Project Title

Towards a Common Quality Control and food chain traceability system for the Greek – Italian primary sector of activity

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INTRODUCTION

This research comes as part of the activities of the project "*Agroquality - Towards a Common Quality Control and Food Chain Traceability System for the Greek - Italian Primary Sector of Ativity*" funded by the European Territorial Cooperation Greece / Italy 2007/2013. The project is implemented by the Technological Education Institute of Epirus (TEI), the parent company, and the Municipality of Lecce, the Italian side.

The main objective of the project is to **develop an integrated management model to support the cultivation of the Olive.** To achieve this overall objective, the project intends to achieve the following specific objectives: to monitor the conditions of cultivation, develop and disseminate among producers and actors of the sector, a roadmap for a high quality and efficient cultivation of olives, to create a system in order to demonstrate the quality of products through quantitative measuring instruments, to help strengthen the market position of quality production. The approach used to achieve these **goals is based on the use of the best available technologies to support traditional crops of quality, in order to increase profitability and become competitive with industrial crops with higher environmental impact.**

This research work was also designed and built by the Municipality of Lecce in view of a first instrument focused on the popular reality of Salento.

Modern agro-industry productivity and competitiveness relies vastly and increasingly on the quality of the product, as well as from our ability to prove this with quantitative measures. Thus, the identification and timeless recordkeeping of the factors that influence the production, such as the cultivated species, the place of origin and its endemic characteristics (altitude, climate parameters, soil composition, etc.) becomes the ultimate sine qua non in modern agro-industry. The constant need and request for total tracking in the food chain also points towards the same direction.

Cooping with this and based on the outcome of previous co-funded efforts, the present introduces a platform and a methodology for the monitoring and record keeping of the factors that influence the quantity and the quality of olives and the major subproduct the olive oil, a traditional and high-interest cultivation in western Greece and South-Eastern Italy.

The whole of the Mediterranean area is traditionally characterised by olive growing. In effect, this specie is so common that its presence is one of the most evident characteristics of this geographic area and that it can be considered as an actual **biodiversity reservoir** both because so many varieties exist and because – being strictly linked to the territory in which the plants are cultivated – they favour an high level of biodiversity of the territories themselves. Moreover, olive growing is traditionally an environment-friendly cultivation since it usually does not affect the natural resources. Finally, olives and olive oil are valuable foods, having very positive effects on human health.

Traditional, environmental olive growing does not guarantee income: that is why, most of the farmers adopt cultivation techniques based on pesticides, with evidently negative effects on the environment. In order to strengthen the olive and its subproducts (i.e. olive oil) positioning in the European and Global market and enhance the performance of the invoked SMEs, the proposed project aims at developing a **model of the total management and control of the olive growing process.**

This document is part of the preliminary analysis of the set of studies and research that the team of the Municipality of Lecce, the Agroquality project partner, has put in place to detect and analyze the status of the olive-growing sector of the province of Lecce and the good practices applied to the cultivation of olives in the territory involved, in particular with regard to effects in the socio-economic and environmental impacts.

The ultimate goal of this phase is to compare the best practices identified by the lead partner, the Technological Education Institute (TEI) of Epirus, in Greece with those identified in the relevant area of the project.

The research work is divided into two sections:

A. Study of the context of reference
B. Analysis and methodology of detection of the Best Practices in the territory of reference

SECTION A

A. 1 The regional context analysis

Italy is the second largest producer of olive oil, after Spain. The Italian production model is mainly oriented towards **quality and variety**, and is based on a variety of small non-industrial oil mills, strongly rooted to the territory .

In Italy there are about 500 varieties of native olives and 41 oils-certified with the PDO (Protected Designation of Origin), of which 5 are from Puglia.

Another element that characterizes the national olive oil sector is the fact that Italy is configured as a net importer, since exports an average of 200-300 thousand tons of oil and imports 400-500 thousand tons. **The market is, however, distorted by speculative exercise to import low quality oil and sell it as Italian olive oil, but at a very low price**.

This situation in part is improving thanks to the regulatory requirement to state on the label the exact origin of extra virgin olive oil.

Puglia is one of the most important producing regions of the world and, for this reason, has a crucial position within the network of trades.

The results of this research reveal that the market structure has changed globally and show substantially a greater foreign competition as regards olive oils of lower quality. The two areas studied have reacted differently to the changes.

While Italy has tried to remain competitive by focusing on olive oil of superior quality and higher prices, Puglia has lost competitiveness in relation to exports of virgin olive oil and extra virgin olive oil. At the same time increased the import of extra virgin olive oil from Puglia, in spite of the excess of domestic supply.

Puglia boasts a wide variety of crops of different types of olives:

- Coratina
- Cellina of Nardò
- Ogliarola barese
- Ogliarola of Lecce,

- Bella of Cerignola
- Sant'Agostino
- Pizzuta
- Leccese
- Marinese
- Nasuta
- Peranzana
- Pisciottana.

The properties of the olive trees in Puglia is quite fragmented and intensive cultivation is not widespread. In addition, the olive groves are strongly rooted in the local culture and outline the regional landscape: the trees are very old (the "secular" are up to 250 years old) are also protected **by a regional law that regulates and limits the extirpation**.

In the region are distributed about **1,150 very small oil mills**: most of them produces less than a thousand tons of oil per year.

Considering **an annual regional production of 200 thousand tons**, you get an average production of less than 200 tons per farm: a very low value when compared, for example, with the industrial standards of Andalusia in Spain.

These data should be interpreted taking into account the structure of the entire production chain in Puglia: about 80% of the mills are "service providers" and not private entrepreneurs or cooperatives of production. This means that they do not work continuously producing their own oil, but they work stocks of olives on behalf of third parties to whom return "their" oil for own consumption or marketing.

This traditional way of producing homemade oil is certainly an impediment to the introduction of modern technologies, but also a condition for maintaining a wide variety of cultivars and high quality oils.

A.2 The provincial context analysis

Since ancient time, the olive has taken a considerable economic and social importance that deeply has concerned, almost the entire territory of the province of Lecce.

In this area of southern Puglia, the presence of the olive has ancient origins and important historical sites are in different districts Salento.

The austere presence of olive trees, unrivaled in beauty and size, is an obvious element of the agricultural history of this area which, by binding to the traditions of an agricultural civilization, has been able, over time, to give a dual role to the olive tree:

- this plant has become functional to the agricultural system for its product
- and it has provided a guarantee of culture and humanization of the territory.

In the olive composition of Salento, the varieties are undoubtedly the "**Cellina of Nardo**" and the '"**Ogliarola of Lecce**" prevailing, two recognized varieties of indigenous origin.

The characteristics of the olive tree, with its great adaptability to different soil and climatic conditions, its capability to become eternal to regenerate, and combined with the high regard that all civilizations have given to this species, have helped to take the plant a full integration with the landscape, a peculiarity for production capacities and an ever-changing variety.

So, in conclusion, because of the action carried out by climatic factors, over time, have favored the adaptation of plants to the various microclimates of the territory and because of the selection work carried out, over the centuries, by growers who patiently differentiated and propagated trees that best responded to the needs of the time, it is now possible to assert that **in Salento there is a population of genotypes, of ancient origin, that can play a key role in the defense of the typical characteristics of the product**.

At the same time, the cultivation of olive trees in time was progressively enriched with an extraordinary genetic variability, expressed in phenotype various forms easily recognizable.

This **biodiversity**, from a technical-agronomic point of view,, is a serious obstacle to the development of the sector, but from a genetic point of view is a unique heritage and deserves to be restored, protected and characterized from the agronomic point of view in order to make better use of this important productive sector.

A.2.1 History

Between alternating phases of richness and depression in the industry, there is much historical information and many bibliographic sources that, since ancient times, can witness the technical and the social role played by the olive in the economy and in the tradition of Salento.

Already at the time of the Greek settlements on the southern coast, the olive tree was one of the main crops grown and the oil of Salento was the subject of significant and recurring exports to Carthage and the Near East.

Some important ancient authors, including Pliny, Cato and Columella, quote in their works the importance of olive production in this land that remains the same in the period of the Roman Empire and until the next period of decline. Only in the Byzantine era the olive of Salento, like the entire southern agriculture, underwent a phase of depression, and recovered its prestige only in the late Middle Ages.

In the 10th century, olive growing regained recognition in a thriving market of precious oils of the Terra d'Otranto ... "*among all the peoples who occupied the shores of the Mediterranean basin*". During the reign of Frederick II (1208 - 1250) and the next dominations first Angevin one (1266 -1442), and then Aragonese one (1442 - 1501), the olive cultivation of Salento went through a period of great wealth, and, then, fell into a period of deep depression, which coincided with the conquest of these lands by the Spanish (1501-1707) and the Austrians (1707-1732).

Olive cultivation could play its leading role soon after the accession to the throne of Charles III of Bourbon, king of Naples and Sicily (1735-59.)

Some information on the prevalence of the culture of the time, can be inferred from the numerous writings testifing, both, the level of absolute splendor of olive cultivation of Salento and the trade flows of the oil that fueled domestic and foreign markets.

The importance of this sector was such that in the 18th century, the markets of Gallipoli and Nardò were able to determine the price of olive oil that had significance at a national level. During this period Presta (Gallipoli. 1720-1797) was able to clarify that "... *in particular tous people of Salento, the olive tree with the money of its product, sustains life*. Moschettini (Lecce, 1747-1820) wrote: *"... this beautiful Iapigia is, in Italy, the country that cultivates the largest olive groves, and it practices as a consequences, the richest trade in oils*."

At the end of 800, the reality was reported precisely and completely in the " Jacini Enquiry", a monumental work on the state of agriculture and the rural world in the 19th century (1877-1885), which can be considered a real encyclopedic discussion of the rurality of that period.

