N', Dakhla 25° 31' N and Siwa 29° 11' N, where ancient Egyptians started to settle in the 10th millennium BC. At that time, the Sahara climate was wetter, with lakes and marshes charged from artesian wells or from naturally flowing springs (Fig. 5), many of which are still discharging water till present time.

➤ The Mediterranean flat coastal plains extending from Salum on the western border (31° 43' N-25° 07' E) to Wadi⁴ Auaris, Avaris, (El-Arish in recent history), (31° 15' N-34° 11' E) in Sinai close to the eastern border. Rain water runoff from southern hills or the sloping limestone plateau was used directly in the main *wadies*, or stored in Roman style built catchments to grow olives on the flat plains.



Fig. 5

A naturally flowing spring from the great Nubian Aquifer in Siwa Oasis irrigating date palms and olives
(Photo by Mohamed El-Snosey)

OLIVE CULTIVARS

It is in the remote Egyptian Oases that the autochthonous olive cultivars have evolved over centuries. In Fayium, it is the 'Aggeizi Shami', 'Aggeizi Akks', 'Aggeizi Balady', 'Sinnara', 'Beid Elhamam', and 'Touffahi' (Taffahi), while in Siwa it is 'Hammed', 'Watieken', 'Moluky', 'Siwi' and 'Marraki'. In El-Arish, it is 'Sinawi', 'Sebhawi', 'Bez Elanza', and 'Abu Monkar'. There are still many other cultivars, which need to be identified and evaluated in El-Farafra, El-Dakhla, and El-Kharga oases, which are among the most arid locations in the Egyptian Western Desert. The latter two lie between the 25° and 26° parallels, much further south than the world's traditional olive growing regions, which are located between 30° and 45° parallels.

⁴ A valley, gully, or streambed in N. Africa and S-west Asia that remains dry except during rainy season.



Some of these cultivars may be considered as a world's heritage as they are adapted to climate changes and global warming, being acclimatized to cold winter nights and extremely hot summer when temperatures can reach 48° C for a few consecutive days. Yet, these cultivars produce commercial crops under such harsh conditions. Most Egyptian cultivars are for table olive processing, while very few are suitable for oil production. The prominent ones among the aforementioned cultivars are:

'Touffahi' ('Taffahi') (Fig. 6, left), with a very large fruit (10-16 g) having a uniform round shape with easily separable stone. Its oil content does not exceed 5%. Harvested green around late August to mid-September at the late stages of maturity, when the fruit reaches normal size with a straw color. At harvest, the flesh is relatively soft and the skin is sensitive. Locally consumed by home pickling in brine, and can be pitted and stuffed. The taste is fruity with slight bitterness. Shelf life after treatment is just a few months after which the texture becomes soft.

'Aggeizi Shami' (Fig. 6, middle), with large fruits (7-10 g) of a slightly oval shape, protruding at one side, with a typical, pointed projection at the apex. The stone is of medium size and oblong. Its oil content is low (7% at best). Harvested when green around mid-August to early September, at the late stages of maturity when the fruit reaches normal size, just before changing color. At harvest, the flesh is firm and the skin is hard. Suitable for processing with brine, or lye treatment (Sevillean Style) and can be pitted, stuffed and sliced. The taste is tangy, and shelf life after treatment is relatively long (18 months) especially when pasteurized.

'Marraki' (Fig. 6, right), the most important autochthonous oil cultivar with a medium size fruit (3-6 g) having an oval shape. Oil content of fully irrigated trees is relatively high, reaching 18% on fresh weight basis extracted under commercial processing. It is characterized by high oleic acid content (75%).



In preparation for the modern Renaissance Era of olive growing in Egypt, many European cultivars were imported and propagated on a commercial scale during the late seventies. Successful cultivars showing great adaptability to the local environment in descending order are the Greek 'Koroneiki', Italian 'Frangivento', Spanish 'Picual' and 'Manzanillo' and Italian 'Coratina'. The latter three do not fulfill their chilling requirements every year, therefore they alternate severely. The Italian 'Frantoio' proved unsuitable, and was either uprooted or grafted with other cultivars.

IMPACT ON ECONOMY AND ENVIRONMENT

Egypt has emerged in recent years with an average olive production of slightly over 400,000 tons/year on average, valued at farm gate price of 250 million USD. Egypt recently ranked as world's second in production and exports of table olives following the EU. However, it comes in ninth position in terms of export revenue with an average of 25 million USD, as most exports are in bulk with little added value. While olive oil production does not exceed 8,000 tons at the best, revenue from exports at its highest levels was estimated at 8 million USD. Main destinations for table olives exports are the USA, Spain and the Gulf States. nearly 85% of all exports are of the 'Aggeizi Shami', prepared to the Sevillean Style.



Fig. 7

"Greening up" the harsh desert with the most adaptable fruit tree (olives in high-density)

(23.4% in an "off" year, and 33.8% in an "on" year of the seasonal work force) in addition to pruning, soil conservation and weeds control. In some recent reclaimed desert lands, where the soil is infertile and available ground water is of poor quality, with a level of total dissolved solids ranging from 4,000 to 7,500 ppm, olives have been grown successfully during the last three decades where other fruit trees have failed to perform (Fig. 7). This offers great opportunity for development and employment as well as improving the desert environment using poor unexploited resources.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Growers in rain-fed regions delay the pruning of their trees until the rainy season is over, so if there is inadequate precipitation, growers prune their trees severely to balance the size of canopies with available soil moisture and to reduce transpiration. Some olive growers of modern times have inherited from their ancestors the practice of hitting the roots of olive trees with an axe six weeks before floral buds differentiation. These growers claim that this practice improves flower's sexual expression and fruit set. This could be attributed to improving the carbohydrate/nitrogen ratio. In some areas where the soil's water holding capacity is high, growers apply an inherited practice of withholding irrigation 4-6 weeks prior



to flowering in order to achieve uniform blooming. A good and unique traditional practice is hand harvesting by tying the front and back tails of the *Galabiya*⁵ to form a pouch at the waist, gently milking the fruits with both hands into the pouch (Fig. 8). An example of accumulated knowledge over centuries, is inter-planting olives and date palms in the extremely hot and harsh environment of desert oases. Palms with their high dense canopies shade the olive trees from high solar radiation, which causes scalding to the tree-wood and fruits, yet palms allow penetration of enough light for photosynthesis. Furthermore, the long fibrous trunks of palms absorb air moisture during night and dawn to release it during the hot daytime, reducing surrounding temperature by 5-7° C. Palms have another important role in protecting the olive trees from the southerly hot Saharan winds, coming from March to May with sand (called locally as *Khamaseen*), just as the trees are in full bloom and fruit setting stages.

Because most soils cultivated with olives in Egypt are on infertile sandy soil, growers incorporate organic matters to improve soil physical structure, chemical composition and biological activity. While this is a good practice, some growers do not sanitize the tools between one tree and the other, which might cause infection by verticillium wilt, nematodes or soil born fungi. In old lands, where olives have been cultivated for centuries, some growers have inherited the erroneous practice of leaving trees untrained during the first years after planting, resulting in multiple trunks (Fig. 9, top). Other growers practice pruning of olive trees incorrectly, not respecting their bushy nature characterized by a high leaf to wood ratio. This results in trees reaching unmanageable heights, causing defoliation in the lower canopy as a result of reduced light penetration (Fig. 9, bottom).



Fig. 8
Picking crew carrying loads
of olive fruits in their *Galabiya* pouch

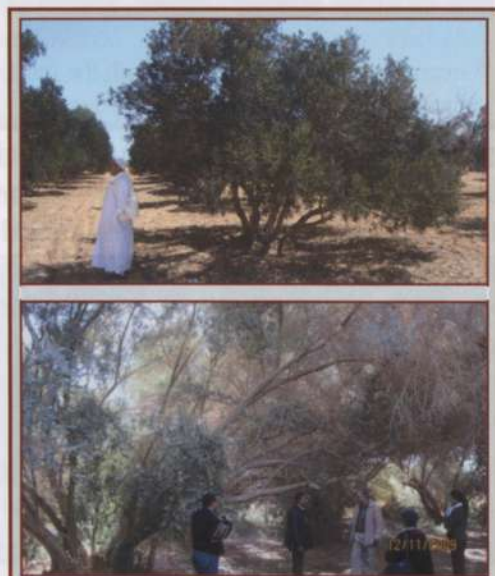


Fig. 9
Top: Multiple trunk trees on old lands
Bottom: Defoliated canopies due to
wrong training and pruning on old lands

⁵ A long loose tunic commonly worn in rural areas

PROCESSING METHODS OF RAW OLIVES

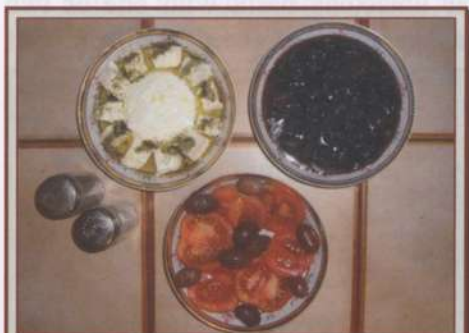


Fig. 10
Olive jam, yogurt and goat cheese



Fig. 11
Sundried black olives

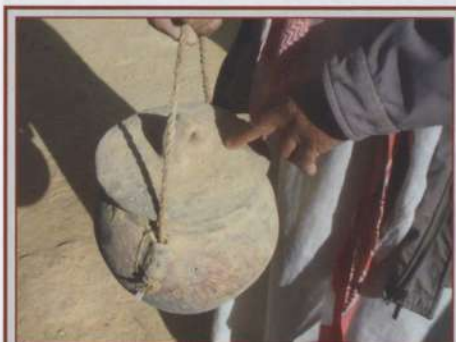


Fig. 12
Earthen jar for olive oil daily use

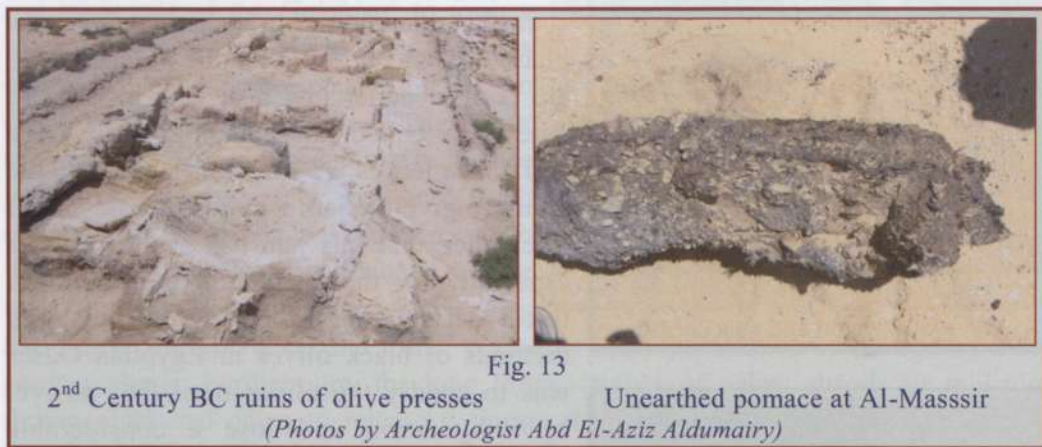
A recipe originated in Siwa Oasis by elderly Sheik Madny Ahmed, is used in some Egyptian homes to make jam from raw black olives (Fig. 10). The de-stoned olives are cooked under low heat in a mixture of date syrup called *Rob* and lime juice. Lime and guava leaves are sometimes added to the syrup to give the jam a distinctive flavor. It is claimed that this jam has health benefits especially for the respiratory system. Until three decades ago, one of the pickling methods of black olives in Egyptian Oases was to sundry the olives until they shrivel by dehydration and lose a considerable portion of their bitterness (Fig. 11). The shriveled olives would then be immersed in warm water and salted to taste. The sundried olives were lighter in weight, which helped growers to transport and trade them for other goods in towns hundreds of kilometers away. Before the construction of paved roads camels transported the olives for days through the Sahara.

Historically the only source of edible oils in Siwa Oasis was olive oil. To ensure a year round supply, most households in the oases had an adjoining storage room with a roof opening and a door at ground level. Olives were harvested, left for a few days to sundry, and then thrown in layers from the opening in the ceiling. Naturally the olives would turn into a solid cake-like shape as a result of fermentation. Every couple of months, the door was opened to cut a part of the cake

using a hoe. The cake was then transported by donkey to olive presses located a few kilometers east of the oasis. The bulk oil was stored in suntanned goatskin bags, while for day-to-day use the oil was kept in an earthen jar (Fig. 12). One of these complexes was named *Al-Maasir*⁶. Recent excavations have unearthed forty

⁶ Plural for *Almazara* which is also used in Spain for “olive mill” originating from the Arabic word.

mills in Al-Qurayshat 30 km to the east of the oasis, which are in very bad condition (Fig. 13). They consisted of a shallow circular limestone basin with one or two drainage canals. Several rectangular stone weights were used to press the olives.



TRADITIONS AND CULTURE

A few years after connecting the isolated Siwa Oasis to urban areas through a 305 km asphalt road, people said they could not see the moon any more. An old man developed a proverb, which became very popular; “the moon is there but you cannot see it because it is now squeezed between two tin cans; the vegetable oil and the sardine fish”. This implies that Siwans were losing their eyesight as a result of changing their diet from natural food and olive oil to canned food and vegetable oil.

Most folkloric events, legends and traditions related to olive in Egypt are still to be found in Siwa Oasis, due to its relative isolation and continuous olive



production over centuries. Annually at the olives and date harvest seasons a three-day feast known as “Reconciliation and Harvesting Festival” or *Eid Al-Siyaha* meaning “Feast of Tourism” is held during the full moon in October or November (Fig. 14). During the feast all Oasis’ inhabitants migrate to the foot of the

mountain of Gebel Dakrur, three km from the center of Siwa, living in shacks, tents and huts as the whole area comes alive with local performances and dances. During the three days, a huge temporary kitchen is used to serve food to the people. At the end of the festival, Siwans settle all disputes of the past year to start a new peaceful year, anticipating the olive and date harvest.

On the seventh day after a baby is born, a celebration called *Seboa'a* takes place. People assemble at the parent's house with presents, where they will be offered home-made sweet balls called *Besisa*, which is composed of a mix of dates, olive oil and wheat from roasted barley grains (Fig. 15). On the thirtieth day after birth, the baby is fed a large amount of olive oil, almost forcibly, based on the belief that this will clean the baby's stomach and make it healthier.



Fig. 15
Besisa with olive oil in the middle
(Photo by Fathi Malim)

Forty years ago when the people of the Oasis started to use less expensive vegetable oils, imitating the evolving urban life style, it was shameful to declare in the community that one was not using olive oil.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Green pickled olives in brine, lime juice, vinegar and mixed with safflower is a common breakfast appetizer for rich and poor Egyptians alike. The traditional breakfast is composed mainly of finely crushed and stewed faba beans or *tamia* (*falafel*), which are then fried and served with parsley, cilantro leaves, dill, onions, garlic and a dried whole grain bun. The common lunch of construction workers is white cheese and pickled green olives because both are cheap, nutritious and can be bought at on street corner. Similar to other Mediterranean diets, *pizza* with olives became very popular in Egypt during the last two decades. In Siwa a traditional breakfast meal called *Tarfant* (Fig. 16) is made of bread crumbs mixed with dates and olive oil.

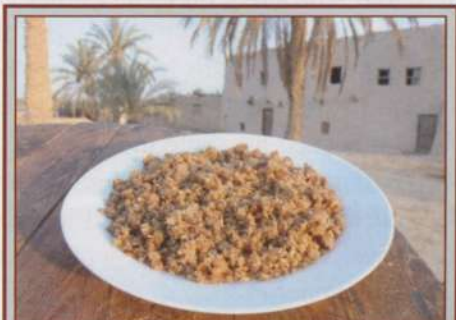


Fig. 16
Tarfant
A traditional Siwan breakfast
(Photo by Fathi Malim)

Unlike their Mediterranean neighbors, Egyptians use very little olive oil in their daily diet; nevertheless some dishes are unique to the Egyptian cuisine. Three recipes for serving four people are given below:

➤ **Kharshuf Mahshi (Stuffed Artichokes)** (Fig. 17):

Ingredients: 8 medium-sized artichokes, 100 g minced meat, 1 egg, 1 minced garlic clove, 8 stoned and chopped black olives, finely chopped ½ small onion, 1 tablespoon tomato concentrate, 4 tablespoon olive oil, juice of one lime, salt and pepper.

Method: Prepare the artichokes by trimming the hard outer leaves and dip in water acidulated with the lime juice. Mix together the minced meat, egg, garlic, onion, olives and tomato concentrate. Season with salt and pepper. Preheat the oven to 180° C. Drain the artichokes and fill the centers with the stuffing. Arrange the artichokes in a lightly oiled ovenproof dish. Drizzle the olive oil on top and bake for approximately half an hour. Moisten occasionally with a little water. Transfer to a dish and serve.



Fig. 17
Kharshuf Mahshi

➤ **Kushari** (Fig. 18) is considered the Egyptian national dish. It is a simple healthful combination of pasta, rice and lentils, with a full complement of protein, a spicy topping of tomato sauce and crispy fried onions. Originally it was a poor man's dish, but for the last three decades *kushari* is enjoyed by all strata of society. It is not necessarily to be prepared with olive oil as any other type of oil can be used. However many people prefer olive oil for its health benefits and because it adds a distinctive flavor to the dish, especially when it is used for sautéing.

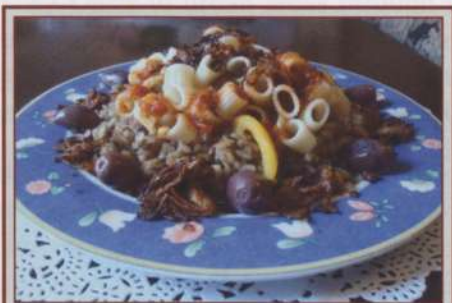


Fig. 18
Kushari

Ingredients: 1 cup rice, 1 cup macaroni pasta, 1 cup lentils, 2 tablespoons olive oil, 1 finely chopped onion, 2 to 3 minced garlic cloves, 2 cups tomato sauce or crushed tomatoes, ½ to 1 teaspoon pepper flakes, , olive oil for frying, 1 thinly sliced onion, salt and pepper to taste.

Method: Cook the rice in 2 cups of water in a covered pot for about 20 minutes, or until done. Cook the macaroni according to package directions, or until *al dente*. Simmer the lentils in 2 cups of water in a covered pot until tender, 30-45 minutes. While the rice, pasta and lentils are cooking, heat the olive oil in a sauté pan over medium-high heat. Add the chopped onions, garlic, and sauté until the onions are translucent and wilted, 4-5 minutes. Stir in the tomato sauce and pepper flakes, reduce heat to medium-low and simmer for 10-15 minutes, add a little water if necessary. Season with salt and pepper and set aside. Heat about 10-15 mm of olive oil in a heavy skillet. Add the sliced onions and fry until brown and crispy. Drain on

paper towels. Place the rice, macaroni and lentils in a large bowl, season with salt and pepper and stir together gently with a fork. Portion the mixture into individual bowls and spoon some tomato sauce over each portion. Top with crispy fried onions and serve hot or at room temperature.

➤ **Eggah be Korrat (Leek Omelet)** (Fig. 19):

Ingredients: 675 g cleaned and finely sliced leeks, 6 eggs, 12 stoned and chopped black olives, 100 ml olive oil, ½ teaspoon sugar, juice of ½ lime, salt and pepper.

Method: Heat the oil in a frying pan and sauté the leeks until they start to turn golden brown. Add the lime juice, sugar, and season lightly with salt and pepper. Cover and stew gently for 10 minutes until soft. In a large bowl beat the eggs. Add the leek mixture and olives and mix well. Adjust the seasoning. Pour a little oil into a large frying pan. Cook slowly until the eggs are set. Invert the *Eggah* (Omelet) onto a plate and carefully slip it back into the frying pan for a few minutes to brown on the underside. Serve, cut in slices, as an appetizer or first course.



Fig. 19
Eggah be Korrat
Leek Omelet

POPULAR MEDICINAL AND COSMETIC USES

The healing and preventive properties of olive oil and olive leaves were known in Egyptian popular medicine for centuries. Some people especially in isolated locations still prepare an ointment (Fig. 20) from finely grinded pomace mixed with low grade or old olive oil to use it mainly on the skin. Some of common present uses are:

- 50 g of olive oil consumed daily before breakfast can help in cases of constipation and stomach ulcer.
- Treat headache by massaging the head with a cream made of olive oil and nutmeg.
- Olive oil is used as syrup to treat cough and children asthma.
- Local application of olive oil on scalp is highly effective against dandruff.
- Warm olive oil is used to massage the pelvis and vagina to ease birth for women in labour.



Fig. 20
Ointment composed of fine graded olive pomace and olive oil

- Olive leaf tea is said to be effective against mouth and lip ulcers.
- Olive oil with coriander is claimed to be effective for indigestion.
- A few drops of a mixture of olive oil, salt and onion juice to treat ear infection.
- Massaging the body with warm olive oil relieves muscular pains.
- Olive oil and vinegar sprinkled daily on salad helps in reducing cholesterol.
- Face wrinkles are treated with a daily massage of olive oil before bedtime.
- A poultice of milk, henna, honey, egg yolk and olive oil is proven as an effective treatment for smoother, fuller and shinier hair.
- A poultice of warm olive oil and ginger placed in a piece of cloth and wrapped around the knee during sleep relieves knee pain.
- Olive oil with juniper leaves is said to relieve gout pains.
- Recently, olive oil is used for the prevention and treatment of diaper rash in babies.

OLIVES AND TOURISM

In addition to the harvest festival mentioned before, another touristic attraction to

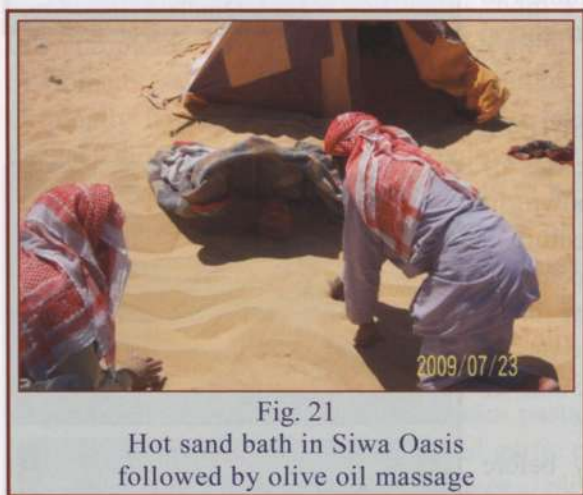


Fig. 21

Hot sand bath in Siwa Oasis
followed by olive oil massage

Siwa Oasis is a rheumatism cure ritual, which partially involves the use of olive oil. During the months of July, August and early September, many Egyptians as well as foreigners visit the Oasis to be treated with a hot sand bath. At around 3 pm when the sand at the foot of Dakroul Mountain reaches 45° C, the patient is buried naked in the sand from neck down for nearly 20 minutes (Fig. 21). A lot of body water will be lost by sweat during burial, and the damp

sand is replaced by fresh hot sand. Following burial, the patient will be covered with a blanket and moved to a nearby sealed tent for another 30 minutes and is offered hot fenugreek and anise tea. The treatment will be repeated systematically for three days at the end of which the patient will be massaged with olive oil mixed with vinegar and lime juice.

OLIVE WOOD AND BY-PRODUCTS USES

In Siwa Oasis walls of traditional houses are made from mud brick, while ceilings are made of palm beams and doors, windows and fixtures are made of olive wood from annual tree pruning. Olive wood is also used for writing boards which can be washed

clean, door locks (Fig. 22, left), some kitchen utensils (Fig. 22, right) and needles for basket making. Pomace from olive mills is used as a mixture in animal fodder.



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Nathalie Moutier¹ moutier@spagro.inra.fr,

Bouchaib Kadari², Françoise Dosba³

¹INRA (French National Institute for Agricultural Research), Montpellier

²CBNMED (French National Mediterranean Botanic Conservatory), Montpellier

³Montpellier SupAgro (Montpellier National Superior School of Agronomy), Montpellier



INTRODUCTION

France is the largest western European country and one of the most important from the agricultural perspective. Its total area is about 549,000 km² with a distance between north and south borders of about 1,000 km. The country is bordered by four sea coasts, with a total of about 3,400 km of coastline; North Sea and the Manche to the north, Atlantic Ocean to the west and Mediterranean Sea to the south (Fig. 1).

Located between latitudes 42° to 50° N, France is characterized by a temperate climate. In the south-east a Mediterranean climate prevails. In the west, the climate is predominantly oceanic with a high level of rainfall, mild winters and cool to warm summers. Inland the climate becomes more continental with hot, stormy summers, colder winters and less rain. Due to this climate and its geographic position, coupled with more than 32 million ha of lands devoted to agricultural activities, France possesses the most important cultivated area in Western Europe. Cereals and pastures are the major sectors, covering 62% and 34% of cultivated land respectively, while less than 4% is devoted to fruit crops. Beside grapevine, the main fruit crop is apple, which makes France a major exporting country. Other fruit crops include peach, cherry, and apricot. Olive production is very limited since areas devoted to olive cultivation do not exceed the limit of 45° N due to a high level of frost risk in the northern regions, which are out of the typical Mediterranean coastal climate (Fig. 1). However, this is a unique situation in comparison to the distribution of olive plantations in the most northern olive areas in Southern Europe like those in Italy, Spain and Greece. Local olive cultivars from the French southern areas are adapted to prevailing climatic conditions, particularly to low temperatures during winter.



Fig. 1

Olive growing regions in France and their production shares in %

OLIVE CULTIVATION HISTORY

Southern France is a Mediterranean area where wild olive was present and evolved before the Neolithic period. According to the Archaeobotanical studies (Terral *et al.*, 2004), oleaster has been used for wood and oil in South France similar to Spain and Portugal. Genetic studies showed that some French cultivars such as 'Picholine du Languedoc' or 'Olivière' were probably selected from local oleasters (Besnard *et al.*, 2002; Khadari *et al.*, 2003). Such investigations indicate the ancient presence of olive cultivation in Southern France since the early period of domestication.

Olive cultivation became important in southern France from the 10th century to the cold period ranging between 1780 and 1870 AD (Fig. 2). Following this period, olive oil production decreased in favor of seed oil that was preferred by the oil and fat industry. Although some olive plantations were replaced by grapevine, olive cultivation was maintained until the severe cold winter of 1956, leading to a drastic reduction of olive trees down to less than one million. Ten years later its cultivation began to increase and the number of olive trees in France reached 3,100,000 by 2000.

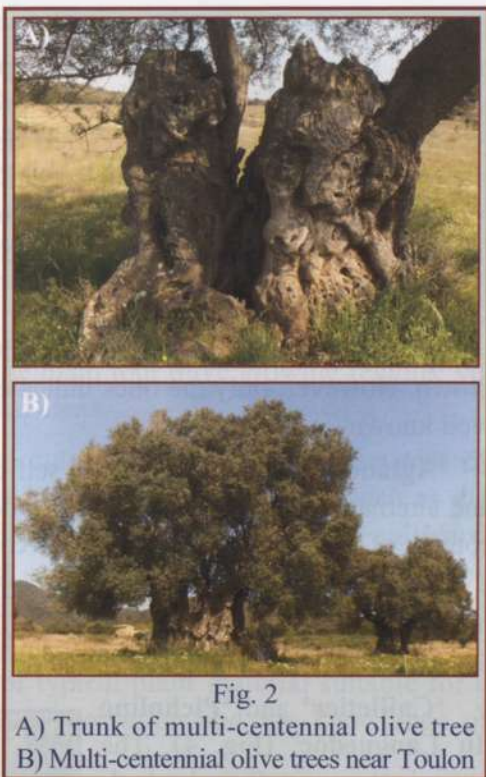


Fig. 2

A) Trunk of multi-centennial olive tree
B) Multi-centennial olive trees near Toulon

AREA UNDER OLIVE CULTIVATION



Fig. 3

Olives on terraces near Toulon

Olive trees are cultivated in Southern France bordering the Mediterranean Sea (Fig. 1, page 126). According to the production level, olive areas are classified into four different regions; Provence-Alpes-Côte d'Azur with 61 % of French production, Languedoc-Roussillon (17 %), Rhône-Alpes (12 %) and Corsica (10 %). The olive plantation area is about 48,500 ha. In traditional olive orchards, the plant density is low, ranging from 30 to 90 trees/ha (Fig. 3). In modern orchards, the planting density is 280 trees/ha on average and the yield is about 1 to 2 tons/ha. Scattered initiatives to

establish modern orchards with high density and mechanization of cultural practices have been noted recently. During the last decades a renovation program of olive orchards supported by the European Union led to planting 3,500 ha of olive orchards and to modernization of oil mills according to European processing standards.

There are more than 25,000 olive orchards; however only 800 (3%) produce more than 50% of the nation's olive production. About 4,000 tons of table olives are produced with well recognized products such as black olives from Nice and Nyons, cracked olive from Vallée des Baux and green olive of 'Lucques' and 'Picholine du Languedoc'. In recent years an average of 4,000 tons of oil is produced annually from about 18,500 tons of olives; however it varies considerably from year to year according to climatic conditions.

OLIVE CULTIVARS

In France, the olive genetic diversity is important since about 150 cultivars are grown. However, only the ones indicated below are cultivated on large areas and are well known.

➤ **'Aglandau'** is a dual purpose, self-compatible cultivar with medium productivity and alternate bearing, grown in Alpes-de-Haute-Provence (95%). It has a medium oil content of top quality. It is resistant to cold, drought and verticillium wilt.

➤ **'Bouteillan'** is an oil cultivar with high and constant productivity. It is moderately resistant to drought and is mainly cultivated under irrigation. Its fruit may vary considerably in size and gives a high oil yield.

➤ **'Cailletier'** and **'Picholine du Languedoc'** (Fig. 4). The latter is the main French, dual-purpose cultivar, with high and constant productivity when irrigated. It is mainly used for green table olives; the oil content of the fruit is medium, of top quality but difficult to extract. It is moderately tolerant to cold, drought and verticillium wilt.



Fig. 4

A) 'Cailletier'; B) 'Picholine du Languedoc'

➤ **'Grossane'** is a dual-purpose cultivar with medium productivity, grown at Bouches-du-Rhone. It is used for sweet-tasting black olives. Its oil content is low (16%), which is very fragrant but does not keep well. It is resistant to cold, drought and verticillium wilt.

➤ **'Salonenque'** is a dual-purpose cultivar, well adapted to poor soils with high productivity. It is cultivated primarily for making split green olives; its fruit gives a medium to high oil yield. It is moderately resistant to cold and drought.

➤ **‘Lucques’** is a table cultivar, grown mainly in Languedoc of Languedoc-Roussillon Province (60%), sensitive to cold and requires irrigation. Its productivity is medium and alternate. The fruit is of medium size, with low oil content and it is used mainly for green olives.

➤ **‘Tanche’** (Fig. 5), is a dual-purpose cultivar, grown in southern Drôme of Rhône-Alpes Province (95%), partially self-incompatible with medium and alternate productivity. It is used for black table olives, but also for high yield of top quality oil. It is certified to AOC system (Appellation d’Origine Contrôlée); which is a certification system for Protected Designation of Origin (PDO). It is moderately resistant to cold and drought.



Many other local cultivars are specific to the main four olive growing regions, yet they are poorly developed with limited cultivated areas.

In 1918 J. Ruby characterized 99 French cultivars. Since that time, a loss of olive tree genetic resources has been observed due to climatic events, such as the 1956 catastrophic frost, and also due to grafting by the most widespread cultivars. Half of Ruby’s cultivars could not be found or identified at the beginning of the 90’s. It appears essential and urgent to save the endangered local cultivars with potential adaptive traits (such as cold resistance, disease tolerance, etc.) and to respond to the demands of growers in term of typical plant material suitable for a given region. The strategy adopted for the conservation and the knowledge of French olive genetic resources is based on a two level scheme:

- A national collection of reference was established in 1980 by INRA Montpellier and CBNMED Porquerolles. This collection is located in Porquerolles Island in the Mediterranean Sea, where frost does not occur, thereby ensuring the long-term preservation of cultivars to allow for their redeployment in case of new catastrophic frosts;
- Establishing local collections in situ to study the local genetic resources and to gather knowledge on them in order to use them later.

Today, ninety French varieties have been correctly identified by molecular SSR markers, described with the international morphological descriptors; agronomically evaluated and their oil has been characterized by organoleptic and chemical tests. This work was done in collaboration of French Institutions and published as a book of two volumes (Moutier *et al.*, 2004 and 2011).

Among the foreign cultivars, ‘Sigoise’, also known as ‘Picholine Marocaine’ was introduced after the catastrophic frost of 1956 for table olive. The Italian ‘Leccino’ and ‘Frantoio’ were also introduced as rootstocks in the 1960’s. More recently, since

1995, 'Arbequina', 'Arbosana' and 'Koroneiki' are the main cultivars imported for the super-high-density growing system. Other Italian cultivars such as 'Ascolana tenera', 'Cipressino', 'Coratina', and 'Pendolino' as well as Spanish 'Manzanilla de Sevilla', 'Picual' and 'Cornicabra', and the Greek 'Amigdalolia' have also been introduced for different purposes (experimentation, pollination, hedges or rootstocks), however on small areas.

IMPACT ON ECONOMY AND ENVIRONMENT

Production of olive oil in France is based on quality and distinctive products. Currently eight oils are designated as Protected Designation of Origin (PDO). These oils are produced from ten main cultivars, giving them specific tastes.

In France, the price for one liter of olive oil may be the highest in Europe, especially for those certified as PDO, or with certain trademarks or for organic olive oil. The consumption of olive oil in France is 91,000 tons corresponding to 1.5 liters/capita while for table olive is 39,000 tons with an average of 0.6 kg/capita (Fig. 6). Thanks to public awareness of the health benefits of a Mediterranean diet, olive oil consumption has been increasing over the last two decades, mainly in the southeast, where olive



Fig. 6
Different styles of French
pickled table olives in a grocery store

oil has been traditionally used and also around Paris. However, consumption peaks are concentrated in the summer (between July and September) because of tourism and high consumption of salads. About 95% of the consumed olive products are imported and only a limited quantity, not exceeding 100 tons, is exported. Olive oil retail trading is mainly through supermarket chains with a share of 61%, while the restaurant share is 29% and specialized shops nearly 10%. French olive oil is sold mainly in local markets and in the outlet shops of mills.

French olive production is very low representing only 5% of the national consumption; however there are many reasons for olive cultivation other than economics. The products are of high quality with a very strong cultural image. The olive tree is traditionally grown in the south, where it contributes to the beautiful landscapes of Provence. There many non-professional people who grow olive trees to produce their own table olive and olive oil on very small holdings, mostly in their gardens, but also for personal satisfaction. In these cases, the olive trees are grown on poor soils, without irrigation. When the olive trees are grown on larger areas, with a commercial purpose, the orchards are managed taking into account all improvements in cultural practices such as pruning, irrigation mainly for table olives, pest and disease management, and mechanical harvesting (for oil cultivars).



Fig. 7

Olive orchards within bauxite landscape in Hérault

(Photo © Jean Weber, INRA)

However, except for high density plantations, which are suitable for mechanization, the labor cost is still high and the cost of the final product is very high ranging between 12 and 25 EUR/liter of olive oil.

In some parts like Hérault in the southern region of Languedoc-Roussillon, olive trees growing on the foot hills of bauxite formations, rich in alumina and iron oxides, form a peculiar scenery (Fig. 7). On the

other hand, the most important positive environmental uses of olive trees is that of firebreaks planted around cities and for organic production with traditionally low levels of pesticides. Such orchards can act as reservoirs of biodiversity.

Among the negative impacts are those related to modern plantations where chemical pesticides, irrigation and mechanization are used intensively, leading to a higher level of inputs and subsequent pollution, if appropriate control measures are not implemented. Olive processing effluents (mainly soda) and vegetation waters have a very negative impact on rivers and the aquatic fauna, again if not controlled.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Olive cultivation in southern France remains mainly traditional, since it displays a substantial diversity of cultivars, while maintaining at least three traditional cultural practices. First, most olive orchards have a low planting density ranging from 100 to 200 olive trees per ha, thus limiting inputs for fertilization and pest control. Second, the olive fruits are mainly harvested manually, offering the possibility to select olive fruits with a common maturity stage, improving the quality of final products. Finally, the pruning procedure is still based on traditional practices even, with technical improvements taking into account the recent knowledge on olive growth habits of several cultivars.

One of the major erroneous practices is ploughing, previously used in all olive orchards, which increases the probability of pathogen infections such as *Verticillium dahliae*. Hence, the use of this practice is decreasing and will be subsequently stopped.

PROCESSING METHODS OF RAW OLIVES

One of the traditional processing methods for green table olives is the most famous "Picholine method" or *Piccoline*, elaborated by two French chemists, the Picholine Brothers; who developed the method and gave their name to the process

as well as to two olive cultivars; one in France and one in Morocco. The method involves several steps. Rinse the green and healthy olives (Fig. 8) with water in order to eliminate dust. Prepare a caustic soda solution (1 liter/9 liter of water) in a wood or plastic container; protecting the eyes with glasses and the hands with plastic gloves. Leave the olives for 7 to 8 hours in this solution. Test the tenderness of the olives and check for the pulp detachment from the stone. If tenderness is sufficient, remove the olives from the solution and abundantly rinse several times until the water becomes clear. Finally drain the olives, place them in hermetic recipient and cover the olives with salted water.



Fig. 8
'Lucques' green table olives

France is not different than many Mediterranean countries in respect of traditional methods for extracting olive oil. Such methods are still practiced on a small scale, mainly in touristic areas of Provence Alpes Côte d'Azur region. Some of the old mills, equipped with stone crushing wheels and screw presses, are well preserved for display to visitors (Fig. 9).



Fig. 9
Old olive mills in Mirabel aux Baronnies (top left) and in Nyons (bottom and right) (Photo © Jean Weber, INRA)

TRADITIONS AND CULTURE

A citation translated from French literature by Georges Duhamel says "*Là où l'olivier renonce, finit la Méditerranée*" meaning: "Where the olive tree renounces, Mediterranean ends". The following are some old provençal proverbs:

French

- *Qui laboure ses oliviers les prie de donner du fruit, qui les fume le demande, qui les taille l'exige*
- *Oulivié de toun grand, castagné de toun paire, amourié tiéu*
- *La figuièro è l'oulivié moron pas*

English

- Who tills the soil of his olive trees, pleases them to bear fruit; who manures them ask it; who prune them, requires
- Olive tree of your grand-father, chestnut tree of your father, mulberry tree yours
- Olive and fig trees do not die without

sènso eiretié

- *L'Oulivié à cent an es ancáro un enfant*
- *Fai-mé èir uno oulivo pèr San jan, te n'en farai vèire milo pèr toussant*
- *Marchand d'oli, marchand joli*

heir

- A hundred-year-old olive tree is still a child
- Show me one olive at St John, I'll show you a thousand at All Saints' Day
- Oil trader, nice trader



Fig. 10

Medal of the Nyons Knights of the Olives' Brotherhood
(Photo © Didier Rousselle)

Due to the old culture and symbolic trait of the olive tree, several traditional events are annually organized. After the strong cold winter of 1956, several Knights of the Olive's Brotherhood were created, aiming to preserve and promote traditional products, supporting the development of olive growing and bringing value to its influence in art and culture. The first Knight of the Olive's Brotherhood was born in 1963 in Nyons (Fig. 10), being the center of growing black 'Tanche' olives. The Brotherhood ceremony was first held in July 1964, during the olive festival. Its first Honorary President, Jean Giono, the famous French writer, who admired olive trees, was also an olive grower.

The ceremony of enthroning a new member of the Brotherhood goes through specific rituals, which start after a street parade (Fig. 11). At the beginning of the



Fig. 11

Ceremony of the Nyons Knights of the Olives' Brotherhood
(Photo © Didier Rousselle)

ceremony, the *Grand Maître* reads the text of the oath to the graduate. "I am very happy to become a member of the Knights of the Olive's Brotherhood and I promise, through my words, my writing and my deeds, to behave as an honest knight, to defend olive and all true material and spiritual wealth attached to it, to practice all the virtues it represents and to help to the best of my abilities to perpetuate and the promote its farming". "To act in favor of olive, symbol of plenty, wisdom and peace, symbol of life". Each graduate each in his/her turn vows to remain faithful to his oath, drinks a glass of the local vintage wine *Côtes du Rhône Villages* and eats one olive. The *Grand Maître* honors them

with an olive branch. Other Knights of the Olive's Brotherhood were established, at les Vans in 1980, in Aix-en-Provence in 1990 and in Montpellier in 1992.

At the beginning of February, which marks the end of the harvesting season, with the new oil flowing from the mills, the Olive's Brotherhood arranges for the *Alicoque* (the festival of the new oil). All olive growers will attend, as well as the





Fig. 12
Alicoque of 2009
(Photo © Didier Rousselle)

residents of the city, to taste and celebrate the new oil production (Fig. 12). In several areas, the festival of the new oil is organized during the first weekend of February and local people as well as tourists participate in this folkloric tradition. In Nyons on the Place des Arcades large tables are set on which everyone can find fresh toasted bread to be rubbed with garlic, dipped in the new oil, and enjoyed with *Côtes du Rhône Village*

wine. The Alicoque festival starts with Provence dances, songs, and finishes with a huge *Aïoli*, the traditional Provence specialty.

As for the grapevine, the olive harvest period, named *Olivades*, is a traditional and social event celebrated by local farmers and population. In south France, family members and workers still mainly harvest the olives manually. That period usually starts in October and ends in January, catering to the maturity timing of different cultivars. Harvesting is usually accompanied by songs and shared meals. Harvest time is considered a meeting opportunity for young people, leading to marriages in previous times. Usually, the harvest period ends with a banquet organized by the growers.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Processed table olives are used in many culinary preparations, particularly in the south of France; however it is becoming more and more fashionable to include table olives in different main dishes containing chicken, veal, duck or beef. Olive oil is specifically very common in the eating habits of people living in the southeastern part of France, even if it is mainly recommended for fresh consumption. It is also frequently used in cooking and for the elaboration of sauces or cakes. Some of the recipes using olives and olive oil are:

➤ ***Salade niçoise*** (Fig. 13) is a mixed salad with black olives, green pepper, tomatoes, green salad, cooked French beans and eggs sprinkled with olive oil and vinegar.

➤ ***Tapenade*** is a typical mixture used for toasts accompanying drinks which consists of 200 g of black or green olives without stone, 70 g of anchovies in oil or 8 salted filets, 70 g capers, 100 ml olive oil, garlic, a spoonful of mustard, lemon juice and pepper, all mixed in a bowl and spread on slices of bread.

➤ ***Aïoli*** is a type of *mayonnaise* prepared with olive oil, 2 egg yolks, salt, pepper and 20 ground garlic cloves. This sauce is traditionally used with the *Brandade* (a cod based dish from Nîmes) and the *Bouillabaisse* (a fish dish originating from Marseille).



Fig. 13
Salade niçoise

➤ **Pompe à huile** (Fig. 14) is one of the thirteen desserts for Christmas night in the Provence area, prepared with different fruits (almonds, chestnuts, hazelnuts walnuts, figs, oranges, pears, etc.), black and white nougats and cakes.

Ingredients: 500 g flour, 100 to 150 ml olive oil, yeast, salt, 125 g sugar, 4 eggs, zests of lemon and orange and orange-flower water.

Method: Prepare the paste with flour and yeast diluted with some water, add the sugar and let it sit at ambient temperature for 2 hours. Work the paste with the hands and add all other ingredients one after the other. Leave the paste again for 4 hours at room temperature. Work the paste again, divide it in two parts and put them in a plastic bag in the fridge for 8 to 12 hours. Next day, form with each of the two paste parts a sphere; leave them again for one hour before putting them in the oven at 220° C for 30 minutes. At the end of the cooking, spray some drops of orange-flower water on the cooked *pompes*.



Fig. 14
Pompe à huile

POPULAR MEDICINAL AND COSMETIC USES

Olive oil has been traditionally used for digestion, poultices, skin care and as an ingredient in the production of ointments or soaps used for body care; Marseille soap is an example of such surviving traditional products (Fig. 15). Olive leaves are used in the composition of pharmaceutical specialties due to their effectiveness in



Fig. 15
Marseille olive soap
(Photo © Jean Weber, INRA)

increasing the discharge of urine and regulating blood pressure. They are very rich in polyphenols, particularly at specific stages of their growth. Olive leaves as well as olive oil are also widely used in the body care preparations and cosmetic



Fig. 16
Olive cosmetic products
(Photo © Jean Weber, INRA)

products (Fig. 16). More recently, an oleo-therapy center has opened near Montpellier for health care and body fitness, mainly using all kinds of natural products from the olive tree. The center even employs, as a body scrub, the husk which is the remaining solids from olive oil extraction.

OLIVES AND TOURISM

There are different olive roads in France, numerous specialized shops for olive products as well as museums which display old tools and items related to the history of olive culture like those of Nyons, Les Mées, Les Vans, the eco-museum of Volx and ethnographic museum in Cagnes sur Mer.

OLIVE WOOD AND BY-PRODUCTS USES

Since Antiquity (Caton in *de Agricultura*, chapter LXIV), the olive wood has been well known for its heating qualities (slow combustion, few ashes, high calorific

yield). Heating with olive wood was an element of social distinction. Nowadays it is not so used for this purpose in France, but is still used for the craft industry for kitchen pieces like salad bowls, spoons and forks, different kinds of recipients (Fig. 17), and for making gift and jewel boxes.



Fig. 17
Olive wood handicrafts

The pomace cake and vegetation water, by-products resulting from the olive oil extraction process cannot be used directly for fertilization of olives trees, due to the high content of different phytotoxic substances (phenols, fatty acids and organic acids, organic and mineral matters), and the risk of pollution mainly in the aquatic environment. Recent EU WFD (2000/60) and French legislation strongly recommend emphasizing the efforts to improve the elimination of these products and/or to find new ways to use them. The new process of membrane filtration is very efficient in extracting molecules such as phenol hydroxytyrosol, useful for pharmaceuticals or cosmetic products.

Compost made from pomace and olive pruning residues and activated by *lombric* (earth worms) are also produced at an experimental level.

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INTRODUCTION

Greece is located in South-east Europe, at the south edge of the Balkan Peninsula (Fig. 1). It has land borders with Albania, the Former Yugoslav Republic of Macedonia (FYROM) and Bulgaria to the north and Turkey to the east. The Aegean Sea lies to the east of mainland Greece, the Ionian Sea to the west, and the Mediterranean Sea to the south. Greece occupies 131,957 km² of which one-fifth consists of islands in the Aegean and Ionian seas. The coastline of the country is the 10th longest in the world, with 15,021 km of length, featuring a vast number of islands (about 3,000 of which 227 are inhabited). Of the total area, 3,783,400 ha consists of agricultural land, 2,241,100 ha are forests, 6,734,400 ha are semi-natural areas and pastures, 179,000 ha are covered by water and 257,800 ha are artificial surfaces covering among other activities urban fabric, industrial units, mines, sport and cultural activity sites, etc.



Fig. 1

Olive growing areas in Greece

Greece is a mountainous country, with flat land that is restricted to many small coastal plains. The mountains, which form part of the Alpine system, generally stretch from north-west to south-east. They are highest and most rugged in the northwest, although the highest mountain, Olympus with 2,917 m above sea level, is in East-central Greece.

The climate is typically Mediterranean. Summers are long, hot and dry, while winters are mild; the minimum average temperature is 9.2° C and it usually occurs in January. Precipitation varies greatly with the average approaching 850 mm/year. Western Greece receives the majority of rainfall, more than 1,500 mm/year, while Eastern Greece, along with the islands of Aegean Sea and Crete, have considerably less rainfall; for example Attica's mean annual precipitation is approximately 400 mm/year, uniformly distributed throughout the year.

Greece is predominantly an agricultural country, although less than one-third of its area is cultivated. The main tree crops are olives covering 797,000 ha mostly in

small holdings, citrus (58,400 ha), deciduous trees (78,100 ha) and other fruits (78,200 ha). Row crops such as cereals, root crops, industrial plants (cotton, tobacco, sunflower, etc.), vegetable and forage plants, cover a total area of 2,175,100 ha, vines (126,100 ha), other crops (17,100 ha), while fallow land covers 453,400 ha (National Statistical Service of Greece).

OLIVE CULTIVATION HISTORY

Olive (*Olea europaea* L.), is a tree species of the Oleaceae family, native to the coastal areas of the Mediterranean basin and Western Asia. It is estimated that olive tree cultivation began more than 7000 years ago. Fossil *Olea* pollen grains have



Fig. 2
Fossilized leaves of *Olea*

been found in Macedonia, Greece and other places around the Mediterranean, indicating that this genus is an original element of the Mediterranean flora. Fossilized leaves of *Olea* were found in the palaeosols (refers to a former soil preserved by burial underneath either sediments -alluvium or loess- or volcanic deposits) of the volcanic Greek island of Santorini (Thera). They were about 37000 years old (Fig. 2), a fact that proves Greece is one of the homelands of the olive tree. As far back as 3000 BC, olives were grown

commercially in Crete; they even may have been the source of the wealth of the Minoan civilization (Faure, 1973). It developed on Crete Island during the Bronze Age and came to dominate the shores and islands of the Aegean Sea, and flourished as a maritime power from approximately the 27th century BC to the 12th century BC. In the palace of king Minos at Malia, which dates from 1900 BC; in the middle of the Bronze Age, storerooms have been found that could hold



Fig. 3
Oil storage of the palace of Phaistos (Crete), (1650-1450 BC)
(Courtesy of Cretan Center for Cretan Olive Oil Promotion - CAPEK)

approximately 10,000 hectoliters of olive oil. Similar storage facilities consisting of multi-sized amphora (Fig. 3) were also found in the Palace of Phaistos, discovered in 1950. This palace was built around the same time like that of Malia Palace and was destroyed by an earthquake in 1700 BC. The much larger new palace was then built, overlapping the old and extending to the east. The whole complex was then gutted by fire in 1450 BC. The excavations in Fourni, Archanes by G. and E. Sakellarakis confirms

that during the Middle-Minoan period (2100-1560 BC), the cultivation of the olive tree constituted one of the inhabitants' most fundamental activities.

In Homer's *Odyssey*, Odysseus crawls beneath two shoots of olive that grow from a single stock and in the *Iliad*, (XVII.53ff) there is a metaphoric description of a

lone olive tree in the mountains, by a spring. Olive wood was one those used to fashion the most primitive Greek cult figures, called *xoana*, referring to their wooden material; they were reverently preserved for centuries. It was purely a matter of local pride that the Athenians claimed the olive grew first in Athens. In an archaic Athenian foundation myth, Athena who is one of the Olympian Gods won the patronship of Attica from Poseidon with the gift of the olive. Though, according to the father of botany Theophrastus of the 4th century BC, olive trees ordinarily attained an age of about 200 years, he mentions that the very old olive tree of Athena still grew on the Acropolis. Furthermore an olive tree in West Athens, named “Plato's Olive Tree”, was rumored to be a remnant of the grove within which Platon's Academy was situated, which would date it to approximately 2,400 years ago, while the age of an olive tree in Crete, claimed to be over 3,000 years old. The prosperity of Athens during the Golden Ages was attributed, among others sources, to the high production of olive oil. When Romans occupied Greece, the olive oil production continued and Romans were able to learn the secrets of cultivation.

During Byzantine times (300-1453 AD) things did not change. The production of olive oil in Greek territories was significant because of the vast size of the Empire. The Empire itself included almost half of the olive oil production areas in the known world; and the product was exported through-out the world. Silver coins which dates back to different periods, have been found in several archaeological excavations in many places in Greece. These coins have common features depicting olive leaves, olive twigs or even amphora indicating the crucial role of olive cultivations and olive oil in supporting the Greek economy at different times (Fig. 4).



Fig. 4

Ancient silver coins

Left: From Athens (440-420 BC)

Right: From Gortin (Crete) 2nd century

(Courtesy of CAPEK)

From that time until today, Greece became the world's most important exporter of qualitative olive oil. The love and high esteem of the Greek olive grower for the olive tree is passed on from generation to generation and from family to family. For Greeks the olive tree continues to be one of the most beautiful and useful trees because of its many usages.

AREA UNDER OLIVE CULTIVATION

Olive growing in Greece covers about 900,000 ha (including not only widespread semi-frosts olive groves but also very small orchards and scattered trees, almost everywhere with more than 150 million trees. Greece currently ranks third in olive production worldwide, after output more than doubled; from 180,000 tons in the

1960's to 420,000 tons in 2000 and succeeding years. This increase in production can be attributed to a number of factors: A) New plantations, mainly established during the 1970's and 1980's, B) Intensification and mechanization, as well as the use of external inputs and irrigation, C) Improvements in olive cultivation and improved oil extraction technologies, increased profitability compared to other crops due to the high level of CAP (Common Agricultural Policy of the European Union) support after the 1980's, coupled with high olive-oil prices and D) The lack of opportunities for other crops due to agro-climatic and socioeconomic conditions.

The olive growing area occupies more than 21% of total cultivated land, with 29% of Greek farms specialized in olives (Fig. 1, page 137). The distribution of olive cultivation among regions is very uneven. Southern Greece (Crete and Peloponnese) produce about 50% of the total Greek olive oil, while other important regions are the Central and Western Greece including Ionian Islands (30%), Thessaly, Northern Greece and Aegean Islands. More than 85% of the olives produced are used for olive oil, while the rest are for table use.

Tree density varies from 80 to 120 plants/ha in some older plantations, to 200-360 plants or more in most new high-density plantations. Tree density and planting patterns depend partly on local tradition, but water availability is also a determining factor. Under rain-fed cultivation or with lower rainfall, the tree density is lower. In recent years, drip-irrigation has been introduced on a large scale, even in traditional plantations in hilly areas of Greece.

The Greek oliviculture is characterized by three main features; most orchards are small in size with less than 2 ha on average, 70% of plantations exist in hilly



Fig. 5

Left: Olive trees on mountainous areas
Right: Drip irrigated trees in southern region

and mountainous areas (Fig. 5), and the need for irrigation in southern regions of the country. Olives grow in different types of soils varying from poor, rocky or fertile soils, existing at elevations up to

1,000 m with annual rainfall ranging from 200 to 1,000 mm/year. Improper management practices in hilly or mountainous areas result in severe soil erosion problems.

OLIVE CULTIVARS

Greece is the one of the richest countries in the world in terms of autochthonous olive cultivars. About 44 native cultivars have been recorded in the National Catalogue

(1985), although recent studies increase them to more than a hundred (Kostelenos, 2010). However, there are nine major cultivated varieties, as published in the World Catalogue of Olive Varieties of the International Olive Council. The cultivars used only for oil production are 'Adramitini', 'Koroneiki' and 'Valanolia'. The 'Chalikidikis' is the only one that is cultivated exclusively for table olives production. The dual purpose cultivars are 'Amigdalolia', 'Kalamata', 'Konservolia', 'Mastoidis' and 'Megaritikiki'. No imported cultivars are grown in commercial orchards.

'Koroneiki' (Fig. 6) is the major PDO status oil cultivar with more than 55-60% of the total olive area, grown mainly in Peloponnese and Crete. Its productivity is high and constant. It is resistant to drought but does not tolerate cold. The fruit size is small (0.9-1.2 g) with oil content around 22-25% of exceptional quality; very high content of oleic acid and high stability. It has deep, bright green color and a fruity, bittersweet taste, hinting at the smooth feeling of various fruits, predominantly apple.



Fig. 6
'Koroneiki'

'Adramitini' is a medium-size oil fruit, PDO status cultivar, moderately resistant to cold, grown mainly in Lesbos and Evia islands, covering about 20% of the total area in Greece. Its productivity is medium and alternate. The fruit has a high oil content of top-quality. It is sensitive to olive fly and to olive knot.



Fig. 7
'Adramitini'

'Konservolia' ('Amphissis') (Fig. 7) is of excellent quality Greek PDO status table olive cultivar, grown mainly in Central Greece, covering 75% of the country's table olive growing area. Productivity is high and alternate. It is used mainly for green table olive, although good for black olives and olive oil extraction. The fruit has a medium oil content of good quality.



Fig. 8
'Kalamata'

'Kalamata' (Fig. 8) is mainly a table cultivar, with accredited PDO status. It has large, black fruit, and grows in Peloponnese and Central Greece (15-20% of the total table olive growing area), mainly for the Greek-style black olives, although its oil is of excellent quality. Productivity is high and alternate. It is tolerant to salinity and moderately resistant to cold.



Fig. 9
'Chalikidikis'

'Chalikidikis' (Fig. 9) is a very large-size fruit, PDO status table cultivar, grown in northern Greece, used for

green pickling olives. Its productivity is medium and alternate. It is resistant to cold and drought.

‘Amigdalolia’ is a dual-purpose cultivar with a very large-size fruit, grown mainly in Sterea Ellas region with medium productivity.

‘Mastoidis’ (Fig. 10) is a dual-purpose cultivar, PDO status, grown mainly in Crete, Peloponnese and Corfu Island. It is resistant to cold, can be cultivated up to 1,000 m above sea level and moderately tolerant to dry climates. Productivity is medium and alternate. The fruit is of medium size (2.6 g) and it has high oil content (25-28%) of very good quality. The fruit is also used for pickling black olives.

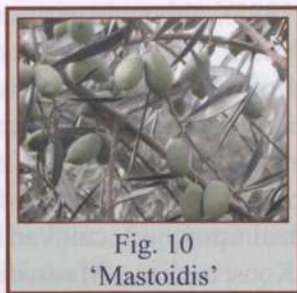


Fig. 10
‘Mastoidis’

‘Megaritikiki’ is a small-size fruit oil cultivar, grown mainly in Attica and Viotia. It is resistant to dry climates and moderately tolerant to cold. Its productivity is medium and alternate. It has high yield capacity and very good oil quality.

‘Valanolia’ is a medium size oil fruit, PDO status cultivar, grown in North Aegean islands, moderately tolerant to cold and drought with excellent quality oil.

IMPACT ON ECONOMY AND ENVIRONMENT



Fig. 11
Without these massive
olive groves, the vulnerable hills
and soil would have been in danger

Olive growing in Greece has a multi-functional use other than agriculture including agro-food production, social sustaining farmers in marginal and hilly areas, and environmental as it protects the soil from erosion and landslides (Fig. 11). Furthermore it also reduces the risk of forest fires since olive orchards provide green coverage while being maintained and cleared from falling leaves and debris. About 450,000 families cultivate olive trees and for many of them income from the olive oil is the sole income of the family.

The annual production of olive fruits is relatively stable in recent years, fluctuating between 2,200,000 and 2,300,000 tons/year. Olive oil production is approximately 350,000 to 420,000 tons/year (NSSG) depending on the climatic conditions, with more than 85% extra virgin. Twenty seven Greek olive oils have Protected Designation of Origin (PDO) and 10 Protected Geographical Indication (PGI). Many of these oils have won gold or silver prizes in the most prestigious international contests. According to FAO Statistics during 2008, Greece exported 77,288 tons of virgin olive oil, valued at 341,078,000 USD as well as 87,545 tons of preserved olives, valued 305,700,000 USD.

Consumption of olive oil in Greece is the highest in the world at 23.2 kg/capita compared to the EU average of 4.65 kg, Spain’s 13.7 kg and Italy’s 12.4 kg.



Table olive production in Greece fluctuates from 70,000 to 90,000 tons/year, representing 5-8% of the world production and 15-20% of the EU total production. Black olives make up the largest part of the production. There are 10 Protected Designation of Origin (PDO) table olives. Olive oil production from the planting of the trees to the oil extraction at the mill is associated with a variety of positive and negative environmental implications. The main sectors that are associated with olive production are: soil, water, biodiversity and landscape. One ecological service provided by olive trees is the prevention of soil erosion in hilly areas (Fig. 11, previous page). To avoid soil losses, terracing is the common practice for conservation; and seasonal plowing, if applicable, is done perpendicular to the hill slope.

In cases where no dry-stone wall has been constructed between terraces (Fig. 12), the wild vegetation and bushes are left in the separating edges, preserving them from erosion. The common practice is to plant or allow growth of a cover crop during the rainy season (autumn to winter), where more than 70% of the total annual rainfall occurs. The crop grows well, taking advantage of sufficient soil moisture, reducing the run-off, which could facilitate soil erosion. The cover crop is grazed or cut early in the spring, before problems of moisture competition arise (Fig. 13). Erosion has been noticed in some areas due to inadequate protection, since intensive cultivation has minimized vegetation.

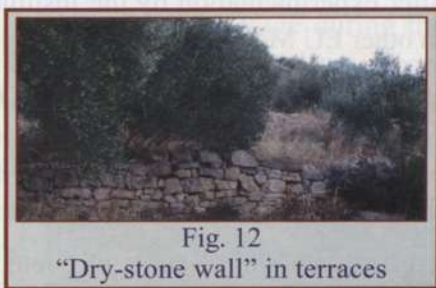


Fig. 12
“Dry-stone wall” in terraces

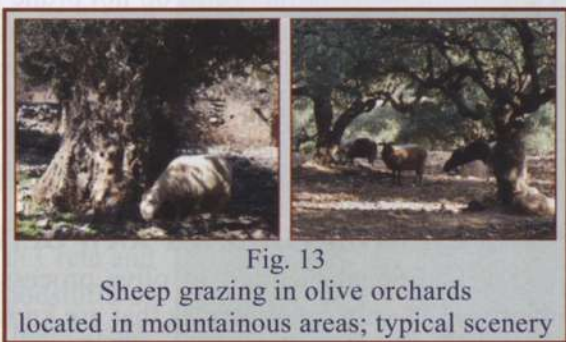


Fig. 13
Sheep grazing in olive orchards
located in mountainous areas; typical scenery

The olive orchards have also an important role in mitigating the damage caused by the “Greenhouse effect” through the positive role in the atmospheric CO₂ fixation. There is also a positive environmental impact from the production of compost using olive by-products, like pomace cake, leaves, pruning residues, that is used for soil amendment and/or organic fertilizer for olive and other crops. Olive orchards also provide an agricultural ecosystem for native insect and bird species. However, the intensification of olive cultivation, mainly in the plains is associated with environmental concerns including the application of chemical pesticides, fertilizers, and the compacting of the soil through use of mechanized tilling.

Furthermore, a negative environmental impact of olive growing, especially after the replacement of traditional olive mills with centrifugal extraction plants in the early 1970’s, is the production of huge amounts of olive mill wastewaters (OMW) and

its management. These wastes are characterized by a high, mainly organic pollution load, causing negative impacts on the environment, mainly to water resources be it surface or ground. Although many management practices have been tested at mill level (aerobic, anaerobic, use of membranes, composting, etc.), their application in most cases is limited due to the high investment or running cost and the technological knowledge required. In the late 1980's evaporation ponds were developed as an alternative for the disposal of OMW. However, despite of the low cost of this method, the odors cause serious problems in villages and touristic areas near the ponds, especially during summer. Controlled application of row OMW on the soil of olive orchards, an environmentally acceptable and economically feasible practice suggested after experimentation by the Institute for Olive Tree of Chania, Crete, and practiced in other EU Mediterranean countries (Italy, Portugal), is not allowed by existing law.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

A beneficial practice still followed by farmers is the cultivation of legumes in olive orchards; usually during April farmers employ shallow plowing to incorporate the legumes into the soil, improve the nitrogen content and organic matter of the soil.

In mountainous lands of Crete, cultivated for centuries, and where 'Mastoidis' is dominant, many farmers still do not prune their trees, resulting in very tall plants with all known problems. Since, it is impossible to harvest by hand or the use of ladders, farmers place nets under the canopy of the trees, waiting for the ripened fruit to fall. Nets are usually picked up to collect the fruits once a month (from January to April). As a result, oil quality is very low, usually with acidity higher than 2.0. Fortunately, this erroneous practice is not used in new plantations.

PROCESSING METHODS OF RAW OLIVES

The traditional methods of olive processing vary according to the olive type, but are based only on principles that are known from antiquity. Hesiodus describes the way olives were crushed for oil in a wood mortar with a wood pestle in ancient Greece. The crushed olives were put in sacks placed in a tub with a hole and pressed with a pile of heavy planks. Thereafter, the pressure increased gradually by putting a huge lever arm over the planks, one of which was fixed in the wall. The oil flows out into a tub and is then channeled into jars, where it is refined. A depiction of this kind of "press" is found on a relief of the 6th century BC, discovered at Thirasia Island, opposite Santorini.

Before the industrialization of olive oil production the traditional method used for olive extraction was the stone mill (Fig. 14). This



Fig. 14
Old stone mill

method was known from antiquity. The function of the stone mills is based on rollers or wheels made of granite which turned the olives to olive paste. The stone mills were hand-operated, moved, by cows or donkeys, or powered by the flowing water of a stream. Then the olive paste was compressed until the extraction of olive oil. The oil-press with millstones was abandoned after the 1980's, but this method is currently being revived again by producers and the consumers. Most olives are processed in modern fully automated centrifugal olive oil plants.

Olives have been the Greek's basic foodstuff since time immemorial. They are never absent from any table, either rich or poor, even during the formal dinners. The consumption of table olives in Greece is relatively high when compared with many other countries as it is estimated at 2.8-3.3 kg/capita on average during the last 10 years. Table olives are prepared (pickled) in many households in Greece; therefore it is customary to sell raw olives (Fig. 15, bottom left), especially in farmers' markets in cities, towns and villages all around the country which helps growers increase their revenue because of selling directly to consumers. On the other hand there are also many growers who process table olives on a small scale with appreciable quality of end products, which are highly in demand in markets and preferred by many consumers over packaged products. Either green and bitterish, or black and slightly salted and crinkled, or combined with limp brine vinegar and olive oil, they constitute one of the most important "appetizers" of Greek meals.

Until the middle of 20th century, olives and bread, which usually was in rusk form in Crete and the islands, still constituted the basic foodstuffs of Greek rural family, since both were homemade. The family recipes, which are handed down from generation to generation are simple. For green olives, whole or crushed it is just washing with clean water to remove bitterness and standing in brine. For black olives, washing and placing directly in a jar with a light sprinkling of salt or preserved in a mixture of olive oil and vinegar. Depending upon the processing they have undergone and their taste they take the names of *alatsolies*, *tsakistes*, *kolymvades*, *charaktes*, *throubes*, *xydates*, *kalamon*, and *amphissis*. The characteristics of these traditional Greek table olives are given below:

➤ **Tsakistes olives (Τσακιστές)** (Fig. 16, left, next page) have a slight bitterness. The olives for table use are harvested in early autumn when they are still green and have very firm flesh. The next step is to "crash" the olives one by one with a flat stone to remove the bitterness. This needs to be done carefully in order not to hurt the kernel.

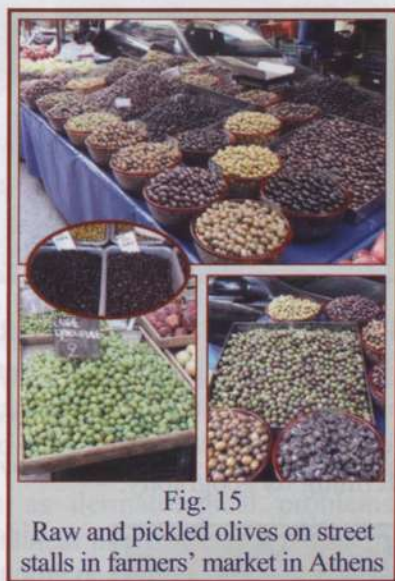


Fig. 15

Raw and pickled olives on street stalls in farmers' market in Athens

Then, they are placed in water for about 10 days, changing it daily, how long they are left in water depends on the desired sweet or bitter flavor required.

➤ **Kalamon black olives (Καλαμών)** (Fig. 16, middle) are found in various forms, mainly determined by how they are processed. During their preparation each olive is carefully scratched in 3-4 points, not hitting to the kernel. Then they are put in the water, which should be changed every day, for 15-20 days until they sweeten. After that, they are removed from water and stored in brine, adding vinegar.

➤ **Alatsolies olives (Αλατσολιές)** (Fig. 16, right) come from the collection of olives, carefully chosen and washed. Then placed in layers in a basket or metal pot with small holes, covering with salt for a few days in order to remove the fruits liquids. Then, they are put in another pot with salt until they reach mature stage and are ready for consumption.



TRADITIONS AND CULTURE

In Greece olive tree is not merely a symbol of geography, of peace or of prosperity. Rather, it is an integral part of Greek culture. More than a mere natural feature of the landscape, the olive tree frequently becomes the landscape itself, defining its geography.



Since prehistoric times the olive tree has shaped the relationship of the Greek people to their land, as well as impacting the economy in general. Over the centuries the olive has held a central place in the symbolisms of religious worship, art and culture. Olives and olive oil appear steadily over time in all aspects of Greek life, both individual and collective: religion, art, social and political events, sports and of course, gastronomy. Every aspect of Greek lifestyle, meets in the presence of abundant olive trees and fruits.

In ancient Greece, the olive was famous for its benefits and usefulness, as shown by angiography and wall paintings in Crete and the mainland Greece (Fig. 17).



Fig. 18
Olive branch used as
wreath for Olympic
Games winners

According to the Greek mythology, Hercules planted an olive tree, after completing the famous 12 labors. The olive is a favorite subject in Minoan Art. Olive trees, olive branches and olive blooms are depicted in many wall paintings and relief works, found at the palace of Knossos (1600-1400 BC); “The Dance in the Sacred Grove” and other scenes with olive foliage, blooming branch, branches and relief olives. It was considered a symbol of peace, wisdom, honorable distinction and victory. At the Olympic Games, which started in 776 BC, ancient Greeks crowned the winners with a wreath *kotinos* made of branches always cut from the same “wild olive tree”, *Kallistephanos* that was planted in the temple of Hera in Ancient Olympia, a tradition that was revived during the 2004 Athens Olympic Games (Fig. 18).

The Athenians represented Athena with an olive wreath on her helmet and an amphora with olive oil or an olive branch. One of the seven wonders of the ancient world, the gold statue of Zeus at Olympia, was crowned with olive branches. At that time, Thales of Miletus used his astronomical observations to predict an excellent olive yield for 596 BC, while Democritus studied the relationship between good olive yields and the positions of the stars.

Olive oil had many uses in ancient Greece, differing according to social status. Poor people did not consume olive oil, while the rich were able to use olive oil in cooking, for body and skin care, as well as for lighting. After taking a bath, ancient Greeks applied olive oil on their bodies and hair for grooming and good health (Fig. 19).



Fig. 19
6th C. BC Painting: Greeks
using olive oil for body care

Ancient Greek doctors believed that virgin olive oil was beneficial to human health and recommended it for afflictions such as dermatological problems, lacerations and burns, gynecological ailment (the medical practice dealing with the health of the female reproductive system; uterus, vagina, and ovaries), inducement of vomit, ear infections and birth control. According to the code established by the father of medicine, Hippocrates, olive oil was held to be beneficial for over 60 therapeutic uses. When medicine was not enough to save the patient, olive oil was used in laying out the dead. Women washed the body and anointed it with olive oil or scented oils. Oil, wine, honey and other natural products were offered as a gift to the dead at the graveside.

Another popular use of olive oil in ancient Greece was for oiling athletes' bodies before exercise in the gymnasium and at games. Furthermore, at the Panathenean Games (600 BC), the winner's prize was a decorated amphora, full of olive oil.



The olive tree is the holy tree of all religions, from the days of idolatry up to the times when the monotheistic religions sprang up around the Mediterranean and particularly for the Christian faith. The olive tree is the living hymn of God's creation. Its evergreen leaves denote immortality. It is the holy tree beloved and claimed by all the civilizations of the Mediterranean, from antiquity to this day. In Greek mythology olive is much related to the well-known story of rivalry between Athena and Poseidon, as to whose should be the city named after (now known as Athens). With a blow of his trident, Poseidon struck the rocky ground bringing forth water from a spring, but it was salty water. Athena, with a blow of her spear hitting the ground, sprouted a beautiful fully grown olive tree, full of fruits. She spoke with wisdom and told the citizens: "With my gift you will never grow hungry, nor will you ever grow cold. For it will give you olives to eat, oil to cook with, and the fire wood to warm your homes". The Immortal Gods were impressed and decided the city to take the name of Goddess Athena (Athens) and became the protectors of the city. The olive was sacred to Athena and appeared on the Athenian coinage.

It is a centuries-old tree that brings to mind Noah's Ark, the wisdom of Athena and the garden of Gethsemane in Jerusalem. There, centuries-old trees survive from the times of Christ, bearing testimony to the presence of Our Lord, who shortly before His Passion blessed them with His prayers and drenched them in the rivers of perspiration from His face. The Orthodox Church uses olive oil for its faithful, to cure and sanctify the soul and the body and as a weapon in the field of battle against evil and ammunition for eternal life. For the holy Baptism mystery, which marks the start of the path that will familiarize us with God, among the material elements of the sacrament are water and oil. The best-known rite in which olive oil is the sole constituent is the *Euchelaion* (*euche*: prayer+*elaion*: oil) a supplication for divine protection and the descent of divine grace through the oil, which is one of the seven sacraments of the Orthodox Church. Olive oil gives light to the dead man's candle.

Homer and Pindarus, Aescylous and Sophocles devoted unique lines to the olive tree, hymns to its existence and its offering. The olive tree is also a protagonist in modern Greek poetry and prose. Palamas, Ritsos, Sikelianos, Seferis and Elytis do not fail to mention the olive tree "with the wrinkles of our parents". The poet John Polemis (1862-1924) wrote a poem that reflects the importance of olive cultivation in Greek culture:

Home land the olive mills, working day and
night

The olives, my dear homeland are like tireless old
ladies

The olives, my dear homeland are trees
blessed

The smell of olive oil fills the
air

By their fruit, feed mothers and
children

standing in the wind with their
branches extended



There are also many proverbs with reference to olive cultivation, with various meanings, reminding us of how profound its bonds are with the life of people in the countryside. Some of them are the following:

Greek	English
• Αν δεν στίψεις τις ελιές δεν παίρνεις το λάδι	• If you don't squeeze the olive, you won't get olive oil. (You must work hard to perform your job)
• Όποιος έχει στο σπίτι του σάρι, κρασί και λάδι έχει όλα τα καλά του κόσμου και την ευλογία του Θεού	• Anyone with wheat, wine and olive oil in his pot has all the goods of the world, good health and God's grace. (Anyone who has these three products in his house, it is like he has everything)
• 'Λαδερές κουβέντες θέλω'	• I want oily words, meaning: I want to discuss things seriously
• Χωρίς λάδι χωρίς ζύδι πώς θα κάνουμε ταξίδι'	• Without oil, without vinegar how we travel. (You cannot work if you don't have the necessary skills)
• Φάε λάδι κι' έλα βράδυ	• Eat olive oil and come by night folk wisdom says with a naughty wink, because olive oil invigorates virility
• Καλλίτερα στο σπίτι μας με ελιές και παξιμάδι παρά στα ξένα ζάχαρη και να μ' ορίζουν άλλοι	• Better to have olives and rusks at home rather than sugar and others in foreign places, telling me what to do. (It declares the preference for one's own land; Crete)

There are also many popular expressions dealing with olive tree and olive oil characterizing personal behavior.

• Είναι καθαρός σαν λάδι	• This is like the water in oil, means that it's pure, innocent
• Ρίχνει λάδι στη φωτιά	• He pours olive oil in fire, is said for one who encourages conflicts making the things worse.
• 'Τείνει κλάδο ελιάς'	• Holds out an olive branch, is said for someone who is conciliatory

Furthermore a person who takes bribes is "oiled" *λαδώνεται* and the crafty person has made the oil-stain *έκανε τη λαδιά του*.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

In Greek cuisine olives are used as a compliment to meat, fish, or vegetables; baked, grilled or fried. Olive oil is a basic ingredient of Greek cuisine. It is used in almost every recipe, not only in cookery but in pastry as well; some are indicated below:

- ***Eliopsomo (ελιόψωμο) Bread with olives*** is typical home-made bread, widely prepared in the Greek countryside (Fig. 20, left, next page).
- ***Horiatiki (χωριάτικη) Greek salad*** or just "salad", is a rough country salad of sliced juicy tomatoes, crisp cucumber, sliced red onion, green pepper, crumbly feta



cheese, a handful of Kalamata olives, seasoned with salt, oregano and a lot of Greek olive oil (Fig. 20, right).

Method: wash the vegetables well and cut them into small pieces. Mix on a plate and add the feta, olives and oil. Season with salt and the salad is ready. A little oregano can also be scattered over the feta, for a stronger flavor.



Fig. 20

Left: Bread with olives, Right: Greek salad

➤ **Cuttlefish with fennel and green (crushed) olives:**

Ingredients: ½ kg cuttlefish, cleaned, 5 spring onions, finely chopped, 1 glass extra virgin olive oil, 1 glass white wine, ½ kilo fennel, finely chopped, 5 tomatoes, grated, salt and pepper, ½ kg *tsakistés* green olives, ink from three cuttlefish, 2-3 cloves of garlic.

Method: Clean and cut the cuttlefish. Sauté with garlic and spring onion and extinguish with wine. Add the fennel, tomatoes, olives, salt, pepper and ink dissolved in ½ glass of water and boil over low heat for about 20 minutes.

➤ **Dakos-Cretan koukouvagia:**

Slightly sprinkle the barley rusk with water, until it is softened. Pour olive oil, making sure to cover the larger surface of the rusk. Spread over the *dakos* chopped tomatoes, chopped cucumber, capers and olives. Add feta and drizzle with olive oil. The Cretan *dakos* is ready.

➤ **Sautéed lamb** (Fig. 21, left):

Ingredients: 1 kg lamb, 100-150 g extra virgin olive oil, oregano, salt, pepper.

Method: Pour the olive oil in a pot, heat it up and just before it starts burning, place the chopped meat. Stir continuously for a couple of minutes until it starts changing colors and longer sticks to the bottom of the pot. Lower the temperature and cook the meat, adding water if required. Close the lid and let the meat simmer in the olive oil and its own juices for about an hour and a half, while stirring regularly. At the end, sprinkle with oregano and serve.



Fig. 21

Left: Sautéed lamb

Right: Artichoke with broad beans

➤ **Artichokes with broad beans** (Fig. 21, right):

Ingredients: 1 kg artichokes, 1 kg broad beans, 1 cup extra virgin olive oil, 2 fresh garlic heads, 1 bunch dill, 2 tablespoons flour, 2-3 tablespoons lemon.

Method: Clean and wash the artichokes. Cut into four parts or leave them whole; put them in bowl of water; adding lemon juice to prevent blackening. Clean the broad beans while keeping the husk if it is tender. Put the oil in a saucepan and when it starts to sizzle, add the broad beans and dill, cooking for 5-7 min. Then add the artichokes,

water, salt and pepper and cook for 20-25 min at normal heat. Put the lemon juice and flour in a big glass and mix them very well in order for the flour to dissolve completely. Add the lemon and flour three minutes before removing from the fire, stirring well.

➤ **Xerotigana, Honey Dipped Spiral Pastries** (Fig. 22):

Ingredients: 3 eggs, juice ½ lemon, extra virgin olive oil, salt, flour (all purpose), water, cinnamon. For the syrup: 2 tablespoons honey, 1 water glass of sugar, 1 glass of water.

Method: Beat together eggs, lemon, olive oil and salt, add the flour and water and knead together. Let it rise for half an hour. Then roll out a very thin pastry sheet, cut in stripes (2-4 cm), fold in desired shapes and fry the *xerotigana* in sizzling oil. When they are ready, remove from the pan and strain. Then prepare the syrup (for 10-15 *xerotigana*) as follows: mix the water and sugar in a saucepan stirring continuously, and let it boil for 10-15 min until the syrup becomes thick. Remove from the fire, add the honey and continue stirring in order for the syrup not to stick. Then dip the *xerotigana* in it one by one, soak them for 1-2 minutes, remove and put in a large flat dish, sprinkling with sugar, cinnamon and some burnt sesame, if desired. Use plenty of oil during frying because the *xerotigana* must be floating in it.



Fig. 22
Xerotigana, Honey
Dipped Spiral Pastries

POPULAR MEDICINAL AND COSMETIC USES

Since Hippocrates era, olive was famous for its many healing properties, particularly in skin diseases. Moreover in ancient times, when the use of soap was not available for personal hygiene, people rubbed their hair and bodies with olive oil to cleanse, to perfume and make skin softer. They also spread oil on clothes to give more sheen.

Olive oil is the basis for soap manufacturing. In Greek villages tablets of soap are made from the lees of the oil *amurca*, lending to clothes a pleasant perfume and sparkling whiteness. The major centers for soap production in Greece, developed from the 18th century, were the olive-producing regions of Lesbos, Peloponnese, Attica and Crete. Nowadays, many Greek labels use olive oil as the main ingredient for the production of cosmetic products, such as soaps, hand creams, body lotions, shampoos, nourishing and moisture creams. Furthermore, jewelry, necklaces, bracelets, and rings, made from olive stones, suitably carved and decorated are produced for fulfilling the feminine vanity.

Recently olive leaves are used for tea preparation. It has a unique taste, provides considerable benefits and combats free radicals almost twice as effectively as green tea. Olive leaf can be taken as a liquid concentrate, dried leaf tea, powder or capsule.

OLIVES AND TOURISM

The connection of olives to the Greek culture is shown in the museums dedicated to olive cultivation. Numerous olive museums preserve and highlight

different aspects of olive cultivation in relation to the residents of each region, the way they cultivated olive trees and processed the oil. Olive museums are located in the islands of Lesbos, Corfu, Kephallonia, Thasos and Andros. In the mainland of Greece there are olive museums in Sparta, Serres and Pylio. In the island of Crete there are three museums. The first is located in Kapsaliana in Rethimno, the second in Vouves (www.olivemuseumvouves.com) near to the ancient olive tree of Vouves (Fig. 23) that is estimated to be more than 3,000 years old. The third is in the Institute for Olive Tree and Subtropical Plants in Chania (www.nagrefcha.gr/kapek/index.htm). Furthermore, since 1998 the "Olive Tree Routes" (www.olivetreeroute.gr) have been taking place with itineraries of culture and dialogue on the olive tree as a «bridge» from Messinia, Greece to other Mediterranean olive growing countries.



Fig. 23

Left: The customary ceremony to cut olive branches for the Olympic Games from the old olive tree of Vouves. This time it took place on May 11, 2012 for the London Olympic Games
Right: The old olive tree in Vouves is an attractive touristic destination for almost very one visiting Crete Island. Mohamed El-Kholy and wife Zeinab Seoudi who participated in Olivebioteq 2011 International Olive Conference next to the tree in a field tour day

There are many festivals in olive growing areas, where visitors come into contact with olive growers, enterprises and institutions around the country, learning from corporate presentations, contests and tasting high quality products of the olive industry (Fig. 24). More often the festivals are accompanied by traditional folk music orchestras singing songs related to cultivation of olive. Furthermore, a new trend in touristic development has been



Fig. 24

Left: A typical olive festival in 2012
Right: A carton of the olive miller with his press and olive tree

created in the past few years. This trend is actually a fusion of mild touristic activity and agricultural activities. Tourists can be hosted in villages and they can participate in the cultivation of olive trees.

OLIVE WOOD AND BY-PRODUCTS USES

For many millennia the wood of olive is used as a fuel in fireplaces and stoves for heating. The wood of olive, which is hard and resilient, is widely used in carpentry and furniture-making. Excavations in Crete have shown in the Minoan age it was used for the roofs of the houses and for stairs. The Aegean carpenters used olive wood in construction of cogged wheels, in the wooden mechanisms of windmills, olive presses and looms. Nowadays, many household utensils, bread boards, chopping boards, salad bowls, and mortars are also made from olive wood (Fig. 25).



Fig. 25
A couch and household
utensils made from olive wood

The solid residue of olive processing, commonly known as *elaiopyrina* (ancient Greek *pyrine*), undergoes special processing in factories, where the olive seed oil is extracted by chemical methods. Olive seed oil is not suitable for human consumption before undergoing chemical processing known in Greek as *rafinarisma*. The dry residue, which remains after the extraction of the olive seed oil, called *Pyrinaxylo*, is used as fuel in olive factories, in open stoves and for central heating in rural houses. The olive pomace mixed with olive mill wastewater, olive leaves and olive pruning material can be composted, and used as a soil amendment.

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INTRODUCTION

Iran is a country located in the Middle East and Western Asia. It lies between latitudes 25° and 40° N, and longitudes 44° and 63° E (Fig. 1). With its area of about

1,648,190 km² it ranks as the second largest country in the Middle East after Saudi Arabia. Iran is considered as one of the most mountainous countries of the world. The Elburz Mountain Range extends from north-west to north-east of Iran with the highest peak of Iran (Damavand, 5,671 m above sea level) near Tehran. The Zagros Mountain Range extends from north-west to south-west and south-east of Iran with several peaks higher than 4,000 m above sea level. The Caspian Sea, being the largest lake of the world, forms a part of Iran northern boundary. The climate in Iran is mostly arid or semiarid, subtropical along Caspian Coast. In most of the country, yearly precipitation averages 250 mm or



less. The major exceptions are the higher mountain valleys of the Zagros Mountains and the Caspian coastal plain, where precipitation averages at least 500 mm annually. In the western part of the Caspian Sea, rainfall exceeds 1,000 mm annually which is distributed relatively even throughout the year. This contrasts with some basins of the Central Plateau that receive 100 mm or less of precipitation annually.

Grape, apple and other deciduous fruits are commercially produced predominantly in mountainous areas of Iran. Its lowland plains are found both along the Caspian Sea in the North and in the South, where the Khuzestan plain is located in vicinity of the Persian Gulf. Pistachio, citrus, date and banana are produced in most of the southern provinces including Kerman, Fars, and Khuzestan. Certain areas in the north of the

country, in the vicinity of Caspian Sea, have exceptional conditions, where a mild Mediterranean climate meshes with the adjacent Elburz mountain range, leading to hosting of a wide diversity of plant species, such as wild and domestic grape, apple, medlar, cherry, pomegranate, citrus, quince, olive, walnut, hazelnuts, tea, rice and melon. Forests, with an area of 14.2 million ha, cover 8.75% and pasture, with an area of 86 million ha, covers 53% of all lands. Additionally, deserts are distributed in 32.6 million ha of the lands.

Climate variation in Iran has led to production of more than 100 different species of field and horticultural crops. Some of the Iranian agricultural products like pistachio, pomegranate, and saffron have worldwide reputation.

The whole cultivated area is about 13,400,000 ha of which 50.23% is irrigated and 49.77% is rain-fed. In 2006-2007 growing season, more than 73,000,000 tons of different agricultural products were harvested, of which 88.65% came from irrigated areas and 11.35% from rain-fed areas. Cereals occupy more than 73% of cultivated land. Flowers and ornamental plants occupy about 5,300 ha of which 2,300 ha are outdoors and 3,000 ha are indoors (greenhouses).

Annual production of cut flowers is more than 1,728 million branches. According to the FAO report, in 2008 more than 2,000,000 ha of whole lands were allocated to cultivation of more than 30 fruit tree species with annual production of more than 12,000,000 tons. Among them are four outstanding crops; grapes with 3,000,000, apple with 2,700,000, orange with 2,600,000 and dates with 1,000,000 tons.

OLIVE CULTIVATION HISTORY

The history of olive cultivation goes back very far in Iranian history. In some literature it is claimed that olive cultivation was initiated in the period of Iranian Empire that expanded to the Mediterranean Basin. Others believe that olive cultivation has been developed in Iran since Greek domination. However, some others documented that Syrian refugees introduced olive from Syria to Iran in the third century (Sadeghi, 2002).

Common belief is that local people living in Iran and Turani area (Near East), introduced olive (Ciferri, 1950), then in the fifth century BC it was distributed from the east to the west, to different Mediterranean countries, and adopted to appropriate climatic conditions of that region (Acerbo, 1937). According to some evidence (Acerbo, 1937; Pecori, 1889) Iranians, Assyrians and Babylonians didn't extract oil from olive and they obtained their edible oil from sesame and castor oil plants.

The first cultivation of olive trees and the consumption of olive oil were initiated by populations from Pre-Semitic races living in the South Caucasus and West Plateau of Iran ca. 6000 BC (Acerbo, 1937 and Viola, 1989). Olive has been cultivated in Iran since 3000 BC and the Persian word of *Zeitoun* is used both for the tree and for the olive fruit (Lauffer, 1919). Presence of old olive trees near



temples shows the sanctity of this plant in religions before Islam. Vavilov (1949-1950) considered Iran and Syria as the origin center of olive and its diversification. In a biosystematic study, Sheik Hassani and his colleagues (2010) showed that Iranian local olive genotypes from Zagros area were placed in completely separated and independent groups than those from Mediterranean areas. This may suggest a theory that Iran could be the center of diversification of olive. The wild species *O. ferruginea* is distributed from Hormozgan Province in the south of Iran to the east, close to the border of Pakistan (Fig. 2 and 3).

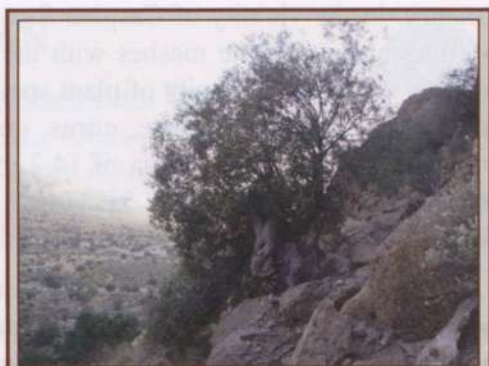


Fig. 2
Naturally growing wild olive tree of the *O. ferruginea* species in Kerman province
(Courtesy of M. Hosseini-Mazinani)



Fig. 3
Trunk of an old olive tree
(*O. ferruginea*) in South-east Iran
(Courtesy of M. Hosseini-Mazinani)



Fig. 4
A very old olive tree in Nehran
Villag, Tarom-e-Sofla region

In Iran, People from Nishabour, Gorgan, Deilam, Ramhormoz, and Fars cultivated olive in the 11th and 12th centuries. Olive was also cultivated in areas in the vicinity of the Caspian Sea in the 19th century. Wild olive genotypes were also found from Caspian Coast to the Atrak River. Meantime, olive cultivation has been also reported from south of Iran. Wide distribution of olive cultivation in the country may lead to the conclusion that it existed before Islam in Iran (Spiegel, 1971). Based on the opinion of people from Rudbar, available olive cultivars were brought to these areas in Abbasid rule (750 AD) by immigrants from the Sham region. Olive trees have also been observed in Balochistan, where they are usually cultivated around shrines (Goldsmid, 1867; Aitchison, 1890). Agronomically good olive genotypes have been found near Bushehr and Kerman (Faizabad) and Tarom (Schindler, 1881; Stolze and Andreas, 1885). Olive orchards are mainly distributed in the path of Rasht-Manjil and Sefidrood River regions (36°, 47' N and 49°, 26' E) (Chodzko, 1850; Polak, 1862).

