
Promoting sustainable production and consumption patterns: the example of olive oil

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Report on the evaluation of the characteristics of olive oil production in Crete

(Summary)



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INTRODUCTION

Oliviculture has always been connected to the history of Crete and apparently dates back as far as 8.000 years. It is connected to the tradition, religion, art as well as the social and economic life of the inhabitants ever since civilization started leaving its mark on the island. Today, olive orchards constitute one of the most dominant elements in the natural environment of the island, covering 65% of the farming land, and offer employment to almost the majority of its farming families. Oliviculture together with tourism make up two of the most important economic resources in Crete. It offers a significant income to the island and constitutes an interesting and cherished activity to a large part of its inhabitants.

The aim of this study was to identify the problems, to come up with ways to take advantage of new possibilities-opportunities and to apply modern proposals – trends in the field of oliviculture.

The main topics of this study are:

- Identification and study of oliviculture systems.
- Assessment of the degradation risk (erosion-desertification) of the soil, water resources (nitrate contamination) and biodiversity involved in the cultivation practices applied in the pilot, olive oil producing area in the Municipal Unit of Mousouroi of the Municipality of Platanias.
- Collecting and assessing information on the applicable cultivation and post-harvest practices used in the production of olive oil.
- Exploring the possibility of adapting existing cultivation treatments to environmentally friendly management systems.

Data were collected from the study area through on-site observation and contacts with producers and organizations involved in oliviculture. Also, this study exploited the knowledge and experience gained from programmes that studied the cultivation of olive trees in Crete and took place in the Oliviculture Laboratory (and Post-Harvest Physiology of the Institute of Olive Trees and Subtropical Plants of Chania) in recent years. Moreover, data was used from the ECOIL project (ECOIL: life cycle analysis as a supporting decision making tool for ecological olive-oil production - LIFE 04/ENV/GR/00011; for more information visit the website: www.ecoil.tuc.gr).

The proposals mentioned in this study aim to the better preparation of olive orchards in Crete so that they may produce quality products through environmentally friendly management systems.

CURRENT SITUATION

Statistical data of olive trees and olive oil production in Crete

130.000.000 olive trees are grown in Greece with an annual production of approximately 250-300 thousand tons of olive oil. About 30 million olive trees are grown in Crete with an annual production of 100-120 thousand tons of olive oil. In the prefecture of Chania, 7.500.000 olive trees are grown, approximately 2.000.000 of which are of the *tsounati* cultivar (*mastoides*). The high-trunked, perennial *tsounati olive* trees are estimated at approximately 400.000 trees. (Data: Directorate of Agricultural Development of the Municipality of Chania). Below you will find a table listing the olive oil producers in the Olive Oil Integrated Management and Organic Production System.

Table 1: Olive oil production in Crete 2009-2010

Integrated Management Groups	No. of Integrated Management Group Members	Production of conventional olive oil (tn) 2009-2010	No. of organic producers 2009-2010
Prefecture of Chania			
VOUKOLIES M.U.	161		
KOLYMVARI M.U.	81		
PLATANIAS GROUP	110		
PLATANOS A.C.	118		
PALAI A ROUMATA A.C.	91		
MOUSOURON M.U.	133		
TOTAL: 6	694	16.355,58	316
Prefecture of Rethymno			
RETHYMNO A' U.A.C.	199		
MARI	95		
SELLIA	185		
HAMALEVRI	108		
AG. KONSTANTINOS	58		
ATSIPOPOULO	79		
ASOMATOS	69		
MYRTHIOS	115		
ERFOI	181		
ADELE	104		
ZOURIDI	40		
MYLOPOTAMOS B'U.A.C.	74		
TOTAL: 11	1307	1850	290
Prefecture of Lasithi			
MERAMVELOS	123		
SITIA	660		
AG. IOANNIS	29		
ORINO	59		
VASILIKI	47		
KOUTSOURAS	22		
TOTAL: 6	940	9.305,15	271
Prefecture of Heraklio			
SOKARA A.C.	341		
KEPEAN C.R.D.C.	365		
KASTEI A.C.	114		
ZAROS A.C.	38		
ASITES A.C.	134		
HERAKLIO U.A.C.	893		
MESSARA U.A.C.	400		
PANAGIA A.C.	69		
PEZA A.C.	111		
PEZA U.A.C.	101		
ASTEROUSIA A.C.	119		
NIPIDITOS A.C.	139		
TYMPAKI A.C.	34		
VIANNOS G.P.C.	674		
PHAESTOS	102		
TOTAL: 15	3.634	41.954,153	235

M.U. MUNICIPAL UNIT, A.C. AGRICULTURAL COOPERATIVE, U.A.C. UNION OF AGRICULTURAL COOPERATIVES, C.R.D.C. CENTRE FOR REGIONAL DEVELOPMENT OF CRETE, G.P.C. GENERAL PARTNERSHIP COMPANY.