At the time, the sizes of the plants were generally small, except for some "majestic and colossal ones found in some municipalities, such as Gallipoli, Cutrofiano, Lizzanello, Vernole and especially in Strudà, a fraction of the latter in the Leccese. Provincial Olive Cultivation was widespread, in an area of 105,749 hectares and provided a production of about 160,000 tons of oil. The olive cultivation, was the prevailing agrarian culture because, vast areas of land were not cultivated as occupied by the flourishing forest of oaks and / or by the maquis, or presented themselves as unhealthy marshes, especially in the areas close to the coast.

A.2.2 The oil mills and presses

The underground oil mill or underground trappito in Salento is the hidden witness of an ancient civilization. It was, in fact, an essential part of the economic and social culture of this land and is in large numbers in all countries of Salento and in most farms. The "*trappet*i" were carved into the rock as a result of contacts with the Byzantines in the 9th century, the economy and the oil business took the place of that of wheat and therefore these production centers were built on the ruins of the granaries of the Messapic age .

The system of underground constructions, however, dates back to the advent of the Basilian monks who used to build so their shelters to hide from those who persecuted them. The main reason for the underground construction of the mills is to be found in their economy (in fact building in elevation was much more expensive than digging deeply) with the ease of excavation of local stone. Another reason for the fact that these places were underground was the need of heat, in fact the production of oil needed a high temperature and, above all, a constant: the temperature oil becomes solid at about 6 ° C; therefore, in order that its extraction is facilitated, it is essential that the environment into which the pressing of the olives takes place is lukewarm. The ideal temperature was about 18 ° - 20 ° C.

Underground lamps and torches burnt, night and day, these flames, combined with a hard physical effort of human beings and animals together with the heat produced by the fermentation of the olives, produced a large heat that the rock walls kept.

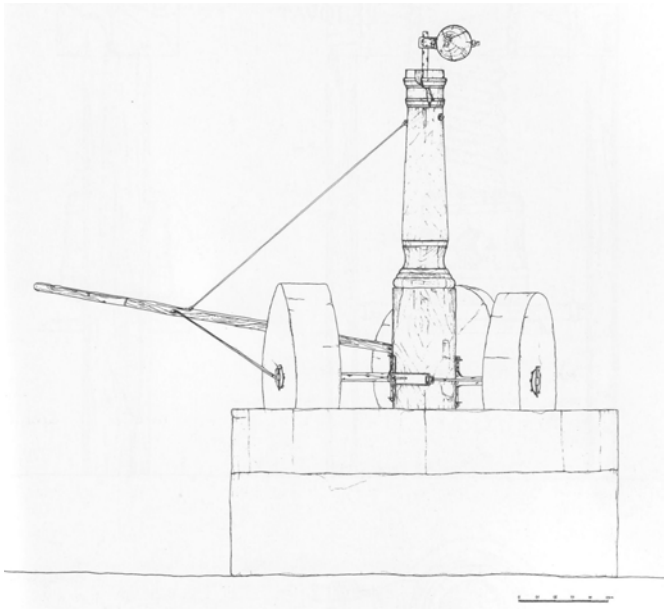


Figure 3. Oil Mill

The entrance to the mill was almost always directed to the south, so that the north wind could not influence the internal temperature. It was usually possible to enter the mill by going down a *staircase ramp*, obtained from this rock covered with a barrel vault. The only source of illumination was derived from one or two holes drilled in the center of the vault of the main compartment; a hole was always located in correspondence of the tank in order to ensure a costant air exchange.

The oil mills reached a share of foot traffic from two to five meters, with an average height ranging from two to four meters. Their planimetric system can be classified into the following types:

- **At aisle system** (longitudinal diagram): the environments are distributed according to a single main road axis;

- **Radial system** (rotation scheme): the smaller rooms such as tanks, shelters, deposits are distributed around the main irregular or circular rooms;

- **At room system** (geometric pattern): the smaller rooms are distributed around a single central and main compartment, of regular or irregular shape, of which the only left example is the crusher of Veglie.

- **Articulated system** (mixlinear diagram): the smaller rooms surround a large main space, the layout of the whole planimetric system is irregular and presents very articulate contours.

The typological schemes are based on the layout of the storage-work-residence rooms, the latter refers to the rooms given to workers and animals, assigned to the rotational movement of the millstones.

The working process was long and exhausting, the sacks of olives were paid within containers called "sciave" through a hole that opened in the surface, this was the only process that occurred without physical effort. Then the olives were placed in a tank where they should be ground, that occurred by means of mills and presses that were rotated by a blindfolded donkey or by men.

The operation of grinding was done for a number of times proportionate to the necessity, since it was necessary to obtain the greatest amount of possible oil. Often also the residues were left at rest for a short period such as to allow the decantation, in order to obtain further oil.

The liquid that was obtained by milling through a funnel was collected in holes (called *Angiolo*) dug in the floor, trough a funnel. The oil which remained on the surface was collected using the goblet, a container in the form of a large spoon, and was then deposited in specific containers. The vegetation water (bilge) was disposed of through the natural fissures of the rocks.

He who would pick up the oil and separate it from the vegetation (bilge) was called "*nachiro*" and was also responsible for the "*trappitari*" he was a sort of work supervisor. So it was he who decided work shifts rest time, blessed the food before meals with the sign of the cross, and before collecting the olive oil in containers, he recited the evening prayers and the holy rosary.

The work was very hard, it was held in a warm, humid unhealthy environment and lasted from 2 am until 6 pm, after which the laborers settled down on a sack of straw placed on wooden boards, which were deposited on pieces of "tufa". Workers (trapittari) entered the mill at the beginning of October and came out in April, a week later or week before, depending on the season. You ate down there, in common pots, especially legumes and vegetables (the famous beans and chicory), which were taken daily from the kitchens of the

owners or cooked on fires made from clumps of residue; even the toilet was down there, a hole in the ground , and even animals (donkeys or horses) lived there under: a corner of the undergrounds mill was used as a stable and equipped with a feeding and watering place.

The underground mills were used until the late 800's early 900, after which they were abandoned to make way to the new mills. The abandonment of these ancient structures was determined by the geo-morphological characteristics of these environments that had become too narrow for new technologies that required bigger and more comfortable. Spaces because of the fact that had been mills caged in to the urban fabric, it was no longer possible to expand them and, therefore, they were finally abandoned. From the 90s many municipalities are working to give dignity to these memories of civilization, in fact the goal was to regain their historical memories, closely tied to the land of Salento, thanks to the production and the trade in oil.

TYPES OF PRESS IN MILLS (trappiti)

The presses were mainly of oak or olive trees and were classified into two types: the Genoese or the Calabrian, the latter was the most widespread in the mills (trappeti) of Salento.

The Calabrian press consists of a large horizontal beam (plank) crossed by two vertical threaded screws embedded on Plini of hard limestone and on the top against the rocky bank. Two millers inserted the screws thus exerting pressure on the soaked reeds to drain the oil. This system was the only one to be used in Salento until the end of 1700.

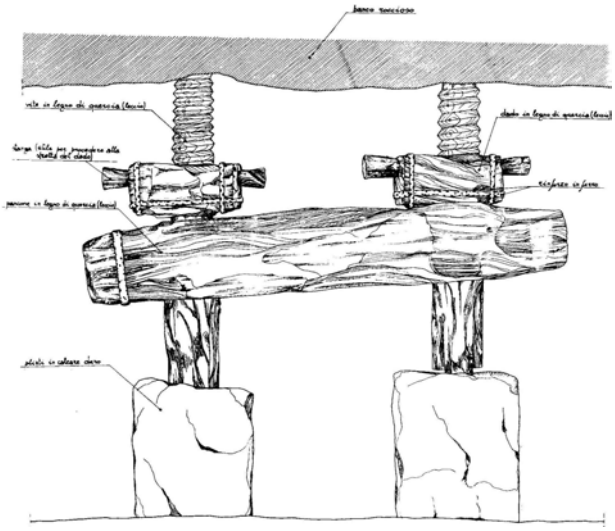


Figure 4: Press from Calabria

The Genoese press was introduced in the Kingdom of Naples only in the early 1800's, thanks to its greater effectiveness in the pressing of the olive paste if compared to the type described above. The press was wedged between two large pillars of stone (tuff and local stone) and was composed of a fixed , located above, whose center was pierced by a mobile screw to which was embodied a base of truncated cone shape, where were drilled circular holes, that were used to insert a rod to tighten the press.

Under the base there was a strong plank (plank) which exerted pressure on the stacked fisculi and stuffed with minced olive paste. During the operations of squeezing, this "plank" vertically went up and down between the two stone pillars. This movement was controlled by two channels carved into the faces of the pillars. Base and nut were reinforced by iron hoops. Some of these presses were entirely made of wood: the nut, the screw, the base and the two columns.

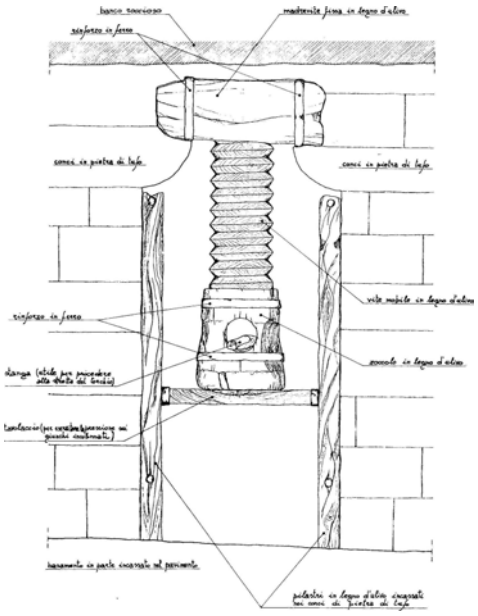


Figure 5: Press from Genova

At first Calabrian presses were used,but then they were supplanted by Genoese presses.

The main difference was purely economic. The Calabrian press had to be necessarily used in a couple even in absence of a lot of material, while the Genoese, being single, could respond, in a more appropriate way, to the needs of production.

For this reason the Genoese presses were installed in "containers" of three or four single presses. The Genoese mills formed that technological improvement that changed the quality

and quantity of the produced oil.