Nowadays, old olive trees can be found in these areas (Fig. 4 and 5).



Fig. 5

An old olive tree in Altin Kosh Village, Taron-e-Sofla Region



Fig. 6

Gold Coin with olive branch and image of Cyrus the Great

In the first half of the 20th century, olive was not considered as an economical crop. However, in the second half of the 20th century, olive and its extracted oil were accepted by Iranian consumers as an edible fruit and as a source of edible vegetable oil. Since

then its nutritional value has been appreciated by Iranian people. Olive has also found some medicinal, pharmaceutical, perfumery and health care uses. In Persian culture in Persepolis monuments (500 BC), there is a statue of olive flower as well as olive branch. In Sasanian era (224-650 AD) taxes were due for olive trees in the territory of the empire. There is a poem in Shahname (Ferdosi, 900 AD) saying that in some years there was so much production of olive that the Kings exempted people from taxation. Recently an olive branch symbol is used on gold coins with the picture of Cyrus the Great (Fig. 6).

AREA UNDER OLIVE CULTIVATION

Olive production in 1990, before conducting an olive development project, was limited to approximately 500 tons of olive oil and 1,500 tons of table olive from nearly 5,000 ha. Since then, efforts have focused on promoting olive cultivation countrywide to contribute a share of the country's need of vegetable oils.

At present the olive cultivated area in the country has reached more than 120,000 ha of which about 40,000 ha are productive. Some of the new orchards have reached 300 ha, while there is one orchard with a size of 2,000 ha. According to IOC reports, Iran produced about 47,500 tons of table olive in 2009-10 growing season, equivalent to 2% of the world production and about 4,000 tons of olive oil. Despite the production increase of olive in the country, olive oil production did not follow the same pattern as it has increased to that figure by nine fold during a period of 15 years. During the past five years, the amount of oil production did not show considerable change, however production of table olive has doubled during the same period.

It is planned to expand the olive cultivated area to reach 600 thousand ha in 24 provinces of Iran by 2026 (Zeinanloo, 2005), when it is predicted that olive oil consumption per capita will jump to 2 kg, and table olive to 500 g.



OLIVE CULTIVARS

Following are main characteristics of four of the important Iranian olive cultivars.

'Zard' (Fig. 7). The origin of this dual purpose cultivar is Rudbar and Tarom region in northern Iran. The tree has a rather strong vigor with spreading growth habit. The density of its canopy is medium and it is tolerant to wind. The cultivar comes to flowering late. Flowers are rather highly self-incompatible, and its suitable pollinators are 'Leccino', 'Mari', 'Belidi' and 'Roghani' respectively. The fruit is of medium weight (average 4-5 g), with an ovoid shape, it is asymmetric, without nipple, with medium and small lenticels. The color of mature fruit is dark red which is not uniform. The flesh/stone ratio is medium (6.6) and the oil content is about 55% of dry weight, and 21-23% of fresh weight. Its time of ripening is medium and the best time for harvesting for oil extraction is early November. This cultivar has a rather good rooting ability and is tolerant to drought and low temperature.



Fig. 7
'Zard'

'Roghani' (Fig. 8). The origin of this oil cultivar is Rudbar and Tarom region in northern Iran. The tree has a strong vigor with erect growth habit. It is considered to be very sensitive to wind. Flowers are rather highly self-incompatible, and its suitable pollinators are 'Zard', 'Leccino', 'Belidi', 'Fishomi' and 'Manzanilla' respectively. The weight of fruit is medium (average 4 g) with an ovoid shape. Its "flesh-to-stone" ratio is medium. The color of mature fruit is dark violet; tends to be black. Oil content is about 27% of fresh weight. The best time for harvesting is early November. This cultivar has a high rooting ability. It is of intermediate resistivity to cold, while rather sensitive to drought. It is not well adapted to hot weather and because of low vigor of canopy, the main branches and trunk may suffer sun scald damages.



Fig. 8
'Roghani'

'Mari' (Fig. 9). The origin of this dual cultivar is Rudbar region in northern Iran. The tree has a medium vigor with spreading growth habit. The canopy has a medium density. It comes to flowering late. Flowers are rather highly self-incompatible and its suitable pollinators are 'Manzanilla' and 'Zard' respectively. The average weight of fruit is 3.5 g, with elongated and asymmetric shape, without nipple. The color of matured fruit is violet, tends to be black, shiny and uniform with few and small lenticels. Complete maturing



Fig. 9
'Mari'

occurs in the middle of September. The flesh/stone ratio is 6.6. Oil content is about 20-22% of fresh weight of fruits. This cultivar has medium rooting ability. Productivity is alternating and it is considered to be susceptible to peacock leaf spot.

‘Tokhm-e-Kabki’ (Fig. 10). The origin of this table cultivar is Shiraz (Fars province) in southeastern Iran. The tree has a medium vigor with spreading growth habit and dense canopy. The shape of fruit is asymmetric to symmetric. The color of matured fruits is black. The oil content is low of about 10-12% of fresh weight. Its productivity is highly alternating. It seems to be somewhat resistant to abiotic stresses (salinity, low and high temperature), however susceptible to some pests like mites and bark beetles.



Fig. 10
‘Tokhme-e-Kabki’

During the period from 1975 to 2002 fifty nine cultivars were introduced, in collaboration with FAO, from different countries of the Mediterranean basin to assess their adaptability. Some were grown successfully especially ‘Conservolia’.

IMPACT ON ECONOMY AND ENVIRONMENT

One of the main objectives of expanding olive cultivation in Iran is to utilize and sustain natural resources (soil and water) and to minimize the negative impacts of instability on production inputs, including soil erosion, sedimentation process, floods management and water deficiencies, all sharing in improving ecosystems, especially in water catchment areas. The cultivation of olive in low-yield lands may increase farmers’ income, sustain previous jobs and reduce erosion; especially in regions similar to the watershed of Manjil Dam, since the soil in this area is vulnerable to erosion (Fig. 11). Another major economic gain of expanding the olive cultivated area is reducing the reliance on importation of vegetable oils which accounts for 90% of domestic needs.

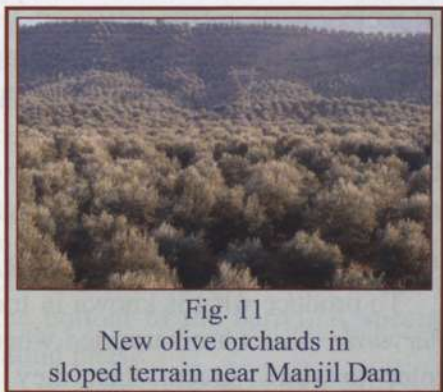


Fig. 11
New olive orchards in
sloped terrain near Manjil Dam

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

One of the common practices in traditional Iranian olive cultivation is the wide spreading of manure as a source of nutrition which also helps in improving the physico-chemical conditions of the soil around the roots. Since in the majority of traditional olive orchards in Iran no chemical fertilizers, pesticides or herbicides are used, it may be considered that olive production from these orchards is somewhat organic.



Fig. 12

Extremely tall trees in search for light due to lack of adequate and timely pruning



Fig. 13

Dead branches on lower parts of canopies due to insufficient light penetration

A major wrong horticultural operation in some villages is paying little attention to olive pruning. Due to high density of plantation and insufficient pruning, trees compete each other for light, and they grow very tall (Fig. 12). As a consequence, the lower branches of the canopy tend to die (Fig. 13) and the trees become weaker with reduced productivity. In addition, harvesting high trees requires more laborers who face the risk of falling while harvesting. Recently, through extension courses farmers have been encouraged to implement rejuvenation pruning (Fig. 14).



Fig. 14

Farmers' field-school on rejuvenation

PROCESSING METHODS OF RAW OLIVES

To produce what is known in Iran as *Zeitun-e-Parvarde*, olives are harvested when they change color to straw green, then they are pitted to remove stones. The de-stoned olives are mixed with crushed walnuts (250-300 g to 1 kg of olive flesh) and milled. The resulting paste is mixed with aromatic vegetables and herbs such as mint, coriander and a pinch of garlic powder with pomegranate juice to make it as dough. It is recommended to serve within 4-8 hours after preparation. When served, it should be mixed with pomegranate paste (Fig. 15).



Fig. 15

Zeitun-e-Parvarde

In a very old primitive method of extracting olive oil in Iran, which resulted in poor quality oil, harvested olives were placed in a pot full of water and boiled for a short time after which they were piled into a small rock vat to drain. The olives

were then dehydrated by placing them in thin layers under direct sunlight to become semi-dried. This procedure would be followed by foot crushing of the olives inside a rock trough by workers who wore boots made of cow's hide. The resulting paste including the separated seeds was heated inside a pot, while hand stirred with a stick, to ensure balanced heat distribution and to avoid burring of the paste at the pot bottom. This heating process would continue for few hours until the water in the paste was fully evaporated. To press the paste, it was confined in bags made of goat hair which were inserted half full between the two wooden boards of the press. Pressure was applied by a wooden spindle for hours for the oil to start flowing. The remaining paste would be sieved to retrieve the seeds which were used as a source for the required heating in the process, while the scum was subjected to further treatment with solvents to extract more oil for soap making.



Fig. 16
Stone mill at Siahpoosh
village in Tarom-e-sofla Region

By 1936 stone mills (Fig. 16), driven manually, by animals, or electricity, when available, were used to crush olive fruits in a pool by rotating stone and at the same time the fruits were mixed. The produced paste was directly decanted inside drums placed on a sloped surface. As a consequence, part of the oil was extracted from the paste, accumulated on the sloped bottom of the drums and collected. This oil, produced without pressing and filtration is called *Varaviz*. Nowadays, this procedure is used by a commercial extraction

plant at Rudbar, in Northern Iran. The remaining paste was placed in bags, made of hemp or goat hair, and pressed in special equipment for separating the liquid (water and oil) and the solid part. The liquid was collected in barrels (or special tanks) and the water evacuated through a tap located in the bottom of the barrel. A special funnel was used for separating the oil from the liquid phase.

OLIVES AND CULTURE

Olive holds high sanctity for Iranian people, especially in areas where it is grown as a monoculture. In such areas, olive trees have special importance and people even avoid cutting their branches. Since olive is among the few fruits mentioned in the Holy Book of Islam Al-Qur'ān "القرآن", olive trees receive a lot of consideration from the religious point of view. For instance, in one of the districts in the city of Tabas (Fig. 17), there is an old mosque



Fig. 17
The olive mosque in Tabas

that is called *Zeitun* or “olive mosque” which has been recently renovated. On the wall of the mosque is an inscription of verse 35 of Surat Al-Noor from the holy Quran in which God calls the olive tree as the blessed tree.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Following are some traditional Iranian recipes in which olive oil is used as ingredient:

➤ Ghormesabzi stew (Fig. 18):

Ingredients: (for 8 persons); 0.5 kg of beef, ½ cup of red beans, 250 g of smashed herbs and vegetables (corianders, leek and parsley), juice of 4 lemons, turmeric, salt and pepper to taste, and enough olive oil for frying.

Method: Fry the meat in olive oil just to change color, then fry the smashed herbs and vegetables in a pan and add the turmeric and pepper. Add the fried herbs and vegetables to the meat and mix. Add the red beans, 3 cups of water, salt and lemon juice then simmer gently on low heat until the olive oil floats on the stew. Serve with rice



Fig. 18
Ghormesabzi stew in the middle served with rice, salad and olives

➤ Qeime stew with eggplant (Fig. 19):

Ingredients: (for 6 persons); 3 eggplants, 2 fried onions, juice of 3 lemons, 400 g of lamb meat, 100 g split peas, 2 spoons of tomato paste, turmeric, enough olive oil for frying, salt and pepper.

Method: Remove the eggplants' skin, split and put them in salted water for 30 minutes. After washing, fry the eggplants in olive oil and put them aside then fry the meat separately. Add the salt, turmeric, peppers, split peas, fried onions and lemon juice to the fried meat and stir fry the whole mix again. Add 3 glasses of water and simmer gently on low heat to boil slowly. Finally add the tomato paste and wait until it boils completely. To serve, pour the stew in a bowl and add the fried eggplants to it. Serve with rice, salad and olives.



Fig. 19
Qeime stew with eggplant served with rice, salad and olives

➤ Rudbar's Shami Cutlets (Fig. 20):

Ingredients: Fat free ground meat, aromatic herbs (coriander and parsley), spices (Persian Hogweed - *Heracleum persicum*), curry, turmeric, salt, tomato, onion and olive oil for frying.

Method: To prepare the *Shami* sauce, stir-fry the onions with grated tomatoes in olive oil. Mix the meat with spices, shape into flat cutlets, and fry on low heat. Put the fried cutlets in another dish, add the *Shami* sauce, olive oil and water, and cook for 10 minutes. Serve immediately.



Fig. 20
Rudbar's *Shami* Culets

POPULAR MEDICINAL AND COSMETIC USES

Following are some of the traditional uses of olive products in Iran:

- Olive oil is used as laxative and remedy of gout.
- Olive leaves water (Fig. 21) is believed to be useful for controlling high blood pressure and diabetes. Usually 20 olive leaves are soaked in 300 g water and boiled for 15 minutes. To taste, a small amount of sugar is added. Use one cup twice a day for two weeks. Withhold the treatment for 8 days and repeat.
- Olive leaves water is used for reducing fever, as antiseptics and tranquilizer. Olive leave extract is sold in medicinal plant grocery (Attari).
- Olive oil is used with lemon juice for repelling gall bladder stone.



Fig. 21

Olive leaves water sold in a medicinal plants grocery in Karaj

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INTRODUCTION

Israel is a small country located in the Eastern end of the Mediterranean basin along the 35° E longitude and between latitudes 29° 30' and 33° 20' N; with a total area of about 21,000 km² (Fig. 1). The climate differs considerably between the different regions, as the country is the meeting point of three major geographic climatic regions: Mediterranean, Irano-Turanic and Saharo-Sindic climates. The northern part of the country is mostly mountainous reaching an elevation of up to 1,200 m, where annual rainfall reaches up to 900 mm. The center of the country is based on a coastal plain with 350-450 mm rain, and the southern part is mostly mountainous desert with 25 to 250 mm annual rainfall, in accordance with the various sub regions. The Eastern region along the Jordan River is mostly below sea level dropping from the north, via the lake of Galilee, to the Dead Sea from + 10 to - 400 m, and increasing again to sea level in the very south at the Red Sea.



Due to the different range of climatic conditions in various regions of the country, a wide range of fruit crops are grown. About 26% of the total country's land (530,460 ha) is cultivated at different levels of intensity. Major crops in the north are various deciduous fruits and grapevines, in the coastal plain the main crops are citrus, avocado, banana, grapevines and some stone fruits. In the eastern inland low valley along the Jordan River the major fruit tree crops are dates, banana, table grapes and pomegranates. In the lower Galilee and southern coastal plain almonds is also an important commodity. The olive orchards for oil extraction were traditionally and continue to be the major tree crop in the northern and mid-land mountains. During the last 30 years the olive oil industry spread at different levels of intensity to most regions of the country. In recent years major developments of intensive olive orchards for oil are taking place in the Negev Desert high land and the Jordan Valley based on local

brackish water and in the occupied Golan Heights on fresh water. The table olives industry (about 8% of the total) is presently distributed in most regions under intensive cultivation. This industry is mainly distributed in small orchards and in somewhat large operations in the Golan Heights. Most of the intensive olive industry in Israel is irrigated with recycled water at a purification level meeting international standards.

OLIVE CULTIVATION HISTORY

The olive growing history in Israel goes back to the very beginning of olive domestication. In cultural traditions olive products were used in human diet, medicine and as liquid fuel. Olive orchards were distributed all over the country, but mainly in the lower mountains in both the north and center of the country in regions with more than 350 mm of winter rain. Archeological documents from about 2,000 years ago indicate specifically the quality of oil from the different regions as well as descriptions of the different cultivars grown. Although the names of the various cultivars mentioned in the old scripts and documents are mostly different from those of the traditional cultivars grown today, yet their description fits rather well some of the remote trees that are still grown in various traditional villages. The scale of the traditional olive industry in Israel varied considerably during the history of the region. Olive culture was most developed during the biblical time and olive oil from Israel and Judea was an important export commodity with a high quality reputation. Many historical scripts and records as well as the bible itself indicate the importance, distribution, cultivation methods and trade in the early historic and even prehistoric times.

Gethsemane, in Hebrew *gat shemanim* meaning "oil press", is an ancient garden on the western slope of Mount of Olives in Jerusalem, which dates back to earlier than Jesus Christ time (Fig. 2). The name Gethsemane suggests that the garden was an orchard of olive trees in which an oil press was probably located. Nowadays, a few old olive trees are growing in the garden of the church, some of which might still have their original trunks. There are also many old olive trees growing in the area around the church.



Fig. 2
Old and recent scenery of olive trees
in Gethsemane Garden in Jerusalem

During the Byzantine era (about 370-650 AD) (Fig. 3), olives were grown on terraces as part of the agricultural development in the southern desert mountains (Fig. 4). In modern times, the remains of these terraces have been used again, by Bedouin nomad tribes, to plant olive trees (Fig. 5).

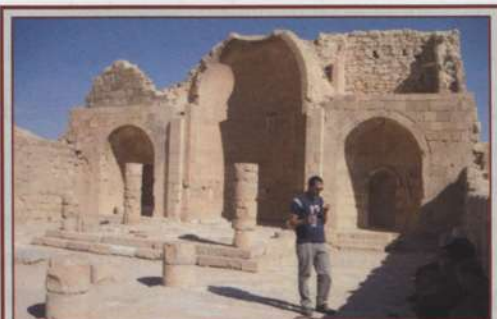


Fig. 3

A Byzantine church in the center of historic agricultural region in the Desert Mountains



Fig. 4

An old olive tree surviving the harsh environment in the Negev desert mountains

In the middle ages the industry shrunk considerably and established itself around villages particularly in the low mountains and their foothills. During most of the Othman period the olive industry remained unchanged, and it was generally confined closely around villages, with some establishments in the center of the coastal plain. Towards the end of the 19th century and up to World War I, many trees were uprooted for military purposes. However, the olive remained a basic commodity in villages and olive oil persisted as an important constituent of the local diet. After World War I, the British Mandate authority initiated a massive replanting of olive trees. These plantings were developed also in new areas somewhat different from traditional systems to encircle villages. Cultivation of all the olive orchards including those planted at the beginning of the 20th century was highly traditional and a significant part of the industry still is.



Fig. 5

Olive trees planted on remains of Byzantine terraces

AREA UNDER OLIVE CULTIVATION

Presently the total area planted with olives in Israel is about 23,000 ha and is annually growing by 200-300 ha. It is the largest tree crop commodity in the country. Most of the plantations are still in the traditional mountainous regions but in the last 30 years an intensive olive oil industry spread also to other regions with different terrains and environmental conditions (Fig. 1, page 164).

The traditional olive industry is mostly concentrated in the Northern Galilee mountainous region occupying an area of 16,000 ha, out of which 10,000 ha

contribute to the commercial production (Fig. 6), while the other 6,000 ha are very small holdings and their crop is consumed locally, not reaching the commercial markets. Some of the traditional orchards are presently receiving a small complimentary irrigation. About 5,400 ha are intensive oil orchards (Fig. 7) which are distributed as follows: 2,200 ha along the coastal plain, 600 ha in the desert high land, 700 ha in the northern hills, 500 ha in the internal valleys, 400 ha in the occupied Golan Heights and 300 ha in the Judea mountains. Most of these orchards are harvested mechanically by means of trunk shakers. About 500 ha of the intensive olive oil orchards are cultivated as high-density hedgerow orchards and are harvested with overhead harvesters. Table olives occupy an area of 1,600 ha grown under intensive cultivation with full irrigation producing high yield. The intensive table olive industry started in the 1920's and was mostly limited to the hot inland valleys including the regions next to the lake of Galilee about 220 m below sea level.



Fig. 6
Typical traditional rain-fed
olive orchard in the center of the country
(Photo by Bruce Satterfield)



Fig. 7
'Barnea' in modern
irrigated intensive orchard

OLIVE CULTIVARS

Two autochthonous cultivars are persisting in the traditional olive orchards in Israel. In the Galilee region north of the East-west Central Valley and the Carmel Ridge nearly all trees are considered as 'Souri', though frequent off types are apparent, some of which are presently used as phenotypic selected clones. South of the valley on the mountains the predominant cultivar is called 'Nabali'. Nearly no mixture of the two cultivars between the two regions occurred except on the western foothills along the center of the country where both cultivars can be found. Very few additional cultivars are found in either of the two regions. On the other hand many villages regarded their trees as a specific clone and guarded them strictly from any "leak" of budwood out of the village. Both leading traditional cultivars, 'Souri' and 'Nabali' are highly resistant to limiting environmental conditions such as shallow soils and water stress. However, in most years at the end of the summer shriveling of fruits is common (Fig. 8). Thus,



Fig. 8
Shriveling of 'Souri' fruits at the end
of summer under rain-fed conditions

traditionally the harvest in the main rain-fed orchards was scheduled to start after the first rain, which would result in re-swelling of the fruit. On the other hand, these cultivars are rather sensitive to biotic disorders and leaf diseases. Following are the main characteristics of these two cultivars and other autochthonous cultivars.

‘Souri’ (Fig. 8) is primarily an olive oil cultivar, but a limited amount is also used for processing table olives. Morphological studies of olive stones, found in various archeological sites, indicate the commercial use of this cultivar in the trade at least 2,500 years ago. Various local phenologically defined clones of this cultivar were identified at different locations showing only minor genetic differences. The tree is of medium size, slow growing and most sensitive to the peacock-eye disease (*Spilocaea oleagina*). The oil content of the fruit is high but the response of trees to intensification and particularly under irrigation is limited. The fruit is slightly elongated and highly suitable for green pickling by the East Mediterranean method in brine without lye treatment. The oil extracted from traditional rain fed orchards is rather pungent and has a well-balanced bitterness.

‘Nabali’ is somewhat similar to ‘Souri’ that is grown in traditional rain-fed orchards. This is the main cultivar in the mountainous inland regions of the Palestinian Authority. The fruit is more pointed, its oil content is slightly lower and its sensitivity to the peacock-eye disease is also high, very similar to that of ‘Souri’.

‘Muhasan’ is a semi traditional cultivar starting from a tree found in a traditional ‘Nabali’ orchard in the 1930’s. It spread rapidly due to its vigor, high yield, larger fruit and easy rooting ability. It was called and is now designated as ‘Muhasan’ as it differs genetically from ‘Nabali’. Its oil content is low; particularly on young trees and under irrigation. However, the taste of the oil is somewhat sweetish and highly desired. It is used in modern irrigated orchards as a dual purpose variety utilized in accordance with the market demands for oil extraction or table olive processing.

‘Barnea’ (Fig. 9) is the main oil cultivar for intensive irrigated orchards. This cultivar was bred in Israel and was released about 40 years ago. It is an upright rapidly growing cultivar, highly productive under irrigation, producing a long term average of 3.2-3.5 ton oil/ha. It is well adapted to mechanical shaker harvesters and currently represents about 50% of the trees in modern intensive olive orchards for the oil industry. It is, however, possible to convert the erect growth habit of this cultivar, like some others, using specific growth retardants to develop a highly fruitful droopy

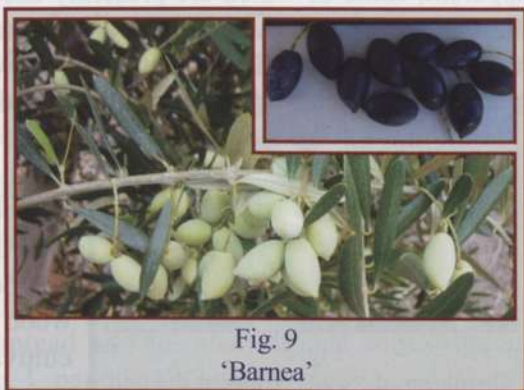


Fig. 9
‘Barnea’

growth (Fig. 10), suitable for overhead harvesting. An advantage of this cultivar, in off years with low crop, is that the size of its fruits becomes large suitable for black pickling in the Kalamata style with wine-vinegar (Fig. 9, previous page, top right).

‘Askal’ is another recently bred Israeli cultivar, is suitable for the high-density hedgerow growing system. It is rapidly spreading in this type of orchards. This new cultivar is highly productive and reaches an extremely high commercial oil content of 28% on a fresh weight basis, even under full irrigation and high fruit yields. The fruit is elongated, ripens at mid-season and the tree is well adapted for overhead harvesting.



Fig. 10
Yield of an irrigated ‘Barnea’ adapted
by a growth retardant

Nearly 130 oil and table cultivars have been imported over the years, most of which are retained currently in a national collection at the Volcani center in Bet-Dagan. About 80% of the intensive table olive industry is based on one major cultivar; the Spanish ‘Manzanillo’. It was introduced to the Jordan Valley in the 1930’s from California, underwent some clonal selection in the country and is now recognized as ‘Manzanillo-TI’. This major cultivar is accompanied in the orchards by a clone of ‘Uovo di piccione’ called ‘Novo’, introduced at about the same time as the ‘Manzanillo’ and was found to be its most efficient pollinator for a number of other cultivars. ‘Novo’ develops very large fruits, which are mainly used, as table olives by hotels for the tourist industry. Another large fruit cultivar ‘Santa Caterina’ was introduced about 50 years ago and is gradually taking the place of ‘Novo’ both as pollinator and for the table industry, due to the higher quality of its processed olives. During the 1960’s and 1970’s many cultivars were introduced from most countries around the Mediterranean basin. None of the table olives introduced during those years developed into an important commercial cultivar. On the other hand a number of oil cultivars gained major importance in the intensive oil industry next to the local developed ‘Barnea’. Presently Spanish ‘Picual’ and French ‘Picholine Languedoc’, both introduced in the mid-1960’s, developed into major cultivars for the modern intensive Israeli olive oil industry. Italian ‘Leccino’ and ‘Frantoio’ are grown in small commercial plots in various regions with limited success. Lately Italian ‘Coratina’ introduction is gaining significant importance in new developments. Spanish ‘Arbequina’ and Greek ‘Koroneiki’ were introduced in the early 1980’s and presently are the major cultivars in the high-density hedgerow growing system. Some new dwarf and semi dwarf table cultivars were lately released from the Israeli breeding program called ‘Kadeshon’, ‘Sepoka’, ‘Masepo’ and the leaf spot resistant cultivar ‘Maalot’.

IMPACT ON ECONOMY AND ENVIRONMENT

Although based on its planted area the olive is the largest single tree crop in Israel, its impact on the national economy is negligible. Most of the traditional rain-fed orchards in the north of Israel serve as a source of complimentary income and for self-consumption of families no longer engaged fulltime farming. Most of these orchards are kept for generations on marginal land, withstanding more economical developments due to special cultural values expressing stability and



Fig. 11

A traditional large olive tree used mainly for recreation and rest in the Carmel Region

status (Fig. 11). Only a few of these orchards are being intensified by receiving complimentary irrigation from the new water recycling plants in the country. Still, the olive orchards planted on the sloped terraces or shallow soils are part of the protected nature and are there to stay. On the other hand, marginal water either recycled waste-water in various regions or brackish water in others, are the basis for the new intensive olive oil industry. The entire new intensive high-yielding olive orchards (similar to other major sections of the Israeli agriculture), are based on marginal water. With the right schedule of irrigation and balanced nutrition highly fruitful olive trees have been developed and are the basis for the modern intensive olive oil industry. Due to restricted availability and extremely high cost of fresh water, no intensive oil industry could be economical in Israel using such water, not even justifiable by the entire olive oil based only on producing high quality extra virgin oils.

The impact of the olive production on the environment in Israel is of highest significance with only minimal negative effects. The established traditional orchards in the northern mountainous terrain reduce erosion, and as a constituent of the basic Mediterranean forest do not disturb the natural environment of wild tree vegetation surrounding orchards. Furthermore, olive trees are presently used in forestation projects in various regions of the country as part of the efforts to re-establish the natural vegetation that was lost due to over grazing and human destruction for many generations. The vegetable water, as well as the olive pomace wastes, resulting from olive oil extraction, are in most cases strictly controlled and utilized for further industrial uses. The use of pomace in composting and the vegetable water for restricted quantity irrigation are part of the controlled means to utilize the oil mill waste and prevent pollution. The waste of the larger oil mills dealing with the fruit of the intensive orchards, be it liquid, semi-dry or dry, is strictly controlled and serves in part as raw material for secondary products such as cattle feed supplements, herbicides for highway sanitation, composts and fuel for heating. Generally the

problem of pollution from oil mill waste in Israel is not very severe due to the actual small olive industry producing limited amounts of waste. On the other hand the modern intensive olive industry is highly instrumental in combating desertification (Fig. 12), developing green islands in the mountainous desert using local brackish water and thus enriching the limited fauna, flora and particularly bird population of the desert. This environmental change is instrumental in developing a friendly environment for new settlements and for the present limited population in these harsh regions. The favorable response of the olive tree to brackish water was a major factor in enabling the development of a highly productive, well balanced and economical olive industry in the desert. This desert olive industry was based on a relatively inexpensive natural local resource previously unfit for most other agricultural developments.



Fig. 12
Olive orchards "greening up" the desert

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

In principle the traditional olive orchards of today are cultivated with about the same methods inherited from generations of historic and probable prehistoric times. However, the equipment used is modern and some basic approaches particularly related to fruit handling have changed during the last 60 years. The awareness of international oil quality standards and demand for low acidity oils in new markets changed the traditional long term family harvesting practice. Fruit accumulation in orchards in non-aerated containers or sacks before transferring to the oil mill and the "pleasant" waiting in line for the extraction of their oil has been eliminated in most villages and the fruits from almost all orchards are now processed within a maximum of two days after harvest. This change in attitude towards the end product caused a significant change in the traditional olive oil industry, although the basic cultivation methods have changed very little over the years. One of these changes relates to the plant material used in new non-traditional orchards. In the past, seedlings usually from easy, uniformly germinating species, were used as rootstock in almost all olive plantation. They produced semi-wild olives with with small fruit. These seedlings were planted, grown for some years until a rather strong high trunk developed, then grafted with the desired cultivar at a height of at least 1.30 m to prevent goats from reaching the canopy. In some cases, and particularly in earlier days, spheroblasts were cut out from the trunks and used for propagation causing considerable damage to the mother trees. Presently, most newly planted olive orchards, under traditional rain-fed cultivation, are based on nursery-grafted, 2-3 year old plants. Except for some difficult-to-root table olives, all cultivars for the modern intensive olive industry are propagated by semi hardwood cuttings under mist.

Influenced by the traditional rain-fed olive industry worldwide, irrigating olive trees devoted to oil production was “taboo” until the mid-twentieth century. This could be considered one of the major misconceptions of the traditional olive oil industry. Once this taboo was broken by Israeli studies showing the great potential of irrigation on olive fruit and oil production, a new era started for the olive industry in the country. The increased productivity of olive oil orchards had a major impact on the economy of the olive industry worldwide. Without the increased olive yields resulting from irrigation, coupled with plantation intensification and mechanical harvesting, Israel would have lost its olive oil industry due to high wages and lack of labor required for the manual harvesting in the traditional olive oil orchards. The traditional industry could not have survived in Israel, as an independent sector, unless based and partially carried by the new intensive economical industry. Modern integrated plant protection is applied in new plantations as well as in traditional orchards for improving fruit and oil quality, yields and tree health. New cultivars with resistance to diseases are emerging and the ‘Maalot’ cultivar resistant to peacock eye leaf disease is already commercially planted.

PROCESSING METHODS OF RAW OLIVES

The local ‘Souri’ cultivar has been used for both table olives and oil extraction; however, processing it for table was traditionally a home operation secondary to oil extraction. The annual amount for olives used for table was, and still, is dependent on yield. Only in “on” years, when there is enough production, the amount of olives used for pickling increases, while in “off” years it is low to cover oil needs having priority. Two methods of processing the ‘Souri’ olives are still used. Both are based on fermenting green olives in salt water. The first method is based on fermenting whole olives in salt water (9-11%), changing the salt solution 2-4 times during the process, usually over a period up to four months. During the last change of the salt solution, lemon slices, garlic and various other herbs are added according to personal taste. The processed olives are usually kept in brine covered with a thin layer of olive oil. The second method is similar; however the olives are cracked prior to the beginning of curing in brine. This process is quicker and requires less changes of the salt water. When this East Mediterranean method is used on industrial scale, the fruits are canned and undergo pasteurization.

The traditional oil mills in Israel were similar to those in most Mediterranean countries and underwent about the same stages of development (Fig. 13). Crushing the fruit and malaxation was done in a stone mill usually with the addition of some warm



Fig. 13
A reconstructed traditional mill at the Volcani Center of ARO, Bet- Dagan

water. The paste was placed on mats and hydraulically pressed. In the early days, the oil water mixture was left for separation in special containers (percolation) and since about 200 years ago it was separated by special centrifugal separators. A specific East Mediterranean method called *Shaluk*, developed at least 2,500 years ago, was based on boiling and drying the fruit before crushing in the stone mill. Another method was based on drying the fruit before crushing but without boiling. The oil produced by this method was called *Mansur Oil*. The extracted liquid phase consisted of pure oil without any water and did not need any further separation. This method was abandoned over the years but could still be seen in some remote villages. Recent analysis of such oil, showed that the process had only a minor impact on the acidity of the oil.

TRADITIONS AND CULTURE

The folkloristic stories related to the olive tree, fruit and oil in Israel are woven in the everyday lives of the population of all three major religions. A statue of three high columns with a growing olive tree on the top of each, representing the three



Fig. 14

A statue of peace overlooking Jerusalem. It represents the three monotheistic religions

monotheistic religions, was erected near Jerusalem overlooking the city (Fig. 14). The holy scripts originated in the land of Israel indicate the uniqueness of the olive and compare it to various aspects of life. Olive oil was one of the seven indicators describing the richness of the Holy Land. The olive has been and still is a symbol of hope, peace and glory since the biblical description of the olive branch brought back by the dove to Noah's ark after the

big flood. It was a symbol of prosperity and status in the old days and is still a symbol of stability, representing land ownership and agricultural fertility. In Jewish tradition stories of miracles related to olives abound, including one about a small jar of oil lasting for eight days of permanent light in the holy lamp of the Jerusalem temple. This is just one example of the endless miracle events woven in the local folklore and tradition related to the olive oil and olive tree. In the local folklore young children are often compared to young strong up-right olive plants, and beauty is compared to fresh colorful olive fruits rich with oil.

The old olive trees usually growing next to traditional olive mills are called *Rumi* (meaning old trees "from the roman times") served as the meeting point for the farmers while waiting for their olives to be pressed. Hot coffee, village gossip and endless versions of olive stories as well as business deals are part of the farmer's relaxations and village tradition. This habit continues in some villages where traditional oil mills are still operating to the present day. This tradition is partially

kept even today in the yards of the modern oil mills serving as the most important meeting point, particularly for the small-holder growers. The judicial system regarding the olive tree was also unique with respect to hereditary rights. Until a hundred years ago allowed the land and the olive tree grown on it could be owned by different persons. In modern times such unique situations were eliminated and the “stories” about olive oil became more rational, although legends about some magic properties and characters of olive oil are still in the air.

CULINARY USES OF TABLE OLIVES AND OLIVE OIL

Both table olives and olive oil are widely used in the Israeli diet. However, it is hard to point out original Israeli recipes which originated in the country, and are accepted as such. On the other hand, the Israeli salad containing tomato, cucumber, bell pepper, and frequently green olives is always richly seasoned with extra virgin olive oil. This type of salad could be considered a typical Israeli breakfast dish. All sorts of olives; be it green, naturally ripened black or dark blackened are widely used in decoration of plates in hotels and restaurants. De-stoned olives cooked in tomato sauce are often served with meat or as a separate dish. Generally, different types of green and black processed olives are part of nearly every Israeli breakfast and most cold dinners. A rather unique dish, which became rather popular, is a white soft cheese with shredded green olives. Finally, a major and typical use of green table olives is its serving with other preserved pickles as a standard dish with *Humus* (a chick-pea mash) and with *Tahina* (a sesame seed sauce) highly popular in Israel. These two dishes are also high consumers of olive oil; the *Tahina* is made with olive oil and the *Humus* is always served with an olive oil topping. These two dishes are among the most typical and popular food dishes in Israel. It is hard to identify specific typical Israeli recipes in relation to olive oil, as olive oil is presently widely used in all foods requiring oil. Various dishes of minced eggplants prepared with oregano, *Tahina* and olive oil might be considered typical Israeli.

POPULAR MEDICINAL AND COSMETIC USES

The use of olive products for medicinal and cosmetics purposes were developed hand in hand with culinary and energy uses from the time of olive domestication to the present era, becoming important push in modern times due to the development of biochemical and medical research. Historically, all parts of the olive tree and fruit were used both for therapeutic and ritual purposes in all Mediterranean cultures. In the traditional and religious scripts the different uses of olive products were widely described. Some of its uses are:

- Olive oil has been always widely used and was considered to cure nearly every internal disorder, heal wounds, prevent hair drop, protects the skin and cures all external skin irritations.
- Boiled olive shoots were used for cleaning of wounds and reduction of pain.
- Heated olive stones were historically applied to reduce toothache.



- Juice of olive leaves was used to reduce pain, calm neural breakdowns and treat madness, or so believed.
- Presently the main use of olive leaves is in reduction of blood pressure via a brew of dried leaves.

OLIVES AND TOURISM

The traditional olive industry has a major effect on the national agro-tourism particularly during harvest and oil extraction. An annual olive festival was established at harvest time in all villages with traditional food and handicrafts related to the olive culture (Fig. 15). Lectures on the value of the olive trees to the environment, the involvement of olive oil in health and the long history of this crop in western civilization are also part of the activities. Visits of families, school classes, as well as professional excursions and symposia take place during the festival.



Fig. 15
Olive Festival in a village

OLIVE WOOD AND BY-PRODUCTS USES

Various by-products of the olive industry developed as a must to reduce pollution of the oil mill waste. The wood of old olive trees gave rise to an important handicraft industry in Israel (Fig. 16). Most of the products of this industry are of a religious nature or symbols indicating the Holy Land, aimed mainly at souvenirs for tourists. In addition to the religious symbols the most common and representative handcraft are camels of different shapes and sizes. Many other small decorative items made of olive wood can be found in the markets, mainly around the holy places. Large pieces of olive wood are occasionally used to create special and distinguished art works.



Fig. 16
A pipe-stand from olive wood

Pruned branches when available are frequently used for making charcoal to be used for barbecuing. Some dried olive pomace is pressed into cylinders and small bricks also used for barbecuing or fire place heating. Most of the vegetable water is used mainly in intensive olive orchards as a minute supplement to the irrigation schedule (about 80 m³/ha/year). This rational application was found un-harmful to the soil, and even beneficial for the development of some crops such as corn, grapevines and the productivity of the olives themselves. Another part of the vegetable water, leaves, shredded pruning wood and oil mill pomace with the addition straw, are used as the basic material for a good compost to be reused in the olive orchard.



Enzo Perri¹ enzo.perri@entecra.it,

Innocenzo Muzzalupo¹, Cinzia Benincasa¹, Damiano Avanzato²

¹CRA-OLI, Olive Growing and Olive Oil Industry Research Center

C.da Li Rocchi, 87036, Rende (CS)

²ISHS Chair Section Nuts and Climate Mediterranean Fruits, Rome



INTRODUCTION

Italy (Fig. 1) is located in Southern Europe, to the north of the central



Mediterranean Sea, stretching in longitude from 5° to 18° E and in latitude from 35° to 47° N. To the north the Italian Peninsula is limited by the Alps, whereas to the west, south and east the Mediterranean Sea forms the natural border. The largest Italian islands of Sicily and Sardinia are located to the south-west and west, respectively. The climate is predominantly Mediterranean, characterized by hot and dry summers and mild, humid winters. Average summer temperatures reach 26° C, while in winter, usually do not fall under 5° C, so that throughout the year, medium temperatures are around 15° C. However, sometimes low temperatures below 0° C can occur and olive trees might be damaged, like in 1985 when a heavy frost

killed trees on 10,000 ha in North and Central Italy. Precipitation occurs mainly from autumn to early spring, with a medium annual rate of about 650 mm.

The total land area of Italy is 301,336 km² (slightly over 30 million ha), less than one third of which consists of plains, while mountains and hills characterize the rest of the territory. The heterogeneous topography, in combination with the climatically manifold conditions, leads to the formation of many different microclimates. Of the total area, 13,213 million ha are arable land, 4,548 million ha forests, and 3,414 million ha are semi-natural areas and pastures. Olive is the main tree crop (1,212 million ha), followed by vines (836,000 ha), fruits (500,000 ha), and citrus (154,000 ha), while the row crops cover a total area of 1,554 million ha (National Statistical Service of Italy - ISTAT, 2000).

OLIVE CULTIVATION HISTORY

It is well known that the olive tree (*Olea europaea* L.) is one of the oldest cultivated plants, and its fruit has been used for more than 5000 years in the



Fig. 2
The *doli* displayed in Museum
of Archaeology in Sibari (CS)

Mediterranean region where it probably had originated. The olive in Italy can be traced back to the Bronze Age. In fact, as early as 1500 BC the Oenotrians⁷ in Calabria region harvested olives and traded in its oil. In the Broglio archeological site, near Cosenza excavations by Peroni and his team unearthed five *doli* (large amphora) from the Late Bronze Age. The *doli* were found in a storeroom, adjacent to a large building, probably a house. This room had a rectangular layout with walls plastered with fire-baked clay. The *doli* were overturned,

possibly following the abandonment of the room, and were not positioned directly on the floor but rather on a layer of a black, greasy substance, probably formed from olive oil residue when the room was in use. The *doli* now conserved in the Museum of Archaeology in Sibari, Cosenza (Fig. 2), is evidence of the production and likely trade of olive oil in Calabria from as early as the Bronze Age, at least five centuries prior to the foundation of Sibari and the long period of Greek colonization (Fig. 3). This suggests that whether wild or cultivated, the olive tree was certainly well-known and appreciated for its fruit and oil. The Broglio remains indicate that it was not introduced by the Greeks, but was already an integral part of the peninsula's flora 3,500 years ago. According to this theory, olive-growing spread in the Calabria region, on the Ionian coast where large settlements in Sibari (708 BC), Croton (708 BC) and Locri (673 BC) flourished. Within the same region, much evidence confirms olive cultivation in Locri, including archaeological finds, engravings, research into the Hellenic diet, and quotations regarding athletes using olive oil to tone muscles and aesthetically enhance the body. Moreover, the main temple in Locri was dedicated to whom the olive tree was consecrated.



Fig. 3
A Greek temple overlooking
an ancient olive tree in Sicily

According to Peroni (1994) intensive olive oil production emerged from the late Bronze Age (ca. 1150-1000 BC) onwards. He stated that overseas Greek contacts

⁷ The Oenotrians ("tribe led by Oenotrus" or "people from the land of vines - Οἰνωτρία") were an ancient Italic people of unknown origin who inhabited a territory from Paestum to southern Calabria in southern Italy. By the sixth century BC, the Oenotrians had been absorbed with other Italic tribes.

lead to the emergence of olive cultivation and a stratified society, in which time and means enabled “rich” farmers to grow olive trees.

An early citation by the Roman Empire writer Lucius Columella (Gades, AD 4-Taranto, ca. AD 70), in his twelve volume book *De re rustica*, speaks of the Calabria region and counts “la Calabrica” amongst the ten olive varieties known at that time, considering it similar to *Oleaster*, the wild olive.

Later on, much of the olive heritage is owed to the Basilian monks whose influence was greatly felt from the 8th to 11th century. Afterwards, from the 12th to the 15th century, it was credited to the Latin monastic orders (Benedictine, Cistercian, Florentian and finally Franciscan), who systemically cultivated olive trees, and were responsible for its dissemination during the uncertain times following the fall of the



Fig. 4
The superb specimen olive trees
in Gioia Tauro (Calabria)

Roman Empire. On the hills and in the interior areas of the southern regions of Calabria, Basilicata, Apulia, Campania, Sardinia and Sicily, the cultivation of the olive found exceptionally favorable conditions for its spread, accompanied by adequate technology for oil extraction. The importance of olive growing in the agricultural history of southern regions of Italy is witnessed by numerous old giant trees, some of which reach to well over twenty meters (Fig. 4), which are still in production.

AREA UNDER OLIVE CULTIVATION

With respect to the orography Italian olive production is located 62% on hills, 27% on plains and 11% in mountainous areas, while in terms of geographic distribution olive growing consists of 2% in the north (mainly in Toscana and Umbria), 19% in the center (mainly in Latium and Abruzzo) and 79% in the southern regions (37% in Apulia, 33% in Calabria, and 8% in Sicily). Several olive areas are classified as Protected Designation of Origin (PDO) or Protected Geographical Indication (IGP) and, in fact, Italy ranks first at European level with 39 PDOs and one IGP, together equal to 43% of the total certified olive oils.

Two major features dominate the scenery of the Italian olive growing area: the difficult topographical conditions (amounting to 30% of total area) and the land farming fragmentation. Near 77% of olive farms are growing less than 250 trees, approximately 12% have 250 to 500 trees and just 1.3% count more than 1,000 trees. The last group represents 25% on total oil production.



OLIVE CULTIVARS

Italy is one of the richest countries with autochthonous olive cultivars exceeding 600, most of them introduced in the germplasm collection of CRA-OLI in Cosenza, however out of this large number the main cultivars are the oil producing 'Canino', 'Cellina di Nardò', 'Cerasuola', 'Coratina', 'Dritta', 'Frantoio', 'Grossa di Gerace', 'Moraiolo', 'Ortice', 'Ogliarola Barese', 'Ottobratica', 'Sinopolese' and 'Tondina'. 'Bella di Cerignola', 'Ascolana tenera' and 'Sant'Agostino' are cultivated exclusively for table consumption. Main cultivars used for dual purpose production are 'Bosana', 'Carolea', 'Dolce di Rossano', 'Itrana', 'Leccino', 'Nocellara del Belice', 'Nocellara Etnea', 'Ogliarola Messinese', 'Ogliarola Salentina', 'Taggiasca' and 'Tonda Iblea'. The main characteristics of some of the cultivars are given below:

'Carolea' (Fig. 5) is a PDO cultivar characterized by a medium-large fruit size (5-7 g), early ripening (around late September) with medium oil yield (19-23%). In general it is characterized by a medium oleic acid content of 72-74% and medium-low phenol content. Suitable for processing by brine and lye treatment and the olives can be pitted and crushed. The taste is fruity with slight bitterness only when olives are collected green.

'Coratina' (Fig. 6), another PDO cultivar with fruit of 5-6 g. Ripens mid to late season, around November-December. The tree has an expansive crown tending towards a globular shape and has long flexible branches. It usually produces an oil yield of 21-23% with high phenols content (500-600 mg/kg), giving it a long shelf life. It is characterized by a high oleic acid content of 75-80%.

'Frantoio' (Fig. 7), also a PDO cultivar with small-medium fruit size (2-4 g), is widely used in Italy for oil production. Oil yield is around 18 to 19% with medium phenol content, thus a medium shelf life. It is characterized by medium-high oleic acid percentage of 76-78 %.

'Ogliarola Salentina' (Fig. 8), also used in PDO, has small fruit size (1-2 g), it ripens early to midseason, around October-November. Late harvest should be avoided because of relatively soft flesh, sensitive skin and oil being poor in phenols. It is characterized by a medium oil yield of 18-19 %, and with medium oleic acid percentage of 70-72 %.



Fig. 5
'Carolea'



Fig. 6
'Coratina'



Fig. 7
'Frantoio'



Fig. 8
'Ogliarola Salentina'

IMPACT ON ECONOMY AND ENVIRONMENT

Despite ranking second in world olive oil production, Italy is insufficiently supplied due to its high internal consumption, and for the huge amount of oil exported. The average annual olive oil production during the period 2005-2009, ranged from 520 to 656 thousand tons extracted from about 3 or 3.5 million tons of olives. The basic product value is estimated at 1,515 million Euros, however when it comes out of the olive value-added chain after processing, storage and packing it reaches 3,690 million Euros.

In 2008-2009 there were 4,973 working olive mills, nearly 70% located in southern areas with 735 mills equipped with small bottling lines. In Italy, small to medium sized businesses (which represent the majority) have oil bottling facilities. Also, there are large-scale commercial operators which acquire olive oil from different sources to make a blend, then market consumers' packages.

The Italian olive sector provides livelihood for approximately one million persons, involved in growing, management and maintenance of olive trees. Three-phase olive processing is the most widely used in intensive production areas for oil extraction. This system produces an aqueous effluent, "vegetation water" and a solid residue, mainly containing the olive skin and crushed stones called "pomace cake". The effluent contains high levels of phenols, plant nutrients, organic compounds, and inorganic salts, which can adversely impact soil and water quality. The average olive mill wastewater (OMW) production is about 2.5 liters/liter of oil extracted, with an annual total of 1.36 million m³ (2007/2008 data). To reduce the polluting impact, the Italian government approved spreading of OMW on cultivated lands in accordance with the quantities designated by laws 574/96 and 152/2006. On the other hand, OMW is also used for compost production, animal fodder and nutraceutical products. Alternative utilization of by-products is also possible, through anaerobic fermentation or digestion of OMW in mixed bioreactor, applied for liquid manure, to produce biogas.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

In general, due to the high production costs orchard management isn't regularly performed annually. Therefore, some growers have inherited the erroneous practice of skipping pruning operations, resulting in trees reaching unmanageable heights, and causing defoliation to lower canopy parts as a result of reduced light penetration. It also promotes disease attacks, like those occurring in some southern areas of Italy, where giant trees are often affected by anthracnose (*Colletotrichum gloeosporioides*).

In the South of Italy some olive growers do not relate harvesting to fruit physiological stages, preferring to delay harvesting in the belief that the oil yield will increase. Furthermore they do not harvest artificially by hand picking or by using harvesting tools but they rather rely on the natural fall phenomenon of the fruits



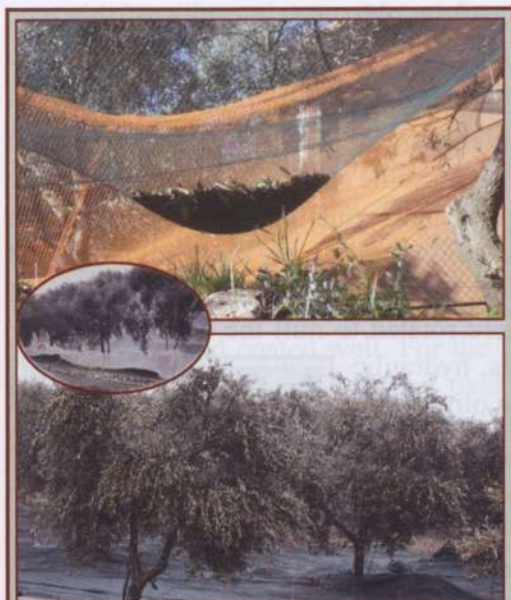


Fig. 9

Nets for harvesting naturally falling fruits
Top: Hanged nets tied to trees trunks,
Middle: Nets slightly off the ground
supported by wooden poles
Bottom: Nets directly spread on orchard floor



Fig. 10

Spraying kaolin, a mechanical barrier
protecting fruits from insect attacks

when over-ripe which degrades the oil quality extracted from such fruits. To catch the naturally falling fruits, growers spread large nets on the orchard floor underneath the trees or sometimes they hang these nets stretched between the trees to avoid soil contamination (Fig. 9). Other than over-ripe fruits, another disadvantage of this harvesting method is that the olives can be left on the nets for days until collected which all in all negatively affects oil quality. Another habitual erroneous practice is collecting fallen olives, mixing them with fruits harvested from the trees and transporting in plastic bags to the mill. The mixing itself affects the quality of oil, but it gets worse in case of long delays in milling the olives. Most olive orchards in Italy are located on hilly soils, easily exposed to erosion processes due to the erroneous habit of mechanical soil tillage. In recent years, sustainable and organic agricultural principles are being adopted, like soil vegetative coverage with advantages in orchard cost management, reduction of soil erosion and improvement of soil texture and fertility.

Recently, a good practice seems to be the canopy sprays with kaolin (Fig. 10) which reduce fruit damage by the olive fly (*Bactrocera oleae*) without any negative impact on the environmental or on oil quality. Kaolin spraying is recommended only in areas characterized by low rainfall between late August and the harvest time.

PROCESSING METHODS OF RAW OLIVES

Nowadays, in Italy the olives are processed in modern fully automated mills. In the past and for several centuries olive oil extraction was solely done using stone mills. Stone mills were established in Magna Graecia colonies, like those in

Selinunte on the south coast of Sicily. Most of the old surviving mills of this type dates back to Roman age.

In the past some Italian olive mills were *hypogean*, meaning they are located in an underground room. The old *hypogean* mills are located mainly in Apulia regions where the karstic phenomenon takes place creating some caves (hypogean karstism). In Apulia the calcium carbonate nature of the land formation allows natural cave formation by water or artificially by man's action and these caves provided good environment for containing olive mills. These mills consisted of vertical standing rollers or wheels made of granite, which were rotated to mill the olives into olive paste by using the force of domestic animals, hydraulic power or even sometimes by hand. Then the olive paste was pressed slowly to extract the olive oil.

These traditional methods, which have witnessed very little development over centuries, are known as “discontinuous” systems. This name came from their stop-and-start nature that results in individual batches of oil, rather than a continuous flow. Traditional methods begin with olives being cleared of any leaves or twigs, then washed in water and dried prior to being milled into a smooth paste. That olive paste was then spread out on natural fiber mats which were stacked, sometimes up to 50 layers high, in a vertical press to extract the virgin olive oil (Fig. 11). The mats were pressed together, using relatively little pressure, to squeeze out the oily liquid which contained a mixture of oil and water. This liquid was later left to decant, as the oil floats to the top due to density differences. The whole process is shown in figure 12.

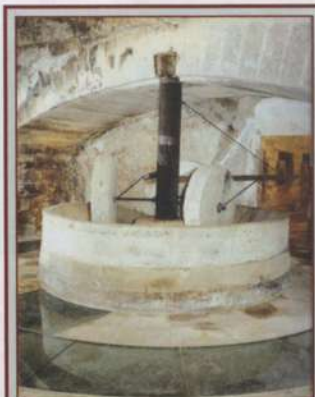


Fig. 11

An old hypogean olive mill from Apulia

(Source: Ricci A., a cura di, *Olio. Tre millenni di olive in Italia*, Bolis edition, 2008)



Fig. 12

The process flow of old “discontinuous” olive extraction method in Italy

First left: Olives being cleared of any leaves or twigs and stored in wood boxes before crushing

Second left: The first olive mill with vertical wheels made of granite, electrically operated

Third left: The first olive vertical press operated hydraulically by using electric power

Last right: The mixture of oil and water is left to decant inside big vessels

The preparation of table olives in Italy has so many different old methods, some of which are still practiced nowadays. A few of these methods is described below:

Olives in ash (Fig. 13): This is an old and environmentally friendly process loved by grandparents which is based on placing the olives in wood. The process entails the use of new and clean wood ash of a weight equal to that of the olives to be prepared. The olives should be freshly picked, clean and undamaged. A liquid paste is prepared by pouring boiling water on the ash, which is then covered and allowed to cool completely. The olives are mixed carefully with the ash paste so that they are fully covered and coated well. For the following 5-7 days the olives are gently turned over once a day. Towards the end of the week, several olives are cut lengthwise. Once the ash process is completed, when the fruit has darkened to about one mm from the stone, the olives are rinsed to remove the ash and submerged in clean water. It should be changed every 4-6 hours for the first day, then daily for 3-4 more days. This process is finished when the released water remains clear. The olives are then preserved in sterile jar in a saline solution as in the usual recipes, adding aromatic herbs, garlic, lemon pieces to taste. A layer of nearly five mm extra virgin olive oil may be added to cover the olives.



Fig. 13
Olives in ash

Maiatica of Ferrandina's: Another traditional and unique table olive processing method which is based on oven-drying the fruits. Normally marketing of the end product is done by the processing company and/or through large and small retailers. The process is somewhat time consuming and very selective with the following procedures:

- Olive harvesting: it can be done by hand picking, by combs or mechanical shakers receiving the olives on nets. The beginning of the harvesting often coincides with the first half of December and the oven-dried product is ready to be sold at Christmas time. But the bulk of the work comes in January, February and even sometimes in March, when higher quantities of fully pigmented olives are available on trees.
- Color grading: the harvested olives are graded for color since only uniform black ones will be selected and they should also be of large size within a range of 16-18 mm. This selection process can be done manually or mechanically.
- Washing and scalding: after selection, the olives are washed with cold water and then scalded in hot water at 90° C for about 1-3 minutes until separation of the stone is achieved.
- Brine process: washed olives are placed in alternate layers with salt (in 1:10 ratio) in perforated crates that can contain about 300 kg equipped with a drain. Olives are kept in the salt for 2-3 days, during which the olives lose much of their water (14-18%), resulting in softening.
- Drying process: the olives are transferred into stacked wooden trays equipped with a mesh bottom and placed in a drying cabinet where forced air circulates for

about 36-48 hour at 45° C. The duration varies in relation to the size and moisture content of the fruit; at this stage, the olives reach 12-15% moisture.

➤ Recovery phase: the olives are kept in wooden trays for 24 hours at room temperature.

➤ Second selection: once the foregoing two steps are completed, the olives are manually selected in order to eliminate those that may be damaged during the previous operations.

➤ Packaging: the olives are packed in polyolefin laminated bags having a size between 0.5 and 1.0 kg.

Castelvetro's method: It takes the name from the Sicilian city where it is used only with 'Nocellara del Belice' fruit. The product is mainly consumed in central and southern Italy. Once the olives arrive for processing, they are graded, selecting only fruits of more than 19 mm in diameter. The selected olives are put into plastic drums and covered with 1.8-2.5% NaOH solution, depending on the fruit ripeness and size. These drums are filled with about 140 kg of fruits each. One hour after the lye treatment begins 5–8 kg of salt is added to each container, and the olives are kept in this alkaline brine for 10–15 days. A mild washing step, carried out before marketing, does not totally eliminate the soda, whose taste is appreciated by the consumers of these olives.

OLIVES IN NATIONAL FOLKLORE

The importance of olive and olive oil to Italians is evidenced by the emblem of the Italian Republic itself. Since 1948 it contains olive branches (Fig. 14, left) symbolizing the desire for peace, harmony and brotherhood for the entire nation.



Fig. 14

Left: The emblem of the Italian Republic, since 1948, contains, among the distinctive elements, the olive branches

Right: The old one hundred Italian lire with Goddess Minerva holding an olive tree

Moreover, the old one-hundred lire coin depicts on the reverse side the image of the Roman Goddess Minerva (Athena in Greek mythology) holding an olive tree facing left. Minerva is the Roman goddess of wisdom, medicine, arts, science and trade,

but also of war (Fig. 14, right).

Since ancient times, people living in Italy have venerated the olive tree as one of the most important plants. The ancient Greeks from the Italian colonies and Romans both told tales of olives and their creation by the Gods, and subsequent cultivation by humans. Greeks from Magna Graecia attributed the creation of olive

tree to the goddess Athena, while Roman mythology ascribes the birth of olives to Hercules, who struck the ground and caused an olive tree to sprout. At the Ancient Olympic Games, the athletes sprinkled their bodies with oil from Italian colonies and the winners were presented with an olive tree branch which was cut with a gold-handled knife from a wild olive tree. The belief was that the vitality of the sacred tree was transmitted to the recipient through the branch. Columella, the most important writer on agriculture of the Roman Empire wrote that *olea prima omnium arborum est*, meaning the olive tree is the first of all trees. This was mentioned in his twelve volumes compendium entitled *De Re Rustica*, which has been completely preserved and forms an important source on Roman Empire agriculture. All the ancient literature ascribes primacy to the olive.

Health benefits of olive oil have been widely recognized in Mediterranean countries for centuries. Doctors, like the Greek Hippocrates and Pedanius Dioscoride, were the first to highlight the beneficial effects of olive oil. However, Galeno, who lived in the 2nd century AD at Marco Aurelius court, was the first to write a book on medical remedies, in which olive oil was the main ingredient for many preparations. However, it is mainly in the Middle Ages that the olive tree and its oil had unanimous approval.

The constant work of the Catholic Church and its influence in the population cultures, makes preserved, still nowadays in Italy, the olive and olive oil importance in social and religious life. In fact, it still happens to find in Catholic churches the "oil lamp" lit near the tabernacle to indicate the presence of the Holy Sacrament. In families where religious traditions are still preserved, the use of preparing oil lamps to be lit in special occasions (deceased's week, saint's day or in case of strong storm) is still practiced. Even a simple anointing with blessed oil is still carried out on religious people in many shrines and places of worship. In Christianity the olive oil has kept an important value in symbology. Each year, a "Chrism Mass" is celebrated and during the ceremony the blessing of olive oil is performed. This oil will be used along the year for the celebration of the sacraments or particular rites. Different names and meanings are given to the oil according to the liturgical use and sacrament, but always in reference to biblical or evangelical indications as following:

- Oil of catechumens: during the Baptism rite, before pouring the water on the catechumen, the anointing of the catechumen itself is expected in order to free him from the bondage of original sin and domination by evil and sin.
- Oil of the sick: the seventh Sacrament, requiring anointment of the sick with blessed oil, is based on the text of the letter of James (5:13-16) and is a practice in the early Church.
- Sacred Chrism (olive oil mixed with balm); a sign of consecration. This special anointing is related to the dignity of the person or the object being anointed. In the Baptism rite, this oil on the neophyte's forehead signifies the gift of the Spirit and



incorporation into Christ in the Church.

➤ Confirmation: the anointing on the forehead indicates the seal *sfraghis*, the confirmation and the commitment to testify to faith in God. In the Order Sacrament, the bishop, after the prayers of ordination, anoints with the chrism the palms of the new priests. In the Ordination of the bishop, the chrism is poured on his head. The use of the chrism is also provided to consecrate new churches. Finally, every year on Palm Sunday, many Catholics participate to



Fig. 15
The Palm Sunday procession with olive branches

the Eucharist, bringing olive branches to be blessed (Fig. 15). These olive branches are then stored at homes for a blessing all year. In the Western World the olive and olive oil are always present as companions throughout life.

Proverbs are popularly defined as short expressions of popular wisdom. The wisdom is in the form of a general observation about the world or a bit of advice, sometimes more nearly an attitude toward a situation. Below some proverbs that use olive and olive oil as a metaphor:

- "Don't call me a little olive until you have picked me."
- "Hold out the olive branch", to indicate making your own business.
- "In the olive orchard, a wise man at the feet and a wild man at the head".
- "The olive orchard of your grandfather, the cherry trees of your father, and your grape vines."
- "The olive dangles more than fruits", to give an estimate on the future harvest.
- "It looks like you bring the oil to the dead", to indicate a depressed or tired person."
- "You are sincere like a three year old bottle of oil", to indicate a person who is not honest."
- "When donuts are fried, only wine should be drunk". In fact, the more water is drunk the more oil is used to fry them, popular Christmas said against the abuse of the oil.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olives were consumed since ancient time, but modern researchers, highlighting the low level of saturated fatty acids, have made olive products more popular as a healthy and tasty alternative to other oils. Stoned or stuffed, green and/or black olives are used alone as an appetizer and as a flavouring and ingredient in dishes. Other traditional recipes are based on green and black olive paste.

Virgin and extra virgin olive oils are normally used for cooking; however they are appropriate for all other uses in food preparation, therefore widely used throughout the Italian peninsula. Its consumption is deeply rooted in Italian cooking where 90% of households use it. The per capita consumption is estimated

at 12.5 liters/year. Excellent when consumed raw to best appreciate its aroma and flavor and to benefit fully from all its natural components, extra virgin olive oil is a very important component of the Italian diet.

The following first few recipes are for traditional spreads in the Calabria region and considered a prototype of the Mediterranean diet. In fact, the way of preparing foods is simple, genuine and healthy, but also characterized by strong flavors. Recipes for using olive oil follow those for the spreads.

➤ **Crushed olives, olive ammaccate** (Fig. 16, left) constitute one of the most famous Calabrian dishes. Juiciest olives of 'Carolea' are harvested, crushed by hand with a stone in a mortar, seasoned and flavored with olive oil, oregano, fennel seeds, garlic and chili pepper.

➤ **Green and black olive paste, Tartine** (Fig. 16, right):

Ingredients: ¼ cup pitted table olives or other green or black olives, rinsed, drained well; 1 tablespoon drained capers; 1 large minced garlic clove, 1 teaspoon fresh lemon juice; ¼ cup extra-virgin olive oil.

Method: Combine olives, capers and garlic in processor and chop finely. With motor running, gradually add lemon juice and oil and process until blended. Serve with crackers and toasted bread slices.

➤ **Rabbit with black olives** is also a popular dish, especially in the Calabria region.

Method: Cut a rabbit in small portions and lay it in a pot in which a tea cup of olive oil has been already poured. Cut two onions and two garlic cloves in thin pieces. Add the olive over the meat. Add two ripe tomatoes thinly cut, a large cup of red wine and cook until it absorbs the liquids.

➤ **Swordfish alsalmoriglio** (for 4 servings). Simple preparation method which entails pouring 40 g of extra virgin olive oil in a bowl. Juice from two lemons is added with some oregano and salt and pepper to taste. Pitch with a fork to obtain a homogeneous sauce. Salt the swordfish slices and grill them; then put them on a dish and sprinkle them with the sauce. Serve immediately.

➤ **Pizza with olive and olive oil** (Fig. 17):

Ingredients for Pizza base: 500 g of plain flour, 1½ teaspoon of sugar, 2 teaspoons of dried yeast, ¾ teaspoons of salt, 300 ml water 1¼ and tablespoon of olive oil. Salt: 0.5% added by weight and not in other ingredients.



Fig. 16

Left: Crushed olives on bread, extra virgin olive oil and tomatoes, Right: Tartine with green olive, black olive, tuna and chili pepper

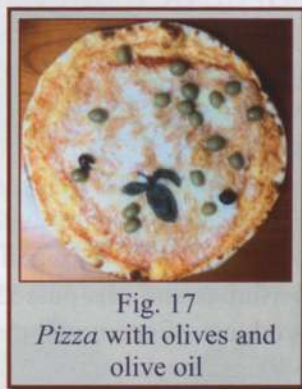


Fig. 17

Pizza with olives and olive oil

Method: Dissolve the dried yeast and sugar in a bit of lukewarm water and stir well. Let the yeast set for 20 minutes. Put your flour in a bowl, sift the flour, add olive oil and salt, and then the yeast and the rest of the water. Knead well, this takes 10 to 15 minutes. Then let the dough set for 2 hours in a warm location or cover the bowl with a towel. Knead again. You can either roll out the dough or pat it on to your pizza dish or baking tray. If you can fling it into the air and turn it the crust is ready to use.

Pizzaiola. Ingredients: 400 g of chopped tomatoes, 1 medium size onion, $2\frac{3}{4}$ cloves fresh garlic of medium size, $\frac{3}{4}$ teaspoons salt, $1\frac{1}{2}$ teaspoons of fresh basil, $1\frac{1}{4}$ tablespoon of dried oregano, $\frac{1}{2}$ teaspoon of ground black pepper; $2\frac{3}{4}$ tablespoons of extra virgin olive oil. Salt 0.5% by weight, not to be added in other ingredients.

Method: Chop the onions and garlic and fry them in olive oil until translucent. Then add the spices and tomatoes. Let it simmer for half an hour to reduce the water content, then take a blender to it and let it cool down. Spread the *pizzaiola* on your *pizza* base; best done by putting a blob into the middle and then moving the pan quickly back and forth, or just use a tablespoon to spread it. Bake your *pizza* in the oven at 350° C. During the baking, put on your cheese or *mozzarella*. Finally, add some black or green olives.

Pastas: always present on Italian tables even served with a simple fresh tomato sauce, basil and extra virgin olive oil. One traditional recipe prepared in Calabria for religious festivities or special days is the *pasta chijna* (full pasta) based on layers of homemade pasta *lasagne* topped with small fried meatballs, slices of hard-boiled eggs, slices of spicy *salami*, *caciocavallo* cheese and grated *pecorino* cheese. Olive oil is always present as a condiment to spice and give extra flavor to the baked dish.

POPULAR MEDICINAL AND COSMETIC USES

The ancient Greeks and Magna Graecia people used to bathe with oil, using a special scraper to take off the excess. In ancient times, cosmetics, hygiene and health were very closely related. In fact, the Roman Galen (second century AD), who was considered the father of medicine, included in some of his water based medical treatments for skin cleansing, ash and animal or vegetable oils such extra virgin olive oil. Galen is credited with the invention of the first body lotion based on virgin olive oil mixed with wax and water. The art of manufacturing cosmetic substances like perfumes and oils passed from Egypt to Greece, where it was perfected. The largest producer of cosmetology centers were in Greece. The Greeks and the Romans spent a long time in public baths and would then rub their bodies with oils such as virgin olive oil in order to hydrate the skin and prevent irritations. Also, when playing sports or doing physical exercise, they would cover their bodies in olive oils to maintain body temperature and protect the body from scrapes.

At present, cosmetics are well advanced in Italy and new compounds are still being discovered. Virgin olive oil has moved from our dining room tables to become a first class cosmetic product. Numerous studies and investigations have



demonstrated the useful applications that therapy and cosmetics have. Therefore, the cosmetic use of olive oil is on the increase and the beauty industry have launched dozens of creams, lotions and ointments whose main active ingredient is olive oil.

OLIVE AND TOURISTIC ACTIVITIES

Many olive trees in the groves around the Mediterranean are said to be several centuries old, and in some cases this has been verified scientifically. Pliny the Older told of a sacred Greek olive tree that was 1,600 years old. In Italy, the first olive orchard was probably cultivated in the south around 1,000 BC. Shortly after, the Romans began bringing the practice of olive tree cultivation to the rest of Italy giving oil an important commercial value for trading.

Some Italian olive specimen trees are believed to date back to Roman times, such as the “Olive tree of Magliano” in Tuscany which is estimated to be more than 3,000 years old. In Montebenichi, Tuscany a tree is dated before the Medici’s time. According to different studies in Santu Baltolu di Carana (Sardinia), a tree is claimed to be 3,000 to 4,000 years old. Olive groves are the most characteristic attractions of Sabina area (Latium region) where a giant tree 1,500 years old lives. In Calabria the oldest tree seems to live in Cosenza and is called *Utatarano* (the grandparent of olive trees) (Fig. 18). These magnificent olive trees (Fig. 19), wherever they grow in Italy, have never been beyond the reach of visitors and tourists because in their soundings people escape to a land full of history, fragrant breezes and sunsets so vivid that all hues are extreme. Nowadays agro-tourism is a flourishing business all around the world with the increased awareness of natural life and the



Fig. 18
The first author and Mohamed El-Kholy standing by the *Utatarano* (Grand parent of olive trees)



Fig. 19
The Italian, giant old olive trees, have been always a distention without competitors

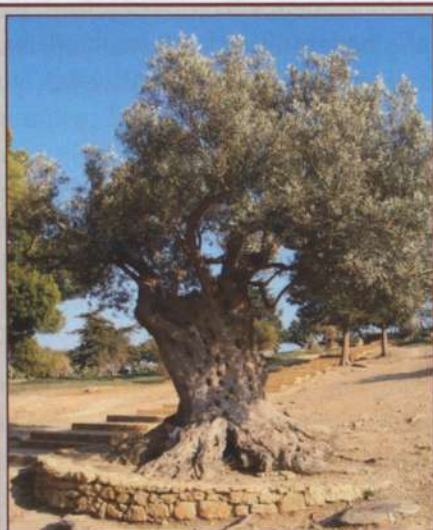


Fig. 20

The ancient olive tree on the acropolis of Akragas in the Valley of Temples (Agrigento, Italy)



Fig. 21

19th MedOliva International Exhibition

extreme complications of urban life. Italy, with its old olive trees, is no exception and these trees are now than ever becoming an attractive destination for tourists and a good source of income to their owners, who have established guest houses and restaurants to serve the increasing numbers of visitors. In Sicily many old specimens are growing on the acropolis of the ancient Akragas⁸, in the Valley of the Temples (Fig. 20).

Olive tree museums are very important touristic attractions. The main olive museums are located in Imperia, Trevi (Perúgia) and Torgiano (Perúgia). A new fashion is the touristic and agriculture sites where people enjoy panoramic itineraries and gastronomic dishes, several of them consisting of olive products.

In Italy, there are several important exhibitions and awards for extra virgin olive oil. The most important among so many are SOL: International Exhibition of Quality Extra Virgin Olive Oil in Verona; Enolitech: International Exhibition Technologies for Viticulture, Oenology and of Technologies for Olive Growing and Olive Oil Production in Verona; MedOliva: International Exhibition in Arezzo (Fig. 21).

OLIVE WOOD AND BY-PRODUCTS USES

Among the many qualities and resources that are represented by the olive tree, a substantial part is made from wood and whose work is known from time immemorial. Olive wood is used for furniture, floors, and doors and in a wide range of handicraft products. Statues, chalices, pastoral, crucifixes, monstrance and icons are examples of sacred art objects. Cutlery and kitchen utensils, cutting boards, dishes and bowls, cups, forks, spoons and colanders are quite useful and frequent

⁸ Is a city on the southern coast of Sicily, capital of the province of Agrigento. It is renowned as the site of the ancient Greek city of Akragas (also known as Acragas (Ἀκράγας) in Greek, Agrigentum in Latin and Kirkent or Jirjent in Arabic), one of the leading cities of Magna Graecia during the golden age of Ancient Greece.



items in the kitchen. Chess-board and inlay are also frequently made of olive wood (Fig. 22).

Very recently, low cost natural phenols extracts, such as 3,4-dihydroxyphenyl ethanol and 3,4-dihydroxyphenyl acetic acid, are produced from olive mill wastewater and/or olive pomace for use as alternatives to Butylatedhydroxyanisole (BHA) and Butylatedhydroxytoluene (BHT). Pomace from olive mills is used as a mixture in animals' fodders to improve milk quality. The most common use of pomace, mixed with olive mill wastewaters, olive leaves and olive pruning material is the production of compost, which is used mainly in olive orchards for soil amendment. The olive stone and seed are an important byproduct generated in the olive oil extraction and pitted table olive industries. The main use of this biomass is as fuel to produce electric energy or heat.



Fig. 22
Artistic inlay of olive wood among different wood types

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Shinji Takeuchi¹ jbptakeuchi@gmail.com, Hideaki Shibata²

¹Japan Business Portal L.L.P., Tokyo

²Kagawa Agricultural Experiment Station, Shozu Olive Research Institute, Kagawa



INTRODUCTION



Fig. 1

Olive growing areas in Japan

Japan (Fig. 1) is an island nation in East Asia, located in the North Pacific Ocean to the east of the Sea of Japan, China and Korea. It stretches from the Sea of Okhotsk in the north to the East China Sea in the south. Of the over 6,800 islands that make up the Japanese Archipelago, the four largest islands, Hokkaido, Honshu, Shikoku and Kyushu, account for 97% of the nation's land area of 377,835 km². About 73% of the land area is mountainous, leaving limited space for farming. A mere 13% is arable land, and about 54% of the 4.6 million ha of farmland are rice

fields. Other major crops include potatoes, sugar beets, oranges, cabbage, wheat and soybeans.

However, this country situated thousands of kilometers away from the olive growing regions around the Mediterranean Sea has a history of olive cultivation that dates back more than a hundred years, a fact very little known around the world.

OLIVE CULTIVATION HISTORY

The country's first encounter with olives did not happen until the 16th century, when Europeans started to arrive. A Portuguese *Padre* is said to have been the first person to bring olive oil into the country, giving it the name *Horuto-no-abura* meaning Portugal's oil. The first Japanese known to have eaten olive fruit was Toyotomi Hideyoshi, who unified the country in the late 16th century (Fig. 2). He received a barrel of salted olives from the Spanish king, Felipe II, in 1594. Between 1861 and 1863 the shogun's physician Hayashi Doukai, who studied Dutch medicine in Nagasaki, made the first attempt to grow olive trees in Japan to produce olive oil for medical use. He imported nursery trees from France and planted them in Yokosuka, south of Tokyo. In 1875, Tsunetami Sano, the founder of the Japanese Red Cross Society, brought back nursery trees from Italy and planted them in Tokyo and Wakayama in Western



Fig. 2

Toyotomi Hideyoshi, believed to be the first Japanese to eat olives



Japan; where in the latter location they produced fruits. The first large-scale planting occurred in 1880, when 2,000 nursery trees were imported from France and planted in government-run breeding stations in Tokyo and Kobe. The latter bore fruits, thus the first domestic olive oil and table olives were produced. None of these efforts, however, led to commercial plantations.

Olive farming in Japan was driven by the government's efforts to reduce dependence on expensive European-produced olive oil in the early 20th century. A major turning point came in 1908, following Japan's victory in the Russo-Japanese War in 1905 through which Japan acquired new territories in the Sea of Okhotsk. With the ultimate goal to produce domestic olive oil to marinate sardine and tuna caught in the new fishing grounds, the government secured 1.2 ha of farmland in each of three locations in Central, Western and Southern Japan to grow olive trees on an experimental basis. One of the locations selected was Shodoshima Island in Western Japan, where 519 trees were planted (Fig. 3, 4 and 5). By 1911, 507 of those trees were still surviving and had produced a total of 74 kg of fruit, an average of 145 g/three-year-old tree. The experiment succeeded only in Shodoshima, while it failed in the other two locations, due to damage caused by typhoons and indigenous pests.

The success on Shidoshima is attributed to the island's Mediterranean climate as well as the utmost attention and care given to the trees by the local farmers, who monitored their condition on a daily basis and addressed problems as soon as they arose. The most significant challenge was the spread of indigenous weevil "Olive Anaaki Zoumushi" (*Pimelocerus perforates* or *Dyscerus perforates*) which almost completely killed off olive trees on the island. Commercial production of olives gradually spread within the island as well as beyond to neighboring regions around the Seto Inland Sea.



Fig. 3
Part of the original orchard
(Photo courtesy of Olive Garden)



Fig. 4
Olive harvesting around 1937
(Photo courtesy of Kagawa Prefecture)



Fig. 5
A stone monument describes
how olive cultivation started

Olives on Shodoshima Island

AREA UNDER OLIVE CULTIVATION

A second major turning point in the recent history of Japan's olive cultivation came in 1959, when olive oil imports were liberalized. The importation of inexpensive

foreign products, coupled with the spread of pests caused by the ban on the use of Endrin, seriously affected farmers' motivation to cultivate olives. Many of them converted to mandarin orange farming, and the area under olive cultivation on the island fell from its peak of 130 ha in 1964 to 34 ha in a little over two decades. Locally produced pickled olives, which do not go through lactic acid fermentation, continued to be sold at high prices and kept olive cultivation on the island alive during this period.



Fig. 6

Olive orchards by rural houses on Shodoshima Island stretch down to the Seto Inland Sea

The area under olive cultivation has increased back to 100 ha on Shodoshima Island (Fig. 6) in recent years, thanks in part to the growing demand for olive oil which is driven by the growing awareness of its health benefits, as well as deregulatory government measures that enabled companies to engage in olive farming. From 1998, cheap nursery olive trees were sold to residents, which led to an addition of 40,000 trees over a 10-year period. Following these expansions

in the olive area and the advances in research, more attempts to plant new olive orchards are now taking place in other parts of the country where the environment is suitable for olive growing.

OLIVE CULTIVARS

Many imported olive cultivars are grown at the agricultural experimental station on Shodoshima Island, but the main ones grown on the island for commercial production are 'Mission' (USA), 'Manzanillo' (Spain), 'Nevadillo Blanco' (Spain) and 'Lucca' (USA). Other Greek, Spanish and Italian cultivars have been imported and grown by processing companies. 'Mission' makes up about 70% of the trees grown on the island, 'Manzanillo' 15%, and others 15%. 'Manzanillo' is used for table olives, 'Lucca' and 'Nevadillo Blanco' for olive oil, and 'Mission' as dual purpose.

IMPACT ON ECONOMY AND ENVIRONMENT

The impact on the national economy is negligible due to the small number of commercial olive plantations. Yet the extra virgin olive oil produced on Shodoshima Island is very expensive with a price ranging from 44 to 63 USD per 180 ml bottle. Therefore, most companies in the olive trade depend on imported olive oil to cover most of their needs. On the other hand, expansion of olive

cultivation in recent years is helping to utilize abandoned farmland, protecting it from degradation and/or erosion (Fig. 7).

OLIVE OIL PRODUCTION METHODS

Since olive cultivation in Japan is relatively new when compared to the Mediterranean basin, there are no traditional methods of olive oil production. Stone mills and presses (Fig. 8, 9 and 10) were used until 1988, when a continuous horizontal centrifuge was first established in a mill. Then in 1998 the compact low capacity two-phase mills were introduced since they fit the size of olive orchards on Shodoshima Island. These small units allow for the production of very high quality extra virgin olive oil with high polyphenol content and distinguished organoleptic characteristics because no heat is applied to the paste and no water is added during malaxation. As of March 2011, more than 20 small units of this type are operating in Japan.



Fig. 7
Olives on terraces



Fig. 8
Women working on a press

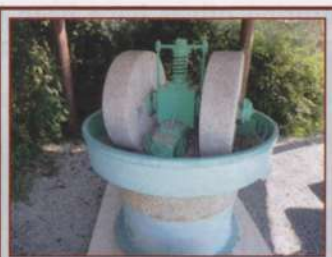


Fig. 9
Stone mill used until 1989



Fig. 10
Olive press used until 1989

COOKING WITH OLIVE OIL

Olive oil is used in traditional Japanese dishes, such as *Hiya-yakko* (cold tofu or bean curd), *Miso* (soybeans) soup and *Sashimi* (thinly sliced raw seafood). *Hiya-yakko* is usually served with soybean sauce, but olive oil and salt can be used instead. Some people put olive oil in *Miso* soup not only to take advantage of its various health benefits but also to protect the stomach and stimulate bowel movements. *Sashimi* is served with olive oil in much the same way as Italian Carpaccio.

POPULAR MEDICINAL AND COSMETIC USES

Olive oil is used in various cosmetic products, including soap, skin lotion, facial and hand cream, shampoo and bath agents. It is also used for the protection of the skin as well as prevention and treatment of sun burn. Cosmetic products are usually sold for high prices; for example a 30 ml bottle of cosmetic oil made from

olives locally-grown selling for around 100 USD. Olive tea is made from shoots and leaves, using the same production process as that of Japanese green tea. The leaves are harvested from dedicated hedgerow trees



Fig. 11
Mechanical harvesting of olive leaves for tea
(Courtesy Yamahisa Co., olive tea producer)



Fig. 12
Olive tea products

which do not yield fruits as a result of frequent cutting of new emerging shoots (Fig. 11) and (Fig. 12). Leftover leaves are dried, powdered and used for sweets and other food products.

OLIVES AND TOURISM

Few tourism facilities featuring olives have been built on Shodoshima Island, and special events are held in the spring as well as during flowering and harvesting seasons. One such facility is called the Olive Garden (*Olive-en* in Japanese)



Fig. 13
Olive Garden Co Ltd., and its president
Takutoshi Takebe standing by the original olive tree

(Fig. 13) which depicts a shop, a restaurant, an exhibition room and an olive orchard where guests can take a tour or visit the oil processing facility during milling season. The harvest festival features activities aimed at familiarizing visitors with olives. They get to experience harvesting in the olive garden orchard (Fig. 14), cooking and hand-making of olive oil using a plastic bag and a PET bottle according to the Shibata method (Fig. 15 and 16), which is also taught to children in schools of Shodoshima Island. The method involves the following steps:

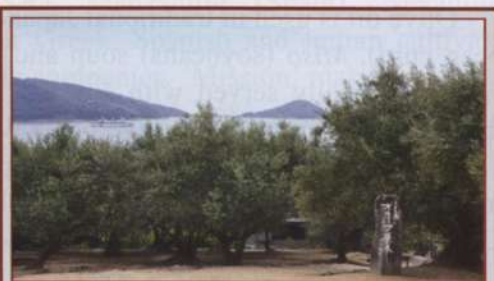


Fig. 14
The orchard at Olive Garden
provides a view of the Seto Inland Sea
(Photo courtesy of Olive Garden)

1. Cut a PET bottle in half.
2. The upper part is used as a funnel, and the lower part as a container. Insert kitchen paper into the mouth, and make sure that it is fully covered with no gaps.
3. Harvest fully ripe olives between the end of November and January. Those ripe enough to be squashed with fingers would be easiest to squeeze.
4. Wash the fruit with water, and put it in double-layered plastic bags.
5. Squeeze and massage the fruit with fingers.
6. Massage well until the juice comes out of the surface (for about 30–60 minutes).
7. Put the squashed fruit into the upper part of the PET bottle. Make sure not to apply pressure, as gaps between the fruit are needed for the oil to trickle down. The liquid will accumulate in the lower part of the PET bottle in a few hours. More oil can be taken quicker if this is done in a warm room. About 20-50 ml of oil can be taken from 500 g of olives.
8. Pour the upper portion into a container to separate the oil from liquid, and it is finished.
9. Enjoy a meal with your homemade olive oil.



Fig. 15
The Shibata Method for producing olive oil by hand (Courtesy of Mr. Shibata)

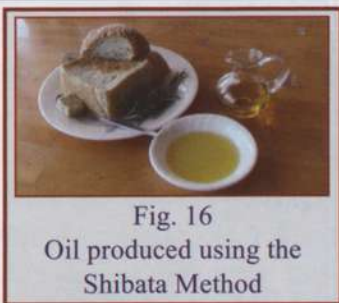


Fig. 16
Oil produced using the Shibata Method

OLIVE WOOD AND BY-PRODUCTS USES

Name Seals are made of dried olive wood in small quantities. Some islanders make chopsticks and containers for powdered green tea as a hobby but not on a commercial basis. Concentrated olive leaf extract is added to processed beverages, such as soda and coke, as well as to soy sauce during production.

Residues from olive oil production are mixed with foodstuff for commercial cattle. The raw meat is branded as “olive beef” and promoted as containing a high level of oleic acid. Dried and powdered olive leaves are added to the feedstuff for farmed yellowtail fish. The fish is sold under the name “olive *hamachi*” (yellowtail) and is popular for its non-oily taste and fresh appearance. Olive’s polyphenol is said to keep the color of the fish from degrading.

ACKNOWLEDGMENTS

The author would like to extend his sincerest gratitude for the outstanding support he received from Shozu Olive Research Institute of Kagawa Agricultural Experiment Station, Shodoshima Town Office, Olive Garden Co. Ltd, Yamahisa, and the Editor in Chief Mohamed El-Kholy in completing this chapter.

Saleh AlShdiefat, M.^{1,2} s_shdiefat@yahoo.com, Salam Ayoub, J.¹ salamayoub@hotmail.com,
Jeehan Nusir¹, Mohamed El-Kholy², Othman Al-Shoul¹

¹National Center for Agricultural Research and Extension (NCARE), Amman

²AARINENA Olive Network Focal Point, Cairo, Egypt



INTRODUCTION

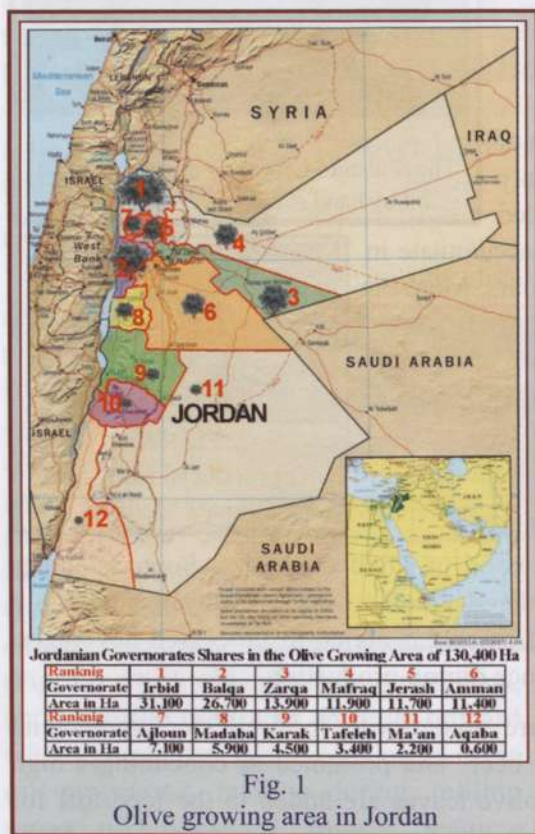


Fig. 1
Olive growing area in Jordan

Jordan, officially the Hashemite Kingdom of Jordan, lies in Western Asia within latitudes 29° and 34° N, and longitudes 35° and 40° E, with a small area that lies west of 35° E on the East Bank of the Jordan River. It has an area of 89,342 km² and a population of 5.91 million people (Fig. 1). It is bordered on the east and south-east by Saudi Arabia, on the east by Iraq, on the north by Syria and on the west by the Palestinian Authority, Israel and the Dead Sea. Although most of the Jordanian territory is covered by the Arabian Desert, yet the north-western part belongs to what is known as the Fertile Crescent, which is considered to be “one of the cradles of civilization”. Jordan consists of arid plateau in the east, with highland area of arable land and Mediterranean evergreen forestry in the west. The highest point in the country is Jabal

Rum, 1,734 m above sea level, while the lowest is the Dead Sea (- 408 m). This is the lowest land point on the surface of the earth. Excluding the Rift Valley, the rest of the country is entirely above 300 m.

Jordan's climate is semi-dry in the summer with an average temperature of 30° C and relatively cold in the winter averaging around 13° C. The western part of the country receives more precipitation during winter season from November to March, while a semi dry weather prevails for the rest of the year resembling Mediterranean

climate. Annual rainfall ranges from 620 mm in the north western highlands to less than 100 mm in desert areas.

Jordan is a small country with limited natural resources. Wheat, barley, lentils, chick-peas and olives are cultivated under rain-fed conditions in the northern and central areas, which are of higher elevations. The periodic droughts and limited land area do not support sufficient yields of cereal crops to meet domestic demand. In the Jordan Valley, under irrigation from the East Ghor Canal, fruits and vegetables including cucumbers, tomatoes, eggplants, melons, bananas and citrus are produced in sufficient amounts enough for local consumption and sometimes for export.