Assessment of soil and water resources degradation in the pilot area of the Municipal Unit of Mousouroi of the Municipality of Platanias, Chania.

The study took place in the Municipal Unit of Mousouron of the Municipality of Platanias, Chania, Western Crete.



Figure 1. Study area-Western Crete (Chania – Mousouron region)

Source: Google Earth

The cultivation practice of no-tillage or minimum tillage reduces the risk of erosion, desertification and water contamination in perennial crops such as olive orchards. The overgrazing of pastures increases the potential and actual risk of soil erosion and degradation. Olive orchards, the dominant crop type in the region of Mousouron, present a particularly high adaptability and resistance to long droughts, protect soil from erosion, support a remarkable biodiversity of flora and fauna and have reduced vulnerability to fire, compared with some natural ecosystems, protecting hilly / sloping terrains areas from desertification.

Characteristics of olive orchards in Crete: Cultivation systems, Cultivars, Problems.

Oliviculture systems are assessed against the following criteria:

- Olive cultivar
- Tree age
- Spacing and regularity of planting
- Size and configuration shape of trees
- Frequency and severity of pruning
- Harvesting method
- Soil management system
- Frequency and method of fertilization
- Pest, disease and weed control
- Existence of activities supplementary to oliviculture.

Semi-intensive and intensive systems are the two most important oliviculture systems encountered in the study area whereas conventional and organic cultivation systems are encountered at a smaller percentage.

Table 2 shows a summary of the characteristics of known oliviculture systems in Crete.

Table 2.: Characteristics of oliviculture systems in the study area					
Criteria	Traditional	Semi-intensive	Intensive	Organic	Integrated Management System
Gradient	Medium - high	Small- medium	Small-medium	Small-medium	
Tree age	>100 years old	>50 years old	10-50 years old		
Tree size	>8 m	5-8 m	<5 m		
Planting spacing	Irregular	Irregular	Irregular		
Planting density	5-8 trees/str	7-20 trees/str	20-30 trees/str		
Pruning	Rare	Medium	Systematic	Systematic	Systematic
Irrigation	Rare	Small percentage, drip irrigation	Yes, drip irrigation up to 270 m ³ /str/year	Usually yes	
Fertilization	Rare	Usually yes (every two years) Annual inorganic fertilization (50-60 kg/str/year) Mostly N, K and P, in smaller quantities Mg, B	Yes, annual inorganic fertilization (60-85 kg/str/year). Mostly N, K and P, in smaller quantities Mg, B	Manure/ Compost for soil improvement	Manure/Compost /chemical fertilization,
Pest & diseases management	Usually yes	Usually yes, chemical for management of problems (mainly <i>Bactrocera Oleae</i>)	Yes chemical for control of pests	Organic control	Organic/chemical control
Weeds control	Grazing/ chemical herbicides	Chemical herbicides /grazing/ cultivation (once per year)	Cultivation (1-2 a year) /chemical herbicides	Cultivation/ grazing/ mowing	Cultivation/ grazing/ mowing/ chemical herbicides

str= 1 stremma is equivalent to 1.000 square metres.

Traditional olive orchards (small inputs of agrochemicals and water, few interventions) are of great environmental value (biodiversity and landscape aesthetics, Fig. 2) and have limited negative effects on the environment. However, the majority of traditional olive orchards is not economically viable and is threatened by neglect.



Figure 2. "Old" olive trees in Heraklion (*Throumbolia*)

The combination of olive orchards with outdoor animal breeding occurs in the conventional cultivation system and should be not only protected but also promoted for environmental, social and economic reasons (Fig. 3).



Figure 3. Animal breeding is an important activity in the traditional olive orchard

The **semi-intensive system** (moderate inputs and interventions) resembles to some extent to the traditional system but it is more intensive and more economically and socially viable, namely it is less environmentally friendly.

The intensive cultivation system (intensive inputs and interventions) is economically viable but not environmentally friendly.

The outlook for **organic olive orchards** (non-chemical inputs, mild interventions) seems more optimistic and this is due to the increased interest of farmers and consumers to produce safe and environmentally friendly products.

This also applies to the **Integrated Management System** of olive orchards in Crete, which combines cultivation methods of the aforementioned systems in order to produce the best possible product – a cost-effective product with the lowest burden possible on the environment, natural and economic resources.

The most dominant **cultivar** in Crete is the Koroneiki cultivar; the Mastoides follows at a smaller percentage and finally, the Throumba cultivar at an even smaller percentage, whereas trees of the Kalamon table olive cultivar are found sporadically.