A. 2.3 Olive tree plant production in Salento

Even today, in the administrative area of the province of Lecce, the olive is widespread.

Photo 1: The olive grove in Salento

Of the 170,234 hectares of agricultural area used (SAU), 82 500 (48.5%) are dedicated to the cultivation of the olive, which is thus able to cover more than 80% of the total area allocated to provincial tree species (Photo 2).

Foto n. 2 - L'oliveto provinciale

Photo 2: Provincial olive groves panorama

The olive groves are a regular landscape feature of the Salento, with a significant presence in almost all municipalities, so great to constitute a real **"olive grove" of about 9 million plants**. Of these, 60% are aged between 25 and 100 years, 30% of old age and / or ultra-secular. While the remaining part is represented by systems created in the last 20 years.

Plants of exceptional growth, real natural monuments, are reported in the literature for their particular landscapes that characterize this area of southern Puglia.

Even today, you can see, in all their majesty, the olive groves of Scorrano, Ruffano, Caprarica of Lecce, Lecce Castri, Vernole and Veglie.

The sample of the variety the "***Ogliarola***" is, of particular importance, existing in the countryside of Vernole (Strudà), already mentioned in books in 800, as a plant of exceptional dimensions, also known as " shepherd is tree" (Photo n. 3) as the trunk, completely hollow, assured shelter and refreshment to a local shepherd.

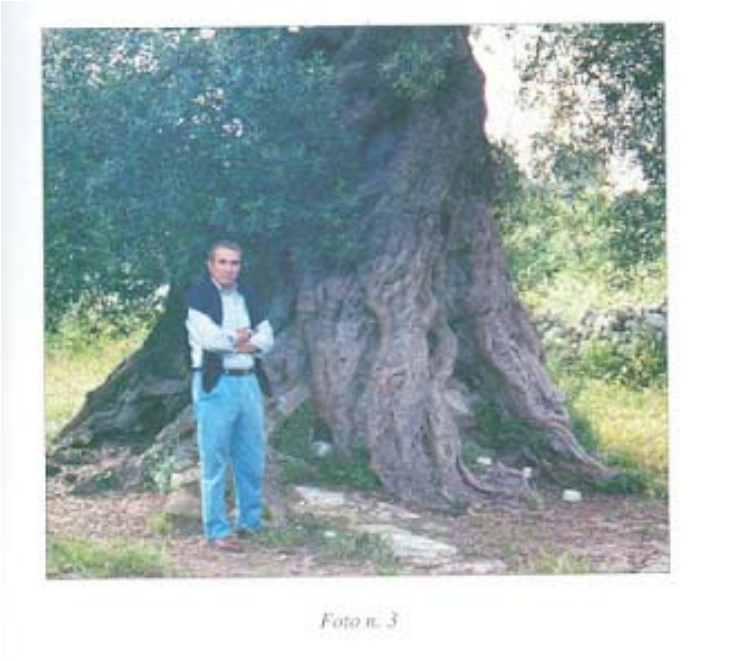


Foto n. 3

Photo 3: The pastor tree

Another plant of exceptional growth and age-old, is the "***Cellina***" located in the countryside of Scorrano, which has a hollow trunk, large enough to accommodate several people (Photo 4).

Foto n. 4

Photo 4: The Cellina

A. 2.4 Soil and climatic condition

The olive groves insist in an area where the **climate** is affected by the moderating action of the sea. The seasonal average **temperature** is 14.8 ° C, with minimum average values of 6.4

° C and maximum of 24 ° C (thirty years average).

The rainfall is low (751.36 mm.) and not uniform, since the rainfall events mainly concentrate in autumn and winter.

The winds are predominantly warm (SE and SW - Scirocco and Libeccio), while in summer, northern winds prevail (N and NW - Tramontana and Maestrale).

The Orography of the area in which the olive cultivation area is mostly flat with small undulations that along the ridge from the Murge Tarantine, come up to the Cape of Leuca (Murge or Serre Salentine).

From the point of view of **the soil**, the Salento peninsula is formed from a base of Cretaceous limestone, covered largely by deposits with clay, sand and marl of Pliocene and Pleistocene (tuffs) and, in the area from Lecce to Maglie and Tricase, also by calcareous tuffs of the Miocene (Lecce stone).

On these rocky substrates originated various types of terrain, without vision and so of indigenous origin derived from the decomposition of the underlying substrate, and generally with a good agronomic attitude.

A. 2.5 Features olive oil in the province of lecce: the three areas

The provincial olive grove , although apparently uniform, according to its structural characteristics (variety, management techniques, age of the plants) and pedo-climatic aspects, can be divided into three homogeneous areas.

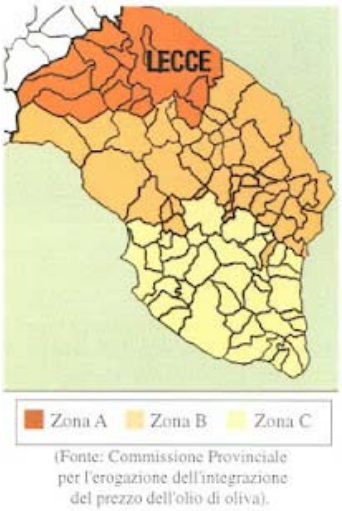


Figure 4: Provincial olive groves

The first zone can be detected in the area surrounding the capital and continues to the north-west, until the border with the province of Brindisi (Towns, Municipalities: Lecce, Anesano, Campi Salentina, Carmiano, Cavallino, Guagnano, Lizzanello, Monteroni Novoli, Salice Salentino, Squinzano, Surbo, Trepuzzi and Veglie).

The overall olive area is equal to 15,085 hectares for a number of olive trees of about 1.6 million. From the point of view of the varieties, the presence of the Ogliarola is equivalent to the Cellina of Nardò (46%).

The plants, of varying ages, can be mostly considered secular. The density of plants per hectare is equal to 90. (Photo n. 5)

Foto n. 5 - Oliveto della Zona A

Photo 5: Olive grove in the A zone

The second zone extends along the central part of the province, from the Ionian Sea to the Adriatic Sea (Municipalities: Aradeo, Bagnolo, Calimera, Cannole, Caprarica of Lecce, Carpignano Salentino, Castrì di Lecce, Castrignano dei Greci, Castro, Copertino, Corigliano d'Otranto, Cursi, Galatina, Galatone, Giuggianello, Giurdignano, Lequile, Leverano, Maglie, Martano, Martignano, Melendugno, Melpignano, Minervino, Muro Leccese, Nardo, Neviano, Ortelle, Otranto, Palmariggi, Poggiardo, Porto Cesareo, San Donato, San Pietro in Lama, Sanarica, Santa Cesarea Terme, Seclì, Sogliano, Soleto, Sternatia, Surano, Uggiano la Chiesa, Vernole and Zollino).

The surface with olive trees is equal to 34,957 hectares, with a number of plants superior to

4 million.

The olive trees have an average density of 126 trees per hectare, which in some quarters, goes over 150 plants per hectare.

The predominant variety is the Cellina di Nardo (52%), followed by the Ogliarola (42%).

The age of the plants is variable, with a predominance of trees with more than 60 years of age and the presence of large trees. (Photo n. 6)

Photo 6: Olive grove in the B zone

The third and final area covers the southern end of the province (municipalities: Acquarica del Capo, Alessano, Alezio, Alliste, Andrano, Botrugno, Casarano, Castrignano del Capo, Collepasso, Corsano, Cutrofiano, Diso, Gagliano, Gallipoli, Matino , Melissano, Miggiano, Montesano, Morciano, Nociglia, Parabita, Patù, Presicce, Racale, Ruffano, Salve, San Cassiano, Sannicola, Scorrano,Specchia, Spongano, Supersano, Taurisano, Taviano, Tiggiano, Tricase, Tuglie, Ugento).

The total area amounts to 35,527 hectares with a number of trees of about 3.5 million. The plants of the area are characterized by medium to high density, with 100 to 115 trees per hectare.

The predominant variety is the Ogliarola (63%) followed by the Cellina di Nardò (35%). The olive groves are very heterogeneous as for as age: is concerned olive trees between 50 and

60 years prevail but there is also a great presence of large old trees and extrasecular ones. (Photo n. 7)

Foto n. 7 - Oliveto della Zona C

Photo 7: Olive grove in the C zone

From what explained until now, the olive-groves of Salento is therefore composed mainly by two indigenous varieties and, only marginally, from "minor" varieties that are typical of other Italian areas and that are not so widespread and important. In particular the Ogliarola is spread by 54%, while the Cellina by 41%.

Although, both are uniformly distributed throughout the area, you can observe how the Cellina grows mainly in the north and center of the province, while the presence of the Ogliarola becomes progressively stronger towards the South.

The Cellina variety because if its features of hardiness, of resistance to climatic and parasitic diseases, of producion consistency and of oil has gradually replaced the Ogliarola that, even if expressing higher oil yields, presents the phenomenon of a more productive alteration.

Today, the province olive grove is structured in to two types: a "traditional" one and a "specialized" one.

Traditional one, are dating back to the 16th and / or 17th century, is of a more "ancient" type and reflects the knowledge of farming techniques of the time.

Olive groves are characterized by irregular Plant spacing: the trees, were propagated by grafting wild olive trees preserved by the actions of the cultivation of land or forest or mediterrean stean. (Photo n. 8)

Today traditional olive groves represent an alternative way to these systems but more recently, they are built with regular sixths even if variables in the distances of the system. Thus, in some areas prevails the distance of 15m x 15m between trees, or the most rational 12m x 12m or 10m x 10m, until you find, in some areas, olive groves with particularly "close'' planting distances (7m x 7m) where there is a very fertile soil, some favorable climate conditions thanks to exposure to wind and modern legal culture.

Foto n. 8 - Antico oliveto tradizionale

Photo 8: Old traditional olive grove

The density of plants per hectare, low in the olive groves of the ancient conception and marginal one (75 plants / ha - Photo n. 9) has progressively increased in the new systems and is directly related to the modernization and specialization of crop.