OLIVE CULTIVATION HISTORY

Many studies indicate that the origin of olive is in the Eastern Mediterranean Region (Asia Minor), including Syria, Palestine and Jordan. Following the discoveries of the ancient village Hadeib Al-Reeh in the Rum area of southern Jordan, joint reports by Jordanian and French archeologists indicate that this region could be the oldest in the world where olive trees were cultivated. Analyzing the ash in three fire places in the village dating back to the Chalcolithic Period (ca. 5400 BC) revealed cultivation of olive trees. The report also noted that the inhabitants of the village used olive wood for cooking, indicating that olive trees were available in abundance at that time.



Fig. 2

One of the so called "Roman or *Romanian* Olive Trees" (Photo by S. Ayoub)

About 15-20% of the 17,000,000 olive trees in Jordan are very old and are called by locals as "Roman or *Romanian* -in dialect- olive trees" (Fig. 2). They might have been given this name to relate their cultivation to the Roman era centuries ago when the Nabataean kingdom was somehow annexed to the Roman Empire around 106 AD. These trees can be found in different parts of the country, where old olive stone mills can also be found, dating to the same period.

AREA UNDER OLIVE CULTIVATION

In 2011 the area under olive cultivation in Jordan had reached nearly 1,304,000 *dunum*⁹ (130,400 ha), representing 72% of the total area dedicated to fruit trees, and about 36% of the total cultivated area in Jordan. Of the total olive area, 59% (76,600 ha) are located within the four smallest governorates of Irbid, Balaqa, Jerash and Ajloun (Fig. 1, page 198), making olive the backbone of the livelihood of fruit growers

⁹ A unit of land area used in territories of the Ottoman Empire representing the amount of land that can be plowed in a day; its value varied from 900–2500 m². It is now defined as exactly one decare (1,000 m²).



in these governorates. The trees are rain-fed and mostly grown on hilly terrains (Fig. 3). The same growing environment also prevails in the area representing 11% (14,400 ha) of the total, distributed in the much larger four governorates in the west (Madaba, Karak, Al-Tafeleh and Aqaba). The remaining 30% (38,400 ha) of the olive area are located within the middle and northeastern governorates under irrigation.



Fig. 3

Rain-fed olive trees (Photo by S. Al-Shdiefat)

OLIVE CULTIVARS

The autochthonous Jordanian olives have been selected over hundreds of years. The local cultivars 'Kfari Ro', 'Kfari Baladi', 'Nabali Baladi', 'Kanabisi', 'Souri' and 'Nabali Muhasan' ('Rasei') are cultivated in the northern part of Jordan, mainly in Ajloun, Jerash, Irbid, and Al-Mafraq, while 'Nabali Baladi', 'Nabali Muhasan', 'Nasouhi Jaba' and 'Shami' are the prevalent cultivars in the central parts of Jordan, including Balaqa, Amman, Madaba and Zarqa. 'Arabi Altafila', 'Bathni', 'Ketat', and 'Rosai' are cultivated in the southern part including Al-Tafeleh, Karak and Ma'an. There are 47 cultivars in the national olive germplasm collection in Al-Mushaqar, some of which are autochthonous and others are imported. The most important cultivars among the aforementioned are:

'Nabali Baladi' (Fig. 4) is the most important and widespread local cultivar. It adapts well to all olive-growing regions in Jordan. It grows in the west mountain range as well as in the irrigated eastern dry plains. A dual-purpose cultivar, with high oil content, ranging from 20 to 30% on fresh weight basis. Oleic acid content is around 67-71%. Its oil has a golden yellowish color, nice medium fruitiness, sweet taste with light to medium pungency, and a pleasant ripe tomato after taste. The tree has a vigorous and spreading growth habit. The fruit is small to medium-sized, ovoid in shape and asymmetric, average weight 2-4 g. The pit is medium-sized, narrow and elongated with clear veins. It is considered as drought and medium salt tolerant cultivar. It grows well in deep soils, in regions that receive more than 400 mm of annual rainfall. In general, it is resistant to most common olive pests and diseases. It is slow-growing, has high tendency to alternate bearing and difficult-to-root.



Fig. 4

'Nabali Baladi'

(Photo by S. Ayoub)

'Rasei' also called **'Nabali Muhasan'** (Fig. 5), an important and a widespread



Fig. 5

'Rasei', also **'Nabali Muhasan'**
(Photo by S. Ayoub)

local olive cultivar which was originally cultivated in Al-Tafeleh in the southern part of Jordan. A dual-purpose cultivar used for green and black pickling and oil production. Its oil content ranges between 15-25% on fresh weight basis. Oleic acid content is around 69-72% of the total fatty acids. It produces high quality oil of medium fruitiness, grassy aroma and very sweet taste with almost imperceptible bitterness and pungency. It grows in the west mountain range as well as in the irrigated eastern dry plains. It adapts to different climates and soils. It has high rooting ability, fast growing and moderate tendency for alternate bearing.

'Souri' is an old cultivar resembling 'Nabali' in tree shape, but the difference is clear in fruit shape and characteristics. A dual-purpose cultivar with a high oil content of 25 to 35% on fresh weight basis. Souri oil has fruity aroma and pungent flavor that are desirable not only in Jordan but in the entire region. It requires deep fertile soil, moderate climate and annual rainfall higher than 400 mm. It grows mostly in the northern parts of Jordan in Jerash and Ajloun Governorates. It is sensitive to olive peacock eye spot disease, especially in the humid areas.

'Nasouhi Jaba' (Fig. 6) a table cultivar, is moderately vigorous. Fruit is medium-large, elongated, bent, smooth skin and attractive looking. Stone is narrow, elongated and pointed at the apex. Excellent for black pickling. Oil content between 10-15% on fresh weight basis. It needs moderate climate, fertile soil and high annual rainfall of more than 400 mm. Sensitive to salinity and is not suitable for planting in dry regions.



Fig. 6

'Nasouhi Jaba'
(Photo by S. Ayoub)

Many olive cultivars were imported from Spain, Italy and Greece, Syria, Turkey and other countries. Some of these were propagated on commercial scale during the seventies of last century. The most successful cultivars adapted to the local environment are the Spanish 'Grosa de Espagna' and 'Manzanillo', Italian 'Frantoio', Turkish 'Ayvalik' and 'Uromegek', Israeli 'Barnea' also called 'K18' and Syrian 'Kaissy'.

IMPACT ON ECONOMY

Olive cultivation in Jordan increased by almost 220% during the last two decades, causing an increase of olive fruit production to reach an average of about



170-180 thousand tons/year. During the last decade the value at farm gate price was more than 100 million USD/year. Nearly 141-145 thousand tons/year (83% of total) are used for oil production and the rest for processing of table olives.

The average annual olive oil production in Jordan is about 26-28 thousand tons and with a local annual consumption of about 24,000 tons providing 4 kg/capita/year, very little quantities are available for export and are mostly in bulk (~ 70%), with little added value.

More than 60,000 Jordanian families with a total population of nearly 300,000 persons rely on the olive sector as their main source of income. Olives and other stone fruits have been always regarded as the backbone of the domestic economy in rain-fed areas of Jordan. Olive growing sustains the livelihood of large numbers of small-holder farmers, with holdings of fewer than three ha on average.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES



Fig. 7
111-year-old Tamam Marhood
Al-Mazaherh
(Photo by S. Al-Shdiefat)

A good inherited practice, which is passed on from one generation to the other is to provide supplementary irrigation in rain-fed areas in late January in case there is no sufficient rain. The growers strongly believe that this can help to achieve uniform blooming and at the same time enhance floral bud differentiation. Hand harvesting is a right practice that preserves the quality of raw olives. Jordanian farmers would not sacrifice it for any other harvesting means; not only for the sake of quality, but also because for them it is a seasonal event which gathers all family members and other members of their small communities.



Fig. 8
Olive trees in the valley around
Ajloun Castle www.ea.tourism.com

Some growers still add olive pomace ash to their olive trees as organic fertilizer, after burning the pomace in their fire places to warm their homes in winter time.

The 111-year-old woman Tamam Eid Marhood Al-Mazahreh (Fig.7) lives in Ajloun (located 76 km north-west of the capital Amman), which is very famous for olive growing on the western mountain range (Fig. 8) and for its old Castle built in 1184 by Izz al-Din Usama, a general in the army of Saladin. She has been using olive oil in her cooking for as far as she can

remember. She tells endless stories of how they cared for their olive trees a century ago, and she attests that alternate bearing at that time was not as noticeable as it is now. At that time they used a single chisel plow driven by two cows or two horses to till the soil three times a year; the first one before rainfall, the second before flowering and the third one after fruit set. She said that when a “Roman *Romanian* olive tree” became old and not capable for high yield, they used to cut it down to the ground surface and years after they would obtain 40-50 strong growing suckers (Fig. 9) that they would plant with parts of the roots elsewhere.



Fig. 9
Large suckers growing around one of the so called “Romanian olive trees”
(Photo by S. Ayoub)



Fig. 10
The same old plowing methods are used in a field adjacent to an olive orchard which has a cover crop
(Photo by S. Al-Shdiefat)

Some olive growers still plow their land 3-4 times a year following the same old practice described above (Fig. 10). Although this practice might be beneficial in suppressing weeds growth and enhancing percolation of rain, yet it causes soil erosion and landslides in hilly and sloppy lands and might cause crusting in some types of soil. It is astonishing how some growers still prefer to plant transplants taken from suckers growing around the trunk crown area, in spite of the fact that they enter production years later than propagated trees from cuttings. In many

instances suckers might be mistaken with offspring growing around the trees from seeds of falling fruits. These often results in trees not having the same characteristics of the parent plant and remain unproductive for years.

One of the wrong practices is that some olive growers do not relate harvesting to fruits’ physiological stages, but they are rather accustomed to conduct harvesting after the first rain, believing that the fruits are cleaned from dust and pests in a natural way and that oil yield will also increase. Another bad habitual practice, which also negatively affects the oil quality, is collecting and mixing fallen and diseased olive fruits with healthy ones and transporting them in plastic bags to the mill.

PROCESSING METHODS OF RAW OLIVES

An old and rare olive oil extraction method, rarely practiced nowadays, was to immerse the olives in large vats full of water and boil them for a while. Then they were

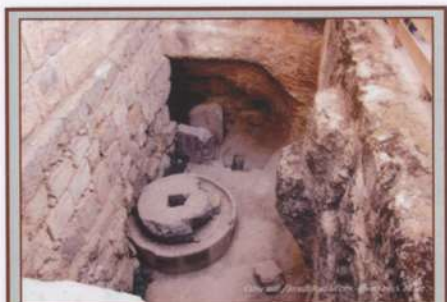


Fig. 11
Roman stone mill in the historical
city of Jerash
(Photo by Shaban Bana)

drained and spread on houses' roofs for a few days to dry out. The olives were then taken for crushing using a stone mill (Fig. 11) and the resulting paste was placed inside sacks made of natural fibers for oil extraction under a manual screw press.

Tamam Eid Marshood Al-Mazahreh, the 111-years-old woman from Ajloun remembers the above method; however she stated that the fruits, after drying, were crushed by beating with hard stone against a rocky surface. Smashed olives were dropped again in boiled

water, stirred, drained and placed in sacks for pressing between two heavy perforated wooden boards by pulling ropes around them to apply pressure.

Another 81-year-old farmer Jber Al-Smady remembers that some people after crushing their olives did not press the paste, but rather dropped it into big drums full of water to skim the floating oil off the water surface. He also explained that some growers added wild thyme to be crushed with olives to give the oil a distinctive taste.

TRADITIONS AND CULTURE

Over the years, generations after generations of Jordanians and Palestinians have developed many proverbs which are very popular in these two countries, some of which are mentioned below:

English	Arabic
• Olive oil is the supporting pillar of my house	• الزيت عمود البيت
• My bread and olive oil are my home pantry stock	• خبزي وزيتي عمارة بيتي
• Keep your oil in the jars till it gets its justice value	• خلي الزيت في جرارة حتى تجيك أسعاره
• Its oil is great; picking it makes your hair grey	• زيتته طيب ولقاطه يشيب
• In September oil builds in olives and acidity in limes	• في أيلول بيدور الزيت في الزيتون والمُر في الليمون
• If it sets in May, prepare the jars	• إن أخرج في أيار حضروا الجرار
• While Nabali oil flows, picking it makes you relax	• النبالي زيتة سيال ولقاطه بهدي البال

There are many folkloric tales related to olive culture that survive from one generation to the other in Jordan. The 80-year-old woman Fatma Um¹⁰ Hussein (from Kafr Abiel village in Irbid Governorate), tells her grandchildren about the

¹⁰ The word Um (أم in Arabic) means mother, however here it means "mother of". It is common culture in the Arab World to call mothers with their first name followed by Um and the name of her oldest son.

festive atmosphere she used to have as a child when she harvested olives at her father's small orchard. She used to sing with her mates the following folkloric song which values olives:

English

My olive tree is a matchless bride / she might not be
valued with any money / she protects me from poverty
and misery / and from the evil of an unpleasant day.

Arabic

زيتونتي أطيّب عروس / ما
بتثمن بالفلوس / تحميني الفقر
والبؤس / ومن شر يوم عبوس.

Um Hussein remembers how they used to judge olive oil genuineness by an old method, which very few people know nowadays; it was customary to add a cup of salt to a large jar full of olive oil to check the color of the oil afterwards. They believed that if the color remained unchanged, then the oil was judged authentic.

Olive harvesting in Jordan is still as it has been always, over centuries an important social, cultural, traditional and festive occasion. It has survived as an activity of communal and family nature. It is also astonishing how Jordanians are extremely proud of the olive harvesting season since it is associated with high ethical values such as cooperation, sharing, , as well as good deeds and blessings, all of which cannot pass unnoticed. Nowadays with urbanization, city workers take their annual vacations during harvesting season and go back home to their villages to help their families in harvesting olives, especially on small orchards. One of the songs the people sing while harvesting goes back more than a century and maybe even before. It says:

English

It is raining around us / rain is falling in droplets / my
beloved ones are also dropping / and I am picking them.

Arabic

الدنيا بتشتي / الدنيا بتنقط /
حبيبي يفرط / وأنا بلقط.

Olive oil was sold over a century ago in two different sizes of pots made of clay and in a leather reservoir called *Zarf* "ظرف". The clay pots were of two sizes; the large one for about 7 kg was called *Sa'a* "صاع" and the small one *Robeiah* "روبيه" for nearly 3.5 kg.

The custom is still that neighboring families who own olive orchards, within the same district, would go hand in hand to help one family to harvest their olives and then move on to the next orchard and so on until all orchards in the district are harvested. Therefore, while working, they usually sing "God helps those who help others" "عاون الله من يعين". One of the typical scenes during the season is to see many people sitting under olive trees having breakfast or lunch together, which is normally composed of light dishes like salads, pickled olives, cheese and honey. Occasionally there are hot dishes like *Almotabag* "مطبق"; however, the main course of



Fig. 12
Jordanian bread
(Photo by S. Al-Shdiefat)

any such meals while harvesting is dipping traditional Jordanian bread (Fig.12), called *Shraak*, "شراك" in olive oil and then in ground thyme (*za'atar*) "زعر". Once the harvest is finished all families gather around a huge table to eat together traditional hot heavy dishes like *Makmorah* "مكمورة" or *Mjadara* "مجدرة" and finish with a dessert called *Zalabia* "زلابيا", all prepared with the new season's olive oil. Sons, daughters, nephews, cousins and all other members of any family, being proud of their new harvest, will exchange presents of olive oil among themselves. They will also support neighboring families who do not own olive orchards by giving them enough olive oil to cover their annual needs, as a good deed.

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

In Jordan, a traditional breakfast is normally based on olive oil as a dip for



Fig. 13
Hummus
(Photo by S. Ayoub)

bread and ground thyme (*za'atar*) "زعر". Olive oil and thyme are not considered as appetizers but rather as main ingredients because oil is poured and thyme is sprinkled on all other plates like *Labaneh*¹¹ "لبنه", the famous appetizer *Hummus*¹² "حمص" (Fig. 13), *Mutabal* "متبل" (roasted grounded eggplant mixed with yoghurt, called *Laban* "لبن" or with *Tahini*). Since per capita consumption in the country is somewhat high compared to other countries in the region, Jordanians use much olive oil in their daily diet.

Some recipes of dishes unique to the Jordanian rural areas, cooked all year around, but especially often during the olive harvesting and extracting season, to enjoy the new oil, are given below:

➤ **Musakhan** "مسخن" is considered one of the meals that are enjoyed on a big platter serving many people sitting around it and eating from the same dish. It is not intended to be light; it is a celebration of the production of another year's oil.

Ingredients: One chicken, chopped onions, ½ cup of olive oil, pine seeds, sumac, lemon juice, salt, black pepper and other spices like nutmeg and cinnamon.

Method: Cut a chicken into two breasts, two thighs, and two wings. Put salt and pepper in a large deep casserole, add 1/4 cup of the olive oil and heat. Lightly brown the chicken parts on all sides over medium heat for about 20 minutes. Remove and set aside. Add the remaining 1/4 cup olive oil to the casserole and cook the onions for about 35 minutes until translucent, stirring occasionally. Add the sumac, mix and cook for 2 minutes. Preheat the oven to 210° C. Place 2 to 3 layers of Arabic loaf

¹¹ White and creamy strained yoghurt, mostly through muslin.

¹² A Levantine Arab food dip or spread made from cooked, mashed chickpeas, blended with *tahini*, olive oil, lemon juice, cumin, thyme, salt and garlic and sometimes with some sumac. Levantine cuisine is the traditional cuisine of the Levant, known in Arabic as "بلاد الشام" (Bilad ash-Sham or Sham countries in Western Asia on the Mediterranean Sea).

bread inside a baking tray and fill a spoon and a half of onions between the loaf layers and then arrange the chicken on top of the last onion layer. Cover with the remaining onions and sprinkle sauce from the casserole. Bake for about 60-90 minutes until the chicken is golden and crispy with the meat almost falling off the bones. Roast the pine seeds in olive oil until golden and sprinkle over the chicken. Serve with yoghurt.

➤ **Zalabia** "زلابيا" (Fig. 14) is a dessert. It is normally cooked in abundance during the harvesting season by the orchard owner to help sustain family members and neighbors who are helping with the picking.

Ingredients: 2 cups white flour, 3 cups of water, 1 tablespoon yeast, 1 teaspoon sugar, ½ cup of warm water, a pinch of salt added to the flour and finally enough olive oil for frying. For preparing what so called *Qater* "قطر", a syrup for sweetening *Zalabia*: a cup of sugar, two cups of water and ½ of a lemon juice to be boiled together.

Method: Mix the yeast with one teaspoon of sugar and some warm water and leave them to ferment. In a bowl mix yeast after fermentation with flour and add water gradually until it becomes homogeneous, cover and leave the dough to reach double its original size. Heat the olive oil in a frying pan over medium heat, take pieces about the size of a large egg out of the dough, and fry them one after the other pushing each one with the spatula into a circular shape (this is what called *Zalabia*). When the *Zalabia* becomes golden-brown on the underside, turn it over and fry till both sides get the same golden-brown color. Take it out and place it in the prepared syrup (*Qater*) for several minutes to be absorbed. Serve hot and add more olive oil straight in the serving plate as needed.

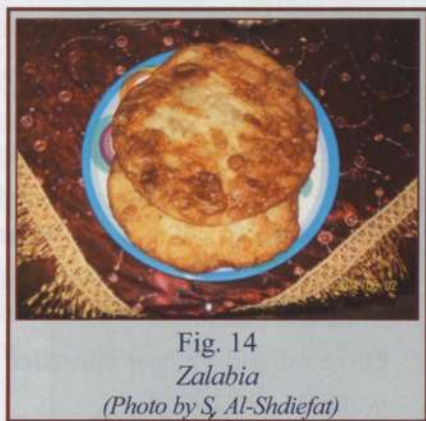


Fig. 14
Zalabia
(Photo by S. Al-Shdiefat)

➤ **Almotabag** "المطبق" (Fig. 15) is a very nutritious, popular and delicious dish served in the northern parts of Jordan in rural areas. Suitable to be eaten as a sandwich, therefore it is commonly seen in orchards during olive harvest.

Ingredients: Minced meat or chicken, 1 finely chopped onion, 1 chopped tomato, 1 tea spoon of mixed spices. For the dough: 3 cups of flour, 1 table spoon of olive oil, 1 egg, 1 cup of warm water, salt, enough extra virgin olive oil depending on the quantity to be served and ¼ cup sesame for garnishing.

Method: Mix flour, oil, the egg and the warm

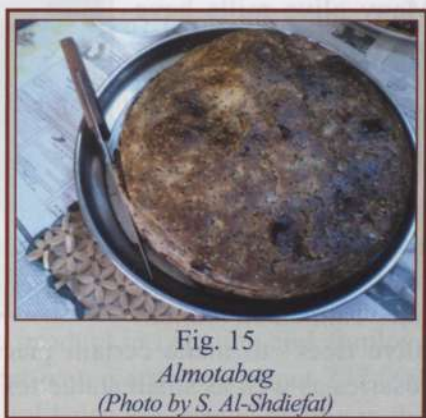


Fig. 15
Almotabag
(Photo by S. Al-Shdiefat)

water well to prepare dough. Divide the dough into 6 handful dough balls, put the balls in olive oil and rest for 30 minutes. While the dough rests, stir the chopped onion in olive oil until golden, add the meat or chicken and stir well until golden brown, add salt, pepper and mixed spices. Finally add the tomatoes and stir well until cooked, and set aside. Spread each dough ball till it becomes very thin, place two layers on top of each other in a tray, after spraying it with some olive oil. Add some of the cooked meat or chicken on the above layer. Repeat twice to finish the dough balls. Sprinkle the sesame on top. Pre-heat the oven and bake for about 30 minutes. Serve with yogurt.

POPULAR MEDICINAL USES

The medicinal properties of olive leaves and oil were known for centuries to Jordanians, especially those living in rural areas, where medications were not easily accessible or available. Some of the common uses that are still practiced by many people substantiating their effectiveness are:

- Table spoon of olive oil consumed daily before breakfast can help in cases of constipation and stomach ulcer.
- Olive oil is used as fresh drops to treat ear irritation and some infections.
- Olive leaves soaked in boiled water is said to be helpful in reducing blood glucose level, when taken warm 2 to 3 times daily.
- Massaging the body with warm olive oil relieves muscular pains.
- Olive oil and vinegar sprinkled daily on salad help in reducing cholesterol.

OLIVE WOOD AND BY-PRODUCTS USES

Olive pomace is used in Jordan mainly as a source of energy to heat homes, especially after the increase in the world oil prices. Many olive mills have machines to compress it in cylindrical form for burning in fire places (Fig. 16).

Talented craftsmen and some artists use the hard olive wood from old "Roman Romanian

olive trees" to make certain pieces of furniture, toys, some kitchen utensils and rosaries as well as small statuettes for holy figures (Fig. 17).



Fig. 16
Dried compressed olive pomace
(Photo by S. Al-Shdiefat)



Fig. 17
Jesus statuette made of olive wood
(Photo by M. El-Kholy)



INTRODUCTION

Lebanon is located in the Near East Fertile Crescent region, which is considered as an important center of diversity in the world and where plant domestication started ten thousand years ago.

Lebanon, which has six administrative divisions called governorates, is a relatively small country with a diverse population of about four million inhabitants living in just 10,452 km² of land along the Eastern Mediterranean between Syria to the north and northwest and Israel and Occupied Palestinian Territories to the south (Fig. 1). The country is shaped by the twin mountain ranges that separate it from Syria. The narrow coast is extended in front of the steeply rising slopes of Mount Lebanon, the range that gives the country its name. The mountains, which are carpeted with pine trees and olive orchards, rise to a maximum height of just over 3,000 meters and are covered in snow each winter. Lebanon is blessed with plentiful supplies of water and is the only country in the region that has no desert. The Bekaa valley, which lies between Lebanon's twin mountain ranges, is one of the most fertile regions in the Middle East.



Fig. 1
Olive growing areas in Lebanon
"L'olio del Libano"
(Italian funded project, 2009)

Although topographical variation creates some differences in climatic pattern from the coast to inland, Lebanon generally has a moderate Mediterranean climate characterized by a long, hot, and dry summer and cool and rainy winter. Rainfall occurs from October to April and can result in violent storms causing soil erosion. The average annual precipitation is about 750 mm with a maximum of 1,000 mm along the western mountain chain and a minimum of about 250 mm in the north of Bekaa valley. In more elevated areas, temperatures usually drop below freezing during the winter with heavy snow cover and occasional frosts.

Agriculture contributes 10% of gross domestic product in Lebanon and employs about 20% of the total labor force. In 2010, the cultivated area was about 277,000 ha of which 135,000 ha are irrigated. The agricultural lands are located mainly in the

narrow coastal plains, in Akkar of the North Governorate, in the inland Bekaa Valley, and in the terraces along West Lebanon Mountains and East Anti-Lebanon Mountains. Topographical, climatic and landscape diversity create various agro-ecosystems ranging from semi-arid to humid that allow facilitate cultivation of a large number of species ranging from temperate to subtropical crops (banana, avocado, annona, guava). Fruit trees excluding olive take about 29% of the cultivated area, while olive alone takes 23% and the remaining 52% is taken by leguminous and vegetable crops, field crops, cut flowers and forests. Among the Arabic neighboring countries, Lebanon is famous for its citrus, apples, grapes and cherries.

OLIVE CULTIVATION HISTORY

Lebanon is illustrious for its rich olive growing history dating back to the Phoenician era. The Phoenicians were said to be the first to plant olive trees in the Levant (now Syria, Lebanon, Palestine and Jordan) thousands of years ago.

Influenced by evidence from artifacts and archaeological remains of the most ancient civilizations, Lebanese people believe that olive growing and olive oil production in Lebanon has been since time immemorial. One particularly impressive discovery, in the central district of Beirut, is Phoenician jars that were found broken *in situ* inside a storage room within a casement wall that dates back to 800-700 BC. Two other imported jars from Greece and Cyprus were also found, proving commercial relations with these two countries.

It is said that the Canaanites and later the Phoenicians played a major role in spreading the olive tree around the Mediterranean. The legend says that as far back as 1600 BC they introduced olive trees to the Greek isles and later to the Greek mainland, Italy, southern France, Spain and finally North Africa. During the Bronze Age (3500-1200 BC) the coast of the Levant¹³ was inhabited by the Canaanites. One of their settlements, Byblos (a coastal town in central Lebanon), became the major Mediterranean port. From there, cedar wood and olive oil were exported to Egypt, the former for shipbuilding and tomb construction, and the latter for use in funeral rituals and cosmetics. In return, Egypt sent gold and papyrus to Lebanon.

The Levant has been home to the olive tree for millennia. The Byblos site, as well as others in the ancient southern city of Sidon, contains evidence of pottery jars, used for storing olive oil, dating back to the Bronze Age (Fig. 2). Both the Museum

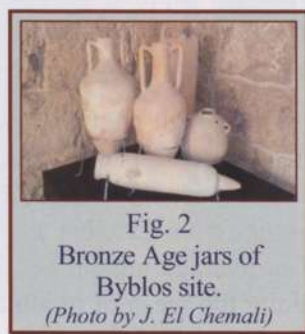


Fig. 2
Bronze Age jars of
Byblos site.
(Photo by J. El Chemali)

¹³ A typical geographical term used by archaeologists and historians with reference to the prehistory and the ancient and medieval history of the large area located in Southwest Asia, south of the Taurus Mountains, bounded by the Mediterranean Sea in the west, the Arabian Desert in the south, and the Zagros Mountains in the east.

at the American University of Beirut and the Beirut National Museum have such jars on display, as well as small oil lamps (Fig. 3, left). In the village of Oum-el-Amed, there is a stone basin used for crushing olives that is thought to date back to the Hellenistic period (300-64 BC), indicating that the inhabitants of this region practiced olive oil extraction. In other archaeological sites in Beirut, traces of olive wood and carbonized olive pits dating back as far as Roman times have been found.



Fig. 3

Left: Diverse types and shapes of oil lamps of different ages: Phoenician, Byzantine, Roman and Islamic. Findings at grave of Cave of Siren "Mgharet-al-Houriye", in Qadicha valley in North Lebanon, excavations Tel Aarqa (Beayno *et al.* 2002),

Right: 2nd Century AD ruins of olive presses in Chhîm, Mount Lebanon

(Left photo by B. Hamadeh)

(Right photo by Archeologist T. Walischewsky)

However, the most significant evidence comes from the Lebanese villages of Chhîm, Marjiyat and Ras el-Ain, where large pottery jars for olive oil storage dating back to the 4th millennium BC were found. Furthermore, archaeologists unearthed the remains of Roman houses and a temple as well as several intact olive presses (Fig. 3, right) and stone basins with shallow channels; all this suggests that southern Lebanon was a significant center of olive oil production in Antiquity. Khan Khalde, a few kilometers south of Beirut, and the mountain village of Beit Mery in the Metn Region, had their own olive presses dating back to the Roman rule, also suggesting they have been centers of oil production. Many amazing iconographies of the 2nd century AD discovered in 1937 in a tomb in Burj-el-Shemali, indicate in particular the importance of olive and other fruit trees in Antiquity.

Most of the ancient olive production areas in Lebanon have some old trees; particularly in the northern village of Bshaale; some of them could be among the oldest olive trees in the world. They date back at least 1,500-2,700 years and are still growing (Fig. 4). These



Fig. 4

The famous old olive trees of Bshaale



trees highlight the rich historical background of the olive tree in this part of the Ancient World.

AREA UNDER OLIVE CULTIVATION

Olive is considered as a major crop in Lebanon. In 2010, the area under olive cultivation was estimated at 57,594 ha. However the latest olive map established through satellite imagery by the Italian funded project “L’olio del Libano” showed that only 45,000 ha of land are used for olive growing. The new map showed progress in olive growing in the semi-arid area of Hermel in North Bekaa Governorate. The foregoing area accounts for nearly 18% of the total cultivated area. This area is distributed in four of the six Lebanese governorates with the largest share of 40% in the North, followed by 20% in Nabatiyeh, 18% in the South, 17% in Mount Lebanon and just 5% in Bekaa. A sustaining growth rate of the olive growing area is expected with approximately 200,000 trees being annually planted.



Fig. 5
Hills carpeted with olive orchards in
Southern Lebanon (Photo by A. Youcef)

Geographically, olive orchards are mainly spread in the coastal area of Lebanon where topography can reach 1,300 m above sea level as in Rachaya of East Bekaa. Typical terrains of olive growing areas vary from slopes and plains to foothills of the mountain massifs (Fig. 5). Olive trees on terraces are common scenery in the North and on Mount Lebanon (Chouf). Family plantations are typically fragmented into small sized orchards of 0.2 to 2.0 ha, while large sized orchards are somewhat common in the main area of cultivation in the North as well as in the South.

OLIVE CULTIVARS

The Lebanese olive germplasm is expected to be highly diversified, as Lebanon is located in the center of origin of olive tree in the eastern Mediterranean. However, only four local cultivars have been described in earlier reports, namely ‘Baladi’, ‘Souri’, ‘Smoukmoki’, ‘Ayrouni’, with a confusion regarding local nomenclature among farmers and growing areas. Recently, a nation-wide plant material collection was established and at least 13 putative cultivar names were inventoried in the Lebanese orchards, including the oldest common cultivars mentioned above in addition to other cultivars that were introduced in the last century such as ‘Bou Chawkeh’, ‘Balah’, ‘Kalb-el-Tair’, ‘Jlot’, ‘Dal’, ‘Bissani’, ‘Remmani’, ‘Chami’, and ‘Sabbighi’.

All the Lebanese cultivars are of dual-purpose, with the exception of ‘Ayrouni’ which has small sized fruits of less than 2 g and is always cultivated for oil production. The two local cultivars named ‘Baladi’ and ‘Souri’ remain the most



commonly planted genotypes. Following is a characteristic description of the most important ones.

‘Baladi’ (Fig. 6) is the oldest and most important cultivar in the country and is widely spread even today. Several studies indicate an extensive heterogeneity within this cultivar that could be the result of a broad geographic distribution, associated with the prevalence of seed propagation on farms. Moreover ‘Baladi’ means “local”, that is something autochthonous, so the name sometimes has been used by farmers to indicate olive genotypes that were only believed to be Lebanese. This has probably contributed to the



Fig. 6

‘Baladi’ (Photo by R. Nabbout)

heterogeneity found under the name ‘Baladi’. It is moderately resistant to drought, cold and salinity. The olive fruit is similar to those of ‘Souri’, generally ovoid with an intermediate fresh weight (2.5-3.5 g), and its productivity is medium to high with alternate bearing. The fruit is highly appreciated by the Lebanese consumer for both green table olives and oil production. The olive oil content ranges from 20 to 24% on fresh weight basis when harvested in October-December. The oil has a distinctive honey and peppery flavor and an herbal aroma.

‘Souri’, originated from the Lebanese small town of Tyre (Sour). It is considered one of the oldest olive cultivars in the world. Its cultivation is concentrated in the north and south of Lebanon. The olive is ovoid with an intermediate fresh weight (2.5-3.5 g) and a tenuous nipple. Despite the problem of alternate bearing, the production is high. The olives are highly appreciated by the Lebanese consumers for both green table olives and oil production. The olive oil content ranges from 20 to 30% on fresh weight basis when harvested in October-December. The oil has high oleic acid content, medium total polyphenols content, green tomato and sweet almond aroma, with fruity and medium bitter taste.

Moreover the introduction into Lebanon of olive propagating material for more than thirty years has led to the introduction of cultivars grown in Syria, Jordan and Egypt such as ‘Abou Ajweh’, ‘Nabali’, ‘Massri’ and ‘Toffahi’ and Europe such as ‘Ascolana’, ‘Manzanilla’, and ‘Picholine’. Recently, the Lebanese Agricultural Research Institute is testing additional foreign cultivars such as ‘Frantoio’, ‘Leccino’ and ‘Pendolino’.

IMPACT ON ECONOMY AND ENVIRONMENT

Olive and oil production in Lebanon represents a common and traditional business that is mostly run by families in rural areas. The total fruit production is estimated at 80,000 to 170,000 tons per year with 5,300 to 30,400 tons of oil production. The economic value of olive growing is estimated at 176 million USD approximately equivalent to 20% of gross agricultural production.



Lebanon has 492 olive mills and around 36 complementary industries including soap, coal, packaging and composting, that are mainly located in the North, South and in Mount Lebanon. Almost 87% of olive mills use the traditional oil extraction method, while 10% use three-phase decanters and 3% use two-phase decanters. Individuals own around 80% of mills, while only 5% are owned by cooperatives. About 48% of olive mills operate informally without licenses or registrations. In a high season, around 120,000 liters of vegetation water is produced and disposed improperly causing severe negative environmental impacts to soil, water and air. Around 79,000 tons of pomace is produced, mainly used for heating, coal and compost production.

The olive sector employs 10% of the national labor force and is considered crucial for poverty reduction, employment creation, migration reduction, fostering trade growth and protecting rural landscape. It has always been considered as the backbone of the domestic economy in the different areas of Lebanon, especially in the North and South Governorates, including the poorest ones where olive growing provides livelihood for a large numbers of smallholder farmers. Furthermore, it employs thousands of seasonal workers in hand harvesting.

Lebanon's olive oil sector is currently facing significant hardships in the form of high production costs, regional competition and sub-standard quality output, which negatively affects exports to different destinations, including Europe. Furthermore, the sector suffers from lack of proper coordination and management by the main actors in the supply chain.

Olive orchards form an integral part of a diverse land-use system in Lebanon and protect mountainous slopping areas from erosion; however the drawbacks of the processing sector are overwhelming, especially the wastewater effluents from mills, which disturbs natural rivers ecosystems. Therefore, efforts to improve management and treatment are underway, thriving to make it an inexpensive source of biomass inorganic and organic compounds.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Many Lebanese growers incorporate green manure into the soil of their orchards and grow legumes to enrich soil with nitrogen and organic matter, which seems to mitigate alternate bearing. Another correct inherited practice is harvesting table olives by hand to keep their quality intact; the opposite wrong practice is also inherited when the pickers harvest olives for oil by beating the tree with long sticks (Fig. 7), which intensifies the alternate bearing potential.



Fig. 7
Harvesting by stick beating
(Photo by H. Youcef)



Fig. 8
Multiple trunks and
unmanageable height
(Photo by R. Nabbout)

Because of its hardiness and longevity, many Lebanese growers mistakenly believe that the olive tree can resist all kinds of biotic and abiotic stresses. This erroneous belief results in erroneous practices in pruning, fertilization, irrigation and pest and disease management, leading mostly to low productivity and alternate bearing.

Another inherited erroneous practice from centuries, which is gradually disappearing, is the olive propagation by suckers. Irrigation also needs to be improved since many growers, instead of applying new technologies of micro irrigation (sprinkler or drip), still apply furrow irrigation. Improper training of young trees results in multiple trunks and unmanageable forms. Many growers practice pruning without respecting the olive's bushy nature, which results in excessive height of the trees and a denuded basal part (Fig. 8). Another wrong practice is the irrational heavy pruning that was often applied to rejuvenate trees, with the conviction that olive trees withstand any level of pruning.

Another persistent practice is late harvesting in December in many parts of the country. This is based on the wrong conviction that the first rains will improve the oil quantity, yet it does exactly the opposite and intensifies alternation. Some growers still apply old practices that negatively affect the quality of extracted oil, such as collecting olive fruits into bags or mixing fallen fruits with freshly harvested ones.

PROCESSING METHODS OF RAW OLIVES

Pickled olives and olive oil have always played a fundamental role in Lebanese day-to-day life, treasured for generations. Even today, they are still considered essential to the household pantry stock called *moune* "مونة" which normally includes winter supplies and pickles prepared by villagers in autumn.

The first green olive fruits are harvested manually at the end of September and prepared by placing them in layers alternated with coarse salt for eight to ten days. Due to osmosis under this condition, the salt removes the fruit moisture and they become dried like raisins, yet salted. These tasty olives are consumed as the earliest ones in the Lebanese households. The most common processing method of green olive fruits in Lebanon entails splitting or bashing each olive with a stone on a wooden stump or cutting board so as to crack it open. Then the olives are soaked in brine (1 part salt to 10 parts water) for several days, replacing the water every day to remove bitterness. In a later stage the olives are covered with salty water, flavored with a sprig of rosemary, oregano or a tarragon branch with slices of lemon, whole cloves of garlic or even hot capsicum. These pickled olives can be preserved for one year under home conditions. The black table olives are picked

when completely ripened, washed with water and then immersed and kept in a brine of 10-12% sea salt. These can be consumed after six to eight months. Pickled olives are commonly consumed all year round at breakfast accompanying other Lebanese dishes, or mixed with salads and appetizers.

For many centuries olive oil has been extracted by the common method of using a stone mill to crush the olives, followed by pressing the paste between woven mats, using a screw or lever press with weights to apply the pressure needed to extract the oil and water (Fig. 9). It is said that long ago robust men were chosen in each village to manually turn the grinding stone, before horses, donkeys and mules were used for the job. The water-oil two-phase liquid was decanted in a shallow circular limestone basin, then skimming the floating oil from the water to store in large jars (Fig. 10).

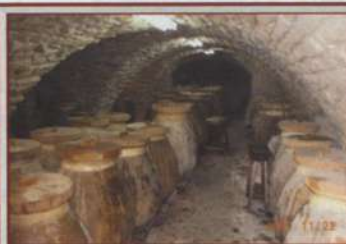


Fig. 9
Stone mill and weight lever press
(Photo by C. El Nakhel)

Fig. 10
Olive oil jars in a storage cellar
(Photo by A.K. Elhajj)

TRADITIONS AND CULTURE

Since old times almost everyone in Lebanon, from city executives to the village growers, has a connection to olives. They either own a couple of trees themselves, or at least their neighbors or relatives do, or they own an immense orchard somewhere in the hills. Lebanese people are proud of having one olive tree at the entry of their residence or building, even in big cities as a symbol of faith, strength and prosperity.

Olive oil has been regarded as sacred for thousands of years. Its spiritual significance is shared by many religions in the Middle East, both past and present.

In the temples of Baalbek in Lebanon's Bekaa Valley, olive oil was offered to the gods at the end of a good harvest, giving thanks. And since Antiquity, olive oil lamps have been used to light temples and later, churches and mosques.

The olive is one of the plants most cited in the Bible, where the dove released by Noah after the Flood came holding in its beak an olive branch after finding a land mass. In Bshaale, a small village in northern Lebanon, inhabitants believe that the massive olive tree on a hill overlooking the village is the oldest in the country and possibly the world (Fig. 11).



Fig. 11
Ancient hollow olive tree
in Bshaale estimated at more
than 1500 years old. It has a
circumference of 20 m

The local legend says that this is the tree from which the dove took the branch to Noah. Of course, this story seems more plausible to those who believe, as many Lebanese do, that Noah eventually died in the Bekaa Valley. Generations of villagers have cherished these ancient survivors and have kept them standing even when their yields had no commercial value. Village children have for centuries played in their hollow trunks and hidden their treasures there.

Even today, the olive plays an important role in Eastern Christianity in Lebanon. During Lebanese Easter celebrations, olive branches are handed out on the last Sunday of Lent in memory of the arrival of Jesus to Jerusalem. Oil is blessed by bishops and then distributed to churches to be used during baptisms and confirmations, ordination of priests and consecration of churches, as well as for anointing the sick and the dying. Pilgrims visiting religious sites like Harissa and Mar Charbel in northern Lebanon take home small bags containing oil-soaked cotton balls, which they give to other family members as a blessing.

During the baptism ceremony, the newborn babies are anointed with oil in the Maronite (Lebanese Catholic) or Roman Catholic ceremony. It signifies entry to a new life. For their part, Greek Orthodox babies get a more comprehensive soaking, being completely covered in oil. If a part of the body is missed, it is said that area will remain weak for the rest of the child's life, as in Greek mythology.

It isn't just Christians who value the olive. In addition to being named as one of the trees growing in Paradise, both the tree and the oil are often mentioned in the Al-Qur'ān "القرآن". Olive oil is a source of divine light to guide men because of its purity. According to some *aḥādīth*¹⁴ "أحاديث" reports by Prophet Muhammad's companions, later followers and tellers Sayyid Al-Ansari, Abdullah bin Umar and Abu Huraira in the compilations book of At-Tirmidhi and Ibn Majah, that the Prophet said: "Eat of the oil (olive oil) and rub your face with, because it comes from a blessed tree". Today, olive branches are used to decorate house doors to welcome back the pilgrims from Mecca and olive oil is given to them as a traditional gift. Even today, many proverbs relevant to olive are still repeated in villages, such as:

- Secure olive oil supply before the house rent • أمن مونة الزيت قبل أجار البيت
- Heat the oil and protect the house • سخن الزيت وإحمى البيت
- No one says about his oil that it is turbid • ما حدا يقول ع زيتة عكر
- The olive tree is known as "the widow tree", implying • شجرة الزيتون تعرف ب
- that it can sustain a widow who cannot tend her orchard • "شجرة الأرملة"
- The olive fruit is also known as the "queen of the table" • ثمرة الزيتون هي "ملكة الطولة"

Valuing olive in Lebanese culture, the national diva Fairuz made her return in 2003 to the festival of Beit El Din with a nostalgic and special song written and

¹⁴ Plural of *hadith* "حديث" which are the recorded sayings of the Islam Prophet Muhammad (May the peace and blessings of Allah be upon him - PBUH)



composed by Ziad Rahbani "Olives Were Different" (كان غير شكل الزيتون), words full of poetry, feelings, sarcasm and poignant despair.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Like Lebanon's Mediterranean neighbors, olives and olive oil are essential in the Lebanese kitchen. The traditional Lebanese breakfast, that will set your day properly, is constituted of some Lebanese flat bread, fresh *Labaneh* "لبنه" (white and creamy strained yoghurt which is the staple of any Lebanese table (see details in the Jordan chapter) with luscious extra virgin olive oil nestled in its fold, green pickled olives with slices of tomato, slivers of English cucumber and fresh mint leaves. Most homes have a bowl of *Za'atar* "زعر" (a mixture of dried wild thyme, sumac and sesame grains) and olive oil at hand for dipping bread. Many villagers commonly eat the *Makdous* "مكدوس" which are tiny, tangy eggplants stuffed with walnuts, red pepper, garlic, olive oil, salt and pepper and conserved for months in olive oil. On all the Lebanese main roads hundreds of bakeries can be found, dedicated mainly to make the *Mankouche* "منقوش", the most popular Lebanese breakfast, which is flat bread topped with olive oil and *Za'atar* "زعر".

Olive oil constitutes the basis of the typical Lebanese kitchen, in both fresh and cooked recipes. There are so many traditional dishes of the Lebanese *Mezze* "مزة"

(Fig. 12) on which olive oil is used exclusively in the dressing sauce like *Hummus Bi Tahini* "حمص بالطحينة" (mashed chick peas – for details refer to Jordan chapter), *Mtabal Baba Ghanouj* "متبل بابا غنوج" (roasted mashed eggplants mixed with yogurt or with *Tahini*), *Tabbouleh* "تبولة" (a mixture of finely chopped parsley, bulgur, mint, tomato and herbs), *Fattouch* "فتوش" (green salad, mixture of tomato, green thyme, fresh mint, parsley, radish,



Fig. 12

An assortment of Lebanese Mezze (from top row down and from left to right) *Fattouch/Hinddbbeh/Moussaka* / *Mtabal Baba Ghanouj* / Chickpeas in oil / *Labaneh* / *Hummus bi Tahini* / Black olives / *Warak Enab Bi Zeit* / *Tabbouleh*
(Photo by Simon Abou Zeid)

cucumber and grilled Lebanese bread). Another typical dish called *Kibbeh Nayeh* "كبة نية" (fresh goat ground meat mixed with burghul, onions, herbs and spices) is served raw and nicely dowsed in olive oil. For the typical cooked recipes, numerous countryside vegetarian dishes are cooked with olive oil such as *Mjadra* "مجذرة" (green lentils boiled with burghul or rice and crispy onion rings), *Loubieh Bi Zeit* "لوبيا بزيت"

(green beans fried then simmered with chopped onion), *Warak Enab Bi Zeit* "ورق عنب بزيت" (grapevine leaves stuffed with rice, chopped onions, tomatoes, parsley, mint, fennel, pepper and lemon juice). A supplement of olive oil is often added cold in the last minute to these cooked dishes, to give a superb taste, flavor and properties.

POPULAR MEDICINAL AND COSMETIC USES

Since old times, Lebanese people have always regarded olive oil as a medicine with multiple virtues. They believe that olive oil cures all kinds of illnesses. That is why healthy or long-lived persons living in olive oil producing villages have always been taken for granted as olive oil consumers. Olive oil alone or mixed with honey and lemon juice, has been used to cure sore throats, colds and mouth fungus. The old tradition of moisturizing and massaging the body of newborn babies after the bath for 40 days is enduring even today. Olive oil is still used to soften the skin and close lesions and wounds, to treat irritations and burns, and to massage the scalp to prevent hair loss. Nowadays, the new trend is to follow the ancient practice of integrating olive oil as an ingredient in many natural body cures.

OLIVES, TOURISM AND LANDSCAPING

Lebanon is known as the "Land of the Olive", symbol of sacred ancient roots, abundance, glory, nobility and peace throughout the rich history of the country. The mild winters and temperate summers of Lebanese mountains are perfectly suited for olive growing. So ubiquitous is the olive tree, from ancient colossi to younger striplings, that it is impossible to imagine Lebanon's countryside without them. Hills, plains and valleys are carpeted with olive orchards, and it would be hard to imagine the country without them, conferring a beautiful and distinguished landscape.



Fig. 13
Church of St. John the Baptist, Byblos
(Photo by B. Hamadeh)



Fig. 14
Monumental tree of Bshaale village

Ancient olive trees are an integral part of each convent and monastery (Fig. 13), from the coastal area to the high mountains. The millenary trees of Bshaale village (1500-2700 years old) were designated as a monument by the Ministry of Tourism (Fig. 14). They are a major attraction for those visiting Lebanon to enjoy its loving history, culture and nostalgia for times past.

More recently, olive trees have been



increasingly used as ornamentals in the yards of mansions and houses, hotels and touristic resorts, schools and universities, rings and edges of roads. Nowadays, old olive trees are frequently seen on the sides of the highways hollowed out from their original place and prepared in large containers to be sold for landscaping (Fig. 15).



Fig. 15

Old olive trees hollowed from their original places, prepared for a new home in landscaping
(Photo by J. El Chemali) *(Photo by A.K. Elhajj)*

OLIVE WOOD AND BY-PRODUCTS USES

Olive wood in Lebanon has been always used in handicraft works and industry. Some special symbols such as church altar and treasury to save the communion cup are made of olive wood (Fig. 16). Old traditional houses of the last centuries were made from mud, while ceilings, doors, windows and fixtures were made of olive wood from annual tree pruning (Fig. 17). Fragmented trunks were used as antique benches and seats. In the old agricultural practices, olive wood was also used to fabricate solid handles for agricultural tools such as hoes. More recently, olive wood is used in the manufacture of artwork (Fig. 18).



Fig. 16

Church treasury
(Photo by C. El Nakhel)



Fig. 17

House ceiling made of olive wood
(Photo by C. El Nakhel)



Fig. 18

Artwork from olive wood
(Photo by J. El Chemali)

Also the trend of olive wood kitchen utensils as replica of ancient fashion is currently practiced (Fig. 19, next pg.). The traditional soap production industry, which

originated in Tripoli and expanded to other towns like Qualamoun, Saida, Batroun, Naameh, Baalback and Kfaraaka, relies mainly to olive oil (Fig. 19). Pomace from olive mills is mainly used for heating and coal production and composting.



Fig. 19

Lebanese Kitchen utensils and souvenirs made of olive wood
(Photo by C. El Nakhel)

(Photo by J. El Chemali)

Colorful olive oil soap
(Photo by F. Dandachi)

ACKNOWLEDGEMENTS

The author thanks Dr. A. Seif at the Directorate General of Antiquities and Mr. C. Zarzour from the Ministry of Agriculture for their critical reading of some parts of this manuscript.

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INTRODUCTION

Libya is a country in the African Maghreb region in the southern coast of the Mediterranean Sea laying between 19° and 34° N latitudes and 9° and 26° E longitudes (Fig. 1). It is bounded in the north by the Mediterranean sea, Egypt to the east, Sudan to the south-east, Chad and Niger to the south, and Algeria and Tunisia to the west. With an area of 1,759,541 km² Libya is the third largest country in Africa with a population of 5,670,688 people. At 1,770 km, Libya's coastline is the longest of any African country bordering the Mediterranean.

Libya forms part of the North African plateau extending from the Atlantic Ocean to the Red Sea. The highest point is Bikku Bitti, or Bette Peak with 2,267 m above sea level in the extreme south. There are few depressions in the south-west extending from east to west where many oases and artesian wells are located and where olive trees are relying on irrigation. On the basis of height above sea level, climate, soil quality and rainfall, the country is divided into five ecological regions as follows: the coastal plains, northern mountains areas, the semi-desert areas, the desert areas, and the southern mountainous ones.

Its climate is mostly hot and dry and desert like in nature. However, the northern regions enjoy a milder Mediterranean climate with less impact further south from the coast. There is a big climatic variation among the ecological regions; moderate with high humidity in the coastal areas with winds blowing during the summer and autumn and average yearly temperatures ranging between 23 and 25° C, while in semi-desert areas it is 24-25° C and up to more than 30° C in desert areas.



Fig. 1
Olive growing areas in Libya

There are no real rivers in the country and annual rainfall is extremely low, with about 93% of the land surface receiving less than 100 mm/year. The average rainfall in coastal areas ranges between 150 to 400 mm/year, and up to 600 mm/year in some areas in the east of the country. Moving south from the coastal belt, the gradient of rainfall decreases gradually; and the Sahara receives less than 50 mm/year. The *ghibli* is a hot, dry desert wind which can change temperatures by 17–22° C in both summer and winter. The agricultural areas receiving more than 300 mm/year are 220,000 ha, those getting up to 250 mm/year are 2.2 million ha, while areas receiving 50 to 200 mm/year are about 13 to 14 million ha.

The total agricultural land is about 3.64 million ha, representing about 2% of the total area of the country, including 470,000 ha under irrigation. Some 358,000 ha of Libyan territory are classified as "forest", but almost all of this land could more properly be called *maquis*¹⁵. The cultivable area of Libya is estimated at about 2.2 million ha, with 1.8 million ha for annual crops (cereals, fodder crops, potatoes and tomatoes and other vegetables) and 0.3 million ha for perennial crops (dates, olives, citrus, apples, etc.); in addition to 13.3 million ha of permanent pastures.

OLIVE CULTIVATION HISTORY

Cyrenaica, the western part of Libya was colonized by the Greeks beginning in the 7th century BC and the region produced barley, wheat, olive oil, wine, and figs among others. Princess Elyssa from Tyre (Phoenicia, now Lebanon) had established the State of Carthage (814 BC) and extended her influence reaching out to commercial centers of the Balearic Islands in Spain to the west and to others in the mid-west Gulf of Sirt to the east. Leptis Magna, present Tripoli was also founded by Phoenicians around 1100 BC, becoming an important city under Carthage and Roman domination. To its far west millions of olive trees were cultivated. The era of the oil industry and oil export flourished so that Leptis Magna contributed part of the tribute to Rome in the amount of three million dinars in the form of olive oil in the 4th century.

Excavation carried out by Cowper (1897) brought to light the archaeological importance of the Tarhuna Region (some 80 km to the south-west of Tripoli) as a zone of intensive olive-cultivation during the classical period. Later, Oates (1953) extended his work from the 1st to the 5th century AD; the Oates' sites consisted for the most part of varying size of farms, which represented the key to the regional specialization in oil production by 130 ruined olive presses.

¹⁵ *Maquis*, plural *maquis*, a scrubland vegetation of the Mediterranean region, composed primarily of leathery, broad-leaved evergreen shrubs or small trees. Garigue, or garrigue, a poorer version of this vegetation, is found in areas with a thin, rocky soil. *Maquis* occurs primarily on the lower slopes of mountains bordering the Mediterranean Sea. Many of the shrubs are aromatic, such as mints, laurels, and myrtles. Olives, figs, and other small trees are scattered throughout the area and often form open forests if undisturbed by humans



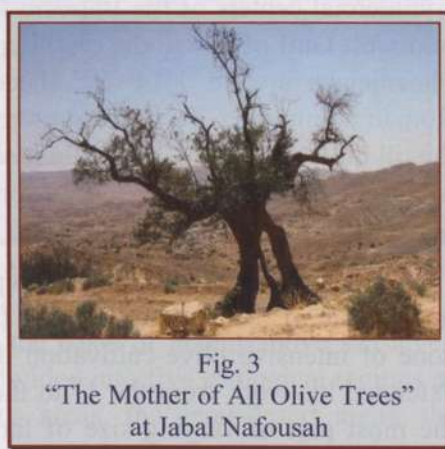
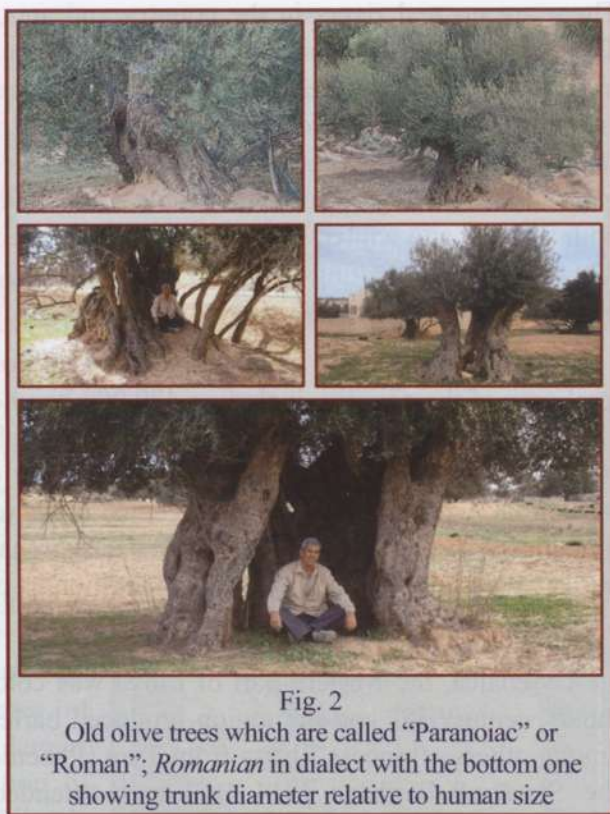
The antiquity of olive growing is also witnessed by the presence of very old olive trees. It is difficult to estimate their lifetime but the study of growth rings indicate an age going to even 3000 years. Such old trees can still be found in abundance in areas surrounding Gharyan, Msillata and El-Gabal El Akhda (the green mountain). Locals in these regions call these trees as the “Paranoiac olive trees” implying their depth into history and also with another name as the Roman trees -*Romanian* in dialect; possibly indicating their planting to the Roman era (Fig. 2).

There is an old tree at Jabal Nafusah which might not be as old, however locals call it “The Mother of All Olive Trees” as it stands alone by itself on the mountain emptiness at an altitude of nearly 700 m above sea level, losing most of its foliage in years of drought, however have been always surviving for the next rain (Fig. 3).

The historiographer Mikhail Ivanovich Rostovtzeff (1870-1952) mentioned that olive oil, fruits and wine are the main products of the cities of Libya; the coast of Africa in ancient Phoenician times was a big spacious garden. It is supported by direct evidence; but there is also indirect evidence in the famous agricultural book of the Carthaginian era, authored by Magon.

AREA UNDER OLIVE CULTIVATION

In spite of its vast territory, Libya accommodates only a small number of olive trees when compared with other countries in North Africa to the west, where the rate of rainfall in some localities is almost triple that of Libya. The majority of these trees are spreading along the narrow Mediterranean coastal plains and mountainous



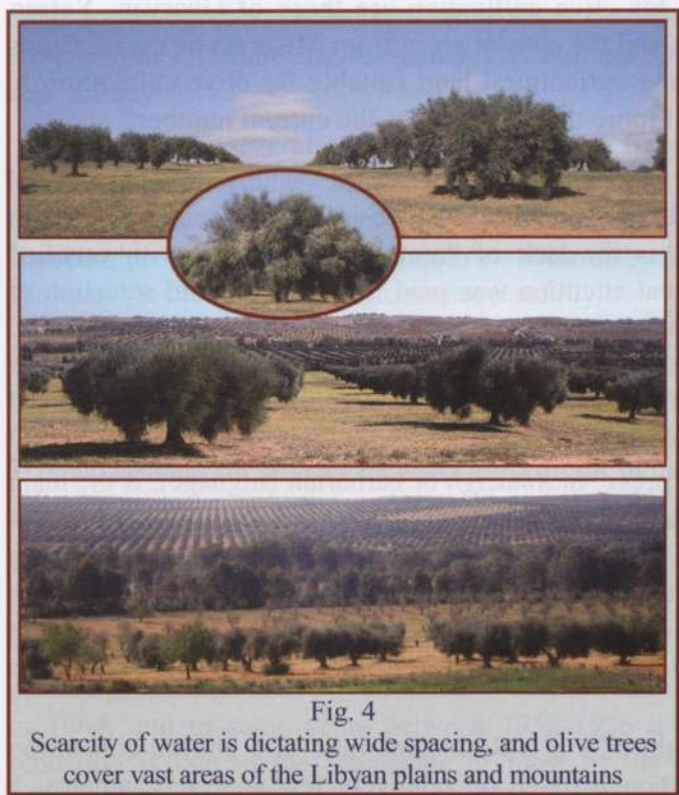


Fig. 4

Scarcity of water is dictating wide spacing, and olive trees cover vast areas of the Libyan plains and mountains

olives/year, which yielded between 33,000 and 37,000 tons of olive oil/year that was considered very low when compared with neighboring olive-producing countries.

From 2007 to 2010 the number of planted trees increased to reach 11 million. This increase both in numbers and density reaching 100 trees/ha came as a result

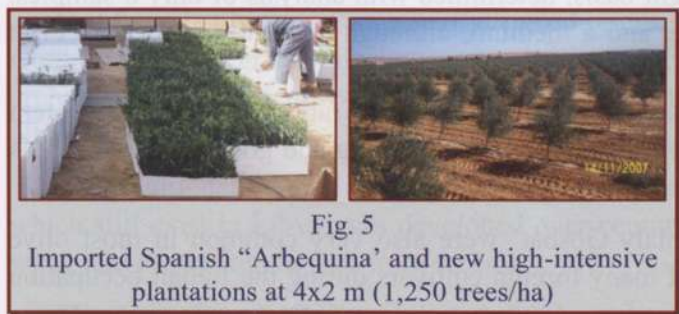


Fig. 5

Imported Spanish ‘Arbequina’ and new high-intensive plantations at 4x2 m (1,250 trees/ha)

nursery trees of ‘Arbequina’ imported from Spain (Fig. 5).

A picture of olive plantations during the 1950’s (Mazzochi) shows that the density was very low at around 20 trees/ha. The olive area at that time was about 170,000 ha dedicated for oil production which ranged from as low as 1,700 tons to as much as 15,000 tons of olive oil/year during the period of 1951 to 1959.

western areas where the climatic conditions are suitable for their growth. On the other hand, no olive trees exist on the coastal plains of the Gulf of Sirt, the lowest point of the southern shores of the Mediterranean where annual rainfall is at its minimum. The number of olive trees have increased from nearly half a million in 1932 to 8.6 million in 2000, and to 10 million trees in 2007 covering an area slightly more than 100,000 ha with an average density of 86 trees/ha on wide spacing being suitable for rain-fed conditions (Fig. 4). They produced on average 170,000 tons of

of many factors, among which is the increase of olive oil prices after 2005, which motivated farmers to plant new orchards. A few of these orchards were planted using drip irrigation, following the new trend of super-intensive system with

The most important areas for olive cultivation are those of Gharyan, Yefran Mountains, Tarhunah, Msillata and the coastal areas from Misurata to Zwaren Cities (Fig. 1, page 222). However, the agricultural land suitable for olive cultivation in Libya permits the cultivation of more than three times the current number.

OLIVE CULTIVARS

Table or dual purpose cultivars are the most desired by farmers. The main problem of the plant material is the lack of "mother plantations" with certified identification. In the 1960's great attention was paid to evaluation and selection of local cultivars following recommendations of experts from the Food and Agriculture Organization of the United Nations (FAO); however the process was not performed on all available cultivars. Following are some of the important local cultivars:

'Endory' or **'Induri'** (the "press" in *Amazigh* or barbarian language), is the main olive cultivar. According to Mazzochi it has several synonyms, like 'Gargashi', 'Jabbugi', 'Kruzi', and 'Shemlali', different from 'Chemlali of Sfax'. This cultivar has a small fruit size, 0.9 g, a flesh/stone ratio of around 4 and an oil content of 22.2% on fresh weight basis. It produces well, although alternating, with fruits arranged in clusters and is harvested from late November onwards. The fruits do not easily drop from the tree.

'Raghiani' has a fruit weight of 1 g, a flesh/stone ratio of 5 and oil content on fresh weight basis of 16%, although based on relatively few analyzed samples; 5 against 28 in 'Endory'. It is also productive and alternate bearing, very late in onset of bearing and very susceptible to olive knot (*Pseudomonas savastanoi* sbsp. *savastanoi*). Fruits tend to drop naturally.

'Rasli' has a fruit size of 1.6 g, a flesh/stone ratio of around 3.7 and an oil content of 24.8% on fresh weight basis, determined with analysis of only 8 samples. It has an early onset of bearing and a medium, although constant production. Fruit matures early.

'Hammudi' shows a fruit size of 2.2 g, a flesh/stone ratio of 4.4 and oil content of 25.3%. It is characterized by very early onset of bearing and good production. It is an early maturing cultivar.

'Shemlali Sfax' and 'Shemlali Gosbat' were also very common in most olive areas before the introduction of many foreign cultivars during the Italian occupation of Libya (1911-1951).

In the 1940's and 1950's many foreign cultivars were introduced, especially from Italy, and planted as organized orchards that widely exceeded the experimental stage with good production. Some were grown successfully in modern olive plantations, forming the bulk of trees producing at the present time in most olive growing areas. The main cultivars are 'Frantoio' and 'Coratina'. Currently more than twenty



cultivars are grown, including 'Moraiolo', 'Coratina', 'Mignolo' and 'Maurino'. Others from different origin, mainly Tunisia, are 'Ouslati', 'Hammody', 'Amboty' and 'Zarazy'.

Furthermore, several cultivars, mainly from Italy, have been planted for local-level adaptation studies in research farms at Alkhathra in Tarhunah, Jaliliah in Garian, and Soffit in Yefran. They were 'Cellina', 'Caninese', 'Gagnano', 'Krusi', 'Leccino', 'Morchiaio', 'Moraiolo', 'Oliardo', 'Rosciola', 'Tombarella' and 'Zalmati'; some of them are grown successfully.

IMPACT ON ECONOMY AND ENVIRONMENT

Agriculture contributes about 9% of gross domestic product of Libya and provides employment for about 5% of the total economically active population. Women account for 67% of the labor force in the agricultural sector.

Libya occupies the 10th place worldwide in the production of olive oil, and occupies the 4th place among African countries; with a production rate of 12% of oil production in the African countries.

The average olive oil consumption in Libya is 30,000 tons, while the domestic present production does not exceed 24,000 tons, although it had reached 71,000 tons in 1964; and in some years between 1952-1956 it went up to 79,000 tons. This reduction is due to the reluctance of most of the people to work in agriculture following the discovery of crude oil in 1959 and the fast development of this industry, which offers much better wages. There are also other factors contributing to low olive production including migration to urban areas, the low productivity of elderly trees and the spread of pests and diseases, which destroys 30-60% of the total annual production.

Had there not been an increase of olive oil prices in 2005, the Libyan olive sector would have seen greater decline in production. The boom in planting more olive orchards has slowed down in the last 3-4 years, influenced by the sharp fall in international prices.

The traditional method of olive farming in highlands by building stone terraces, which still exist in Libya, was developed over centuries as a way of harvesting rain water and protecting the soil from erosion.

There are about 210 olive mills spread throughout the country, of which 142 are of the continuous system and 68 of the traditional press type.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Most erroneous inherited practices are related to fruit harvesting and post-harvest handling. The olive fruits suffer damages followed by fermentation prior to pressing due to the long sticks used to hit the branches for harvesting. Furthermore this method



results in weakening the trees due to loss of large vegetation volume from falling twigs and leaves, thus intensifying the alternate bearing cycle. Wounding the branches and shoots from beating contributes to the spread of viral and bacterial diseases.

The so-called process of “Heaping Olives” (Fig. 6) is the accumulation of olive fruits in piles around the mill, exposed to the environment for up to one month before being processed. It results in poor quality olive oil due to fermentation and growth of moulds. During the prolonged storage period, the olive fruits lose much of their oil as well as their moisture content; yet farmers sadly believe that they are getting higher oil crops. They take as evidence that a bushel of heaped olives gives a greater oil quantity than the same bushel of non-heaped olives, forgetting that the heaped olives have shrunk because of moisture loss. Other wrong post-harvest practices implemented by some growers and processors are shown collectively in figure 7.



Fig. 6
“Heaping olives”. Within few days these piles will grow considerably



Fig. 7

Erroneous practices related to processing: 1- Late harvest of overripe fruits, 2- Delivering olives in bags and leaving it for days to be processed (bags are soaking water and oil on the ground), 3- Storing the oil in plastic containers for domestic use, 4- and 5- Storing and handling of olive oil using galvanized steel

On the other hand Libyan olive growers possess profound experience in rejuvenating old olive trees either by pruning and reducing the wood volume of the main scaffold structure or by training suckers to replace ageing trees (Fig. 8).

Organic farming is a new system for agricultural production to avoid the use of chemical and synthetic fertilizers. In Gherian region at El-Gabal El-Gharby's Highland a trial with 'Endory', 'Frantoio', 'Shemlaly' and 'Zafaraney' was done using manure from camel, sheep and chicken. Olive trees when fertilized with organic manure gave the higher leaf content of a and b chlorophylls, N, P, K, Ca, Mg, Fe, Zn and Mn, and produced increased numbers of inflorescences per shoot and flowers per inflorescence. Local trials proved that organic fertilization maintains

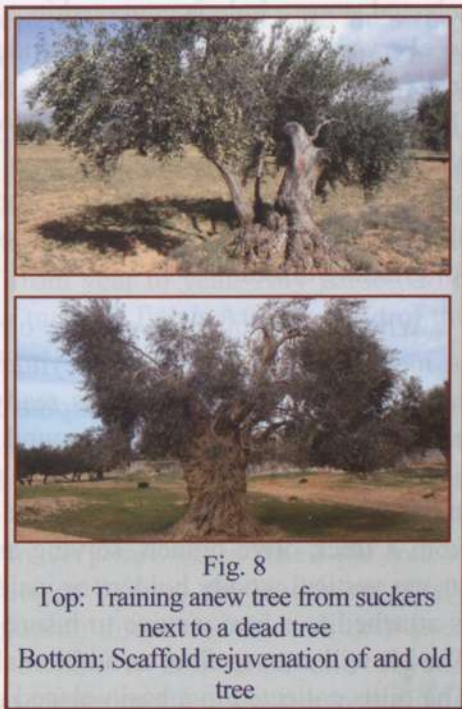
adequate mineral content in the leaves during growth cycles and increases the percentage of fruit set, improving yields. Furthermore it has been noticed that the natural fruit drop phenomenon during stone lignification and ripening is minimized and that oil properties are also improved. Organic virgin olive oil was of superior quality compared to the conventional virgin olive oil, i.e. lower acidity value, lower peroxide index, higher stability and higher organoleptic scoring (Fayed, 2010). Therefore, camel, sheep and chicken manures are recommended for olive cultivation in sandy soil under arid and semi-arid conditions, where water resources are limited.

PROCESSING METHODS OF RAW OLIVES

The preparation of pickled or salted olives in the Libyan home was known since ancient times. Normally large sized fruits are chosen for this purpose to enjoy their pickles with popular dishes as appetizers.

Traditional processing methods vary with the color of fruits and their degree of maturity. Salting with sodium chloride is used for ripe black olives, while for green immature olives a relatively complex method is followed. It uses vinegar and lemon juice, and sometimes caustic soda for speeding up the fermentation process.

There are two main traditional methods for the extraction of olive oil since ancient times. For the small household quantity a relatively smooth and heavy stone is used for crushing the olives. The stone is normally obtained from valleys where it has been smoothed by the pressure of rapidly moving water. Matching the size of the



selected stone a hole is engraved in a big rock conveniently placed within the village so everyone can have access to produce his own olive oil. A small amount of olive fruits is placed in the concave rock and the stone is then rolled over them manually (Fig. 9, left). Once the olives turn into a well ground paste, it is placed in a big pot of water so that the oil being lighter will float on the surface to be skimmed. The oil obtained this way normally has a wonderful taste, as long as the fruits are harvested at the right ripening stage and processed without delay using a huge cylindrical rock for grinding olives.

When a large quantity of olive oil is needed, the olives are placed in a large rock or metal basin in which large cylindrical stones are spun by animal force, usually camels. When the oily paste is ready for pressing, it is placed in small quantities inside numerous *Alshawami*, a round disk made of hard plant fibers with a diameter of nearly 70 cm (Fig. 9, right). The *Alshawami(s)* are piled one on top of the other under the primitive pressing machine (Fig. 9, middle), which is a woody post made from a thick olive branch, serving as a lever. One end of that post is fixed inside strong vertical woody holders or inside a cavity of a rocky wall, while the other end is attached to a heavy stone to insure the desired pressure on the pile of *Alshawami*. The oil will start to flow as additional stone weight is applied at the end of the pole. The oil is collected in a basin placed underneath the press. Many of these presses are still found in the mountains caves or in stone buildings.

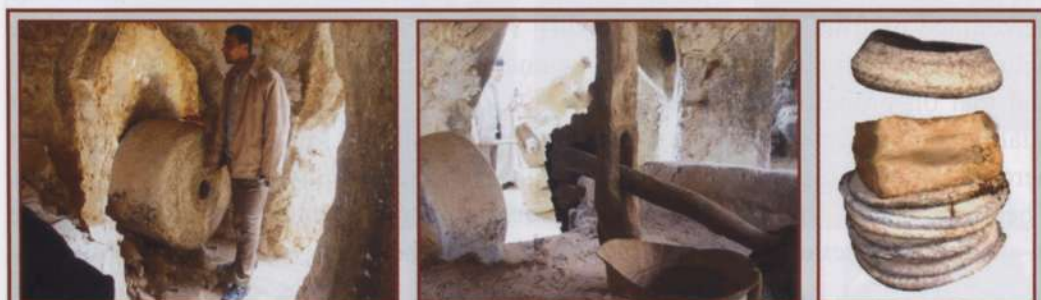


Fig. 9

Left: A huge cylindrical rock used for grinding olives
Middle: A primitive old lever press made of olive wood, Right: *Alshawami(s)*

TRADITIONS AND CULTURE

The tight relationship existing from time immemorial between the olive tree and the inhabitants of the Western Mountains, which lives up to the point of holiness; developing customs and social habits. For example in this region even olive owners cannot determine the dates of olive harvest; this is done by *Arrabti*, a person of the tribe elders entrusted to guarding the trees in the forest. The *Arrabti* is the one who announces, in the mosque of the village, the start of the olive harvest season, determining when and where olives will be picked. Following his announcement a large number of the tribe members gather to

harvest the fruits in a certain orchard as directed by the *Arrabti*, and then they move to the next orchard and so on, only following his directions. It is astonishing how the directions and orders of the *Arrabti* are spread to the surrounding villages by women and children inviting all to share in the ceremonial event of olives harvesting. Young children to take part in harvesting having fun with each other while men are harvesting with harvesting poles and ladders and women picking up falling fruits and preparing meals for the harvest crew in a memorable event that repeats itself from year to year. Any person who contravenes the rules developed by the *Arrabti* must be fined. After the end of the season the *Arrabti* is paid a share of the production from every olive grower.

In this region olive properties are mixed uniquely in a regime which exists nowhere else. The land is owned by a person other than the owner of the olive tree; custom sets a dependency area of land under the tree limited by the area shadowed by the tree canopy during mid-day to the owner of the olive tree. This area is not used except for serving the tree. In very rare cases when the tree is uprooted for any reason or it dies, the land returns back to the landowner. Only when the roots sprout with new suckers, developing into a tree does its dedicated area remain in the possession of the tree owner. It is strange and beyond imagination that this thorny situation does not create problems between the land and the tree owners, both respecting the rules which do not apply to any other type of fruit trees.

During harvesting season the conventional village shops open to buy olive fruits at a fixed price from growers or from young children who pick their tiny share of fruits from left-overs on the ground or from the very few branches that owners of the tress leave unpicked, calling them "the share of birds and children". In fact lucky children make fortunes from selling the fruits they harvest or pick this way. This deliberately induced custom is part of the community method of raising children with a love for olive trees.

The poor people also expect their share of the olive crop in the form of *Zakat* (a 2.5% portion of anybody's wealth or annual income which Islam inflicts as donation to the poor). Frequently during the olive harvest period the *beddal*, who is a travelling grocer, visits the village two or three days a week on average, loaded with goods needed by the women and children, exchanging them for olives, which he sells to olive mills.

The landowners in the region adopt a conventional method, called *almagarsa*, to plant their lands with olive trees. This social solidarity system requires the landowner and the investor to authenticate an agreement that permits the investor to plant a certain area with olive trees, taking care of them for years until the onset of bearing, and then the ownership of that area of land will be shared in halves between the original land owner and the investor.



The word olive is repeated in holy book of Islam Al-Qur'ān seven times, indicating the great reverence toward the olive tree. The famous verse 35 of Surat (Chapter-24) An-Nur (The Light) clarifies this fact (ref. page 55 and 290).

Many of the proverbs contain the impact of olive oil mentioned in this verse. Such proverbs indicate the importance of olive oil and its relationship with healthy food and medication. Some of these proverbs are given below:

- Wait for me O Ali with your lunch until oil comes from Gheryan, it implies the disappointment about the lack of a desired thing which is unreachable.
- When it comes to olive oil, I bet you can eat *fitoura* (it is the solid residues from the pressing of olive fruits which is used only as fuel for bakeries or is mixed with animal feed). The proverb means that even the *fitoura* which cannot be considered as food commodity can still be eaten only for its content of olive oil. In fact it implies that even a bad person should be treated well just as a courtesy and for the sake of his good relatives.
- If the water goes to the nabk tree, the olive tree is worthier for it. It means that if the flood waters irrigate the bad trees it is better to irrigate the good trees, i.e., the benefits should go to those who deserve it.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olive oil is the main ingredient of nearly any dish or meal in Libya. It is almost impossible to cook or prepare any Libyan food without it. Its use in North Africa goes back thousands of years, and its healing goodness and life-prolonging properties were well known to the ancient Libyans. Offering of the olive branch to the Oracle of the God Amon at the Egyptian Siwa Oasis indicates its sacred nature and antiquity. Processed table olives are mainly used as appetizers with traditional foods as *kooskoos*, macaroni, rice, and in sandwiches. Olive oil is used in the Libyan traditional food, in cooked meals, as well as in sandwiches and popular dishes known locally as *zommita* and *besisa*. It is also mixed with putty of dates and with dry figs having a delicious taste. The Libyan lady will not be able to prepare any dish in the absence of olive oil. Following are two Libyan recipes using olives and olive oil:

➤ Tajine Sfinari (Libyan Lamb Casserole with Carrots and Green Olives) (Fig. 10):

Ingredients for 6 persons: 1 kg veal or lean lamb (deboned and diced into bite size pieces), Bone or 1 liter stock, 1 kg carrots sliced diagonally, 1 medium onion, chopped, 1 teaspoon freshly grated ginger (or ground ginger), 2 cinnamon sticks, 2 teaspoons caraway seeds, salt and pepper to taste, a handful of good quality pitted green olives, 1 heaped teaspoon of *harissa*, olive oil, juice of 1 lemon, 1 cup chopped parsley.

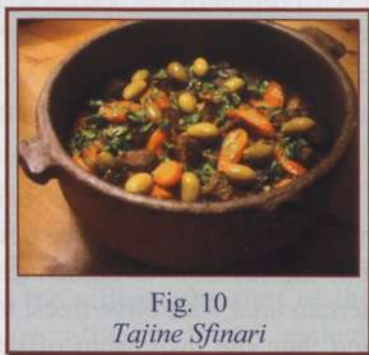


Fig. 10
Tajine Sfinari

Method: Place the onion and spices in the pan with olive oil, and stir on medium heat. Add the diced lamb or veal and stir occasionally until it is evenly browned. Add about one liter water and a bone, or cook in stock. Cover and leave to cook at medium heat until the meat is just done, at this point the stock should be reduced to about half the amount. Remove the meat from the pot with a slotted spoon and place in an ovenproof dish, cover it with the cooking liquid after straining it through a sieve. Add carrots sliced at an angle to the meat and broth, cover tightly with foil or your ovenproof pot lid, and place in the oven for about 45 minutes at 250° C. Add a teaspoonful of *harissa*, and mix it in the sauce. Scatter olives on top and place the *tajin* in the oven for about 10 minutes without a cover. When some of the sauce has evaporated and the lamb has browned slightly, remove from the oven. Don't let it dry out! Add the fresh lemon juice over the *Tajin* and drizzle generously with olive oil, then garnish with chopped parsley. Eat with warm Arabic bread to soak up the sauce.

➤ **Libyan Olive Salad**

Ingredients: 200 g black olives, 200 g green olives, juice of 1 lemon, 2 tablespoon parsley, chopped, 1 teaspoon paprika, 1/4 teaspoon chili powder, 1 garlic clove, crushed, 1/2 teaspoon ground cumin, 2 tablespoon olive oil.

Method: Mix the oil with the cumin, chili powder, paprika, garlic and lemon juice. Add the olives to the bowl and stir to ensure that they are evenly coated with the dressing. Chill the salad in the fridge and serve. This can be used as either an accompaniment or as one dish in the traditional North African selection of starters or mezzes.

POPULAR MEDICINAL AND COSMETIC USES

Libyans customarily use olive oil in popular medicine for the treatment of many diseases such as sore throat, colds, ear infections, treatment of cracked skin, reducing blood pressure, stiffness of joints, etc. It is also used to smooth the hair and individual facial wrinkles. Elderly people and the owners of popular medicinal care facilities treasure a lot of traditional prescriptions using olive oil on its own or as a main ingredient in the composition of popular medicine. Recently many people started to use boiled olive leaves in water for the control of blood pressure, and as a tonic for gum health.

OLIVES AND TOURISM

Large old olive orchards in mountainous regions having attractive landscape scenes are open to visitors and some offer shows of the local traditions in song and dance, making these regions attractive to tourists.

OLIVE WOOD AND BY-PRODUCTS USES

Olive wood is hard and used in the manufacture of many items for daily use, such as sticks, holders of knives, sickles, axes, shovels, mowers, handles of kitchen



utensils, doors, windows, locks, woody keys, bowls, plates, cups, vases, spoons, plows, boxes, shelves, cupboards, and recently utensils and gifts (Fig. 11). In addition, olive wood is used for ceilings of houses and buildings, wooden stairs in traditional private stores, and used as fuel for cooking



Fig. 11
Different items made of olive wood. Item 1 is a spinning spindle

Olive leaves after drying are stored to be used for animal nutrition in dry or winter seasons. It is also used in the stoves as fuel for the preparation of bread. The dry residues resulting from oil pressing, called *fitoura*, is used as a good fuel for furnaces and ovens. It is also used as a mixture with nutrients for animal feed. Recently, studies proved that it can be used as a fertilizer for poor soils if added at certain rates. The low-grade oil extracted from the liquid residue of olive pressing, the so called *morjeen* by locals, is used in manufacturing soaps and shampoos.

ACKNOWLEDGEMENTS

The authors would like to extend their sincere thanks and appreciation to all members of the Editorial Board: Damiano Avanzato, Juan M. Cabellero, Kostas S. Chartzoulakis, Facundo Vita Serman and Mohamed El-Kholy for their help extended to us, guidance and revisions of the original manuscript. Without their help this chapter would have not been developed to its present shape.

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Natasha Farrugia¹ natasha.a.farrugia@gov.mt,

Mary-Anne Bonello², Jeanette Borg³, Matty Cremona⁴, Nadia Theuma⁵

¹Oleiculture Unit, Agriculture Directorate Ministry for Resources and Rural Affairs

²Agriculture Directorate, Ministry for Resources and Rural Affairs

³Merill Eco Tours - Malta, ⁴Food Journalist, Researcher and Author

⁵Institute for Tourism, Travel and Culture, University of Malta



INTRODUCTION



The Republic of Malta (Fig. 1) is a Southern European archipelago situated in the heart of the Mediterranean Sea, consisting of seven small islands only three of which are inhabited, and these are the main Islands of Malta, Gozo and Kemma. Malta lies within co-ordinates 35° 50' North and 14° 35' East, 93 km south of Sicily and 288 km east of Tunisia, with the Strait of Gibraltar 1,826 km to the west, and Alexandria 1,510 km to the east.

The land area of about 320 km² is populated by nearly 413,000 people with a density of 1,282 inhabitants/km². Although the agricultural sector in Malta has a low economic contribution, it is considered to be of great importance. Maltese agriculture, in which only elders and a small number of youth are involved, faces certain

constraints. Among them is the serious land fragmentation caused by splitting the land when the land is passed from one generation to the next through inheritance.

According to the Farm Structure Survey carried out in 2007, the total utilized agricultural area (UAA) in the Maltese Islands amounted to 10,326 ha, unutilized agricultural land amounted to 138 ha and other land including typical *garigue*¹⁶ areas amounted to 1,213 ha. *Garigue* areas have an important agricultural role, as the typical wild thyme (*Thymus capitatus*), found growing in these areas, is the most important species for the production of honey. Agricultural land is highly fragmented over approximately 12,000 holdings with an average size of 0.85 ha; 80% of which have an area less than one ha. Maltese agriculture is characterized by small scattered land

¹⁶ A low open scrubland with many evergreen shrubs, low trees, aromatic herbs, and bunchgrasses found in poor or dry soil in the Mediterranean region.

parcels. Interestingly kitchen gardens cover 986 ha representing 9.5% of the UAA, while fruit trees cover 1,322 ha with nearly 12.8% (0.9% olive, 0.9% citrus, 7% vineyards and 4% other fruit trees). Nearly 7% is fallow land and the remaining 70.7% is used for the production of potatoes, vegetables, forage, flowers and seeds.

OLIVE CULTIVATION HISTORY

For many centuries, the Maltese Islands were ruled by the dominant power of the time. It is almost certain that the olive tree was brought to Malta by the Phoenician traders who travelled widely around the Mediterranean Sea and its cultivation was extended by the Romans.

Some of the most ancient monuments in Malta are the oldest free-standing temples in the world (even older than the pyramids) and among the oldest of these monuments, traces of the olive story in Malta appear. A distinct layer of charcoal discovered during excavations at Skorba temples, considered as one of the most exciting Neolithic sites dating back to 4500-4100 BC, revealed the carbonized remains of several tree species, one of which was *Olea europaea* (Olive). More interestingly, tests carried out at the Royal Botanical Kew Gardens by Dr. C. R. Metcalf reveal that although "It is quite impossible to distinguish wild from cultivated material of this kind from microscopical characters, the samples came from the destruction level of the temple, and must represent the timberwork of its roof. The implication is that they were from well-grown olive trees, not from wild scrub olive."¹⁷ This evidence implies early olive cultivation; however, whether the trees were grown for their fruits or for oil, given that extraction means were discovered at that time, would possibly forever remain shrouded in mystery. The only certainty is that olive trees were present in Malta for millennia.

Archaeological excavations have led to the discovery of sites from the Roman period, bearing the first clear-cut evidence of olive oil production in Malta. One of the more extensively excavated Roman villas at San Pawl Milqi, was in use until the end of the Byzantine Period. Several *trapetum*¹⁸ (Fig. 2) discovered here and still found today, revealed that this villa was used as a country house and center for olive oil



Fig. 2
Trapetum at San Pawl Milqi

¹⁷Prospero's Cell, a nonfiction book by Lawrence Durrell.

¹⁸Huge olive oil stone mill where the fruits were crushed to an oily paste. Such mills consisted of two stones or hemispherical wheels (*orbis*) suspended on a base stone shaped like a mortar (*mortarium*). The wheels, in addition to their circular movement, could turn in on themselves, thus creating the effect of crushing or grinding the olives. The distance between the wheels and the mortar was adjustable; thus there was the option to select the type of grinding, with or without crushing the olive stones.

production. A similar site, not so well known, is found at Zejtun, a village which takes its name from the Sicilian Arabic for olive, *zaytun*.

When the Arabs occupied Malta, from 870 to 1090 AD, they introduced the cultivation of citrus and cotton, which was a successful cash crop, to the detriment of the slow maturing olive tree, and the money made from cotton exports was used to import vital grain and other food supplies. Cotton was more practical; it was planted and harvested, either leaving nothing behind in the empty fields, or allowing for the cultivation of another crop, unlike olive trees which were permanent and needed care and protection.

Many olive trees were also cut down for ship-building without being replaced. Despite all this, several villages and towns, named during the Arab period, indicate that Malta was synonymous with the growth and production of olive trees. These include Birzebbuga meaning the well of olives, Haz-Zebbug meaning an olive village, Ghajn Zejtuna meaning the spring of olive oil, Bir id-deheb meaning the well of gold (as olive oil was referred to as liquid gold), and Iz-Zejtun meaning the cultivated olive for oil production.

By the 16th century, olive trees were again plentiful, so much that “The olive orchards furnished the oil which was a useful article of commerce and was carried to Spain and there exchanged for silver”¹⁹. In the last half of the sixteenth century there was a large demand for cotton from Spain with the result that around 80,000 olive trees were chopped down.

AREA UNDER OLIVE CULTIVATION



Fig. 3
Typical olive orchard

The cultivation of olive trees in Malta is distributed all over the three main Islands of Malta, Gozo and Kemmuna (Fig. 1, page 235). Many of the trees contributing to the local olive growing area are scattered, used as wind-breaks, or mixed with other fruit trees. The main reason for the irregular distribution is due to the typical size of Maltese agricultural land parcels, which are small and fragmented, often separated by typical stone “rubble”

walls. The recent re-establishment of the olive industry led to planting olive trees in orchards, starting from as little as 0.1 ha with a mean planting density of 300 to 400 trees/ha (Fig. 3). The area under olive trees in 2010 amounted to 138 ha.

¹⁹ Cultivation and Diseases of Fruit Trees in the Maltese Islands by J. Borg MA MD.

OLIVE CULTIVARS

With the re-establishment of the olive industry in the late 1990's, international cultivars were introduced, mainly originating from Spain and Italy. The most common include 'Frantoio', 'Leccino', 'Carolea', 'Pendolino' and 'Cipressino' for oil and 'Uova di Piccione' and 'Bella di Spagna' for table. In order to study their adaptability to the local environment, the Agricultural Directorate established an organic experimental orchard in 2003 with 20 of the most commonly planted cultivars. In this orchard, Maltese cultivars were also planted as a genetic resource to study their characteristics

Old trees still found in Malta have been identified as native. A cultivar known as '**Bidni**' (Fig. 4), named after the village Bidnija where it is still found, is indigenous to Malta and has been growing for centuries. These trees are between 1,500 and 2,000 years old and are still in production today (Fig. 5). The '**Bidni**' trees grow vigorously with a strong scaffold structure. The leaves are typically broad and short and the fruit is very small with a comparatively small stone. The fruit is rich in both oil and flavour and is free of bitterness; therefore, it can be considered as a dual-purpose cultivar. The tree and its fruit are quite resistant to diseases, especially to the attack of the olive fruit fly, allowing the fruit to be ripened on the tree. Fruit ripens around October or early November and turns to a dark violet color at maturity. Other old olive cultivars include '**Il-Malti**' meaning the Maltese Olive, '**Il-Helwa ta' Sqallija**' meaning the sweet Sicilian olive, '**L-Imrajja ta' Marsala**' meaning olive from Marsala, and '**Il-Bajda**' meaning the white olive. The so called Maltese Olive is a fair sized tree with a strong scaffold. The leaves are broad and the fruit is elliptical in shape, having a small to medium size, with a relatively large stone, maturing in November or December.