The principal enemies of olive trees in the region include the olive fruit fly (*Bactrocera oleae* Gmelin). The olive fruit fly is mainly treated with chemical sprays.

On sloping areas the presence of terraces or dry stone walls is evident. They are often not well maintained as cracks or subsidence were created over the years, decreasing their functionality, downgrading their cultural and historical value, and depicting an image of derelict land (Fig. 4).



Figure 4. Lack of maintenance is evident in the dry stone walls

Due to the intense relief of the area, special attention must be paid to avoid overgrazing and fires, which constitute two of the major factors of soil erosion and desertification in mountainous and hilly/mountainous areas.

Biodiversity of the olive orchards of Crete

Table 3 shows the taxonomic classes of the most common plant species that are found in the olive orchards of Crete.

Table 3. Botanical classification of plant species indicative of the biodiversity of Cretan olive orchards

Family	Species
Compositae	<i>Cichorium</i> spp., <i>Sonchus</i> sp., <i>Anthemis</i> sp., <i>Inula graveolens</i>
Leguminosae	<i>Trifolium</i> sp., <i>Vicia</i> sp.
Hypericaceae	<i>Hypericum crispum</i>
Umbelliferae	<i>Daucus</i> sp.
Graminae	<i>Cynodon dactylon</i> , <i>Phalaris</i> sp.
Oxalidaceae	<i>Oxalis</i> sp.
Rubiaceae	<i>Galium</i> sp.
Araceae	<i>Arum orientale</i> , <i>Arum arisarum</i>
Liliaceae	<i>Asphodelus</i> sp.
Malvaceae	<i>Malva</i> sp.
Cruciferae	<i>Capsela bursa-pastoris</i>
Rosaceae	<i>Poterium spinosum</i>

Post-harvesting treatments of the olive fruit

Harvesting period, harvesting and transportation means, storage period of the fruit before extraction, olive mills

Figure 5 shows the appropriate harvesting season for the *koroneiki* cultivar, depending on the average weight of fruit samples collected in lowland areas of Crete. Three types of fruit were used: small (0,4-0,8 g), medium-sized (0,8-1,2 g) and large (> 1,2 g). Typically, smaller fruits have a smaller ratio of flesh / kernel, they ripen later than the larger ones and the corresponding trees should be harvested later as shown in Fig. 5.

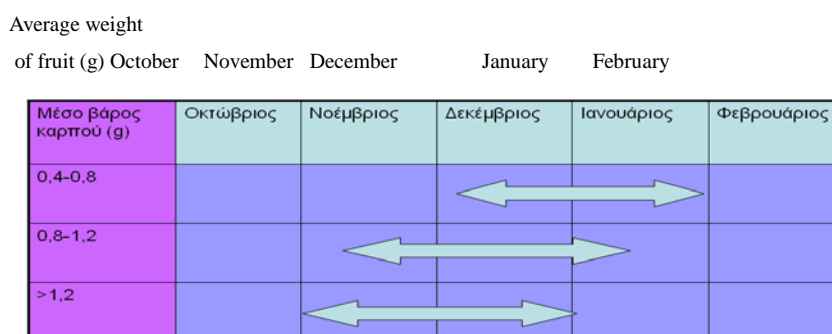


Figure 5. Recommended harvesting season of *Koroneiki* olive oil cultivar, depending on the average weight of the fruit in lowland areas of study in Crete.

The picking of the fruit using olive harvesters is currently the predominant method.

Olives are often transported in sacks under conditions of compression and decreased ventilation. They are also usually stored for several hours, which results in degradation of the produced olive oil.

Most of the olive mills in Crete use a 3-phase extraction process, fewer olives end up in 2-phase olive mills and conventional olive mills and the management of olive mill wastewater is made by evaporation ponds.

PDO-PGI olive oils in Crete

Olive oils of Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) are mentioned below.

PDO olive oils

- Viannos, Heraklion Crete
- North Mylopotamos, Rethymnon Crete
- Peza, Heraklion Crete
- Archanes, Heraklion Crete
- Kolymbari, Chania Crete
- Sitia, Lassithi Crete
- Crete Apokoronas
- Thrapsano, Extra virgin olive oil
- Selino Crete, Extra virgin olive oil

PGI olive oils

- Chania, Crete

SUMMARY OF PROPOSALS

Based on the aforementioned information, here are our proposals in brief:

- Actions to improve the productivity and economic viability of olive orchards such as: replacement of old trees by new more productive cultivars, with low cultivation cost, appropriate pruning of existing orchards etc.
- Application of cultivation practices on the soil taking into consideration its protection from degradation (erosion, desertification).
- Rational management of water resources based on actual needs.
- Rational fertilization based on analyses.

- Proper Plant Protection, in the appropriate season, based on sampling
- Promotion of the products.

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