Foto n. 9 - Oliveto "marginale".

Photo 9: Marginal olive grove

La forma di allevamento dominante è il vaso con 2 o 3 branche principali.

The dominant training form is the vessel with 2 or 3 main branches. The olive trees in the most ancient systems are more than five feet heights and possess leaves that usually take considerable development and are frequently more than ten meters high. The height of the trunk shows of the agronomic technique practiced in the past. The systems were generally not specialized, often occupied non-irrigated land were associated to other tree crops and / or grasses for pasture. The height of the tree is also demostrates the propagation technique adopted. In general the olive trees were grafted other olive trees, or more simply, propagated " Magliolo technique".

Of course these types of systems, are in contrast to the olive groves of recent esecution (about 6,000 hectares), with lower sixths (6m x 6m or thicker) and with the application of more and more innovative farming techniques. (Photo n. 10)

Foto n. 10 - Impianto moderno con varietà autoctone.

Photo 10: Modern plant with native varieties

In these cases, **specialized installations** are made using self-rooted trees and raised in a container: there is irrigation, farming forms of free low vase are preferred and, in general, the olive grove is conducted using advanced techniques and mechanization of farming practices. These groves are mainly composed of non-native varieties, of oil and / or of dual purpose, a large drupe (Leccino, Coratina, Picholine and Nociara). (Photo n. 11)

Foto n. 11 - Impianto intensivo con varietà introdotte.

Photo 11: Intensive plant with introduced varieties

A. 2.6 Salentine native olive varieties

In the composition of the olive cultivation of Salento, the prevailing varieties are undoubtedly the **Ogliarola of Lecce** (41.1%) and the "**Cellina of Nardo**" (53.3%) two recognized varieties of indigenous origin; the remaining 3.6 % is made up of varieties of recent introduction.

The first is of a particular importance: it is more gentle, less resistant to adverse weather conditions, to standing water and disease, it has found its ideal environment mainly in the area stretching from Cape Leuca to Scorrano, where it is grown on a rocky terrain and provides a relatively constant product and a high oil yield (up to 25%); it is a plant of exceptional size, also known as the shepherd is tree as the trunk, completely hollow, assured shelter and refreshment to a pastor of the place.

Another plant of exceptional growth and age, is the "Cellina", it is more rustic,it characterized the "Green Field", the magnificent floodplain between Ruffano, Supersano, Collepasso, Noha, Cutrofiano, Scorrano, Carmiano, Nardò, where it uses deep soils,sails which are humid: the Cellina assumes gigantic proportions and gives production of Pugliese olive oil of really high quality, when it often has a little oil yield, it has a hollow trunk, large enough to accommodate several people.

The characteristics of the olive tree, with its great adaptability to different soil and climatic conditions, its capability to regenerate and become eternal, combined with the high regard that all civilizations have given to this species, have also helped to take the plant full integration with the landscape, a peculiarity for production capacities and a constantly changing variety. So because of both, the 'action carried out by climatic factors over time have favored the adaptation of plants to the various microclimates of the territory and because of the selection work carried out, over the centuries, by growers who patiently, differentiated and propagated olive trees responded better the needs of the time it is now possible to assert that in the area there is a population of genotypes, of ancient origin, that can play a key role in the defense of the typical characteristics of the product. Similarly, the olive cultivation, over time, has gradually enriched with an extraordinary genetic variability, expressed in various phenotype forms easily recognizable.

This biodiversity, from a technical-agronomic point of view, is a serious obstacle to the development of the sector, but from a genetic point of view is a unique heritage and deserves to be restored, protected and characterized from the agronomic point of view in order to make better use of this important productive sector.

The olive trees in Puglia oil are over 9,500,000, the traditional olive groves on rocky and poor terrain, without irrigation, alternate with olive irrigated groves, capable of producing up to 300 tons of olive oil per hectare.

The production of olives in brine is limited, as the main product is oil, and the average olive production per plant fluctuates around 45Kg. and the yield around 18%.

A.3 Classification of olive oil

The virgin olive oil has two important features that characterize it from the other vegetable oils, making it very refined: **it grows out of a fruit; it is edible immediately after the production if the raw material is good.** But, although the first feature depends on a natural phenomenon, the second one is due to the fact that virgin oil is extracted from olives only by mechanical means.

The virgin olive oil is extracted through some appropriate equipments activated from physical forces that permit the separation of the different stages that represent the complex

vegetable process.

The olive oil proceeds from the squeezing out of a fruit – the European 'olea' – represented by an oval drupe with a middleweight of approximately 1-3 gr., depending on the different types.

The principal constituents of this above mentioned fruit are: water (35-50%), oil (15-35%) and solid materials (cellulose and other carbohydrates, proteins, etc) that represent the 25-40% of its weight.

The olive oil is constituted mostly by glycerides of oleic acid (70-85%) and by palmitin acid (10-18%), linoleic acid (7-12%) and '*stearico*' acid (1-3%), together with a small amount of other glycerides, lecithin, waxen and resinous material, smelling terpenes; the chlorophyll and the carotenes give it the characteristic yellow-green color.

The proportion of the different glycerides changes according the maturation degree of olives and the climate in which the plant grows.

CHEMICAL COMPOSITION OF THE OLIVE OIL

Water and other impurities	da 0 a 0,5%
Specific weight	a 15° 0,915-0,919
Number of iodine	79-88
Saponification number	187-195
Refractive index at 25 ° C	1,4665-1,4679
Not saponifiables substances	0,60-1,20%

Tab. 1: Chemical composition of the olive oil

Systems of olive harvesting have a profound effect on the quality of the oil derived from it. In most cases, especially with large trees (the average is 5 meters but they may even reach 12mt),the olives, as they mature, fall to the ground and are then collected to be minced.

The level of freshness and integrity of the olives is then varied according to the days that can pass between the fall of the first ones and the last ones, a more "acid" oil should result.

In the areas of oil production, oil that is at a very low grade of acidity (the most valuable oils), the collection is made by hand, directly from the plant, but only performed in some family context and olive cultivations of modest size (up to 50 plants).

Most of the olives, therefore, today **are mechanically harvested**, with considerable positive effects both from the economic point of view and from the qualitative point of view.

The mechanical practice, in fact, requires less time than the traditional manual practice and allows you to program the collection when the olives are in the right ripening or in the veraison (when the olive is half green and half black). Furthermore, with the modern mechanical harvesting, you should no longer wait for the olives to fall nor to be picked up from the ground, thus affecting the quality of the oil.

The acidity is a parameter that indicates the percentage of oleic acid in an oil and is the main indicator of quality.

The higher its value, the poorer is the quality of the product. The acidity is a direct consequence of the release of fatty acids due to the hydrolysis of glycerides, and is a quality parameter defined only by means of laboratory analysis. It is the parameter that allows to evaluate the possible changes in the olives and the oil obtained from them suffer during the collection, transport and transformation process. In addition, its assessment allows the product classification of the oils. The determination of acidity is carried out in the laboratory and is a simple analysis that now almost all mills can run independently.

The degree of acidity of an oil is strongly conditioned by the state of health, of the olives, by the collection technology, by the time of storage, by the transformation technology adopted (eg. High temperatures of kneading) and by the care put by the operators in the treatment and in the storage of the product.

It can be classified as **extra virgin olive oil when there is an oil free acid content of less than 0.8 g / l.**

On the base of the quality of olives, their freshness and integrity, the degree of acidity and processing, olive oils are classified as follows:

1st: Extra virgin olive oil:

"Superior category, of olive oil, obtained directly from olives and only by mechanical means." Virgin olive oil has a free acidity, expressed as oleic acid, of not more than 0.8 g per 100 g, and other characteristics which correspond to those fixed for this category.

2nd: Virgin olive oil:

"Olive oil obtained directly from olives and solely by mechanical means." Virgin olive oil has a free acidity, expressed as oleic acid, of not more than 2 grams per 100 grams and characteristics which correspond to those fixed for this category.

3rd: Olive oil - Composed of refined olive oils and virgin olive oils:

"Oil containing exclusively olive oils that have undergone a refining process and oils obtained directly from olives." Olive oil obtained by blending refined olive oil and virgin olive oil different from "lampante oil", with a free acidity content, expressed as oleic acid, of not more than 1 gram per 100 grams, and other characteristics which correspond to those laid for this category. It is the result of the mixing between a ground oil, which has undergone a chemical process that is aimed at the elimination of chemical and organoleptic defects, and a virginoil. The law does not require a minimum quantity of virgin olive oil that should be in the mixture, it is usually a minimum, just enough to give color, smell and taste to the oil that results on the whole quite 'flat'.

fourth: Olive-pomace oil:

"Oil containing exclusively oils derived from the treating the product, obtained after the extraction of the oil and oils obtained directly from olives "or" oil conteining exclusively oils obtained by processing olive pomace oil and oils obtained directly from olives".

Oil obtained by blending refined olive-pomace oil and virgin olive oil other different from lampante oil with a free acidity content, expressed as oleic acid, of not more than 1 gram per 100 grams, and other characteristics which correspond to those laid for this category.

A.4 Production Cycle

Olive oil has a very important role in the agricultural landscape, at local, at regional and national level.

Puglia is a leading Region in the Nation and the EU with about **59 million trees** over an area of over 376 000 ha, equal to 40% of that of the South, and to 32% of the

national olive surface and to the 8% of the Community, so that, globally, 12% of the production of olive oil is represented by olive oil from Puglia.

According to data given from the Puglia observatory, on the rural world, the incidence of Apulian olive production is equal to 36.6% of the national average.

The production of olive oil in Puglia appears to be strongly linked to the local conditions and olive is one of the most interesting sectors in the agro-food panorama in Puglia.

The olive trees that produce oil in Salento are over 9,500,000; traditional olive groves on rocky and very poor terrain, without irrigation, alternate with regal olive groves, irrigated, capable of producing up to 300 tons of olive oil per hectare. The production of olives in brine is limited, since the oil is the main product, the average olive production per plant fluctuates around 45Kg. and oil yield around 18%.