Fig. 4
Fruits and typical leaves of '**Bidni**'



Fig. 5
Old '**Bidni**' olive trees

In order to conserve and revive the Maltese cultivars, the PRIMO project (Project for the Revival of the Indigenous Maltese Olive) was launched in November 2006. This is an environmental initiative with the aim of reviving autochthonous cultivars in order to arrive at a reasonable quantity to produce local olive oil derived from these cultivars, and eventually obtaining certification and a Protected Designation of Origin (PDO). Until 2011, over 3,000 trees were planted in 32 distinct areas around the Islands, with a planting density of 200 trees/ha.

Other old olive trees that were cultivated in the Maltese Islands around the 1920's were mostly named after the country in which they originated. These included the Italian 'Nocellara', 'Prunara' or 'Caloria', 'Rizzolone' or 'Basciona', 'Frantoio', the French 'Ghiandara' or 'Franzone', 'Biancolilla', the Spanish 'Sivigliana' or 'Spagna', and the Large almond shaped olive 'la Grossa'.

IMPACT ON ECONOMY AND ENVIRONMENT

The hardy and drought tolerant olive trees are grown all over the Maltese Islands, including areas facing extreme conditions such as strong winds, or areas with low water availability due to limited rainfall. These areas are now embellished with olive trees; otherwise, they would have been left uncultivated or abandoned. The low input required for their cultivation facilitates conversion to organic farming, although at present there are only 2.39 ha under organic cultivation.

The role of the olive tree in the Maltese Islands not only contributes to agricultural use but also to preserving the typical Mediterranean landscape. Olive orchards are mostly intended for the production of olive oil. The existing eight oil mills in Malta and Gozo were established within the last decade, two of which are certified organic. With the exception of one mill that uses a traditional hydraulic press, all the others are of modern continuous type, with capacities varying from 50 kg/hour to 750 kg/hour. The mill owners normally buy the olives from growers; however, it is also common in some instances for growers to request the provision of a pressing service against payment, or by donating a percentage of the olive oil extracted to the mill owner. The main advantage of local olive oil production is that distances are short and olives may be pressed shortly after harvesting; ensuring the best possible quality for extra virgin olive oil. Most of the olive oil producers have their own orchards, but due to the limitation of land, the purchasing of olives from other growers is nearly always the case, except for one of the organic mills that produces olive oil only from its own organic orchards. Some marketing companies utilize the pressing services of the existing mills, where they bottle and label the olive oil themselves. Maltese olive oil is solely produced and marketed under the extra virgin category and is consumed locally with minimal exports of 1-2%. The production of olive oil has gradually increased during the period 2006-2010 to reach its highest level in 2008/2009 marketing year with 28.9 tons. Over this five year



period the total production amounted to 118.2 tons with an average of 23.64 tons/year.

Olive trees growing outside development zones in the Maltese Islands and all olive trees exceeding 50 years of age are protected²⁰ by the Planning Authority under the Environment Protection Act.

PROCESSING METHODS OF TABLE OLIVES

A unique method of processing table olives is the “Black Fried Olives”. Strongly flavored ripe black olives are picked, followed by hitting each one with a mallet just hard enough to remove the stone. The de-stoned olives are then stir fried in olive oil with some thinly sliced garlic and finely chopped fresh rosemary until the whole lot is soft. The ‘Black Fried Olives’ may be served hot or at room temperature with bread, olive oil and perhaps some fresh salad and a full-bodied red wine.

Although no commercial table olive processing plants are found in Malta, the preservation of table olives using the traditional brine method is common to many households. Olives may be bought from growers unprocessed, or else processed and preserved in brine.

Curing black olives using coarse sea salt is also another method used in Malta; however, it is not as common as the brine method. This is prepared by covering the bottom of a strong cane basket known as a *Qoffa* (Fig. 6), with coarse sea salt followed by a layer of freshly picked black olives, and repeated until the basket is full. The final layer is topped with salt and the basket is covered with a cloth or a net and set over some kind of container, so that the bitter juices extracted by the salt can flow out of the basket to be caught in the container. The process lasts for about four weeks and the resulting soft, chewy olives are rinsed from the salt, dried and placed in sterile jars covered in oil.



Fig. 6
Qoffa

For almost all household processed olives, it is a very common practice to crack the olives once they are cured, and preserve them in a marinade of oil and herbs. The most common ingredients used are garlic and parsley, but chili is also sometimes used. These are traditionally served as appetizers before meals or with salads as an essential ingredient of traditional Maltese dishes.

OLIVES AND PROVERBS

A number of idioms and everyday phrases use the word “oil” as a way to illustrate everyday practices as well as to teach and impart its significance. Although the phrases quote “oil” and not “olive oil”, the influence derives from the importance

²⁰ Protected trees cannot be damaged or uprooted



of olive oil in early times. The following are some of the most used phrases in different situations, still in use today in the Maltese language, making reference to one of the main products of the olive; the oil.

Maltese

English

Planning

- *Jekk (ma' ghandekx zejt), fid-dlam torqod* • If you do not have oil - for the lamp - you will sleep in darkness; meaning if you do not plan, prepare and think ahead you will be left on your own as no one will take care of your needs
- *"raqad bla zejt fil-kus* • He slept without oil in the lamp; also used in situations where one has not done any preparations

Conduct

- *Inqela f'zejt* • He got fried in his own oil; meaning someone did something to achieve a goal but, instead it ended worse off
- *Bla zejt f'wicc* • He does not have any oil in his face; used to refer to a person who does not have any morals, and to a person who is not ashamed of doing wrong thing
- *halla z-zejt fil-bieb tal-Knisja* • He left the oil at the doorstep of the Church; refers to a person who is without ethics

Truth

- *Iz-zejt jitla f'wicc l-ilma* • Oil floats on top of water; meaning good will always triumph, even if it takes time
- *Bhaz-zejt f'wicc l-ilma* • When something is progressing well, like the oil, it slowly manages to rise on top of the surface

Oil as a means of lubricant (in a metaphoric sense)

- *Tah iz-zejt* • He gave him oil 'fuel'; is used in two contexts:
 - 1) When someone is mentoring somebody and he continues to drum a point home
 - 2) When two people are talking and someone mentions a sore point and the other person is given additional space for complaining.

Life and Death

- *Ghad baqa zejt fl-lampa* • There is still oil in the lamp; is used when a person is referring to someone who is rather old or sick but there is still life (or hope that a person will continue to live).
- *Spiccalu z-zejt* • He ran out of oil; is a continuation of the above and is used when a person has died

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

Situated at the heart of the Mediterranean Sea, the Maltese diet is characterized by Mediterranean products including those of the olive tree. The following preparations are among the famous Maltese dishes using olive derived ingredients.



➤ **Hobz biz-zeit** (Bread with Oil) (Fig. 7), made of the two oldest foods available, must be a very ancient snack. Today it is still one of the most popular dishes, considered as a national food and can be eaten as a work lunch or snack at any time of day. It is prepared using the traditional crusty Maltese bread (*Hobz*; which is what sustained the vast majority of the population for centuries), tomatoes, mint, capers and a drizzle of local olive oil, *Zeit*. This oil is the original and most natural choice of fat for Mediterranean people. In winter when tomatoes are dull, watery and lacking in true flavour, *kunserva* (tomato paste) is used instead. The taste is different and oddly more substantial but just as good and perfect for winter days. While tomatoes are comparatively new to the Mediterranean scene, the original *Hobz biz-zeit* was probably made without them which might have changed the flavor forever, unlike the name that remains unchanged. The vital thing is that it must be made with real Maltese bread because other bread just does not work.



Fig. 7
Hobz biz-zeit

Ingredients: Really fresh crusty Maltese bread, ripe and juicy summer tomatoes, mint, basil and Maltese marjoram (*merqtux*), sea salt and freshly ground pepper.

Method: Slice the loaf of Maltese bread into thick slices. Rub the cut side of a halved tomato over the slices of bread to brush the bread with a lovely tomato red juice, without flattening the bread entirely. Pour a generous amount of olive oil into a saucer and dip each slice of bread, tomato side down. Lay the bread slices on a plate and season them and scatter with herbs. The used tomato halves may be diced and added to the bread. This makes the most basic *hobz biz-zeit*; however, to make it more sophisticated other toppings may be added, including de-stoned and roughly chopped olives, herbs and capers, scattered over the bread and sprinkled with salt and pepper and either tuna/anchovies or *gbejniet* (goat/sheep soft cheese) according to personal taste. Boiled beans seasoned with olive oil, garlic and parsley may also be added, especially if making a *fira* (flat Maltese bread).

➤ **Lampuki pie**. *Lampuki* is a traditional fish *Coryphaena hyppurus* that is common to the Maltese rocky coasts, during the summer and autumn.

Ingredients: sufficient to make a 30 x30 cm pie. **Pastry:** 1 kg plain flour, 300 ml olive oil, 2 eggs, enough water to bind and salt. **Filling:** 6 medium potatoes, 1 kg very well drained cooked spinach, 300 g onions, 6 cloves of garlic, 200 g de-stoned and chopped Maltese green olives, 200 ml thick tomato sauce, 3 tablespoon fresh marjoram, 3 table spoon fresh mint, 1½ kilo filleted and skinned *lampuki*. Use 2 eggs beaten with little water to assemble the pie.

Method: Sieve the flour into a heap on a work surface and make a hollow in the top. Pour in the olive oil and rub it into the flour until it is evenly distributed, add the eggs and enough water to bind. Flatten the dough and fold in half and flatten again. Repeat a couple of times until the dough come together then shape it into a ball.



Leave to rest in the fridge. Peel and finely chop the onions and garlic and fry them in lots of olive oil until soft and golden, add the olives and herbs and fry for a minute or so, then stir in the thick tomato sauce and cooked spinach. Flour and fry the *lampuki* until golden and put to one side. Thinly roll out half the pastry, and use it to line the pie dish. Peel and slice the potatoes as thinly as possible and use half of them to line the base of the pastry, then add half the cooled spinach and make a neat layer on top of the potatoes. Top this with the fried fish fillets, cover it with a layer of the remaining spinach mixture and top with the rest of the potato slices. Roll out the rest of the pastry and lay it on top of the potatoes, seal carefully, using some of the egg and water mixture to stick the edges together properly. Finally, brush the top with the rest of the egg mix and bake the pie at GM5/190° C for approximately 45-55 minutes or until crisp and golden.

➤ **Olive Paste** (Fig. 8). This is made by destoning green or black olives, and blending them with herbs and other flavourings. Crushed garlic, parsley and olive oil are commonly added to the basic recipe. These additional flavourings are added according to the color of the olives:

- Grated lemon zest and juice as they match well with green olives, as well as the fresh flavours of mint, chives and fresh fennel fronds.
 - Grated orange zest, crushed fennel and coriander seeds, chopped chili and finely chopped fresh rosemary go very well with black olives.
 - A filleted anchovy or two, mashed and stirred into the olive paste adds great flavour.
- Olive paste is served with bread or typical *galletti* (water biscuits) (Fig. 8), and also makes a delicious relish served with grilled fish or stirred into a bowl of hot pasta.



Fig. 8

Left: Olive paste and *galletti*
Right: Olive paste can be also served with Maltese loaf, olive oil and olives

POPULAR MEDICINAL AND COSMETIC USES

Popular medicine in Malta was often the realm of healers who created medicine unguents, and poultices from the various plants, roots, leaves, fruits and even insects or worms found in the surrounding environment. The olive tree played a special role in healing both physical and spiritual ailments. Most traditions are still in use today.

Washed olive leaves are boiled and the water is used as herbal tea. This herbal drink is reputed to lower high blood pressure, and to relieve stomach and gastric problems after a very heavy meal. Olive oil is reputed to act as a laxative. At times where there was the fear of an outbreak of the plague, people believed that if they put olive oil on their skin, they would not get the disease since the oil would act as a deterrent to anything trying to enter through the skin. Olive oil was used as a lubricant by midwives assisting women giving birth at home. It was also used on babies to reduce fever and in the nasal passage when one had a cold.

The olive tree and its products also played a role in spiritual healing and traditional rituals. Of important note, is the old ritual that still takes place on Palm

Sunday, when the parish priest blesses olive branches that are then distributed to the congregation. Each family takes home a small olive branch, which is then placed either at the back of the front door or else in the kitchen, where traditionally there is a shelf with statues of Holy Mary, favourite saint or patron saint or holy pictures. This shelf usually has a candle or an electric lamp that is constantly lighted. The blessed olive branch is placed on the holy shelf. The branch is endowed with special properties, and will protect that family from evil for the whole year. In some cases, a part of this branch is also given to husbands to place in their cars, again to protect them against any harm or traffic accidents. In the past, and possibly until the early 20th century, blessed olive branches were also used in a ritual called *tbahhir*. This remedy was used in cases where a house started to experience unexplained maladies. This was a sure sign that somebody had cast the evil eye on that household. In order to free the household of the evil eye, olive branches were placed on a flat pan *tigan* (very similar to a frying pan) and burned. Once the flames died down and the branch is emitting white fumes, the mother of the house would go around the house saying prayers to remove the evil eye, seven Hail Marys and seven Creeds. In some households this practice was conducted on the eve of Easter, as a precautionary ritual.

OLIVES AND TOURISM

Olive themed activities have been received well in the last few years by individual tourists, tour operators as well as destination management companies. Eco-friendly excursions are still in their infancy and are made available to visitors who ask for greener options. Given the islands' small area and favourable climatic conditions, getting around these areas of interest is relatively easy and practical. Tourism operators have tapped this opportunity and are starting to provide experiences related to agro-tourism.

Visiting historical locations still bearing remains indicative of ancient olive cultivation adds historical value to the aspect of cultivation and processing in relation to ancient times. Recently established olive orchards are a highlight in such excursions. Olive oil tasting is often accompanied by other local products such as bread, fresh beef steak tomatoes and pickled onions. Olive orchards are often located in areas having amazing views of terraced fields that complement the orchards. The best time to experience such tours is during the cooler months between October and April. This is an advantage as Maltese tourism is at its peak during the summer months imposing heavy environmental pressures. By promoting the Maltese Islands in the off-season months, the seasonality issue is addressed and tourism activities with resulting revenues are improved and are more balanced. Majestic olive trees also play a part in urban and rural landscaping. This is particularly pronounced in villages such as Zebbug and Zejtun.

OLIVE WOOD AND BY-PRODUCTS USES

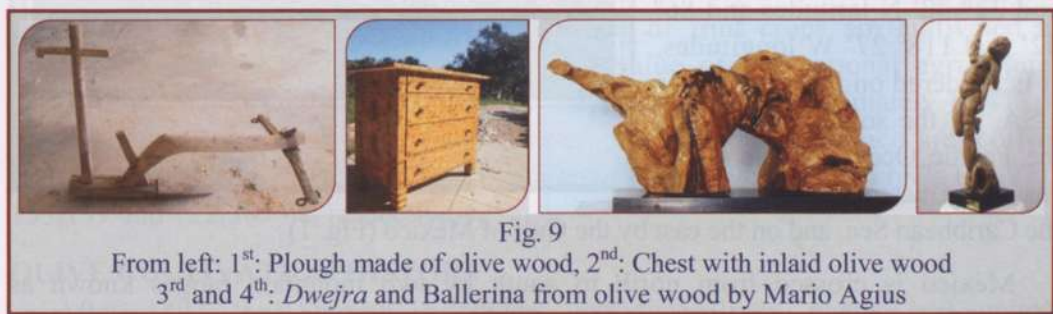
Olive wood is known to be a prestigious wood in Malta due to its scarce availability. It is hard, heavy and strong with a high overall density. Therefore, since ancient times, olive wood was used for making ploughs (Fig. 9, 1st left, next page) and



tools, as it is considered one of the strongest woods found locally. To avoid excessive carving of this heavy wood, which was done by hand, in some cases an ideal pliable branch was selected and trained by the use of weights to orient its growth in the desired shape, achieved in eight to ten years.

In Malta, today, olive wood is used by individual carpenters and amateurs to construct old fashioned inlaid Maltese chests of drawers (Fig. 9, 2nd left) as well as other artifacts, such as picture frames and mantle clocks. The wood generally used derives from pruned, old, fallen or damaged trees. The wood is left to dry naturally indoors, then sliced longitudinally. This is done mechanically as olive wood is hard with irregular veins and more knots than other wood. The skeleton of the chests of drawers is first constructed in wood, and then painstakingly covered with regularly shaped pieces of olive wood. Due to the scarcity of olive wood, sometimes other types of wood such as lemon are used. Once the underlying wood is covered in the olive collage, the unit is sanded over and polished for a brilliant finish.

Talented Maltese sculptors inspired by irregularly shaped olive wood of various age, make use of particular features to enhance their expressionist renderings. These wooden sculptures are worked directly on untreated wood, which after having been transformed in the finished work of art, are treated for protection against rot and atmospheric damage (Fig. 9, 3rd left and right). Some of these sculptures have been awarded international medals.



ACKNOWLEDGEMENTS

The authors express their personal appreciation of the valuable assistance given to them in their research through personal communications with the indicated persons below. Without their cooperation the extensive work involved in compiling background information and preparing this chapter would have been incomplete.

Carmelo Vella (Maltese Carpenter), Mario Agius (Maltese Sculptor) and Carmelo Briffa (Senior Agricultural Officer, Fruit Trees and Crop Husbandry Section, Agricultural Directorate, Ministry for Resources and Rural Affairs).

CONTRIBUTIONS TO THE CHAPTER

Natasha Farrugia and **Mary-Anne Bonello**: General information and internal editing, **Jeanette Borg**: Olive and tourism, **Matty Cremona**: Historical background of olive cultivation, unique processing and consumption of olives and **Nadia Theuma**: Popular medicinal and cosmetic uses.



Miguel Ángel Perales C.¹ miguel_perales@yahoo.com,

Raúl Leonel Grijalva C.², **Ernesto González G.¹**,

José Saúl Padilla R.¹, **Juan M. Caballero³**

¹INIFAP - CIRNOC - Campo Experimental Pabellón. Aguascalientes

²INIFAP - CIRNE - Campo Experimental Costa de Hermosillo - Sitio Experimental Caborca, Sonora

³International Consultant, Córdoba, Spain



INTRODUCTION

México, with an area of 1,964,375 km² ranks third among the three largest countries of North America, after Canada and the United States of America (USA) and the fifth in the whole continent. It is located between 14° 33' and 32° 43' N latitudes and 86° 42' and 118° 27' W longitudes. It is bordered on the north by the USA, on the south and west by the Pacific Ocean, on the south-east by Guatemala, Belize, and the Caribbean Sea, and on the east by the Gulf of México (Fig. 1).



Fig. 1

Types of olive orchards in México

México is crossed from north to south by two mountain ranges known as Sierra Madre Oriental and Sierra Madre Occidental, which are the extension of the Rocky Mountains from northern USA. From east to west, at the center the country is crossed by the Trans Mexican Volcanic Belt also known as the Sierra Nevada. A fourth mountain range, the Sierra Madre del Sur, runs from Michoacán to Oaxaca. As such, the majority of the Mexican central and northern territories are located at high altitudes, and the highest elevations are found at the Trans-Mexican Volcanic Belt: Pico de Orizaba, 5,700 m. From its furthest land points the country is 3,219 km in length. Its coastline is 11,592 km long, with 4,260 km in Baja California and 1,207 km in Sonora, the two more North-western States, where around 70% of the national olive surface is grown.

The Tropic of Cancer divides the country into temperate and tropical zones. Land above the 24° parallel experiences cooler temperatures during the winter



months, while south of it they are fairly constant year round and vary solely as a function of elevation. This gives Mexico one of the world's most diverse climatic conditions. More than 50% of the national territory corresponds to arid and semiarid zones, with hot, dry summers with average temperatures from 32° to 38° C, where fruit crops like peaches, grapes and apples play an important role in the country economy. But that territory may be separated in three regions defined by their accumulation of chilling hours (less or equal than 7° C) during winter time. Region I reaches from 200 to 350 hours, Region II from 350 to 500 and Region III from 500 to 800 hours equal or below 7° C.

Region III includes the main olive growing areas of Baja California and Sonora. Region II corresponds to the northern part of Zacatecas, the south of Durango and the *Laguneras* region (Durango-Coahuila), where olive orchards of the 1970's are being recovered. Region I is in the central part of Mexico, from the Pacific Ocean in Jalisco to the Gulf of Mexico in Tamaulipas, where the olive surface has jumped from 200 to 2,000 ha in the last seven years. The reason is that olives are considered more efficient in the use of irrigation water, also that they need less winter chilling than other fruit trees

The area devoted to agriculture is about 21,902,572 ha, which comprise about 317 different crops; among them the two most important in Mexican diet, corn and dry beans, which represent 38.6 and 7.42%, respectively of the total agricultural area (SIAP, 2009). About 41 different species of fruit crops are cultivated in Mexico, contributing with 22% to the total value of the national agricultural production. They occupy an average area of 2,286,428 ha (approximately 10.4% of the total agricultural land). The main fruit crops cultivated in México are: coffee, oranges, mangoes, lemon and avocado, which averages 796,823; 344,687; 182,971; 153,139 and 122,385 ha, respectively.

OLIVE CULTIVATION HISTORY

After 1492 the Spanish colonizers introduced new plants and animal species brought from Spain, which continued for decades. Cultivated fruit trees like peaches, figs and olives entered to Mexico via the sea port in the now Veracruz State, which provided access to the interior of the country.

The first olive plants introduced to America for observation and cultivation were brought from Seville by Franciscans and Jesuits priests in the 16th century. They first arrived to the Antilles Islands and later on plants were transported to México, Perú, Argentina and California (Grijalba *et al.*, 2009 b). In México it was introduced by Fray Martín de Valencia, by planting the first olive orchard in America in 1531, at Tulyehualco, besides the Xochimilco Lake (Fig. 2, left, next page). Vasco de Quiroga established a 51-trees orchard at the former Convent of Tzintzuntzan, Michoacán, also in 1531 or in 1534, according to different sources



(Fig. 2, right). Olive shipments from Spain had to continue during many years as on August 31th, 1531 a Royal Decree (*Real Cédula*) stated that: “From now on, all masters going to the New Spain must take in their ships a given amount of grapes and olive plants, as such that none of them leave without some of those plants”.



Fig. 2

Left: One of the first olive trees
planted in America at Tulyehualco, Mexico DF
Right: A view of the olive trees
planted at Tzintuntzan convent, Michoacán

Environmental conditions in the area next to the Xochimilco Lake were so favorable for olive growth that trees had great yields. Thus, a strip with olive orchards of more than 12 km in length was planted along the lake. Currently, there are still two large areas with those historical olive trees. One of them is located to the east and is called *Olivar de Santa Maria* and the other to the west known as *Olivar de las Ánimas*, both of them now located within the area of the *Universidad Autónoma Metropolitana*, Xochimilco Campus (UAM). Later on, by providing planting material, this and other similar orchards gave rise to more olive plantations in Texcoco and Chalco, as well as in Ameca, Jalisco, Baja California and Michoacán.

At the end of the 17th century olive cultivation expanded again, mainly due to the efforts done by the missionary Francisco Eusebio Kino, known as *Padre Kino*, who established the first plantations in about 110 missions (Grijalva *et al.*, 2009a and Navarro *et al.*, 1993). Nevertheless, expansion of oliviculture and olive production became so important that they were seen as competition for the Spanish crown. This fact was the reason why Carlos III signed a Royal Decree dated January 17th in 1774, which prohibited planting more grapes and olives in México; in 1777 he issued a new mandate ordering to destroy all the olive trees planted in México. Although these decrees had the main objective of facilitating trade among Spain and its colonies, they are famous for the banning they contained.

Fortunately, some olive trees of the 16th and 17th centuries survived from the massive destruction, but this incident caused a slowdown in the development of the crop until the 1950's (Flores, 1996). At that time olive was promoted in Mexico as a state project. Furthermore the National Olive Commission was created, which was in charge of introducing vegetative material from Spain to be established in several Mexican states.

AREA UNDER OLIVE CULTIVATION

The oldest olive trees currently found in México, aging up to 480 years, are considered as relicts of the first introductions. They are mainly ornamental trees, but are also growing in peripheral fences or small organic orchards, with sizes from 1 to 3 ha (Fig. 1, page 246). In that map those trees are named *acriollados*, because of their origin, relating to the initial Spanish colonizers or his descendants (Perales *et al.*, 2008). They are mainly located along the *Camino Real de Tierra Adentro* (Royal Road), also known as *Ruta de la Plata* (Silver Route). Not a single state (including their subdivisions) along that Royal Road grows more than 20 ha of olive trees: Jalisco (Encarnación de Díaz, Lagos de Moreno and Tepatitlán), Hidalgo (Ixmiquilpan), Aguascalientes (Aguascalientes, Cosío, Asientos and Rincón de Romos), Guanajuato (San Cristobal and San Felipe) and Zacatecas (Guadalupe, Luis Moya, Ojocaliente, Fresnillo and Jeréz).

The olive growing area was of only 157 ha in 1940 and 2,160 ha in 1950, while in 1960 there were 3,082 ha. The maximum area planted with olive orchards reached 12,000 ha at the beginning of the 1980's. However, the area dropped in about 6,000 ha in the 1990's (Navarro *et al.*, 1993; Navarro, 1999; SIAP 2009). In 2008 a new increase in the planted area was registered, reaching 9,309 ha.

Traditionally the main olive producing areas have been the Baja California and Sonora North-western States. In Baja California there are 5,246 ha, most of them around Ensenada, but also in Valle de las Palmas, Tecate, and Mexicali. The second olive area is in Caborca, Sonora, with 2,098 ha, where the highest olive yield of the country has been registered, with an average of 7.5 tons/ha. These two areas are mainly devoted to table olive production. Nowadays most of the olive trees are between 30- and 60-year-old.

In 2005 the Mexican olive industry gives a complete turn and starts considering the central region of the country, from the Pacific Ocean to the Gulf coast as a new area having a good potential to grow olives, which could substitute the abandoned areas of Baja California. This new and third area is initiated with the establishment of 1,200 ha in Tula (Tamaulipas). Now it has 1,900 ha mainly for olive oil cultivars. The occurrence of olive cultivation in latitudes as low as 23° N (Tamaulipas) is due to the place being at higher altitude, 1,150 m above sea level.

OLIVE CULTIVARS

Considering the different origin of the olive genotypes introduced along the years into Mexico, the country has a rich olive germplasm from Oaxaca in the south (17° N and 1,538 m above sea level), to Lázaro Cárdenas, Tlaxcala at the central area (19° 32' N and 2,525 m above sea level) and to Baja California in the north (32° N). This olive diversity is the result of natural crosses and seed propagation of the plant material



brought from Europe, mainly from Spain. Among that germplasm there should be well adapted genotypes susceptible of being used for registering new olive cultivars.



Fig. 3
'Hidrocálida', the first olive
cultivar selected in Mexico

The first olive genotype registered in México is '**Hidrocálida**' (Fig. 3), selected by INIFAP as a 12-year-old tree in Aguascalientes State in 2006, in an orchard established in 1934 at the municipality of Asientos. Some of the agronomic characteristics of '**Hidrocálida**' are: late flowering, which occurs in the second part of April, thus escapes cold temperatures of the winter season, high olive yields and fruit ripening at the end of October and low alternate bearing (Perales *et al.*, 2011). Another important characteristic is the oil yield, which in three growing seasons (2008-2010) averaged from 22 to 25% over fresh fruit in three different sites.

The traditional cultivar is '**Misión**', mainly cultivated in Caborca (Sonora), Tecate, Ensenada and Mexicali (Baja California). It represents 85% of all olive trees in Mexico. Its name comes from the fact that it developed in the *Misiones* mentioned before. This cultivar is still in use because has low alternate bearing index, cold tolerance, high quality oil and early harvest (August-September). However, since 1920 when demand for table olives started, new plantations were established with '**Manzanillo**', although up to six different types have been found (Grijalva *et al.*, 2009a,b). It is known that the name 'Manzanilla' is used in Spain for several different olive cultivars, including 'Manzanilla de Jaén'. Farmers prefer to grow 'Manzanillo' due to its higher selling price and early ripening. Being considered as a good pollinator since the 1950's, it has been cultivated along with '**Sevillano**' ('Gordal Sevillana' of Spain) and 'Ascolana'. The latter cultivars have big fruit and therefore are grown for table olive. Due to the soft texture during harvest or processing the fruit requires more careful management than 'Misión' or 'Manzanillo'. Another cultivar in commercial use is 'Nevadillo', which also originated in Spain, well appreciated because it is rustic, tolerant to cold, salinity, and to excess soil moisture (Grijalva *et al.*, 2008).

In September 1999 the Italians 'Coratina', 'Carolea', 'Leccino', 'Grossa Di Casano', 'Nocellara del Belice' and 'Messinese', which are used to produce olive oil were introduced in Caborca. However, results of their evaluation during 2005-2009 indicated a lack of adaptation to that region, since only 'Carolea' could be recommendable; but it has a greater alternate index than 'Manzanillo' (Grijalva *et al.*, 2009a).

In 2006 'Arbequina' and 'Arbosana' from Spain, 'Frantoio' and 'Leccino' from Italy and 'Koroneiki' from Greece were introduced to Aguascalientes, where six field plots were established at a density of 416 plants per ha. Results are

promising and showing good adaptation. In 2009 INIFAP introduced in Caborca, Sonora, the following olive cultivars sent by the Olive World Germplasm Bank of IFAPA, Córdoba, Spain: 'Arbequina', 'Arbosana', 'Empeltre' and 'Manzanilla de Sevilla' from Spain; 'Pendolino', 'Frantoio', 'Carboncella' and 'Casaliva' from Italy; 'Koroneiki' and 'Kalamata' from Greece and 'Barnea' from Israel to evaluate its yield and quality potential.

IMPACT ON ECONOMY AND ENVIRONMENT

Annual olive production is estimated at around 50,000 tons and at least 95% of that amount is devoted to table consumption. However, olive growing is especially important for the country since its cultivation requires an average of 595,808 working days/per year (64 working days/ha) for the crop management, mainly for the harvest (SIAP, 2009).

After 2005, the new olive industry in México has been focused in the reconversion of the olive growing areas of the arid and semiarid regions of the north and central parts of Mexico, which are facing many problems due to the lack of irrigation water and low profitability of the traditional fruit crops. In this sense, olive crop may have an impact since its cultivation may save up to 4,000 m³/ha/year of irrigation water.

PROCESSING METHODS OF RAW OLIVES

At the central part of the country a series of extra virgin olive oils has been elaborated under artisanal systems in familiar agro-industries, transforming olives cultivated using organic materials and in simple installations. In the elaboration process, milling of olives is done using "pulpers" (iron mills) of about 450 to 600 kg/hour and/or pitters to separate pulp from stones. After this, pulp is passed through a beating process in *bombos* (large bowls), *marmitas* (kettles) and/or *mexaladoras* (mixers) for 10 minutes and finally it is processed using compressing equipment made of stainless steel to squeeze the extra virgin olive oil. This good quality oil is successfully commercialized under specific brand names as artisanal products. Such products are mainly sold in regional markets.

OLIVES AND TOURISM

In 1971 when olive crop was considered of high socioeconomic importance for the country, the *Feria de la Alegría y el Olivo* (Amaranth and Olive Fair) was created at Santiago Tulyehualco, Delegación Xochimilco, México DF. Since then the Town and Neighborhoods Council from Mexico City are in charge of organizing each year the festivities, whose purpose is that people know and consume the products obtained from amaranth and olive, as well as to reinforce the cultural identity of Xochimilco inhabitants.

In 2006 and thereafter, at the food "Expoagro" in Aguascalientes, state olives and olive oil have been one of the important sites of interest to people, in which



more than 1,500 persons have the opportunity to taste the artisanal olive oil elaborated in same state located at the central part of Mexico.

“The Olive Fair” at Chimalhuacán in the state of México was initiated in 2009 with participation of olive producers from Xochiaca, San Agustín, San Lorenzo and Xochitenco. Also in 2009, the October “Expo-Olive” was initiated at the community of *El Olivo*, Ixmiquilpan, Hidalgo, where an “Olive dance” is performed. Presentations of technical and scientific conferences, olive wood handcrafts and gastronomic dishes based on olives and olive oil are also organized.

RECIPES WITH OLIVES AND OLIVE OIL

At the Amaranth and olive Fair the main dish is called *sopas de borra*, elaborated with olive pulp in *salmuera* (brine), fried in olive oil. Another traditional way of consuming olive fruit is in a kind of frying, mainly sold in the central parks of small cities, where mature olives are toasted at low fire in a *comal* (steel plate), then adding salt. They are eaten directly. In traditional olive growing areas like Sonora, Tulyehualco and Baja California a traditional dish is to cook ***frijoles* (beans) and mature olives** altogether (Fig. 4).



Fig. 4
Traditional dish of *frijoles* with olives

Another traditional way to eat pickled green olives at lunch time is serving them with soya sauce and lemon juice to give them a sour-sweet flavor (Fig. 5, left). A mixed salad of lettuce, tomato, onion and olives is also used to accompany beef roast and ***seafood with olives*** (Fig. 5, right), as well as pasta salad with olives and a puff of picadillo (mincemeat), cactus and olives.



Fig. 5
Left: Pickled olives in soya sauce with lemon juice
Right: Seafood soup with mixed olive salad

➤ ***Cactus salad with olives*** is a sign of the good imbrications of local and foreign cuisines.

Ingredients: 500 g peeled and chopped cactus, 2 onions, 6 tomatoes, 1 bunch of cilantro, 5 *serrano* peppers, 100 g of olives, 1 avocado and salt.

Method: heat 500 ml of water in a pan until it starts boiling, then add the peeled and chopped cactus, salt them to taste and boil for 5 minutes. Place the cactus in a colander to get drained and cool. Onions, tomatoes, cilantro and *serrano* peppers are chopped to a uniform and small size (Fig. 6, left), then mixed with the cactus, olives and oil. The salad is served in a plate of lettuce, avocado slices and tomato wedges (Fig. 6, right).

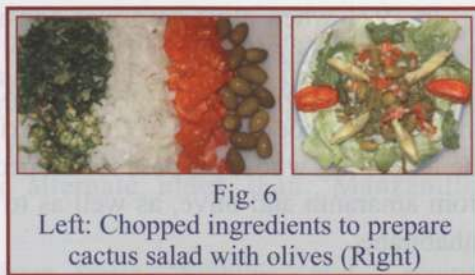


Fig. 6
Left: Chopped ingredients to prepare cactus salad with olives (Right)

MEDICINAL AND COSMETIC USES

Mexican olive production is mainly devoted to table olives; therefore there is no tradition about using olive oil for medicinal purposes. However, olive oil is already being used for developing hygienic care and cosmetic products, separately or along with other regional products. An example of this is the liquid and semisolid cream elaborated with olive oil and *Opuntia* leaves for taking care of the dry skin. This product has demonstrated that with frequent use it can reduce and/or eliminate skin cracks.

Based on the well-known properties of olive leaves, an olive grower of Caborca is exporting dried and press-packed olive leaves to Japan, where they are used for elaborating teas with medicinal use.

OLIVE WOOD USES

At Ixmiquilpan, Hidalgo, an artisan industry is developing, using olive wood to produce different types of utensils and toys (Fig. 7, right). One way of taking advantage of olive pruning residues is practiced in Caborca, Sonora, where a firm is successfully using them to produce charcoal for barbecues (Fig. 7, left).

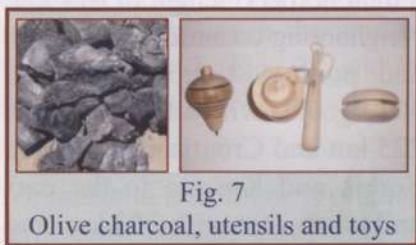


Fig. 7

Olive charcoal, utensils and toys

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Biljana Lazović biljanal@t-com.me, **Mirjana Adakalić**

*University of Montenegro, Biotechnical Faculty, Centre for Subtropical Cultures,
Topolica bb, 85000 Bar*



INTRODUCTION

Montenegro is a small country located in South-eastern Europe, on the Adriatic Sea. Its total surface area is 13,812 km² (Fig. 1), with a total borders' length of 614 km. Neighboring countries to the north and north-west are Bosnia and Herzegovina with a border line of 225 km and Croatia with 14 km, Serbia and Kosovo to the east and north-east with 203 km, and Albania to the south-east with 172 km and the Adriatic Sea on the west with a coastline of 293.5 km. The general topography of Montenegro is characterized by large hilly mountainous areas with distinctive relief and only small areas of lowland. As to the altitude, only 10% of the territory is up to 200 m above sea level, 35% from 200 to 1,000 m, 40% from 1,000 to 1,500 m, while about 15% is at an altitude over 1,500 m. The highest mountain is about 2,500 m above sea level.

Climate in Montenegro varies dramatically in a relatively small area from Mediterranean to Sub-continental and Continental. The climate is influenced by close proximity to the Adriatic Sea with relief intersected by deep and narrow river valleys and mountain chains, amongst which narrow relief units, basins and karsts plateaus are positioned. Annual rainfall in different areas of Montenegro is variable; 1,260 to 1,940 mm on the coastal line, 2,000 to 3,400 mm in central areas and 800 to 1,345 mm in the continental area. However in Crkvice, the wettest place in Europe, it reaches 4,900 mm.



Agriculture land, as a significant national resource, with its total area of 516,219 ha (equivalent to approximately 0.84 ha per capita) occupies about 38% of the total land area of Montenegro. This area is distributed as 62% for pasture, 25% meadows, 9% field crops, and only 3% for fruit crops and vineyards. Agriculture is diversified, from olive and citrus growing in the coastal strip, vegetables and grape in the central, to the extensive livestock breeding, particularly in the northern part. The sector is mostly labor intensive and plays a role of a social buffer, as it represents the main source of income or a part thereof for about 50,000 rural households. Farming is characterized by low level of chemicals use, which offers high potential for organic production and marketing of special environmental friendly products.

OLIVE CULTIVATION HISTORY



Fig. 2
*Stara Maslina (Old Olive Tree) at
Mirovica, Bar (Photo by M. Adakalić)*

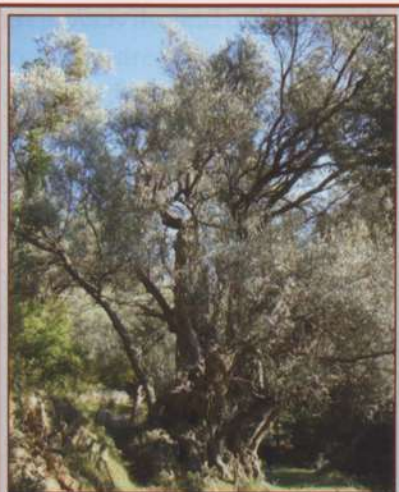


Fig. 3
*Velja Maslina (Big Olive Tree) at
Ivanovići, Budva
(Photo by M. Adakalić)*

It is not quite clear when olives were first grown in this area, but exemplars in the area of Bar, protected by law in 1963 (Fig. 2), and in Ivanovici near Budva (Fig. 3), testify for a period of thousands of years.

Favorable environmental conditions prevailing on the Montenegrin coast enabled olive trees to become the leading species. In this region, great attention has always been devoted to olive trees, because not only they provided food, but also they were a main source of income for coastal populations. The importance of olive is evident from manuscripts dating back to the 11th century and the statutes of the coastal cities from the 13th century in which the practices on protection, preservation and cultivation of olives were legalized. It was obligatory that peasants had to plant 60 olive trees on each hectare of land and later on 40 trees making it a 100 at least.

In the Statute of Grbalj from 1427, it was mentioned: "the farmer, in the age of 20-30 who does not plant 50 olive roots and does not provide a weapon for himself, is not worth seating with men".

Agrarian Law of 1756 gave farmers an incentive to grow olives by exempting them from paying taxes estimated at one tenth of their

production. On the other hand, the law gave the State the right to confiscate orchards which underwent three years of neglect. These measures improved cultivation of olives and increased the number of trees to one million, with a production of 2,000 to 4,000 tons of olive oil. However, many olive orchards were uprooted after one century of unfavorable laws as well as replacing olive oil which was used for lighting by imported petroleum. This was coupled with more demand

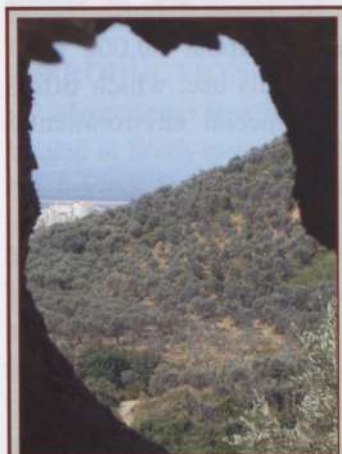


Fig. 4

Olive trees on steep slope,
(Bar area)

(Photo by M. Adakalić)

for local wine, following the destruction of many vineyards across Europe by *Phylloxera*. The trend of improving olive growing was continued in the Kingdom of Montenegro in the 19th and beginning of the 20th centuries. Young men were not allowed to marry before planting 10 to 30 olive trees, and such measures caused an increase of olive trees on the coast to reach 620,000. This period was followed again by difficult times after World War II, during which 200,000 olive trees were lost.

Because olive trees sprout with multiple trunks from their root systems, trees were traditionally counted according to the number of sprouts not by trunks. When a bull cart measuring 4-5 m can pass between two olive root bushes, this would count as two trees. In the southern part of the coast farmers call the group of olive trees as “flock of olives” (Montenegrin: *buljuk maslina*), and an area near city of Ulcinj facing the sea is called *Baš buljuk* meaning “the best olives”.

AREA UNDER OLIVE CULTIVATION

Olives trees are spread mainly in the coastal area of Montenegro, between 41° 52' and 42° 29' N and between 18° 26' and 19° 22' E. The terrains of olive growing areas are either sloped with very high inclination (Fig. 4) or foothills of the mountain massifs of Orjen, Lovćen and Rumija (Fig. 5, 6 and 7). Influence of costal climate can be effective up to 500 m above sea level.



Fig. 5

Olives on foothills, Bar
(Photo by M. Adakalić)



Fig. 6

Olives on terraces, Valdanos,
Ulcinj



Fig. 7

Stone encircled trees, Lustica
(Photo by M. Adakalić)

To a lesser extent, olives are also grown in the areas of Scadar Lake (Fig. 8) and Podgorica, where in the last five years planting of olive trees in small household farms has been intensified (Fig. 9) where drip irrigation is used in some places.



Fig. 8
Olive orchards overlooking Scadar Lake



Fig. 9
New small-size orchard of 'Arbequina'

In 2010, olive trees in Montenegro totaled 460,890 covering approximately 3,200 ha, which is one third of the total area under fruit cultivation. From this area nearly 70% are traditional orchards with trees of more than 100 years old. These trees are very tall, the majority of which are harvested by collecting fruits from the ground (Fig. 10). New olive orchards represent approximately 10% of the area and have been increasing (Fig. 11). The majority of orchards are located in the coastal area which is divided into two sub-areas; Bar in the south and Boka Kotorska in the north (Fig. 1, page 254). Holdings are characterized by being fragmented as the majority of orchards are of 0.2-2.0 ha. Bigger plantations exist in the south, around the area of Valdanos with nearly 80,000 trees (Fig. 12), which are protected by law, and around Luštica in the north with 20,000 trees.



Fig. 10
Olives picking in an old orchard
(Photo by T. Perović)



Fig. 11
Recently planted olive orchards,
representing 10% of the total olive area



Fig. 12
Large olive orchards in Valdanos
(Photo by B. Lazović)

OLIVE CULTIVARS

In the small coastal area of Montenegro, where traditional olive growing took place for a millennium, many different genotypes (cultivars) were developed. The number of cultivars is not known due to the presence of synonyms and homonyms, as well as present variability in the dominant cultivar.

In the olive assortment of autochthonous cultivars, the most important ones are 'Žutica' and 'Sitnica' for oil production, 'Crnica' for dual purpose and 'Lumbardeška' for table olive. These dominant cultivars are described below:

'Žutica' (Fig. 13) predominates in southern sub-area with 95-98%. It was named by the color of the fruit, that is straw-yellow before gradually turning into wine-violet and finally to black. The tree is vigorous and may reach a height of 12 m. The

branches are upright and the trunk is characterized by plenty of hyperplasia (Fig. 14). Flowering happens in the second half of May and maturation begins in early October. It is a self-fertile cultivar and alternate bearing can be reduced by applying

regular agriculture practices. The oval shape fruit has an average weight of 3.2 g and an average oil content of 23.0% on fresh weight basis. The stone is smooth with 0.6 g average weight. The cultivar is resistant to olive knot (*Pseudomonas savastanoi*), and is sensitive to peacock eye (*Spilocaea oleagina*) and to the attack of olive fly (*Bactrocera oleae*).



Fig. 13
'Žutica'
(Photo by S. Hrnčić)



Fig. 14
'Žutica', trunk details
(Photo by M. Adakalić)

'Sitnica' or 'Sitnjaka' (Fig. 15) occupies 5.5% in Boka-Kotorska sub-area

(Grbalj and Luštica). It was named upon the fruit size which is small, 1.8 g. The stone is smooth with 0.3 g average weight. Oil content is 17% on fresh weight basis and is of good quality. It is partly self-fertile, highly productive, however it shows alternate bearing tendency. It is not susceptible to peacock eye and olive knot, and is moderately tolerant to other pests.



Fig. 15
'Sitnica' or 'Sitnjaka'
(Photo by S. Hrnčić)

'Lumbardeška' is a table cultivar also grown in Boka-Kotorska sub-area representing 6.6% of total plantings. The tree is vigorous. Flowers in mid of May



Fig. 16
'Crnica' or 'Crnjaka'
(Photo by S. Hrnčić)

and fruit ripen in November. The fruit is large, black with white flesh, weights 4.0 g and the stone is 0.7 g. Oil content is 13%. Fruits are used for black conservation.

'Crnica' or 'Crnjaka' (Fig. 16) is found in Boka-Kotorska sub-area representing 14.8% and partly in Bar sub-area in Budva. The tree is of medium vigor, flowers in mid-May and ripens in November-December. The fruit is oval with a weight of 3.9-4.5 g and the stone is 0.8 g. It is well adapted to the poor environment and is medium in regard to production and alternate bearing. Oil content is 14.5 % on a fresh weight basis and of good quality. Mature fruit is dark violet to black color and the name of the cultivar is connected to its color. Besides oil, it is used also as black table olive. It is susceptible to peacock eye, and resistant to olive knot.

'Picholine', 'Leccino', 'Coratina', 'Itrana', 'Ascolana tenera' etc., have been introduced since the 1980's and represent about 3% of the total olive area in the country.

IMPACT ON ECONOMY AND ENVIRONMENT

In Montenegro only 15% of olive orchards are under regular cultural practices, while the majority of orchards are used for sheep grazing (Fig. 17) and the terrain under the olive trees is cleaned before harvesting in the autumn (Fig. 18). In general, olive production in Montenegro can be considered as organic, with favorable conditions for potential certification and further development.



Fig. 17
Sheep grazing in an olive orchard
(Photo by B. Lazović)



Fig. 18
Cleaning orchard floor from weeds and debris just before commencing harvest

Although the International Olive Council (IOC) data for Montenegro production is 500 tons of olive oil, there is a potential to produce more than 2,000 tons of olive oil that has not yet been achieved for different reasons. A high share of the produced oil is

consumed locally, mostly sold during the tourist season; however the estimated average consumption is less than 0.5 kg/capita. Domestic production of olive oil does not meet the national needs, although market demand for the product exists.

During recent years (2006-2010), the number of olive trees has tended to increase; however the main olive habitat along the Montenegro coast is threatened by the construction of tourism facilities.

Recent reforms in the agricultural sector have definitely influenced the olive sector in Montenegro. The main reform document, adopted in 2006, is the “Montenegro’s Agriculture and European Union-Food Production and Rural Development Strategy”. It foresees the reform of the Montenegrin agricultural policy through its gradual harmonization with EU Common Agricultural Policy (CAP). The national program for food production and rural development (2009-2013), adopted in 2008, defines support measures for the agricultural sector, with specific focus on rural development. The most relevant measure for further development of the olive growing sector is the investment support for restructuring crop plantations, which allows subsidies up to 50% of the investment. Other schemes also apply to the sector including support to investment in storage, packing and processing, support to producer organizations, support for improving the quality of agro-food production and products, as well as measures for sustainable management of natural resources (support to Less Favored Areas, preservation of resources in agriculture and organic agriculture).

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

There is an inherited deep belief among Montenegrin growers that olive trees like the company of man. Therefore they spend as much time as they can in their orchards attending the trees to make them “happy” and improve their productivity. One of the good practices that is still alive, although it involves hard work, is to put stones deep in the planting hole to improve drainage in cases of long heavy rain or impermeable soils. In the southern olive growing areas, supplying olive trees with nutrition is still following the traditional method of digging trenches of 30-40 cm wide and 20-25 cm deep around each tree at a distance of 1.0-1.5 m from the trunk to incorporate manure with the excavated soil into these trenches. That was the only fertilization provided, and even today this method is still practiced in old orchards.

Planting olive trees from suckers growing on the root system (Montenegrin: *priljepak*) was once the most widely spread method of propagation. Although growers know that separating suckers damages the root system of the mother tree to some extent, and that the trees propagated this way might take years to produce, which can reach 10 to 15 years in some instances, yet they persist to apply this wrong traditional practice. Old growers have a strong belief that olive trees are planted for the coming generations; therefore they do not mind that their newly planted trees



enter production late. They even believe that propagation by this method will ensure the development of a strong root system and large canopy capable of resisting strong winds and producing high yields. Some growers buy suckers with trunks as thick as a man's arm, if they do not have them in their own orchards.

In olive growing areas where goat and sheep production has been practiced as a parallel activity, olive tree pruning (Montenegrin: *kraštenje*) has been somewhat influenced. To allow for grazing, growers used to prune the lowest branches which made the trees develop upward reaching unmanageable heights that caused harvesting to become difficult and thus growers used to collect the falling fruits off the ground (Fig. 10 and 18). This pruning practice is still exercised at present time, however some old growers don't like to apply severe pruning as they feel as if their own arms are being cut, which in a way proves their strong connection with olive.

PROCESSING METHODS OF RAW OLIVES



Fig. 19

Olive collectables "House of olives"



Fig. 20

Old wooden press

Traditional olive processing methods were practiced along the Eastern Adriatic Coast, consequently in Montenegro for centuries. The traces of such wooden and stone mills can be

found in some areas of the central and northern coast (Budva, Lastva Grbaljska). Some components such as mill, stone pot for oil storage (Montenegrin: *kamenica*), etc. from the area of Bar were collected in the "House of Olive" in the Old City of Bar (Fig. 19 and 20).

The greatest improvement in olive oil production came with establishment of modern olive oil plant "Braća Marić" (Marić brothers) in 1927 in the southern area of the coast in Bar. The oil produced in this plant was of famous quality and was exported to European countries and to America. This enterprise initiated new business relation with olive growers, whereby the produced oil was stored under optimum conditions, to ensure its quality, whereby growers could withdraw oil according to their needs. Surpluses were sold to the plant or to olive oil dealers. This olive oil plant was for quite long time the forerunner of modern technology and good storage facilities.

In the second half of 20th century the tradition of the "Braća Marić" olive oil plant was followed by "Primorka", a state owned factory, which after using hydraulic presses introduced continuous olive processing line with a capacity of 2-3 ton per



hour. This plant was the biggest on Montenegrin coast in terms of production and storing capacities. At the same time, small scattered olive oil mills continued to work as this mill, located in the south, was very far to transport harvested olives from other regions. These mills were using traditional equipment and in the last decade some of them introduced continuous centrifugal lines of smaller capacity which took over the production previously done by "Primorka". Nowadays, there are 25 traditional and 12 centrifugal olive oil mills in Montenegro.

Despite its importance, the table olive processing sector is not developed. In 1984 the FAO-UNDP project (YUG 76-002) in Ulcinj introduced industrial processing for a 50 ha plantations, cultivated with imported foreign table olive cultivars. During the transitional period of the country, the land was given back to the previous owners and the processing was abandoned. There is a small scale home production utilizing traditional ways, mostly of 'Žutica', 'Crnica' and 'Lumbardeška' olives. One widely used method of pickling green olives for quick consumption is the "Sliced Olives". Green olives are carefully harvested (mostly in September), washed and then scratched by a knife through to the stone on both sides of the fruit. Fruits are then totally submerged using a cover plate in a container full of cold water. Within nine days, while the water is changed daily, the fruit bitterness will be removed through the cuts into the water. After this preliminary treatment, the fruits are submerged in salt solution of 6% concentration, the level of which might change depending on the taste and duration of storage required. The fruits are kept submerged in the solution by a grid and some herbs like rosemary, bay leaves, etc. can be added to give the olive fruits a distinctive flavor. After 10-15 days the fruits are ready for eating. If the olives are too salty, they can be rinsed with potable water and kept in a salt solution of lower concentration between 2 to 4%. When served, a mixture of olive oil, crushed garlic and parsley can be added or just olive oil.

TRADITIONS AND CULTURE

Montenegrins are used to say "Vine is like a girl, if you neglect her she would go, and olive is like a mother, whenever you come she will be happy and repay for your care". In the area of Bar, the importance of olive is resembled by an adage mentioning that: "When olives turn their branches down (with high yield) people from Bar have their heads up (proud and expecting income from the oil that will sell) and when olives have their branches up (not bearing or poorly loaded with fruits) people from Bar turn their heads down (worried how to manage until next year)". In the northern area of the coast snow is rare and stays for just a few hours, so when it falls during January-February and covers olive trees, people say "Olives are mating", using the same expression as for sheep mating, which means for them a better production that year.

Pozrnica in Montenegrin indicates the period after harvesting, when growers leave their orchards to allow poor people or those who did not have their own



olives to collect some fruits for pickling or even for oil extraction. This tradition was practiced for centuries. In the area of Boka Kotorska when growers needed to borrow money in the city, they used to carry with them an olive branch as proof they could pay back the loan. If there were shoots on the branch, the farmers could get the loan because it meant that there would be fruits and olive oil for payment. *Moba* is a Montenegrin expression that indicates unity and harmony among the farming society and in a way it is similar to the adage "one for all and all for one". When it was time for harvesting olives, people in the village used to organize *Moba* to harvest one day for one grower and the next day for another grower and so on until all olives were harvested. They sang during the work, eating together and celebrated the end of harvesting. Sadly, nowadays no such events are to be seen in olive growing areas.

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

➤ *Branje or Varivo* (Fig. 21):

Ingredients: Onions, about 0.5 kg leeks, 2 carrots and 2 potatoes, all chopped into cubes.

Method: Cook with the addition of a few tablespoons of olive oil. After half an hour of cooking add some chopped mangle, fennel, mint and dill and cook another 20 minutes or until mangle soften.

➤ *Japraci* (Fig. 22):

Ingredients and Method: Shred 1 kg of onions, scrape 3 large carrots together and fry in olive oil. When onion becomes vitreous add 3-4 garlic cloves, bunch of parsley, pepper, mint, red pepper, salt to taste and add tea mug of rice. Continue frying for a short time, and then leave to cool. Take 2 teaspoons of the mass and roll it in young grapevine leaf (also kale leaves, briefly boiled to soften). Put *japraci* in a pan lined with several leaves of grapevine or kale, pouring over a tea mug of water and wine. Simmer on low heat for about 2 hours.

➤ *Priganice* (Fig. 23):

Ingredients: 1 kg of wheat flour (type 500), 2 packs of fresh or dried yeast, 600ml lukewarm water, tablespoon of sugar; teaspoon of salt, scraped lemon peel.

Method: Put the flour into a large vessel (that could make the dough rising), make a hole and add a yeast diluted in water and sugar (dry yeast is placed directly into the flour with other ingredients). Whisk the dough well until it starts separating from the ladle. When



Fig. 21

Branje

(Photo by M. Adakalić)



Fig. 22

Japraci

(Photo by T. Perović)



Fig. 23

Priganice

(Photo by B. Lazović)

bubbles start to appear, cover the dough with a clean cloth and leave it in a warm place until doubled in size, which will be a little more than half an hour. Gently stir the raised dough with a ladle, and then by the teaspoon take a little dough and fry in hot oil. Can be served with honey, with white cheese and olive oil or just sprinkled with vanilla powdered sugar or salt.

POPULAR MEDICINAL AND COSMETIC USES

Olive oil in Montenegro is consumed either as food or as a medicine; it is believed to regulate body functions. In addition, olive leaves are used for preparing tea used for regulation of hypertension, to widen blood vessels, to regulate blood circulation in general and to improve the immune system.

A common traditional and extensively used application in folk medicine is to treat the skin wounds by the “Klamath weed oil” (Montenegrin: *kantarionovo ulje*), also known as “Common St John’s wort”, “Tipton’s weed” or “Chase-devil”. The Ointment preparation is also used to treat burns and to obtain better skin color throughout the summer direct sun period. This medicine can be found in many Montenegrin homes first-aid kits. Fresh blossoms of Klamath weed (*Hypericum perforatum*) are harvested carefully, finally cut and placed in a transparent glass jar or bottle. Olive oil is then poured to cover the blossoms and is kept for 40 days in a sunny spot and daily shaking is preferred. After this period the oil becomes infused and imparted with the herb’s qualities and is ruby, red in color and fragrant. The suspension is drained, packaged in small bottles and is ready for use. It can be used up to a year when stored in a cool dark place.

OLIVES AND TOURISM

The olive is highly incorporated into the culture and every-day life of the people of the coastal area of Montenegro. As a symbol of peace and art, the “Old Tree” in Bar was traditionally used as a place to discuss problems and difficulties arising in the community, therefore this place was named *Mirovica* which symbolizes peace and reconciliation among people. Since 1987, the same spot became the place for the “International Meetings under The Old Tree” (Montenegrin: *Susreti pod Starom maslinom*), which is a kind of celebration involving poetry for kids, followed by creative art work on olive, peace and friendship topics. Since 1995, the “Golden Olive” became the prize given for the best TV and documentary film show on the “International Film Festival” in Bar.

In the last decade some festivals were introduced honoring olive and olive oil. The most popular one is the *Maslinijada* event (Fig. 24 and 25, next page) launched in 2001 in the Old City of Bar; organized every year after harvesting by the Society of Olive Producers, accompanied with competition for best olive oil, young olive orchard, etc. Similar celebrations at different times of the year are held in the area of Boka Kotorska Bay.





Fig. 24

Maslinijada Festival with a memorable scene of olive trees on the hills of Bar



Fig. 25

*The lively Maslinijada Olive Festival
(Photo by T. Perović)*

OLIVE WOOD HANDICRAFTS

Rejuvenation and severe olive pruning was not a traditional practice in Montenegrin olive growing, so there were no large tree parts available to meaningful handcraft work. Recently people started to use olive wood, and nowadays in the market some handmade souvenirs like clocks, lamps, small tables, pots, etc. can be seen (Fig. 26).



Fig. 26

*Clock from olive wood
(Photo by M. Adakalić)*

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INTRODUCTION

Morocco is called in Arabic “Al Maghrib” which means “far west” or “where the sun sets”. With slightly over 33 million inhabitants, Morocco is situated strategically in North-western Africa, bounded on the west and north by the Atlantic Ocean and the Mediterranean Sea which separates it from the southern coast of Spain, at a stone’s throw of about 15 km at the Gibraltar Strait. On the east it is bordered by Algeria and on the south by Mauritania. The total land area is 710,850 km² with a long coastline of 1,835 km. Moroccan territories fall between latitudes 27° 30' and 35° 52' N, hence a large part of the area is located within the traditional Mediterranean belt of olive growing between 30° and 45° N latitudes.



A large part of Morocco is mountainous, thus the country is subdivided into four distinct topographical zones. The Rif Mountains of the Gibraltar Arc in the northern part facing the Mediterranean coast, rising up to 2,400 m above sea level, presenting extensive arable coastal lowland where citrus, olives, tobacco and grains are cultivated. The Atlas Mountain ranges in the middle with highest point of 4,165 m at Jebel Toubkal. Third is the region of broad coastal plains along the Atlantic Ocean and finally the plains and valleys south of the Atlas Mountains, which merge with the Sahara desert at the south-eastern borders of the country. This diversification reflects on the climate which is moderate Mediterranean with rainy mild winters and hot dry summers on the northern and western regions. On the other side of Atlas Mountains (East Atlas) in the center of the country, the climate changes due to the barrier/shelter effect of these mountains system, and temperatures are more extreme with very hot summers and cold damp winters. Towards the southeast the climate is desert. Nearly 78% of the country is considered arid receiving less than 250 mm/year precipitation, while 15% is semi-arid zone with 250 to 500 mm/year and only 7% is sub-humid to humid zones of more than 500 mm/year.

The total agricultural area is about 9 million ha (18% of the total land) of which 1.2 million ha (5%) are irrigated by a system of dams and irrigation canals developed since the 1960's. The agricultural sector is the backbone of the Moroccan economy as it generates between 15-20% of the national gross domestic product, contributes with 18% in total exports, and it employs about 40% of the national active workforce and 80% of the rural workforce. This makes the sector the largest employer in the country. However, agricultural production varies with the weather conditions and most crops are grown by subsistence farmers. On the other hand a modernized sector using economies of scale has been immersing steadily during the last two decades targeting export markets.

According to the Agriculture Situation Report for Morocco (2005), fruit trees occupied nearly one million ha, with olives having a share of 56%, followed by nut fruits 16.1%, almond 13.7, citrus 7.6%, vines 4.9% and the remaining 1.7% divided among dates, figs, apples and other fruits. Barley, wheat, and other cereals are amongst the main products.

OLIVE CULTIVATION HISTORY



Fig. 2
1st Century AD olive mill and press
in the ruins of Volubilis
(Photo B. courtesy of V. Challancin)
<http://flavorsofthesun.blogspot.com/>

The olive tree was introduced to Morocco from its original cradle in the Eastern Mediterranean. The fossils found by archaeological research date back its existence a few thousand years ago to the first millennium BC. Evidences reveal that it was cultivated during Phoenician and Roman times in the regions around Tingitane, Volubilis, Lixus and Tinja forming part of a chain of Carthaginian-Phoenician-Roman settlements and towns along the Atlantic coast of what is now Morocco.

The archaeological site of Volubilis features the best preserved Roman ruins in North Africa and has been listed as a UNESCO World Heritage site in 1997. Situated near the westernmost border of Roman conquests in, it was the administrative center of the province in Roman Africa called *Mauretania Tingitana*. It was built in the first century AD at the foothills of the Rif Mountains on the site of a previous Carthaginian settlement dating back to the third century BC. The fertile lands of that province produced many commodities such as grain and olive oil, which were exported to Rome, contributing to the province's wealth and prosperity. Volubilis historical structures suffered damage during an earthquake in the 1700's; however old olive presses survived (Fig. 2) and are still preserved in the ruins

near the present town of Moulay Idriss, located midway between Fez to the east and Rabat to the west (Fig. 3).

It is possible that flourishing exports of olive oil to Rome when Morocco was a Roman colony caused the expansion of olive into other areas located at the foothills of the Rif Mountains in the 11th century AD during the Idrissids Dynasty. The same happened in the Marrakech region (Fig. 4) under the ruling of Al-Moravids and Almohad²¹ which were Moroccan Berber-Muslim dynasties founded in the 12th century. During this period great attention was given to olive oil as a source of income (Fig. 5). During the 17th century, under the Alawites ruling, olive cultivation extended south to the Oases of Souss and Draa Tafilalet.

At the time of French colonization around 1912, olive growing moved to the northern regions of Fez, Meknes and with further expansion in southern areas including Marrakech and Beni Mellal with rather modernized orchards. At that time, one million olive trees were planted in the northern region and about 1.5 million trees in the south. The expansion of olive cultivation was intensified after the independence of the country in



Fig. 4
Traditional old olive
orchards in Marrakech region



Fig. 3
Olive trees at the background
of the Basilica ruins in Volubilis



Fig. 5
12th century AD press made
during the Al-Moravids dynasty

1956 through the development of integrated table and oil olive industries and the extension of irrigated orchards, all leading to exports growth.

AREA UNDER OLIVE CULTIVATION

The development of the olive area over the last 20 years is related directly to government's policies. Nowadays Morocco has 73 million olive trees planted on an

²¹ From Arabic 'al-Muwahhidun', i.e., "the believers in one God".

area of 735,000 ha, nearly 37% of which is irrigated (Fig. 6). Olive trees cover 56% of the area planted with all fruit trees and nearly 6% of the country's arable lands. To reach this olive area, the Moroccan Government launched in 1998 a twelve-year "National Olive Plan" (NOP: 1998-2010) with the target to double the olive area to one million hectares. The aggregate investment has been four thousands millions Moroccan Dirham (438 million USD at that time), 37% financed by the state and 63% by the private sector. The NOP did not reach its objective; nevertheless the olive area has been increased by a massive 50% from the old area of slightly less than 500,000 ha. A new strategy for the whole agriculture sector, giving considerable attention to developing the olive sector is called "Plan Maroc Vert" which targets at increasing the olive area to reach 1.2 million ha by 2020, and increasing production by four folds through improvements of agricultural practices.



Fig. 6
Basin irrigated olive orchard

Although olive cultivation spreads in almost all regions of the country, yet there are two major areas where it is concentrated (Fig. 1, page 266). The northern region is the major area with nearly 40% located in Fes, Meknes, Taza, Taounate, Ouezzane and Chefchauen, where the soils are rich, the terrain is rough and the rainfall is between 400 to 1,000 mm/year. The other is the central region with approximately 32% of the area in Marrakech, Essaouira, Souss Kelaa, and Beni Mellal, where the soils are rich and deep, the terrain is not very rough and the rainfall is between 250 and 370 mm/year. Furthermore, a small percentage of the olive area is located in the Er-Rachidia Oasis to the west of the country and Ouarzazate Oasis in the center, where olive trees are incorporated with the date palms.

OLIVE CULTIVARS

Historically, the olive grown in Morocco has been commonly regarded as one cultivar called 'Moroccan Picholine', as it represents nearly 95% of olive trees grown in the country. However, by 1920's it was reported in major oil-producing regions that there were several cultivars grown under different names.

In the northern regions of Fez, Meknes, Taza, Taounate and Ouezzane the most important oil cultivars are 'Bouchouika', 'Bouchouk Laghlide', 'Bousbina', while the main for table is 'Bakhboukh Beldi'. Two other cultivars are very distinct to those from this area; 'El Berri', which means wild in Arabic, having small fruit and low oil content, highly appreciated for its oil quality, and 'Gortbiewishich' is a cultivar



Fig. 7
Grafting on wild olive tree

with large sized fruit, mainly grafted (Fig. 7) on the wild olive tree in the Ouezzane and Larache districts. A famous cultivar of the region is 'Meslala' which is characterized by large fruit, early maturation and it is the best cultivar for the traditional popular preparation of table olive known as Moroccan *Tagine*. It is not suitable for commercial processing and canning due to the sensitivity of its skin. Another cultivar known around Taza is 'Nouqal', for oil.

'Meslala', 'Bouchouk Laghlide' and 'Bouchouika' ripen very early in the season and they have a flesh/stone ratio higher than 'Moroccan Picholine'. 'Bouchouk' and 'Bouchouk Rkik' are for oil production.

In the central region, the *Zit* "زيت" (meaning oil in Arabic) is widespread in Marrakech district. 'Soussia' is a large sized dual-purpose cultivar, probably given that name as it spreads in Souss (Agadir) and in Mesfioua near Marrakech.

At national level, the most predominant cultivars are:

'**Picholine Marocaine**' (Fig. 8) was given this name during the colonization times to preserve its identity as an autochthonous Moroccan cultivar and to differentiate it from a cultivar in France with similar name. This dual-purpose cultivar is hardy and shows great adaptability to the local environment with a medium productivity and alternate bearing. The fruits are characterized by a rather uniform oval shape, with a high flesh to stone ratio and a shallow stem cavity. Maturation is in December. Its high quality oil is extremely appreciated worldwide for its mild fruity flavor with a hint of bitterness. This cultivar is very sensitive to the *Cycloconium oleaginum* fungal disease.



Fig. 8
'Picholine Marocaine'

'**Haouzia**' and '**Menara**' (Fig. 9) are the new national cultivars resulting from a selection among the olive orchard of the Menara Olive Garden, (Boulouha, 1995). They are characterized by high productivity and high oil content levels with low alternate bearing tendency; fruit weight of both cultivars is 3-5 g and with high flesh/stone ratio; both cultivars are dual purpose with a preference of the 'Haouzia' for table olives.



Fig. 9
'Haouzia' 'Menara'

'Picholine of Languedoc' is a table olive cultivar introduced in 1920 from France, initially used in the canning industry for export. Presently it occupies 4% approximately of the national olive area. The fruit weight is between 4 and 5 g with a high flesh/stone ratio. The oil content is about 18% on fresh weight basis. It is resistant to the *Cycloconium oleaginum* but sensitive to drought.

The Spanish 'Picual' and 'Manzanilla' were introduced in 1987, and they still have a small share of less than 1%. Spanish 'Arbequina' was introduced in 1996 as a suitable cultivar to develop intensive and super-high-density plantations.

IMPACT ON ECONOMY AND ENVIRONMENT

Coupled with its processing sector, olive growing plays an important role in the socio-economic aspects of the Moroccan population. The olive sector contributes with a share of 5% in the agricultural gross domestic product and its share in the overall revenue from agricultural product exports reaches 15%. Nearly 75% of olive oil production is consumed domestically, thus contributing with 16% of the country's consumption of edible oils. Recent export revenues recorded 8 million USD of which olive oil gained 30% while table olives had a higher share of 70%. Morocco is among the largest exporters of table olives with an annual average of nearly 60,000 tons.

The olive growing sector in Morocco is fragmented, with over than 400,000 orchard holdings mostly owned by smallholder growers, therefore it provides livelihood for more than two million people. Furthermore, the olive industry generates 20 million workdays annually, which is equivalent to 100,000 permanent jobs.

The Moroccan olive growing sector has both positive and negative environmental impacts. On the positive side it helps to develop marginal lands, especially in the Rif Mountainous region, protecting the land from erosion and desertification and efficiently utilizing the limited water resources of the country, especially in the semi-arid southern regions. On the other hand, the development in the processing sector has brought about ecological concerns that have been witnessed during recent years. For example, around Fes, Meknes and Marrakesh there is serious threat to the environment from olive industry by-products (both residual vegetation water from olive oil extraction or discarded brine from table olives processing) not properly managed to avoid environmental pollution. The government is therefore giving great attention to improving public awareness for environmental consciousness and for the importance of recycling by-products.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Moroccan olive growers give great attention to provide supplemental irrigation to their trees during winter if precipitation is not enough. Their conviction of the importance of winter irrigation is expressed by an old adage which says: "On its own, the olive tree is irrigated seven times in winter, so what about the one which has a grower who takes care?" This ancient practice has been supported by research



in modern times. In contrast, many growers withhold irrigation at the blooming stage in spring, as they fear to cause flowers drop. It is a deep rooted belief and through extension it should be changed with time.

The old technique of grafting wild olive trees in the northern mountainous areas is still practiced nowadays by Moroccan growers who have mastered it for centuries. It is used to commercialize wild trees in the forests, which produce small fruits with low oil content, with cultivars like 'Bouchouika' and 'Gortobie'

A common wrong practice is late harvesting to get, what is mistakenly believed, more oil. Growers also prefer to delay harvest because ripe fruits are easier to harvest due to high abscission tendency, so with few hand shakings to the main branches or beating with a stick, the fruits normally drop readily. This practice threatens the quality of about 50% of the oil produced at country level.

PROCESSING METHODS OF RAW OLIVES

A unique method in Morocco for extracting olive oil, called *Alwana*, is probably known from the 1st century AD. The method is still used by subsistence farmers to produce their own needs of oil in what may be called as the "family oil mill". The process is confined to the region of Taounate in the north region of the country, where the geography, climate and isolation from roads have probably conserved it. Taounate is located in the hills and plains between 650 m and 1,000 m above sea level where a Mediterranean climate prevails with hot dry summers, cold winters and precipitation that can reach 1,000 mm/year.

Green olives or preferably those turning to purple color are hand-picked, and left overnight in a traditional brick oven covered with charcoal and ash remains which are still hot after baking bread. The next day, the dehydrated "smoked" olives,



Fig. 10
Home wooden olive press

now having a very dark color, are removed from the oven using a shovel to be crushed manually by hand beating with a stone. The resulting coarse paste consisting of olive pulp and fragments of pits will be heated for nearly 15 minutes with the addition of small quantities of water. The hot paste will be packed into mates to be placed in a home wooden press to extract the oil. This small press, which is made by local artisans, is composed of lower and upper wooden boards, the latter being drilled for the passage of two spindles which are used to apply pressure by two large nuts turned manually (Fig. 10). Unfortunately, the resulting olive oil which is in

no way produced on a commercial scale is highly appreciated by locals and is considered to be of the highest quality.

TRADITIONS AND CULTURE

In Morocco olive plantations are considered a sign of wealth and value in the community, especially in the mountainous regions of Northern Morocco. Coupled with its religious values, Moroccans have developed over centuries many adages which connect the olive tree with their day to day life. Some of these adages reflect community values and some reflect how the tree should be managed as well as the nutritional benefits of olive oil shown below:

English	Arabic
• Marry him, even if he is old. He has olive trees in the mountains up there	• تزوجيه حتى لو كان عجوزا فلديه اشجار الزيتون هناك في الجبل
• The olive tree says "Reduce my wood, and I will make you rich with oil"	• تقول شجرة الزيتون: إجعلني فقيرة من الأغصان أغنيك زيتا
• The olive tree that does not have a guardian should be irrigated seven times in winter	• الشجرة التي ليس لها والي تسقى سبع مرات في ليالي الشتاء
• The tree says "Prune me in the winter or let me keep what belongs to me"	• تقول شجرة الزيتون "إزبرني في فصل الشتاء أو اتركني في حالي"
• If there is little rain during the season, the planting and the ploughing will come to nothing	• إذا ما قل المطر في السنة فلا فائده في الغرس ولا في الحرث
• Planting without knowledge gives poor trees	• الغراسه بدون معرفة تعود بالضعف
• A year in which there is much oil is blessed, the people eat it and keep at homes	• السنة ذات منتج كبير من الزيت تكون مباركة يأكل منها الناس و البيوت
• A poor year is the one without wheat or olives	• السنة الهزيلة ما فيها قمح ولا زيتون
• A meal with black olives worth ten without	• وجبة بالزيتون الأسود تعادل عشر بدون

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olives have an important role in the national cuisine, where marinated table olives in spices and herbs are a staple, common to be found in huge mounds in all local markets (Fig. 11). Moroccan cooking is full of dishes which use olives and olive oil as main ingredients, examples of which are the following two recipes:

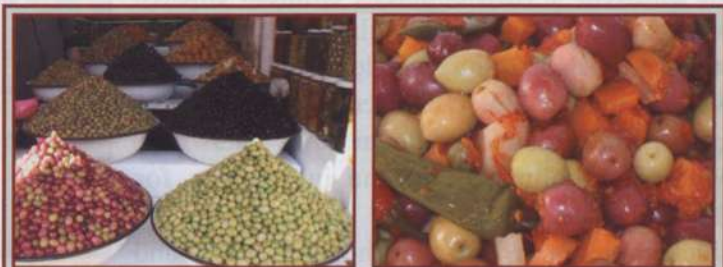


Fig. 11
Processed table olives in local markets
(Photo courtesy of Victoria Challancin)
<http://flavorsofthesun.blogspot>

➤ ***Kefta Tagine*** "طاجين كفتة" (Fig. 12) is a delicately spiced meatball in a robust tomato sauce with eggs poached on top.

Ingredients: A) For the sauce: 4 tablespoon olive oil, 1 finely chopped onion, 2 crushed garlic cloves, 500 g tomatoes, handful of chopped coriander, 1 tablespoon tomato paste, pinch of dried chili flakes, paprika. B) For the *Kefta*: 4 teaspoon cumin seeds (dry-roasted and ground), 1 finely chopped onion, 1 crushed garlic clove, 500 g minced lamb meat, 5 eggs, handful of chopped parsley, olive oil for frying, salt and pepper.

Method: to make the sauce simmer the onion, garlic, tomato paste and tomatoes until thick, stirring from time to time. Add the coriander, chili flakes, paprika and salt and pepper. To prepare *Kefta*, put the onion, garlic, chili, cumin seeds, parsley, salt and pepper in a bowl and mix thoroughly. Add one beaten egg to bind the mixture. Form into small balls about the size of a walnut. Heat the oil in a frying pan and gently fry the meatballs until browned all over. Put them into the tomato sauce and simmer gently for 10 minutes. Make four indentations in the sauce with the back of a spoon and break an egg into each. Cover and simmer for 8-10 minutes until the eggs are lightly set. Sprinkle with paprika and serve with bread.

➤ ***Chicken Tagine with Green Olives*** (Fig. 3) "طاجين الدجاج بالزيتون":

Ingredients: A) For the marinade: 1 grated onion, 3 crushed garlic cloves, 1 piece of fresh, peeled and grated ginger, 1 bunch minced cilantro, pinch saffron, juice of 1 lemon, 3-4 tablespoon olive oil, 1 tea spoon coarse sea salt and freshly ground cracked black pepper. B) For the chicken: 4 each boneless, skinless chicken breasts, 2 tablespoon olive oil, water or chicken stock as needed, 2 preserved lemons (cut into 10 wedges each), 200 g cracked green olives, 1 tablespoon fresh minced thyme.

Method: combine all of the ingredients for the marinade in a shallow pan and rub the chicken pieces in it so that they are evenly and thoroughly coated and keep in the refrigerator for 1-2 hours. Heat the olive oil in the *tagine* (the special earthenware pot), take the chicken pieces out of the marinade and brown in the oil. Pour the reserved marinade over the chicken and add enough water or chicken stock to the *tagine* so that $\frac{1}{2}$ of the chicken breasts are sitting in liquid. Bring the liquid to a boil, reduce the heat, cover with the lid and simmer for approximately 30 min. Turn the chicken several times to insure even

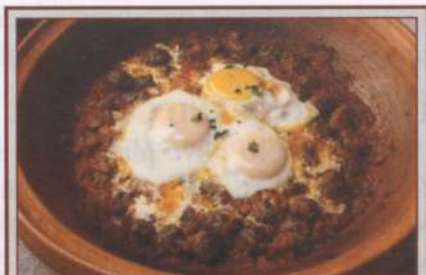


Fig. 12
Kefta Tagine



Fig. 13
Chicken Tagine

cooking. Add the preserved lemons, olives and $\frac{1}{2}$ of the thyme to the *tagine*. Cover, and continue simmering for an additional 15 min. Check the seasoning. Garnish with the remaining thyme and serve immediately from the *tagine*.

POPULAR MEDICINAL AND COSMETIC USES

Olive oil has been widely used as a cosmetic product for hair and scalp care for men and women. It is effectively used for massaging the body to relieve different muscle sprains or aches of the back, arms and legs. Many Moroccans attest that few drops of olive oil, warmed slightly, are perfectly used in cleaning ears. Others say that one tablespoon in the morning on an empty stomach for three days acts as a laxative for constipation and that a tablespoon of olive oil, heated slightly, is used to moisten fresh scars or skin irritations and hasten their healing.

OLIVES AND TOURISM

The Olive Garden of Menara in Marrakech (Fig. 14) is a historical monument of touristic attraction to city visitors. It was built over an area of about 80 ha by the Almohad Sultan Abd al-Mu'min ibn Ali who ruled between 1130 and 1163 and used Marrakech as the capital of his empire that extended as far as Egypt. The garden is equipped with a huge irrigation basin which is supplied with water through a hydraulic system which conveys water from the mountains located 30 km approximately away from Marrakech. The majority of the garden is occupied by olive orchards, cypress and fruit trees. The trees are planted on a ten-meter grid, imposing a strict regularity on the landscape. Pathways through the garden fit into the logic of the grid, as ten-meter wide dirt paths stretch between rows of trees to divide the garden into approximately twenty-five rectangular parcels of varying sizes and orientations.



Fig. 14
Menara Garden amidst olive orchards

OLIVE WOOD AND BY-PRODUCTS USES

Olive leaves and young twigs from pruning are collected and used for feeding livestock and the wood is used to heat traditional mud or brick ovens for bread baking. The pomace by-product from extracting olive oil is used to heat the old public steam baths called *Hammam* "حمام" which are common in all Moroccan imperial cities like Fez, Meknes and Marrakech.



COUNTRY INTRODUCTION



Fig. 1

Olive growing areas in New Zealand

New Zealand (*Aotearoa* in Māori²²) is an island country in South-western Pacific Ocean. It is situated east of Australia across the Tasman Sea, south of the Pacific island nations of New Caledonia, Fiji, and Tonga. New Zealand is made up of North and South Islands separated by the Cook Strait, 22 km wide at its narrowest point and lies between latitudes 29° and 53° S, and longitudes 165° and 176° E. It is long (over 1,600 km along its north-east axis) and narrow (a maximum width of 400 km), with approximately 15,100 km of coastline and a total land area of 268,021 km². Due to its far-flung outlying islands and long coastline, the country has extensive marine resources.

With a mild maritime climate, the land is mostly covered in forest. The geography of New Zealand is highly varied, from snow-capped mountains to lowland plains. The country's varied topography and its sharp mountain peaks owe much to the uplift of land and volcanic eruptions caused by the Pacific and Indo-Australian Plates clashing underfoot. The South Island is the biggest one and a range having 18 peaks above 3,000 m above sea level divides it longitudinally. The highest peak is Mount Cook, with 3,754 m.

Auckland and Wellington in the North Island and Christchurch in the South Island all receive a yearly average in excess of 2,000 hours of sunshine. The southern and south-western parts of the South Island have a cooler and cloudier climate, with around 1,400-1,600 hours; the northern and north-eastern parts of the South Island are the sunniest areas of the country and receive approximately 2,400-2,500 hours.

²² Māori or *te reo Māori* (pronounced ['ma:ɔɾi, te 'reɔ 'ma:ɔɾi]), commonly *te reo* ("the language"), is the language of the indigenous population of New Zealand, the Māori. It has the status of an official language in New Zealand.



The climate is temperate and dominated by a westerly wind flow within an oceanic environment that gives a weather pattern which is changeable over short periods. In the South Island the mentioned range modifies the weather pattern. The country as a whole is subject to extremes of wind and rain with annual rainfall varying from below 360 mm to 1,334 mm. Summer droughts are common in many areas and all regions of the country experience frost except the northern part of the North Island.

The main crops grown in New Zealand are kiwifruit, wine grapes and apples; avocados and olives are becoming increasingly important crops, with large increases in plantings recorded in 2002. Vegetable crops include tomatoes, capsicums, cucumbers, potatoes and onions, also cereals like wheat and barley.

OLIVE CULTIVATION HISTORY

Early records show that olives existed in New Zealand before 1835 as they were documented by Charles Darwin, when he visited the northern-most region of the country.

Olives were growing successfully in the Auckland region; indeed, an early colonists' guide of that period suggests the following trees as being suitable for the New Zealand climatic conditions: 'Cailletier', 'Blanquette' and 'Picholine' amongst others. It is doubtful whether many of the trees imported at this time were true to type as it is possible they would have been grown from seedlings.

Between 1860 and 1880 two prominent early settlers, Logan Campbell and Sir George Grey independently attempted to establish an olive industry. Logan Campbell imported 5,000 olive seedlings from South Australia that were planted on land he later gifted to Auckland city. The venture only lasted a few years before it was abandoned; apparently because the yield and flavor of the oil did not match the Italian oils that Campbell was familiar with. His legacy to Auckland, a beautiful large park, still contains several very large olive trees left from the original plantings. Sir George Grey's efforts to produce olive oil also failed but there are no records to tell why they were unsuccessful.

In 1877 "The Report on Olive Culture" was presented to the government of the day. It emphasized the potential for olive growing in New Zealand if the recommendations as to soil type and climate were adhered to. The report was a detailed study of the Tuscan industry. It was ignored, possibly because of the experiences of Grey and Campbell.

New Zealand has to wait until 1960 for any further developments in the country's olive story. At this time, 'Ascolana', 'Manzanilla', 'Mission' and 'Verdale' trees were imported and cuttings also taken from old, well established trees. These cultivars were planted in trial blocks in sites deemed suitable. Reports based on this work note that in the view of those undertaking the evaluation, olives should not be

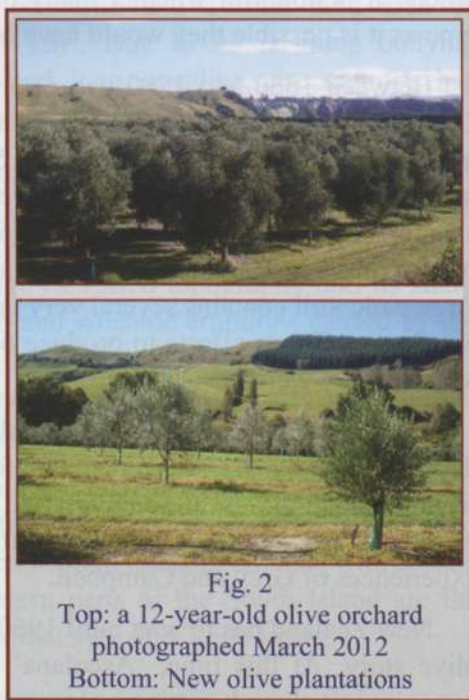


grown for oil production, but fruit for pickling would be a possibility. There was a cautionary note saying that “before any serious attempt is made to establish commercial olive groves it would be necessary to ascertain the demand, bearing in mind that olive products can be imported fairly cheaply.” Although this report was largely ignored, many of the trees included in the study still survive and one in particular. It was given the name ‘J5’ after the nurseryman, Milton Johnson who propagated the original cuttings from a tree found in Northland area, at the north of North Island; ‘J5’ thrives in the northern regions of New Zealand. Another cultivar propagated at that time from a tree found on the west coast of the North Island was named ‘El Greco’. However, rather than being part of the olive industry, it has an important role in New Zealand for landscaping and shelter belts on rural properties.

In 1971 eight olive trees were donated by the Cretan people in remembrance of New Zealand’s soldiers who fought in Crete during World War II. These trees were distributed around the country. Trees propagated from one particular Cretan tree, have been named ‘Kala’ and produced fruits that were more suitable for table olives. At the end of the 1980’s Gideon Blumenfeld, a former FAO staff member asked for and received plant material from the Olive World Germplasm Bank of Córdoba, Spain for experimental purposes. A 10 cultivar trial was planted at Nelson, at the top of South Island.

Following the development of a fledgling industry, particularly in Marlborough, the region in the north of the South Island most noted for producing the famous New Zealand wine, *Sauvignon Blanc*, the mid-1990’s saw a boom of the industry (Fig. 2). At this time two associations, The New Zealand Olive Association (now renamed as Olive New Zealand, ONZ) and Oliveti were formed to undertake research and to provide networking opportunities. Oliveti Northland Incorporated is a support group for Northland growers, it has over 200 members and its estimates indicate the possibility of up to 200,000 trees planted in that area.

A major step was the granting of an Observer Status to New Zealand in 1996 by the International Olive Council and as a consequence, the arrival of Dr. Luciano Di Giovacchino from I.S.E. (*Istituto Sperimentale per l’Elaiotecnica*) of Pescara, Italy to teach the first course for virgin olive oil tasters in New Zealand. This and his



welcome return in 1998 were milestones in the development of the New Zealand's olive industry that led to the eventual establishment of a tasting panel for extra virgin olive oil. For the first ten years, the industry concentrated largely on horticultural aspects and it is only relatively recently that the emphasis has changed to the production of high quality extra virgin olive oil.

AREA UNDER OLIVE CULTIVATION

New Zealand's olive oil industry is small, but it is growing. Small orchards total less than 500 trees, while largest orchards have 20,000-40,000 trees each. So far official governmental figures about production are scarce. The olive industry association has around 400 olive growers; however, there are many people growing olives and producing olive oil outside the Olives New Zealand organization (ONZ).

In the 1980's New Zealand pioneers proved olives could be grown in the country; therefore orchards are being planted from the top of the North Island to Central Otago deep in the South Island. Nelson has already established itself as one of the better areas in New Zealand. Currently, the main olive growing regions are Nelson, Marlborough, North Canterbury and Central Otago in the South Island and Kapiti, Wairarapa, Hawkes Bay, Bay of Plenty, South Auckland, Waiheke Island and Northland in the North Island (Fig. 1, page 276), in different microclimates ranging from dry to wet and from cool to warm environments. Commercial harvest time in North Island starts in early April and ends in early June and in South Island in June and can be extended until the beginning of July.

OLIVE CULTIVARS

Commercial olive orchards in New Zealand are planted with a range of cultivars from Mediterranean countries, like 'Frantoio', 'Leccino', 'Pendolino', 'Moraiolo', 'Koroneiki', 'Manzanilla', 'Picual', 'J5', 'Chemlali', 'Nabali', 'Picholine' and 'Verdale', 'Kalamata', 'Super', 'Minerva' (patented clone of 'Leccino') and 'Barnea'; however 'Manzanillo', 'Barnea', 'Frantoio', 'Leccino' and 'Picual' are dominant. The Village Press olive orchard has over 20 olive cultivars. The 45,000 olive trees therefore vary in their growth habits, frost tolerance, fruit yield, fruit size and shape and oil content.

Although New Zealand has no autochthonous olive trees, there are many examples of "local" trees that have been propagated from olives brought into the country in the nineteenth century. These trees have been given a variety of names, some for example after a geographical region; others after the nurseryman who carried out the original propagation. However, as there is no documentation that identifies these trees, it will require a well-funded research program and DNA testing to establish their true genetic identity. With the development of a commercial olive industry, the emphasis has somewhat naturally switched to the planting of named cultivars imported from the Mediterranean region.



During the early 1990's the New Zealand olive industry has promoted Barnea cultivar as the olive tree to be of choice for any commercial olive orchard, anywhere in the country. However, in many areas, particularly in the warmer northern places, 'Barnea' and 'Carolea' have not lived up to its expectations and have in a number of cases been replaced with other suitable cultivars.

Most orchards have a mix of cultivars and there is very little history on which to base decisions such as which cultivar is best suited to a particular region so further experimentation will be undertaken before clear indications begin to emerge over the next ten or so years. However through growers' experience, the industry is now geared up to promote certain cultivars that have proved to be the most reliable in certain locations.

The most common New Zealand "local" cultivars are: 'Rakino', 'Super', 'J5', 'J1', 'J2', 'One Tree Hill', 'Tamaki', 'Motu', 'Fossil Bay', 'El Greco' and 'GB01'. Of these, 'Rakino', 'J5', 'Super' and 'GB01' are the trees most likely to be found in commercial orchards producing extra virgin olive oil. Some characteristics of main cultivars are indicated below:

'Rakino' was propagated from an olive tree found on the island of Rakino in the Hauraki Gulf off the coast of Auckland. These trees are thought to have originated from 'Verdale' or 'Blanquette' and although they have not been positively identified, now thrive in some of the commercial olive orchards on Waiheke Island, another of the islands in the Hauraki Gulf. They require consistent heavy pruning to keep them within a manageable size, bear heavily and produce medium quantities of good quality oil.