The Province of Lecce produces 30-40%of the oil produced in the Region and 8-10% of the national production.

A.4.1 Production

The production cycle of olive oil consists of **two different steps**: the growing, that happens in a farmland, and the extraction that happens in the oil-mill. The oil chain consists of two different and interconnected production systems.

The first, represented by farms that have the same features and the same problems such as production marginality, organizational and technological underdevelopment, the lack of innovations important for the outcome.

The second, represented by oil mills that transform the olives. These oil-mills during the last years faced some important changes but they limited themselves to carry out a simple role (oil extraction).

Below we report a brief description of the different phases that represent the production cycle of olive oil.

A.4.1.1 The growing of olive tree

The growing of olive tree consists of different phases that are always the same:

- Manufacturing
- Fertilization and dunging
- Pruning
- Defense
- Harvesting.

These phases are very important for the production of an high quality oil.

They are very important also for the production outcome on a quantity level, because it's true that the use of some appropriate production techniques limit the deficit due to a production alternation typical in some oil productions, for example in Salento area.

It's important to describe concisely the features of these different phases and their importance on the final qualitative outcome.

A.4.1.2 Manufacturing

The management and the care of the land in the oil sector are very important in order to avoid some unwanted phenomena such the erosion and the impoverishment of the soil.

Too often the cultivation methods used consist of extreme manufacturing and weeding.

Manufacturing has to take into account the practicability of the olive trees; for this reason, in order to achieve important outcomes, it's necessary the strengthening of the covering grass and a better preparation and use of the harvest nets.

A.4.1.3 Pruning

Pruning made after the harvest has a great importance because it balances the plant physiology and it has a function of control of vegetation.

This kind of control of vegetation made after the phase of pruning (every two years) influences in a positive way during the phase of harvest facilitated through mechanical means, while that made every year with intervention of 'spollonatura' and on the young shoots is an important phytosanitary custom to check the cryptogamous and the bacteria.

A.4.1.4 Fertilization and dunging

Fertilization is very important for the plant nutrition and for the maintenance of fecundity of the soil; dunging can have different possibilities: from the spreading of organic fertilizer to the filling up of the grass after the cutting up of the remains of pruning; from the green manure to the shedding of waters of vegetation. In some occasions there are dunging of the leaves.

A correct dunging allows an improvement and an increase of productions. These years we are using more and more irrigation systems typical of fruit cultivation.

A.4.1.5 Phytosanitary defense

Damages aroused by pathogen agents on the olive tree grove and on the drupe are very noxious.

There is a greater use of chemical solutions sprinkled on the olive tree grove in different phases but especially in order to struggle damages provoked by the 'fly of the olive tree'. These years there are new systems of monitoring pathogen agents. This control of the principal pathogen agents allows to avoid some unpleasant flaws of the product such the acidity degree.

The use of natural substances in order to struggle pathogen agents allows, on the other hand, to get oils free from chemical remains that can affect the aromatic and antioxidant elements of the oil.

A.4.1.6 Olive Harvesting

The olive harvest ends the cycle of the plant. It is perhaps the most sensitive operation for its effects on the quality of the oil. The grower knows the right degree of ripeness of the olives, he knows that this affects the quality and quantity of oil.

The collection of local varieties is between early November (early maturation of the olives) and the end of December (forwarded maturation).

Our growers use various collection systems, each suited to the type of the olive and the characteristics of the soil and the plant.

In the **traditional system of harvesting**, until not long ago still in use in the Salento countryside, either spontaneously or because driven by the wind, ripe olives fell to the ground of pitches prepared at the foot of the plant and were then assembled by hand with brushes. Then they were sorted to remove soil and leaves and then transported to the mill for the milling operations.

Within a few years this practice has been replaced by the use of facilitating machines as sweeping machines, which can also be equipped with a collecting basket. These machines greatly reduce the time and costs of this hard operation

In some areas of Puglia and Salento, this is performed manually by picking which consists in taking the olives one by one directly from the plant. This method is best to obtain a quality product.

“The shaking” and **combing, instead,** allow “the olives fall” as a result of hitting the branches or going through them with special combs.

The olives fell on special nets placed on the ground and then are transferred to the grinding.

Modern olive cultivation uses a lot of facilitating machines, such as the collection **shakers** that by vibrating the branches or the trunk of the plant cause the “olives fall”.

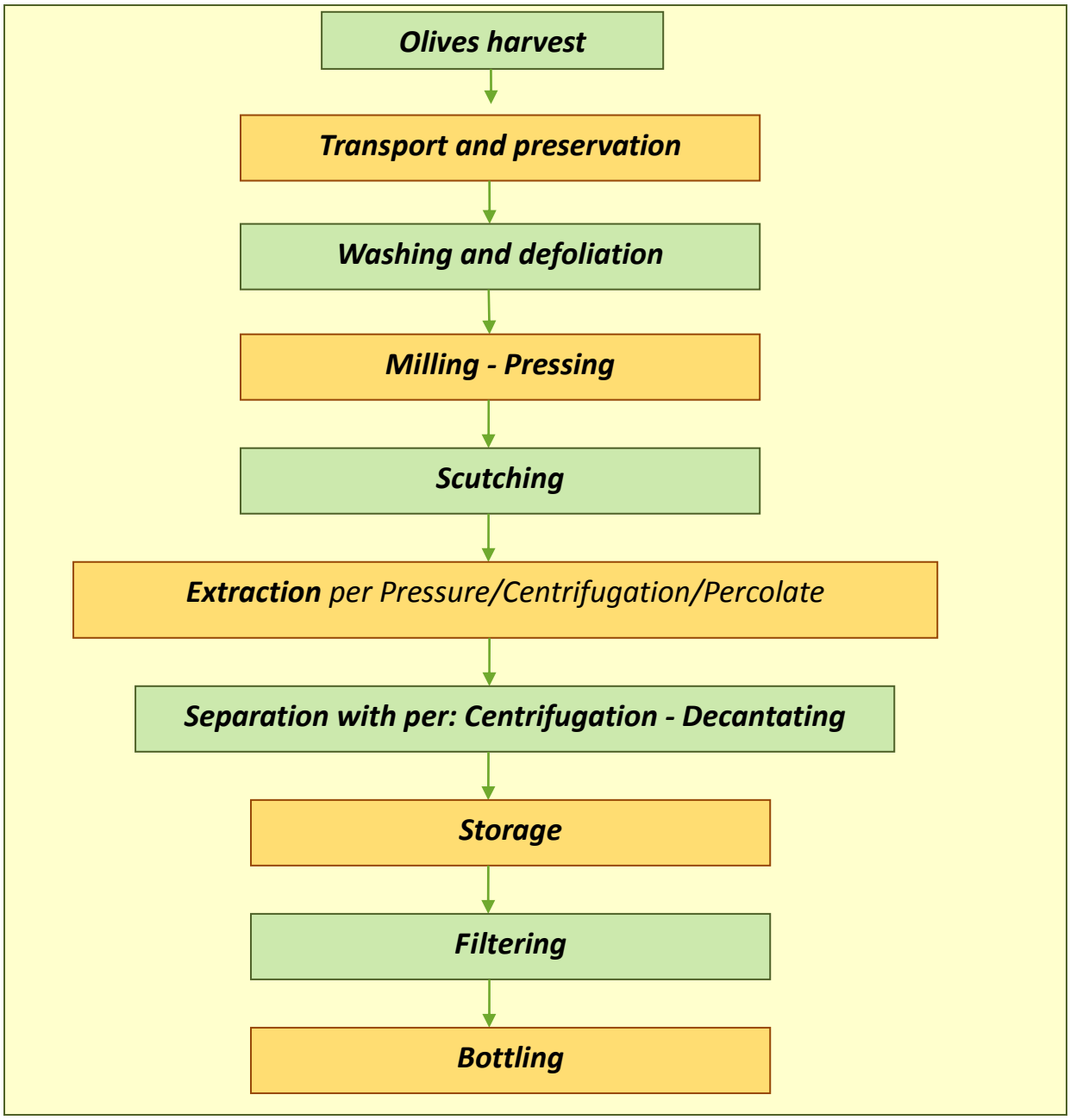
These can be intercepted in mid-air (by umbrellas) or on the ground by special networks resting on the ground. The transfer in to that mill, occurs by using powerful vacuums that convey the olives on special collection wagons.

Another collection system makes use of small shakers carried on the shoulders by the operators these shakers cause less energetic vibrations than the big shakers. These small

machines apart from determining a sensitive acceleration of collection time, being able to work on smaller branches of the plants and therefore more elastic, also permit a less mechanical stress of the plant.

A.4.2 The olearia transformation

Fig. 5 CHART OF OLIVES PROCESSING



Olives, freshly picked and put in a ventilated place, where, waiting to be milled, they are

stored in a cool and dark place.

Before passing to the department of frangiture, the olives undergo the **washing** operation and the **defoliation,** in order to remove any impurities that may confer alterations to the taste and may compromise the quality of the oil. An excessive amount of leaves, for example, may determine an accentuated bitter taste, a leaf taste, which is not very pleasant.

A.4.2.1 Crushing Phase

In the **crushing phase** the olives are crushed. A few decades ago, the olives were cut in to pieces with the traditional system of the millstone. In any case, with the operation of pressing, however, it is carried out, apart from the olives crushing, you also have the crucial breaking of the cells, resulting in a leakage of liquid, the wort, which is a mash of oil and vegetation water.

A.4.2.2 Scutching Phase

The mixing is intended to emulsify the oil present in the paste, derived from just pressed olives, so that, the many oil drops, formed as a result of the mechanical stress, may join together and form much larger drops from which the transition to the next time of extraction is easier.

A.4.2.3 Extraction

Extraction is the central phase and the most delicate of all the oil production process, on which a good quantitative yield and a high quality end product depend. In the traditional system of mills, this operation was done through the hydraulic presses, that exerted a direct pressure for the pressing of the dough.

The system of **centrifugation** is one of the modern techniques for the extraction process which exploits the principle of the different specific weight of the constituent parts of the dough. Through some decanters with horizontal axis, the extraction as a result of the rotation, due to the centrifugal force of the olive paste takes place, paste which thus arranges, according to the different specific weights of its components. The solid part the

heavies, it arrives towards the end of the rotation axis; the oil, instead, that is lighter, remains collected at the center, around the rotation axis; finally, the water is arranges in a intermediate position.

Another technique of extraction of the oil from the paste is the percolation, which is based on the principle of different surface tension existing between the water and the oil. The extractor, a series of steel blades, by penetrating the olive paste and, according to the different surface tension of the liquids, by wetting in the oil, collect it until it drips in the underlying container.

A.4.4 Separation

The last stage of the processing of olives is the **separation** of the oil from the vegetation water contained in the must. This is done through the vertical axis centrifuges. The oil obtained is stored in containers made of stainless steel.

A.4.2.5 Decantation and storage

The oil obtained by squeezing, presents considerable suspended substances and, if it has been centrifuged, small amounts of emulsified water. With the time the suspensions decant and seasoned oil is always clear.

Wanting a rapid clarification is usual to resort to the filtration which is obtained with simple gravity filters and with plates filters. The oil must be kept away from air, light and from any smell, which could be easily absorbed. The temperature kept low (12-15 ° C). The optimal material for the storage of oil is stainless steel.

A.4.2.6 Blending and bottling

Olive oil is usually put on the market after an appropriate mixing of oils of different types and organoleptic characteristics. The mixing is necessary for the proper characterization of oils that must meet the different needs of consumers and because the mono-varietal oils,

that is obtained from a single variety of olives from the beginning, hardly possess the characteristics most suitable for a given market.

The mixing is carried out during pouring and prior to bottling. This last phase is essential to better enhance the final product that will reach the final consumer through countless commercial channels, including the one that nowadays is the most important one, the GDO.

A.4.2.7 The preservation and conditioning of olive oil

The oil must be kept away from air, light and from any smell, which could be easily absorbed. The temperature must be low (12 ° -15 ° C) without reaching the freezing which, with the crystallization of saturated glycerides, alters the homogeneity of the product and slows the settling.

Periodically, every 6 months, it is required of decanting to separate the greasy deposit that accumulates on the bottom of containers. Depending on the duration of the retention period oils are classified as musty oils for the first six months, as young oils until the first year and old oils over this period, till become decrepit oils.

The young oil preserves the aroma of the fruit, is colored and opalescent: with aging these characteristics get lost, until you have crystal clear colorless oils.

A.4.2.8 Damage and deterioration

All fatty substances take with great ease the odors and therefore oils obtained from olives that are defective or extracted with little accurate technique can present many defects of taste, of which the most common are: the earthy flavor given from muddy olives picked up from the soil, the characteristic dried flavor of too ripe olives, the taste of worm usually accompanied by a dark color, resulting from the larvae of Dacus oleae (olive fly) developed in the olives.

The olives affected by unexpected frosts give to the oil a special taste of “not cooked” and when they are moldy or rotten for not being well preserved, they communicate to t6he oil a taste of mold oil or a fetid smell. By pressing the olives with many leaves the oil takes on a

bitter taste and an intense green color, which then disappear with aging.

Numerous external odors (smoke, manure, naphtha, ozone, tobacco) may arise from the processing and from storage in irrational conditions. These defects of taste, if they are not very pronounced, can be mitigated by filtration and treatment with special activated carbon with high absorption power; above all it is important to avoid the formation of these odors, with the necessary caution of good housekeeping, with the selection of the altered olives and avoiding the formation of noxious odors in the premises of the oil mill.

A.4.2.9 Growing Rancidity

All oils are easily oxidable and they can alter spontaneously when exposed to air. The oxidative rancidity is the most severe alteration that occurs in the oil during storage, the smell becomes unpleasant, the taste sour, disgusting, the acidity increases and the product becomes inedible and must be passed to rectification. This alteration always occurs after a prolonged aging or because an irrational conservation , because it is a phenomenon of oxidation of fatty acids, due to the contact with the air and especially favored by light and heat, and also by the presence of water and small amounts of metals.

It should be avoided any prolonged exposure of the oil to air and light in hot places; it is important to ensure that during processing the oil remains in contact with containers of copper or iron and that it is well separated from the water.

A.4.2.10 Souring

The free acidity of the oil is, even for the provisions of law, the most significant index of its quality. The oil contained in the rightly ripe fruit is not significantly acid, but it becomes quickly when the olives are altered, badly or for too long stored. It is also a consequence of the oxidation; the acidity gradually increases during storage and more rapidly as it is higher at the beginning, especially if the oil contains water in emulsion. It is therefore necessary to avoid the predisposing cause, quickly separating the oil from the amurca, containing lipase, immediately after extraction of the oily juice; you will also have to keep separate batches of

oil obtained from sour or altered olives, not mixing them with oils obtained from healthy olives. The elimination of defects resulting from rancidity and acidity is not possible with the means available in an oil mill and altered batches should be sent to be refined in specialized establishments.

SECTION B

PREAMBLE

The landscape of Salento, close embraced by two seas, is made even more unique by the majestic olive trees: if you choose more or less important roads, it is quite common to bump into these secular, an amazing experience.

For centuries, the olive tree has been the main economic resource of Salento and is still associated with both the economy and the culture of Salento.

Moreover, the numbers speak for themselves: only in Lecce the Salento, the olive tree surface is about 86,000 hectares with 9 million trees and the olive farms (about 68,000) represent 76% of the farms in the whole district. Salento and Apulia in general, have, the Italian record for the number of cultivated hectares and for the amount of produced oil (record also given to Calabria in relation to the years).

In this context, **the crisis in the olive oil sector**, which is closely linked to the region's economy, can only arouse deep concern. The analysis of the **strengths and weaknesses of the oil industry** may help to take first awareness of the current situation and in order to find right ideas to give new life to this important agricultural sector.

The Italian olive-growing industry is going through a phase of structural crisis which can be mainly traced back to the difficulties it runs into adapting to the profound changes of the economic and institutional context.

To the global economic and financial crisis of the last years must be added the effects of some changes in the scenario of the oil and olive-growing industry which witnessed a fast increase of the supply and the internationalization of the olive oil market. In particular, Spain's productive potential considerably increased and some non-European Mediterranean countries (Tunisia, Syria, Turkey and Morocco) and “emergent” countries (Chile, Australia, Argentina, etc...) gained a new important role in global markets.

The internationalization of the olive oil market strengthened the leading role played by multinational packaging companies and by modern distribution companies. At institutional level, **the common agricultural policy reform** reinforced the policy of income support

decoupled from production by establishing a single payment scheme, bound to a sustainable environmental management by the company (conditionality).

These changes have become part of the Italian olive-growing structural context, characterized by an extreme fragmentation of companies and by the prevalence of traditional plantings with less than 200 trees per hectare that limit both the mechanization and the productivity.

In order to improve the competitiveness of the Italian olive-growing industry and to reduce production costs, it is doubtless necessary to renovate the olive groves and to adopt innovative models for olive growing.

Several authors, both in Spain and Italy, recommended the adoption of high-density plantings, designed for mechanical harvesting and able to ensure higher yields and lower production costs (Fontanazza, 2000; Tombesi et al., 2008), by proposing two models: **the intensive one** (with more than 200 trees per hectare), already widely-used both in traditional producing countries and in emergent countries, and **the overintensive** (with more than 1500 trees per hectare) (Tous et al., 2007), introduced in some Spanish regions (Aragon, Andalusia, etc…) and in other olive oil producing countries (Tunisia, Morocco, California, Australia, Portugal, France, Chile, Argentina, Italy, etc...).

The overintensive model seems to ensure both high yields a few years after the planting and the complete mechanization of the cultivation, even though in Spain there were problems concerning the efficient management of tree crowns 6-7 years after the planting and these problems negatively affect production and make it difficult to extend economic life beyond the 15^{th}-16^{th} year of age (Tous et al., 2007; Pastor et al., 2006).

The studies carried out until now to prove the adaptability of the overintensive model to the Italian context relate the so far achieved outcome, concerning the first years of the production cycle and focused on agronomic aspects (Camposeo e Godini, 2010) or on the advantages deriving from the reduction of harvesting costs (Bellomo e D'Antonio, 2009).

A correct economic evaluation with regard to the adoption of this model requires, on the contrary, a profitability analysis of the investment through a comparison with the intensive model.

Since the investments resulting from the adoption of the two models have a different economic life, for a correct evaluative procedure it is necessary to take into account the complete life cycle of the most long lasting olive grove.

B.1 Peculiarity of olive oil production in the reference area

Olive growing, in southern Italy and in our area of interest, has several significant peculiarities:

⇒ First of all, it is a **perennial Mediterranean cultivation** and for the firms this implies some difficulties adapting to the economic trend. It takes between 5 and 7 years for a planting to become fully productive;

⇒ **Production varies greatly** according to the biological alternation of the olive tree (good harvest followed by a poor one), the farming methods (with or without irrigation), the varieties and the pedoclimatic conditions;

⇒ **There are few alternatives to olive trees** in marginal regions with poor productivity (mountainous or hilly areas): they can grow onbarren, stony lands whichare ill suited to growing other cultivations. Consequently, they play an important environmental role (soil fixation, biodiversity, landscape);

⇒ **The peak in activity** occurs in winter, therefore this cultivation is compatible with other agricultural and non-agricultural activities.

⇒ With traditional growing methods, labour represents over half of production costs, and therefore olive growing plays an important **role in society**;

⇒ **The production structure** is very fragmented (small firms);

⇒ In Mediterranean regions, olive growing is an **important element of the heritage and of socio-cultural life**.

B.2 Swot Analysis

From the elements previously highlighted emerge the following strengths of the olive oil supply chain in Puglia.