'J5' is considered a unique cultivar which was developed from one of NZ's oldest trees as mentioned before. It is planted widely in Northland and Waiheke Island. The mother tree used for its propagation still thrives on the edge of marshy land. It is then not surprising that, unlike most other cultivars, the trees grow well in soils that are not well-drained and tolerates relatively humid conditions very well. 'J5' produces good oil yields without tendency towards alternate bearing.

'GB01' was the name given by Gideon Blumenfeld to the cultivar arising from a well-established eighteen year old tree. It has appreciable high oil content.

'Super', like 'GB01' was propagated in the Blumenfeld nursery from a very productive olive tree growing near a supermarket in Marlborough; hence the name. Records indicate that it may be a 'Verdale' tree. 'Super' olives also produce good quantities of oil. This cultivar is more likely to be found in the more southerly olive growing regions.

IMPACT ON ECONOMY AND ENVIRONMENT

Olive oil consumption in New Zealand has increased from just less than 295 tons in 1988 to more than 3,200 tons in 2000 with trends continuing to grow. The future for the olive industry appears to be very positive. Effective border controls that have



prevented the arrival of major deleterious olive pests and diseases and a clean green environment are an advantage.

New Zealand's olive-growing industry has experienced continuous development in recent years; recent reports and success stories not only indicate progress achieved in quantity, but also, and more importantly, in quality. Some growers only produce on a small scale, mainly for their own enjoyment and that of family and friends, while others run thriving businesses filling mail orders and supplying shops nationwide. Many producers have won awards and garnered plaudits both in New Zealand and overseas for their oils. During consecutive recent years, olive oils from different production areas have consistently won gold medals in both national and overseas extra virgin olive oil competitions.

New Zealand's fledgling olive industry could be made more competitive by adapting modern olive growing systems and minimizing the cost of production, especially that of harvesting. This might enable local growers to compete in the domestic market with annual imports of 2.3 tons of olive oil valued at about 12 million USD.

CULTURAL PRACTICES DEVELOPMENT

Cultural practices are in fact a reflection of the relatively small olive area, especially that small orchards have largely been developed by enthusiastic people with a passion for olives. Some growers concentrate in their orchard management on creating a balanced soil that will feed the trees allowing them to produce effectively and at the same time be more tolerant to pests and diseases. There is an overwhelming faith that such strategy will reduce the need for controlling pests with chemical sprays.

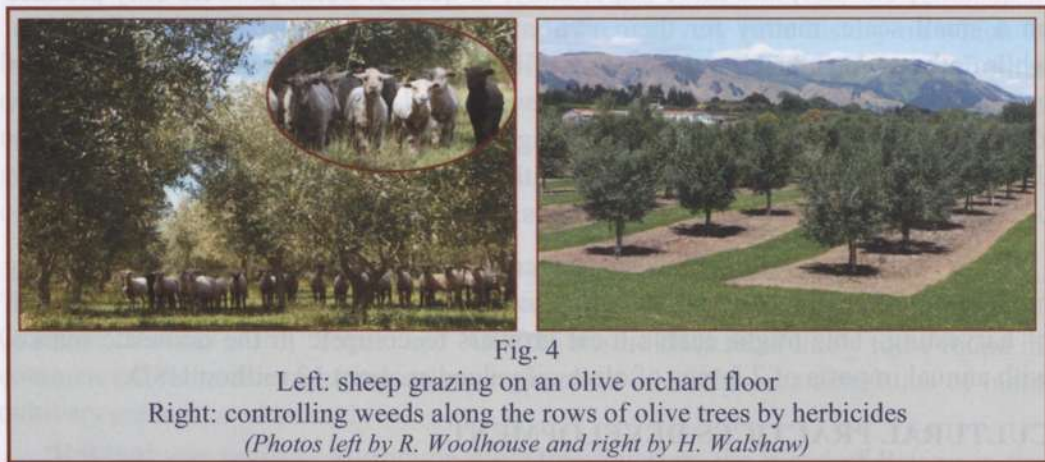
Some olive growers planted a shelter belt of olives (Fig. 3) to replace a shelter belt of pines that had grown too big and were affecting the olives in the orchard making them to grow more than the pines and be "lopsided". Using olives as shelter creates the opportunity to plant these margin trees more closely than the general spacing used in the block, to manage their canopies slightly differently (e.g. taller, reflecting their primary purpose), to employ them as a supplementary pollen source to increase fertilization and fruit set in the main block and possibly to generate additional yield (their fruit can be harvested too in a good year). Olive tree shelters could also be used with grapes (Fig. 3).



Fig. 3
A typical olive shelter belt (wind-break)
in a vineyard (Photo by B. White)

There are strong ties between New Zealand and Australia; therefore there are always cases of exchanging information and knowledge between the two countries or

the two Islands; one is big in size and the other is much smaller. In oliviculture many New Zealander growers rely on their counterparts in Australia to learn about new technologies and develop their own cultural practices. Among the mirror image practices are controlling weeds along the rows with herbicides and grazing of sheep on the orchard floor in non-sprayed orchards (Fig. 4).



PROCESSING METHODS OF RAW OLIVES

When it comes to olive processing for oil there is a major advantage in being a young industry; that is the ability to incorporate some of the latest technology. In consequence, the vast majority of the processing is carried out using centrifugal equipment of varying capacity from different European sources. Whilst some boutique oil producers, regardless of size, prefer to undertake their own processing in most areas, one or two large processing facilities have been established by contractors to service the rapidly increasing volumes of olives.

OLIVE OIL IN COOKING

The Māori are the indigenous people of New Zealand; they are Polynesian²³ and comprise about 14% of the country's population. Originally, they were hunters, but soon became peasants, living off agriculture. Polynesians settled New Zealand in 1250-1300 AD and developed a distinctive Māori culture²⁴. The first contact with

²³ The Polynesian people are considered to be by linguistic, archaeological and human genetic ancestry a subset of the sea-migrating Austronesian* people and tracing Polynesian languages places their prehistoric origins, ultimately, in Taiwan.

*The Austronesian-speaking peoples are various populations in Southeast Asia and Oceania that speak languages of the Austronesian family.

²⁴ Māori culture is the culture of the Māori of New Zealand, an Eastern Polynesian people, and forms a distinctive part of New Zealand culture. Within the Māori community, and to a lesser extent throughout New Zealand as a whole, the word *Māoritanga* is often used as an approximate synonym for Māori culture, the Māori suffix *-tanga* being roughly equivalent to the qualitative noun ending "-ness" in English.

Europeans was made in 1642. Māori cooked their food in earth ovens, known in New Zealand as *hāngi*. Migrants to this small island from other countries around the world have had a great influence on what today's New Zealanders eat.

Olive oil is great for day to day cooking in New Zealand. Olive oil is best to use for drizzle on cooked meat, mushrooms, fish, pasta and vegetables, great for salads and antipasto platters. It is used with sauces and can be used to mash potatoes instead of butter and milk. The products such as olive bread, olive and orange relish (sweet citrus and cinnamon, fantastic with cheese), olive *dukkah* (Fig. 5), composed of delicate olive, horopito and roasted nuts flavor, black olive tapenade (a rich blend of black olives, anchovies, capers and herbs) are widely used. A quick and easy dish to prepare for a gathering alongside olive salad with balsamic drizzle and olive oil is *pesto* pasta salad (Fig. 5). Cooked pasta catches and hold the bits of basil pesto. Can dress up the *pesto* and pasta with any number of things; cherry tomatoes, olives, nuts, peas, and olive tapenade, cheese, slivered almonds, sun-dried tomatoes and olive oil.



Fig. 5

Left and right: *Pesto* pasta salad and olive salad (Courtesy Telegraph Hill Olive Company)
Middle: Bread, olive oil and *Dukkah*, a widely spread and healthy snack in New Zealand

A large variety of herb spread ingredients is used along extra virgin olive oil to enrich the taste and flavour of the food. These include parsley, apple cider vinegar, NZ sea salt, garlic, rosemary, NZ spinach, nasturtium, calendula, dandelion, plantain, sage, oregano, thyme and lavender.

POPULAR MEDICINAL AND COSMETIC USES

Before the arrival of Europeans, Maori people used native plants as medicine, named *Rongoa* in their language. Use of these medicines prevented many sicknesses, and provided remedies for the sick, taken from plants, shrubs and herbs. Nowadays, olive oil is used as the base oil, for both cosmetic and medical purposes. Olive oil is used in skincare such as facial and hand creams, body lotions and balms, soaps, shower gel, face scrubs, cosmetics and medicine.

The essential oil produced from Manuka plant, native to New Zealand, is reported to have therapeutic value. Olive oil and Manuka honey moisturizer combined with the rich and hydrating properties of jojoba oil, olive oil and Sweet almond oil will feed and nourish even the driest skin. *Manuka* honey and olive oil

soap provides a rich, moisturizing, replenishing action to refresh and enrich the skin. The fresh goat's milk, olive oil and wheat protein are natural moisturizer for the skin.

Megannan's bush balm recipe: Calendula flowers, *Manuka* seeds, Kawakawa leaves, extra virgin olive oil and beeswax.

OLIVES AND TOURISM

The annual New Zealand Olive Festival is a day to celebrate all things about olive (Fig. 6, top). Held at Hawke's Bay the Festival includes olive oil tasting, olive appreciation workshops, cooking demonstrations by top local chefs, olive grower stalls, as well as plenty of great food, wine and entertainment. Cooking workshops are organized, where to learn how to use olive oil in daily cooking. Other workshops as well as seminars are aimed at disseminating information and knowledge on how to grow olives and process them as pickles or for oil extraction.

In Waiheke Island the Olive Food Festival takes place in November each year. In this popular olive festival, growers launch their new season's extra virgin olive oil.

Tourists also have the chance to visit the Observatory at the *Atutahi* olive orchard, which is a small boutique orchard in the Wairarapa, near Wellington, that was given the Māori name for the star *Canopus*, the second brightest star in the southern sky, reflecting the owners' interest in astronomy. The magnificent *Atutahi* Observatory (Fig. 6, bottom), built on the highest point of the olive orchard, commands not only the night sky but provides an expansive view all-round the South Wairarapa valley from the Tararua Ranges in the west to the Canoes of Kupe in the east.

ACKNOWLEDGEMENTS

Thanks to all who invited me to visit their olive orchards and provided me with photographs.

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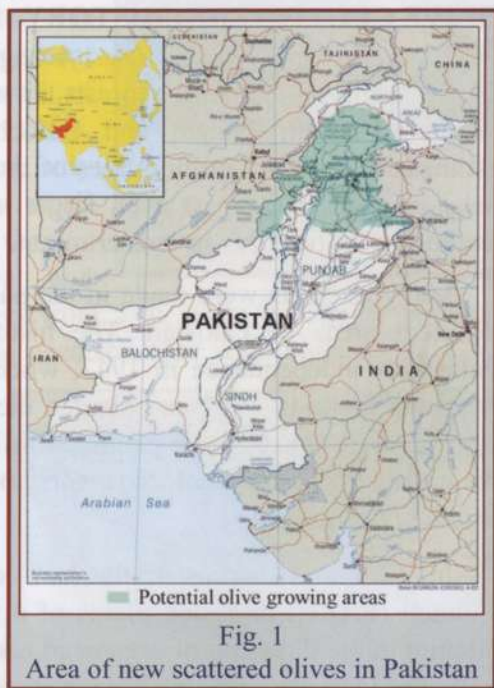


Fig. 6
Top: Olive Festival 2008
Bottom: The *Atutahi* Observatory



INTRODUCTION

Pakistan is a South Asian country (Fig. 1), with an area of 796,095 km², located in a strategic position between the important regions of South Asia, Central Asia and the Middle East. It has a 1,046 km coastline along the Arabian Sea and the Gulf of Oman in the south, and is bordered by Afghanistan and Iran on the west, India on the east and China on the northeast. In the north it is separated from Tajikistan by the narrow Wakhan Corridor. Pakistan is a federal parliamentary republic consisting of four provinces and four federal territories. With 170 million people, it is the sixth most populous country in the world and has the second largest Muslim population after Indonesia. It is an ethnically and linguistically diverse country with a similar variation in its geography and wildlife. The geography of Pakistan is a blend of landscapes varying from plains to deserts, forests, hills, and plateaus ranging from the coastal areas of the Arabian Sea in the south to the mountains of the Karakoram Range in the north. Pakistan is divided into three major geographic areas: the northern highlands, the Indus River plane and the Balochistan Plateau.



In Pakistan, about 25% of the total land area is under cultivation and is watered by one of the largest irrigation networks in the world. Agriculture accounts for about 23% of the gross domestic product and employs about 44% of the labor force. Pakistan is among the world's largest producers and suppliers of certain agricultural products, having a high ranking, such as chickpea (2nd), apricot (4th), cotton (4th), sugarcane (4th), milk (5th), onion (5th), date palm (6th), mango (7th), tangerines, mandarin oranges, clementine (8th), rice (8th), wheat (9th) and oranges (10th). During 2008-09, the area under fruit crops reached 860,000 ha. The main fruits are citrus, mango, apple, banana, guava and dates.

The diversification of crops in Pakistan is very much a reflection of its climate, which varies from tropical to temperate, with arid conditions existing in the Coastal South characterized by a monsoon season with adequate rainfall and a dry season with lesser rainfall. There are four distinct seasons; a cool dry winter from December through February, a hot dry spring from March through May, the summer rainy season or south-west monsoon period from June through September and finally the retreating monsoon period of October and November. Rainfall can vary radically from year to year, and successive patterns of flooding and drought are common.

OLIVE CULTIVATION HISTORY

Olea cuspidata W. and *Olea ferruginea* R., locally known as *Kau* grow in the form of groves in natural forests in many areas of Pakistan, mainly in Khyber Pakhtoonkhawah, Punjab and Balochistan Provinces. According to a recent estimation, about 45 million trees of those species are available in these areas. It is believed that in the past even larger numbers were present. However, the figure declined over time due to indiscriminate use of these trees for timber and firewood.

Many attempts were made in the past to introduce olives (*Olea europaea* L.) in different areas of Pakistan. The history of this introduction goes back before Pakistan's independence in 1947, when English rulers imported olive plants from Italy and Spain in 1941 and planted them in Rawalpindi, near the country's capital Islamabad. A few of these plants are still growing in some places. Years after, there were scattered individual endeavors to import olive plants from countries in the Middle East and Italy.

In the early nineties of the last century, the Pakistan Agricultural Research Council (PARC) imported plants of a few cultivars from Italy. That was the first attempt in the direction of organized research on olive growing in the country. Nine cultivars with five plants of each, received from PARC, were planted at Barani Agricultural Research Institute (BARI), Chakwal, in 1991. In 2000-01 the Pakistan Oilseed Development Board (PODP) started grafting *O. ferruginea* and *O. cuspidata* trees with olives under a project aimed at converting or top-working the so called "wild olives" into producing real olive cultivars. The grafting was started with the assumption that those "wild olive" forests will be converted into oil producing olives. In this project more than seven million plants were grafted in various climatic zones. This assumption has proved not to be correct all the time; as up till now, top-worked trees are not bearing fruits or sometimes showing very little production. It is assumed that lack of production could be mainly due to agronomical factors such as the use of unsuitable cultivars, absence of proper pollinizers, low fertility of soils and absence of proper management, training and pruning of plants after grafting. However, a major reason of not bearing might be the graft incompatibility between *Olea europaea* L. with *Olea cuspidata* W. and



Olea ferruginea R., which in many cases is evidenced by a gall appearing at the graft point, which may hinder the flow of cell sap from rootstock to scion (Fig. 2).

AREA UNDER OLIVE CULTIVATION

In Pakistan, olive is a new introduction just passing from the research phase; therefore very limited areas are cultivated with olives. The first commercial olive orchard of about 30 ha was established by the Pakistan Oilseed Development Board in 2000-01 at Sangbhatti District Sawabi of Khyber Pakhtoonkwa Province. Till today, commercial olive orchards bearing fruits are only public pilot projects. Exceptions of a few small orchards with 4-50 trees can be seen in various locations in Punjab, Khyber Pakhtunkhwa and Balochistan Provinces. The fruit yield ranges from 5 to 30 kg/tree under planting density of 250 trees/ha; therefore there is no need for large scale mills for the time being. However, small olive oil extraction units (Fig. 3) are available at public sector institutions, offering olive oil extraction to olive growers without charge in a campaign to promote olive growing in Pakistan.

During the last 3-4 years, private farmers who realized the importance and profitability of olives compared to other crops, have started its cultivation. However, such ventures are taking place on marginal lands where cultivation of other crops was not economically viable. The trend of olive growing, especially in marginal lands, is increasing gradually and it is expected to increase significantly in the next few years. Nevertheless, the development is still slow due primarily to the lack of known and certified olive nursery plants, with proven track records that they can bear fruits under a particular growing environment. Although importation of olive trees from nurseries is very expensive, farmers have already imported small numbers from Italy and Turkey to establish their own olive orchards. On the other hand, limited numbers of olive nursery plants are provided by PODP and BARI in Chakwal; an example is 10,000 plants of 17 imported cultivars that have been planted at a privately owned olive orchard during 2010 near Talagang in the Punjab Province. Another 4,000 plants of six different cultivars have been planted at Khura near Nowshera also in the same



Fig. 2
Grafting of olive
(*Olea europaea* L.) on "wild olive"
(*O. cuspidata* or *O. ferruginea*)



Fig. 3
Olive oil extraction
and demonstration to growers

province. These are the two main private olive orchards, in addition to several others with one hundred to five hundred plants each. It is expected that with the commercial fruiting of these orchards, more farmers will take the initiative and plant olive trees on their lands. As these orchards were planted with identified olive cultivars, already tested and found suitable for certain areas, it is expected that these orchards will start yielding in the coming 2-3 years.

OLIVE CULTIVARS

Olea cuspidata W. and *Olea ferruginea* R. trees existing in Pakistan have no economic value, other than timber, due to their very small sized fruits. They are found in wild groves, and since they are seed-propagated and influenced by different climate and topography, they vary remarkably in plant stature, vigor, branches and leaf characteristics. Therefore, they are not cultivated for fruit production in Pakistan.

Little is known about the morphological features and bio-agronomic behavior of



Fig. 4
Visiting expert at
olive germplasm unit at BARI

the imported olive cultivars in the past. Therefore, the identification process of the existing plantations is difficult due to lack of expertise, lack of recorded data and the bad status of plants. Performance evaluation studies were first conducted at BARI in Chakwal. The Italian 'Coratina', 'Frantoio', 'Ottobratica', 'Leccino', 'Moraiolo', 'Pendolino', 'Carolea' and 'Biancolilla' were planted in 1991. Later on, more cultivars from different countries were imported and included in the

germplasm unit at BARI, Chakwal (Fig. 4). Currently 47 accessions in different age groups are under evaluation.

Initial results are encouraging, with 21 cultivars currently fruiting. Considering



Fig. 5
Newly established orchard

yield and other parameters, 'Coratina', 'Frantoio', 'Leccino', 'Ottobratica' and 'Pendolino' were found promising in Chakwal and Pothowar areas. To study the performance in other areas, these five cultivars have been planted recently at 51 locations in 18 districts of Punjab Province and at five locations in Khyber Pakhtunkhwa Provinces and Gilgat Baltistan. Considering the varying climate of the different areas of Pakistan, available cultivars

have been planted in different environments, where their cultivation was expected to be feasible (Fig. 5). Results of this evaluation study will generate valuable

information about the potential for olive growing in different edapho-climatic zones of the Punjab Province and other parts of Pakistan.

EXPECTED IMPACT ON ECONOMY AND ENVIRONMENT

This decade may be the beginning of olive cultivation in Pakistan, although no commercial cultivated orchards have reached the fruiting age. This possibility is based on success stories in small orchards in various edapho-climatic zones of the country, which indicated a potential for olive to play a role in the economy. Pakistan is among the highest per capita oil consuming countries in the world with imports of edible oils reaching 1.63 billion USD in 2009-2010, coming in second position after petroleum imports. The major portion of imported edible oil was palm oil, which is very inferior in quality and health benefits compared to olive oil. When olive cultivation proves to be commercially viable, there shall be great potential for increasing its area significantly, reducing the cost of edible oil imports and the cost of health care.

However, in the potential olive growing areas of Pakistan, agricultural production depends on rainfall. In these marginal areas prolonged drought causes drastic reduction in crop yields, threatening food security and farmers' livelihood. At present the main crops are wheat, brassica, groundnut, maize and pulses. Due to uneven rainfall, these annual crops fail more often than not. Olive is becoming popular in those areas; being perennial in nature and having relatively lower water requirements. Introducing olive growing in the uneven topography of the marginal areas of Pakistan represents a new way to utilize barren lands with the added advantage of soil and water conservation, improving water harvesting and reducing dangerous soil erosion.

CULTURAL PRACTICES

Since olive cultivation is relatively new in Pakistan, growers have little experience with appropriate cultural practices, such as training, pruning, pest management and fertilization required during the growth and fruiting stages. Consequently, it is not surprising to see sometimes bushy olive trees with multiple stems growing in a natural bushy shape or trees with very low yields. Olive growers on the other hand apply other cultural practices, like irrigation, based on their experiences, gained over decades from managing other fruit orchards like mango, citrus, peach and guava. Since flooding has been the predominant method of irrigation in those orchards it has also been applied to the olive plantations (Fig. 6).



Fig. 6
Commercial fruit-bearing olive orchard
under flood irrigated conditions

While drip irrigation should be the preferred irrigation method, especially with the increasing scarcity of water, the high cost of installation and energy are limiting factors for most Pakistani olive growers.

A common practice is the grazing of animals, especially ruminants, in olive orchards that were established on typical grazing lands with rough terrain and without fencing. Sheep and goats cause damage to olive trees by feeding on lower branches of the crotch and chewing the bark of young trees (Fig. 7). Some farmers grow olive trees between citrus and peach trees, which causes difficulty in adapting proper cultural practices.



Fig. 7
Bark damage
caused by goats

PROCESSING METHODS OF RAW OLIVES

Table olive processing in Pakistan generally follows the same methods used in traditional olive producing countries, using a lye or brine solution to remove bitterness.

Since olive production in Pakistan has not yet reached commercial levels, available olive extraction units are small and the fruits are mainly used for preparing table olives. Some olive growers, living far from the olive processing units extract the oil for their household by using an abnormal technique. The olive paste is prepared by crushing the fruits manually in stone pots. While stirring, the paste is heated very gently over a charcoal fired stove. As the oil is released it is skimmed off and stored in bottles. Using this method $\frac{1}{2}$ to $\frac{3}{4}$ of the total oil content can be extracted depending on the expertise.

OLIVE IN RELIGION

Olive culture is rather deep as it is very much related to Islam. The Muslim majority of Pakistan praises the olive tree and its oil, because both are considered sacred by the Holy Book of Islam Al-Qur'an "القرآن", like all holy books which honor this tree.

Of the seven times olives have been mentioned in Al-Qur'an, the following are three quotations thereof:

English Meaning	Arabic
- From <i>Surat</i> (Chapter) At-Tin (The Fig), 95 verse 1-4: - Allah (God) swears: By the fig and the olive {1}, and [by] Mount Sinai {2}, and [by] this secure city [Makkah] {3}, We have certainly created man in the best of stature {4} - From <i>Surat</i> (Chapter) An-Nur (The Light), 24 verse 35:	- من سورة التين رقم الآية ١-٤ - وَالَّتَيْنِ وَ الزَّيْتُونِ {١} وَ هَذَا الْبَلَدِ الْأَمِينِ {٢} لَقَدْ خَلَقْنَا الْإِنْسَانَ فِي أَحْسَنِ تَقْوِيمٍ {٤} - من سورة النور الآية ٣٥



• Allah is the light of heavens and the earth. The parable of His light is as (if there were) a niche and within it a lamp: the lamp is in a glass as it were a brilliant star, lit from a blessed tree, an olive, “neither of the east nor of the west”*, whose oil would almost glow forth (of itself), though no fire touched it. Light upon light! Allah guides to His light whom he wills. And Allah sets forth parables for mankind, and Allah is All-Knowers of everything {35}

• An olive tree that is located in the middle of the orchard protected from the wind gets optimum light and optimum pollination thus produces best oil. In another interpretation; it is in the center of the universe (i.e. the Mediterranean)

• From *Surat* (Chapter) Al-Mu'minin (The Believers), 23 verse 20:

• And a tree (olive) that springs forth from Mount Sinai, that grows (produces) oil, and (it is a) relish for the eaters {20}

The blessings of olive oil and its healing powers, in which Pakistani people believe, have been also mentioned in so many *ahādīth*²⁵ "احاديث" of Prophet Muhammad (PBUH) as he said for example "Eat the olive oil and massage it over your bodies since it is from a blessed tree" and "Eat the olive oil and apply it (locally), since there is cure for seventy diseases in it, one of them is Leprosy."

OLIVES AND OLIVE OIL IN COOKING

Olive syrup *Sharbat*²⁶ (Fig. 8) might be unique to Pakistan, simply because it is not known that it can be prepared from olives that have a bitter taste, while the ordinary *Sharbat* is basically a sweet drink. It is prepared as a concentrate by boiling bitterness-removed-olives in water. Sugar is added after removing the olives from their extract to start making the syrup. The mixture of extract and sugar is left to boil very gently for as long as it takes till a thick syrup is formed, which is then cooled and stored in glass or plastic bottles. In the hot summer season, this syrup is

• اللَّهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ ۖ مِثْلُ نُّورِهِ كَمِثْلَاكِ فِيهَا مِصْبَاحٌ ۚ الْمِصْبَاحُ فِي زُجَاجَةٍ ۚ الزُّجَاجَةُ كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ لَمْ تَمْسَسْهُ نَارٌ ۚ نُورٌ عَلَى نُورٍ ۗ يَهْدِي اللَّهُ لِنُورِهِ مَن يَشَاءُ ۚ وَيَضْرِبُ اللَّهُ الْأَمْثَالَ لِلنَّاسِ ۖ وَاللَّهُ بِكُلِّ شَيْءٍ عَلِيمٌ {٣٥}

• بعض التفسير أشار إلى أنها الشجرة التي تتوسط البستان محمية من الرياح ويصلها أفضل كمية من الضوء والتلقيح والبعض أشار بأنها تتوسط الأرض في حوض البحر المتوسط

• من سورة المؤمنون الآية ٢٠
• وَشَجَرَةً تَخْرُجُ مِنْ طُورِ سَيْنَاءَ تَنْبُتُ بِالذَّهْنِ وَصِبْغٌ لِلْكَافِلِينَ {٢٠}

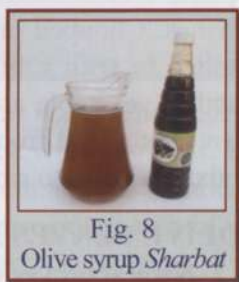


Fig. 8
Olive syrup *Sharbat*

²⁵ Plural of *hadith* "حديث" which are the recorded sayings of the Islam Prophet Muhammad (May the peace and blessings of Allah be upon him - PBUH)

²⁶ *Sharbat* or *Sherbet* (Arabic: شربة *sharba*; Persian/Urdu: شربت *Sharbat*; Turkish: Şerbet; Azerbaijani: Şərbət) is a popular Middle Eastern and South Asian drink that is prepared from fruits or flower petals. It is sweet and served chilled. It can be served in concentrate form and eaten with a spoon or diluted with water to create the drink. Popular sharbats are made of one or more of the following: Rose, Sandalwood, Bael, Gurhal (Hibiscus), Lemon, Orange, Mango, Pineapple, Falsa (*Grewia asiatica*). Most of the sharbats are very common in Pakistani, Turkish, Arab, Iranian, Afghan, Bangladeshi and Indian homes. These are claimed to have several medicinal values and to be ayurvedic in nature.

presented after diluting it with cold water. In the winter the syrup is served mixed with hot water and is called olive tea *Kahwa*. The boiled olives removed from the extract are used for the preparation of olive jam (Fig. 9). After blanching, they are dipped and boiled in a concentrated sugar solution and then allowed to simmer gently until the concentrated texture is achieved. This jam is served as a dessert in dinners of special occasions.



Fig. 9
Olive jam

Pickled olives are consumed as such with traditional bread known as *Chapatti* (Fig. 10, left) and are added to salads. Olive *Chatni* (Fig. 10, right), unique in its taste, is prepared from olive paste mixed with spices, salt and sugar and is served with bread, especially for breakfast.



Fig. 10
Left: *Chapatti* bread Right: Olive *Chatni*

Olive oil is not yet widely used in Pakistani cuisine. However, some people who suffer from high cholesterol or other heart problems prefer to use it in preparing vegetables and meat dishes. Chopped onion is roasted in olive oil, and then chilies, salt and spices are added in with a little water. A sauce of red color is thus prepared and then meat and/or vegetable are added and cooked for about twenty minutes. Small quantity of water is added from time to time while stirring. Finally the pan is covered and the mixture is left to simmer for another twenty minutes.

OLIVE LEAVES AND WOOD USES

Natural groves of wild olive-like trees in Pakistan provide leaves and shoots for grazing animals. The wood is very hard and is used in hand tools, crafts, furniture and agricultural implements throughout Pakistan. It is also used as roofing material in villages and is widely used for fuel since it burn aggressively, producing one and half times more heat than any other wood known in Pakistan.

Following Olive Footprints in PALESTINE



Ismail A. Abu-Zinada¹ isalznada@hotmail.com, Jad Isaac² jad@arij.org,
Fares F. Jabi³, Nader Hrimat²

¹Faculty of Agriculture, Al-Azhar University-Gaza

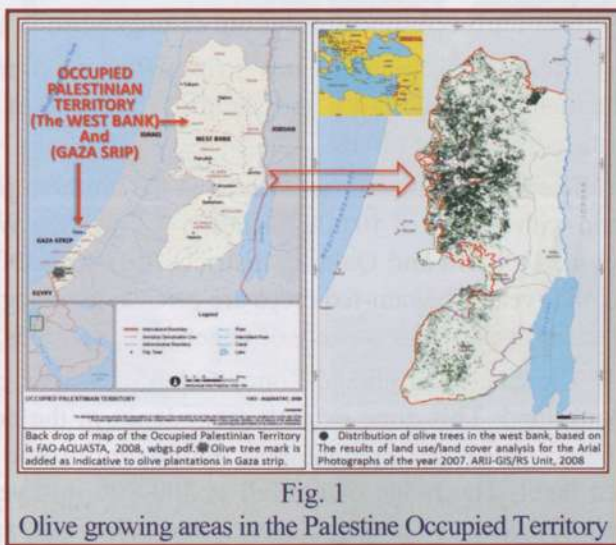
²Applied Research Institute-Jerusalem

³Palestinian Center for Agricultural Researches and Development, Nablus



INTRODUCTION

The extension of Historical Palestine and the current Palestine Territory (Fig. 1), which constitutes 22% of the area under British Mandate over Palestine in 1948, have gone through many changes starting in the second half of the 1940's due to occupation and conflicts over land in the region. According to the Food and Agriculture Organization of the United Nations (FAO) report²⁷, "the occupied Palestine Territory has a total area of 6,020 km². The West Bank is a landlocked territory on the west bank of the Jordan River with a total area of 5,655 km², surrounded by Jordan to the east and Israel to the south, west and north. The Gaza Strip is a narrow coastal strip of land along the Mediterranean Sea with a total area of 365 km², bordering with Egypt to the south and Israel to the north and east. Under existing arrangements (2008) the Occupied Palestine Territory is not recognized as a fully sovereign state and it only has full control of parts of the West Bank and Gaza Strip".



Historical Palestine has a unique geographical location as meeting point between Eurasia and Africa. Despite its small area, it enjoys rich and diversified climate, eco-system, topography, biological resources, rainfall, and elevation from the sea level. Thus, it deserves the given name as the "land of milk and honey". These factors have resulted in a rich natural environment where hundreds of beneficial and economical plants, trees and shrubs are growing and diversifying the Palestinian food basket. This nature has reflected in the economic and social

²⁷ <http://www.fao.org/nr/water/aquastat/countries/wbgs/index.stm>



characteristics of the Palestinian community which has always been identified as agricultural community among all generations.

In mid-2010, the occupied Palestinian Territory had a population of 4.05 million; 2.51 million in the West Bank and 1.54 million in the Gaza Strip. In 2008, the total agricultural area used by Palestinians reached 185,390 ha, representing 29.8% of the total land area. Of the cultivated area, 91.4% is located in the West Bank and 8.6% in Gaza Strip. Rain-fed agriculture is practiced in 85.7% of the total cultivated area, while only 14.3% is irrigated agriculture. Up to 56% of the irrigated areas are located in Gaza Strip with the remaining portion in the West Bank. Rain-fed agriculture is dominant in the West Bank as the Palestinians are allowed to use only 118 million m³/year, which constitutes 18% of their ground water rights.

Five agro-ecological zones are distinguished in the Palestinian Territory as follows:

- The Coastal Zone of Gaza Strip, with a semi-arid Mediterranean climate. Rainfall fluctuates between north and south in the range of 200-300 mm/year. Most crops are rain-fed including olives.
- The Semi-coastal Zone, located in the northern part of the West Bank. It is a narrow strip with an area of 40,000 ha (nearly 7.1% of the West Bank area), comprising parts of Jenin, Tulkarm and Qalqilia districts. It is 100-300 m above sea level, with 600 mm rainfall/year. The rain-fed crops are cereals, grain legumes, and olives while the irrigated ones include a wide variety of vegetables, potatoes, citrus and other fruit trees.
- The Central Highland Zone, with 350,000 ha, constitutes nearly 62% of the West Bank land. This zone extends from Jenin in the north to Hebron in the south and is characterized as a mountainous terrain, with some locations reaching 1,000 m above sea level. The range of rainfall is 400-700 mm/year. Of the cultivated area, 95% is rain-fed with 60% being olives, grapes, almonds, and fruit trees.
- The Eastern Zone, with 150,000 ha, located between the Central-highland and the desert areas of the Jordan Valley. Its altitude varies between 800 m above sea level to 200 m below sea level. Rainfall range is 150-200 mm/year making it a semi-arid to desert zone with marginal agricultural production, however, olives are cultivated.
- The Jordan Valley Zone, a narrow strip between the eastern slopes and the Jordan River. Rainfall is 100-200 mm/year. Without access to water this zone would have been a desert.

In general, the Palestinian Territory has a Mediterranean climate characterized by long, hot, dry summers and short, cool rainy winters, as modified locally by altitude and latitude. The summer season is relieved by the gentle wind that blows from the Mediterranean Sea. January is the coldest month, with average night/day temperature of 5/13° C in the West Bank and 8/18° C in Gaza Strip. July-August is the hottest period at average night/day temperatures of 18/30° C and 21/32° C in the West Bank and Gaza Strip, respectively. The *Khamasin* wind is a climatic phenomenon shared



with Egypt, which blows on the West Bank and Gaza Strip. It is called *Khamasin* (meaning the fifties) as its duration lasts for fifty days between mid-April to mid-June. This wind comes with blown sand and ambient temperature rising up to 45 C°.

Olives, grapes, almonds and citrus represent the leading fruit crops in the Palestinian Territory, where up to 105 main crop types are cultivated. In 2008, the agricultural statistics showed that fruit trees occupied the largest area of agricultural land in Palestine Territory with 63.2% of the total agricultural land followed by field crops forages and vegetable crops with 26.7% and 10.1%, respectively.

OLIVE CULTIVATION HISTORY

Olives were under cultivation long before the time of earliest recorded history.

In Palestine olive trees must have been grown long before Jesus Christ, since the Mount of Olives was mentioned in the Holy Bible; therefore there are large numbers of centuries-old olive trees all around (Fig. 2). Olives have been one of the main agricultural crops in Palestine since ancient times and have always played a crucial role in shaping the cultural, social and economic features of the country. They have been grown for over 4,000 years. This has been shown by evidence found in excavations conducted in various locations where many olive-related items were unearthed such as stones, clay pots for oil storage, stone olive mills and inscriptions of olive tree leaves on rocks (Fig. 3, next page).

Olive oil has been exported from Palestine to Egypt since around 2400 BC, during the time of the second Pharaoh, who belonged to the fifth Egyptian dynasty. King Thutmose III of Egypt described in his novel about the war in Syria and

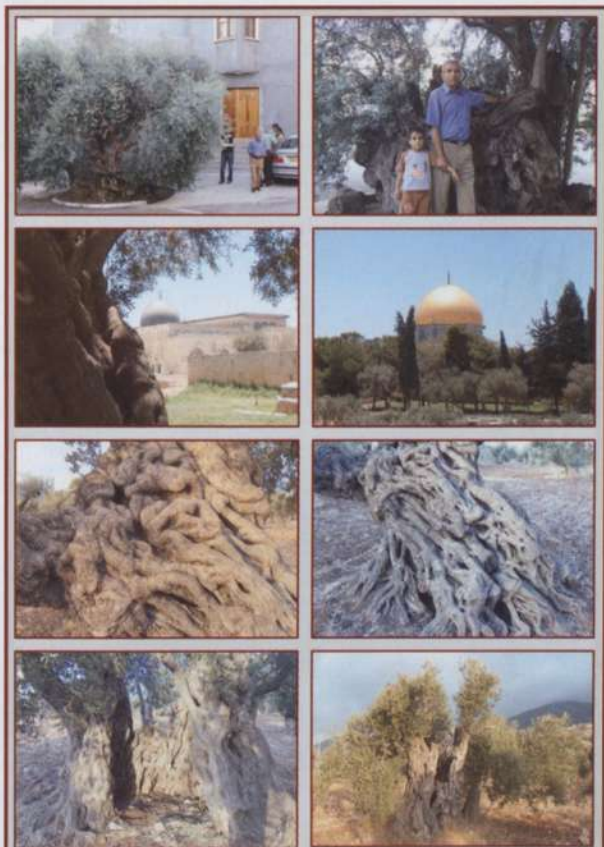


Fig. 2

Top row: The famous old tree from Arrabet El-Botoon Village, estimated to be 3000-4000 years old.

Second top row: Al-Aqsa Mosque surrounded by olive trees Bottom two rows: Trunk detail of old trees from Upper Galeel (Palestine before 1948)

(All photos except top two courtesy of Mohamed Carim)

<http://www.arab-album.com/album>

Palestine, that the two regions were rich in oil. It was also reported that in 1000 BC, King David dedicated Ministers specifically for olive and oil. Historically, Palestine olive growers managed to develop agricultural practices for olives such as propagation, plowing, pest control, fertilization, irrigation, olive pressing and storage of olive oil.



During the Umayyad dynasty, Muawiyah I was ordained as Caliph in Jerusalem in 661 AD. From that time on, and until 749 AD trading relations between Palestine and Europe were strong, and a trade-fair took place in Jerusalem every year in September, where merchants from Pisa, Genoa, Venice and Marseilles converged to acquire spices, soaps, silks, olive oil, sugar and glassware in exchange for European products. Later during the Abbasid Dynasty, within the ruling of Caliph Abu Ja'far Abdullah al-Mamun Ibn Harun, between 813 and 833 AD, Palestine used to be the Islamic Kingdom's richest land in olives and most productive in olive oil. Taxes were paid in olive oil, in addition to 200,000 gold Dinars (currency of that time).



and their oil. Centuries later the olive trees were still dominating the landscape, when

Robison and Smith wrote in 1838 about the Palestinian olive wood industry and olive plantations in Bethlehem, where olive trees were grown in regular lines with equal distances. According to the authors, this pattern was not followed abroad, adding that olive orchards in the Western Mediterranean coast were highly productive.

Following the Allied Powers victory in World War I, and the partitioning of the Ottoman Empire, the Palestinian olive sector had another period of prosperity during the British Mandate (1922-1948). During that period, the olive cultivated area increased to more than 50,000 ha (500,000 *dunum*, ref. footnote 9, page 199) when farmers found that growing olives was a profitable business. Therefore, during World War II, olives constituted a major source of income and food for the Palestinian population.

AREA UNDER OLIVE CULTIVATION

Due to water scarcity and its restriction within the Palestinian Territory, the olive trees remain the most widely spread as a good choice among other fruit trees; not only for their low water requirements, but also due to their acclimatization to low rainfall and hot summer weather. Their longevity is another reason why farmers plant them in preference to other fruit trees. Olive covers 94,771 ha, representing 81.1% of the fruit tree area. Of that area, 95.6% is covered by bearing trees, while the remaining portion has not, as yet, started production. These non-bearing trees are either newly planted or replacement trees for uprooted ones by the Israeli occupation and settlers.

Aerial images of 2007 showed that 87% of the olive trees in the West Bank are grown in the Central Highlands Zone and 11.5% in the Semi-coastal Zone. Also, 10.6% of the West Bank olives are growing in areas with average rainfall of more than 500 mm yearly, while 29% are in areas with 300-500 mm average rainfall. The olive area is mainly concentrated in the district of Nablus, followed by Jenin, Ramallah and Al-Bireh, Tulkarm and Hebron of the West Bank, with 97.5%, while Gaza Strip share is only 2.5%. These six districts have a share of 77.5% of the total olive production in the occupied Palestinian Territory. Rain-fed olives are dominant with 97.15%, while the irrigated portion of 2.85% is mostly located in Gaza Strip. Therefore, production fluctuates heavily year to year, enhanced by natural alternate bearing. The olive productivity in rain-fed region varies between the humble figures of just 150 and 1,850 kg/ha in “off” and “on” years respectively, while it is considerably much higher for irrigated trees reaching 1,500-5,000 kg/ha.

OLIVE CULTIVARS

Some of the dominant planted cultivars are Palestinian autochthonous while some are from neighboring countries. Among these are the following:

‘**Souri**’ is an old cultivar which, most probably, originated in Lebanon. It ranks first with respect to the planted area and is grown mainly in Nablus, Jenin, and Tulkarm. The fruit is small with a weight of 2.5-3.5 g and a flesh/stone ratio of 2.5. Fruits mature during October in warm regions and at the beginning of November in



cool ones. The oil content on a fresh weight basis from rain-fed trees is relatively high, reaching 31%. It is moderately affected by olive fly (*Bactrocera oleae*).

'Nabali' also known as 'Baladi' (Fig. 5). The name of this local cultivar is supposed to have originated from the word Napolis, which is the name Nablus. It occupies the second largest area after 'Souri', with distribution in Nablus, Jenin, Tulkarm and Ramallah. It is a dual purpose cultivar although most years it is used for oil extraction, because of its high oil content of 23% on a fresh weight basis, however; it can reach 34% for rain-fed olives having 50% moisture content. The fruit weighs 3.1 g with a flesh/stone ratio of 4.88. Fruits mature at the beginning of October. The olive yield ranges from 15 to 30 kg/tree for mature rain-fed and 80 kg/tree for irrigated trees. It is susceptible to olive fruit fly.



Fig. 5
'Nabali'

Other less important cultivars, which cover minor areas, are 'Mulleesi', having a small fruit of 1.4-2 g with oil content of 16-22%. The advantage of this cultivar is that it is rarely affected by the olive fruit fly, or peacock spot disease (*Spilocaea oleagina*). Spanish 'Manzanillo' has shown that it needs irrigation to produce commercially under Palestinian conditions, therefore it is rarely cultivated.

IMPACT ON ECONOMY AND ENVIRONMENT

The total olive production from 1994 to 2007 reached 1,283,902 tons, with an average of 91,707 tons/year. Annual production ranged from 38,463 tons (season of 1998-1999) to 156,493 tons (1999-2000). In "off" years, the olive production fluctuates between 18,000 and 35,000 tons. Of this amount, 4,000-5,000 tons are exported to Arab and European countries, with revenue of 24,000-30,000 USD and an amount of up to 10,000 tons is marketed to Israel. The average amount of olives used locally for pickling reaches 400-500 tons/year, while another 400-500 tons/year are sold to table olive processors in Israel. In "off" years, the average amount of olive oil production is normally in the range of only 6,000-8,000 tons, therefore very small quantities are exported.

In 2008 the market value of the produced olives was 94.7 million USD, which constitutes 6.9% of the agriculture sector revenue. Palestinian olives contribute 2.3% to the gross domestic product for that same year. The olive sector is providing livelihood, either directly or indirectly, for over 100,000 families. It offers employment for owners or hired hands in different sectors of the olive industry from growing of trees, applying different cultural practices; including manual harvesting, marketing and exports.

There is also a phenomenal attitude of producers and consumers at the local level in villages, districts and governorates that encourages producers to improve the quality of their product, while helping to improve their revenue. It is customary that the



citizens of most regions are very proud of the olive oil produced in their locality. Their taste buds can differentiate between what they call “our olive oil” and other oils produced in other regions of the Palestinian Territory. Even Palestinians living in Jordan and other countries insist in buying several gallons of the territories’ oil each year. Consequently, the olive oil produced in some regions can reach double market price, yet it easily finds consumers who are willing to pay extra just to have “their own oil”.

During the last decade it has been noticed that the rainfall pattern has changed in the areas where the 97.15% rain-fed olive plantations exist. This change has had its negative impact on productivity. However, it is the hardiness, drought tolerance and longevity of the olive tree that emphasizes its important role in protecting the ecosystem via its adaptability to these changes. Being an evergreen tree that can still survive with rainfall, it will continue to serve protecting soils from wind erosion rather than from rainfall erosion. Furthermore, the olive plantations under these conditions have a profound positive effect on the environment, both at the micro and macro levels.

On the other hand, while the olive plantations share in environmental protection and sustaining the livelihood of the Palestinian population, it is unfortunate and saddening that the Palestinian olive trees, some having been on the land for centuries, have been targeted by the Israeli occupation and settlers. According to the Palestinian Ministry of Agriculture (April 2006), more than 465,998 olive trees were destroyed from 1994 by uprooting, cutting or burning. Furthermore, the Segregation Wall, which was constructed in the West Bank, has isolated 9,089 ha planted with olive trees, (which constitutes 9.8% of the total cultivated area in the West Bank) from their Palestinian owners. Other olive growing areas are captives of the Wall in Salfit, Qalqiliya, Bethlehem and Ramallah.

There are 276 operational olive mills, the majority of which are of the continuous centrifugal system; 260 mills are in the West Bank and 16 in Gaza Strip. These olive processing facilities produce not only olive oil but also two by-products known as olive mill waste-water (OMW) and a solid or semi-solid residue of pulp and stone, known as olive pomace cake. The OMW is considered a high polluting organic agent, which is harmful to the ecosystem, especially aquaculture, due to its high level of phenols with a high chemical oxygen demand, thus endangering fish life and causing the growth of algae when it reaches water bodies. In the Palestinian Territory, OMW is a persistent problem, while the olive cake is used as a source of heating fuel, compost and animal fodder.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Many, if not most, of the cultural practices applied in managing olive trees, are inherited from one generation to the other. Among the right ones is the selection of the adequate cultivar for the right location, where the trees might show fewer tendencies for alternate bearing. Palestinian growers normally select land with lower



altitudes having light soils and receiving adequate precipitation for their orchards. They pay attention to the shape of their young trees and have good inherited knowledge on rejuvenating old trees. Constructing terraces on sloped lands is not only an inherited art, as it requires the right knowledge of where and how to construct them, not only for the sake of making use of the land in a proper way and protecting it from erosion, but also on how to maximize the amount of harvested rain water to ensure that adequate moisture is available in the soil to meet the trees requirements. Some of these terraces are so small that they contain only one tree.

Tilling the soil using chisel plough driven by domestic animals, like donkeys, mules and horses, is still a common practice to improve water holding ability, prevent compaction and control weeds. Many Palestinian olive growers would not allow tractors into their orchards, even if it is for free, preferring ploughing over herbicide use to control weeds. One of the very good practices taught by ancestors is to harvest the crop early, however not too early. Old growers always believed that early harvesting with fruits turning-color will allow the trees to regain their strength and health before the winter season, when they enter a relative resting period.

Modern researches proved the importance of early harvest not only for the sake of trees health, but also and most important for producing high quality olive oil with distinct taste and aroma, with high polyphenols content, which ensures the stability and the shelf life of the oil.

The wrong cultural practices include non-annual pruning, the use of stick in harvesting tall olive trees, which negatively affects the quality of the extracted oil, and damages some of the new one-year shoots, thus promoting the alternate bearing cycle. Some growers discard infected and fallen fruits from sound ones, however some sun-dry the fruits before sending them to the mill on the wrong belief that this practice will increase the oil yield, which, in fact, does nothing but lower the moisture content of the fruits and, in return, lowers the organoleptic attributes of the oil and increases the acidity and peroxide value of the resulting oil.

There are also some other wrong practices related to harvest, when some growers pick their fruits too early in the season during September, even before ripening starts. This is not commercially viable and furthermore, the oil will have a very bitter taste that is not favored by many consumers.

PROCESSING METHODS OF RAW OLIVES

Palestinian use the raw olive fruits mainly for extracting olive oil and small amounts for pickling. In historical Palestine, the traditional stone mills were used for extracting the olive oil. Many archeological findings all over the country are proof of this deep rooted method. These mills were driven by domesticated animals, usually a blindfolded camel, so that it would not become dizzy from moving round and round for hours. Once the olives were reduced to paste, they were put into flat baskets or





Fig. 6

Stone mill driven by animals and hand operated press made of hard wood
(Photo by Rashied Mohamed Nasser)

bags, which were placed one on top of another and pressed in a screw press, made of hard wood, and operated by human force until the oil flowed out of the paste (Fig. 6). Later, with the introduction of gasoline-powered tractors in the early decades of the 20th century, stone mills were operated via wide belts from the rear drums mounted on the shaft of power take off (PTO). Old presses were also modified for the use of hydraulic power. It was reported that a European-made olive mill was imported to Nablus in 1867.

Most households in Palestine process their own table olives and would not buy them from the market. Green or turning color fruits are selected from cultivars characterized by easy separation of the stone from the flesh. They should be undamaged, of large and uniform size. After washing with clean



Fig. 7

Home pickled cracked green olives and black dry salted black olives served with *Za'tar*, olive oil and local bread

running water, the fruits are cracked with a hint of a stone or wood hammer. Nowadays there is a machine in the market that does the cracking of the fruits for just a few cents equivalent of the local currency. The olives are placed in different size containers and are immersed in a solution containing 10% salt, hot pepper, lemon slices and lemon juice. The pickled olives become edible after four to six weeks (Fig. 7). Although not necessary, some people might change the solution from time to time, to accelerate the

removal of the fruits' bitterness. Some others tend to store the containers in a relatively warm place (20-30° C) to speed up the fermentation process.

To prepare black olives with the traditional Palestinian method, black ripe olives free from any defects are chosen and washed thoroughly with clean water. Two longitudinal slits are made to the flesh using a sharp knife. The fruits are then soaked into water that is changed daily, for a few days, to get rid of the bitterness. Afterwards, they are soaked in a salty solution of 10-12% concentration to accomplish the pickling process. The other method is the dry salt method which involves washing with water, mixing with dry salt, followed by containing the mixture in wooden boxes, or in baskets of natural fibers or cloth bags. The fruits are stirred from time to time in the container. The process results in wrinkled olives. Continuing the process for about one to two weeks, the fruits will tend to a certain degree of sweetness, while retaining a

palatable bitterness. Before consuming table olives prepared this way, they are normally mixed with some olive oil that gives them a better taste. The shelf-life of dry-salted olives is relatively short (Fig. 7, previous page).

TRADITIONS AND CULTURE

The olive harvest period (Fig. 8) is a joyful and festive time and a national event that is celebrated by almost all citizens, whether olive owners or not. Members of almost all families, who own olive trees, dedicate their time to collect the olive fruits. There is no exception here because men, women, children and even elderlies, join the harvesting crews from sunrise till sunset, all of them consuming their daily meals out in the orchards. For Palestinians it is really a family gathering that goes on for weeks. The olive orchards come alive during the harvest period because of the crowd, the lovely sounds, and popular songs that go along with the harvest. Although women share in the harvest, they do not take rest while preparing meals for the whole crew. Everyone shares in singing and it is all about olives. It is no wonder that the Palestinian Authority has authorized olive harvesting as a vacation, where schools and universities are closed to give students the opportunity to participate in harvesting their olive trees.

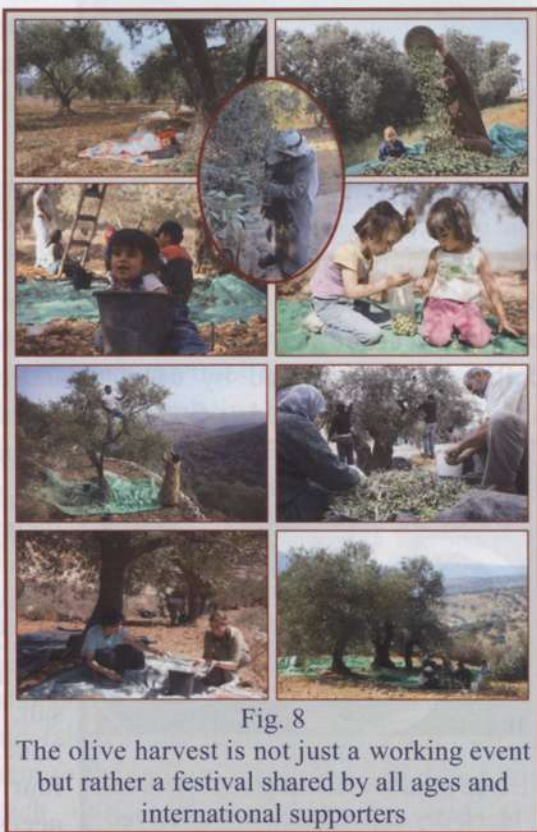


Fig. 8

The olive harvest is not just a working event but rather a festival shared by all ages and international supporters

Furthermore, many of the solidarity groups and freedom movement associations from nearly every spot on earth and from so many nationalities come to the Palestinian Territory to share in harvesting olives. The members of these solidarity movements also help the Palestinians to access their lands that are threatened by confiscation or that are unreachable due to the separation wall.

It is the appreciation of the olive tree by the Palestinian people that made numerous organizations, associations and companies, not necessarily close to the olive industry, to choose the olive tree, in so many ways as a symbol to their business, promotions and enterprises. Not only that, but the olive tree is also among the favorite subjects of children and professional or amateur artists (Fig. 9, next page).





Fig. 9

Olive harvest in the eyes of children who grow up harvesting olives

(Photo by Rashied Mohamed Nasser)

In the West Asia North Africa Region, the Palestinian proverbs and folklore remain incomparable. They are rich and numerous as well as unforgettable as they are used in day-to-day life.

Among the folktales, there is one that tells of an old man who was born blind and traveled every winter with his

son, in the 1940's, on camelback from their residence to visit his old parents in another district. The trip took two days, and on their way, they crossed an old olive orchard with big, tall trees, with branches normally touching the father's face. On a regular trip, the blind father asked his son "Should not we now be crossing the old olive orchard with the tall trees?" The son replied "Father, we have already crossed it two hours ago". The father with astonishment then said "But why have I not felt the branches of the olive trees touching my face, have they rejuvenated them?" The son paused for few seconds, and said sadly "No father, they have cut them down during the war to clear the land". The father said, with his blind eyes full of tears "Then this is the end of the world, for when someone cuts down olive trees, it means that the judgment day is nearing."

In the old days, district administrators used to send out a crier to roam the city streets to announce: "Oh, people of the town, by the order of the governor, olive harvesting will be on Monday, the tenth of October (for example), will those present inform those absent!". Following this announcement, wooden ladder, basket, cloths and others were prepared. During the olive harvesting season, a man passes in the streets carrying pictures of Christ and Virgin Mary. Behind him, follows his donkey bearing four tins. He asks those with olives to contribute a little oil to the convent of Al-Khader, crying "Oil for Al-Khader, oil!!" People come out of their homes carrying bottles and glasses full of oil, which they empty into the tins, and then kiss the pictures.

Palestinian Bedouin women who live under harsh conditions, are known for being strong, hard workers and for taking good care of their families. Therefore, the olive growers used to say that "the olive tree is like the Bedouin woman, who grows everywhere and is satisfied with very little."

There are so many proverbs in the Palestinian folklore about the olive tree and the olive oil. The following proverbs are among the widely spoken ones:

English

Arabic

Orchard Management and Processing

- Prune fig trees from the crotch and prune olive trees from the crown (implying the importance of light penetration for olives)
- التين اقطع واطيه والزيتون اقطع عاليه



- Cold is what it needs to get good fruit set (chilling requirements)
- If they (olive trees) flower in March, prepare your jars (this is the right time for flowering and for a good crop)
- Olive oil flows in December like rainfall in that month (oil time)
- On the cross festive day (13 September), have your harvesting stick on your trees (time to start harvesting)
- While 'Souri' olive oil is so good and tasty, harvesting it turns your hair gray (indicating the small size of the fruit)
- While 'Nabali' olive oil flows, harvesting it makes you cool (indicating the large size of the fruit)
- The miller is known from his cloths (smeared with oil)

Health Benefits of Olive Oil

- Bread and olive oil in my household, makes me sing and clap my hands for joy (indicating importance of these two food items)
- Olive oil mixes well in dough and is never lost (indicating that the health benefits of olive oil move entirely to the dough)
- Olive oil from green olives gives body warmth much more than using dry firewood in the fireplace (energy from olive oil)
- Olive oil in your jars will definitely bring happiness into your home (a healthy family without illnesses is a happy family)
- Olive oil for nerves and body joints, especially nails is like joining screws (positive effects of olive oil on nerves and bones)
- Drink olive oil and you will hit the wall with the forehead (indicating the strength the body gains from consuming olive oil)
- Olive oil is the king of all curing agents and of all miracles

Conduct and Behavior

- He/she is so irrational in his/her behaviors like oil on water surface (he keeps changing his positions and ideas all the time)
- He/she is like an owl standing on an olive tree (a person who moves his head left and right to interfere in others affairs)
- He/she is not feeling at ease like oil in the lamp; water below it and fire atop (somebody not happy, complaining all the time)
- Our oil is mixed in our wheat (implies good and strong relations, especially when establishing new ones like in marriage)

- ندى وسموم تيعقد الزيتون
- إن أزهر الزيتون بأذار جهزوا له الجرار
- سيل الزيتون من سيل كانون
- لما يصلب ما ترفع عن زيتونك القضييب
- السري زيتة طيب أمالقاطه بشيب
- النبالي زيتة سيال ولقاطه بهدي البال
- الزيات ببين على ثيابه

- إذا كان في البيت خبز وزيت ، زققت أنا وغنيت
- الزيت في العجين ما بضيع
- أخضر الزيتون ولا يابس الحطب
- الزيت في جراك بجيب السعادة لدارك
- الزيت مسامير المعصب أو الركب
- إشرب زيت وناطح الحيط
- الزيت ملك المعاجز

- طايش مثل الزيت على المية
- زي البومة على الزيتونة
- زي عذاب الزيت في القنديل تحته مي وفوقه نار
- زيتنا في دقيقنا

Palestinian lives are truly inseparable from the olive trees. They have affected their wellbeing and day-to-day activities so deeply that there are so many folk songs that involve the olive tree. One such song is very famous and is sung during harvest and at many other events, even in wedding parties. It has a repeatable folkloric theme that cannot be easily translated and has an easy memorable melody and saying:



Ala Dalouna Ala Dalouna (Roughly translated to let's go and help)

My country's olives is as beautiful as it can be

My country's olives and green almonds

The sage and don't forget our thyme

Omelet dishes when fried

How delicious they are with olive oil

Ala Dalouna Ala Dalouna (Roughly translated to let's go and help)

May God bless our olive oil

My country's olive has the most beautiful fruits

How beautiful they look, how precious is their oil

The whole world desires to eat it

And its fruit is as good as it could be

على دلعونة وعلى دلعونة

زيتون بلادي أجمل ما يكونا

زيتون بلادي واللوز الأخضر

والميرامية ولا تنسى الزعتر

وقراص العجة لما تتحمر

ما أطيب طعمها بزيت الزيتون

على دلعونة على دلعونة

بارك يارب شجر الزيتون

زيتون بلادي ما أذكى حياته

ما أحلى شكله ما أغلى زيتاته

العالم كله يرغب أكلاته

والحبة منه أحسن ما يكون

Many poets wrote about the olive tree. However, the famous and legendary Mahmoud Darwish wrote a poem reflecting his feelings and those of the Palestinian People at large. It says:

On the western slope of Mount Gerizim²⁸

Where the olive trees and plantations catch the eyes and souls

There I used to rest at every day's dusk near to a blessed olive tree

Her shadow relaxes my soul and her branches fondle my head

I felt always that she exchanges with me the same intimacy and love

So that she knows of my sensations and feels what I feel

In her shadows, this romantic tree

How many times did I have dreams and fantasies

في السفح الغربي من جبل جرزيم

حيث تملأ مغارس الزيتون القلوب والعيون

هناك ألفت القعود في أصل كل يوم عند زيتونة مباركة

تحنو على نفسي ظلها وتمسح على راسي غذبات أغصانها

و طالما خيل إلي أنها تبادلني الألفة والمحبة

فتحس إحساسي وتشعر بشعوري

وفي ظلال هذه الزيتون الشاعرة

كم حلمت أحلاماً و همت أوهاماً

Most of God's messengers were either born in Palestine or crossed it to spread the word of God. Therefore it is called the Holy Land and the Palestinian People are religious by nature. They respect their own religions and others for that matter and cherish the word of God in all holy books.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Within the Near East Region, the Palestinian kitchen is known for using olive oil in almost all sorts of food preparation. In Palestine wherever the word oil is mentioned, it means olive oil, because in the old days, most Palestinians used olive oil only. Nowadays, because of the economic situation and the cheap prices of other oils, some household have started to use other oils, alongside olive oil. The following are recipes of some traditional dishes:

²⁸ Is one of the two mountains in the immediate vicinity of the West Bank city of Nablus, and forms the southern side of the valley in which Nablus is situated, the northern side being formed by Mount Ebal. The mountain is one of the highest peaks in the West Bank and rises to 881 m above sea level



➤ **The Palestinian *Musakhan*** (Fig. 10) is simple to make and the ingredients needed are easily obtained, which many account for the dish's popularity. *Musakhan* is a dish that one typically eats with one's hand. It is usually presented with chicken on top of the loaf, and could be served with soup. The term *musakhan* literally means "something that is heated"

Ingredients: Medium size chicken (4 pieces) washed and dried, special spices for boiling chicken, 1 kg of onions peeled and cut in thin slices, 3 cups of olive oil, 4 tablespoon of sumac, 1 teaspoon salt, 4 loaves of *baladi* bread and 100 g of pine seeds.

Method: Season the chicken pieces with spices and cook until tender. Mix the sliced onion with olive oil. Stew the onion slices in olive oil. Add the sumac and salt to onion mixture and oil and stir. Fry the pine seeds and distribute the mixture of oil, onion, sumac on the face of each loaf then add fried pine nuts. Put each loaf separately in the oven at 180° C. Cover the chicken pieces with the remaining onion mixture and then grill them. Put one piece of roasted chicken on the top of each roasted loaf in larger plate. This dish is eaten with fresh vegetable, salad and yogurt.



Fig. 10
Musakhan and Homous
(inside frame, top left)

➤ **The Palestinian *Manakeesh Zeit* and *Za'tar*: (bread with olive oil and seasoned dry thyme)** (Fig. 11) is a popular Levantine food consisting of dough topped with thyme, cheese, or ground meat. Similar to a *pizza*, it can be sliced or folded, and it can be either served for breakfast or lunch.

Ingredients: For the dough: 2 cups flour, ½ cup warm water, 2 teaspoon yeast, ½ teaspoon salt, ½ teaspoon sugar, ¼ cup olive oil. For the thyme mix: 8 tablespoons of dry thyme, seasoned with sesame and other spices and ½ cup olive oil.

Method: In a bowl, mix all the thyme mixture ingredients together; add some water, if needed, to get a medium fluid mixture. To prepare the dough: mix the flour, sugar and the water dissolved yeast. Add olive oil and mix again. While kneading, gradually add the water until you get a well-combined dough. Cover the dough with a plastic wrap and leave it to rest in a warm place for at least one hour. After the dough has risen, knead it again, with some flour on the hands. Divide the dough into big parts and roll each part on a lightly floured surface using a rolling pin. Cut the dough into 10 cm diameter circles, using a circular pastry cutter. Top each circle with 1 tablespoon of thyme mixture. Slightly grease 2 oven trays with olive oil and place the *manakeesh* on them. Bake at medium heat for around 20 min or until the bottom of the dough turns lightly brown. Serve warm or at room temperature.



Fig. 11
Manakeesh

POPULAR MEDICINAL AND COSMETIC USES

Almost all Palestinians believe in the healing power of olive oil for illnesses. They use it as a face massage to clear black heads and to slough off dead, dry skin

cells and to add a natural, healthful glow to the face. It is believed that a mixture of olive oil, lemon juice and honey can expel worms from children's stomach. Many growers chew fresh olive leaves to help in getting rid of gum and salt counting on the belief that this will make them strong. Old-fashioned people will often begin the day by drinking a small cupful of olive oil. Other common uses of olive oil and other olive products in popular medicine and cosmetics include treating stomach ulcers. To relieve chest pain a piece of warm cloth is dipped in olive oil and placed on the chest after a shower. Olive leaves herbal tea is used to reduce body temperature as well as the pain of arthritis. A mixture of orange juice, olive oil and glycerin is used as a hair massage to strengthen it and make it shinier and brighter. Olive pickling solution is used to treat *vitiligo* (skin disease), by application to the position of injury and the process is repeated until healing.

OLIVES AND TOURISM



Fig. 12

Olive festivals activities

competitions, all revolving around olives.

The value put on the olive tree for the Palestinians is more than for producing olives; it has religious value as most of the pilgrims to the Holy Lands visit the Mount of Olives where Jesus had spent the last night. Also, there are very old olive trees, especially in the Bethlehem and Jerusalem areas, which are considered touristic attractions, not only for religious purposes, but also to see the centuries old trees.

OLIVE WOOD AND BY-PRODUCTS USES

Olive wood carving is an ancient tradition in Palestine that continues to the present day. It involves the skillful chiseling of olive wood and is most common in the Bethlehem region. It began in the 4th century BC under Byzantine rule in Bethlehem following the construction of the Church of the Nativity. Greek Orthodox monks taught local residents how to carve olive wood. This art is a major industry in Bethlehem and nearby towns like Beit Sahour and Beit Jala. The craft has passed on from generation to the next. This art continues to be a major source of income for Bethlehem's residents and is the most profitable tourist product in the city with the main purchasers being Christian pilgrims visiting in Christmas time. Olive wood is carved into crosses, boxes, picture frames, and covers for historical and old books, candle holders, rosaries, urns, vases and



Christmas ornaments as well as scenes of the Holy Family (Fig. 13). Olive wood branches are supplied by olive groves in nearby villages as well as from the Nablus and Tulkarm region, despite the difficulty of transportation in the West Bank.

It is worth mentioning that during the last year more than one million tourists and pilgrims visited Bethlehem. This means that handicrafts made of olive wood have flourished due to the high demand for the olive wood of the Holy Land. Some of the small branches from pruning are used either as firewood or to produce coal.

Other olive by-products include the famous *Nablusi* soap in which olive oil is a major constituent. The olive pomace remaining from oil extraction is used to feed small ruminants by mixing a small portion with the normal feed. Also, the dried olive cake can be utilized to control nematodes in the eggplant, tomato, pepper fields. Furthermore, the small portion of low quality oil that is extracted from the cake is used to produce green liquid soap for household cleaning purposes.

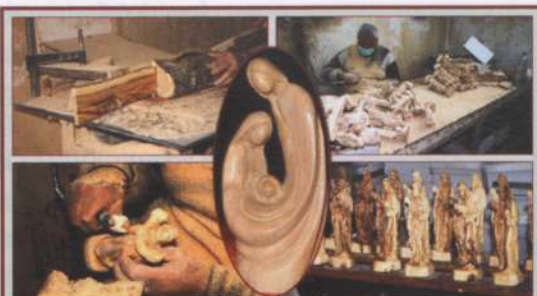


Fig. 13

The production process of olive wood and a statuette of the Holy Family among other products

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INTRODUCTION

Perú (Fig. 1) with its population of 29,248,493 inhabitants is located in the central western part of South America facing the Pacific Ocean. It is bordered by Ecuador and Colombia to the north, Brazil to the east, Bolivia to the south-east, Chile to the south and the Pacific Ocean to the west. With its area of 1,285,216 km² it ranks as the third largest country in South America and the sixth in the continent. It extends between latitudes 0° 2' to 18° 21' 34" S and longitudes 68° 39' 7" to 81° 20' 13' W. It is divided in three geographic regions by the Andes Mountains that run from north to south. These are the *Costa* (Coast) to the west, the *Sierra* (Highlands), and the *Selva* (Jungle) east of the Andes. The Coast is a flat desert strip that reaches a maximum width of 180 km in the Sechura desert. From latitude 6° to the border with Chile is the Peruvian sector of the Pacific Desert which is crossed by short river valleys of seasonal regime. Along the coast, *pampas* (plains) covered by sand can be found, that form the country's deserts, such as the Sechura Province in Piura Region and Pisco Province of Ica Region. The *Sierra* (high and rugged Andes in the center) is the commanding feature of Perú's territory which is made by the Andes Range, with three parallel chains in the north, three in the center and two in the south. The highest peak, the Nevado Huascarán is in the central part and measures 6,768 m above sea level. *La Selva*, to the east of the Andes range, is a plain and vast region covered by jungle vegetation. Its maximum height is 3,500 m.

There are 3,600,000 ha under cultivation, of which 1,200,000 ha are under surface irrigation at the arid coast. These are mostly valleys, which range from 10 to 3,000 m in altitude. Although many valleys have limited water supplies, a few, due to glacial runoffs, enjoy abundant water for irrigation. In the protected valleys the dry



climate is temperate, with no frost in winter and high temperature in summer. In the high plateau or Puna regions above 3,939 m, the climate is cold and severe, often going below freezing at night and seldom rising above 16° C by day. About 93,120 km² of the *Sierra* is natural pasture over 4,000 m in altitude, too high for agriculture. The coastal climate is influenced by the Humboldt or Peruvian current. Thus, the central and southern coasts have an arid subtropical desert climate, with an average annual temperature of 18° C and annual rainfall of less than 180 mm, while the northern coast has a tropical-dry climate, with no rain except at the northern most part. Most of the cultivated crops are annual. According to a 2002 survey, there were only 393,000 ha of horticulture crops, located in the coast and highlands valleys. The main fruit tree crops along the coast are citrus, mangos, avocados, grapes, bananas and olives. The latter represents about 3.5% of total horticulture crops.

OLIVE CULTIVATION HISTORY

The introduction of olives to the Viceroyalty of Perú was ordered by Spain's *Real Cédula* (a Royal Decree, permit or order issued by the government) in August 31, 1531. It stated that "all the artisans who departed to our Indies should take with them a number of grapes and olive plants on their ships". However, it was only in 1560 when Don Antonio de Ribera, Procurator General of Lima, planted the first olive trees. He brought 100 olive plants from Spain (probably from the Aljarafe area at Seville) but only three of those arrived in good condition. Garcilaso de la Vega el Inca reports that Don Antonio de Ribera planted them in Lima in an orchard of his own where he already produced many types of fruits, and that one of the three olive plants was stolen in spite of much surveillance around them. That plant gave origin to olives in Chile, although it was returned to his place some years later.

That old orchard is said to be the origin of the more than 400-year-old olive orchard known now as *Bosque El Olivar* (Olive Park) in Lima (Fig. 2). It is the most valuable asset of the distinguished San Isidro district. It was declared national monument by governmental resolution of December 16, 1959 as a cultural living memory of the history of Lima. Furthermore, it is considered that plant material from that first orchard was used to plant other very old trees from the colonial times that are still productive at Yauca, Chaparra and Ilo Valleys south to Lima. There is written data certifying the exchange of olive oil produced there. In the early years of the 17th century the Spanish Jesuit missionary



Fig. 2
Bosque El Olivar (Olive Park) in Lima with
detail of an old trunk



Fig. 3

Present time olive orchard in Valleys of Ilo (top) and Pocoma (bottom). Both are slopping towards the Pacific Ocean (indicated by the red arrows)

Bernabé Cobo (born at Lopera, Spain, 1582; died at Lima, Perú, October 9, 1657) wrote that one *almud*²⁹ of olive oil was sold at just one *Peso*. He also mentioned that it was better than the olive oil brought from Spain, and since production was in excess it was exported to Guatemala. The French voyager Amadeé Francois Frezier who arrived to Ilo in 1718 described that its olive orchards produced the best oil in Perú. In 1792, another voyager Antonio Álvarez Jiménez on his notes after visiting Ilo Valley (Fig. 3, top) wrote "water at Ilo was so scarce that the only crop which could survive and produce was olive".

On that same year, the famous scientific newspaper *Mercurio Perúano* published an article reporting that most of the Viceroyalty of Perú had olives,

with the most important in the valleys of Nazca, Camana, Ilo and Arica. Aurelio Miró Quesada Sosa, the distinguished historian and director general of the Peruvian newspaper *El Comercio de Lima*, in his book *Costa, Sierra y Montaña*, published in two volumes in 1938 and 1940 wrote that olive trees were introduced to Ilo during the second half of the 16th century and that they were cultivated not only in the valley but in other places including Alastaya, Hierbabuena, Chiribaya, Amoquinto, San José, Alfaro, Quebrada Seca, Pocoma (Fig. 3, bottom), Tacaguay and Talamolle or Alfarillo; that were desert cliff promontories north and south of Ilo which had water from natural springs. The historian Juan Rómulo Cúneo Vidal, referring to the location Alastaya wrote "...Over this olive orchard and other close by ones, the Spanish king Carlos III, in 1769, gave the title of *Conde* (Count) to Ignacio Nieto y Roa, Mayor of the city of Moquegua".

AREA UNDER OLIVE CULTIVATION

Olive cultivated areas in Perú are located mainly from Lima to the south near

²⁹ An obsolete unit of measurement of volume used in Spain and in parts of the Americas that were colonized by Spain. The exact value of the *almud* was different from region to region ranging from 4.6 to 20 liters

the border with Chile. Old olive orchards (Fig. 4) are found along the Southern Coast in narrow valleys as Yauca, Chaparra and Ilo. From 1956 new orchards are planted in the old valleys, especially in Tacna, mostly in desert plains utilizing modern irrigation techniques that use water from rivers but also from underground. Before 1956 all the planted olive trees were propagated from the original cultivars introduced by Spain in the 16th century. They are known as 'Criolla' or 'Sevillana', used mainly for the production of table olives. In 1956 a government initiative promoted the introduction of Italian cultivars for oil production, mainly 'Frantoio', 'Coratina', 'Pendolino' 'Moraiolo' and 'Liguria'. In 1958-1959 other cultivars were introduced from Chile, some of which were of Spanish origin; 'Farga', 'Gordal' and some of Italian origin; 'Leccino' and 'Ascolana tenera'. Then, in 1964 the government promoted the establishment of new plantations through the "Plan Costa", a development and credit program that included the establishment of state olive nurseries to promote new plantings at areas where olives were behaving quite well. As a consequence new orchards were planted until 1982.



Fig. 4
Ilo Valley

Top: Author Antonio Biondi next to a trunk of an old olive tree in Ilo Valley cut down for rejuvenation from the root system

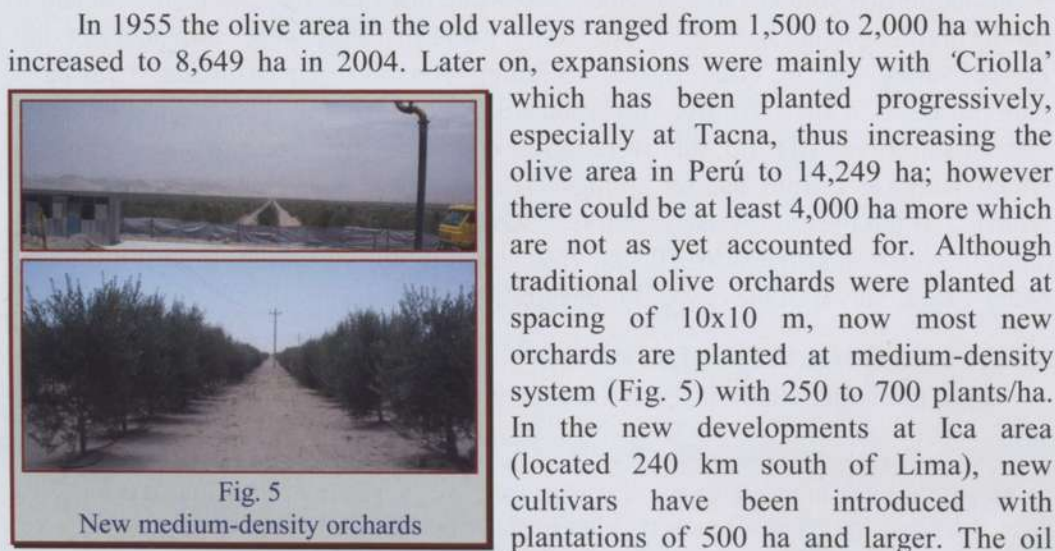


Fig. 5

New medium-density orchards



producing cultivars are the Israeli 'Barnea', the Spanish 'Picual' and 'Arbequina', while for table olives they are the Spanish 'Manzanilla' and the Greek 'Kalamata'.

Perú also has the particular feature of growing olive trees at latitudes lower than those of the traditional olive countries of the Mediterranean basin, namely from 18° 04' at Tacna to 12° 06' S at Lima. This is explained by the climate being influenced by the aforementioned Humboldt Current that lowers the expected temperatures along the coast. At the olive production areas winter average minimum monthly temperatures range from 12 to 14° C, however the high range is 18-20° C which are generally warmer than those of the traditional olive growing regions. The summer average minimum monthly temperatures range from 16° to 20° C and a high of 28-32° C which are again slightly higher. These climatic characteristics reflect on extending the period for full bloom, prolonging ripening and reducing pre harvest natural drop.

The main characteristic of that climate is that olive winter chilling needs are not fully satisfied, especially when the El Niño raises the Pacific Ocean water temperature, thus raising the lowest average winter temperatures in olive growing areas, which go to more than 17° C. Under such rare conditions, olive does not flower and the next production season passes without any production at all. In the last forty years strong El Niño phenomenon had only occurred three times: 1972-73, 1982-83 and 1997-98.

OLIVE CULTIVARS

It may be considered that 'Criolla' and 'Sevillana' are different names of the same cultivar. The genetic material was certainly introduced from Spain, but has not been found over there, even after the Spanish olive survey of last century. In any case this cultivar behaves outstandingly in the Peruvian arid desert coast, which is disease-free. It is well adapted to the region's mild climate where supposedly the chilling requirements for normal olive flowering and production are not met. This behavior has proved to be valid for other foreign cultivars which have been introduced in the 20th century from other parts of the world.

In South America the old cultivars which have been grown for centuries in three different regions, 'Arauco' (Argentina), 'Azapa' and 'Sevillana de Azapa' (Chile), and 'Criolla' and 'Sevillana' (Ilo and Lima, Perú) have shown some differences in their production behavior in Tacna; although the morphological descriptors of their leaves, inflorescences and fruits remain almost about the same.

'Criolla' (Fig. 6), the fruits of which are large of 4 to 14 g (average 8 g), of elliptical



Fig. 6
'Criolla'

asymmetrical shape. They become roundish when well irrigated, however the stone maintains the asymmetric shape. The fruit has a high flesh/stone ratio of 9 and 4 according to fruit size of 90 and 320/kg, respectively. The tree has a vigorous growth tendency, favored by age and lack of pruning in some orchards. In the valleys where it started to be planted there are trees of 12 m high. Under irrigation, the oil yield varies from 16 to 18% on fresh weight basis, and it is of good flavor and quality with oleic acid as high as 72% if harvested before ripening, but it may go down to 55% when fully ripe.

All the oil and table olive cultivars introduced during the second half of the 20th century are behaving well under Peruvian growing conditions. These are 'Frantoio', 'Coratina', 'Pendolino', 'Moraiolo', 'Liguria', 'Farga', 'Picuda', 'Gordal', 'Leccino', 'Ascolana tenera', 'Barnea', 'Picual', 'Arbequina', 'Manzanilla' and 'Kalamata'. A set of other European cultivars such as 'Hojiblanca', 'Conservolea', 'Carolea', 'Cornicabra' and 'Koroneiki' have been introduced too, but they are not commercially planted as yet.

IMPACT ON ECONOMY AND ENVIRONMENT

Up until the 1950's plantations were established along the southern Peruvian coast in narrow valleys like Yauca and Ilo and in the *quebradas*³⁰ and side promontories where natural springs and the winter mists made it possible for the trees to grow and produce olives. Under these conditions, olive proved to be the only plant capable to withstand such a harsh environment. The new intensive orchards are developing on marginal desert land creating new communities around them.

Olives of 'Criolla' ('Sevillana') are traditionally harvested black for fermentation in brine, so that the final pickled olives will get a purple red wine color with a distinctive light bitter acid flavor that Peruvians enjoy. Other introduced cultivars may be harvested fully ripe for sale to foreign markets. Until 1970, the whole 'Criolla' harvest was prepared as black in brine; however the opening of supermarkets chains created a growing demand for green stuffed olives mainly in Lima. Later on, around 1994, when olive exports to Brazil started to grow, production of green olives increased year after year to meet the growing demand of that market. Lately, a new market for unripe changing color olives has been created by Chilean importers who process them as black ripe (California style). A portion of fully ripe olives falling from trees are partially consumed as sundried olives, while the remaining portion is used for oil production.

Although the Criolla cultivar is the most widely planted, with the influence of globalization the market for future production is not guaranteed, because it is labeled

³⁰ A Spanish geological term which designate a narrow valley with rugged or cliffy features at the foothill of mountains where small water streams flow.



as an ethnic cultivar. Its olives processed as natural black fruits are called *de botija* (jar olives) and are not so popular outside Perú with the exception of a few countries in South America. These olives have proved suitable for Spanish style preparation, yet its future remains uncertain because its stone shape does not allow for good standard de-pitting. For all these reasons it cannot compete with the fruits of 'Manzanilla' or 'Hojiblanca' on a global level.

Averaging "on" and "off" years production is estimated at around 60,000 tons per year with 20,000 tons going to green Spanish style processing, 25,000 tons to black natural or color changing system and 15,000 tons for oil production.

Total exports of table olives in 2010 were estimated at 24,500 tons with a value of 37,500,000 USD. The continued growth of exports and diversification of destinies have pushed up the interest in growing olives. A secondary effect is the renewed interest of traditional olive growers in giving special care to their orchards. Furthermore, new modern processing plants are now starting to spread. All these developments are causing a notable higher demand for labor, which is becoming scarce and more costly. Therefore, in the near future there shall be a need for change towards more mechanization of the olive industry which will reflect positively on growers' income as proved by those who have already switched to full mechanization.

A major negative environmental impact is anticipated at Tacna, where most of the new olives are being planted in desert plain and irrigated with underground water from a limited aquifer that might run dry; its water will become degraded or ultimately will collapse after pumping too much water, causing environmental and economic damage.

Environmental damage of effluents from the olive industry are not yet noticeable because the amounts of green olives processed with lye to the Spanish style are not large, and black olives in brine do not normally produce much waste. Processing plants in cities are using the municipal sewage system, and in rural areas the brines are mainly sprayed on dirt rural roads.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

Since the new olive culture started at around 1956 it began to have problems with pests. Therefore, beginning in 1963 biological control was successfully introduced for controlling all new emerging pests.

The lack of adequate winter chilling has led growers to cease irrigation during the second half of autumn and the first half of spring, forcing the plants to rest by restricting their growth from lack of water to produce flowers in the spring. However, some olive growers do not apply this technique, perhaps afraid of making the trees to suffer while they still have fruit on them, since rainfall is so scarce in such areas. In the old valleys olive pruning was not done adequately and timely, giving rise to excessively tall trees, up to 12 m. Although such trees can give high



production in some years, especially when climatic conditions are favored, yet their large size is often associated with many problems among which are severe alternate bearing and difficulties in pruning and harvesting related to low efficiency and personnel safety climbing high ladders (Fig. 7).

‘Criolla’ trees are considered to benefit from cross pollination, especially in years of excessively warm conditions during blooming. But not all olive growers use pollinating trees in their orchard. In addition cross pollination may not provide the expected benefit when incompatible cultivars are used.

Biological control practices are widely used in Perú, but there are still some growers applying pesticide control measures.



Fig. 7
Traditional hand
picking of ‘Criolla’
using high ladders

PROCESSING METHODS OF RAW OLIVES

The ‘Criolla’ fruits are very bitter at harvest. However if the brine process is properly used the bitterness can be neutralized, leaving a strong flavor that has given Peruvian cuisine many flavorful dishes. When completely ripe, the olives falling from the trees are mostly black when they are picked up and placed under sun exposure. The sun dried olives are cleaned by washing in brine then dried and sorted for sale. A portion of these olives are marketed with pits, but most are sold as pitted. The most popular recipe to improve the texture and enlarging the fruits is to put them to boil, just covered in water with vinegar and salt to taste. Then they are drained and mixed with *salsa criolla*, a mixture of onions cut in julienne and orange hot pepper known as *Mirasol*. Treated this way, they become ready to eat with bread or as an appetizer.



Fig. 8

Left and bottom right: Old wooden press and
stone mill Top right: Deserted mill in Ilo

Before roads were built joining the old colonial valleys with the capital and main cities, olive trees were not harvested. Olive growers waited till the fruits fell to the orchard floor, then they picked and spread them over the *paseras* (soil areas where the olives were dehydrated to become shriveled). Afterwards, the bigger ones were kept for table olives, and the smaller ones directed for oil extraction. In those days stone rollers for milling the olives

were used that turned around a wooden shaft inside a stone concave basin. Pressing the paste was done using screwed spindle presses made of hard wood (Fig. 8). Some of these mills are deserted in the original locations like in Pocoma for example and



Fig. 9

Natural black 'Criolla' olives, processed by lactic fermentation in drums (top right)

some are now preserved in parks and museums. There are historical evidences that support the transport of olive oil extracted at Hacienda Alastaya, by pack mules along the immediate coastline and up the Osmore corridor to neighboring economic centers in the highlands.

In the valleys where olive trees have been growing for centuries, the fruits harvested during the changing color stage were hit with a piece of wood until they were cracked. Afterwards they were put

in brine for about 90 days during which they would release part of their oil. The combination of brine, oil and the fermentation process gives a distinctive taste.

Peruvian natural black olives were harvested completely ripe and treated inside wooden barrels with brine to go through a lactic fermentation diminishing the natural bitterness and developing a characteristic flavor and purple red color. Lately, the wooden barrels have been replaced by large plastic or fiber glass containers (Fig. 9).

RECIPES WITH OLIVES AND OLIVE OIL IN COOKING

Peruvians, whether rich or poor, value good flavorful food. Presently, there are many traditional dishes and recipes in different parts of the country that in many cases are a fusion of original aboriginal cooking with the influence of those from Spain, other European countries and China.

Peruvian table olives prepared as described earlier, are eaten alone as an appetizer, used as ingredient in stuffing of vegetables, or in main dishes. They are also used for stuffing *empanadas*³¹ and *tamales*³². Olives also have a place as a decorative ingredient in some Peruvian dishes and lately on *pizzas* (Fig. 10) and breads. For centuries urban Peruvians have served natural black table olives with bread for breakfast.

Olive oil had limited use in the 20th century



Fig. 10

Pizzas with ripe and green olives

³¹ Stuffed bread or pastry baked or fried in many countries of Latin America and Spain.

³² Traditional Latin American dish made of *masa* (a starchy dough, usually corn-based), which is steamed or boiled in a leaf wrapper.

until the first modern mills were introduced in 1962. Oil consumption has been increasing steadily due to the spreading knowledge of its health benefits, and because television cuisine programs have progressively become more popular. More than being considered as a special food ingredient, olive oil is replacing vegetable oils, limited only by its normally high price. The following are some recipes of main Peruvian dishes using olives and olive oil:

➤ **Relleno (stuffing) for filling vegetables such as peppers and for empanadas:**

Ingredients: 4 tablespoon of olive oil, 1 cup of chopped onion, 2 minced garlic cloves, 2 teaspoons of oregano, 1 teaspoon of chopped parsley, 1½ kg of roast meat either of beef, pork, chicken or turkey, 2 chopped hard-boiled eggs, ¼ kg of chopped black pitted Peruvian olives, ½ cup of raisins, salt and pepper to taste.

Method: After frying the onion, garlic, oregano and parsley, add the finely chopped meat. Then add and mix salt, pepper and eggs, olives and raisins and use for stuffing.

➤ **Arroz tapado (rice cake)** (Fig. 11):

Method: Put the stuffing prepared above alternately with cooked rice inside a cup, a deep layer of rice, then the stuffing and another layer of rice. Then turn the cup upside down and remove the mold.

➤ **Mashed potatoes:**

Method: Press baked potatoes forming a layer and extend the same kind of stuffing over it. Then turn the baked and pressed potatoes so that the stuffing gets inside and fry it in extra virgin olive oil.

➤ **Pulpo al olivo (Octopus with olive sauce)** (Fig. 12):

Ingredients: 1½ kg of octopus, 150 g of pitted Peruvian black olives, 3 tablespoons of Tahitian lime juice, 1¾ cups of olive oil for preparing mayonnaise, 2 tablespoons of finely chopped celery, 2 eggs, 1 garlic clove, 1 bay leaf and 1 medium size potato, salt and pepper to taste.

Method: Clean the octopus and cook fully covered in water with the garlic clove, the bay leaf and potato. The octopus will be cooked when the potato is cooked in about 30 to 40 minutes. Let the octopus to become cold, peel it slightly with a knife, and cut it in slices or small pieces. Liquefy the eggs with the salt, pepper and the lime juice adding slowly the olive oil till getting a mayonnaise with good texture. Then add the olives and blend. Arrange the octopus on the dish and cover with the olive mayonnaise. Decorate with the chopped parsley.