Strengths at the level of agricultural production

- Remarkable spread of crops and the presence of suitable areas for both quantity and quality of product;
- High potential for the production differentiation (PDO / PGI);
- High environmental, scenic, historical, cultural and anthropological value;
- The possibility of stabilizing the production, limiting the oscillations and by streamlining and expanding irrigated areas;
- Good image of the product to national and international consumers.

Strengths in terms of processing and marketing

- Strong ability to penetrate foreign markets;
- Strong image of the product from Puglia and generally of made in Italy products;
- Broad base of procurement of raw material;
- Consolidated expertise in the ability to meet the demands from foreign markets and distribution;
- Globalization of markets.

The weaknesses in the olive oil supply chain in Puglia can be highlighted as follow:

Weaknesses at the level of agricultural production

- Fragmentation of the productive structure (reduced size of the company).
- The prevailing presence of traditional systems and limited diffusion of mechanization and irrigation.

- Strong fluctuations of production in terms of quality.
- Very weak role of producer groups in the concentration of supply and in the enhancement of the product.
- Delay in the implementation of technological innovations.

Weaknesses in processing and marketing

- Low level of vertical coordination.
- Use of the made in Italy not coordinated with the production level.
- Presence in the foreign market of small businesses with phenomenon of unfair competition.
- Location of the mills is not always optimal.
- Financial and logistical difficulties for compliance with current regulations.

In summary emerge the following critical factors of the sector at the level of agricultural production:

- The reduction of production costs to be pursued through a modernization of equipment, of techniques of cultivation and harvesting;
- The improvement of the quality of production also to be pursued through good agricultural practices and technological innovation;
- The supply concentration and enhancement of the product;
- Greater vertical coordination with the phase of processing and marketing.

Critical factors of the sector in terms of processing and marketing

- The supply of the product with constant quality standards.
- Effectiveness and efficiency of the distribution network
- Price.
- Promotion and advertising of the product.

- Improving the quality of the processing and storage phases.

B.3 Agroquality research methods and used criteria

Modern agro-industry productivity and competitiveness rely more and more increasingly on the *quality* of the products, as well as on producers's ability to prove it with quantitative and measurable tools.

Thus, the identification and the recordkeeping of the factors that influence the production, such as the cultivated species, the place of origin and its endemic characteristics (altitude, climate parameters, soil composition, etc.), are of vital importance for a flourishing modern agro-industry. The constant need and request for total tracking in the food chain also point towards the same direction.

In this *scenario*, Agroquality aimes at introducing a platform and a methodology for the monitoring and record keeping of the factors that influence the quantity and the quality of the production of olives and olive oil, a traditional and high-interest cultivation both in Western Greece and in South-Eastern Italy.

As part of the project activities, implemented by the Technological Institute of Epirus (TEI) in collaboration with the Municipality of Lecce is foreseen a research based on a qualitative survey on companies producing olives and olive oil in the two territories.

The main purpose of the ex-ante evaluation is the collection of useful information that will be the basis for the future implementation of other actions within the Agroquality project.

The project team of the Municipality of Lecce decided to map the olive oil producers in Salento using the following methodology:

- desk analisys
- interviews with experts and workers in the sector
- determination of the sample of producers according to specific requirements
- interviews and questionnaires submitted to the sample producers.

The questionnairies are addressed to farmers and private individuals which are related to the production process in the agricultural sector and specifically with the chain of

production, processing and trading of table olives and olive oil.

The questions aim at recording data which concern productive, trading and transport issues as well as subjects related to the use of information technology and communications tools in the sector.

Thus, it was decided to adopt a **best practices-oriented approach**: consider and share the experiences among the olive oil producers of a specific area who are willing to collaborate on the Agroquality project in order to compare a series of characteristics concerning in brief:

- cultivation and production techniques
- marketing and transport techniques
- tools and machinery
- use of the modern information technology.

Therefore, the work was structured in several phases: from the identification and comparison of the Best Practices and the drafting and diffusion of the questionnaire through focused interviews to the analysis of the investigation outcome, preparatory to the testing on **two pilot cases** as provided for by the project programme.

B.3.1 The qualitative research: the questionnaire and the interviews with the selected sample of producers

Once the desk analysis and the sample of producers and companies was determined, the project team initiated the action concerning the qualitative research, meeting every producer directly in his farm.

The instrument used to interview the producers was a questionnaire about n. 90 questions, the same used by the Lead Partner and only partially revised and edited to better adapt to the sample chosen by project team of Municipality of Lecce.

This questionnaire is addressed to farmers and private individuals which are related with the production process in the agricultural sector and specifically with the chain of production, processing and trading of table olives and olive oil.

The territorial cooperation action has set as a goal the development of a common framework of rules and good practices for the reinforcement of the position of table olive and olive oil in the international food market.

The project is materialized by the Technological Educational Institution (TEI) of Epirus in cooperation with the Municipality of Lecce and the main objective of the present questionnaire is the gathering of useful information which will form the foundation for the optimum realization of the action.

The questions are aiming in recording data which concern the productive, the trading and transport issues as well as subjects related with the use of information technology and communications tools in the sector.

The tool is divided into three macro areas:

A. GENERAL INTERVIEW DATA
B. QUESTION REGARDING DEVELOPMENT AND COLLABORATION DISPOSAL
C. DATA REGARDING LAND PARCELS AND CULTIVATION TECHNIQUES.

The questionnaire is characterized both **open questions** and **closed questions**.

Below the model questionnaire that the project team of the Municipality of Lecce provide to adopt far the maping producers.

B.3.2 The model questionnaire used

QUESTIONNAIRE STRUCTURE

A. <u>GENERAL INTERVIEW DATA:</u>

1. QUESTIONNAIRE NUMBER
2. INTERVIEW DATE
3. INTERVIEWER FULL NAME
4. FARMER FULL NAME
5. FARMER SEX
6. FARMER'S RESIDENCE ADDRESS
7. FARMER'S TELEPHONE NUMBERS
8. FARMER'S AGE
9. FARMER'S EDUCATIONAL LEVEL
10. FOREIGN LANGUAGE (Y/N)
11. PARTICIPATION IN OLIVE CULTIVATION UNIONS (COOPERATIONS, FARMERS GROUP ETC): (Y/N)
12. ATTENDANCE OF OLIVE CULTIVATION TRAINING: (Y/N)
13. FARMER AS MAIN PROFESSION (>50% AGRICULTURAL INCOME): (Y/N)
14. OTHER THAN AGRICULTURAL INCOME COMES FROM
15. THE FARMER OFFERS AGRITURISTICO RECEPTIVE STRUCTURES
16. AREA (ha) OF PERSONAL OLIVE TREE LAND PARCELS
17. OWNERSHIP OF OLIVE TREES LAND PARCELS + OLIVE TREES LAND PARCELS LED TO OTHER TITLE
18. NUMBER OF PARENTS INVOLVED IN THE OLIVE TREES CULTIVATION
19. FIELD TAKEN INTO CONSIDERATION: SHEET – PARTICLES
20. NUMBER OF TREES IN FAMILY AND IN RENTED OLIVE TREE LAND PARCELS
21. OWNER OF AGRICULTURAL CAR
22. OWNER OF ARBORICULTURAL TRACTOR
23. OTHER OLIVE CULTIVATION MACHINERY
24. INCOME INTEGRATION: (Y/N)
25. ORGANIC or INTEGRATED MANAGEMENT or CONVENTIONAL CULTIVATION: (Y/N)
26. ARE YOU FAMILIAR WITH THE TERM QUALITY CERTIFICATION? (Y/N)
27. DO YOU KNOW WHAT POD (Protected Designation of Origin) PRODUCT MEANS: (Y/N)
28. DO YOU KNOW WHAT PGI (Protected Geographical Indication) PRODUCTS MEANS: (Y/N)

29. DO YOU KNOW WHAT ISO IS: (Y/N)

30. DO YOU KNOW WHAT HACCP IS: (Y/N)

31. DO YOU KNOW WHAT OSDE (Integrated Information System for Agricultural Exploitations Management) IS (Y/N)

32. DO YOU KNOW THE FACTORS THAT AFFECT THE QUALITY OF YOUR PRODUCTS: VERY WELL/ WELL/FAIRLY/JUST A BIT/NOT AT ALL

33. WOULD YOU BE INTERESTED IN QUANTIFING AND PROVE THE QUALITY OF YOUR PRODUCTS: (Y/N)

34. IF YES, HOW MUCH WOULD YOU DEDICATE TO THIS: NO TIME/ONE DAY PER YEAR/ONE WEEK PER YEAR/MORE

35. WOULD YOU BE INTERESTED IN KEEPING A CULTIVATION RECORD: (Y/N)

36. WOULD YOU PLACE COMMON LABEL WITH OTHER FARMERS TO YOUR PRODUCT: YES-NO/YES, UNDER PRECONDITIONS

37. BY WHICH WAY ARE YOU INFORMED ABOUT DEVELOPMENTS AND RECENT DISCOVERIES REGARDING CULTIVATION, PACKAGING, STORING, PROCESSING AND TRANSPORTATION OF YOUR PRODUCTS: BY NO WAY/ WEB SEARCH/QUESTIONS TO EXPERTS/QUESTIONS TO RELEVANT PUBLIC AUTHORITIES/QUESTIONS TO COOPERATIONS/ OTHER (SPECIFY)

38. IN WHICH EXTEND DO YOU CONSIDER SATISFYING THE DIFFERENT WAYS YOU CHOOSED: LITERATURE/WEB SEARCH/QUESTIONS TO EXPERTS/QUESTION TO RELEVANT PUBLIC AUTHORITY/COOPERATION/ OTHER: A LOT/JUST A BIT/ENOUGH/NOT AT ALL

39. HOW FAMILIAR ARE YOU WITH THE USE OF PC: A LOT/ENOUGH/FAIRLY/JUST A BIT/NOT AT ALL

40. DO YOU HAVE A PC: (Y/N)

41. DO YOU USE THE INTERNET: (Y/N)

IF YOU ARE USING INTERNET PLEASE ANSWER THE FOLLOWING QUESTIONS:

42. DO YOU HAVE AN EMAIL ADDRESS: (Y/N)

43. WHICH WAY ARE YOU CONNECTED TO THE INTERNET: FROM MY PC/FROM MY MOBILE PHONE

44. HOW OFTEN DO YOU USE THE INTERNET: EVERY DAY/ SOME TIMES PER WEEK/ SOME TIMES PER MONTH/ LESS THAN ONE TIME PER MONTH

45. FOR WHICH REASON DO YOU USE THE INTERNET: PROFESSIONAL REASONS/PERSONAL REASONS/ EDUCATIONAL REASONS

46. DO YOU KNOW ELECTRONIC COMMERCE:(Y/N)

47. HAVE YOU EVER DONE PURCHASES OR SALES VIA INTERNET: NO NEVER/YES AND I PAID ELECTRONICALY/YES AND I PAID ON DELIVERY/ YES AND I WAS PAID ELECTRONICALY

48. WOULD YOU BE INTERESTED IN TRADING YOUR PRODUCT VIA INTERNET:(Y/N)

49. WOULD YOU INTERESTED IN KEEPING AN ELECTRONIC RECORD OF YOUR CULTIVATION AND TO SHOW IT TO PEOPLE THAT ARE INTERESTED FOR YOUR PRODUCT: A LOT/ENOUGH/FAIRLY/JUST A BIT/NOT AT ALL

50. IF YES, HOW MUCH WOULD YOU DEDICATE TO THIS: NO TIME/ONE DAY PER YEAR/ONE WEEK PER YEAR/MORE

51. WHICH OF THE FOLLOWING INTERNET SITES DO YOU KNOW, DO YOU USE OTHER SIMILAR? (Note: most of following the sites are fited to greek market):

www.politicheagricole.it	www.sian.it	www.ogeeka-dimitra.org.gr
www.regione.puglia.it	www.agrocert.gr	www.meteo.it
www.olivanet.com	www.pma.regione.puglia.it	www.coldiretti.it
www.facebook.it	www.ebay.com	

B. QUESTION REGARDING DEVELOPMENT AND COLLABORATION DISPOSAL

52. IS THE FARMER DISPOSED FOR FURTHER COLLABORATION IN THE FRAMEWORK OF THE PROJECT: (Y/N)

53. WHICH IS HER/HIS OPINION REGARDING THE FUTURE OF OLIVE CULTIVATION AT THE REGION:

54. ADVANTAGES OF THE REGION REGARDING OLIVE CULTIVATION

55. DISADVANTAGES OF THE REGION REGARDING OLIVE CULTIVATION

56. WHAT DO YOU THINK THAT PUBLIC AND PRIVATE ORGANISATIONS CAN DO FOR THE IMPROVEMENT OF THE EFFICIENCY OF OLIVE CULTIVATION

57. WHAT DO YOU THINK THAT PUBLIC AND PRIVATE ORGANISATIONS CAN DO FOR THE IMPROVEMENT OF THE EFFICIENCY OF OLIVE CULTIVATION

58. INTEREST REGARDING VERTICAL DEVELOPMENT OF THE EXPLOITATION BY FOUNDING OLIVE MILL: (Y/N)

59. INTEREST REGARDING VERTICAL DEVELOPMENT OF THE EXPLOITATION BY FOUNDING OLIVE OIL PACKAGING UNIT: (Y/N)

60. INTEREST REGARDING VERTICAL DEVELOPMENT OF THE EXPLOITATION BY FOUNDING PROCESSING AND PACKAGING UNIT FOR TABLE OLIVES: (Y/N)

61. HAS SHE/HE SUBMITED ANY INVESTMENT PROPOSAL REGARDING THE EXPOITATION: (Y/N)

62. HAS SHE/HE METERIALISED ANY INVESTEMENT PROJECT REGARDING THE EXPLOITATION: (Y/N)

63. DO YOU PRODUCE TABLE OLIVES? (Y/N)

64. WHICH QUANTITY OF THE PRODUCED TABLE OLIVES PER YEAR HAS TRADING PROBLEMS

65. WHICH QUANTITY OF THE PRODUCED OLIVE OIL PER YEAR HAS TRADING PROBLEMS

66. INTEREST FOR EXPORTATION OF THE EXPLOITATION PRODUCTS (TABLE OLIVE): (Y/N)

67. INTEREST FOR THE CERTIFICATION OF THE EXPLOITATION AS PDO (Protected Designation of Origin): (Y/N)

68. INTEREST OF THE FARMER FOR COOPERATION or SUPPORT FOR THE TRADING OF THE PRODUCTS: (Y/N)

69. a) MEAN OLIVE TREE DENSITY: TOTAL NUMBER OF TREES/ TOTAL AREA (ha)

b) TOTAL ECONOMIC PERFORMANCE 2011

c) PERFORMANCE CHARACTERISATION: POSITIVE/NEGATIVE

C. DATA REGARDING LAND PARCELS AND CULTIVATION TECHNIQUES

70. LAND PARCELS WITH OLIVE TREES

Geographical position / District

Area (ha)

Number of trees (Total)

Number of trees (ha)

Variety

Tree age

Self owend / Rented / Family (overseed)

Soil type (S: Sandy, C: Clayey, L: Loamy)

Have you done soil analysis (before how many years)

Location/Region

Slope/Height (I: Inclined, H: Horizontal, C: Combination)

Irrigation (Y/N)

Electricity (Y/N)

Distance from residence (km)

Orientation (table olive - olive oil, other products i.e. olive paste)

Quality Certification (IM: Integrated Management, OC: Organic Culture, Other)

Alternate-bearing (Y/N)

Table olive production (mean per year, tn)

Olive oil production (mean per year, tn)

Acidity of produced olive oil (mean value)

71. GENERAL QUALITY OF THE PRODUCED OLIVE OIL

WEED-KILLING

Location/Region

Weed-killer

Quantity per ha

Application months

72. WEED REMOVAL / CUTTING

Location/Region

Machine type

Application months

73. PLOWING

Location/Region

Machine type

Depth

Application months

Other specify (perimetrical hoe)

74. IRRIGATION

Location/Region

Irrigated (Y/N)

Water source

Water transportation method (pump, tank)

Irrigation method (Surface/Flood irrigation, Ditch, Sprinkler, Drip)

Irrigation system (Suspended / Surface / Subsurface)

Irrigation months

Irrigation frequency (number per month)

Water height or water volume or irrigation duration per irrigation event

75. FERTILISATION

Location/Region

Have you done soil/nutrition analysis?

Typical application 1:

Fertilisers

Number of application

Time of application

Type of application

Kg per tree

Kg per ha

Typical application 2:

Fertilisers

Number of application

Time of application

Type of application

Kg per tree

Kg per ha

76. PLANT PROTECTION

Typical application 1:

Location/Region

Enemy (Pest)

Time of application

Pesticide

Method of application

Quantity per ha

Typical application 2:

Location/Region

Enemy (Pest)

Time of application

Pesticide

Method of application

Quantity per ha

Typical application 3:

Location/Region

Enemy (Pest)

Time of application

Pesticide

Method of application

Quantity per ha

Typical application 4:

Location/Region

Enemy (Pest)

Time of application

Pesticide

Method of application

Quantity per ha

77. PRUNING

Typical application 1:

Location/Region

Type (S: Shaping, R: renewal, F: Fruit)

Time of applcation

Quantity of green wastes per tree

Method of green wastes management (Burning, Breaking, Fire woods, Combination)

Typical application 2:

Location/Region

Type (S: Shaping, R: renewal, F: Fruit)

Time of application

Quantity of green wastes per tree

Method of green wastes management (Burning, Breaking, Fire woods, Combination)

78. HARVEST

Location/Region

Harvest method (M: Mechanical, H: by hand, C: Combination)

Starting date

Ending date

Transport method (S: Sack, C: Crate)

Transport vehicle (tractor, cab car)

Compostion of harvesting team

workers number

Sex

Ages

Nationality

Participating in the harvest (family members, workers, combination)

Quantity of olives per worker (kg/day)

79. FINAL PRODUCTS

Location/Region

Table Olives

Olive oil

Olive paste

Other

80. OLIVE OIL EXTRACTING

Location/Region

Extracting percentage: kg of olive oil / kg of olives

Acidity of the produced olive oil (mean value)

Who measures the acidity? Do you find the applied methods credible?

General quality of the produced olive oil

Pit management

81. PRODUCTS TRADING (OLIVE OIL)

Sell of olive oil (Trading as PDO (Protected Designation of Origin)) to gross-merchant (Y/N)

Quantity

Price 2010

Price 2011

Packaging type

Sell of olive oil (Trading as PDO (Protected Designation of Origin)) to cooperation (Y/N)

Quantity

Price 2010

Price 2011

Packaging type

Direct sale of table olives to final consumer (Trading as PDO (Protected Designation of Origin)) (Y/N)

Quantity

Price 2010

Price 2011

Packaging type

Other

82. PRODUCTS TRADING (OLIVES)

Quantity

Price 2010

Price 2011

Packaging type

Type of processing

Sell of olives (Trading as PDO (Protected Designation of Origin)) directly to final consumer

Quantity

Price 2010

Price 2011

Packaging type

Type of processing

Other

83. PRODUCTION COST OF TABLE OLIVES

Location/Region

Pestiside

Weed removal

Plowing

Irrigation

Fertilisation 1

Fertilisation 2

Plant protection 1

Plant protection 2

Plant protection 3

Plant protection 4

Plant protection 5

Pruning

Sprout removal

Harvest

Sorting

Processing

Packaging

Sale price (per kg)

84. PRODUCTION COST OF OLIVE OIL

Location/Region

Pestiside

Weed removal

Plowing

Irrigation

Fertilisation 1

Fertilisation 2

Plant protection 1

Plant protection 2

Plant protection 3

Plant protection 4

Plant protection 5

Pruning
Sprout removal
Harvest
Olive mil
Packaging
Sale price (per kg)

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