Fig. 11
Arroz tapado (rice cake)

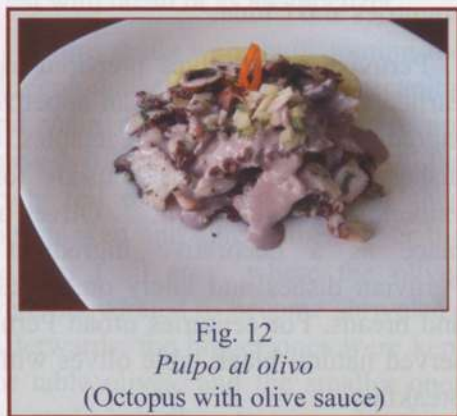


Fig. 12
Pulpo al olivo
(Octopus with olive sauce)

➤ **Rice with olives:**

Ingredients: ½ kg of rice, 1 cup of pitted Peruvian black olives, 2 finely chopped garlic cloves, 1 teaspoon of minced orange hot pepper, ¼ cup of olive oil, salt to taste, and water.

Method: Blend the olives in half cup of water. Fry the garlic in a pan till done, add the rice mixing with olive oil, add salt to taste, the hot pepper, the blended olives and three cups of water. As soon it starts to boil, cover and reduce the fire or the stove temperature to a minimum letting it to cook till rice is right. Mix with a fork, put on a plate and serve.

ACKNOWLEDGMENTS

This chapter is the fruit of our main hobby and passion for olive as well as our deep involvement in the olive industry for so many years. Our dedication to olives has given us many satisfactions. It is the result of the experience and knowledge through years of field work, trips, and collaborations and dissertations of many experts without which this work would not have taken shape. Perú has been a closed surprise box for the olive world and ongoing research might change many hypotheses that were commonly referred to in oliviculture with respect to olive flowering and fruit setting until now.

We appreciate and are grateful to Dr. Juan M. Caballero, who recommended us to the Editor in Chief for compiling the Perú chapter as contribution to this book. We also thank the Editorial Board for all the sincere efforts extended to us as well as in revising the initial manuscript to give it its final shape.

Last but not least, we also extend our thanks to our wives who never complained while we were absent, travelling for long periods to cover as much as we could of olive plantations to assemble the required material and photographs instead of enjoying a traditional vacation trip.

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Francisco L Santos¹ fls@uevora.pt,Francisco Mondragão-Rodrigues², António M. Cordeiro³, Cidália Peres³¹Instituto de Ciências Agrárias e Ambientais Mediterrânicas,
Universidade de Évora²Escola Superior Agrária de Elvas, Elvas³Instituto Nacional de Recursos Biológicos, Instituto Nacional de Investigação Agrária,
Oeiras

INTRODUCTION

With a population of 10 million inhabitants, Portugal occupies the western part of the Iberian Peninsula, bounded on the west and south by the Atlantic Ocean and on the north and east by Spain. Portugal is a territory of 89,971 km², including the *Região Autónoma dos Açores* (Azores Islands) with 2,322 km² and the *Região Autónoma da Madeira* (Madeira Islands) with 801 km². Its shape is roughly that of a rectangle, with its short sides on the north and south (286 km) and its long sides on the east and west (577 km), 36° 57' 42" to 42° 09' 15" north of the Equator and 06° 11' 20" to 09° 31' 01" west of the Greenwich Meridian (Fig. 1).

Administratively, the continental Portugal is divided into 18 districts within five regions; these are Norte, Centro, Lisboa, Alentejo, and the Algarve. Although the districts are currently in a process of being phased out, they are socially recognizable territorial divisions of the country.

In spite of being a small country, Portugal has a wide variety of landforms, climate, and soils. The major contrast is between the mountainous regions of the north with its highest peak at the Serra da Estrela (2,000 m) and across the Rio Tejo, the great rolling plains of the south in Alentejo (<1,000 m). The 2007 Farm Structure Survey recorded 275,000 farm holdings in Portugal, representing a 15% decrease since 2005. These farms occupied 3.3 million ha of utilized agricultural area, 5% less than in 2005, which makes 18 ha the average size of a farm holding in Portugal, compared with 16 ha in 2005.

Portugal has a Mediterranean climate with hot, dry summers and mild winters, especially in the south, which is considered as one of the warmest European



territories, with high summer temperatures moderated by sea breezes. In the north the weather is wetter, and cooler, particularly in winter. The country receives an average rainfall of 708 mm/year. This climate has always offered high potential to grow olives under rain-fed conditions. Therefore, in 2007 olive orchards occupied 292,162 ha in mainland Portugal representing 49.51% of the land used for permanent crops (590,156 ha). Olive was followed by vineyards with 172,765 ha (29.27%), nuts 68,877 ha (11.67%), fresh fruits 36,800 ha (6.24%), citrus fruits 18,083 ha (3.06%) and finally subtropical fruits 1,469 ha (0.25%).

OLIVE CULTIVATION HISTORY

In Portugal, although there are remnants of the presence of the olive tree from the Bronze Age, it would have been the Romans and later the Visigoths and Arabs that contributed mostly to the development of its cultivation.

According to several paleontological studies, the presence of olive trees (*Olea europaea* var. *europaea* and its ancestor, the *Olea europaea* var. *sylvestris*) in this territory goes back several millennia BC. However, olive oil was brought in by the Phoenician and Greek merchants. Later on, after 218 BC, the Romans, in the ancient Roman province of Lusitânia, south of the Douro river, expanded and refined its production. Testifying these developments at a later period in history, the ancient Greek philosopher, historian and geographer Strabon (64/63 BC- ca. 24 AD) mentioned exportation to Rome of olive oil from the Alentejo plains.

Both Gaius Caecilius Cilo, a magistrate of Ancient Rome (ca. 61-112 AD) and Gaius Plinius Secundus, a Roman naturalist and philosopher (23-79 AD) reported that high quality oil was locally produced. Also, the Visigothic code, comprising of a set of laws circulated during the late Roman Empire, prescribed heavy sanctions in order to protect olive trees from vandalism and misuse. As early as 1170 AD olive trees were accounted for in the records of land grants awarded by the first Portuguese king Afonso Henriques to the new settlers in Lisboa, Almada, Palmela and Alcácer do Sal. Similarly, land grants for Algarve (1269) and Évora (1273) extensively refer to the cultivation of olive trees in those regions. Reports for plantations in Évora and Coimbra date back to the beginning of the 14th and 15th centuries, during the reign of King João I. These old plantations became most abundant, mainly between Coimbra and Évora, extending through the valley of the Tagus from Santarém to Lisbon.

In the 16th century, Portuguese olive oil and wine had a privileged position in the list of products exported to Flanders, Castile, León, Galicia, India and Brazil. Matching with such trade, the “Rules for Press Operators of Olive Oil Presses” were the first standards written for the job of “olive press operator”. They emerged in 1572 as a part of the rules for the mechanical occupations of the City of Lisbon. Licenses for Master of the olive press were given to the candidates, after they had been thoroughly examined, by taking an oath on the Holy Gospels. Thus, the quality



of the olive oil and the professional competence of the producers were guaranteed. During the 18th century, Santarém became the main producing region, and by then, the country was already recognized for its high quality olive oil, leading to a prestigious award at the Exposition Universelle (World's Fair) of 1889, held in Paris.

With the Portuguese maritime expeditions to the African, Asian and American continents, olive oil and salted olives were presented to many parts of the world and took a major role in the trade made with these far off lands.

With the emergence of the margarine era in the 1960's, Portuguese olive oil production and consumption decreased, mainly because it was not considered economically viable competing with low priced fats that people at that time did not recognize well its negative health impacts. At the beginning of the 1990's, olive oil consumption started to grow due to growing awareness of its health benefits and the stumbled industry started to regain its momentum through cultivating new olive orchards.

AREA UNDER OLIVE CULTIVATION

The olive growing area has been steadily increasing for the last decades in all regions of continental Portugal, from 316,396 ha in the 1989 Agricultural Census (RGA89) to 386,824 ha in 2009. Nearly 80% of this area is located in the southern regions; with Alentejo and Centro having the highest shares of about 174,170 ha (45%) and 120,351 ha (31.1%), respectively. The 70,000 ha area increment was developed in Norte, Centro and Alentejo, especially in the last two. Olives are not grown in the Azores and Madeira Islands. The expansion of olive growing area is taking place mainly in Alentejo, with 15,000 ha of new intensive and super-high-density irrigated orchards. The most evident consequence of such new areas is the change in the



Fig. 2
Traditional rain-fed olive orchard of low density
with detail of an old tree (inside frame)

average age of olive orchards. In 1999, the prevailing distribution of olive orchards showed the supremacy of orchards over 50 years old (74%) and a very small share of those less than 15 years old (15%). Today, in spite of the steady increase in the number of new orchards, the old ones still dominate the landscape, representing around 65% of the national olive orchard area, intertwined with a 15% increase of new plantations (<15 years old).

Olive orchards are traditionally dry-farmed (Fig. 2), comprised of approximately 100 trees/ha (10x10 m or 12x12 m tree spacing). The trees are widely spaced to take

full advantage of the stored water from winter rains towards spring and summer growth. Some are in the process of being converted to drip irrigation. In recent years, and due to the



Fig. 3

New irrigated super-high-density and intensive orchards

rising interest of growers in increasing the size of their olive orchards, hundreds of orchards have been established with drip irrigation to ensure good productivity. Some of these orchards are of intensive (≥ 300 trees/ha on 7x5 or 6x5 m spacing) and some are of super-high-density ($\geq 1,700$ trees/ha on 3.75x1.35 m tree spacing) (Fig. 3). That trend increased olive tree productivity, pushing up the national olive production more than two fold, from 175,000 tons in 2000 to 425,000 tons in 2009.

According to the 1999 Agricultural Census (RA99), only 14,130 ha of the existing 335,028 ha were irrigated, corresponding then to only 4.2% of the total. Today, the new orchards are drip irrigated, particularly in Alentejo and in 2009 the irrigated area was estimated to be around 10% of the total. However, dry-farming orchards are still dominant, making the national olive productivity low at only 1,096 kg/ha in 2009, which is directed almost entirely to olive oil production. Only 11,235 ha (2.9%) are devoted to table olive, a constant share that has not changed in the last two decades.

OLIVE CULTIVARS

Most Portuguese cultivars are mainly used for olive oil production. There are two olive cultivars with national importance, the 'Galega vulgar' and the 'Cobrançosa'. The trees of both show strong vigor, dense canopy and erected habit. They are very productive, with early production and alternate bearing, showing low capacity for vegetative propagation. Trees are very susceptible to anthracnose (*Colletotrichum gloeosporioides*), and as to oil extraction and characteristics fruits are usually low in oil content, however, it is very stable. Both have medium fruit maturity. Following are some main features of the important cultivars:

'Galega vulgar' (Fig. 4) is widely used in Portugal for olive oil production. However, within rural communities this cultivar is also used for table olive, mainly processed by traditional methods to produce excellent black pickled olives, albeit with small size. A great percentage of the national table olive production comes from this cultivar, though the bulk is prepared by homemade methods and consumed domestically.



Fig. 4

'Galega vulgar'

The final quality may depend on the composition of the fresh fruits, production technologies and environmental conditions during the fermentation processes.

‘**Cobrançosa**’ (Fig. 5). Trees are tolerant to cold and iron chlorosis. The fruits have average oil content. Its natural fruit drop during ripening is minimal.

The other Portuguese cultivars have only regional importance. The prominent ones in the northern part of the country are the ‘Madural’ and ‘Cordovil de Trás-os-Montes’, while in the south the most important ones are ‘Carrasquenha’, ‘Cordovil de Serpa’ and ‘Verdeal Alentejana’ (Fig. 6).



Fig. 5
‘Cobrançosa’



Fig. 6
‘Verdeal Alentejana’

Over the past forty years, a lot of foreign cultivars were introduced, mainly from Spain, especially in the central and south-central parts of Portugal at Ribatejo and Alentejo respectively. In the 1980’s, mostly the Spanish ‘Picual’ dominated, but lately, in the super-intensive plantations, the Spanish ‘Arbequina’ and the Greek ‘Koroneiki’ are the dominant ones, with the Spanish ‘Hojiblanca’ and the Italian ‘Leccino’ found in smaller areas.

IMPACT ON ECONOMY AND ENVIRONMENT

The main permanent crops in Portugal are olives and vines, planted in almost all farm lands. In 2005, olive orchards accounted for 40% of all farms, occupying almost half of the area devoted to permanent crops (vines, fruit trees, etc.) and 10% of the Utilized Agricultural Area (UAA), surpassed by permanent pastures only.

The average national size of olive orchards is around 2 to 4 ha per UAA. However, an increase in size of the newly established olive orchards, with the highest value of 6.9 ha per UAA, is reported in Alentejo. The largest olive orchards are located in this region; with several being of 500 ha or larger, and quite a few with more than 1,000 ha.

In 2009, Portugal produced 53.4 thousand tons of olive oil (IOC data), which is almost twice the quantity produced in 2000. The share of Alentejo in this quantity was 55.6 % and that of Centro was 25.5%. This amount of olive oil was produced in 562 mills, mainly located in Centro (311 mills), followed by Norte (139 mills). Only 104 mills are located in Alentejo, however, they are the largest ones operating in the country.

The increment in the area of olive orchards, and the higher productivity, explain the sustained increase in national olive oil production. Nevertheless, self-sufficiency is

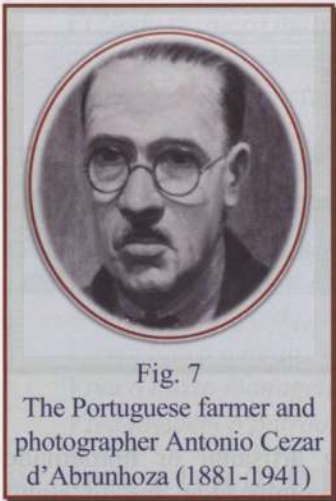


still only 60-70% of domestic consumption estimated at around 80 thousand tons/year, while part of the production is exported to Brazil, Venezuela, USA and Canada.

Currently there are six regions with the title Protected Designation of Origin (PDO), which certifies the quality of the olive oil (*Azeite*) produced in each region according to its main olive cultivars. In 2007 the area devoted to grow PDO olives was around 33,608 ha, corresponding to 8.8% of the total olive area reported for the year. A total of 231,235 liters was certified as PDO oil production, equivalent to 6.6% of the total oil production in 2007. This quantity was obtained from olives of 7,517 orchards, of which 5,850 were located in the region of Azeites de Trás-os-Montes, attesting the small size of orchard holdings in this PDO region.

INHERITED CULTURAL PRACTICES

Although oliviculture in Portugal is not as wide spread as it is in neighboring countries of the European Union, yet there are deep rooted cultural practices some of which have changed little over time. With the exception of mechanical harvesting with over-row harvesters in super-high-density orchards and trunk shaking of adaptable trees in old orchards, table olives are still harvested by hand in different ways, though expensive. For a documentary book like this one, following the adage "A picture is worth a thousand words" is the best approach to portray some of the old traditional cultural practices that were performed in Portuguese olive orchards during the 1920's-1930's as caught with the eyes and camera of Antonio Cezar d'Abrunhoza (1881-1941) (Fig. 7) who was a farmer in Beira Baixa, a region in the center-east of Portugal. He was also an amateur photographer. D'Abrunhoza was born into a prosperous family which gave him an education even although he was a deaf mute. His disability may have highlighted his interest in the visual world, a



world he captured with rare beauty. All photographs (Fig. 8, 9 and 10) are used with the appreciable permission of his family. These photos were published in 2003 in the book "Olivais e Lagares".



Fotografias de Antonio Cezar d'Abrunhoza", ISBN: 972-95881-4-7, coordinated by Maria Inês de Abrunhosa Mansinho and edited by the Portuguese Horticultural Association (Associação Portuguesa de Horticultura-APH).



Fig. 9

Women olive pickers de-leaving harvested olives, then sorting and packing them in hessian bags (1920's)



Fig. 10

Olive mill operations in the 1920's

TABLE OLIVE PROCESSING METHODS

In Portugal, table olive processing is mostly using artisanal or homemade methods, with accessibility to localized markets in the countryside and in small towns. The artisanal processing method takes advantage of the natural micro-flora on the fruit, and uses some selected flora which helps fermenting the fruit. Prior to fermentation, olives are soaked in water that is changed daily. After washing, olives are slit deeply with a small knife, one by one; the largest fruits are slit in multiple places and subsequently immersed in a brine of 8-10% (w/v) salt. After some weeks the concentration drops from 10% to around 5 to 6%, after the water in the olives moves into the solution and the salt penetrates the olives. The olives are edible within two weeks to one month, but can also be left to cure for up to three months. This type of table olives maintains some of their bitter taste. Olives can also be flavored by adding various marinades to the solution, or removing the pit and stuffing them. Popular flavorings are herbs, spices, olive oil, capsicum, lemon and/or orange, garlic

cloves, vinegar, almonds, and anchovies. Sometimes, after washing and brining, if the olives are not slit, they are lightly cracked with a hammer or a stone to trigger fermentation. This method of curing adds a slightly bitter taste to the olives.

OLIVES AND CULTURE

No better place to witness the love affair of the Portuguese with olive trees, olives and olive derivatives than in the traditional *Quadras* or folk quatrain compositions forming rhythmical songs chanted in the daily routine of picking olive, harvesting or preparing meals. An expression of those *Quadras* follows:

Quadra popular

*Avarejai avarejadores,
Apanhai apanhadeiras,
Apanhai baguinhos de oiro,
Que caem das oliveiras.
Oliveiras, oliveiras,
Ao longo são olivais,
Por muito que tu me queiras,
Ei 'inda te quero mais.
Ó Senhor da Piedade,
Lá no mei' dos olivais,
Guardai-me a minha azeitona,
Não a comam os pardais.
Oliveira no adro,
Dá a toda a igreja,
Quem tem seu amor ao lado,
Tem tudo quanto deseja.
Vivam todos quantos estão,
Viva o nosso manageiro,
Viva também o patrão.*

Folk quatrain (free English translation)

Move those sticks, olive shakers,
Pick up fast, olive pickers,
Pick up those golden beads,
Falling from olive trees.
Olive trees, olive trees,
By large connecting orchards,
No matter how much you love me,
I do love you even more.
Our Lord of Pity,
In the middle of the orchards,
Watch over my olives,
Keep them from the sparrows.
Olive tree in the church yard,
Giving to all coming through,
Who's love is by their side,
Their wishes have come true.
Blessed be all that came forth,
Blessed be our manager,
Blessed be also our boss.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

The interaction of Portugal with other cultures (Celts, Romans, Moors and Spanish) is particularly noticeable in its cuisine. One of the most important ingredients of Portuguese cuisine is olive oil. In addition, culture and tourism are fundamentally related to gastronomy and, consequentially, olives and olive oil are a "bridge" between them.

The Portuguese cuisine is based on simple preparations to allow the quality and simplicity of food ingredients to stand out. It is characterized by its rich, filling and full-flavored dishes, closely related to Mediterranean cuisine. Bread and aromatic herbs are the essential ingredients that give body and taste to soups, *migas* (bread purée), *ensopados* (stews) and *açordas* (ragouts), with olive oil used as the main ingredient, both for cooking and flavoring meals. Although in early history the Portuguese used olives in their diet, but like many Mediterranean countries, the



Romans were the ones responsible for locally introducing the fine art of producing and extracting higher quality olive oil. Nowadays olive oil is undoubtedly the primary fat used in the preparation of Portuguese dishes and also one of the main and most used seasonings and condiments.

Some of the most popular recipes in Portuguese cuisine are soups, which are at the heart of the traditional cuisine. Made out of all kinds of vegetables, fish and meat; creating a rich assortment of soups, stews and chowders, all spiced up with olive oil. Originating from the Northern Province of Minho, soups are now deeply-rooted in the cuisine of all regions. Four traditional recipes are given below:

➤ **Caldo Verde (Collard Greens Soup)** (Fig. 11) is probably one of the most typical; it is made of dried active baking yeast, sugar, polenta, warm water, salt, olive oil and corn flour. The soup is prepared with extra virgin olive oil (*azeite*), potatoes and julienned collard green, thin slices of garlic, and served with corn bread (*broa*), olives and red wine. The Portuguese green cabbage, dark-green and very aromatic, has to be shredded in very thin strings and cooked in a light stock of potatoes and olive oil and spiced up with a few slices of Portuguese pork sausage *salpicão* or *chouriço*.

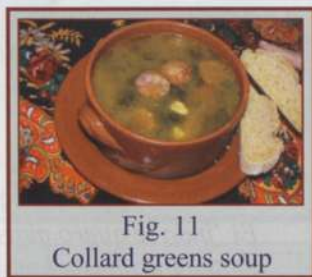


Fig. 11
Collard greens soup

➤ **Bacalhau cozido com batatas e couves (Boiled Salted Cod with Potatoes and Cabbage)** (Fig. 12):

Ingredients: 8 cod fillets (reconstituted), 4 Portuguese cabbages, 16 large potatoes, 8 hard-boiled eggs, 1 cup of extra virgin olive oil, 4 cloves of garlic, salt and pepper.

Method: Boil the cod for 15 to 20 min. In a separated pan; boil the cabbage (after removing the external hard leaves) and in another pan boil the previously washed potatoes with skin. To prepare a desirable amount of sauce, peel the garlic cloves and cut them in thick slices. Heat the extra virgin olive oil, and as soon as it is hot, add the slices of garlic until tender (do not let it burn or turn brown). Dress the cod, with this sauce, at the table. Serve with corn or whole grain bread.

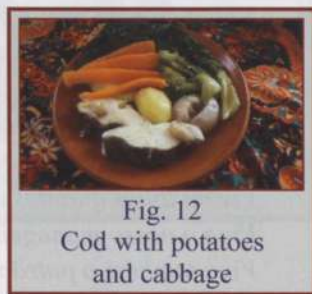


Fig. 12
Cod with potatoes and cabbage

➤ **Borrego assado no forno (Roasted Lamb with Olives)** (Fig. 13):

Ingredients: 1 medium sized lamb, ½ cup of extra virgin olive oil, slices of bacon, 4 onions, 4 cloves of garlic, 2 bay leaves, parsley, 1 cup of white wine, 1 teaspoon paprika, ½ kg of small roasting potatoes, margarine, and salt and pepper.

Method: Mince two onions, the garlic cloves and the bacon, add a ¼ cup olive oil, paprika and ⅓ cup white wine, season with sea salt and pepper. Coat the lamb with the preparation. In a large roasting pan roast the remaining onions cut in

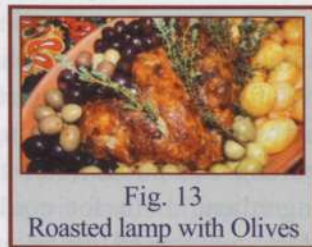


Fig. 13
Roasted lamb with Olives

slices, adding some olive oil. Add the lamb, parsley and bay leaves and let marinate for 24 hours in a cool, fresh place. Add the remaining white wine, the peeled potatoes and season with salt and pepper. Add some margarine and roast in the oven, basting once in a while. Serve with green and black olives.

➤ **Folar da Páscoa (Easter bread)** (Fig. 14):

Ingredients: 1 kg of regular flour, 1 cup extra virgin olive oil, 50 g of baker's yeast, 100 g of sugar, 3 eggs, $\frac{1}{5}$ cup of regular milk, a pinch of salt, 1 teaspoon of ground anise (*erva-doce*), and 1 teaspoon of cinnamon.

Method: Dissolve the yeast in warm milk, with $\frac{1}{4}$ kg of flour to make dough, and let it rise. Mix the remaining flour with the eggs, sugar and milk, to obtain light dough. Add olive oil, salt, anise and cinnamon. Work the dough well and add it to the first batch of risen dough. Work the dough. Cover and let rise for 2 to 5 hours in a warm place. Divide the dough in shaped balls and flatten them. On each one place one or more hard boiled eggs. Brush dough and eggs with egg yolk and bake in a hot oven until brown.



Fig. 14
Easter Bread

➤ **Orange-olive oil cake** (Fig. 15):

Ingredients: for serving 10-12 persons: nonstick baking spray with flour, 4 to 5 large navel oranges, $3\frac{1}{2}$ cups all-purpose flour, $1\frac{1}{2}$ teaspoons baking powder, $1\frac{1}{4}$ teaspoons salt, 5 large eggs, 3 cups granulated sugar, $1\frac{1}{2}$ cups extra virgin olive oil, confectioners' sugar for sprinkling.

Method: Put up the oven to heat to 175° C. Coat a tube pan with baking spray and set aside. Finely grate the zest of 3 of the oranges, squeeze 4 or 5 of them to have at least $1\frac{1}{2}$ cup of juice and set aside. Whisk the flour, baking powder, and salt in a large bowl and set aside. Beat the eggs with a mixer in a large bowl until well combined. Slowly pour in the granulated sugar and continue beating until thick and pale yellow. Alternately add the flour mixture and oil, starting and ending with the flour, and beat until just a few wisps of flour remain. Pour in the orange juice and zest and whirl for a few seconds to bring the batter together. Pour the batter into the prepared pan and bake until a cake tester comes out with a few moist crumbs clinging to it, about $1\frac{1}{4}$ hours. If the top is browning too much as the cake bakes, cover lightly with foil. Transfer to a wire rack and cool for 15 minutes. Turn the cake out onto the rack and cool completely, then place it in a covered cake stand and let it sit overnight. Just before serving, dust with powdered sugar.



Fig. 15
Orange-olive oil cake
(Photo by Zeinab Seoudi)

OLIVES AND TOURISM

Aside from many people camping in old olive orchards (Fig. 16, next page), there are two well-known olive touristic activities in Portugal, the "Olive Oil route in Trás-os-Montes" to the North and the "Olive Oil route in Alentejo"; both take visitors through special programs to see and enjoy the traditional making of olive oil, as well



Fig. 16
Camping in old olive orchards

as to inform them about the potential richness of olive growing in those regions. Besides, the visitors have the opportunity to take part in the olive harvest, using traditional and ancient methods, as well as seeing how olive paste is made for oil extraction.

The “Olive Oil route in Trás-os-Montes”, coordinated by the Associação Comercial e Industrial de Mirandela, has 15 itineraries grouped in four touristic destinies (www.rotadoazeitetm.com). These have names like “At

the center of Trás-os-Montes”, “In-between rural and urban”, “In the land of formidable wines and olive oils”, and “From the capital of Manueline architecture to the prehistoric, rock art in the Côa Valley Archaeological Park of Portugal”. The Manueline or Portuguese late Gothic is a sumptuous Portuguese architectural style incorporating maritime elements and representations of 16th century motifs of the discoveries era.

The “Olive Oil route in Alentejo”, coordinated by the Centro de Estudos e Promoção



Fig. 17
Mohamed El-Kholy under the shade of old olive trees in the garden of Afonso de Albuquerque Square

do Azeite do Alentejo (CEPAAL) and the Associação para o Desenvolvimento dos Municípios Olivícolas (ADEMO), has three main programs to offer (Short, Medium and Complete). They allow visitors to know and enjoy the local culture and folklore around olive and olive oil sites in the 3 PDO regions of Alentejo (Norte Alentejano, Alentejo Interior and Moura). The itineraries include visits to orchards, mills, listening to folk groups, guided visits to historic monuments and museums related to olive growing, processing and oil making among others (www.azeitesdoalentejo.com).

The City-Hall in Mirandela also promotes the “Olive route” under the Terra Olea Project offering the visitor a touristic package specialized around the olive and olive oil (<http://www.cm-mirandela.pt/index.php?oid=897>).

Within few hundred meters apart in Belém municipality of the capital Lisbon lie few of the touristic attractions of the city like the Belém Tower, Belém Palace, Jerónimos Monastery and the Coach Museum. Many visitors normally take a rest after their tours in the garden of Afonso de Albuquerque Square where they enjoy the shade of the old olive trees fused with the refreshing breath from the Tagus River.

OLIVE WOOD USES

Traditionally, olive wood is used as winter firewood. However, more recently it has been used for the artisanal production of furniture and decorative pieces and carving. Sun-dried, high quality and authentic olive wood logs are used in the process.



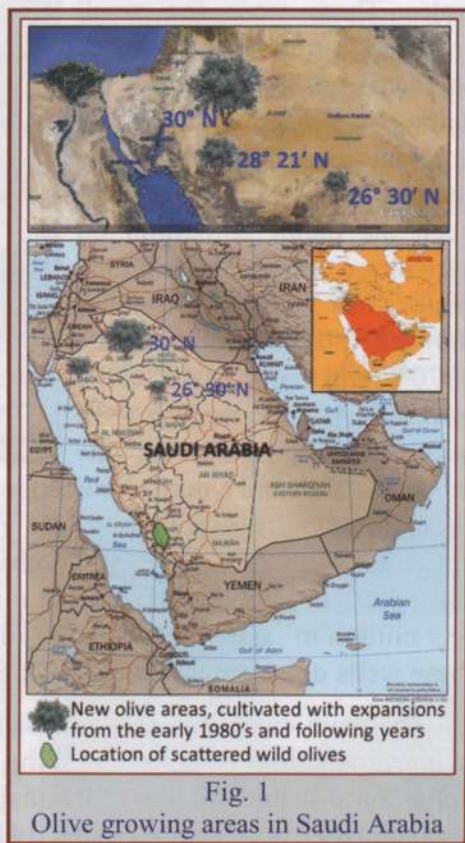


INTRODUCTION

Saudi Arabia (Fig. 1) occupies about 80% of the Arabian peninsula, lying between latitudes 16° and 33° N, and longitudes 34° and 56° E. It has an area of approximately 2,149,690 km², and an estimated population of 27 million inhabitants. Saudi Arabia's geography is dominated by the Arabian Desert and associated semi-desert and shrub lands.

The country comprises of a number of deserts that include the 647,500 km² *Rub' al Khali* (Empty Quarter) الربع الخالي in the southern part of the country, the world's largest sand desert. There are no permanent rivers or lakes in the country, but there are many valleys or *wadis* (ref. footnote 4, page 115). Fertile areas are found in the alluvial deposits in *wadis*, basins, and oases. The main topographical feature is the central plateau which rises abruptly from the Red Sea and gradually descends into the Nejd and toward the Persian Gulf. On the Red Sea Coast, there is a narrow coastal plain known as the Tihamah, parallel to which runs an imposing escarpment. The South-west province of Asir is mountainous, and contains Mount Sawda, which is the highest point in the country with an elevation of nearly 3,207 m above sea level.

Except for the South-western province of Asir, Saudi Arabia has a desert climate with extremely high day-time temperatures and a sharp temperature drop at night. Average summer temperatures are around 45° C, but can be as high as 54° C, while in the spring and autumn it is temperate with an average of around 30 °C. In the winter the temperature rarely drops below 0° C. Rainfall is slight and irregular over



most of the country, however it takes place only in the South-west; in the mountains of Asir, close to the Yemen border where rainfall average is 500 mm/year, 60% of which occurs between October and March due to the influence of the Indian Ocean monsoons. This region accounts to 3% of the land area and this level of rainfall is sufficient to support regular crops. This region plus the southern Tihamah coastal plains sustain subsistence farming.

Saudi Arabia's plant life mostly consists of small herbs and shrubs requiring little water. There are a few small areas of grass and trees in southern Asir. Nevertheless the date palm (*Phoenix dactylifera*) is widespread all over the country. Lack of water has always been the major constraint on agriculture and the determining factor on where cultivation may take place. During the late 1970's and early 1980's, the government undertook a multifaceted program for the

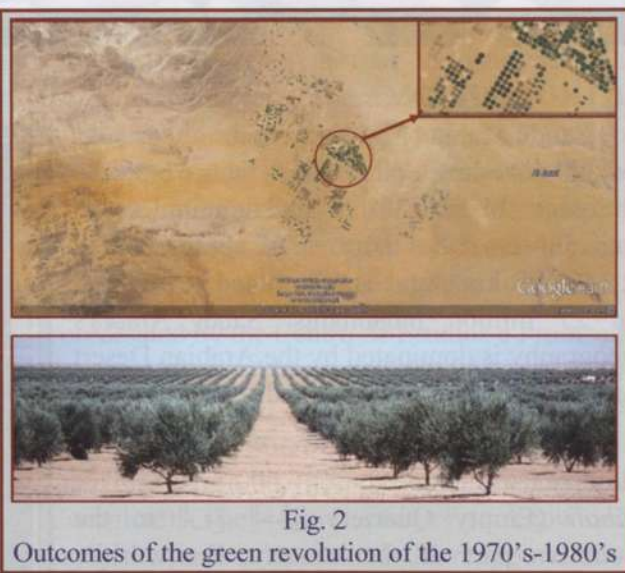


Fig. 2
Outcomes of the green revolution of the 1970's-1980's

modernization and commercialization of agriculture which included the distribution of more than two million ha of reclaimed uncultivated land to farmers and agricultural companies on free-of-charge basis. Within the program, more than 200 dams were constructed to preserve rainwater, with an estimated storage capacity of 689 million m³ and a huge number of artesian wells were drilled; however some of these wells draw water from non-renewable aquifers.

The main cultivated crops in Saudi Arabia are barley, maize and wheat. Date palm production is considered the most important economic support for the agricultural sector and one of the major incomes for farmers and others. Date palm plantations cover an area around 141,000 ha (15% of the total world area, 2002) which is occupied with 18 million trees. The total production is estimated at approximately 829,000 tons (13% of the total world production, 2002). Other than date palm, the country now produces olives (Fig. 2) and small amounts of apricot, peach, pear, plum and grape.

OLIVE CULTIVATION HISTORY

Olive cultivation history in Saudi Arabia has not been well studied as oliviculture was out of focus until the early 1980's when commercial olive orchards started to appear gradually in the northern region of the country, close the borders with Jordan



Fig. 3

The unearthed petrified olive tree trunk

and Iraq. However during recent operations for land reclamation a huge petrified olive trunk (Fig. 3) has been unearthed indicating the presence of olive trees centuries ago in the country. There are some indications that ever since early Islamic times some 1400 years ago, Tabuk was famous for its production of olives and olive oil.

Wild olive trees exist in scattered form on the peaks of Asir Mountains in the south-west of Saudi Arabia among juniper trees, however they do not produce commercial crops of meaningful value and birds feed on their fruits, although bitter. These adapted wild olives to the harsh environment need to be well studied for either possible commercialization or for replacing juniper trees. The later alternative should consider sustaining native biodiversity and its essential support of ecosystem prior to implementation.

Traditional olive cultivation has been localized in the arid and semi-arid regions and the mountainous zones. The olive tree has low productivity in those regions; however it provides a model of sustainable use of natural resources, while limiting desertification and supporting water and soil conservation.

AREA UNDER OLIVE CULTIVATION

The present area covered with olive trees has reached slightly more than 15,000 ha with about 11 to 13 million olive trees. The main area of olive cultivation is located in the extreme northern region of the country known as Northern Asir or Northern Arabia. The plantations are concentrated in the three administrative divisions of Tabuk, Hail and Al-Jouf, the later having 80% of the olive trees in the region planted in Wadi al Sirhan, which is a large basin as much as 300 m below the surrounding plateau. Olive trees are grown in this region between latitudes $26^{\circ} 30' N$ at Hail (640-780 m above sea level) and $30^{\circ} N$ at Al-Jouf (615-640 m above sea level) and are drip irrigated from artesian wells (Fig. 4).



Fig. 4

Top: Olive trees as far as the eye can see in a mega orchard in Hail
Bottom: 204 tree/ha in Tabuk

The average tree density is 204-400 trees/ha on spacing of 7x7 m and 5x5 m, however there is a new trend to increase the plantation density through growing cultivars suitable for mechanical harvesting with over-the-row straddle machines like

the Spanish 'Arbequina'. The majority of the olive area belongs to large agricultural development companies, therefore orchards are of mega size, one of which is considered the largest organic olive orchard in the world with one million trees.

OLIVE CULTIVARS

Local available cultivars in wild forms have not been used in establishing new orchards. Since there were no olive tree nurseries in the country in the early 1980's that could meet the increasing demand, private farmers and agricultural companies imported huge numbers of olive nursery trees from northern neighboring countries. Therefore most planted cultivars at the beginning were the Jordanian 'Nabali' and the Syrian 'Sorani', 'Jlot', 'Koddieri' and 'Kaissy'. Later on, Spanish 'Picual' and 'Manzanilla' along with Italian 'Coratina' were introduced.

IMPACT ON ECONOMY AND ENVIRONMENT

In recent years olive cultivation has gained special importance in Saudi Arabia, and olive oil has become one of the important products positively impacting the economy and food security. With per capita consumption of 0.4 kg/year, Saudi Arabia aims to reduce its reliance on importing over 10,000 tons/year of olive oil through expansion in the cultivated olive area. During the last fifteen years the national production of olive oil has increased steadily and managed to cover a large portion of domestic needs.

In Saudi Arabia there are currently more than 3,000 ha of olive trees that are certified for producing organic olives and olive oil, with demand increasing after gaining recognition in international markets. One orchard contributes some 5,000 tons of organic olive oil and 2,700 tons of organic table olives to the global olive market, and for a start has already exported 200 tons of olive oil to Italy and 400 tons to Spain. The government is motivating organic culture realizing that sustaining the national olive sector depends on quality more than quantity. In pursuing this objective, the Ministry of Agriculture in collaboration with the Food and Agriculture Organization (FAO), is conducting a quality improvement project in the olive industry.

One of the large companies which grow olives has the largest single flock of sheep in the world to be sold during the *Haj* season and when there are natural fatalities in the flock, the dead sheep are buried in deep trenches down to 1.80 cm below ground level. When the corpses are fully decomposed, olive trees are cultivated over these trenches; an environmental friendly practice and a good recycling process. Considering that olive trees have a shallow root system, it is astonishing to see how the roots of young trees planted on top of sheep graves, under drip irrigation, penetrate the soil that deep in search for nutrients released from the decomposed corpses (Fig. 5).



Fig. 5
Arrows indicate roots down to nearly 2 m reaching sheep decomposed corpses.



Fig. 6

Olive trees in midst the endless Sahara

The modern orchards of perfectly lined olive trees marching across sandy hills and dotting the desert in a vibrant green geometry are adding a new environmental depth to the desert (Fig. 6). Now that the government is controlling the water abstraction from underground aquifers, the new planted olive trees, with their low water requirements, will sustain these aquifers which nourished ancient farms that gave life to the region's earliest dwellers.

With olive expansions in the northern region, a new city named مدينة الزيتون (olive) is being built in Al-Jouf in the vicinity of olive oases. It is expected that it will attract investments worth 500 million Riyals equivalent to 133 million USD.

RIGHT AND WRONG CULTURAL PRACTICES



Fig. 7

Erroneous training of young olive trees resulted in developing too much wood and defoliation

With little knowledge and know-how about olive cultivation and maintenance, Saudi Arabia moved into this industry with great pace and within just couple of years there were thousands of hectares already planted. Among the mistakes done during the first years was the wrong selection of certain cultivars which showed little adaptability to the desert climate where they have been grown.



Fig. 8

An olive seminar conducted by Egyptian olive expert Moh. El-Kholy

Furthermore, training of young trees was improper. Many trees were either left to grow on multiple stems or the branching of the main scaffold was too close to the ground with too many limbs that turned into thick wood within a very short period (Fig. 7). Experts from Europe, Egypt, and Syria and even as far as Australia were invited by the large olive growing companies to assist in human capacity building through seminars and hands-on training in the field (Fig. 8). This policy has helped in overcoming initial

problems and improved knowledge of oliviculture in general.



So far olives are harvested manually (Fig. 9), however measures are under way to use mechanical harvesting. Most olive orchards are in remote desert locations and there is no way but accommodating large harvesting crews in the orchards during harvesting season, which is logistically difficult and increases harvesting costs.

Other than new cultivars which are imported for high density plantations, the private sector has developed a strong nursery industry which has the capacity of meeting local current demands and even exports to neighboring countries (Fig. 9).

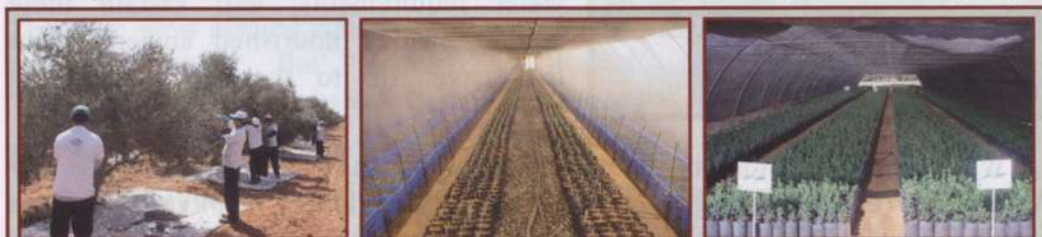


Fig. 9

Left to right: Olive harvesting on a large orchard and nurseries of olive trees

PROCESSING METHODS OF RAW OLIVES

In Saudi Arabia it is hard to find old traditional olive mills. With the booming of olive planting in the 1980's, the first unit of centrifugal extraction was introduced in 1983. Nowadays there are 22 processing facilities using this system most of which are in Al-Jouf region. Some of these facilities are small; however there are some with large capacity that can handle up to 80 tons of olives/day. Production of oil relies mainly on European cultivars and some of the Syria and Jordanian ones, while table olive processing is mostly using cultivars which were imported from the latter two countries.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

The people of Saudi Arabia are very traditional in their food habits. The average meal of the Bedouin nomads, who are reduced in number nowadays, is much simpler than that of the urban Saudis who are the majority nowadays. However, the basic ingredients are the same: fava beans, wheat, rice, yogurt, dates, and chicken. Some recipes of the traditional Saudi dishes using olives and olive oil are given below:

➤ **Sureed (The king of all foods)** (Fig. 10):

Ingredients: 1 kg meat cut into pieces (chicken, beef, mutton or camel), 3 teaspoon ginger garlic paste, ground red chili to taste, salt to taste, 2 cups of olive oil, 2 chopped medium onions, 1 teaspoon turmeric, 2 teaspoon coriander powder, 1 teaspoon cumin seeds, 5-6 cloves, 2-3 sticks cinnamon, 2 cardamoms, 5-6 black peppers, 2 chopped tomatoes, 1 cup yogurt (optional), and 1 teaspoon ground *garam masalah*.

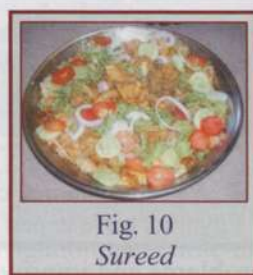


Fig. 10
Sureed

Method: Bread: for this Arabic recipe the most important thing is the special bread that is used to make it. The wheat breads used are made very thin, therefore the dough should be kept somewhat soft. Meat: if mutton or beef are used, it is better to cook the meat first until it is tender. If chicken is used, then there is no need for cooking. In a pot, heat olive oil and fry onions until golden brown. Add meat and fry for few seconds. Then add ginger garlic paste and fry on medium heat for 1-2 minutes. Add tomato and yogurt and all the spices and dry ingredients except ground *garam masalah*. Cook well and fry until oil separates from masala. Add 15 cups of water to it. Boil for 10-15 minutes and remove from heat. Sprinkle ground *garam masalah* and cover. Take out the meat pieces from the gravy. Make pieces of bread, neither too small nor too large (about 4-7 cm). Then take a big serving plate and put these pieces in it. Pour the gravy enough to be absorbed by the bread pieces. The thin bread will absorb a lot of the gravy; however avoid too much gravy left over. Place the meat pieces that were set aside. Sprinkle pomegranate also onto it. The delicious *Sureed* is ready to be served. The traditional way to serve it is on ground sitting. All the people eat from the same big plate called *saini* sitting in a circle.

➤ **Kimaje (Flat Bread)** (Fig. 11). This bread is traditionally served warm from the oven and is used to scoop up other foods.

Ingredients: 1 pack of active dry yeast, 1¼ cups lukewarm water (more if required), 1/4 cup olive oil, ½ teaspoon sugar, ½ teaspoon salt, 3½ cups all-purpose flour.

Method: In a large mixing bowl, dissolve the yeast in the lukewarm water. Add olive oil, sugar, salt, and 2 cups flour, and stir until smooth. Add just enough of the remaining flour to make dough that is not sticky and is easy to handle. Place the dough on a lightly floured work surface and knead until it is smooth and elastic, about 10 minutes. Put the dough in a lightly oiled, large mixing bowl and move it around to grease all sides with the oil. Cover the bowl with a towel and set it in a



Fig. 11
Kimaje (flat bread)

warm place to rise, for about 1 hour, until the dough doubles in size. When the dough has risen, punch it down and move it to the lightly floured work surface. Divide into 6 equal balls. Place the balls side by side on the work surface and cover with the towel. Let them rise for another 30 minutes. After they have risen, flatten each ball with a lightly floured rolling pin or the palm of your hand, until it is a circle about 3 mm thick and 15 cm across. Using 3 cookie sheets, place 2 breads on each so that they are not touching, cover them with towels, and let rise for another 30 minutes. Preheat oven to 230° C. When breads have risen, bake in oven for about 10 minutes or until golden brown and puffed.

POPULAR MEDICINAL AND COSMETIC USES

It is because the olive tree and olive oil are mentioned in the Al-Qur'ān, the Holy Book of Islam, that most Saudis believe in the holiness of the tree and in the healing

power of olive oil which they use in many treatments like mixing it with juniper leaves to relief gout pains. Massaging the fore-head with a paste of olive oil and nutmeg is useful for curing headaches. It is very common to apply olive oil on dry skin and scalp with dandruff. Most Saudis also add olive oil and vinegar to their salads following Prophet Muhammad diet habits, a mixture that helps reducing cholesterol.

OLIVES AND TOURISM

During the last few years, the Ministry of Agriculture in collaboration with the private sector of the national olive industry organizes an annual cultural event called “Al-Jouf Olive Festival” from mid of December to mid of January to improve public awareness of the health benefits of olive oil and to advocate the quality of the locally produced olive oil and table olives. Among the activities of the festival are folklore dancing and art exhibitions (Fig. 12). High value prizes are given to producers who achieved best olive oil quality; the winner of first place receiving as much as 100,000 Riyals (USD 27,000) (Fig. 13).

Trade and household handicrafts fairs are organized as sidelines of the main event. The olive festival attracts visitors from neighboring countries and also from Europe and has effectively contributed to the economic activities of the northern region. One significant outcome is that it highlights the historic and archaeological significance of the region and its vast potentials in the economic, agricultural and tourism sectors. Visitors to the festival now have the chance to explore some of the archaeological monuments in the region including the Marid Fortress, which dates back to 2000 BC, Al Hamra Palace and Al Ablaq Palace. Queen Zenobia, the ruler of Palmyra, was defeated here in 272 AD, mainly by the solid castle walls.

OLIVE WOOD AND BY-PRODUCTS USES

Soaps having olive oil as an ingredient are produced in tribal areas on small scale for domestic use. The by-product olive cake resulting from olive oil extraction is used as animal fodder and as combustion fuel in the country side. Decorative items of carved olive wood are also commonly available in Saudi markets. These are made by local farmers and skilled labors from pruning wood.



Fig. 12
Olive art exhibition as part of
“Al-Jouf Olive Festival”



Fig. 13
First prize for olive oil contest

Following Olive Footprints in SLOVENIA



Dunja Bandelj^{1,2} dunja.bandelj@zrs.upr.si,
Darko Darovec¹, Emilija Kastelic¹, Vasilij Valenčič^{2,3}

¹University of Primorska, Science and Research Centre, Koper

²University of Primorska, Faculty of Mathematics, Natural Sciences and Information Technologies, Koper

³LABS LLC, Izola



INTRODUCTION

The Republic of Slovenia is a rather small country located in South-central Europe at 45-46° N and 13 and 16° E (Fig. 1). It covers 20,273 km² and has a population of 2.05 million. Slovenia borders Austria to the north, Italy to the west, Hungary to the north-east and Croatia to the south and south-east. Its coastline, with a length of only 47 km, lies along the Adriatic Sea. Owing to its strategic position between the Alps and the northernmost gulf of the Mediterranean Sea, Slovenia hosts two of the most important European transit routes from South-east Europe towards the west and from Central Europe towards the south. Slovenia is well known for its rugged terrain and climate diversity, distinct cultural landscape, architecture and settlement heritage, as well as rich and diverse natural systems. It has three main climatic areas: the Mediterranean, the Alpine and the Pannonian.



With 66% of its entire area being covered by forests (1,185,145 ha), Slovenia is a forested country par excellence, ranking third in the EU after Sweden and Finland. Agricultural land covers 27.8% of its area (468,496 ha) with 57% taken up by meadows and pastures, followed by 37% fields and gardens, while fruit tree crops ranked last with 5% consisting of vineyards (16,086 ha), extensive crops (4,979 ha), intensive crops (4,714 ha), and root-stock nurseries (224 ha). In terms of number of fruit trees apple comes first with 59.9% followed by olive (18.4%), peach and nectarine (11.2%), pear (4.7%), cherry (2.4%), walnut (2.3%), apricot (0.7%) and

sour cherry (0.4%). In recent years, the percentages of apple and olive trees have increased, while that of pear trees has been decreasing drastically.

The Slovenian climate is mostly Mediterranean on the coast, continental with mild to hot summers and cold winters in the plateaus and valleys to the east. Slovenia gets most of its rain in the late spring (May and June) and autumn (October and November). Precipitation varies among averages of about 900 mm in the east, 1,300 mm to 1,600 mm in the center, 1,100 mm to 1,300 mm on the coast and up to 3,500 mm in the Alps.

OLIVE CULTIVATION HISTORY

In Istria (the largest peninsula in the Adriatic Sea), the origin of olive growing dates back to 600 BC when the Phoenicians introduced the olive tree to the Northern Mediterranean Coast as a result of exchanging amber from this region with commodities from the Southern Mediterranean. The first documents on olive oil production and trade in the region was written in Roman times.

The Venetians started to regulate olive oil “industry” relatively early, with the oldest Decree dating to 1383. In the 14th century, the area of Piran (small town on the north-western Istrian coast) wanted to protect its olive oil production and, consequently, the town authorities prohibited the import of olive oil from other places, which certifies the ample production of this commodity. Since the 16th century, the control and taxes on olive oil trade as well as oil production were on the increase. The olive industry was usually regulated by individual communes, which issued town statutes and later on special collections of town tax provisions in order to regulate the manner of production in presses and the level of tax levied. Interestingly, they also included the prohibition of olive harvesting prior to a certain date (e.g. prior to the feast of St. Lucia in October in the town of Koper), aiming at preventing locals from harvesting unripe fruits. In those times, there was hardly a report written by the local governor to the Venetian authorities that did not mention olive oil, which was not at all surprising since in the 17th and 18th centuries olive oil accounted for the most important and the highest income from taxes levied by the Venetian rulers in Istria. Consequently, its production and trade were kept under strict control. Notably, at that time olive oil was not primarily a foodstuff, rather a durable industrial material used for the illumination of towns and soap making.

A detailed description of that olive oil production process can be found in the Koper Statute of 1301. According to its provisions, oil producers had to make sure that olives brought in by the olive growers were not damaged. Before pressing, the olives were washed, boiling water added in the prescribed ratio and then pressed. All these activities, including the decanting of olive oil into vessels, had to be supervised by olive growers or their proxies. For centuries to come until the early decades of the 20th century, with very little technological improvements, stone mills and presses were used for oil extraction. The museum of Tona's House in St. Peter village



exhibits one of these old mills with one of its stone reservoirs for oil (Fig. 2). Most of those mills were privately owned, while some were owned by the church. Mills adjacent to streams were operated through water wheel driven by water impulse. Others were operated by animals like a donkey, horse or oxen. Work in these mills was still very laborious and owners used to hire three or four millers who were generally relatives or villagers or sometimes seasonal workers who came from other remote villages and stayed at the mill just for the season before going back home with the money they earned. Milling was concentrated mainly in the winter when the fruits were ripe, so that oil extraction was easier. Nevertheless, it was customary to pour boiled water on the paste to boost extraction.



Fig. 2

Complete old oil mill on display at Tona's House with a stone reservoir for oil
(Courtesy of Maritime Museum "Sergej Masera", Piran)

As revealed by archaeological excavations in Koper, olive residues were used not only as fuel but also as watertight material in the fortification of town piers. When the nearby city of Trieste introduced gas lighting in the second half of the 19th century, the demand for Istrian olive oil decreased considerably. Another reason for the reduction was the competition of high quality oils produced by French and Italians. Allegedly, Istrians used an inappropriate oil production method because olives were soaked in tubs filled with plain or sea water before pressing (olive growers were convinced that such treatment increased oil yields and fat content), consequently, they started to rot.

In the 17th and 18th century, olive oil took over the economic role of salt, which used to be the foremost Istrian production and export commodity yielding considerable income not only to the Venetian treasury but also to local salt makers largely owing to incredibly widespread smuggling. Its volume could be even six times higher than that of legal trade. Thus in the 18th century, salt smuggling by sea, an activity typical of north-western Istrian towns, was replaced by olive oil smuggling.

At the end of the 19th century, Slovene Istria had around 320,000 olive trees. Later on, their number was severely reduced by frosts, with the most devastating being that of 1929 when, according to some estimates, their number tumbled to only 110,000. In the aftermath of World War II, local peasants grew mainly vegetables,

fruits and grapes as olive oil sale did not pay off. The 19th and 20th centuries witnessed several declines in Slovene olive oil production in 1880, 1885, 1914, 1929, 1956 and 1985, resulting either from bad economic situations or from severe frosts. Even though, attempts to revitalize the industry proved successful; resulting from the application of modern technologies, the establishment of nurseries, the selection of proper planting material and the public awareness of the health benefits of olive oil consumption.

AREA UNDER OLIVE CULTIVATION

Similar to the Italian places of Lombardy, the Treviso commune and the Veneto region, the Slovene coastal belt along the Northern Adriatic is the northern-most geographic area where olives are still grown in large cultivated areas. With low winter temperatures and occasional winter and spring frosts being the main limiting factors, olive growing spread mainly throughout Istria. In Slovenia olive growing prospers mainly in the south-west of the country, i.e. in the region of Slovene Istria extending up to the edge of the Kras Plateau (limestone borderline plateau region extending in South-western Slovenia and North-eastern Italy). As favorable influences from the Adriatic Sea reach through the Isonzo Valley up to the town of Gorizia, olive trees can be also found in the Goriška Brda Hills and in some places in the Vipava Valley (Fig. 1, page 339).

In 2010 Slovenia reached 1,778 ha of olive plantations. Owing to specific relief conditions (steep slopes and terraces) and fragmentation of agricultural land, the area is distributed in small lots of 0.32 ha on average with only 10% exceeding 3 ha (Fig. 3). Since 1988, the country has been witnessing an increase in olive areas, as well as the transition from extensive to intensive olive growing. The renovation of



Fig. 3
Largest olive orchard of
14 ha located on Ankaran Peninsula

olive plantations increased rapidly until 1996 when planting reached the peak of around 60 ha/year, but in recent years it dropped to 20 ha/year, with a similar trend expected to continue in the future. Irrespective of this decrease, it is envisaged that in the future olive areas will increase in particular in overgrown locations owing to great interest in olive growing in the Slovene Littoral. With overgrown locations covering an estimated area of 1,000 ha in Slovene

Istria, it is feasible that the total increase in olive areas might reach 2,600 ha. Further extension of olive plantations may also take place in the Brda Hills and in the Gorica district. In 2010, the estimated annual olive oil production was 500 tons.

OLIVE CULTIVARS

In the past, Istrian olive growing was under the influence of central Italian olive growing; this was especially evident from the Italian names (deriving from the regions of the Marches, Tuscany and Umbria, and from the environs of Rome) given to Istrian olive cultivars. The introduction of good olive cultivars occurred with demographic oscillations and by the migration of the population from central Italy to Istria. Unfortunately, no older historical records are available on the origin of cultivars in Slovene Istria. The varietal structure of olives in Slovene Istria is a result of different attempts to revitalize olive growing in the region, with the process spanning several centuries. The first records from the end of the 19th century, and subsequent records from the mid-20th century show that major changes in varietal selection happened in the middle of the last century, as a result of periodical frosts, difficult economic conditions before World War II and lack of local planting material after the war. These records included a systematic description of morphological characteristics and the classification of Istrian olive cultivars.

On the basis of local background and traditional olive cultivation, 'Buga', 'Štorta' and 'Črnica' are regarded as traditional, while 'Istrska belica' as a recent introduction to Istrian oliviculture. The main characteristics of these cultivars are given below:

'Buga' (Fig. 4) has the following synonyms: 'Boga', 'Bugi', 'Burla', and 'Bugla'. In the 19th century, it was spread throughout the Istrian Peninsula and renowned for its good quality oil due to high bio-phenols content, although oil yield is low. The tree is characterized by intermediate vigor and abundant quantity of burr knot (ovules). Fruits are medium sized and of dark color at harvest. With first fruits being ripe at the end of October, it is considered an early cultivar. It is resistant to the olive peacock spot and slightly less resistant to the olive fly. Today it is cultivated only in low numbers inside olive orchards.



Fig. 4
'Buga'

'Štorta' (Fig. 5) has two synonyms: 'Ukrivljena' and 'Fažolina'. In the past, it was only locally cultivated in the areas of Izola, Strunjan and Lucija. The plant is characterized by intermediate tree vigor, medium leaf size, and elongated and asymmetric fruits, which are used mainly for pickling due to their flesh texture and easy detachment of the flesh from the pit. It is an early cultivar, harvested in October.



Fig. 5
'Štorta'

'Istrska belica' has a number of synonyms: 'Belica', 'Cepljena Belica', 'žlahtna Belica', 'Bijelica', 'Istarska Bjelica', 'Bianchera', 'Bianca Istriana', 'Biancara'. It is

the most common cultivar in Slovene olive plantations. Before the frost of 1929, it was grown only in the Ankaran Peninsula, and it was only after the frost of 1956 that it rapidly spread to olive plantations in the hinterland of Slovene Istria. Owing to its numerous positive characteristics, local olive growers massively grafted the autochthonous cultivars 'Črnica' and 'Buga' with 'Istrska belica', which resulted in the modified varietal structure of Istrian olive plantations. It is well adapted to low temperatures and its erect growth habit and vigor make pruning very demanding. The cultivar is self-compatible and gives ample and regular crops in well-maintained plantations. As a late cultivar, the medium sized fruits, which exhibit high oil content, are usually harvested from mid-November to mid-December. It is not that resistant to the olive peacock spot and very sensitive to olive fly.



Fig. 6
"Purissima" olive collection

For evaluation and conservation of national genetic resources there are two national collection orchards, one in the village of Strunjan hosting 27 cultivars and one called "Purissima" at the Ankaran Peninsula with 37 cultivars (Fig. 6). In addition, there is also an *in situ* olive collection at the "Forma Viva" Park near Portorož.

Until 1956 Slovenian olive plantations hosted small numbers of imported cultivars. Italian cultivars, which showed good yields and high oil content, were introduced after 1985. Today's most common cultivars in Slovene olive orchards is 'Istrska belica' (70%) followed by the Tuscan 'Leccino' (25%) and its pollinating 'Pendolino', with the remaining 5% being taken up by autochthonous and imported cultivars.

IMPACT ON ECONOMY AND ENVIRONMENT

In comparison with other olive oil producing countries in the European Union (EU), Slovenia produces negligible amounts of olive oil, yet its quality is extraordinarily high. The annual olive fruit production ranges from 1,800 to 2,500 tons, out of which 400 to 500 tons of olive oil is produced. With domestic olive oil production covering only one third of local market demand, Slovenia has to import about 1,000 tons of olive oil per year. Recently, the average olive oil consumption of 0.8 kg/capita has been on the increase.

Based on its geographic location, climatic conditions and grown cultivars, Slovenia introduced the Protected Designation of Origin (PDO) for its extra virgin olive oil of Slovene Istria. In 2007 the EU recognized it as the first Slovene product bearing such a PDO label. The applicant and holder of the designation is the Society of Olive Growers of Slovene Istria established in 1992.



Participating in major international contests, Slovene olive oil producers have proved to be very successful. With Slovene olive oil recording high prices in the market, olive growing plays an important role in the national economy, even if it has always been only a supplementary activity and, as such, an additional source of income to rural families. Nowadays, olive growing is practiced by approximately 2,000 growers who mainly possess small orchards, offering part-time jobs to the local population and serving as an additional source of income to family farms. Some factors limiting economic returns include relatively high production costs, fragmented agricultural land and steep terrain, making the use of automated technologies impossible, especially when it comes to pruning and harvesting. Slovene olive growers have to cope with periodical frosts occurring on average every 30 years; and during the last decade they suffered from frequent droughts. Furthermore, Slovene olive orchards are occasionally threatened by mass infestations of pests, in particular the economically detrimental olive fly, intensified by climate changes.

Being well aware of the importance of nature and environmental conservation, olive growers tend to use environmentally friendly technologies. Slovene intensive plantations (Fig. 7) are marked by medium density of 7x6 m (240 trees/ha), nevertheless, there are still a number of higher density plantations.



Fig. 7
Intensive olive orchard

CULTURAL PRACTICES

The majority of olive growers have embarked on integrated and ecological olive growing and lowered the use of chemical pesticides to a minimum. Moreover, recent research has confirmed that Slovene olive plantations boast extraordinary biodiversity. The use of agricultural machinery is limited, with handwork prevailing, especially when it comes to olive pruning and harvesting (Fig. 8). The plantations are overgrown with turf, so the soil usually does not exhibit lack of organic matter. As there are almost no olive irrigation systems in Slovenia, available water resources are not burdened.



Fig. 8
Hand picking

In Slovenia olive growing is one of the most important and most appropriate agricultural activities, helping to preserve the attractive appearance of typical Mediterranean landscape.

PROCESSING METHODS OF TABLE OLIVES

Table olive production in Slovenia is extremely low, since less than 1% of the crop is processed into table olives. Table olives are produced from the 'Štorta', 'Istrska belica', 'Buga', 'Mata', 'Žižula'. Table olive production is also limited in terms of type of production almost entirely domestic in households. Traditionally olive fruits are first left in water, completely submerged to prevent oxidation, for 10 to 20 days, with water being changed every two days. Olives are then fermented in 3.5% brine for 2 days, then in 4.2% brine for 5 to 7 days, and finally in 6.2% brine for 6 to 8 months or until fermentation has been completed. This method is mainly used for black table olives, although it could also be used for green or partially pigmented olives.

Traditional local table olive processing is related to traditional salt harvesting in the Piran salt pans. Since 2008, table olives from Slovene Istria have been protected through the Protected Designation of Origin (PDO) system. Their special taste is a result of local climate conditions, cultivars, controlled protection against pests (integrated or ecological olive growing), immediate processing, and the processing method using brine made of Piran salt. This salt is harvested in accordance with a recognized technique with a 700-year-old history using traditional tools only. The basic process involves natural crystallization on salt pans lined with *petola* (few-mm-thick biological sediment composed of minerals and microorganisms).

TRADITIONS AND CULTURE

In Slovene literature, the olive and olive-related customs and practices can be found in the poems: *Oljka* (Olive) and *V pepelnični noči* (During the Ash Night), published in the collection of poetry by Simon Gregorčič in 1882. Olives also appear in folk sayings revealing inherited folk wisdom and the philosophy of life. The Istrian people use them in order to illustrate their teachings, which are of vital importance in education, to explain their arguments, to be witty, to reject someone else's arguments, etc. Many Istrian folk sayings were taken over from the Romance inhabitants of Istrian coastal towns and were adapted to suit their local environment and dialect. The most commonly found forms are dialectal expressions about the olive's beauty, fertility and growth and olive oil characteristics, such as:

Slovenian

- *Ulka je bela ku ruha*
- *Murja je lišo ku ulja*
- *Ulka je krgana ku koronca*
- *Pleše ku pu ulje*
- *Je umazan-a ku športa*
- *Ulja je zalano ku lek*

English

- The olive is white as a sheet (when in bloom)³³
- The sea is smooth as oil
- The olive is brimful as a rosary
- She/he is dancing as if on oil (smoothly, elegantly)
- She/he is dirty as an olive crate
- Oil is green as a medicine

³³ In the original, the sayings are written in a dialect, whereas their translations are in the formal register (translator's note).



- *Je slatko ku ulja*
- It is sweet as oil

There also exists an interesting metaphor revealing spitefulness:

- *Naj sa je, dunjar ja ulka zalana*
- Let him/her worry until his/her olive is green

Olives appear in sayings related to weather forecast: e.g.

- *Za bet letna dobra, mora bet ulka*
- It takes a wet olive or a wet *pinca* cake for a
- al pinca mokra*
- good crop

The beginning of olive harvest is mentioned in the following proverb:

- *Sveta Katarina sveto ulje ima*
- Saint Catherine (25 November) brings holy oil

The following two sayings reveal the art of olive growing and pruning:

- *Ulka mora bet čista, da pralati sokolić umes*
- The olive must be neat for a birdie to fly through it (some of its branches have to be cut off)
- *Ulka če šakarje, ne pilo*
- The olive needs scissors not a file

The value of the olive and its oil can be inferred from the following words of wisdom:

- *Uljka je kraljica naša, ulje pa nrslajša paša*
- The olive is our queen, its oil is our sweetest pastures
- *Trto se sadi za sina, ulka za unuka*
- The vine is planted for the son, the olive for the grandson
- *Ulka je božja mana Mediterana*
- The olive is the manna of the Mediterranean (a more modern saying)

The presence of olive is also reflected in place and fallow names and in nicknames, e.g. the village of Olike (Olive), the fallow names U ulkah (In the Olives), Pod ulkame (Beneath the Olives), Marija Ulkica (Mary The Small Olive), Bepo Ulkar (Bepo The Olive Grower).

Olive symbolism is commonly met in the Christian tradition, which has a great impact upon Slovene manners and customs. In Slovenia, the olive is used for celebrating Palm Sunday. In the Primorska region and in Venetian Slovenia, the feast day is called *oljčnica* or *ojčnica* (Olive Sunday) (Fig. 9 and 10, next page). In Slovene Istria, old people often fetch home-blessed olive twigs, in particular twigs with an olive fruit or two still on them. Sometimes they tie them in a sheaf called *fašina* or *faš* in the Vipava Valley. Big intertwined twigs are called “palms”.



Fig. 9
Blessing of olive twigs
for Palm (Olive) Sunday



Fig. 10

Bunches of olive branches prepared for blessing on Palm (Olive) Sunday in the old days and at present time

The housewife usually keeps the twig throughout the year to have it close at hand in case of bad weather or death in the house. In the Kris area, the blessed olive twig is stuck into the doorpost so that God can protect everything and everyone inside the house. With the blessed olive twig being a symbol and extension of spiritual blessing and God's protection, it is used for sprinkling holy water on Christmas Eve or on other occasions. In some places, people like to embellish all pictures in the house with it, to stick it into the doorpost or in the garden,

orchard or field in order to get good crops and to protect the crops against pests. Olive twigs are also often used to adorn the crucifix standing in the corner or the beams in the loft of the house, stable or outhouse. When danger is in the air, they are burnt in the hearth to avert evil. In the past, they were burnt for their smoke that had to be inhaled by the person allegedly bewitched, since holy smoke was believed to turn bad spells away. In some places, bundles are still burnt on Good Friday when blessed food is prepared or on Christmas Eve when burning bundles are taken around the house. The ashes of blessed bundles were often put in the fodder. The Dolenjska Region has been well known for its special olive crosses of an olive leaf inserted into the slit of another leaf. They were stuck into different nooks and crannies as a symbol of blessing. In the Slovene village Šentjur pod Kumom, such a cross protected every hayrack against the wind. Many of these customs are still observed nowadays, mostly on Olive Sunday.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olive oil and olives form an integral part of Mediterranean cuisine in Slovenia. Olive oil can be found in cakes, bread, different spreads, salads, and is used for roasting, deep-frying and cooking. Following are some common recipes using olive oil:

➤ **Bruschetta** is a typical Italian dish and one of the most famous snacks prepared in Istria. Is prepared using homemade bread, extra virgin olive oil, garlic and salt. The bread is sliced and browned on both sides. Peel and split a clove of garlic and rub it over one side of the slice. Drip or spread with oil and sprinkle with salt. The basic recipe for *bruschetta* can be modified by adding fresh tomato and a few basil leaves, mozzarella and rosemary, or goat cheese and rocket.

➤ **Anchovies in spinach** is another well-known Mediterranean dish. Prepare by coating anchovy fillets with flour and deep-fry them in olive oil. Chop and boil the spinach, fry it in olive oil and season with salt and pepper to taste. Fill the baking pan with layers of anchovies and spinach, sprinkle with chopped garlic, dribble with oil and bake.



➤ ***Bakala*** is a traditional Christmas dish with main ingredients of dried cod and olive oil. To prepare it put the cod in the pot and add milk to get a creamy sauce. When it starts boiling, season with salt to taste and take the pot off the stove. Then add chopped parsley and olive oil. *Bakala* can be served with maize porridge.

Table olives were and still are used as an additive to different dishes and cold cuts or as an ingredient in spreads (Fig. 11). In Istria, locals also make olive paste tapenade from pitted black olives, capers, salt pilchards or anchovies, a garlic clove and a few spoons of olive oil. All ingredients are mixed well to make a homogenous paste and olive oil is added while mixing. The paste can be spread over toasted bread slices or used as an ingredient in pasta sauce.



Fig. 11
Olive spread served at the festival
“from the wine to the olive grower”

It is unfortunate that some erroneous beliefs on olive oil usages can still be found in cookery. Some consumers still believe that olive oil cannot be used for baking and deep-frying. As proven scientifically, olive oil is suitable for these cooking methods because it has a higher smoking temperature point, in comparison with other oils and fats. It is a healthy frying fat, which does not break down to fatty acids and toxic compounds, because of this high smoking temperature point which is much higher than the frying temperature.

Another erroneous belief is that the nutritional value of vegetables goes down when cooked with a drop of olive oil. In fact, the nutritional value may even increase because the food is cooked more quickly; therefore it takes less fat when frying in olive oil.

Due to poor knowledge of olive oil categories in retail, some consumers tend to mistake bad olive oils for good ones as they are still convinced that rancid oils boast a good, homely taste, while they dislike quality olive oils, characterized by a bitter and pungent taste. Luckily, these wrong beliefs are gradually disappearing nowadays.

OLIVE BY-PRODUCTS USES

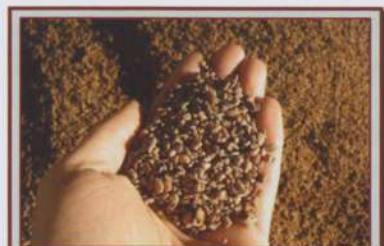


Fig. 12
Olive pits used as biomass

Locals in Slovene Istria use other parts of the olive tree, mainly leaves. The concentrated extract of dried olive leaves is believed to have anti-inflammatory effects (in the past, it was also used to cure malaria) and is supposed to lower high blood pressure. Olive wood is not widely used in Slovenia, not because of its high cost, but mainly because there are only limited quantities available. When olive presses were widely in use, dried olive

pomace was a useful by-product used by olive growers as fuel for stoves or as fodder. Nowadays, with modern processing systems, the majority of olive growers spread the wet by-product pomace over agricultural land as a fertilizer and use olive pits as biomass (Fig. 12, previous page).

OLIVES AND TOURISM

Olive growing has facilitated sustainable development with a positive impact on tourism development through increased touristic activities and services related to olive harvesting, local cuisine, growth of quality labels of olive oils, olive oil tastings, festival of olives and wine, etc. Slovene Istria boasts two festivals, which links olive production to tourism: the "Olive Branch" and "From the Wine to the Olive Grower". The former organizes a number of olive-related events: olive oil tastings, seminars on olive growing and olive oil production, workshops for quality olive oil recognition and for preparation of culinary delicacies. The latter combines guided tastings of wine and olive oil. The festivals seek the participation of numerous oil producers who consider them as a platform for presenting their products to the public and for interacting with consumers in a pleasant non-formal atmosphere. In addition, some places in the hinterland of Koper (Dekani, Padna) organize olive feasts such as that of St. Catherine, patron saint of olives, celebrated on 25 November. In the past, it marked the beginning of olive harvesting, while nowadays it is also a touristic event combining tradition with modern *šagra* (party time).

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Following Olive Footprints in SOUTH AFRICA

Linda J. Costa linda@olivesinfact.com

Independent entrepreneur (passionate about all things olive), Stellenbosch



INTRODUCTION

South Africa (Fig. 1) is situated on the southernmost tip of Africa, stretching from latitudes 22° to 35° S and longitudes 17° to 33° E, covering 1.2 million km². The Tropic of Capricorn (23° E) dissects the most northerly section. South Africa has a dual agricultural economy: a well-developed commercial sector and a predominantly subsistence sector. About 12% of the country can be used for crop production. High-potential arable land comprises 22% of total arable land. Some 1.3 million ha are under irrigation. Agricultural activities range from intensive crop production and mixed farming to cattle ranching in the Bushveld³⁴, and sheep farming in the more arid regions.

Climatic conditions generally range from Mediterranean in the south-western corner of South Africa to temperate in the interior plateau, and subtropical in the north-east. Most of the country has warm, sunny days and cool nights. Temperatures are influenced by variations in elevation, terrain, and ocean currents more than latitude. Rainfall generally occurs during summer (November through March), although in the south-west, around Cape Town, it occurs in winter (June through August) within a range of 600-1,000 mm/year. Rainfall varies considerably from west to east. In the north-west, annual rainfall often remains below 200 mm. In contrast, much of the eastern Highveld region receives 500 to 900 mm/year; occasionally, rainfall there exceeds 2,000 mm/year. A large area of the center of the country receives about 400 mm of rain, on average, and there are wide variations closer to the coast.



Fig. 1

Olive growing areas in South Africa

³⁴ Is a sub-tropical woodland ecoregion located in the North West Province of South Africa, the Central and North-East Districts of Botswana and the Matabeleland South and part of Matabeleland North Provinces of Zimbabwe. The elevation of this region varies from 750 to 1,400 m. There are three significant mountain ranges in this region.



Olive growing has been concentrated in the South-western Cape for many years but is now spreading to many areas of the country where sufficient water is available. Production consistency in these summer rainfall areas has yet to be determined. Olive cultivation is a relatively new agricultural practice in South Africa and is in the process of evolving into a meaningful industry.

OLIVE CULTIVATION HISTORY

According to an entry in the diary of South Africa founder, Jan van Riebeeck (1619-1677), on July 18, 1661, the first 2 olive trees were growing well on a farm called Boschheuveld in the Western Cape, near Cape Town. A rather tenuous launch of the South African olive industry! It would be approximately 232 years before any local interest was shown in this humble tree. A visit to Californian olive orchards prompted a Wellington (Western Cape) pioneer by the name of Piet Cillie, to report in the Agricultural Journal of 1893 that he believed vast areas of land in South Africa would be very suitable for olive cultivation. He set the ball rolling by planting some trees in Wellington, and was followed by Jan Minnaar who planted trees in Paarl. By 1907 he had produced an olive oil which was rated as the finest olive oil in the British Empire. It may have been the only one, but the tale is one of the pillars of South Africa olive history, and the foundation of claims of quality olive oil produced in the country.



Fig. 2
Ferdinando Costa
(1884-1969).

It is indubitable that the man historically acknowledged as “The Father of the Olive Industry in South Africa” was solely responsible for recognizing the vast potential and, more specifically, for entrenching olive culture in a country where the olive was little known. Ferdinando Costa (Fig. 2) landed in South Africa in 1903, and from the outset he aspired to one day be able to cultivate his first South African olive tree. He was a very highly qualified agriculturist, having completed his studies at St. Illario Agriculture College in Genoa, Italy. The similarity in climatic conditions between Italy and South Africa, coupled with the fact that the wild *olienhout* trees flourished all over the

Western Cape foothills, added further confidence to his idea.

Ferdinando set about contacting his former associates at St. Illario Institute, and through their cooperation was able to import scions of the best cultivars available in Italy, which were used to graft onto the local wild *Olienhout* rootstock. These included ‘Ascolana’, ‘Frantoio’, ‘Leccino’ and ‘Taggiasca’. This was the formal start of a further seven years of experimentation, determining suitable cultivars able to adjust to local conditions.

When he purchased a farm in Paarl in 1925, he became the first farmer to concentrate on olives only, rather than planting them as a side-line. He inspired others to follow suit by offering any cultivation advice they needed. Once he had established

the first local olive oil mill, with an imported hydraulic press from his homeland, Italy, he offered to purchase the fruit from these followers of his advice. He produced his first olive oil in 1936 with first label in 1937 and his success story continued (Fig. 3).



Fig. 3

The story of developing the olive processing industry in South Africa by Costa family

A) Pressing olives in Paarl, Western Cape, 1939

B) Philip Costa bottling olive oil, 1948

C) 1st olive grader, Paarl, Western Cape, 1958

Ferdinando's older son, Philip (1921-2005), (Fig. 4), followed in his footsteps and his grandson, Guido, now runs the family farm. Ferdinando's second son, Nino (1922-), independently forged a name for himself, first in the wine industry and then in the table olive industry. His innovative processing



Fig. 4

Philip Costa
(1921-2005)

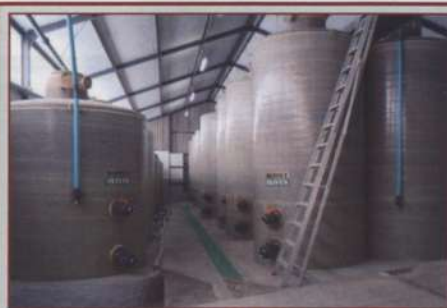


Fig. 5

Nino Costa's table olive
processing plant designed 1988

plant designed in 1988 (Fig. 5), specifically for table olives, remains unsurpassed in South Africa to the present day (2011).

During the last 70 years, the South African industry has grown exponentially, albeit with a slow start as the olive tree and its products were foreign to the local farming community. At present the industry is going through continuing rapid expansion, trebling its output in the last 10 years (2000-2010). Production of olive oil is now close to 1,500 tons/year while the table olive production is 3,500 tons/year.

AREA UNDER OLIVE CULTIVATION

An estimated 2,500 ha are in production as of 2011 with an average of 500 trees/ha and another 500 ha consisting of high-density plantings (1,000 trees/ha). Some new super-high-density orchards are planted with 1,600 trees/ha (Fig. 6). The highest concentration of trees at present is located within a 150 km radius of Cape Town (Fig. 1, page 351), where the climate is ideal. Due to the hot, dry summers, very few dry land orchards are found. The average yield per irrigated mature tree is ± 20 kg.

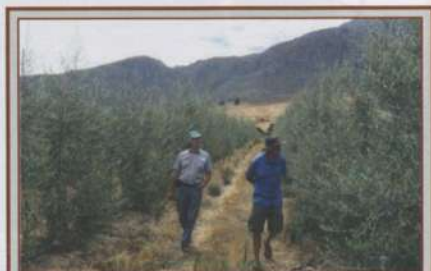


Fig. 6
High-density
14-month-old 'Maurino' trees

OLIVE CULTIVARS

The autochthonous wild olive, *Olea europaea* subsp. *africana*, (Fig. 7, A) occurs throughout Southern Africa. Ecotypes of this subspecies are widely adaptable and found growing in diverse geographic zones ranging from semi-desert, subtropical, temperate forest lowlands and mountainous highlands; from the coastal region to the interior plateau. In the early part of the 20th century, this wild olive was used as a rootstock for commercial tree propagation; and this practice led to the establishment of the local olive industry. The wide adaptability of this wild olive holds promise as a source of valuable rootstock material for future breeding programs.

The dune olive (*Olea exasperata*), another wild olive autochthonous, is the only one found in a few isolated locations along the Western Cape coastal area (Fig. 7, B). This low growing bush grows on sand



Fig. 7

A) *Olea europaea* subsp. *africana*, Cape Town, (Photo by Abu Shawka)
B) *Olea exasperata*, Western Cape

dunes close the sea, exposed to strong salt-laden winds and hot dry summers, often surviving when burnt by wild fires. This species also holds potential for genotype development with low vigor, and adapted to saline conditions

No autochthonous olive cultivars are grown commercially, although seedlings of cultivated olive occur sporadically, sometimes hybridized with the indigenous species. A research programme at the Agricultural Research Council aims to find improved genotypes for cultivars and rootstocks, through evaluation of imported selections and locally developed seedling populations.

To support the new emerging olive industry, South Africa has imported, over decades, several olive cultivars from different regions of the world. The Italian 'Frantoio' and 'Leccino' were introduced in 1904, Californian 'Mission' and Spanish 'Manzanilla' in 1930 and in 1950 it was the Greek 'Kalamata' and Italian 'Barouni'. Between 1980 and 1995 other cultivars were introduced like Greek 'Koroneiki', Spanish 'Arbequina' and Italian 'Coratina', 'Favoloso' and 'Nocellara del Belice'.

'Mission' (Fig. 8) is very widely planted due to its adaptability and excellent production. It is a late-ripening cultivar, often resulting in alternate bearing of the trees, especially when harvested for table olive production. 'Frantoio', 'Leccino' and 'Manzanilla' trees bear extremely well, while 'Kalamata' trees tend to deliver lighter crops in general. 'Coratina', 'Favolosa' and 'Nocellara' are not as widely planted to date, and yet are delivering very good yields. The quality of the oil produced in this country is internationally recognized, as demonstrated by numerous awards received. In the Los Angeles International Extra Virgin Olive Oil Awards 2011, a 'Nocellara del Belice' oil from Porterville was awarded best in Class.



Fig. 8
'Mission'

IMPACT ON ECONOMY AND ENVIRONMENT

The overwhelming majority of olive fruit produced is hand-harvested. This provides income for many workers in the agriculture sector. In the Western Cape the olive harvesting season commences as the grape and other deciduous fruit harvesting is completed, thereby extending the employment period for fruit pickers by at least three months. Overall the local industry adds at least 230 million South African Rand (29.5 million USD) to the economy.

Many marginal areas, where no cultivation took place before, are now covered with silver-green olive trees, vibrant and productive. Where biodynamic farming

practices are followed, bird and insect life has returned to these areas and the effect on the surroundings is positively synergistic.

Waste management is a major focus. The olive oil extraction equipment used is two-phase, therefore wastewater is minimized and the pomace is utilized for composting. A greater challenge is the brined waste resulting from table olive production. Lined evaporation ponds are common, together with aeration systems to reduce the polyphenol content of the wastewater. After suitable treatment and dilution the water is recycled.

CULTURAL PRACTICES

With a more recently developed industry, the advantage is that it is not hamstrung by inherited, possibly outdated, practices. A miscalculation in the earlier days was that the influence of pollinators in a grove was underestimated. Monoculture orchards have been discontinued due to low fruit-set results.

MEDICINAL AND COSMETIC USES

Until 50 years ago, the only olive oil available to the average consumer was from a pharmacy shop. Its uses were limited; often suggested only as a means of clearing wax out of the ears of hard-of-hearing children! Many older folk religiously swallow a tablespoon of olive oil every day to enhance general health. Traditional cultures have used olive oil as a skin remedy for many years, but only recently have exquisite ranges of creams, soaps, shampoos and the like been developed, and these are now enjoying burgeoning consumer appreciation. Development of a cosmetic range holds huge potential for businesses with vision.

OLIVES AND TOURISM

As global awareness of the olive grows, more groups of tourists, both local and international, are requesting information on the local olive industry. Many wine routes have been set up, and interest in similar olive routes is mounting. Rather than remaining an add-on to the wine farms, olive oil and olive products are gaining recognition as a tourist destination in their own right.

USES OF OLIVE LEAVES

Olive leaf extract is widely recognized as being anti-microbial, in other words, anti-bacterial, anti-fungal and anti-viral. It has been reported that it may be used for treating HIV Aids due to its strong anti-viral properties; however its effectiveness is still being researched. Olive leaf tea has been used for many years by a very small group of the population on the premise that it boosts the immune system. The active ingredient is the bitter principle found in the fruit and leaves, namely oleuropein which is strongly antioxidant, hence its antimicrobial properties. A few supporters maintain that the leaves of the indigenous wild olive (*Olea africana*), are far more strongly antimicrobial than the leaves of the cultivated olive, but supporting data is lacking.



OLIVE WOOD AND BY-PRODUCTS USES

The beautiful wood of the wild olive (*Olea africana*) is used to make many striking ornaments such as bowls, vases and candle stick holders, and is especially attractive turned to make pepper grinders (Fig. 9).

As with any emerging industry, time is needed for the development of the peripheral by-product branches. Very interesting research is being undertaken by the University of Cape Town on the isolation of antioxidants from the waste water. The team is looking into innovative ways of treating spent fermentation brines. Processes include the recovery of water and inorganic salts for re-use in the fermentation process or for packaging of the product, minimizing waste discharge, and recovery of valuable components of the waste such as antioxidants and lactic acid (Water Research Council report K8/814 of 2009).



Fig. 9
Pepper grinders made from
olive wood of *Olea africana*

ACKNOWLEDGEMENTS

Much appreciation especially to all the pioneers of the South African olive industry, who persevered and left us a viable legacy. Appreciation and gratitude to all the passionate and committed participants who are presently involved in every aspect of the industry. The synergetic combination of our energies will move the industry forward. Sincere thanks to my cousins, Guido and Carlo, for their invaluable input; to Carlo for sharing his research results, and to Guido for the historical photos.

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Juan M. Caballero juanm.caballero@yahoo.com

IFAPA, Centro Alameda del Obispo, Former Chief of Olive Growing Department
International Consultant, Córdoba



INTRODUCTION

Spain, with 47,190,493 inhabitants consists of most of the Iberian Peninsula, the Balearic and Canary Islands and two Autonomous cities in North Africa, just south to the peninsula. Palma de Mallorca, capital of the first archipelago is at 360 km to the east of Valencia, in the Mediterranean Sea. The second archipelago is in the Atlantic Ocean, with the capital of the central island at 1,284 km to the south-west of the main south-western city in the peninsula, Cádiz. Continental Spain borders with France, Andorra and Cantabrian Sea to the north, the Mediterranean Sea to the east, the same sea, Gibraltar (United Kingdom) and the Atlantic Ocean to the south and the said ocean and Portugal to the west (Fig. 1). It lies between the parallels 43° 47' N and 36° N and the meridians 3° 19' E and 9° 18' W.



Fig. 1
Olive growing areas in Spain

Spain's average altitude is 660 m, the third in Europe after Switzerland and Austria if Andorra and Liechtenstein are not taken into account, because of the high central plains (*mesetas*) and mountain ranges like the Pyrenees and Sierra Nevada. The highest peak is the Teide, in the Canary Islands, with 3,718 m, while in the peninsula it is the Mulhacén, with 3,478 m. Its total surface is 504,750 km², mostly in the peninsula, 492,460 km². The Spanish peninsular coastline is 4,515 km, reaching 7,880 km taking into account the islands. The climate is predominantly Mediterranean, with annual mean temperature of 14-16° C, with no true winter, except in the interior. The periphery enjoys milder winters and hotter summers, attenuated along the shores. There is a small humid area in the north, with mean rainfall above 600 mm, reaching 2,000 in some places. The rest is dry, less than 600 mm, even 200 in the south-east area, falling mainly during autumn and winter months. Olive tree areas receive from 200 to 700 mm rainfall, although 400 to 500 mm is more common.

Spain has 17,203,324 ha of agricultural land, equal to 34% of the total surface (2010). Cereal grains represent 35.6% of cultivated land, olive trees 15% and all other fruit trees (including vineyards) reach 13.7%. The Southern Region, Andalusia, has a surface of 87,370 km² (17.3% of Spain), representing 60%, 14% and 12% of the national surfaces of olive trees, other fruit trees and cereal grains, respectively. National olive surface amounts to 2,572,793 ha (2010), 24.3% of the world total in 2008. The surface for oil production is 2,449,564 ha.

OLIVE CULTIVATION HISTORY

Charred wood and/or endocarps of wild olive trees [*oleasters*, *Olea europaea* L. sbsp. *europaea* var. *sylvestris* (Mill.) Lehr.] show that man started harvesting wild olives around 17000 BC in several Mediterranean areas, like the Middle East, Spain and Morocco. It was long before man started to practice agriculture (Vernet *et al.*, 1983). Olive domestication was achieved in Spain as early as 5500 BC as shown by olive charcoal found in *Cova de les Cendres* at Moraira, Alicante. It was done by cloning *oleaster* trees, thus giving rise to *Olea europaea* L. sbsp. *europaea* var. *sativa* Lehr. Wood and stone charcoal from cultivated olive trees are distinguishable from those of wild trees (Terral and Arnold-Simard, 1996). Phoenicians, Greeks and especially Romans likely brought more cultivated varieties; but they mainly improved local techniques, expanding cultivation. Olive growing started to become very important with Scipio (211 BC), mainly in the *Betica*, named as such because of the river *Betis*, now Guadalquivir (*Wadi-Elkebir* وادي الكبير, big river in Arabic).

Most of the classic Dressel 20 clay amphorae (210 liters each) accumulated in the Roman Testaccio hill during two centuries was from *Betica*, now Andalusia. This trade reached all other parts of the Roman Empire; for instance, more than 1,000 Spanish amphora seals have been found in Alexandria, Egypt. Columela (Lucius Junius Moderatus Columella) wrote his 12-volume book *De Re Rustica* (The Works of the Farm) in Rome from 55 to 65 AD. In the volume about trees he dealt with olives and discussed previous knowledge along with the results of his own experience in his homeland of *Gades* (Cádiz), in the *Betica*. Dealing with olive cultivars he wrote that “as of vines, also from olives there are many varieties, but to me news from only 10 have arrived, the “posio”, the “licinio”, the “sergio”, the “nevio”, the “culminio”, the “orquis”, the “regio”, the “lanzadera” and the “mírteo”.

Olive cultivation was also important during the Arabic era, 711 to 1492. Several local authors wrote about it; but the main one was Ibn Al Awam al Ishbili, born in Seville. He wrote the best agricultural book of the Middle Age in the 12th century. He gathered the rich Greco-Roman agricultural tradition, the important oriental inheritance and the practical know-how of his region, Andalusia. The Spanish language has many words of Arabic origin, i.e. *aceite* (olive oil), coming from *az-zait* الزيت, olive juice, and *aceituna* (olive fruit) from *az-zaitoon* الزيتون. In Andalusia the olive mill is named *almazara*, coming from *al-mässara* المعصرة.



The present illumination system of the Córdoba Cathedral-Mosque (Fig. 2) resembles that burning olive oil in candles as they did during the 10th century. Most of the oil produced during that time was also exported. The antiquity of olive cultivation is corroborated by the presence of many millenary trees (Fig. 3).

The publication of *Agricultura General* by Alonso de Herrera in 1513 reflected a significant increase in olive surface during the 16th century. That book also facilitated the expansion of olive cultivation to the New World since 1520 (the first olive trees in México were planted in 1531 and those in Perú in 1560). In Spain a good example of olive expansion at that time is the *diezmo* tax (a tenth of the revenue) that olive growers had to pay. In Estepa (Seville) that tax increased from 64 to 683 *arrobas*³⁵ of olive oil since 1493 to 1551 (Caballero Páez, 2004). In 1767 Carlos III brought 6,000 families from Central Europe, Catalonia and Valencia to colonize lands of Andalusia along the route Madrid-Seville, where olive cultivation is important today.



Fig. 2
Candle illumination in the
Cathedral-Mosque of Córdoba



Fig. 3
Millenary trees at Ulldecona,
Tarragona (Photo by Joan Tous)
Inside frame: at Mondrón, Málaga.
(Photo by Concepción Muñoz-Díez)

Olive surface also grew by taking advantage of the railroad network started to establish in the 19th century, with further expansion provided by olive oil being well sold in Europe after World War I. It increased again after the Spanish civil war (1936-39) for assuring food security, attaining 2,366,715 ha in 1963. Cultivation was reduced to 2,075,552 ha in 1985, due to hand-labor becoming more expensive and too scarce because of rural people migrating to industrial areas of Spain and other European countries, while olive oil price could not rise up. That uprooting of around 300,000 ha was a very great shock for both olive owners and workers. But olive surface expanded again, reaching 2,572,793 ha in 2010. The book *El Cultivo del Olivo* (Barranco, Fernández-Escobar and Rallo, six editions from 1997 to 2008, already translated into English) is another sign of the importance of olive growing in Spain.

AREA UNDER OLIVE CULTIVATION

Spanish olive growing areas are shown in figure 1, page 358 (Civantos, 2010). “Seas of olives” in either intensive or traditional orchards are seen everywhere over rolling

³⁵ Is a unit of weight used in Spain in the past, weighing 11.5 kg. Its origin is Arabic from the word الربع, meaning one fourth of another unit of weight.

hills (Fig. 4). Some areas bear the name of their main cultivar, like that of ‘Picual’. It covers Jaén province and some small zones of Córdoba, Granada and Ciudad Real, totalling around 860,000 ha in 2007 (Barranco, 2010). ‘Cornicabra’ is the major cultivar in the Central area, where it grows in 269,000 ha in Ciudad Real, Toledo and Madrid. The ‘Hojiblanca’ area is in Córdoba province plus one county of Seville, Málaga and Granada. That cultivar covers 217,000 ha. ‘Picudo’ is also grown in 60,000 ha inside the ‘Hojiblanca’ area, also a small area in Granada and Jaén.



Fig. 4

Intensive-type “olive sea” at Córdoba countryside

Traditional “olive sea” at Jaén countryside

‘Lechín de Sevilla’ grows in 105,000 ha in Cádiz, Huelva, most of Seville and a county of Córdoba (Western Andalusia). ‘Manzanilla de Sevilla’ (‘Manzanilla’ or ‘Manzanillo’) grows in 85,000 ha in Seville, also in Badajoz (Western area). This cultivar is widely planted in other countries all over the world. ‘Morisca’ dominates in the Western area, with 74,000 ha in Badajoz. ‘Manzanilla Cacereña’ is also grown in the Western area in 64,000 ha in Cáceres and Salamanca. ‘Empeltre’ is the main cultivar in the Ebro valley, with 72,000 ha in Zaragoza, Teruel, Tarragona and Balearic Islands. ‘Arbequina’ is now planted in most Spanish areas and abroad, but in 1997 it grew mainly in Lérida and Tarragona, with 71,000 ha in the area of its name. ‘Farga’ is the main cultivar in Tortosa-Castellón area, with 45,000 ha. ‘Lechín de Granada’ is the most planted in Eastern Andalusia, with 36,000 ha, mainly in Granada and Almería, but also in Murcia (Levante area). The main cultivar in Levante is ‘Villalonga’, with 24,000 ha.

The traditional planting density is around 70 trees/ha, with three trunks per tree, but the new olive growing developed since the 1970’s uses 200-400 single-trunk trees/ha, amounting to around 500,000 hectares. Olive trees have traditionally been grown under dry-farming, but now drip irrigation is used in more than 700,000 ha. As in most of the traditional olive-growing countries, Spanish oliviculture is characterized by the use of marginal lands, especially in terms of orchard slope and shallow soil. In Andalusia almost 1,000,000 ha grow in slopes higher than 7%. Out of that figure, 350,000 ha are in slopes from 13% to 20% and 300,000 ha in slopes higher than 20%. Olives reach up to more than 1,300 m above sea level in certain areas.

The importance of olive growing is also highlighted by the 1,283 villages and places that have names relating the olive tree, the olive or the olive oil. Out of them, 460 are in Andalusia, with 114 in Jaén, 108 in Madrid and 96 in Tarragona. Twenty are in provinces where there is no olive cultivation, in the north-western corner of peninsular Spain; and there are only two provinces not having any olive related name (Carrillo López *et al.*, 2010).

OLIVE CULTIVARS

A national survey found more than 500 different cultivar denominations. Organ morphological descriptions allowed identifying 262 cultivars: 24 are majors, 27 secondary, 36 dispersed and 175 are only local (Barranco, 2010). Most cultivars have not moved out of their zones of origin, mainly because of the difficulty in transporting the large propagules (Fig. 5) needed in the past (Caballero and Del Río, 2010). A study of the 160 more ancient olive trees in Andalusia has shown that 56 are wild and only 10 out of the 104 determined as cultivars correspond to material being grown today, like ‘Gordal Sevillana’, ‘Lechín de Granada’, ‘Verdial de Vélez Málaga’ and ‘Picual’ (Díez *et al.*, 2011). In the following brief descriptions the values are taken from the Olive World Germplasm Bank of IFAPA, Córdoba (Caballero and Del Río, 2005, Del Río *et al.*, 2005), while the qualitative descriptions come from Barranco (2010) and Uceda *et al.*, (2000).



Fig. 5

Pruned branches may produce propagules, firewood and *picón* (a tiny charcoal)

‘**Picual**’ (Fig. 6) is much appreciated for its early onset of bearing, high productivity and easy orchard management. Its fruit is ovoid, asymmetric, rounded at the tip, with no nipple and abundant but little lenticels. Fruit size is medium, 4.3 g, having an oil yield of 22% at first half December (50% under experimental conditions if referred to fruit dry matter). It is tolerant to olive knot (*Pseudomonas savastanoi* pv. *savastanoi*), susceptible to olive leaf spot (*Fusicladium oleagineum*) and very susceptible to verticillium wilt (*Verticillium dahliae*). Harvesting should start by the middle to the end of November. It produces high quality oil, fruited, fragrant, with positive attributes of some bitterness and pungency; it stands out for its high stability (about two years) and high oleic acid content, 78.3%.



Fig. 6

‘Picual’

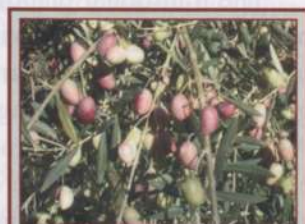


Fig. 7

‘Cornicabra’



size is medium to small, 3 g, with a good oil yield in its growing area, 21% at first half of January (41.3% over fruit dry matter). It is particularly susceptible to olive leaf spot, olive knot and olive fly (*Bactrocera oleae*). It is a late ripening cultivar. Its oil has excellent organoleptic characteristics: fruited and fragrant, with a green flavor, mild to taste. Its stability is quite high and the oleic acid content is 75%.

‘**Hojiblanca**’ gives high production, but not regularly, mainly if harvested too late. Its fruit is ovoid, symmetric, rounded at the tip, with no nipple but abundant and small lenticels. It weighs 4.8 g and has a low oil yield, 19% during first half of January (43% over dry matter). The trees are resistant to calcareous soils and drought, but susceptible to olive leaf spot, olive knot and verticillium wilt. Its oil is fruited, mild and sweet in the mouth. It has a medium stability and an oleic acid content of 73%. This cultivar is very suitable for California black olive pickling because of its firm fruit texture.

‘**Manzanilla de Sevilla**’ (Fig. 8) has good productivity and medium onset of bearing. The fruit is spherical, with rounded tip and no nipple, with abundant and small lenticels. It weighs 5 g and has good oil yield if used for that purpose, 20% during the second half of November (48% over dry matter). However, it is almost exclusively used for green pickling; its fruit flesh/pit ratio of 10 is very high. It is very susceptible to olive knot and verticillium wilt and susceptible to olive leaf spot.



Fig. 8
‘Manzanilla de Sevilla’

‘**Arbequina**’ (Fig. 9) shows early onset of bearing, high and regular productivity, spherical fruit without nipple and small and few lenticels. Fruit weighs 1.9 g and has an oil yield of 20% during the second half of November (48% over dry matter). This cold resistant cultivar is susceptible to iron chlorosis. It is tolerant to olive leaf spot and verticillium wilt. Super high-density plantings started with this cultivar. Its oil is much fruited, of sweet taste, very fluid in mouth, but with medium-low stability. Its oleic acid content is 68%, but does change with latitude.



Fig. 9
‘Arbequina’

Only two foreign cultivars are grown in Spain, Italian ‘Frantoio’ and Greek ‘Koroneiki’. The first one is being used since several years ago but only as replacement when scattered trees die in orchards because of verticillium attacks, as it tolerates that disease. ‘Koroneiki’, ‘FS-17’ and ‘Tosca’ are being tried in hedgerow orchards, with no benefits compared to ‘Arbequina’ and especially ‘Arbosana’ and ‘Sikitita’, the cultivar bred for compact growth by UCO and IFAPA.

IMPACT ON ECONOMY AND ENVIRONMENT

The average olive oil production increased by 124% from 1986-90 to 2007-11, up to 1,234,320 tons. The average bearing surface of 1986-90 was 2,060,820 ha, showing that orchard productivity (20.8%) has increased much more than surface.



The olive oil and table olive production represent 43.6% and 23.6% of the world production during 2006-10, respectively. Olive-growing provides 5% of the total Spanish agricultural production and 30% of it is in Andalusia, a region producing 83% and 76% of the national olive oil and table olives, respectively. Domestic olive oil consumption has gone from 395,000 tons to 539,525 tons, while exports have increased from 287,000 tons to 737,475 tons. So, close to 60% is exported as follows: 50% to Italy, 23% to France and Portugal and the rest to USA, Canada, Japan and a hundred of other countries. The average table olive production has also jumped from 220,000 to 528,702 tons. During the last five-year period an average of 258,000 tons of table olives were exported mainly to the USA, but also to Italy, Russia, France, Germany, etc. mainly in Spanish green style, but also in the California black one.

Olive oil and table olive production are deeply rooted in the Spanish people. The sector counts 175,000 olive exploitations, more than 50% in Andalusia. About two thirds of the national olive surface is owned by people having from three to five hectares, still separated in several small plots. At the national level it provides more than 30 millions working days per year, more than 50% during harvest. Most trees are harvested mechanically, shaking tree limbs or trunks, but the development of the new super high-density or hedgerow model orchard originated in Catalonia in the mid 1990's is based on integral harvesters that ride over the tree rows. There are 1,747 olive mills, 45% in Andalusia, where they provide 25,000,000 working days per season, apart from the 7,500 jobs throughout the year. There are 474 table olive processing plants. With just 5% of the olive surface, table olives provide 6,000,000 working days per year in the field and 7,500 jobs during the year in processing. This accounts for more than one third of total employment in the national agro industry.

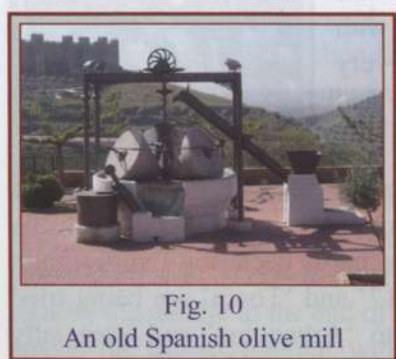


Fig. 10
An old Spanish olive mill

The traditional *almazaras*, which mill olives by rolling trunk-conic stones over them, have almost disappeared (Fig. 10). In 2005-06 they processed just 1.16% of the total milled olives. However the modern and friendlier two-phase centrifugation system was then processing 90% of the crop with just 72% of the total mills. This is the result of the huge investment made by olive growers, mainly through the cooperative system, partly supported by the Common Agricultural Policy of the European

Union during the 1990's. It has given rise to spectacular increases in the production of extra virgin olive oil, as the olives are now processed at the rate they are harvested. The establishment of 31 Protected Designations of Origin (PDO) in olive oil has established even higher thresholds for awarding the extra virgin qualification to the olive oil they produce.

The search for olive oil quality is leading to broad participation in national and international quality contests to gain name and markets. Spanish olive oils have repeatedly won many prizes in several world contests like Mario Solinas (IOC), Biol (Andria, Bari, Italy), Armonia-Alma (International School of Italian Cooking, Italy), Sol d'Oro (Verona, Italy), LA International EVOO (Los Angeles, USA), Olive D'Or (SIAM Montreal, Canada), Oil China I (Shanghai, China), Olivinus (Mendoza, Argentina), etc. Spanish olive oils are also appearing in international tourist guides or related publications, like TOP 15, Guida L'Extravergine of Marco Oreggia, or the Olivenöltest TOP 50 of the German newspaper "Der Feinschmecker".

Olive cultivation is so concentrated in some areas that they are often called "olive seas" as they constitute real groves, full of life (Fig. 4, page 361). They include mammals like rabbits, hares and partridges and many kinds of birds, some of them migratory like thrushes, coming from North African countries. The olive grove constitutes a Mediterranean-type forest, an ecosystem with reptiles like lizards and snakes, some rodents like the field mouse and the dormouse. Even predators use them as hunting fields, like some raptors birds, wolves and genets.

The unique Spanish system of renovating scaffold branches by pruning produces abundant thick wood plus secondary and tertiary branches, respectively named *leña* (fire-wood) and *ramón*. The thick wood was used as propagules for rooting but also as the only energy source for heating in home chimneys and bread ovens (Fig. 5, page 362). Until today, this procedure is much used as there are special stoves designed for efficient and safe heating. A good wood supply is assured by the renovation pruning, normally done every other year. In the past it also protected neighboring forests from over-use, as in areas where olive trees were not grown. The *ramón* is burned in the orchard or used for feeding goats and other ruminants. Still today the remaining naked *ramón*, after losing the leaves is used to produce *picón*, a tiny charcoal (Fig. 11) inside single-use earth ovens.



Fig. 11

Picón to be burned in a *mesa-camilla*
(Photo of María Gómez)



Fig. 12

Reservoirs to evaporate *alpechín*, residual waters from mills (Photo by Javier Hidalgo)

The main environmental problem of the traditional and three-phase mills was the high volume of *alpechín* (olive fruit water+processing water) that had to evaporate in special reservoirs until the summer (Fig. 12) with the risk of spills reaching the

streams. This oil elaboration system also produced *orujo*, a type of cake still having some pomace oil. Before extracting it that cake was used as feed complement to nourish pigs at home. It was much used, providing a family food supply during the year. The pomace oil was also extracted and the remaining cake used for heating ovens in ceramic industries. Today the *alpechín* is no longer a problem because the horizontal two-phase centrifugal mills are producing just oil and a wet cake, the *alPerújo*, which has much more water and less pomace oil than the now absent old cake type. Nowadays the grind-stones are separated from the cake and widely used for heating in the mills and in homes as stoves can be fed continuously. They are also successfully exported. Pellets made from the pruned branches are also used for central heating, even in large buildings.

The Spanish cooperatives and other enterprises have been able to establish systems aimed at using the *alPerújo* and pruning residues to produce electricity, the co-generation process. An example is the cooperation of 216 olive mills from seven Andalusian provinces. During 2009-10 this complex used 1.26 million tons of *alPerújo*, generating 245,679 Megawatts/hour. It is using 30% and 70% of the Andalusian and Córdoba's *alPerújo* volume, respectively. Today it is considered that Spanish olive biomass (pruned branches) and the *alPerújo* provide an energy equivalent to 1.5 million tons of petrol. The *alPerújo* can also be used along with olive leaves to produce good compost. In fact many mills are entering this business, trying to give back to the orchard soils what they "export" as by-products.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES



Fig. 13

Training of traditional Andalusian trees

- A: An olive *mata* before reaching the 3-trunk adult shape,
- B: Too severe heading back cut (*afrailado*), not needed at all to develop the canopy
- C: The shooting response to the excessive *afrailado* must be trained again

Most traditional trees have three trunks (Fig. 13, B and C) because of the old propagation method: groups of three 60 cm-long hardwood cuttings were planted in 1-m³ holes. They sprouted producing a *mata*, just a bundle of 10-15 shoots (Fig. 13, A). Training consisted of gradually cutting the excessive trunks at soil level as demanded by the *mata* rhythm of growth, until each definitive trunk establish its own canopy. In some places the process was worsened by successively cutting each trunk at a height of

1.5 m in the wrong belief that it helped to form the canopy (Fig. 13, B). 'Gordal Sevillana' is so difficult to root that until mid 20th century it was often grafted to hardwood cuttings of an easy-to-root cultivar before burying them in holes. Also, one method used until those times to change cultivar in adult orchards, was to graft the main roots after isolating them from the trees, removing the old trunks some years later.

More than half of these traditional three-trunk trees are at least 100-year-old. However they keep producing because of the systematic renovation pruning so widely practiced, especially in Andalusia (Pastor Muñoz-Cobo and Humanes



Guillén, 2006). Every two - three years, from one to three scaffold branches, having lost productivity because of their age, are cut near their insertions on the trunk heads. Vigorous shoots sprout just around and below each cut, from which selection will be done

starting the next winter so that new scaffold branches will develop, thus substituting the removed ones (Fig. 14, left). However, this needed but severe pruning encourages the production of suckers at the trunk's basal parts, which have to be removed during the summer. On the other hand suckers arising just around the trunks have been and are still used as substitutes for the old trunks by selecting one or two of them (Fig. 14, right). The latter is a kind of rejuvenation process, which makes to think that many trees or orchards are really older than it could be thought.

Since the late 1970's propagation by rooting softwood cuttings under mist gave rise to an olive nursery industry allowing growers to forget about the traditional method (Caballero and Del Río, 2010). But renovation of scaffold branches by pruning is also a key factor for productivity in the new olive-growing method, developed some 30 years ago by growing single-trunk trees planted at 200-400 trees/ha (Pastor Muñoz-Cobo *et al.*, 2001).

Renovation of scaffold branches is not used in 'Manzanilla de Sevilla' table olives because of the need for good fruit calliper. Instead, most of the young leafy twigs are removed by severe thinning out, so that few fruits per tree will be produced. In this case the scaffold branches are maintained almost forever, until the trees look much older than they really are. This also makes to lose fruit load and encourages alternate bearing. This excessive pruning of fruiting twigs is also practiced in the 'Arbequina' area, for the protection of the trees against black scales (*Saissetia oleae*) and the

resulting sooty mold. However, in the Lecrín valley of Granada, an area high above sea level, lack of pruning is used to produce large and tall olive trees, which shade other fruit trees, protecting them against frosts in winter and heat in summer.

The reason why farmers established the traditional density of 60-80 three-trunk trees/ha was probably due to the need to grow intercrops (wheat, barley, beans, chickpeas, etc). The olive areas were densely populated and people owned too little land to produce everything. The plots also became increasingly smaller by successive divisions among the progeny. At the same time this orchard model could have provided space for growing fodder in between the three trunks and the need for digging that space when other associated crops would avoid doing it. Intercropping, even with vineyards and almond trees, was forgotten when crop specialization was proven more economical, but olive growers continued using the same planting densities, probably because of their traditional reluctance to change techniques passed on from fathers to sons. In specific areas another tradition is mounding soil around the trunks, like in Jaén for avoiding suckering, or in Tarragona for making the fallen fruit roll down to facilitate the harvest.

Spanish olive growers keep their orchard soils free from weeds by ploughing, to reduce the competition for water; the more they plough the better growers they are considered to be. That custom resulted in too many ploughings, especially when tractors facilitated that task around half a century ago, producing more erosion (Fig. 15, left), especially in steep areas. Soil erosion became a major concern, giving rise to different protective measures, like maintaining green covers in between the orchard rows during fall and winter or laying chopped pruning residues over these areas, which also slowly adds manure to the soil (Fig. 15, middle). Another method to reduce erosion impacts is to group soil stones as an inert cover (Fig. 15, right).



Fig. 15

Left: Frequent or deep ploughing intensify soil erosion

Middle: Chopped pruning residues protect against erosion and slowly add organic matter

Right: Grouping the soil stones also protects against erosion as an inert cover

(Middle photo by Javier Hidalgo, right by Milagros Saavedra)

Another old practice was to dig the soil under the tree canopy until a depth of about 20 cm around April, after the second annual ploughing, when this was still done by mules. It was tough work; a man could not do more than six trees from dawn

to dusk. The purpose was to assure no weed growth, but the root system was kept deep and then unable to exploit the superficial, rich soil layer. Another tradition was called *abrir los olivos* (to “open” the olive trees). It consisted of digging a strip half a meter wide around the external sides of the three trunks of the tree up to around 20-25 cm depth. That strip was filled with mule manure and the removed soil was turned back on top. It was done when the manure was insufficient for distribution over all the orchard soil.

The use of sticks to drop the olives from the trees was the common harvesting system. Men beat the trees with sticks (Fig. 16, top) and women picked the fallen olives from the soil (Fig. 16, bottom). Since some 20 years ago that beating is no longer used, substituted by shaking the trunks or limbs and spreading nets on the ground to receive the olives.



Fig. 16

Fiesta del Olivo, 1957

Top: Olive pickers at the parade

Bottom: Female olive pickers
(Photo courtesy of Ayuntamiento of Mora, Toledo)

PROCESSING METHODS OF RAW OLIVES



Fig. 17

Left to right: A tower press and a beam and screw press
at Museo de la Cultura del Olivo, Baeza, Jaén
(Photos by Juanma Caballero)

Olive oil processing has left a special footprint in the Spanish countryside, as many *cortijos* (farm buildings) still show the tower where the head of the olive press was located, especially in Andalusia. The old Spanish system of olive milling was by rolling trunk-conic stones (*rulos*) over another flat stone (*empiedro*). It successively used donkeys, mules, hydraulic power and then electricity to move the *rulos*. Now it can be seen almost exclusively in museums or parks (Fig. 10, page 364). Different types of presses have been used along the centuries to separate the water and oil from the solid part of the olives. The tower press applied the pressure by moving a mass down a spindle by means of levers (Fig. 17, left). The beam and screw press had to be operated by screwing the long thick beam at one of its extremes so that pressure was applied to the *cargo* at the other extreme (Fig. 17, right). The *cargo* was a tower of many layers of beaten olive paste separated by hemp discs.

The main method of preparing table olives is the Spanish or green style, born in the Seville area for 'Manzanilla de Sevilla' olives. Fruit is harvested by hand at the green-yellow stage, putting it into special padded containers (*macacos*) that workers hang from their necks. At the factory fruits undergo selection and classification before being put in caustic soda or light lye (sodium hydroxide solution) to remove bitterness. After washing to remove the excessive lye, olives are placed in *salmuera* (brine) where they stay until complete lactic acid fermentation. Then fruits are selected and classified before pitting and stuffing them with almonds, anchovies, pepper, garlic or whatever. The process ends with packaging the product that used to be preserved by providing the correct acidity and salt values. More recently, as people look for lower prices, the cans, jars, and other types of packaging are pasteurized.

One popular way of preparing green olives at home is to place them in a bucket with caustic soda water for 6-8 hours to remove the bitter taste (200 g of caustic soda for 5 kg of olives). Then the lye is substituted by clean water for 24 hours. Afterwards they are placed in an *orza* (a ceramic jar) with brine (3-4 handfuls of coarse salt). Some days later they are tested and rectified with salt if needed. The brine may also have an *aliño* (dressing) consisting of a dry orange peel, a few savory twigs, 2-3 heads of garlic, thyme, fennel and laurel leaves.

Another popular method is to crush yellow-green olives with a wooden mallet and wash them thoroughly. The water is changed as needed over 15 days. Then they are placed in a jar and covered with water. The *aliño* is then added allowing it to work for some days. It may be the same but with a little bit more salt and including a fresh lemon peel. In fact the *aliño* does change from village to village and even from home to home. At Baños de la Encina (Jaén) black olives are given 3-4 longitudinal shallow cuts and placed in a ceramic jar with olive wood ash in alternate layers. Then water is added until covering during 8-10 days. Afterwards they are washed every other day during 10 days and fennel and thyme added if desired. An artisan industry has also developed, presenting table olives in many different, local dressing types, as not every family may do it at home now, as they did in times past.

TRADITIONS AND CULTURE

The long history of successful olive-growing explains the deep imbrications into human life; songs and poems, gastronomy, painting, handicraft and folklore. *Flamenco*, the world famous singing and dancing of Andalusia, has been recognized as Intangible Cultural Heritage by UNESCO. It has a specific *palo* (type of singing) named *aceitunera* (female olive picker), typical of Jaén province during harvest time. The huge need for manpower during the 60-100 days harvest time (Fig. 18, next page) is one reason for this brotherhood between oliviculture and people's folklore and daily life. Harvest used to finish with a feast named *el remate* (the end). Also, when the owner visited his orchard while the harvesting team was picking, one *aceitunera* put a scarf on his shoulders which meant that the team is asking him



politely to invite all of them for a party that evening. Like in other Christian nations, olive tree and olive oil also play an important role in religion and liturgy, well explained in the Armenian, French, Greek, Italian and other chapters of this book.

The task of making *picón* discussed above was so important that one of the masterpieces of the painter of Córdoba Julio Romero de Torres is "*La Chiquita piconera*", a girl preparing *picón* in a brazier. The men making *picón*, the *piconeros*, used to live in the same district or street, depending on the city or village size. And they had to travel to the field to do their work and to fetch their product on donkeys or mules. Many singers of the 20th century, like Imperio Argentina, Concha Piquer and Rocío Jurado, celebrated *piconeros*, who sold their product moving along the streets advertising it.

Picón is also rooted in people's life because it represented the only way to heat homes during winter, burning it in braziers (Fig. 11, page 365) inside *mesas-camillas*. A *mesa-camilla* is a table covered by a special type of blanket down to the floor, the *faldillas* (little skirts). In this way all people sitting around it are kept warm during the long, cold winter evenings (Fig. 19).

Literature and poetry have also been permeated by oliviculture. A very popular poem of the Middle Age deals with olive harvesting:

Spanish

*Tres morillas me enamoran en Jaén, /
Aixa, Fátima y Marién. / Tres morillas
tan garridas / Iban a coger olivas / Y
hallábanlas cogidas en Jaén. / Aixá,
Fátima y Marién.*

English

Three little moors make me fall in love in
Jaén, / Aisha, Fatima and Mariem. / Three
little moors so graceful / Were going to pick
olives / And found them picked up in Jaén.
/ Aisha, Fatima and Mariem..

Many poets have sung of the olive, like Antonio Machado, Federico García Lorca, Rafael Alberti and Miguel Hernández. The following are quotations from a poem by Antonio Machado (1875-1939) entitled *Los Olivos*, "The olive trees":



Fig. 18

Harvesting teams of old times
(Courtesy of Museo de la Cultura
del Olivo, Baeza, Jaén)



Fig. 19

A *mesa-camilla*
(Courtesy of Museo Molino Santa Ana
of Valdepeñas de Jaén)
(Photo by Soco Caballero)



Spanish

English

*¡Viejos olivos sedientos / bajo el claro
sol del día, / olivares polvorientos / del
campo de Andalucía!*

*¡El campo andaluz, peinado / por el sol
canicular, / de loma en loma rayado / de
olivar y de olivar!*

*¡Olivares y olivares / de loma en loma
prendidos / cual bordados alamares!*

*¡Olivares coloridos / de una tarde
anaranjada; / olivares rebrunidos / bajo
la luna argentada!*

*¡Ciudades y caseríos / en la margen de los
ríos, / en los pliegues de la sierra!...*

*¡Venga Dios a los hogares / y a las almas
de esta tierra / de olivares y olivares!*

This poem, *Aceituneros*, "Olive pickers", is from Miguel Hernandez (1910-1942):

*Andaluces de Jaén / aceituneros altivos, /
decidme en el alma: ¿quién, / quién levantó
los olivos?*

*No los levantó la nada, / ni el dinero, ni el
señor, / sino la tierra callada, / el trabajo y
el sudor,...*

*Unidos al agua pura / y a los planetas
unidos, / los tres dieron la hermosura / de
los troncos retorcidos.*

*Levántate, olivo cano, / dijeron al pie del
viento. / Y el olivo alzó una mano /
poderosa de cimiento.*

*Andaluces de Jaén, / aceituneros altivos, / decidme
en el alma: ¿quién / amamantó los olivos?*

*Vuestra sangre, vuestra vida, / no la del
explotador / que se enriqueció en la herida
/ generosa del sudor.*

*No la del terrateniente / que os sepultó en
la pobreza, / que os pisoteó la frente, / que
os redujo la cabeza.*

*Árboles que vuestro afán / consagró al
centro del día / eran principio de un pan /
que sólo el otro comía.*

*¡Cuántos siglos de aceituna, / los pies y las
manos presos, / sol a sol y luna a luna,
/ pesan sobre vuestros huesos!*

Thirsty old olive trees / under the bright day
sun, / dusty olive groves / from
the Andalusian field!

The Andalusian field, combed / by the
canicular sun, / from hill to hill striped / by
rows of olive trees!

Olive groves and olive groves / from hill to
hill pinned / as embroidered *alamares*!

Colorful olive groves / of an orangish
afternoon; / burnished olive groves / under
the silvered moon!

Cities and hamlets / in the bank of the rivers,
/ in the sierra folds!...

God come to the homes / and to the souls of
this land / of olive trees and olive trees!

Andalusians of Jaén, / proud olive pickers, /
tell me in your soul: who, / who rose up
the olive trees?

They were not raised up by anything, / nor by
money, nor by the landlord, / but by the silent
earth, / by work and by sweat.

Together with pure water / and together with
the planets, / the three gave the beauty / of the
twisted trunks.

Rise up, hoary olive tree, / they said at the
foot of wind. / And the olive tree rose /
a powerful foundation hand.

Andalusians of Jaén, / proud olive pickers, / tell
me in your soul: who / suckled the olive trees?

Your blood, your life, / not that of the
exploiter / who got wealthy on the munificent
/ wound of sweat.

Not that of the landlord / who buried you in
poverty, / who trampled your forehead, / who
made you bow your head.

Trees that your eagerness / brought into the
broad light of day / were the beginning of the
bread / eaten only by someone else.

How many centuries of olives, / with your feet
and hands kept captive, / from sun to sun and
moon to moon, / weigh down on your bones!



*Andaluces de Jaén, / aceituneros altivos, / pregunta
mi alma: ¿de quién, / de quién son estos olivos?*

*Jaén, levántate brava / sobre tus piedras
lunares, / no vayas a ser esclava / con
todos tus olivares.*

*Dentro de la claridad / del aceite y sus aromas,
/ indican tu libertad / la libertad de tus lomas.*

Andalusians of Jaén, / proud olive pickers, / asks my
soul: to who, / to who do these olive trees belong?

Jaén, rise up bravely / on your moon-like
stones, / so you do not become slave / with
all your olive groves.

Within the clarity / of the oil and its aromas, / they
show up your liberty / the liberty of your hills.

So long history of olive cultivation has accumulated a long series of proverbs where popular knowledge is condensed. Some examples are given:

• *Casa del padre, viña del abuelo y
olivar del bisabuelo,*

• *Si alguna vez me olvidares, tálame
aunque no me ares,*

• *Una aceituna en San Juan, ciento en
Navidad,*

• *Si el olivo pudiera hablar se quejaría
del varear,*

• *Por San Silvestre, en tinaja el
aceite,*

• *Ni gato en palomar ni cabra en
olivar,*

• *Al molinero y a la esposa, siempre
falta alguna cosa,*

• *Cada mochuelo a su olivo,*

• *El vino calienta, el aceite alimenta,*

• *Más vale pan y aceitunas que estarse
en ayunas,*

• *El olivo es más agradecido que la
gente, por cada beneficio te devuelve
veinte,*

• *La verdad, como el aceite, queda
siempre por encima,*

• *Aceite de oliva, todo mal quita,*

• *Llevar aceite a Andalucía necedad
sería,*

• Father's house, grandfather's vineyard
and great-grandfather's olive orchard

• If ever you would forget me, prune me
although do not plough me

• One olive by San Juan (June 24), one
hundred for Christmas

• If the olive tree could speak it would
complain of the stick

• By San Silvestre (December 31), the oil
in the jar

• Neither cat in dovecote nor goat in olive
orchard

• To the miller and the spouse something
is always lacking

• Every owl to its olive tree, meaning each
one must do his task

• Wine heats, oil nourishes

• Better bread and olives than fasting

• The olive tree is more grateful than
people, for every benefit it gives you back
twenty

• The truth, like the oil, always remains
above

• Olive oil every evil removes

• It would be foolishness to take oil to
Andalusia

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Olive oil is a basic ingredient in many popular dishes like *gazpacho* and *mayonesa* that have gained international appreciation. The *gazpacho*, a refreshing liquid salad with olive oil and vinegar was basic in the summer diet of the 15th century. Some authors claim its presence during the Roman Empire. The *mayonesa* is





Fig. 20
The *cucharro* of Baños de la
Encina (Jaén)

now made with any type of vegetable oil; but only olive oil could be used when originated in 1756 in Mahón, a city in Menorca (Balearic Islands). A huge edge of round bread, well irrigated with extra virgin olive oil after making a hole in its internal side has been the dinner of many people, in past times of food scarcity and nowadays. A tomato is squeezed on the bread. It is eaten along with a portion of seasoned cod or other protein food and olives. Its name is *hoyo* (hole) but also ***cucharro*** (Fig. 20).

A very popular breakfast includes *tostadas* (toasted breads), covered with extra virgin olive oil, salt, sugar, honey or marmalade. Pig sirloin, sheep and goat cheeses, partridges and Spanish sausages of different types are conserved in extra virgin olive oil in ceramic jars, named *orzas*. No less important is the use of olive oil in traditional pastry, normally associated with religious events, mainly Christmas and Holy Week, like *magdalenas*, *hornazos*, *torrijas*, *pestiños*, etc. Two recipes of very popular dishes are given below: *Salmorejo* and *Tortilla de patatas*.

➤ ***Salmorejo*** (Fig. 21, top and bottom right). It is from Córdoba, used as *tapa* (snack) or meal entry.

Ingredients for six servings: 200 g of white bread crumbs, 150 ml of extra virgin olive oil, 1 kg of ripe tomatoes, 1 garlic clove, 2-3 tablespoons of vinegar, salt to taste.

Method: Peel and chop the tomatoes. Add the bread cut in thin slices and mix everything until the bread gets wet. Add the garlic, the salt and the vinegar, stirring them. Then add the olive oil until you get a homogeneous mixture. Let it rest for 30-40 minutes and triturate that paste in an electric mixer until it reaches the creamy consistency. Refrigerate for a couple of hours before serving. Decorate with chopped hard-boiled egg and Spanish *jamón* (ham).

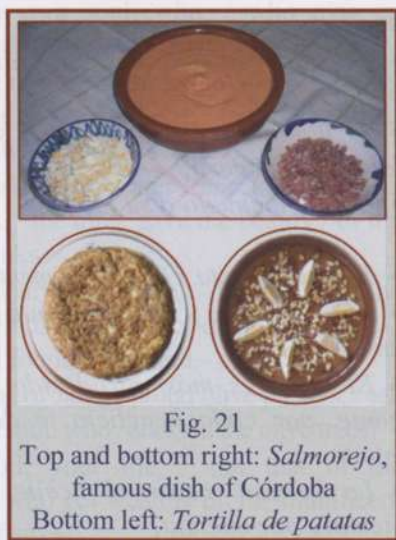


Fig. 21
Top and bottom right: *Salmorejo*,
famous dish of Córdoba
Bottom left: *Tortilla de patatas*

➤ ***Tortilla de patatas***, Spanish omelette (Fig. 21, bottom left). Used throughout Spain, eaten at home but also as lunch, like when harvesting olives.

Ingredients for eight servings: 6 eggs, 1 kg of potatoes, around 400 ml liter of extra virgin olive oil, salt to taste.

Method: Peel the potatoes, cut in thin slices and fry in abundant olive oil, stirring them frequently. Set aside to drain with a little salt. Beat the eggs in a bowl and add the fried potatoes, mixing thoroughly. Put a couple of spoons of the used oil in an anti-stick flat pan of around 25 cm diameter and pour in the bowl content. Cook at medium

fire, moving the pan frequently to avoid sticking, without touching the *tortilla*, first on one side and then in the opposite after turning it over by covering the pan firmly with a plate of at least the same size. Use medium fire until the *tortilla* gets golden in its second face, checking it is cooked but still juicy. Serve in triangular portions in plates or just cut it into small squares to be taken as *tapas*. It can also be dipped in *salmorejo*.

POPULAR MEDICINAL AND COSMETIC USES

Olive oil was advised to enter in the diet of persons suffering from liver, gallbladder, circulatory apparatus, and stomach, intestine, skin and kidney disorders. It was used as laxative by taking one or two tablespoons of raw oil before breakfast. A tea of olive leaves before lunch and dinner was suggested to reduce hypertension, to complement a low glucose diet for diabetics. According to information transferred from father to sons, olive leaves acted against spasm and fever, also being antipyretic and antiseptic as well as having a dilating action for arteries. In recent years medical research has made many studies showing that regular consumption of olive oil protects human health in different ways.

Olive oil had many applications as a cosmetic. It was used to hydrate the skin by adding a tablespoon to the bath, to heal wounds by applying a mixture of apple juice and olive oil, and to strengthen the scalp and the hair by using it as hair mask for 40 minutes. Olive oil was widely used to relieve soreness for babies due to diaper use. To protect the facial skin a mixture of an egg yolk with a little spoon of raw olive oil was applied for 15 minutes and removed with milk or warm water. For fatty cutis a few drops of lemon juice was added. Applying a mixture of olive oil and limewater was very good for treating skin burns. A few drops of olive oil were used in a piece of cotton as makeup remover, then washing the face with water. Today all this knowledge is returning and diffused with the help of the internet.

OLIVES AND TOURISM

Spain is the world leader in olive oil and table olive production and third in tourism, with 56.7 million tourists in 2011. The increasing knowledge about the health benefits associated to the use of extra virgin olive oil is also helping in the development of touristic activities in the olive sector that is so widely rooted throughout the country, with the special characteristics of most olive areas, including ancient tree structure and old age as well as the hilly countryside resembling "olive seas". Many olive areas are inside or very near Natural Parks. This increasing importance of olive related tourism is taking advantage of several developments, like the mentioned establishment of 31 Protected Designations of Origin in olive oil.

Several museums are already established where installations, equipment and instruments of great archaeological and cultural value are shown. They allow visitors to better understand olive related activities by providing a deep insight of the past. Some names are given: *Museo de la Cultura del Olivo* of Baeza and *Museo Activo del Aceite de Oliva y la Sostenibilidad* (GEOLIT, *Fundación del Olivar*) of



Mengíbar, province of Jaén; *Museo del Olivo y del Aceite* of Baena, *Museo del Aceite* of Montoro and *El Olivo Viejo* (Hecoliva SA) of Cabra, in Córdoba province; *Museo Hojiblanca* of Antequera and *Museo Etnográfico* of Benalauría, Málaga province; *Museo del Aceite de Oliva Castillo de Tabernas*, in Almería province; *Museo Tecnológico del Aceite* of Monterrubio de la Serena (Badajoz); *Museo del Aceite* of Mora, Toledo province (*Patrimonio Comunal Oliverero*); *Museo del Aceite Molino del Medio* of Robledillo de Gata (Cáceres); *Museo del Aceite El Lagar del Mudo* of San Felices de los Gallegos (Salamanca); *Museo del Aceite* of La Muela (Zaragoza); *Parque Temático del Aceite* of Les Borges Blanques and *Museo del Aceite y el Mundo Rural* of Castellldans (Lleida); *Museo del Aceite* of Segorbe (Castellón); *Museo del Aceite* of Montesa (Valencia); *Museo Almazara Casa Grande* of Cieza (Murcia).

Many touristic routes relating to olives and oil are offered, promoted by private or public bodies like *Diputaciones Provinciales*, Municipalities, Rural Development Groups, etc. Some are of great scope like *Legado Andalusi* (Andalusian Heritage), the Caliphate Route, *Caminos de Santiago* and *Mozárabe* (Santiago and Mozarabic pathways). Driving through those areas people may visit orchards and mills, museums, headquarters of PDOs, etc., where they can buy olive oil and table olives, soaps, gels and emulsions made of olive oil, as well as handcrafts made of olive wood and other traditional products of the area. Visitors can also enjoy typical olive mill breakfasts and traditional meals made with extra virgin olive oil and attend local folklore activities. Many ancient olive mills have become restaurants or museums.

The important olive industry of Spain is also clearly supported by several Olive *Ferias* or *Fiestas*, organized by Olive Clubs, Municipalities, Foundations, etc, where the latest technologies are exposed, also including national and international seminars or symposia as well as oil quality prizes. There are many Fairs (*ferias*) throughout Spain but the most famous is Expoliva of Jaén, which also organizes an International Symposium. Many cities also organize biennial *ferias*, like those of Montoro (Córdoba), Campotéjar (Granada), Reus (Tarragona) and Baeza (Jaén). Others are annual, like “Ecoliva” of Puente Génave about organic olive oil, Expo-Martos, and *Feria de Maquinaria Agrícola* of Úbeda, the three in Jaén province, Expo Baena and Agro Priego of Córdoba, and those of Calaceite (Teruel) and Don Benito (Badajoz). The more important table olives *Ferias* are those of Seville, Utrera and Pilas (Seville). The most famous *fiestas* are those of Mora (Toledo), Martos (Jaén), and Alcañiz (Teruel). That of Mora is the oldest one, since 1957 (Fig. 22).



Fig. 22
Parade at Fiesta del Olivo, 1958
(Courtesy of Ayuntamiento of Mora, Toledo)

OLIVE WOOD AND BY-PRODUCTS USES

Olive wood is ochre, from yellow to light green, with irregular veins forming attractive drawings. It has a silky aspect and touch, with no pores, compatible with its great hardness and durability. It dries slowly and has a tendency to crack, but once worked it provides very smooth and polished surfaces. Also it supports well dyes and other treatments. Throughout history olive wood has been used for furniture like benches, tables, chairs, cupboards, storage bins, also for kitchen hardware and for working tools. It is great for making handles for axes and hoes, both of them important instruments in traditional, ancient olive-growing.

In the 1960's, when tourism started to develop in some areas having abundant unemployed hand-labour, like Alameda (Málaga), an artisan furniture industry developed, making many kinds of olive furniture for apartments, hotels and restaurants. Later on increased

competition brought about by softer and easier-to-work woods resulted in a decline of that activity. However, it has been revived in many places, like in Castro del Río (Córdoba), where several artisans have formed the association *Artesanos de la madera de olivo* to keep producing every type of olive wood furniture (Fig. 23) and utensils. The handcraft activity is widely practiced, giving rise to different types of products, like jars, mortars, fruit baskets, cutlery, vases, nutcrackers, trays, ashtrays, napkin holders, etc (Fig. 24).

ACKNOWLEDGEMENTS

The collaboration of Francisco Barea on some cultural aspects related to olive growing is much appreciated. The author is also grateful to his parents, Francisco and Socorro, and to his wife, María; without them he would not have started and developed his professional career, respectively. He also acknowledges his masters, José Humanes and Luis Rallo, and all the people having helped him in his working life.



Fig. 23

Olive wood furniture in Castro del Río (Córdoba)
(Photo by Juanma Caballero)



Fig. 24

Olive handcrafts in Museo de la Cultura del Olivo, Baeza (Jaén) (Photo by Juanma Caballero)

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**Anwar Al Ibrahim^{1,2}** mmze-bse@scs-net.org,**Munzer Darweesh¹, Malek Abdeen¹, Mohamed El-Kholy²**¹*General Commission for Scientific Agricultural Research (GCSAR),
Department of Olive Research, Idlib*²*AARINENA Olive Network Focal Point, Cairo, Egypt*

INTRODUCTION

The Syrian Arab Republic with nearly 22.2 million inhabitants is located in South-western Asia, north of the Arabian Peninsula in the Middle East, at the eastern coast of the Mediterranean Sea (Fig. 1). Syria is located north of the equator between 32° 19' and 37° 20' latitudes and is divided into four main geographical regions; the coastal plain zone to the west, which stretches south from the Turkish border to Lebanon followed eastwards by a narrow double mountain belt enclosing a depression, the interior middle plateau and a much larger eastern desert which extends east and east-south to the Iraqi and Jordanian borders, respectively. Syria's importance is attributed to its strategic position at the crossroads of three continents and several old civilizations, as well as present diverse cultures. It covers an area of about 185,000 km² (18.5 million ha), out of which is about 10 million ha that can be classified as agricultural land which is the nation's most important natural resource. The vast Syrian Desert is suitable for weed development, which is used as pasture during seasons of sufficient rainfall.



Fig. 1
Olive growing areas in Syria

The Mediterranean climate prevails in Syria, characterized by rainy winters and hot dry summers, separated by two short seasons. However, the climate is predominantly dry, hence about three-fifths of the country's interior has, on average, less than 250 mm of rain a year. At the coastal plains the annual rainfall is over 600 mm/year, which allows some agricultural crops to grow without irrigation.

The total area planted with fruit trees is estimated at about one million ha, of which olive farming occupies approximately 65%, with an area of 647,000 ha



distributed among the various ecological zones, with nearly 80% of the area located within regions of stable rainfall averaging 350-500 mm/year. The remaining 35% of fruit area is distributed as 8% pistachio, 5% almond, 6% grape, 5% apple, 4% citrus and 7% for others (peach, apricot, fig, pomegranate and cherries).

OLIVE CULTIVATION HISTORY



Fig. 2

Wild olive trees in mountainous terrains

The olive tree is one of the most distinctive plants of the Mediterranean basin and it has been associated with ancient civilizations. According to the botanist A. De Candolle (1806-1893), Syria and Iran were the two origins of the olive tree. From there, it spread to other regions of the Mediterranean basin. The deep history of oliviculture in Syria made it of paramount importance from the socio-economic and cultural perspectives. Proved by archeological findings and ancient written sources, the olive tree grew in the wild and was initially only known to the people of the Eastern Mediterranean, before Greek and Phoenician merchants transported the tree westward. It has been almost proved that it was found for the first time in that region, particularly in greater old Syria known as *ash-Shām* "الشام". Therefore, in many parts of Syria a huge complex of non-domesticated, wild-looking forms of oleasters exist, potentially ranging from wild to feral forms (Fig. 2).



Fig. 3

Olive oil jars and olive stone mills unearthed from the archeological site of Ebla Kingdom (2400 BC)

typically used for oil storage and large number of small-sized stone olive mills (Fig. 3). In the stores of this small kingdom 4,000 and another 7,000 olive oil jars were found which belonged to the royal family and the municipality of Ebla, respectively. Each jar could contain 60 kg of oil, and taking into consideration that

The Italian archeologists excavating in Tel Mardikh site for the ruins of "The Kingdom of Ebla" have found evidence that the olive tree was present in the area since more than 2400 years BC. They have unearthed jars, which were



Fig. 4
One of Ebla Tablets

the population of Ebla was only 15,000, this amount of jars proves the importance of olive cultivation, oil production and trade of olive oil since ancient times, especially in the northern region of Syria. Furthermore, the Ebla tablets collection that contains as many as 1,800 complete clay tablets (Fig. 4), 4,700 fragments and many thousand minor chips found in the palace archives of the ancient city of Ebla refer to some areas planted with olive trees, belonging to the Royal Palace, producing about 350 tons of olive oil per year.

Large jars, used for olive oil storage and exports to other Mediterranean countries were unearthed in another archeological site at Ugarit; an ancient port city near to the location of the present port of Latakia. This port was definitely used by the Phoenicians (1550 to 300 BC); however, first written evidence mentioned it has come from the nearby city of Ebla, in around 1800 BC. Syrian archaeologists found olive stone mills and very old trees in many ruin sites within Syria, especially in the coastal areas around the present cities of Latakia and Tartous, near Damascus and in the ancient city of Palmyra, *Tadmur* تدمر (Fig. 5 A and B). The later always known as the “Bride of the Desert” is located in the center of Syria, in an oasis 215 km north-east of Damascus and had long been a vital caravan city for travelers crossing the Syrian Desert. Although its establishment date is not clearly known, it was recorded in Babylonian tablets indicating its existence some 2500 to 1800 years BC. Currently, there are about 22 olive cultivars that thrive in *Tadmur* and are adapted, over centuries, to the harsh climate of the desert.

More evidence related to olive cultivation in the past was also found around Idlib in the well preserved “ghost” cities of Al-Bara (Fig. 5 C and D) and Serjila, both being within a group of 700 abandoned settlements in North-west Syria between Aleppo and Hama. They date



Fig. 5

- A) Palmyra temple surrounded by olive trees
- B) Wall engraving of an Eagle holding an olive branch
- C & D) Pyramid tomb in Al-Bara

back to before the 5th century BC and contain many remains of Christian Byzantine architecture. Chris Wickham, the British historian and authority on medieval history, argues in his 2005 book "Framing the Early Middle Ages" that these were settlements of prosperous peasants which have few or no urban features. The impressive remains of domestic architecture are the result of the prosperity of peasants who benefited from a strong international trade in olive oil at the end of Antiquity. These cities were abandoned by their settlers for yet disputed reasons.

AREA UNDER OLIVE CULTIVATION

The olive area (Fig. 1, page 379) had reached 647,000 ha in 2010, with nearly 82 million trees. This area is distributed in five regions with the eastern one having a small share of 1.3%. Due to fast expansions during the last few years, there is a large area of 140,000 ha (21.6% of the total) covered with young trees that have not started commercial production.

Olive cultivation in Syria is spread across the country with varying densities, from the west coastal region receiving heavy rains of over 600 mm/year to the eastern arid desert region. The olive trees are grown in different soil types ranging from limestone dust, to heavy clayey and sandy soils in some inland areas. Olive plantations are located at altitude ranging from 10 m above sea level at the coastal plains up to 1,050 m at the mountain belt. In the first half of the last century, olive cultivation was limited to five locations: Aleppo and Idlib in the north, Latakia and Tartous on the western coast, Damascus in the south, and the desert site of Palmyra, where olive trees were intercropped with date palms for centuries. Starting with the early 1970's, olive cultivation began to expand in the central area of Syria around Homs – Hama, and in the south at Dara'a, Al Swedaa and Al Qunaytra. With the early 1990's, it started to spread east to Deir Al-Zour, Al Raqqa and Al Hasakah, located in the North-eastern flat plateau, even in desert areas, where supplemental irrigation in dry seasons is secured via new nearby irrigation projects or from wells in remote locations.

OLIVE CULTIVARS

Syria is rich in olive genetic resources with a wealth of genotype diversity that may be considered as a Syrian heritage. These genotypes are both domesticated and non-domesticated, the later existing in wild olive forests. The first group includes more than 75 cultivars; however, there are very few ones that are extensively and commercially cultivated. The five main autochthonous cultivars, which occupy nearly 90% of total olive area in Syria, are 'Zaity', 'Sorani', 'Doebli', 'Khodieri' and 'Kaissy'.

Characterization of olive genetic resources in Syria was performed through a project in cooperation with the General Commission for Scientific Agricultural Research (GCSAR) and the International Olive Council (IOC). According to their usage purposes, Syrian olive cultivars can be classified into a group for oil extraction, such



as 'Sorani', 'Zaity', 'Dermlali', 'Khodieri' and 'Dan' and a group for table olives such as 'Kaissy', 'Jlot', 'Mosaabi' and 'Tufahi'. There are also other olive cultivars that are used for dual purpose. The prominent ones among the Syrian cultivars are:

'Zaity' (Fig. 6-1) is an oil cultivar, widely spread in the north of Syria within Aleppo province, covering about 33% of the total area, and is sensitive to drought. Its fruits have a very high oil content of about 30-32% on fresh weight basis, which is correlated to its name Zaity "زيتي", which means in Arabic "oily" or "my oil". Its oil is very rich in polyphenols. This cultivar is characterized by high productivity and a less alternate cropping. It shows some tolerance to cold and salinity and it is susceptible to verticillium wilt and leopard moth.

'Sorani' (Fig. 6-2) is mainly used for oil production, although it can be used for table olive processing. It produces high quality oil, rich in polyphenols, at an extraction rate of about 28-30% on fresh weight basis. The main area of its cultivation is Idleb Governorate north of Syria. It is also spread to nearby Aleppo, Hama in the Center and Dara'a and Al-Swedaa in the South, covering about 30% of the total olive area. The productive performances are very good, with slightly alternate bearing. 'Sorani' is characterized by its tolerance to cold, drought, and salinity, but it is susceptible to verticillium wilt.

'Doebli' (Fig 6-3) is an oil cultivar having an oil content of about 22-24 %. The oil has a high content of Δ^7 -Stigmastenol of more than 0.5 %. It is mainly concentrated in the coastal zones of Syria and covers about 12% of the total olive area. This cultivar is susceptible to dry conditions and has a strong alternate bearing tendency. It is also susceptible to peacock eye and olive fly.

'Kaissy' (Fig. 7) is the main Syrian green-table cultivar, however with high oil content of nearly 18-20%, of good quality. Productivity and tendency to alternate bearing are both high. It is mainly grown in the north area of Syria, around Aleppo, covering about 5% of the total olive area. It is tolerant to cold and drought and resistant to olive leaf spot and olive knot.

In 1982 a few olive cultivars were imported to Syria from Italy including 'Frantoio', 'Leccino', the later shows the highest degree of adaptability to Syrian environment. Also, well



Fig. 6
1) 'Zaity', 2) 'Sorani',
3) 'Doebli'

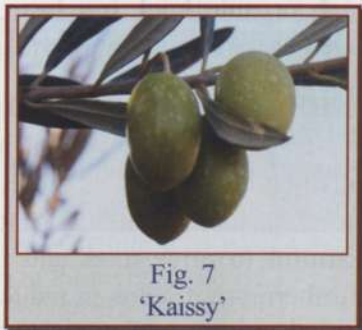


Fig. 7
'Kaissy'

adapted is the Turkish 'Trilia' imported same year. 'Nabali Mohassan' was imported from Jordan and is cultivated in small areas.

IMPACT ON ECONOMY AND ENVIRONMENT

In recent years Syria became the world's fifth biggest producer of olives. Olive cultivation is considered a natural resource and strategic choice for agricultural commercial ventures on a large portion of arid and semi-arid lands within Syria. The national olive industry shares with 3.5% of the gross domestic product, provides essential food product for the Syrian population and plays a major role in generating employment and income within its agriculture and processing sub-sectors. Furthermore, it contributes to export and foreign trade; exports of olive oil in recent years reaching on average 40,000 tons/year, of which 51% to Europe, 16% to Arab Gulf States, 14% to Asia, Arab countries 11% and to other countries 8%.

The olive sector ensures livelihoods for more than 15-20% of the population directly or indirectly through different activities of production, processing, storage, transport and export of olives and olive oil. The working days generated by this sector through the various stages of the production chain is more than 40,000,000 annually.

This sector has a crucial environmental value, which is related with its role in soil protection from erosion and the reduction of desertification potential. In general, olive farming is practiced in marginal lands, where conditions do not allow other crops to grow successfully, especially in arid and semi-arid lands with very limited water resources for irrigation and soils with medium to high levels of salinity. Finally, this sector provides valuable inputs for the production of domesticated animal feed, organic matter for soil amending and energy through proper exploitation of its by-products. The by-product vegetation water resulting from olive oil extraction, which is considered as a severe pollution source for the environment due to its high organic load, has been used safely during the last few years as supplement fertilizer to olive orchards (Fig. 8).

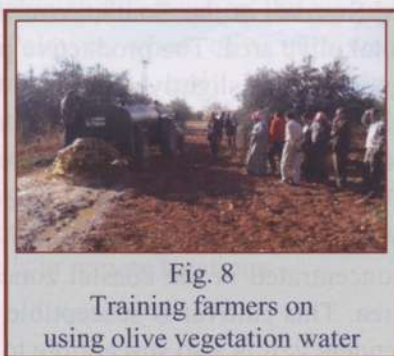


Fig. 8
Training farmers on
using olive vegetation water

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

There are some ancient management practices that still have positive effects in olive orchards, such as the establishment of terraces on steep land to protect the soil from erosion and sliding. Manual harvesting methods, being an old profession, is less harmful to olive trees and their fruits, ultimately leading to the best oil quality. Furthermore it helps in reducing unemployment. One of the best inherited practices, still practiced by the growers, is the incorporation of organic fertilizers in the soil, which composes mainly on animal and vegetation residues.

On the other hand, there are some inherited wrongful practices, which negatively affect the health status of trees and their productivity. They include harsh and severe pruning; exercised every 2-3 years rather than annual moderate pruning (Fig. 9, A). This erroneous practice causes imbalance between the root system and the canopy, in addition to removing a large proportion of fruiting branches.

Obsessive frequent tillage using tractors three to four times a year is a major traditional practice. Disadvantages of this practice, the least of which is increasing production costs, especially in slopping orchards include destruction of soil tilt, causing loss of soil organic carbon, opening the path for downward washing of the fine soil particles to where they clog together, blocking the natural percolation of water and creating soil crusting, which in turn increases water run-off. In some cases it causes rock fragments to come to the top soil surface. It disturbs the activity and decreases the populations of earthworms and microorganisms, thus it reduces fertility and natural aeration of the soil. It also spreads *Verticillium dahliae*, especially when the soil is wet, due to the injury of roots. Many growers, who have lost the top soil of their orchards as a result of this practice, recognize the problem when they see the roots of their trees exposed, so they start to haul soil from other locations. In many instances the brought-in soil is not compatible with the parent soil, so instead of solving the problem, it becomes more complicated (Fig. 9, B).

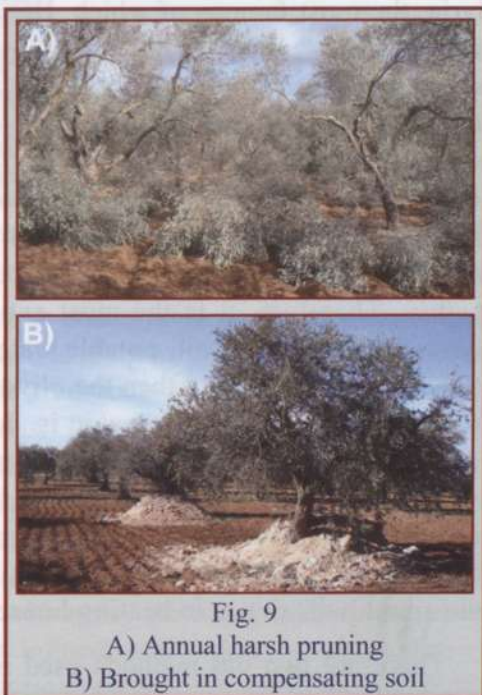


Fig. 9

A) Annual harsh pruning
B) Brought in compensating soil

PROCESSING METHODS OF RAW OLIVES

Until introducing the modern continuous extraction systems in Syria five decades ago, olive oil production was mostly based on developed versions of the traditional stone mills (Fig. 10), which have not changed over centuries except in the source of the driving power.



Fig. 10

Left: Stone mill in Palmyra (1800 BC)
Right: Olive mill Al Bara (5th century BC)

Nowadays, there is still one uncommon method for extracting olive oil, used

rarely, and is only confined to few small villages in North-western Syria, the most famous of which is Afrin "عفرين" village. The olive oil is called *Khreaj* "الخريج" (Fig. 11) and it is not suitable for human consumption because its acidity, which is normally higher



Fig. 11
Khreaj olive oil "الخريج"
(Photo by Marwan Soft)

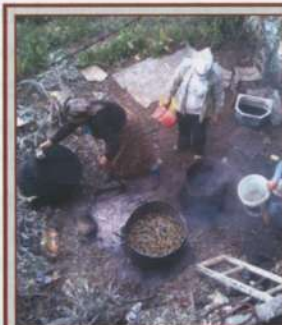


Fig. 12
Boiling the olives
(Photo by Fady Chahin)

than 8%, with high peroxide value of over 45. However, many local residents consider it as being of the highest quality. Therefore, it is the most expensive olive oil in Syria. To extract this oil, potable water is heated first up to the boiling point, and then the olives are dipped in for one hour while the water is boiling (Fig. 12). The water is drained and the olives are staked in layers covered with hemp cloth for 3-4 days to dry. The raisin-looking olives are then crushed using a small stone mill, which is normally driven by a donkey. The resulting paste is dropped in hot water and women skim the floating oil to store it in large jars. The remaining residues are squeezed to drain the water, and made into small balls to use in heating house furnaces.

There are two old methods used in most Syrian homes to pickle the family's



Fig. 13
Typical olive shop and a fruit cracking machine

need of green olives. The first method prepares olives for immediate consumption; caustic soda water is used at a random concentration that can reach up to 10% for 24 hours, followed by washing the olives with running water several times and salting them to taste. The processed fruits can be eaten within 3-4 days. The second method is to stock the whole year's needs with a process that applies slight smashing to the olive fruit using a small hammer or at the market, by a especially designed cracking machine (Fig. 13), when purchasing the olives. The olives are put in potable water for 5-7 days to remove the bitterness, and then placed in special containers full of salty solution with a concentration of 16%. Olives can be consumed after 2-3 months with a long shelf life to nearly the next year's harvest.

A popular method for processing black table olives is to place the fruits in hot salty water which is left to cool, then packed into containers kept in a dry warm place to ripen. The ready to eat black olives by this method will have a high salt content.

TRADITIONS AND CULTURE

Among the very famous proverbs related to olives in Syria are the following:

- | English | Arabic |
|---|------------------------------------|
| • During olive oil extraction season, by the time I go to bed, I need to wake up again (implying the associated hard work) | • أيام الزيت أصبحت أمسيت |
| • Wheat and olive oil are two tigers in the house (in the sense of mightiness and protection) | • القمح والزيت سبعين في البيت |
| • An olive tree needs as much as you need from her (trees in Arabic are feminine), (meaning one has to manage the orchard well) | • الزيتون مثل ما بدك منها بدها منك |
| • From the tree to the stone (mill the fruits without delay) | • من الشجر للحجر |

During the olive harvesting season, the Syrian countryside would customary have a special flavor mixed with great social values, leading to a season of joy, reunion and recalling memories. It activates folkloric traditions and uncovers cooperation values often found in heritage and local songs. The season plays a major role in strengthening team work within the community; because neighbors and all families within the village or the district work together. It helps passing the passion for the olive tree from one generation to the other, thus preserves ownership of olive orchards within families and prevents division of the land. Due to the generated income, the olive harvesting season is linked with many marriages taking place at its

end or immediately following the closure of harvesting activities, and this is one of the reasons why the season comes with joy. Some of the customs making the harvesting season a special event are the competition in terms of workers speed, the presence of candy sellers, as well as serving a popular meal known as *Al-Zannanah* "الزنانة", which is composed of bread dipped into a mix of pomegranate seeds, some squashed garlic and fresh cut vegetables in fresh olive oil. This festive atmosphere also inspires too many talented painters, who enjoy spending the season out in the olive orchards (Fig. 14).



Fig. 14
Olive harvesting
(Painting by Essam El-Said Yusuf)

RECIPES WITH OLIVE OIL IN NATIONAL COOKING

Olive oil is used in almost all traditional dishes in Syria, which include:

➤ Tabulla Salad.

Ingredients: a glass of smooth Burghul, bunches of parsley, ½ kg of tomatoes, a bunch of green peppermint, 2 medium-sized onions, juice of 4 lemons, tea spoon of salt, olive oil as needed.

Method: Leave the Burghul to soak, then add the lemon juice and leave the mixture for 30 minutes. Finely chop the peppermint, parsley, tomato and onion. Then, mix all the vegetables with the Burghul. Finally, add olive oil.

➤ **Chickpeas with Tahini and Homos** "حمص" (Fig. 15):

Ingredients: ½ kg of chickpeas, 5 cloves of crushed garlic, a glass of pure lemon juice, tea spoon salt, a cup of "Tahini"³⁶, and olive oil.

Method: Boil the chickpeas until tender, then grind well and finally mix with the crushed garlic. Add Tahini and mix well, then pour the lemon juice gradually and mix well while pouring. Spread the mixture on a plate and add some chickpeas, radish and parsley for garnish. Finally, pour some olive oil.



Fig. 15
Chickpeas with Tahini

➤ **Raw Kibbi** "كبة نية" (Fig. 16):

Ingredients: ½ kg of red meat, 2 glasses of smooth Burghul, 1 shallot, ½ tea spoon cumin, ½ tea spoon of salt, ½ teaspoon of black pepper, 1 tomato, olive oil, almond and pine for garnish.

Method: Leave the Burghul to soak for 30 minutes then grind it twice with the onion, tomato and red meat. Add salt, cumin and pepper to the mixture. Knead constantly till the mixture is firm. Cut the mixture into small pieces and arrange on a plate. Finally, add pine and almond for garnish and serve with olive oil.



Fig. 16
Raw Kibbi

➤ **Stuffed Vine Leaves "Yalinji"** (Fig. 17):

Ingredients: 1 kg of tender vine leaves, 1 kg of tomatoes, 2 onions, 3 bunches of parsley, 1 bunch of green peppermint, 1 glass of rice, a cup of olive oil, a spoonful of ground coffee, 3 spoonful of pomegranate treacle, salt and pepper as needed.

Method: Wash the vine leaves, overflow them with water and put them on fire to boil. Filter and put aside the boiled vine leaves. The filling is prepared by chopping the veggies smoothly, which are then mixed with the olive oil, rice, salt, pepper and coffee. The vine leaves are to be stuffed with the previous ingredients and arranged in a pot. Then, add some pomegranate treacle, a little tomato paste, two cloves of garlic and a little of dried peppermint. Finally, overflow with water and put on mild fire till it gets tender. It should be served cold as it is an appetizer.



Fig. 17
Stuffed vine leaves

POPULAR MEDICINAL AND COSMETIC USES

It is popular to use olive oil in the following cases of illness or health disorders:

- Cure for children diaper rash.
- Treatment for ear infection by putting several drops in it.

³⁶ Tahini or sesame paste (from Arabic *Tahinah* "طحينة") is a paste of ground sesame seeds used in cooking. North African and West Asian Tahini is made of hulled, lightly roasted seeds. East Asian sesame paste is made of un-hulled seeds. The Arabic word *Tahain* طحين simply means flour.

- Resisting common cold. It is enough to put one drop of olive oil in the nose.
- Moistening children tummy with warm olive oil to remove colic.
- Moistening the chest with warm olive oil to get rid of cough.
- Using olive oil to get rid of kidney stones.
- Using olive oil to strengthen the hair and stop grey hair.
- Adding some olive oil to cows' milk to make it close to the mother's milk.

OLIVES AND TOURISM

The improvement achieved to the Syrian olive oil quality during the last few years has given birth to a major integrated promotional tour named the “Olive Road”, in the area of Idleb. The venture has been promoted by the MED Project which aims to increase the know-how exchange between the European and Mediterranean countries for the development of rural areas. The main concept of the road is based on participative approach methodology, joining public and private stakeholders. The path of the “Olive Road” has been chosen carefully following a study of the territory to collect main information about history, geography, culture, local handicraft and rural life attractions (Fig. 18). This road links olive growing areas and olive oil outlets to archeological sites among which

are ancient olive mills. Tourists on the road visit workshops of pottery, mosaic, handmade blown glass, and goat cheese making in some farmers' homes and enjoy home cooked meals, presented with oven hot bread for dipping into olive oil.

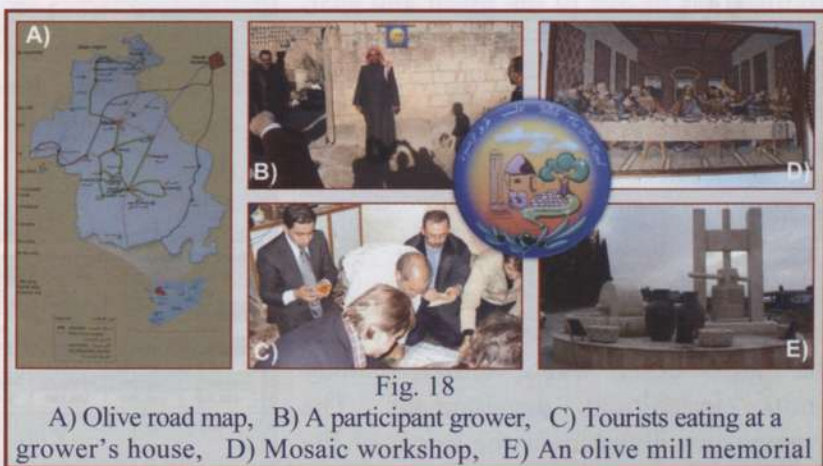


Fig. 18

A) Olive road map, B) A participant grower, C) Tourists eating at a grower's house, D) Mosaic workshop, E) An olive mill memorial

OLIVE WOOD AND BY-PRODUCTS USES

Olive wood is used as a combustion material in fire places during winter or in cooking stoves, and in making handicrafts. Olive leaves from pruning, as well as pomace, in certain mix are used as fodder, mainly for sheep and goats, or composted to use as an organic fertilizers. Until recently, olive vegetation water from olive mills was considered as a major pollutant but with research development it is now used as a fertilizer by spraying on top of fields' soil.



INTRODUCTION

Tunisia (Fig. 1) anciently named Ifriqia "إفريقيا" (Africa in Arabic), gave its name to the African Continent. Its history of more than 3,000 years has been shaped by its geographical location that made the country a crossroad of many civilizations between the Orient and Occident. Its fertile land along the 1,148 km coast also contributed in this history.

Tunisia is located at the eastern part of North Africa, bordered by Algeria to the west, Libya to the south-east and the Mediterranean Sea to the north and east. Its population of nearly 11 million is concentrated on the eastern coastal regions situated along the Atlas Mountain Range. The climate is a reflection of the country's topography. In fact, it varies from temperate with mild, rainy winters and hot, dry summers in the north, to hot and dry in the central plain, and arid in the south, which is mostly merging into the Sahara desert where rainfall scarcity limits agricultural development. The average precipitation in the north of the country is 450 mm annually, while in the south it is less than 200 mm with most of the rainfall occurring in autumn and winter seasons.

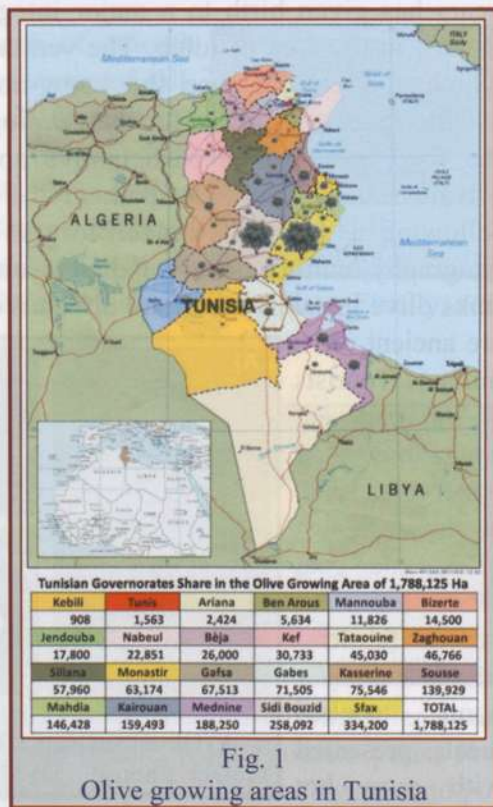


Fig. 1
Olive growing areas in Tunisia

The so-called "Green Tunisia" has a total area of 163,610 km². The useful agricultural area does not exceed 97,000 km² (9.7 million ha), of which 50,000 km² (5 million ha) are cultivated. Forests, located in the north, occupy 6,500 km² including wild olive trees (*Olea europaea oleaster*) grafted by inhabitants to constitute part of the olive area, which covers nearly 80% of the area dedicated to fruit trees in Tunisia. Other fruit crops, which are produced in the central and northern territories, include grapes, citrus, figs, pistachios, almonds, peaches and



apples. Unlike olive areas, the expansion of the area under other fruit trees is limited because of frequent droughts in the arid regions of the country, representing two-thirds of the area. Cereals are produced in the north, while the date palm is the main crop in the oases of the extreme south.

OLIVE CULTIVATION HISTORY

Olive growing history in Tunisia is an integral part of the country's historical evolution, as it gives a true view of what the fingerprints of the domesticated olive tree has left on the country's development, as it has in all around the Mediterranean basin. Thousands of years ago it was introduced to anchor conquests and territorial appropriations and has eternally contributed in strengthening the prosperity of all emerging civilizations in this part of the world. Tunisia with all its civilizations since the Carthaginians, were built on rain-fed cultures in which olive trees played an important role, due to its hardiness and drought resistance allowing development of areas exposed to desertification. Old olive trees are an integral part of the national heritage of all Tunisians (Fig. 2).

Olive cultivation in Tunisia dates back to the 8th century BC, even before the establishment of the famous city of Carthage in 814 BC on the southern Mediterranean shores under the leadership of Queen Dido, who is also known in some sources as Queen Elyssa. Carthage became independent of Phoenicia in the year 500 BC and a new empire was born in the Mediterranean, leading to the introduction of olive trees in Tunisia by the Carthaginians. With the development of the new empire, Carthage became known as "The Great Jewel of the Mediterranean"; and its agricultural production was highly prized in Rome and Greece, especially wine and olive oil. Trading in these commodities was strengthened by the Carthaginian fleet of merchant ships, which was comparable in size and tonnage to the fleets of major European powers and surpassed even those of the cities of the Levant³⁷. Herodotus, the ancient Greek historian (484-425 BC), described the presence of olive trees in north-eastern Tunisia and in Kerkennah Island in the south.



Fig. 2
An aged olive tree in good
condition from Cap Bon

³⁷ A typical geographical term used by archaeologists and historians with reference to the prehistory and the ancient and medieval history of large area located in Southwest Asia, south of the Taurus Mountains, bounded by the Mediterranean Sea in the west, the Arabian Desert in the south, and the Zagros Mountains in the east.

Olive growing among other crops thrived because Carthaginians were the best farmers and they practiced highly advanced agricultural techniques like irrigation and crop rotation. Mago, a botanical writer from Carthage, who has been referred to as the “Father of Agriculture”, based on his 28-volume agricultural treatise written in Punic (the Carthaginian language), described Carthage as surrounded by two rings of agricultural plantings: the inner ring with olives, fruit trees, grapes and vegetables, and the outer, less dependent on irrigation with vast wheat fields. He wrote about planting and managing practices of olive orchards in a Treaty that, later, when Carthage was conquered by the Romans (146 BC), was translated into Latin by order of the Roman Senate.

When Greeks attempted to attack Carthage by land (310 BC), the invaders had no trouble feeding their army because of the agricultural wealth that encircled the city.



Fig. 3

Olive trees around Alexander Severus's Arch (Roman Emperor 222-235 AD) at the well preserved ruins of the Roman village of Dougga, North Tunisia (UNESCO World Heritage)

When Hannibal returned home from Rome after the second Punic war (264-146 BC) he gave a boost to agriculture to help restore Carthage's economy, and he asked his soldiers to expand olive tree cultivation at the coastal Sahel of Tunisia, which was highly successful (Fig. 3). After the Third Punic War, Carthage was captured and destroyed by the Romans in 146 BC. However, the Romans rebuilt it as a

Roman settlement that became the Empire's 4th most important city.

Under Roman rule Tunisia exported cereals and olive oil to other parts of the Empire and thus was known as one of the “bread baskets” of Rome. Furthermore settlers from across the Empire migrated here and olive areas increased. Olive oil trade flourished so that by the 2nd century it exceeded cereals as an export item. Olive trees in Tunisia survived all political and demographic changes in the centuries to come. In 533 AD the Byzantine Emperor Justinian sent an army that crushed the Vandals and took over Carthage, ruling until 698 AD when the city was taken by Muslim Arabs and destroyed a second time. Tunisian oliviculture benefited from the Arab Agricultural Revolution, also known as the Islamic Agricultural Revolution or Medieval Green Revolution, which allowed for the diffusion of many crops and farming techniques leading to improvements in olive cultivation, especially in arid regions of Tunisia.

The olive tree and its oil have been highly cherished in Islam, both considered consecrated. Therefore the area under olive cultivation in Tunisia increased again during all dynastic periods of the Muslim rulers from the Umayyad Caliphates to Aghlabides, Ismailis, Fatimides, Zirids, Banu Hilal, Muwahhidines, and Hafsides who were not less competent than Carthaginians and Romans as they reclaimed soils in the Dorsal Mountain by adopting rainfall water harvesting techniques, that were fortunately continually adopted for centuries to come; and to the expansion of olive plantations in the Sahel (the coastal central part), as well as to the arid regions. Andalusian refugees (13th century) brought with them olive cultivars and intensification techniques applied mainly in the north of the country at what is presently known as Testour, TebourSouk and Ras Jebel. Later, during the Ottoman rule between 1574 and 1705, Tunisians were encouraged to extend olive plantations. In modern history, expansion of olive cultivation continued up to the present day, constituting one of the region's strategic pillars of the agricultural economy. Olive area expansion did not stop when Tunisia became a French protectorate in 1881 as French troops entered from Algeria up until its independence in 1956.

AREA UNDER OLIVE CULTIVATION

Tunisia is one of the most important olive-growing countries of the southern Mediterranean region; over 30% of its cultivated land is dedicated to olive growing (1.78 million ha), extending from the north to the south in very diverse environmental conditions (Fig. 1, page 390). Only 2.9% (51,852 ha) of the area is irrigated. Both, the area and number of trees have increased considerably since the independence of Tunisia in 1956; from 27 million trees to 70 million in 2012. Both the geographical distribution of olive and the growing area exemplify the economic importance of this crop. A relatively large share of 708,000 ha is located in the southern desert region with a hot sub-tropical climate where rainfall is less than 250 mm/year on average (Fig. 4). Due to water scarcity in this region, the planting density is extremely low being only 20 trees/ha, whereas in the north it is much

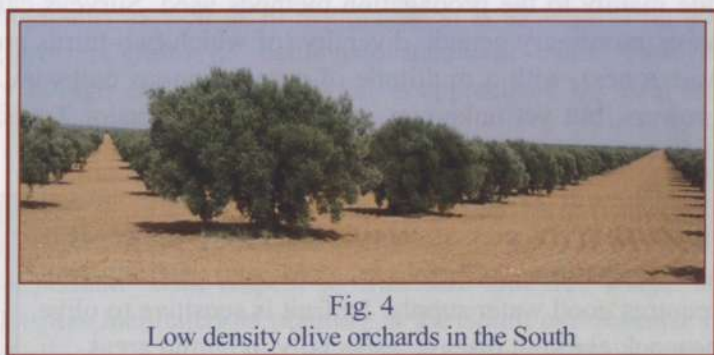


Fig. 4
Low density olive orchards in the South

higher. There are nearly 842,000 ha of the area in the central plateau region which has semi-arid Mediterranean climate with rainfall reaching up to 400 mm/year. The remaining 230,000 ha are located in the northern part of the country having a sub-tropical Mediterranean climate and rainfall over 500 mm/year. At

present, there are 2,000 ha of super-intensive orchards, which produce an average 7-8 ton/ha. Notably the olive tree in Tunisia faces competition for land, in the center and north, from other tree species and crops where rates of rainfall are higher.

OLIVE CULTIVARS

In Tunisia, like many other olive growing countries of the Mediterranean basin, the genetic diversity of olive (*Olea europaea* L.) is very rich in cultivated varieties and spontaneous genotypes. Plant selection, natural or by human interventions gave cultivars directed to the needs of producers and consumers.

Tunisian olive orchards are essentially dominated by two olive oil cultivars 'Chetoui' in the north and a mixed population with the generic denomination of 'Chemlali' in the center and south of the country, even though there is confusion among farmers and growing areas regarding nomenclature. The 'Chemlali' population, which has small sized fruits of less than 1.5 g, is always cultivated for oil production. This group includes the principal cultivar known as 'Chemlali Sfax'. Furthermore, these two cultivars have been the most propagated by nurseries and olive growers. The limited use of other cultivars explains the relative importance of the 'Chemlali' denomination that includes different vigorous and small-fruited genotypes, an extensive heterogeneity within this heterogeneous population, with clear differences in tree and fruit shapes and characteristics. (Trigui, 1987; Trigui, 1993, Trigui and Msallem, 2002). Its significant geographic expansion and its persistence are due to its adaptation to the most prevalent arid conditions in Tunisia, while satisfying profitability requirements of olive growers and quality criteria for consumers.

A high number of local cultivars are also present, but only in small areas due mainly to the propagation methods used. Surveys carried out since 1984 found an extraordinary genetic diversity (of which two-thirds are located in arid and semi-arid zones), with a multitude of autochthonous cultivars, preserved in situ by olive growers, but yet unknown in nurseries. The major Tunisian cultivars are described below:

'Chetoui' (Fig. 5) is the most spread olive cultivar in the northern part of Tunisia for dual purpose. It is self-compatible, tolerant to cold and salinity but requires good water supply. Its fruit is sensitive to olive peacock eye spot disease, especially in humid areas.

'Meski' is the most widespread olive cultivar for pickling green olives. The fruit is of good quality with very low oil content. Its productivity is medium and constant, needs a pollinator and requires deep fertile



Fig. 5
'Chetoui'

soil and annual rainfall higher than 400 mm. It is resistant to salinity, but sensitive to drought, growing mostly in the northern parts of Tunisia in irrigated orchards. It is very susceptible to olive leaf spot.

‘Chemlali Sfax’ (Fig. 6) is the oldest oil cultivar in the country and is still widely spread. The tree is vigorous with spreading growth habit and is well adapted to arid conditions as a drought tolerant cultivar. Therefore, nurseries and growers in all olive-growing regions prefer this cultivar, especially in the central and southern regions of Tunisia, where the annual rainfall is less than 250 mm. It is moderately tolerant to salinity; but it is sensitive to olive knot. Its small fruits have high oil content, ranging from 24 to 30% on a fresh weight basis. Its oil has a golden yellowish color and a nice medium fruitiness. Consumers of the central and southern parts of Tunisia, as well as export markets, prefer it because of its delicate sweet taste.



Fig. 6
‘Chmelali Sfax’

‘Chemchali Gafsa’ is the most important dual-purpose cultivar in the southwestern part of Tunisia. Its high olive oil content and high rates of unsaturated fatty acids are interesting for growers, therefore having great potential for widespread expansion.

‘Barouni’ is a dual-purpose cultivar, planted mainly in traditional orchards in the east-central region of Tunisia (commonly named Sahel). It is generally mixed with the common ‘Chemlali’ and it is often removed during orchard renovation because it is little appreciated by growers.

‘El Leguim’, also known as **‘Oueslati’**, referring to its origin in Oueslat Mountains. It is the best olive oil cultivar of that area, although its fruit is also used for table olives. It grows in mountains as well as in dry planes. It is slow-growing and difficult to root. Therefore, growers graft it on seedlings of a cultivar called ‘Horr’ or ‘Chemlali’. Its productivity is high and alternate. Its oil is appreciated by local and foreign consumers because of its distinctive taste.

Due to the Tunisian climatic conditions, imported cultivars are very rare. ‘Koroneiki’ from Greece ranked first on the list of non-native cultivars. However it is not comparable in numbers to the local cultivars. Some of its characteristics are somewhat similar to ‘Chemlali’ with respect to fruit size and tree shape. Its success under arid conditions has facilitated its planting in the South and recently in intensive plantations. ‘Picholine of Languedoc’ represents a large share of table cultivar plantings in the north because ‘Meski’ (the best local table cultivar) has pollination problems. Many other cultivars were introduced and tested decades ago by foreign growers, or recently in the search for a good pollinator for ‘Meski’; however they have never been grown on a large scale in mono-varietal plantations.



Other European cultivars which have been introduced in super-high-density cultivation have not given satisfactory results until now because of the special climate of Tunisia with a long vegetative cycle and dense canopy development.

IMPACT ON ECONOMY AND ENVIRONMENT

Olive growing, with its processing sub-sector, plays a very important socio-economic role in Tunisia, directly and indirectly providing livelihood for over one million people, and generating 34 million workdays per year, equivalent to over 20% of the employment in agriculture. In the year 2000 there were 236,500 agricultural holdings with olive orchards, 84% of which were under 5 ha. Thus, it acts as a stimulator of social wealth-fare.

Tunisia is the second largest exporter of olive oil after the European Union; there is 1,728 olive mills, processing nearly 99% of the 755,000 tons of olives produced on average/year. Between 1988 and 1998, Tunisia olive oil production was 152,000 tons/year on average, increasing to 163,000 tons/year during the period 1998-2008. Production has oscillated from a low of 32,000 tons in 2001/2002 to a high of 310,000 tons in 1996/1997, the latter figure indicating a rainfall record. These great variations are due mainly to frequent draughts, rain-fed management and intense alternate bearing (possibly due to climate change), and aging of some old orchards. The export revenue for the 2006-08 period amounted to 360 million Euros per year.

Olive growing in Tunisia is practiced traditionally as monoculture in many regions of the country, specifically in the south. Therefore it revitalizes, in a permanent way, the economic activity in these regions and activates many other economic sectors for more than four months every year. These include packing, transportation, and artisanal industries. It generates profits and provides employment, specifically for women in harvesting (Fig. 7), which give impulse to the social life in poor rural areas.

Due to Tunisian climate peculiarities dominated by aridness, the olive tree is considered a unique species, able to improve the value of land. It constitutes a real barrier against desertification and the sweeping dunes of the Sahara. It has proved its resilience, staying alive under the same conditions where other fruit trees such as almonds or pistachio had disappeared when drought persisted for long periods. When the choking grip of nature fiercely and persistently hit olive trees, growing in the desert with high speed winds during droughts, the sand will either drift



Fig. 7

Tunisian women olive pickers
(Photo by Moh. El-Kholi)

away leaving the olive trees standing on soil mounds or build sand dunes around the trees. On the other hand, uncommon heavy rains can create gullies in the loose sandy soil exposing the root system (Fig. 8).

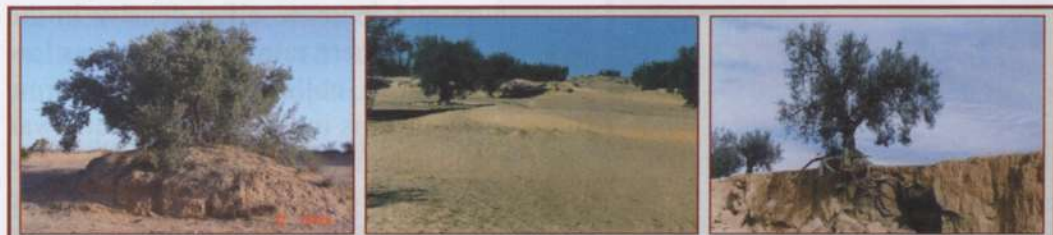


Fig. 8

Olive tree on mound from sand drifting, sand dunes encroachment and gullies from rainfall

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

The ancestral know-how and experience of the Tunisians in growing olives in the desert under low rainfall is unsurpassed. Over centuries, techniques and traditional modes of olive dry farming have evolved. Among which is the selection criterion

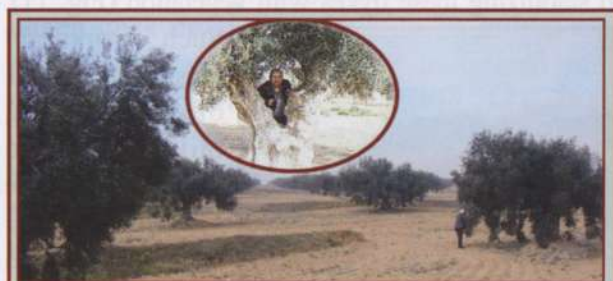


Fig. 9

Wide layout in the South
with detail of an old trunk (inside frame)
(Photo by Moh. El-Kholy)

of the plant density suitable to the average rainfall in any given region. It varies from 100 to 200 trees/ha in the north where average rainfall is over 500 mm, to 17 trees on a layout of 24x24 m (Fig. 9) in the groves of the southern arid zones receiving less than 200 mm in certain localities. However, with the advancement of water saving technologies, yet respecting the

indigenous knowledge, it is now possible to double the number of trees in the arid zones.

Due to the vastness and relative isolation of olive plantations in the south, Tunisian growers were, and some still are, totally independent in securing their need for expanding olive surface. Their methods have always been based on selective conservation of cultivars. An easy propagation method, which requires relatively little attention, especially in arid zones, is to use tree stumps of 2 to 5 kg each, often not rooted. Usually a large hole of one m³ is dug, the tree stump is placed inside and covered with soil to shelter it from direct sun; and at the same time the big hole is supposed to receive extra rain water from the surrounding area. Some growers have used grafting on trees stemming from germinated seeds; however this technique has rarely been practiced, in spite of the strong roots of the rootstock, because grafting might not always be successful. Semi-hardwood cuttings have been adopted since 1975 across the country in order to produce better supply of nursery trees and to conserve the genetic patrimony.

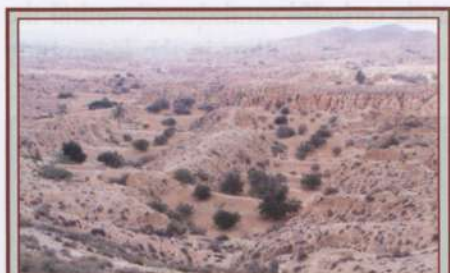


Fig. 10
Meskats (low spots) and Jessours

Since ancient times, farmers have used the technique of *Meskats* "مسقاة" and *Jessour* "جسور" in the center of Tunisia to construct impluvium and increase olive density in the extreme south, where rainfall has been as low as 100 mm/year, collecting water to grow olive inside it. This innovative technique was created and adopted by Tunisian farmers to improve rainwater harvesting, increasing available water to the trees and making the best out of every drop of it (Fig. 10). This system also helps in reducing soil erosion. In order to reduce rainfall losses and increase both its recovery and infiltration, many local traditional engineering works have been developed and adopted over centuries. They include placing stones and gravel pebbles in the planting holes to improve infiltration, constructing both embankments to slow rainwater flushing and diversion dykes (*Jessours* "جسور") to retain water inside olive orchards, as well as strengthening and stabilizing these dykes with vegetation (Fig. 11).



Fig. 11
Rainwater retained by diversion dykes (*Jessours*) inside an olive orchard and vegetative cover for stabilizing dykes

Such works in these harsh areas of producing olives take a considerable share of growers time to conserve and manage soil and water.

In late autumn ploughing the soil, although it has some potential disadvantages, is still an essential practice, taking place in arid olive plantation to improve infiltration and eliminate competition for the limited available water from winter and spring weeds. Most of the wrong inherited practices are related to harvesting and include beating the trees with poles, collecting and mixing fall fruits with freshly picked ones and delaying harvest on the erroneous belief that oil yields will increase (Fig. 12).



Fig. 12
Beating branches with a stick, collecting fallen fruits from the ground and late harvested fruits
(Photos in the middle and right by Moh. El-Kholy)

PROCESSING METHODS OF RAW OLIVES

Traditionally, almost all the Tunisian olive fruits are used for oil production. Therefore olive processing methods have evolved from the simplest to the most sophisticated.

Tunisian traditional practices in commercializing olive and olive oil continue to be practiced till today, however with advancement in processing technologies. A few old stone mills are still in use in remote and isolated areas (Fig. 13). Growers and even consumers in Berber zones, including those of Douirat and Chenini, have a strange peculiarity; they do not stock oil, but rather stock dried olive fruits to be milled and pressed in a local communal traditional mill when needed, all year round (Fig. 14). They wet the dried olives in water for a few days before milling to facilitate oil extraction. Naturally such oil is of very low quality; however locals are accustomed to its taste and would not accept any other olive oil, which they consider tasteless. Some practices in the processing sector still exist after more than a century (Fig. 15).

TRADITIONS AND CULTURE

Tunisians hold great respect for the olive tree and its oil, not only because it supports the life of many people and helps the Tunisian economy, but also due to its appreciation by the Islamic religion. It is the emblem of fertility and the symbol of peace and glory. Traditionally a family's wealth has always been estimated by the number of their olive trees, not for their monetary value or for their income, but rather for the pride they give; and as a measure of patrimony within a family or a tribe.



Fig. 13

Different types of old stone mills and a lever press



Fig. 14

Blind fold camel driving a stone mill in Berber village of Chenini in 1984
[www.copix.co.uk/Christine Osborne](http://www.copix.co.uk/Christine%20Osborne)



Fig. 15

Like a century ago, a man emptying olives from a basket in the mill hopper
(Lower photo by Moh. El-Kholy)

In major olive growing regions, Tunisians spend half of their time every year in a festive atmosphere, preparing for the “olive season”. Activities include sorting manpower and tools, securing finance, emptying and cleaning oil reservoirs, managing harvesting, transportation to the mills and on top of everything the excitement by families of growers and consumers of tasting and stocking the new season’s olive oil.

Local olive festivals, including musical and cultural events, are regularly celebrated every year. Tourists visiting those areas enjoy a brief participation in olive harvesting, enjoying local meals prepared with olive oil. Some of the Tunisian folk sayings and songs related to olives are below:

English	Arabic
• Water going to jujubes, olives need it more	• الماء الماشي للسدر الزيتون أولى به
• A song saying: divine rain, irrigate olive roots and wet (meaning give drink) Mohamed and Ali	• يا مطر يا ميمونة، اسقي عروق الزيتون واسقي محمد وعلي
• Bread is backed and olive oil is in pottery jars	• الخبز مخبوز والزيت في الكوز
• Bread and olive oil, health and peace at home	• خبز وزيت، صحة وهناء في البيت
• Put her* shadow far from mine, I will be able to give you both her and mine charge (olives)	• بعد ظلي على ظلها، نهز حملي وحملها
• Scorch me by fire and do not irrigate me end of February	• كوية بالنار ولا مطرة في أيار

* Trees are feminine in Arabic and here the importance of pruning to give space and allow for light penetration is emphasized

Olive orchards constitute a wealth for each Tunisian and a saver for difficult situations and times. So, everyone preserves his/her olive trees inheritance, no matter how many and most people prefer to own few trees or an olive orchard rather than keeping the money in a bank. When Tunisian bury their beloved ones and people visit them to give condolences, the family of the deceased offer the huge number of visitors olive oil and bread as a good healthy meal that requires little time to prepare. When Tunisians travelled on camels or horses back for days crossing long distances, they used to take with them barley and olive oil as food ration.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Tunisian food is one of the spiciest among the North African countries. It is typically based on “Sun cuisine”, like other Mediterranean countries, based mainly on the extensive use of olive oil, spices, a variety of vegetables, lamb meat and beef and fish in certain areas near the coasts. Thus, most Tunisian hot meals are traditionally prepared with olive oil. Furthermore many Tunisians take pleasure in having the dessert of their cold breakfast meal by dipping hot bread in honey covered with olive oil or dipping dates in olive oil. Table olives are a



common constituent of breakfast. Therefore it is not surprising that a large segment of the Tunisian cakes and sweets use olive oil instead of animal fats.

➤ ***Tajine Zaitun (Lamb and Olive Stew) "طاجن زيتون"***

(Fig. 16) is one of the common Tunisian dishes using both table olives and olive oil.

Ingredients: 1 kg lamb, cut into large cubes, 250 g black olives, 6 tablespoon olive oil, 1 chopped large onion, 2 peeled garlic cloves, 3 tablespoon tomato concentrate, 1 l water, 2 bay leaves, 3 tablespoon chopped parsley, 1 table spoon flour, 1 tablespoon fennel seeds and salt and pepper to taste.

Method: Heat the oil in a large pan. Gently fry the meat, onion and garlic for ten minutes, stirring occasionally. Add the tomato concentrate, bay leaves, parsley, fennel seeds and water. Season it with salt and pepper. When the sauce comes to the boil, lower the heat and cook for 45-60 min until the meat is tender. In the meantime place the olives in a sauce pan, cover them with water and cook gently for seven minutes. Remove and drain. When the meat is cooked, add the olives and mix well together. Cook for a few more minutes. Mix the flour with a little water and add to the stew. Cook for two more minutes until the sauce thickens. Transfer to a large dish and serve.

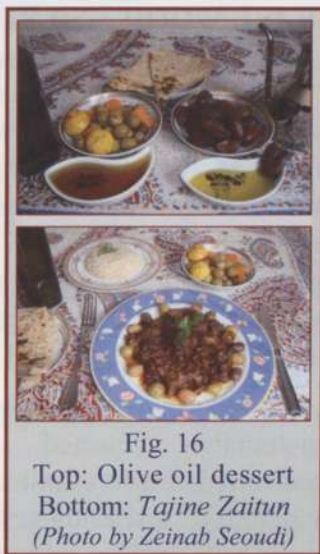


Fig. 16
Top: Olive oil dessert
Bottom: *Tajine Zaitun*
(Photo by Zeinab Seoudi)

POPULAR MEDICINAL AND COSMETIC USES

Many Tunisian midwives believe that using olive oil for a perineal muscle massage helps with stretching that area during the birthing of the baby. New born babies are customarily smeared with olive oil to ease afterbirth pains and protect their tender skin. Olive oil is taken when stomach aches occur or to stimulate bowel movements. In addition olive oil has a special place in the beauty uses of Tunisian women; it is traditionally used in oiling different part of the body, mixed in many beauty creams and used in various cosmetic products, including soap skin lotion, facial and hand cream. It is also used for the protection of the skin and prevention and sun burn treatments. Fresh olive leaves are traditionally used to lower blood pressure when consumed as herbal tea.

OLIVES AND TOURISM

Tourism in Tunisia is a flourishing industry which accounts for nearly 7% of gross domestic product. During the olive harvesting and milling season many tour operators organize one-day tours, or sometimes longer, to olive orchards to witness and share in olive picking, visit olive mills to taste fresh olive oil and learn how to judge its authenticity. Different events are held yearly, like festivals, to celebrate the

olive oil campaign and to conduct contests for best dishes prepared with olive oil, best olive picker and best oil.

OLIVE WOOD AND BY-PRODUCTS USES

The forest tree area in Tunisia is small; therefore olive wood from rejuvenated or uprooted trees has been used in making some expensive furniture pieces. Wood from annual pruning is used to produce small kitchen utensils and artwork (Fig. 17 and 18).

Small olive branches were customarily burned under controlled fire to eliminate the potential of spreading pests and to produce coal for barbecuing. However with improved public awareness about environmental issues, this practice is diminishing gradually and the wood is now used for artisanal and artistic products notably in the coastal cities and towns, which receive many tourists.

Olive mills annually produce massive quantities of residual pomace cake, which have been beneficially valorized in different ways. It is mixed in small proportions with livestock feed either alone or with olive leaves. Based on local experience, cracked pits can be segregated from the cake to be used in furnaces.

The residual vegetation water from olive milling, which is produced in large volumes, is collected in big evaporation ponds, and then it is sprayed on the olive orchard floors in controlled quantities as a supplemental organic fertilizer.

Fresh olive leaves from pruning are given green to sheep and camel populations, and they can be dried and stocked as feed during the summer when green grass is rare.

ACKNOWLEDGEMENTS

The authors are indebted to the Editor in Chief Mohamed El-Kholy for his valuable revisions of the original manuscript and for his knowledge about the Tunisian olive sector, resulting from his multiple visits, which he shared with us in compiling this chapter.



Fig. 17
Olive wood art work



Fig. 18
Olive wood art work
(Photo by Essam Agami)



Mahmut Boynudelik¹ mahmutboynudelik@gmail.com,

Fügen Durlu-Özkaya², Mücahit Taha Özkaya⁴,

Renan Tunalioglu⁵, Mehmet Ulaş³

¹Freelance researcher, olive producer, İstanbul

²Gazi University, Faculty of Tourism, Department of Gastronomy, Ankara

³Olive Research Station, Bornova, İzmir

⁴Ankara University, Faculty of Agriculture, Department of Horticulture

⁵Adnan Menderes University, Faculty of Agriculture, Department of Agricultural Economics, Aydın



INTRODUCTION

Turkey is a transcontinental “Eurasian” country literally expanding from east to west like a bridge between Asia and Europe (Fig. 1). Asian Turkey was known as Asia Minor in antiquity and it was called Anatolia by ancient Greeks, meaning “the land of the rising sun”. This Asian part that includes 97% of the country is separated from European Turkey by the Bosphorus, the Sea of Marmara, and the Dardanelles (which together form a water link between the Black Sea and the Mediterranean Sea). European Turkey, also known as eastern Thrace or Rumelia is located in the eastern end of the Balkan Peninsula and comprises the other 3% of the country. Turkey’s territory is more than 1,600 km long and 800 km wide, with a roughly rectangular shape. It lies between latitudes 35° and 43° N, and longitudes 25° and 45° E. Turkey’s area, including lakes, occupies 783,562 km², of which 755,688 km² are in South-west Asia and 23,764 km² in Europe.



Fig. 1
Olive growing areas in Turkey

Turkey is the world’s largest producer of hazelnut, however others with magnitude of production are cherry, fig, apricot, quince and pomegranate. Turkey’s traditional image as an agricultural country has been transforming rapidly in recent decades. Output of agriculture is decreasing against industry (automotive, textile, electronics) and the service sector (banking, tourism) in the country’s economy. The share of agriculture is only 17% of the country’s gross domestic product. In 1980 agricultural products represented 80% of total exports while today it is only 10%. Similarly there is a notable shift from rural population to urban population and the labor employed in agriculture is decreasing with time.



Although Turkey is geographically located in a temperate climate zone, the diverse nature of the landscape, and the existence in particular of the mountains that run parallel to the coasts, result in significant differences in climatic conditions from one region to the other. While the coastal regions enjoy milder climates, the inland Anatolia plateau experiences hot summers and cold winters with limited rainfall. Turkey receives most of its rainfall in the winter season. A big difference is observed when the total rainfall between coastal and inland stations, are compared. The Black Sea coasts (Rize, Hopa) receive 2,200 mm rainfall while Konya and Iğdır 250-300 mm. Annual precipitation in Turkey is mainly determined by elevation. The Aegean and Mediterranean coasts have rainy conditions in winters but dry in summers. Annual precipitation in those areas varies from 580 to 1,300 mm. The Black Sea coast receives the greatest amount of rainfall and is the only region that receives rainfall throughout the year.

OLIVE CULTIVATION HISTORY

According to the World Olive Encyclopedia, the cultivated olive tree originated around 4000 years BC somewhere in Asia Minor, in what is today's Turkey. The existence of wild olive forests in southern and south-eastern parts of the country, especially in the Taurus Mountains might be considered as evidence of this long history.

Recent archaeological discoveries are unearthing olive oil mills in various parts of the country dating from 10th to the 7th centuries BC. One of those was perfectly



Fig. 2
Replica of the ancient lever press of Klazomenai

restored and reconstructed in 2004-2005 and used for oil extraction demonstrations with the antique technology of a lever press (Fig. 2). This antique olive mill, in Klazomenai (38 km west of Izmir, also spelled Clazomenai or Clazomenae), today's Çeşme, dating from 600 BC is probably one of the oil mills rented by ancient Greek mathematician and

philosopher Thales (ca. 624-546 BC). In order to show the benefits mathematics Thales predicted a plentiful olive harvest season after observing the skies and weather and he rented a couple of olive oil mills in the area, one of which is probably that of Clazomenai. Historians noted that Thales made a fortune from olive oil production that year. It is interesting that the olive oil decantation method used in this ancient mill was still practiced by local farmers until recent years. The method consisted of a group of liquid collecting troughs connected together while installed at different levels to receive the oil/water liquid from the press. The oil, being lighter than water, floats from one trough to the next with the flow of the liquid from the press.

Olive production has been a major economic activity since those times. Like today, the main olive growing regions of Turkey were historically located along the coasts of Mediterranean and Aegean Seas (Fig. 3). Olive oil trade was also an important activity since fishermen or sponge divers frequently find olive oil amphorae in sunken trade boats from Greek or Roman periods. Flourishing olive oil trade continued to facilitate the exchange of new ideas and new technologies as well as bringing wealth and prosperity to the region in Byzantine and Ottoman times.



Fig. 3
Olive trees overlooking the Mediterranean

Olive farming and olive related trade were protected and promoted by Ottoman Sultans, especially for the provision of Istanbul and the Topkapi Palace which was initially constructed in the 1460's to become the primary residence of Ottoman Sultans. Each year, tons of the best table olives and olive oils were transported to the Palace from favorite olive growing regions of the Empire, Crete, Lesbos, İzmir and from the eastern region of Edremit. Olive oil was used not only for culinary purposes but also to illuminate the royal mosques. The members of the Ottoman Imperial family devised special olive orchards to supply very fine olive oil for mosques. Some of these olive orchards are still protected by the State.



Fig. 4
Hand operated screw press

Due to the deep history of olive farming and oil production, modern techniques were introduced at a relatively very late date. The first hydraulic olive presses were brought by British entrepreneurs in the late 19th century, however traditional hand screw presses (Fig. 4) were still in used until the 1960's. Following State promotions in recent years, today almost 95% of olive oil production is made by modern centrifuge technology.

AREA UNDER OLIVE CULTIVATION

Turkey today represents 9% of world olive growing areas, 17% of olive trees, 8% of olive fruit production, 5% of olive oil production and 14% of table olive production. Therefore, the olive sector is one of the most important in Turkish agriculture.

Total arable land of Turkey is 21,351,000 ha of which 1,686,000 ha are covered by various fruit trees. The olive cultivated area has increased during the last 10 years by

26% reaching 778,000 ha, which represents 3.6% of total arable land and 46% of fruit trees area as a result of the support and promotion of the State. From the total olive area, 218,000 ha are cultivated for table olives and 560,000 ha for olive oil.

The seven geographic regions of Turkey are divided into 81 administrative provinces, 41 of which grow olive trees. Three provinces of the Aegean Region produce 48% of the nation's olives; these are Aydın (25%), İzmir (14%) and Muğla (9%). Marmara Region comes in second position with 8% and 5% from Balıkesir and Bursa Provinces respectively. Others growing areas are located in the Mediterranean and South-eastern Anatolia Regions.

OLIVE CULTIVARS

The provinces of Hatay and Kahramanmaraş in the Mediterranean Region and Mardin in the Southeastern Anatolia Region are commonly accepted as one of the origin centers of the richness of autochthonous olive in Turkey. Besides the cultivars suitable for the production of oil or table olives, there are others that also have commercial importance.

The germplasm collection orchard established in 1969 in Kemalpaşa of İzmir Province contains 84 olive cultivars from five growing regions in Turkey (Aegean, Mediterranean, Marmara, Southeastern Anatolia and Black Sea) in addition to 28 foreign cultivars.

The most commercially viable cultivars originating from Aegean Region are the following:

'Ayvalık' (Fig. 5) is the most widely grown cultivar for high quality olive oil and is highly appreciated in Edremit due to its balanced organoleptic characteristics. Productivity is high but alternate in bearing. Trees are of medium vigour with erect growth habit, suitable for mechanical harvest. The spherical shape fruit, sometimes used for green pickling, is medium size, weighs 3.65 g on average, and yields 24.7% oil under commercial extraction.



Fig. 5
'Ayvalık'

'Domat' (Fig. 6) is an important table cultivar extensively used for green pickling, distributed throughout the Aegean region. It has high and constant productivity suitable for intensive irrigated orchards, but it is sensitive to cold. The fruit is large elongated and weighs 5.3 g on average, however the oil content on a fresh weight basis is relatively low, 20.5%.



Fig. 6
'Domat'

'Memecik' is a dual purpose cultivar very important in the Aegean region where it occupies nearly 50% of

the olive area. Trees have large canopies and strong dropping lateral branches. It is tolerant to cold and resists conditions of extreme drought. The ovoid shaped fruit is medium size of 4.8 g on average and is harvested early for green pickling and late for black table olive processing or olive extraction, yielding 24.5% oil on a fresh weight basis; and the oil has a strong flavour.

‘**Gemlik**’ (Fig. 7), for dual-purpose, is the widest spread cultivar in the Marmara Region and is also the most famous cultivar used as black “Gemlik-style” table olive of Turkey. The spherical/oval fruit is medium size, weighing 3.7 g on average. It has high oil content (29%), and the fruits that cannot be used for pickling are used for oil production. It is partially resistant to low temperature.

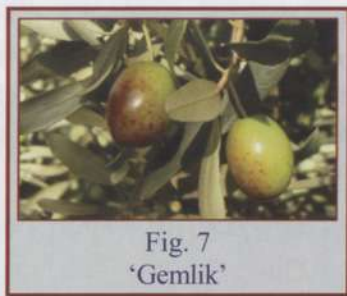


Fig. 7
‘Gemlik’

The most important local cultivars in the Mediterranean Region are ‘Tavşan yüreği’, ‘Büyük topak ulak’.

Since Turkey has a rich autochthonous olive heritage, there are very few imported cultivars in the country. ‘Manzanilla’ and ‘Arbequina’ are the most important cultivars introduced into Turkey. ‘Manzanilla’ was imported in the 1970’s and has become one of the most important green table olive cultivars. In the last five years ‘Arbequina’ has been imported especially for establishing high density olive orchards.

IMPACT ON ECONOMY AND ENVIRONMENT

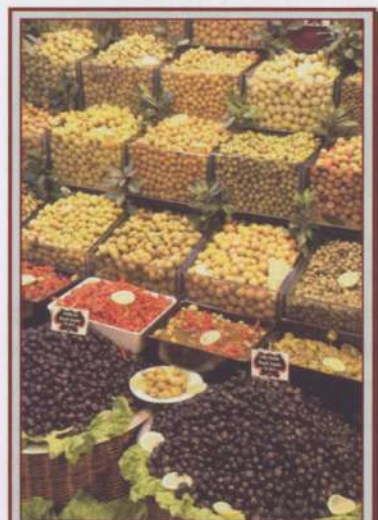


Fig. 8
Different styles of pickled olives

Olive farming is one of the leading agricultural activities in coastal areas along the Marmara, Aegean and Mediterranean Seas. Traditional olive orchards are mostly owned by small family holders. In recent years, with support from the State, intensive orchards, using new agricultural techniques, are becoming the major trend in the country and olive growing is spread into new areas, replacing citrus and tobacco cultivation.

About 400,000 families make their living from olive farming and related industries. Nearly 30% of olive production is processed for table olives and 70% is used for oil production. Despite a huge domestic consumption, Turkey is one of world’s important exporters of different kinds of table olives (Fig. 8). Germany, USA, Bulgaria and Romania are the main markets for black table olive exports, while Germany, UK and USA are major green table olive importers. Olive oil production in Turkey averaged 145,000 tons/year during the period 2004-2008 and made Turkey the world’s fifth largest producer, while exports range from 50,000 tons to 90,000 tons/ year.

There are serious environmental concerns from olive mill wastewater produced from the three phase olive oil centrifugal processing systems, which constitute 75% of the 1,242 olive oil extraction facilities in Turkey.

Olive orchards became a symbol of resistance for Turkish environmentalists. The olive tree protection act, dating from 1939, forbids construction of any industrial or any form of polluting activities in locations which are closer than 3,000 m to olive orchards. With the help of this act, many activities which might be a threat to the environment such as oil refineries, gold mines and cement factories were banned after long juridical struggles. Thus, industrialists and mining corporations regard the olive tree as their enemy.

INHERITED WRONG CULTURAL PRACTICES

Olive farming is a very deep rooted activity in Turkey; consequently many traditional practices contradict modern techniques. In traditional olive orchards, trees are still beaten by wooden poles to detach the fruits during harvesting. Although modern branch shakers or vibrators are becoming more and more popular, this traditional harvesting method is still practiced. In traditional olive orchards, mostly on steep slopes, harvested olives are kept in big bags and due to transportation difficulties are carried to olive mills by mules or camels. These methods of olives storage and transportation negatively affect the quality of olive oil. Fortunately, such practices are gradually diminishing by introduction of contemporary technologies.

PROCESSING METHODS OF RAW OLIVES

For household consumption, green, black, or semi-ripe raw olives are treated in brine or dry-cured in salt. In some olive growing regions green or black olives are used to prepare olive jam. The olives are de-stoned and cooked to remove the bitter taste, and then they are mixed with clove (*Syzygium aromaticum*) and boiled in sugar syrup and lemon juice for about 15 minutes.

TRADITIONS AND CULTURE

The olive tree is a significant constituent of folklore in Turkish olive growing regions. Although olive harvest season is usually hard and troublesome for olive pickers, every olive season is expected with great hopes. In the first days of olive picking all the young girls look to find a double olive, since is believed it brings good luck and fertility. Usually the young girl, who brings the first double olive of the season, is rewarded by the landowner. The end of the olive harvesting season is usually celebrated as a feast. The foreman is tied by ropes to an olive tree to be released only after getting a present from the landowner.

There are a number of songs and poems that are connected with olive fruit and olive tree. A well-known poem by famous Turkish poet Nazım Hikmet (1902-1963) recommends planting an olive tree as a sign of passion for life:



Yani, öylesine ciddiye alacaksın ki yaşamayı / yetmişinde bile, mesela, zeytin dikeceksin, / hem de öyle çocuklara falan kalır diye değil, / ölmekten korktuğun halde ölüme inanmadığın için / Yaşamak yani ağır bastığından.

I mean, you must take living so seriously / that even at seventy, for example, you'll plant olive trees / and not for your children, either, / but because although you fear death you don't believe it, / because living, I mean, weighs heavier.

Another tradition related with olive oil, unique to Turkey, is olive oil wrestling (Fig. 9). The wrestlers wear a special type of hand-stitched trousers made from water buffalo leather weighing approximately 13 kg called *kispet* and cover all their bodies with olive oil before the start of the game. It becomes very difficult for the wrestlers to catch the opponent because their bodies are very greasy. As the wrestling takes place, the drum and shawm bands play the traditional repertoire of the festival. Oil wrestling is still very popular and practiced all over the country, but the most famous oil wrestling championship is annually organized in Kırkpınar, near Edirne in the north-eastern part of Turkey. According to legends, the Kırkpınar competition goes back more than 500 years.



Oil wrestling of Kırkpınar is inscribed on the Representative List of the Intangible Cultural Heritage of Humanity of UNESCO because Kırkpınar oil wrestling is open to men from all cultures, regions and ages without discrimination between religion, language or race. The wrestlers known as *Pehlivan*s are considered exemplary figures in society with attributes such as generosity, honesty, respectfulness and adherence to traditions and customs.

RECIPES WITH OLIVES AND OLIVE OIL IN NATIONAL COOKING

Wine, table olive and in particular olive oil were the center of the diet during the Byzantine period, which was based on an abundance of meat, fish and a variety of grains, fruits and vegetables grown from Balkans to Anatolia and from Syria to the Caucasus. Turkey being part of Asia Minor, Turks had no difficulty in adapting their diet habits with those of the Mediterranean region. In their diet, they also adopted vegetables, green stuffs, marine fish, table olive and olive oil. They applied their own

in zeytinyağlılar (dishes with olive oil). Specifically, vegetable dishes are cooked with olive oil, which enriches the taste of beef or lamb meat. Recipes of several Turkish dishes with olive oil are given below:

Karniyarik (Stuffed Eggplant) (Fig. 10) is a very famous and popular dish in Turkey. **Ingredients:** 6 medium size eggplants, 250 g ground beef meat, 3 large tomatoes (2 diced and 1 sliced), 5 garlic cloves, 400 g green peppers, 1 sliced tomato, 3 large size green banana peppers, olive oil for frying, black pepper and salt.

Method: Peel eggplants leaving lengthwise strips of skin and remove stems. Lightly fry in olive oil by turning all around, remove from pan once getting brown, place in a baking dish side by side and split from both ends and make longitudinal recessions in the center with the back of a tablespoon. Put aside until stuffing mixture is prepared. Roast meat and chopped onion in olive oil till meat gets crumbly. Add diced tomatoes, green peppers, green banana peppers and black pepper to the meat-onion mixture, stir and simmer to simmer until vegetables get tender. Fill prepared eggplants with this mixture, and top with sliced tomato. Pour hot water mixed with two spoons tomato paste, and bake in oven at 180° C for 45 minutes and serve it hot.

Imambayıldı (Fig. 11) has similar ingredients to Karniyarik without ground meat. Onions are cut in half and sliced into 1.5-2 mm thick slices. Onions are sautéed in olive oil until tender. Diced tomatoes and peppers are added in mixture and simmered until vegetables are tender. Add hot water mixed with two spoons tomato paste from the corner of the baking dish, and bake in oven at 180° C for 45 minutes and serve cold.

Sarma and Dolma (Fig. 12) are also popular foods in Turkey and Turkish cuisine. Several vegetables and herbs may be used for preparing *Sarma* (meaning rolling or rolling).

Ingredients: 1 head cabbage, 300 g ground beef meat, 1 cup rice, 2 medium size onion, finely chopped parsley, tomato paste, mint, olive oil, salt and black pepper.



Fig. 10
Karniyarik



Fig. 11
Imambayıldı



Fig. 12
Sarma and Dolma

For filling, mix all other ingredients well, place one table spoon of the mixture on each piece of the cabbage leaves, and fold the edges of the leaves into shaped rolls *Sarma* about 2-2.5 cm in diameter and 5-6 cm long. Place the stuffed cabbage rolls in a baking pan side by side in layers, pour on hot water and olive oil and simmer for about 45 minutes till cabbage and rice are tender, and then serve hot. Several types of vegetables may be used as wrappers for preparation of *dolma*. They include green pepper, eggplant, tomatoes, celery root, squash blossom, onion and summer squash.

POPULAR MEDICINAL AND COSMETIC USES

The healing power of olive oil was known since antiquity, and in Turkey it is still regarded and used as a remedy for different health problems. It's most popular use as a remedy is for softening muscles by rubbing; it is said that this treatment would relieve even the strongest muscular pains.

Almost every family in olive growing regions in Turkey prepares its multi-purpose home remedy based on olive oil as a major constituent. A bunch of wild *Hypericum perforatum* L. (commonly known as St John's wort or *kantaronin* Turkish) is infused in olive oil for a couple of weeks. When the flowers and the oil turn into a crimson red color the preparation is completed. This folk remedy is believed to be tranquilizer, anti-depressant, a digestive aid and for healing open wounds.

Olive leaves have been regarded as a traditional remedy and believed to be antioxidant and antibiotic. Their healing properties created a new economic activity and nowadays modern factories started producing olive leaves tea bags which are becoming very popular. Olive leaves boiled in water for a couple of minutes, as herbal tea, can be used for regulating blood pressure.

If someone drinks a teaspoon full of extra virgin olive oil in the morning it is believed to be a laxative and helps day-long digestion problem.

Experienced drinkers start their evening adventure by drinking a spoon full of extra virgin olive oil on the belief that it protects the stomach and prevents the harm of alcohol.

OLIVES AND TOURISM

Agro and rural tourism in Turkey, in which olives can play an important role, are developing rapidly as one of the alternatives to cultural, leisure, recreational and other types of tourism.

The Ida Mountains area (*Kız dağları*) located in North-west Aegean coasts is becoming one of the most important agro tourism destinations focusing on olive as a cultural object. All through history this area has been regarded as one of the major olive growing and olive oil production centers of Turkey. Experts believe that the best olive oil in Turkey is produced in this region. Adatepe, the first Olive Oil Museum of



Turkey was opened in 2001 in this region to collect and exhibit objects related to olive culture (Fig. 13). Every year thousands of people visit this museum and learn about the rich traditions of olive culture in the country.

Tourists coming from cities or from other countries visit the Aegean Region and stay in family type small hotels or pensions in villages. They join in the daily agricultural activities of local people. Special culinary courses are given to teach traditional homemade food with local and natural ingredients. Tourists observe goat cheese making, they learn traditional food preservation methods from local villagers and they make tomato pastes, pickles, noodles or jams to bring back to their homes. At harvesting season, olive picking becomes a very popular activity within this concept. Tourists participate in olive harvest teams and at the end of the day either they learn to cure their olives by traditional methods or they can bring their olive baskets to the traditional mill of Adatepe Olive Oil Museum and see how olive oil is extracted.

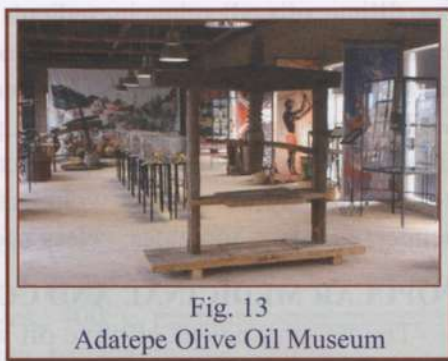


Fig. 13
Adatepe Olive Oil Museum

This kind of agro tourism is becoming popular all over the country. Especially when the *Ta-Tu-Ta* project introduced a system involving 72 farms where participants are expected to stay in farm houses and help daily agricultural activities. The idea is to enjoy an active holiday, go through new experience and learn ecological living in an environment which is quite different to multi star hotels.

Almost all olive growing areas in the provinces of Bursa, Balıkesir, Çanakkale, İzmir, Manisa, Muğla, Mersin, Hatay and Mardin organize a festival, harvesting days or a carnival during the olive harvesting season. Some of the activities that take place include picking olives together with growers, pressing the olives in old traditional presses, making natural olive-oil soap, cooking various meals with olive-oil and olives, participating in a drawing and photography contest of olive trees, cutting different utensils from olive-tree wood, music and lectures. Other activities that are also common in some of these festivals are olive oil tasting sessions, seminars or symposiums as well as national or international fairs or exhibitions. Through such events olive culture and folklore are protected from extinction, and furthermore olive growers, producers and other stakeholders of the table olive and olive oil sectors can come together with consumers, promoting consumption and highlighting increased yields and quality while meeting consumer's expectations.

OLIVE WOOD AND BY-PRODUCTS USES

Items made from olive wood are becoming popular souvenir objects (Fig. 14, next page). Local craftsmen create a number of different toys, accessories, statuettes, home and kitchen tools, and similar items.





Fig. 14
Olive wood products

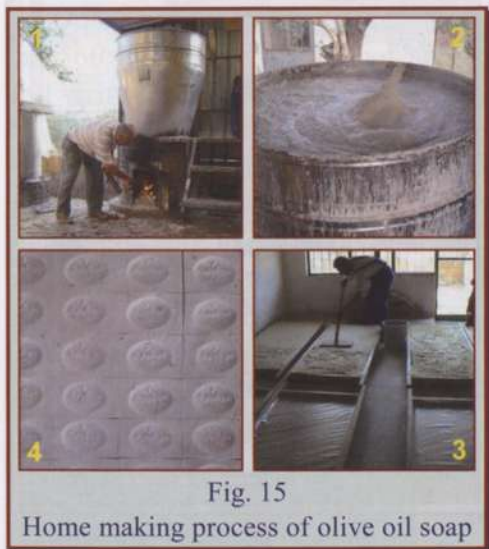


Fig. 15
Home making process of olive oil soap

About 60 % of Turkey's crude pomace oil is used for food sectors after refining and the remaining, as well as low quality virgin olive oil, are used for soap making and other cleaning products. Residual pomace is added to animal feeds while pomace cakes are used as a source of energy for heating by burning in special furnaces in households, within olive growing regions.

Many Turkish families produce their own soaps at home (Fig. 15). They boil their low quality olive oil and the residue from decantation in special cauldrons. When the oil starts to boil either wood ashes or diluted caustic soda is added for saponification. The soap making process is finished after adding salt to enhance hardening of the mixture. The soap base is poured into large block moulds, left to dry and after hardening is cut by knives or thin wire.

In recent years traditional olive oil soap has been re-discovered by people who realized the negative effects of industrial soaps

with many small companies starting to revive boutique-type soap manufacture.

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Following Olive Footprints in URUGUAY

Paula Conde¹ pconde@inia.org.uy, José Villamil²

¹Instituto Nacional de Investigación Agropecuaria (INIA)

Punta Gorda, Montevideo

²Private Consultant, Punta Gorda, Montevideo



INTRODUCTION

Uruguay is located in south-eastern part of South America between latitudes 30° and 35° S. It borders with Brazil to the north-east, with Argentina to the west, and has a coastline of 660 km, almost half of it is on the Atlantic Ocean to the south-east and the rest is on the River Plate's Estuary to the south (Fig. 1). Its area is 176,215 km² with a population of nearly 3.5 million inhabitants. It is the only South American country lying entirely outside the tropics. Uruguay is a water-rich land, due to its prominent rivers Negro and Uruguay, the later forming the country's western border with Argentina.

The landscape consists mainly of low plateaus slightly undulating, and low hilly regions (*cuchillas*) with a highest peak of only 500 m above sea level according to the zone, the soil varies from clayey-muddy to marked clayey-muddy, fertile, moderately well drained, to stony, less fertile, shallow, acidic (pH 5-6) and with slight moderate slope.

The climate is temperate-humid with mild winters and mean annual temperatures of 17° C with variations of 16° to 19° C from south to north with a mean relative humidity of 72%. The mean monthly temperatures vary between 7° C in July to 25° C in January. The mean annual rainfall varies from 1,400 mm in the north-east to 1,000 mm in the south-west decreasing with distance from the sea coast, and is relatively evenly distributed throughout the year. With these climate and soil characteristics olive trees present high cultivation potential.

The most important economic activities are livestock raising and agriculture, the bulk of which is destined for grain production. Uruguay is one of world's



Fig. 1
Olive growing areas in Uruguay



largest producers of soybeans ranking in 9th position. In recent years, other sectors like forestry and fruit growing have developed significantly. Citrus (orange, lemon, and mandarin) covers 16,179 ha, nearly 41% of the fruit growing area, followed by 8,127 ha (20%) of grapevines, 8,000 ha (20%) of olive and 7,363 ha (19%) of others deciduous fruit trees.

OLIVE CULTIVATION HISTORY

The majority of Uruguayans are of European descent, mostly Italian and Spanish. Many of the prevalent customs are acquired from these countries, such as food, clothing and even livestock production and agricultural activities, among which olive growing stands out.

Don Antonio de Ribera traveled to Spain as Procurator General of Perú and in 1560 took olive plants that he had obtained in Seville to Lima. The historian and writer from the Spanish Viceroyalty of Perú, Garcilaso de la Vega, El Inca (1539-1616) wrote in his *Stories from Perú*, Volume V, Chapter 44, quoted by Pérez Castellano that “out of the 100 plants only three had survived, that were planted in a beautiful fenced state”. As they were considered of great value they were taken care of with slaves and protected by watching dogs, nevertheless “one night one of the three plants was robbed which in few days it dawned in Chili, 600 *leguas* (around 3,400 km) from Ciudad de los Reyes” (present Lima). From that individual plant many saplings were obtained which became beautiful trees. In Chile, they developed better than in Perú and people thought that this was due to the fact that Chile growing areas were in similar latitude to that of Spain.



Fig. 2
An old olive tree in
Colonia del Sacramento

According to Pérez Castellano, the last cuttings were brought from Buenos Aires to Uruguay in 1810. He narrates that more than 250 plants started to grow in September on the banks of the Miguelete stream which is now the Prado neighborhood in Montevideo. At that time Pérez Castellano commented that the best olives that grew in this location belonged to a Basque immigrant, Juan Pedro Aguirre who had a farm on the opposite side to that of Pérez Castellano, separated by the Miguelete stream. He noticed that the olives were 25- to 30-year-old and the tree canopy had a 5-7 m diameter. From these observations it can be assumed that these plants were introduced in about 1780. On the other hand, other hypotheses consider that Portuguese

introduced some olive plants in the surroundings of Colonia del Sacramento (Fig. 2) when they occupied the lands between 1680 and 1760.

In 1857 the Viscount of Mauá bought his farm and build the Castle of Mauá located in the Department of Soriano. In 1892 Caviglia acquired the Castle as well as about 3,500 ha and started an important venture of livestock raising and agriculture, where wine and olive oil were produced, among other products (Fig. 3, left).

In the Santa Clara School, former convent of the Josephine Sisters, founded in 1896 and located in the Cerro de Montevideo, there are olive trees that date over 160 years (Fig. 3, right).

In the north-east of Montevideo, in the Manga neighborhood, the Saeletian Congregation inaugurated in 1915 the Jackson Agricultural School. This school developed a fruit and vegetable activity for over 100 years. In this location, olive trees were used by the priests to extract olive oil in a small oil press located in the same place. At present, part of the old plantation still exists covering a tiny area of only one hectare.

In 1934 a new collection of Italian and Spanish cultivars was introduced for evaluation in the experimental field of the Agronomy Department of University of Salto (San Antonio). Some of them are still in production (Fig. 4).

The Law of Promoting Olive Tree Plantation was enacted on December 7, 1937. This law introduced tax exemptions and incentives to promote olive growing as well as the establishment of olive nurseries in Uruguay. Cost-free olive transplants were issued to interested producers, and they were exempted from paying property tax as well as from licensing fees of up to two vehicles. The law allowed the hiring of a foreign expert technician for up to three years. Probably this event triggered off expansion of plantations during the 1940's. Among those orchards, the Los Ranchos establishment stands out. It is situated in Río Negro and covers 100 ha of Italian olive cultivars with a tree spacing of 10x10 m. The Los Ranchos olive oil is still produced and it was the first olive oil exported to Europe under a specific trade name.



Fig. 3
Old olive trees
Left: Soriano. Right: Santa Clara School



Fig. 4
1934 experimental field
at University of Salto

AREA UNDER OLIVE CULTIVATION

Up to the year 2002, 85% of the olive trees were over 50 years old, but at present over 90% of the olive growing area corresponds to new plantations. The new olive era in Uruguay evolved following the intensive olive plantation system of 285-400 trees per ha. The growth rate during the period 2005-2010 has been outstanding reaching over a thousand ha per year with a peak in 2009 of 1,666 ha. Now the total area has reached close to 10,000 ha.

OLIVE CULTIVARS

In 2002, the first comparative trial of cultivars with potential aptitude to Uruguay's agro-climatic conditions was introduced and established in the National Agricultural Research Institute (INIA) Research Centre Las Brujas, Canelones. The cultivars tested were 'Arbequina', 'Manzanilla', 'Barnea', 'Leccino', 'Frantoio' and 'Picual'. Different parameters have been studied, such as phenology, vigor and yields as well as different cultural practices such as pruning and sanitary aspects. Jointly with the Chemistry Faculty of the National University oil quality and sensory analysis have been performed through the OLIVIA Project (Olive Oil Research and Consultancy). In 2005, based on an agreement with CNR from Italy, 16 cultivars were introduced through Consorzio Riproduttori Olivicoli. They were 'Ascolana', 'Bosana', 'Canino', 'Cipressino', 'Coratina', 'Frantoio', 'Grignan', 'Tirana', 'Leccio', 'Maurino', 'Moraiolo', 'Seggianese', 'Pendolino', 'Picholine', 'Taggiasca' and 'Tanche'. In 2006 and 2007, 11 other cultivars of different origins were also introduced: 'Arauco', 'Empeltre', 'Farga', 'Mission', 'Changlot', 'Carolea', 'Koroneiki', 'Hojiblanca', 'Arbosana', 'Alfafara' and 'Carrasqueña'.

Currently the Spanish 'Arbequina' occupies 50.5% of the 10,000 ha, while Italian 'Frantoio' 14.8%, Israeli 'Barnea' 8.1%, Spanish 'Picual' 7.4%, Italian 'Coratina' 5.6%, and 'Leccino' 5.3%. The remaining 8.3% is divided with varying shares on Spanish 'Manzanilla', Greek 'Koroneiki', French 'Picholine' and others.

IMPACT ON ECONOMY AND ENVIRONMENT

According to local conditions, intensive olive plantations requires on average one worker per hectare, which has created around 10,000 employment positions. A new business has also developed for machinery, oil presses, harvesters, pruners, etc. The demand for local oils has increased in the last three years. At the beginning of the recent olive expansion there were only two oil brands while at present, six brands has started to have a preference in international market. However, Uruguay imports of olive oil and table olives were about 800 tons and 400-600 respectively in 2010.

In Uruguay, olive trees have shown good adaptability to forest soil. At this stage of expanding the olive area, olive trees have set good footing because there are some



farmers who favor planting them, rather than letting the land for forestation which has some negative implications from the environmental point of view.

INHERITED AND CURRENT CULTURAL PRACTICES

In the past, observing that olive suckers growing around the basal trunk develop into small trees forming their own roots had convinced some farmers that olive could be grown anywhere. These plants, after properly shaped were planted approximately on 7x7 m between trees in holes of nearly 80-85 cm in diameter and 60 cm in depth. However, the trees took longer to produce and some were not true to type as they were germinated from seeds of falling fruits.

Nowadays the planting system is performed according to the physical conditions of the soil as well as to its topography. In marked clayey-muddy soil, the orchard floor is prepared with soil ridges along the row of 1 m wide and 40-50 cm high to



Fig. 5
Left: Planting on ridges
Right: In-rows planted with pasture for cattle

avoid water logging (Fig 5, left). For weed control along the tree rows either herbicides or organic mulches are used. A third alternative is to grow cover crops like *Louts subiflorus*. In some cases *Festuca* and red clover are intercropped to obtain fodder or for pasture (Fig. 5, right).

PROCESSING METHODS OF RAW OLIVES

In the Department of Soriano at Mauá farm established in 1892 with trees still producing, an old system for olive oil extraction is still used nowadays (Fig. 6) especially to process olives collected from the ground. The olives are crushed in stone mill and the paste placed in mates under a press, followed by separating the oil from water by decantation. Originally the press was manually operated but later a hydraulic press was put in place.



Fig. 6
Old olive oil extraction equipment at Mauá farm

One of the practices to prepare black olives for table consumption in family farms is a method probably originating around the Mediterranean, where there have

been always vast traditions in olive production. Olives are salted and hanged in a piece of cloth, for the elimination of Oleuropein that give them a bitter taste. Afterwards the olives are washed, hydrated and finally bottled in olive oil.

OLIVES IN TRADITIONS AND TOURISM

In Uruguay Catholicism is the main religion. One of the links between religion and olive is evident on “Palm Sunday” before Easter when blessing olive shoots and laurel branches is celebrated. Believers carry these branches in their hands, commemorating the entrance of Jesus into Jerusalem.

Tourism is one of the most important ventures of the Uruguayan economy which is associated with the quality of life and what the country may offer. One of the most important areas attracting many tourists is at Colonia Sacramento in the West littoral Region. Colonia was founded by the Portuguese in 1680 and at present has been declared Cultural Heritage by UNESCO. Another important tourism site for olive is the city of Punta del Este, in the province of Maldonado. Both destinations have large olive growing areas in the country and many touristic tour programs offer visits to olive orchards, where visitors can wonder around, taste and buy olive oil locally produced.

One of those tours called the “Olive Route” that offers the visit to different establishments, is located near the city of Punta del Este. The tour stretches on 120 km road and covers an area of 500 ha of olive trees.

OLIVES AND OLIVE OIL IN NATIONAL COOKING

A typical Uruguayan dish is *chivito*, a small thin steak of cow meat with crisps or salad and can be eaten as a dish or as a sandwich, in a roll with an olive on top of it for decoration. On the 29th of each month, the Italian immigrants follow their tradition of eating *gnocchi* of various thicknesses, soft dumplings and one of the ways of preparing them is with a *pesto* sauce (traditionally consists of crushed garlic, basil, parsley and pine nuts blended with abundant olive oil and *Parmigiano Reggiano*).

In the traditional *pizza*, green and occasionally black olives are used, with mozzarella cheese. Popular is also the Italian famous *calzone*, a turnover or folded *pizza* with a mozzarella fillings, olives, mushrooms and ham. There is also frequent consumption of *empanadas* (Fig. 7), which are stuffed bread or pastry baked or fried in many countries in Latin America, Western Europe, and parts of Southeast Asia. The name comes from the verb *empanar*, meaning to wrap or coat in bread. Empanada is made by folding a dough or bread patty around the stuffing. The stuffing usually

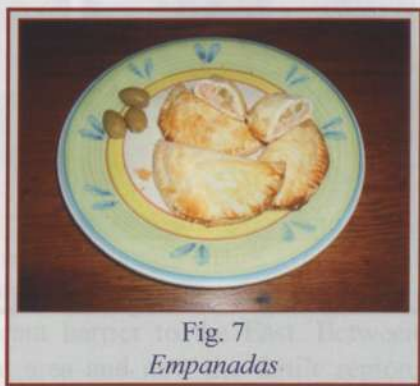


Fig. 7
Empanadas

consists of a variety of vegetables, cheese, olive or minced meat, and even sometimes fruits among others. Olive oil is used for making special bread sandwiches, the *bocatas*.

The Middle East immigrants prepare the *pita* bread with a filling of *humus* with chickpea flour and olive oil. To serve as snacks, mayonnaise is prepared mixed with cream cheese and chopped olives to spread on crackers.

OLIVE WOOD AND BY-PRODUCTS USES

There is an Uruguayan enterprise that is devoted to making buttons made of olive wood (Fig. 8). For the manufacturing of buttons and decorative fastenings, olive wood is used since it presents good characteristics as shininess, beautiful grains, and hardness which allows adequate turning into round shapes. The raw material is obtained from the pruning of the olive orchards in Río Negro (Los Ranchos). This enterprise is run by Italian immigrants since its beginning over 25 years ago. The firm exports at present to Argentina, Mexico, Canada, USA, and several European Union countries.



Fig. 8
Stock of machine-turned olive wood bars for making buttons / Upper right: Finished product

Several Uruguayan craftsmen devote themselves to the carving of olive wood for the production of mortars, pestles, bowls, cups and bowl toys, and several utensils that are afterwards commercialized in shops and markets (Fig. 9).

In the past, white cow bristles sprayed with oil were used for ant control.

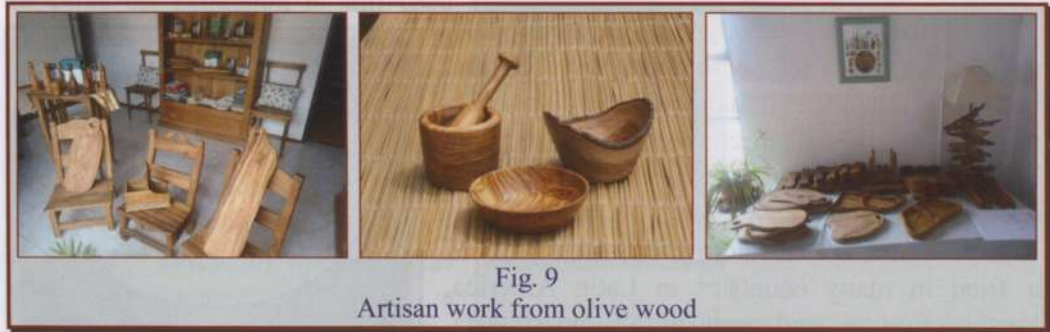


Fig. 9
Artisan work from olive wood

Following Olive Footprints in **THE UNITED STATES OF AMERICA**



Judith M. Taylor judithmtaylor@horthistoria.com

Horticultural Historian, San Francisco, California



INTRODUCTION

The United States of America (USA) is situated mostly in central North America continent. It lies between the Atlantic Ocean in the east and the Pacific Ocean in the west and is bordered by Canada to the north and Mexico to the south (Fig. 1). The country is made up of 50 states, including Alaska in the north-west of the continent and Hawaii in the mid-Pacific Ocean. With a total area of 9.83 million km² and with over 312 million people, the United States of America is the fourth largest country in the world.



Fig. 1

Olive growing areas in the United States of America (State of California)

Because of its large land mass the USA includes widely divergent climate types. To the east of the 100° meridian, the climate ranges from humid continental in the north to humid subtropical in the south. The southern tip of Florida is tropical, as is Hawaii. The Great Plains west of the 100° meridian are semi-arid. Much of the Western mountains are alpine. The climate is arid in the Great Basin, desert in the South-west, Mediterranean in coastal California, and oceanic in coastal Oregon and Washington and southern Alaska. Corn, soybeans, wheat, sorghum, sugar-beets, tomatoes, potatoes, grapes, oranges and deciduous trees are the main crops grown in USA.

California, the 3rd largest state, is located on the West Coast of the USA between latitudes 34° and 41°. The state is 1,448 km in the north-south direction and about 483 km from east to west. Its climate is defined by major mountain chains. The coastal chain in the northern section of the state is very close to the sea, creating a rain shadow. The Sierra Nevada forms another significant barrier to the East. Between them lies the Central Valley, the major agricultural area and now the fertile region, where the largest portion of all the fruit and vegetable crops in the USA are grown.



The geological features are the source of the state's Mediterranean climate, with long dry summers and rainfall confined to the cooler months. The degree of precipitation varies over very long cycles, often corresponding to the El Niño and La Niña phenomena. These terms refer to the changes of temperature at the surface of the Pacific Ocean and thus the amount of moisture which evaporates and is released as rain. Without irrigation California's climate is arid.

California grows over 200 different crops, some grown nowhere else in the nation. California produces almost all of the country's almonds, apricots, dates, figs, kiwi fruit, nectarines, olives, pistachios, prunes, and walnuts. It leads in the production of avocados, grapes, lemons, melons, peaches, plums, and strawberries. In the USA, olives are mainly grown in California (99%), and to a lesser degree in New Mexico, Arizona and Texas.

OLIVE CULTIVATION HISTORY

The cultivated olive, *Olea europaea* L., is not native to North America. It is thought to have originated more or less at the same time in several areas surrounding the Mediterranean Sea, around 5000 years BC. The proximal source of the olive in California was Mexico but in its turn Mexico received the tree from Spain. In 1520 the Casa de Contratación in Seville recorded that Spanish colonists took olive cuttings with them to the Antilles in the Caribbean. The trees did not thrive in the tropical climate but the Franciscan friar Father Martin de Valencia went to what is now Mexico City with twelve other friars. They established a religious house and in 1531 planted an olive orchard with new cuttings from Spain which did survive. The wife of the Spanish ambassador to Mexico in the mid 1840's, Doña Frances Calderon de la Barca, commented on the beauty of the orchard by moonlight 300 years later

In 1769 Don José de Galvez sent an expedition of Spanish soldiers and missionaries from Baja California in Mexico to Alta California, (now the state of California in the USA). The explorers landed at San Diego and the Spanish Franciscan friar Fray Junípero Serra founded a mission there. Over the next 50 years the Franciscans built 22 more missions always planting olive trees and vineyards for religious purposes.

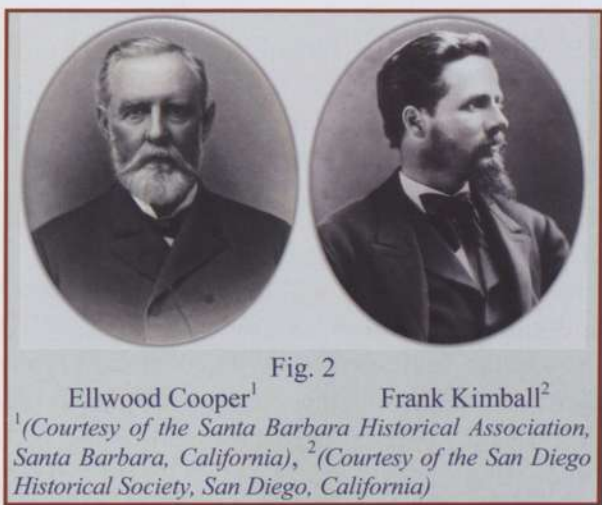
The first documented information about locally grown olive trees in California was in 1803. The director of the Franciscan's missions, Father Fermín Francisco LaSuen, recorded that for the first time they used oil from their own trees for baptism in the San Diego mission. This brief history gives the most important reason the friars planted olive trees: liturgical. They also needed the oil for cooking, lighting, soap and in a few cases to process the wool from their sheep.

The first commercial olive oil mill was most likely established in Ventura County, at Rancho Camulos, in 1871. Unable to compete with low-priced oil from Europe, the California olive industry turned its attention to table olive production around 1900. Table olives then dominated the domestic olive scene for over three-quarters of a century.



The history of olive growing in the United States is embedded in the history of California. Apart from a very small area of Arizona, the entire olive industry is concentrated in the state of California. The principal reason for this is the climate. All attempts to grow olives commercially in other states failed, even one by such a distinguished agronomist as Thomas Jefferson in Virginia, in this case because the cold winters destroyed the trees. He tried to do this at the end of the 18th century and beginning of the 19th. A recent tour of the current attempts to develop oil olives in two states south of Virginia, Georgia and Florida, confirmed the climate of the southeastern United States is unsuitable for olive production. The mild winters punctuated by sharp freezes defoliate the olives and the spring rains prevent pollination. It is possible to grow an olive tree but not produce fruit (Ferguson, personal communication).

Modern olive cultivation began in California in 1868 as the result of the efforts of two outstanding individuals. The 1848 gold rush had brought more than 100,000 people to California over a two year period. Feeding them all posed a huge challenge. The missions were the sole places where crops could be grown but they were completely derelict by then. Once Mexico became independent of Spain in 1822 and disestablished the Franciscans in



1834, no one was left to manage the mission lands. In spite of total abandonment and neglect the olive trees survived. A few Spanish and Italian immigrants collected the olives and made their own oil on a family scale but two Yankee men, Ellwood Cooper and Frank Kimball, both decided to tap this resource on a large scale in 1868 (Fig. 2).

Cooper obtained land in Goleta and set out thousands of olive cuttings from the Santa Barbara mission. Kimball bought the Rancho Nacional outside San Diego. He took cuttings from the trees at the San Diego mission. The trees were planted 187 to 240 per hectare, current practice at the time. Given that olive culture is a Mediterranean tradition it is slightly counterintuitive that two “Anglo” men should be the pioneers. All the trees in the state were thought to be clones of the initial material sent from Spain in 1531, ‘Cornicabra-Cornezuelo’, now known as the ‘Mission’ olive. Modern examinations using molecular biology now show that these conclusions were not correct. Cooper and Kimball’s success led to increasing interest in olive crops and was a reason new cultivars were introduced.

The next major step was taken by a German, Frederick Pohndorff, a cellar-man at the Dreyfus winery in San Francisco. He was travelling in Spain to find more suitable grapes for his employer and came across the 'Manzanillo' olive in the same area. He realized that if the olives succeeded in the wine regions of Spain they would also do very well in the similar terrain of California. Starting in 1874 olive growers in California imported both 'Manzanillo 1' and 'Manzanillo 2' olive trees in large quantities. Pohndorff also recognized the value of the big fleshy 'Sevillano' for the table olive industry. Within 20 years the 'Manzanillo' and 'Sevillano' were equally as common as the 'Mission' olive in California and in fact the 'Manzanillo' was more frequently planted. By 1885, 800 ha were devoted to olive growing (Wickson, 1889).

Since then more than 150 olive cultivars have been imported into California but only a few of the newer imports became useful commercially, like the 'Ascolano', the 'Barouni', the 'Picholine' and the fruitless 'Swan Hill' for landscape use (Taylor, 2000). The federal government carefully preserves all the others to make certain that as many of them as possible remain viable in the event of a catastrophe requiring a completely fresh start.

At the end of the 19th century there was a very unrealistic and optimistic attitude about growing olives in California. This turned out to be unwarranted. The olive's antiquity and its Biblical connection gave the tree an aura of romance and clouded people's judgment. Growing olives was encouraged by ministers of the church and seemed to be somehow godly but alas, the reality was rather different. Although the industry originally developed to produce olive oil, that tapered off very sharply at the end of the 19th century and was overtaken by the production of table olives. After the first flush of enthusiasm, oil was made from table olive rejects and of poor quality. That failing has now been corrected. In 2012 the amount of land devoted to growing table and oil olives in California is almost equal at approximately 10,000 ha each.

The recent California olive-oil renaissance began in the late 1980's when a small number of growers began to produce high-quality olive oil for the gourmet market. For the first time in many years, olives were planted specifically for oil. In 1999 a radical new system was introduced. This involved "super high density" planting of between 1,675 and 2,250 trees/ha: 'Arbequina', 'Koroneiki' and 'Arbosana' were now the most frequent olive oil cultivars in California. The new cultivars were chosen because they had a long tradition of producing oil of a very high quality plus being considered adapted to this new super high density model orchard (Sturzenberger, 2009).

AREA UNDER OLIVE CULTIVATION

Table olive growing in California started in the northern Sacramento Valley and later spread to the southern San Joaquin Valley. It has always been confined to



these extremes of California's Central Valley. The counties of Glenn, Tehama and Butte in the northern Sacramento Valley and Madera, Fresno, Tulare and Kings in the southern San Joaquin Valley were the centers of table olive production. Table olives processing has decreased over the past 50 years until there are now only two major canneries in California. The major reason for this decrease is the inability to compete globally using manual labor for pruning and harvesting. Interestingly, it is the ability to prune and harvest the new oil cultivars mechanically that has precipitated their recent increase in California.

Before 1999 most of the trees were the table cultivars Mission and Manzanillo and the 'Manzanillo' pollenizer, 'Sevillano' and the Italians 'Frantoio', 'Leccino', and 'Pendolino' for oil, but the last six and particularly the last three years before 2004 have been dominated by the Spanish 'Arbequina' and 'Arbosana' and the Greek 'Koroneiki' suitable for super-high-density planting and oil production (Vossen and Davarenne, 2004).

The leading olive oil producing counties have many mature table cultivar orchards in full production that have traditionally provided a significant amount of California's olive oil. Butte County was also the first to plant significant acreage into the super-high-density system, which is reflected in its production.

OLIVE CULTIVARS

'Manzanillo' (Fig. 3), California's most popular table olive cultivar, is harvested physiologically immature and green, then processed into the "California black ripe" olive, Green ripe or "Spanish style" processing is a very small part of California's production. The differences between 'Manzanillo No 1' and 'Manzanillo No 2' are minuscule. It is not completely clear which one became dominant in California but more probably it is 'Manzanillo No 2'. It is a large rounded-oval fruit averaging 4.8 g. The most popular size for canning ranges from 4.0-5.5 g. It has a flesh to pit ratio of 8.2. Though not commonly used for oil it is 20.3% oil by weight. 'Manzanillo' is not tolerant of cold winter temperatures and therefore is produced primarily in the southern San Joaquin Valley counties of Tulare, Fresno and Kings. Though the winter temperatures further south would also produce good olives susceptibility of this cultivar to the soil borne fungus *Verticillium wilt* (*Verticillium dahliae*) precludes production south of Kings County.



Fig. 3
A 'Manzanillo' and B 'Sevillano'
olives (Cover of the George
P. Roeding catalogue California, 1909)

‘Sevillano’ (Fig. 3, previous page) is the second most popular table olive cultivar in California and the pollinizer for ‘Manzanillo’. It is the largest of the table olive cultivars averaging 13.5 g and has a flesh to pit ratio of 7.3. While it makes gold olive oil it has a low oil content, 14% by weight. It is intermediate in cold tolerance being more cold-hardy than the ‘Manzanillo’ but less cold-hardy than the Mission cultivar. It is planted mainly in northern California. It is resistant to peacock spot fungus (*Spliocaea oleagina*) but not to the olive knot (*Pseudomonas savastanoi*). It also has physiological disorders which results in the styler end of the fruit softening, “soft-nose”, a splitting of the pit and the parthenocarpic fruit set called “shotberry”.

‘Mission’ is a medium-sized (4.1 g), oval fruit cultivar, used both for table olives and oil. It has the lowest flesh to pit ratio of the commercial table cultivars (6.5) but the highest oil content (21.8%). It is grown primarily in the northern California table olive production counties of Glenn, Tehama and Butte as it is the most cold resistant of the table cultivars. Most of the ‘Mission’ trees have been grafted with more favorable table cultivars. It is susceptible to peacock spot and olive knot.

‘Arbequina’ is a recently imported olive oil cultivar to California. It is rather hardy and can thrive in saline soils and cold temperatures. (Barranco Navero *et al.*, 2000).

IMPACT ON ECONOMY AND ENVIRONMENT

When commercial olive growing began in California the market was very fragmented. French, Italian, Spanish, South American and a few Greek or Middle Eastern immigrants used olive oil in daily life but the dominant Northern European immigrants did not. Gold, followed by wheat and cattle hides, were the principal commodities in the state, driving all business activities. The basic necessities for a modern market economy such as banks, railroads, and distribution systems were still in the formative stages.

During the last quarter of the nineteenth century all this fell into place and California olive oil became more widely available. Up until then the small immigrant populations had imported their oil from Europe. Local oil was quite expensive because of higher fixed costs. As soon as California oil appeared to be successful the European exporters responded to this threat by reducing their prices and flooding the California market with much cheaper oil. Unbridled adulteration with cheaper substitutes was another serious problem. This was also the time at which Dr. Wesson refined the very unpleasant cotton-seed oil, making it blandly edible. These cheap substitutes, collectively known as “salad oil”, had a very serious effect on the market for California olive oil.

At no time has California olive oil been able to compete on price with European, North African or Middle Eastern sources. The growers circumvent that problem by focusing on producing an oil of exceptional quality in a specialized niche.



The impact of olive growing in California on the environment has only been recognized fairly recently. The most serious impact of the olive industry on the environment is the processing of table olives. This uses more salt than even the cucumber pickling industry. Getting rid of the excess saline in a responsible manner is a very big challenge. The industry sponsors research into methods which reduce the amount of salt needed to produce an acceptable olive as well as methods to remove it afterwards. The environmental impact of the olive oil industry is less significant. Neither the watery effluent nor the mass of discarded crushed fruit poses too many difficulties. The remains of the crushed fruit can be recycled as fertilizer.

INHERITED RIGHT AND WRONG CULTURAL PRACTICES

The first olive growers in California were missionaries, mainly priests and educated men, not farmers. Their leader, Father Junípero Serra, had grown up on a farm in Majorca (Spain) but he could not devote himself to agricultural work. The friars at the missions learned their farming from antique texts, some of them dating back to Roman times. *Agricultura General* by Alonso de Herrera was written in 1513 in Spain. This text had been faithfully reprinted time after time, starting in the 16th century. It says a lot about the antiquity of olive culture that these techniques still worked unchanged in the California missions 200 years later.

Cooper and Kimball were businessmen and only had broad general knowledge of farming and agriculture. They had their critics. Dean E.J. Wickson of the College of Agriculture was not impressed by the scrawny little cuttings, set out in long rows. He dismissed them as “factory farms” but as he had begun life as a dairyman his opinion was not too troubling.

The missionaries were not concerned about yield. The slow growth of the trees



Fig. 4
Hand picking table olives
(Courtesy of Louise Ferguson)

and the long interval before they could get a sufficient crop to press for oil did not bother them. Wide spacing has been shown to give each tree a better opportunity to reach the sparsely available groundwater (Kearney, 1908). The use of irrigation in the summers and closer spacing of the trees led to improved yields. Very recent changes stem from the introduction of modern concentrated orchard management, based on mechanical harvesting. Table olives have been

traditionally harvested by hand in California (Fig. 4), at extremely high cost as it represents from 50 to 75% of production costs and consumes nearly 50% of the overall revenue.

Even using gangs of immigrants, starting with the Japanese a century ago, and currently Hispanics from Central and South America the labor is still too costly. With the ever growing cost and scarcity of hand labor in the USA and other countries, efforts to adapt mechanical harvesting became crucial. In the 1940's in California and in the 1960's in Europe experiments began to adapt methods used in other trees such as ground sweeping, hand held combing and limb shaking devices, trunk shakers (Fig. 5, left), double or single sided picking head mechanisms, and straddle type harvesters (Fig. 5, right) used for bush and vine harvesters. All such machines still have negative effects on the quality of the fruit and the results, as a body, are extremely variable. Mechanical harvesting of olives is slowly gaining ground in most of the major production areas of the world with research for development moving faster than ever. In California research is concentrating currently on harvesting table olives.



Fig. 5

Trunk shaker and Argentinian-Australian straddle harvester

(Courtesy of Louise Ferguson)

Until the middle of the 20th century the systems more frequently used for olive propagation were the rooting of hardwood cuttings of different lengths and grafting seedlings. In California those cuttings used to be 20-30 cm long, with a thickness of around 2.5 cm, taken from two- or three-year-old wood. Longer and thicker hardwood cuttings were also divided into 30 cm long truncheons that were placed horizontally in the nursery, around 20 cm deep. The grafting procedure needed some years to prepare a nursery tree, starting by sowing the seeds and grafting the resulting seedlings one or two years after germination, needing some two to three more years to produce a nursery tree.

The important contribution of Professor Hudson T. Hartmann (Fig. 6, next page) at the University of California at Davis to this technique was to root 10-15 cm long semi-hardwood cuttings, taken from previous- or current-year wood, thus having leaves, from 2 to 6 in their upper ends. This revolutionary advance was due to the advent of the automatic mist propagation system at the middle of the 20th

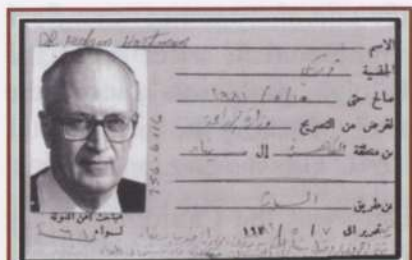


Fig. 6³⁸

Professor Hudson T. Hartmann
(Courtesy of Mrs. Hazel Hartmann)

century, allowing the leaves to remain alive during the two months needed for the cuttings to root. The leaves survived because they were misted frequently whenever they became too dry. One nursery tree ready to be planted in the orchard is obtained by growing the rooted softwood cuttings for one growing season (Fig. 7, left).

Since ‘Sevillano’ pollen was proved to help in pollinating ‘Manzanillo’ trees this practice is widely applied both in California and México by blowing it onto the trees to increase fruit set (Fig. 7, right).



Fig. 7

Left to right: One-year-old olive nursery trees produced by rooting semi-hardwood cuttings under mist and application of olive pollen (Courtesy of Steve Sibbett)

PROCESSING METHODS OF RAW OLIVES

The University of California was founded in 1868. The newly appointed dean of the new College of Agriculture at the new University of California was the very prominent and well-respected German scientist Eugene Hilgard. He recognized that the olive industry was becoming important and appointed several experts to his faculty. Hilgard himself promoted a good way to cure table olives, based on frequent changes of water to leach out the bitter anthocyanins. Hilgard was more interested in table olives than olive oil. Table olives needed impeccable fruit of high quality. Preserving them properly was a priority. At that time oil was made from all sorts of rejects and was therefore not considered to be an important scientific topic. The university led the way scientifically with research into pickling the fruit and canning them safely.

³⁸ A travel pass issued to Prof. Hartmann by the Egyptian Government in May 1981 to facilitate his mission while he was investigating to formulate the “Agriculture Development System Project” known as the “California Project 1982-1986” which was funded by the U.S. Agency for International Development (USAID) as a collaboration project between the Egyptian Ministry of Agriculture, and the University of California. Through this project and the efforts of Prof. Hartmann and his team including U.C Farm Advisor Steve Sibbett, Egypt entered a new area of olive propagation and cultivation on a large scale.

When the botulism epidemics struck, in 1919, the university issued very clear instructions on how to prevent this from happening. Botulism arises when the preservative is alkaline rather than acid. The early olive processors packed the olives in glass jars and did not sterilize them adequately. Packing the pickled fruit in metal cans and heating the sealed cans to above 116° C kills the botulinus spores.

California's main contribution to the olive industry was the California "black olive". Green fruit were treated with lye to remove the source of its bitterness, mainly oleuropein. Then the fruit is oxidized by blowing air into the preserving brine in which they are contained. This makes the olives turn black, simulating the color of a truly ripe olive.

RECIPES WITH OLIVE OIL IN COOKING

Cooking with olive oil is as old as human history itself and ethnic cuisines developed in isolation from each other. Vast numbers of dishes used this ingredient together with the foods local to the specific region. Modern travel has erased these divisions, enabling anyone to cook in whatever style they chose.

The culinary traditions of California reflect the makeup of its population, derived from all countries of the globe. Selecting any one set of recipes is thus an arbitrary act but in this context the work of Gemma Sciabica is most apposite. The Sciabica family emigrated from the Marsala city of Sicily in 1911. Nicola Sciabica finally settled in Modesto, California and built a house next to his vineyards and peach orchard in the 1920's. The house is still there and the family still lives in it.

His son Joseph took over the business and married Gemma Sanita in 1943. They celebrated their golden wedding in 1993 (Fig. 8). The author had the great privilege of joining the family for lunch while doing the research for her book (Taylor, 2000) Other remarkable families such as the Obertis and the Fusanos also made olive oil and had successful businesses.



Fig. 8

Joseph and Gemma Sciabica with their sons
on their golden wedding in 1993
(Courtesy of Gemma Sciabica)

Gemma published three recipe books promoting the use of olive oil. The most unusual was for a cake made unexpectedly with olive oil rather than the more usual butter. She is permitting me to reproduce two of her recipes below. Today every newspaper cooking section offers recipes for sweet confections made with olive oil but when Gemma Sciabica introduced her ideas it was not yet widespread.

➤ **Lemon sponge cake** (Fig. 9):

Ingredients for 12 servings: 6 eggs at room temperature, separated, 1 cup flour, 1 cup sugar, 1 teaspoon baking powder, ½ teaspoon salt, 2 tablespoons very mildly flavored olive oil, grated peel of 1 lemon, ¼ cup lemon juice.

Method: Preheat oven to 177° C, beat the 6 egg whites till foamy. Add ½ cup of the sugar gradually, beating until stiff peaks form. In a separate bowl combine the rest of the sugar, the flour, baking powder and salt. Make a well in the center. Stir in the egg yolks, olive oil, lemon juice and lemon peel. Blend until smooth. Carefully fold the beaten egg white mixture into the batter until they are combined. Do not stir or beat. Pour this batter into an ungreased 10x4 inch spring form pan. Bake between 40 and 50 minutes or until the center of the cake springs back when gently pressed. Cool by turning the cake upside down, suspended over the edges of 2 large cans. When completely cool remove the cake from the baking pan.

➤ **Baked polenta:**

Ingredients for six servings: 1 cup polenta, 4 cups fat free broth, chicken or beef, or water, salt and pepper to taste, 2 tablespoons olive oil, ¾ cup shredded Provolone romano, or mozzarella cheese for garnish.

Method: Pre heat oven to 177° C. Lightly grease a 24x35x8 cm baking dish. Combine all the ingredients except for the cheese in the prepared dish and bake for about 40 to 50 minutes. Stir 2 or 3 times while it bakes. The polenta is ready when all the liquid has been absorbed. Sprinkle with the cheese before serving.



Fig. 9
Cakes made with olive oil
(Courtesy of Gemma Sciabica)

OLIVES IN TOURISM AND LANDSCAPING

The Central Valley in California has two components: the Sacramento Valley in the North and the San Joaquin Valley in the South. Toward the northern end of the Sacramento valley, the town of Corning bills itself as the “olive capital of the world”. This is a very impressive claim for a town with only one traffic light. People travelling north through California to Oregon pass close to Corning. Once they are there enterprising shopkeepers offer olive tastings, olive souvenirs and a choice of olive oils.

This is the legacy of a promotional genius, Warren Woodson. Woodson was a very religious real estate broker who wanted to take advantage of the huge westward movement of the American population after the railroads were established. He had the brilliant idea of offering smallholdings in Corning with orchards on them. His other clever idea was to advertise his lots in church magazines across the country, somehow conveying the impression that his orchards were Biblical.

Woodson bought the cheapest fruit trees he could find and did not pay close attention to what he was buying. He did not even realize there were ‘Manzanillo’

olive trees among them. All the other trees died from neglect but the olive trees survived. He thus established a considerable olive industry in the town. Nowadays California's olive orchards are split between the northern Sacramento Valley counties and the warmer San Joaquin Valley in the south.



Fig. 10
A boulevard in Davis,
Yolo County
(Courtesy of Essam Agami)

In some counties of California as well as in other parts of the country, olive trees are used for landscaping (Fig. 10). This is because the olive tree has attractive, grey-green foliage, and develops a picturesque, gnarled trunk and branch system as the tree grows older. It is used as a street, lawn, or *patio* tree and many people grow them in their back yards to enjoy their home-made olive pickles. However some would prefer the “fruitless” ‘Swan Hill’ which produces staminate, or male flowers only. This cultivar originated in Australia in the 1930’s from a seedlings population and only one tree was “fruitless”, apparently as a genetic characteristic; the failure of the pistil (female part of the flower) to develop normally.

ACKNOWLEDGEMENTS

The author is grateful to Louise Ferguson, Juan M. Caballero, Axel Borg, Darrell Corti, Nicole Sturzenberger, Kiley Athanasiou, Dan Flynn, Dan Sciabica, Gemma Sciabica and Steve Sibbett for their assistance.

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INTRODUCTION

With 24 million inhabitants, Yemen is located in South-west Asia between latitude 12° and 20° N and longitude 41° and 54° E (Fig. 1). It is bordered by Saudi Arabia on the north, Sultanate of Oman on the east, Arabian Sea and Gulf of Aden on the south and the Red Sea on the west. The total area of the country is about 555,000 km² with a long coastline of 1,906 km. The terrain in Yemen is characterized by narrow coastal plain backed by flat-topped hills and rugged mountains; dissected upland desert plains in the center, sloped into the desert interior of the Arabian Peninsula. The highest point in Yemen is Jabal an-Nabi Shu'ayb with 3,760 m above sea level.

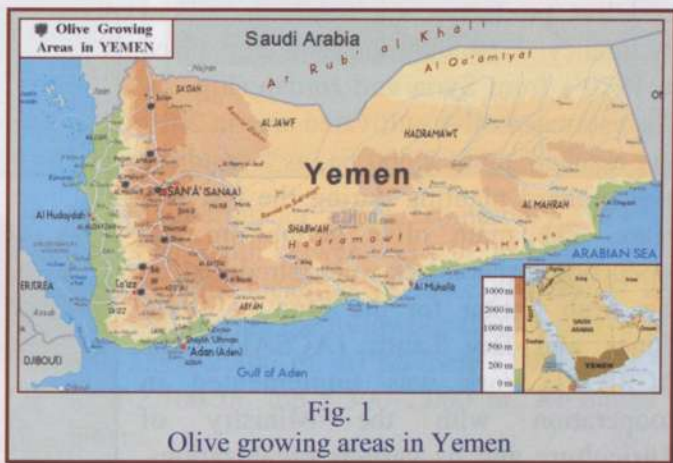


Fig. 1
Olive growing areas in Yemen

Average rainfall ranges from 50 to 800 mm with the highland areas receiving more rain, which falls in two seasons; the first is April-May and the second is July-August and sometimes slightly later. Temperature depends on the elevation too; the coastal and desert areas are hot and temperature may reach more than 40° C, while the highlands are much cooler and frosts are very common.

The contribution of the agricultural sector in Yemen to the total gross domestic product of the country is about 20% while employing around 54% of the total workforce. The population majority resides in rural areas and work in agriculture or agricultural related activities. Most of the fertile soil in the country is located in the West (Sana'a, Dhamar, Taiz, Hodidah, Abyan, Amran, Lahj, Bayda) and because of the rough terrain, the total agricultural area is limited, estimated at 1,668,858 ha, of which, 1,132,910 ha (68%) is cultivated while the uncultivated area is 535,948 ha (32%). Out of the total cultivated area 47% is rain-fed, 38% is irrigated via wells, 4% is irrigated from underground water via wells, and 11% is flood irrigated. The arable land is divided in 1,115,515 fragmented holdings.



Despite its small cultivated area, Yemen has a very diverse crop production system due to the various agroclimatological zones in the country. Fruit trees, such as dates, mango, guava, banana, are widely cultivated in the coastal areas; in mid elevations of 1000-2000 m subtropical fruits such as citrus, coffee (*C. Arabica*), which is indigenous to the Yemeni Mountains) are encountered; then in higher elevations, deciduous fruit trees such as grape, almond, peach, apricot, and olive are grown. Due to huge variation in altitude on the mountain ridge, it is not uncommon to see all the aforementioned fruit trees within a 50-km drive or even less; depending on the topography of the area.

OLIVE CULTIVATION HISTORY

Olive production in Yemen is still in its infancy. First introductions took place in 1970's from Syria and Jordan (Fig. 2). The estimated olive cultivated area in 2010 had reached about 2,000 ha, as a result of new orchard planting during the last few years. The main olive germplasm and production technologies were introduced by the Arab Center for the Study of Arid Zones and Dry Lands (ACSAD). The ACSAD's work was implemented in cooperation with the Ministry of Agriculture and its various organizations. In support of these endeavors, experimental orchards have been established for research purposes.



Fig. 2
First planted olive trees in the
"Revolution Park" in the capital Sana'a

Following the success of the first and subsequent experimental orchards (Fig. 3), in 2005 the Yemeni Government selected olive as one of the country's five strategic crops to be given priority. This has led many donors and non governmental organizations to work in the various aspects of oleiculture. Therefore, rapid expansion took place in the targeted mountainous zone at 1,500 m altitude, and higher, where the trees may get sufficient chilling covering water requirements with rainfall. Because Yemen is suffering from



Fig. 3
Recent experimental orchard of
the Agriculture Research Authority

severe water shortages, olive cultivation could play a crucial role in sustained agricultural production due to its low water requirements. As the topographical

nature of the country is rough, olive could also be planted on terraces to prevent soil erosion and will allow for intercropping on such terrains (Fig. 4 and 5).



Fig. 4
Olive trees planted at altitude of
2,400 m, behind a rainfall harvesting dyke



Fig. 5
Olive tree planted
on the fringe of an alfalfa field

Unlike olive cultivation in the Mediterranean basin, commonly between latitudes 30° and 45° N, in Yemen it is far south between $13^{\circ} 30'$ and $14^{\circ} 42'$ N, however on much higher altitudes. The eight locations of olive plantations are predominantly on the main mountain ridges having the following altitude above sea level: Sa'adah 1,800-1,900 m, Amran 2,000-2,400 m, Al Mahwit 1,800-2,000 m, Sana'a 2,000-2,400 m, Dahmar 2,000-2,700 m, Ibb 1,800-2,000 m, Al Bayad'a 2,000-2,400 m and Ta'izz 1,500-2,200 m.

OLIVE CULTIVARS

Many olive cultivars have been introduced since 1977 showing different levels of adaptability to the local conditions. The well adapted cultivars are the Syrian 'Khodaire', 'Rosaiee' and 'Kaisse', the Palestinian-Jordanian 'Nabali', the Moroccan 'Picholine' and the Spanish 'Manzanillo'. However, their performance under the various agro-climatic zones, having great differences, is not yet fully understood and in certain cases some of them may not produce. Signs of insufficient chilling are apparent in many cultivars, like the Syrian 'Jlot'. Many Jordanian cultivars such as 'Jabaa', 'Baladi' and 'Jrosad' have not yet produced fruits, although they were planted in the 1980's. Meanwhile, some 10 year old unidentified cultivars produce more than 80 kg of fruit per tree.

CULTURAL PRACTICES

With a limited history of olive cultivation, almost all cultural practices implemented for growing olives in Yemen are acquired through training by ACSAD, while postharvest processing technology is still lacking in the country. Most of the olives are processed as table olives at the household level. The route for developing an integrated olive industry in Yemen is still a long way ahead; as comprehensive

evaluation and studies are still needed to select the most appropriate cultivars and introduce the right cultural practices, along with the development of small-scale olive processing units.

OLIVES IN NATIONAL TRADITIONS

Yemenis respect the olive tree because God mentioned it in the Islamic Holy Book, Al-Qur'ān "القرآن"; therefore people plant the tree in their back yards, farms, schools and even sometimes in locations not suitable for olive production. Both olive oil and table olive consumption have increased during the last two decades due to the growing public awareness of their dietary and health benefits. Therefore, unlike never before, grocery shops and large supermarkets have olive oil on their shelves (Fig. 6) imported from different countries like Syria, Tunisia, Turkey and Spain. However, per capita consumption is still low, probably due to the high price of the product. Traditionally many people used olive oil for treating joint pain, constipation and as a skin moisturizer. It is also used as a hair cream for smoothing and to prevent hair fall and dandruff. Olive leaf tea is used by some to control stomach acidity.



Fig. 6
Olive oil on supermarket shelves
(a new phenomenon in Yemen)

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A Glimpse about AARINENA

Association of Agricultural Research Institutions in the Near East and North Africa

Established in 1985, the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA) is an autonomous body and a platform for agricultural research and innovation in the West Asia and North Africa (WANA) region, created in accordance with the recommendations of the 14th and the 16th FAO Regional Ministerial Conferences.

AARINENA includes five sub-regions: 1) Arabian Peninsula (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE); 2) Maghreb (Algeria, Libya, Malta, Mauritania, Morocco, Tunisia); 3) Mashreq (Cyprus, Iraq, Jordan, Lebanon, Palestinian Authority, Syria); 4) Nile Valley & Red Sea (Djibouti, Egypt, Sudan, Somalia, Yemen); 5) West Asia (Iran, Pakistan, Turkey).

AARINENA main goal is: a) to act as an instrument of change for strengthening national and regional agricultural research capacities in order to reverse the downward trends in agricultural productivity and the deterioration of the natural resources. b) to contribute to the enhancement of agricultural and rural development in member countries through fostering agricultural research and technology development and c) to assist member countries in creating effective national agricultural research systems that serve the goals of sustainable agricultural development, as well as strengthening regional and sub-regional scientific collaboration.

In accordance with this goal, the association has acted as a collaborator and partner with other relevant regional and international institutions and recognized by the Global Forum on Agricultural Research (GFAR) and the Consultative Group on International Agricultural Research (CGIAR) as an important and formal regional association representing the WANA region in global research community.

To achieve AARINENA objectives, the Association identified several tools and actions to strengthen cooperation among members and stakeholders including: 1) The establishment of seven Regional Technical Networks on: Date-Palm, Cotton, Olive, Medicinal Plants, Water Use Efficiency, Agricultural Biotechnology and Plant Genetic Resources; in addition of the establishment of Consortium of Farmer Organizations with the aim of reducing duplicative efforts among national institutions in several countries and to provide a cost-effective instrument for information exchange and institution building; 2) Regional Agricultural Information Systems (RAIS) established and developed to increase the effectiveness of the agricultural research in the region. AARINENA RAIS Steering Committee was established with the support of GFAR, FAO and ICARDA with the aim to strengthen RAIS in the region. The National Agricultural Research Information Management System (NARIMS) and Near East and North Africa Rural and Agricultural Knowledge and Information Network (NERAKIN) were also established as information platforms to strengthen the capacity of the Agricultural Research Centers (ARC) and for knowledge sharing and collaboration for ARD; 3) AARINENA Website (www.aarinena.org) launched to be a gateway to as many information resources, to share information related to agricultural research and innovation for development, 4) to develop collective capacities of its stakeholders by integrating and transforming agricultural knowledge into innovative practices. AARINENA in collaboration with its partners (GFAR, FAO, ICARDA, BI and IFPRI), organized a wide range of meetings, workshops, symposiums, seminars, and training courses in different agricultural research for development. Proceedings of such events are published and documented on AARINENA website and in the newsletter along with the publication of success stories.



A Glimpse about IOC

International Olive Council

The International Olive Council (IOC) is the world's only international intergovernmental organisation in the field of olive oil and table olives. It was set up in Madrid, Spain, in 1959, under the auspices of the United Nations.

The Council is a decisive player in contributing to the sustainable and responsible development of olive growing and serves as a world forum for discussing policy making issues and tackling present and future challenges. It does so through four main fields of activity:

- **Statistics and economic studies.** Like other similar organisations, it produces world statistics on production, consumption, stocks, imports and exports compiled from data provided by its member countries and it conducts economic studies on subjects requested by the IOC Members.
- **International trade standards.** Unlike other similar organisations, the IOC is mandated to draw up and update international trade standards for olives and olive oils incorporating both chemical and sensory criteria. The IOC Members apply these rules in their international trade, which represents an aggregate 98 per cent of olive oil and table olive exports on the world market. This explains why the IOC works so closely with other international standards organisations such as the International Organisation for Standardisation (ISO) or the Codex Alimentarius Commission.
- **Technical assistance.** The aim in this sphere is to provide Members with customised help to raise the quality of the olive oil and table olives they produce. To do so, the IOC encourages international technical cooperation in research and development projects, training, the transfer of technology (with the focus on enhancing the environmental impact of technology) and the identification and conservation of genetic olive resources.
- **Promotion.** Assisting Members with their national promotion campaigns, nurturing media relations through media tours and best article competitions and running promotional campaigns in target importer countries selected by the Members on the basis of prior market research are just some of the ways in which the IOC helps to increase the number of olive and olive oil consumers around the world and to enhance their awareness of these products.

Also, besides meeting with the official representatives of its Members' governments, the IOC has also built up a close partnership with the private sector via an Advisory Committee.

Its current Members (Albania, Algeria, Argentina, Croatia, Egypt, European Union, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Morocco, Montenegro, Syria, Tunisia and Turkey) include the leading international producers and exporters of olive oil and table olives. IOC producer Members account for 98% of world olive production and are concentrated primarily in the Mediterranean region.

The IOC is committed to the integrated, sustainable development of world olive growing. It attempts to translate this commitment into tangible advancement for its member countries and for all the people who earn their livelihood from the produce of the olive tree.



A Glimpse about ISHS

The International Society for Horticultural Science

Strengthening Worldwide Scientific Cooperation

The ISHS is a society of individuals, organizations, and governmental agencies devoted to horticultural research, education and industry to improve human wellbeing, dated from 1864 and formally constituted in 1959. The ISHS is composed of 7,000 Individual Members in 150 countries, 120 Institutional Members, and 60 Country Members (on all continents).

The scientific programme developed by the Society consists of about 50 symposia/year published in **Acta Horticulturae**. Other publications are **Chronica Horticulturae** quarterly ISHS member's magazine and **Scripta Horticulture**, publication series of special topics.

A quadrennial event -the **International Horticultural Congress (IHC)** - is organized with ISHS delegates discussing at global level all matters of interest for the horticultural sector. The hosting country is selected by secret vote by the representatives of the Country members. Next 29th IHC is scheduled in Australia in 2014 in Brisbane.

The Governance and Management of ISHS is led by five Board members and the Executive Director, supported by the Executive Committee (Section and Commission Chairs). Board and Executive Committee are elected each 4 years and are in office for a maximum of two mandates, only. Governance and Scientific activity is biannually submitted for approval to the Council consisting of Representatives of the Countries.

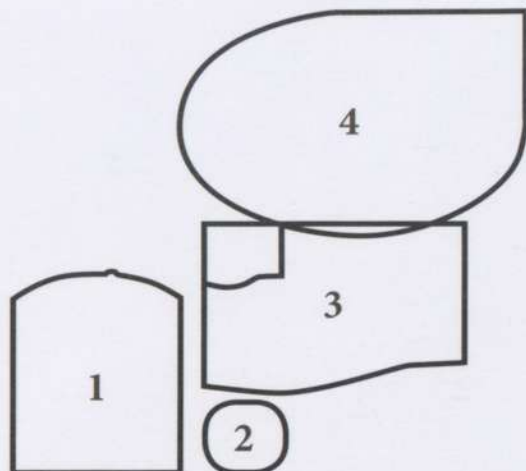
The ISHS scientific structure consists of Sections (*Medicinal and Aromatic Plants, Nuts and Mediterranean Climate Fruits, Ornamental Plants, Pome and Stone Fruits, Citrus, Root and Tuber Crops, Tropical and Subtropical Fruits, Vegetables, Vine and Berry Fruits, Banana and Plantain*) Commissions (*Biotechnology and Molecular Biology, Economics and Management, Education, Research Training and Consultancy, Horticultural Engineering, Irrigation and Plant Water Relations, Landscape and Urban Horticulture, Nomenclature and Cultivar Registration, Fruits and Vegetables and Health, Plant Genetic Resources, Plant Protection, Plant Substrates, Protected Cultivation, Quality and Post Harvest Horticulture, Sustainability in Integr. and Organic Horticulture*). Sections and Commissions are supported by 120 Working Groups. The chairs of Sections, Commissions and Working Group are appointed by vote each four years by e-mail or during the business meeting on site at the symposia. The Society is doing big efforts involving colleagues from developing countries in the activities of the Society. These are: discounts for Individual membership fees, and promoting more activities in countries of the South.

In conclusion the ISHS is the right 'trade'-union between scientists, farmers and horticultural stakeholders for promoting a free and fruitful



Photographs on the front cover:

1. Fig. 2, page 113.
2. Olive flower, courtesy of Steve Sibbett.
3. Fig. 4 page 31.
4. Fig 23 page 152.



Photographs on the back cover:

- Fig. 6, page 71.
- Fig. 10, page 109.
- Fig. 18 page 122.
- Fig. 14, page 135.
- Fig. 11, page 410.
- Fig. 13, page 206.
- Fig. 7 page 301.
- Fig. 16, top, page 401.
- Fig. 18, page 87.
- Fig. 17, page 86.
- Fig. 16, page 388.
- Stamps from different counties with olive trees and olive oil.
- Fig. 2, bottom, page 224.
- Fig. 2, page 34.
- Fig. 3, page 360.
- An old olive tree of 1500 years in Lebanon (Photo by Lamis Shalak).
- Fig. 2, page 95.
- Fig. 15, page 12.
- Fig. 15 page 12.
- Fig. 10 page 64.
- Fig. 23, page 377.
- Fig. 13,308.
- Fig. 12 page 65.

