

Economic analysis in organic olive farms: the case of the ancient olive trees in the rural parkland in Apulia

RAMEZ SAEID MOHAMAD*, MARIE REINE BTEICH*,
GIANLUIGI CARDONE*, ANDREA MARCHINI**

Jel Classification: Q12

1. Introduction

Italy is well known for its distinguished extra virgin and virgin olive oil production and quality, to which Apulia region contributes with the highest share in terms of olive production surfaces (34.6%) and quantities of olive (32.7%) and olive oil (34.2%) (ISTAT, 2013). The olive oil production in Apulia region covers almost 8.5% of the EU one (EC-DGAGRI, 2012; IS-TAT, 2013). In terms of organic olive production areas, Italy is second in the EU after Spain with 12% of its total olive surfaces under organic production. Apulia region represents 27.8% of the national organic olive surface and more than 10% of the EU organic olive surface (SINAB, 2011).

The olive trees, their unique landscape and olive oil production constitute an integral part of the very ancient culture and traditions characterising the Apulia region. Olive oil production has played from the ancient times and continues to play a key role in Apulia's economy, in terms of both production and workforce. Numerous productive ancient olive trees exist in this region conferring a distinctive landmark to the area landscape.

Uprooting the ancient olive trees from Apulia and transplanting them in the private and exclusive gardens in north I-

Abstract

The regional law on the protection and enhancement of monumental olive trees landscape in Apulia represents a key action for the safeguarding of the area imprint and of its agricultural production. In this paper, a case study approach is used to evaluate the profitability of five organic farms in the Rural Parkland of Ancient Olive Trees. A microeconomic analysis is developed to assess the economic sustainability of ancient olive orchards in relation to other local existing types of olive orchards. Results show that ancient olive orchards have a positive net margin, although lower than the thickened and intensive ones. However, a better management and an optimization of agricultural practices of ancient trees can increase extra virgin olive oil production, reduce production costs, and decrease the net margin gap in the ancient orchards compared to the other ones. Governmental subsidies can help improving mechanization and promoting the denomination of "Extra virgin oil from Apulia ancient olive trees" foreseen by the Law.

Keywords: organic farms, organic olive oil, ancient olive trees, rural parkland, microeconomic analysis, profitability.

Résumé

La loi régionale sur la protection et sur la mise en valeur des oliveraies monumentales des Pouilles est une action clé pour la protection des zones agricoles et de leur production. Cette étude a réalisé une analyse microéconomique basée sur une approche de type étude de cas afin d'évaluer la performance et la rentabilité de 5 exploitations biologiques dans le "Parc rural des anciens oliviers". Ce travail a évalué la durabilité économique des anciennes oliveraies par rapport aux autres types d'oliveraies existant. Les résultats montrent que les anciennes oliveraies ont une marge nette positive même si plus basse que dans le cas des systèmes intensifs. Toutefois, une meilleure gestion et l'optimisation des pratiques agricoles des anciens oliviers peuvent réduire les coûts de production, produire plus d'huile d'olive extra vierge que d'huile lampante et réduire l'écart en termes de profit net des anciennes oliveraies. Les subventions gouvernementales peuvent contribuer à améliorer la mécanisation et à promouvoir l'appellation d'"Huile extra vierge des anciens olivier des Pouilles".

Mots-clés: exploitation bio, huile d'olive, anciens oliviers, parc rural, analyse microéconomique, rentabilité.

taly and Europe became a recurrent activity and a lucrative business that damaged the landscape, the environment and compromised the sustainability of the region. The local authority Regione Puglia (2007, 2013), approved two regional laws (L.R.N. 14 of 4 June 2007 and L.R. N.54 of 11 April 2013) for the protection and enhancement of the monumental olive tree landscape in Apulia in order to protect and to emphasize the monumental ancient olive trees considering their productive function, their ecological and hydro-geological protection as well as their peculiar elements that characterized the history, the culture and the regional landscape. It intends to balance between the protection and the valorisation of olive trees and the requirement of income and of the activity of the farmers.

Based on this regional Law, an association of

public institutions, farmer's unions and research institutes are promoting the establishment of "The rural parkland of olive trees" (Selicato, 2001). The park area is characterized by the presence of century-old rural traditions and well-built farming practices for ancient olive growing, as well as the presence of archaeological, architectural and tourist attraction elements (Ciola and Tanzarella, 2003). Several farms within this area are managed and certified organic since the organic system is observed to meet the aims of the regional Law from the environmental and the socio-economic point of view.

The importance of the landscape, geo-morphological and

* Mediterranean Agronomic Institute, Ciheam - Bari, Italy.

** Department of Economics, Finance and Statistics, Agricultural Economics, University of Perugia, Italy.

pedo-climatic characteristics of the ancient olive trees comes together with the economic returns of its production and marketing issues (Mili, 2006). Therefore, productivity is a focal issue that brings together and preserves these aspects and ensures the ancient olive trees sustainability.

Since the regional Law prevents uprooting the ancient olive trees for private activities, some farmers tend to intensify their ancient olive orchards by planting new trees (olive and/or other species) to increase their income and their quality of life; while others abandon or ignore their ancient olive orchards when their productivity and profitability are not enough. The abandonment phenomenon is aggravated by the absence of governmental supports. The abandonment might lead to ecological and social impacts such as soil fertility lost leading with time, to hydro-geological instability, erosion and landslide devastating the ancient olive characteristic landscape and consequently the touristic component it gives to the area.

Several studies on olive orchards investigated the environmental impacts (Salomone and Ioppolo, 2012) or combined the economic performance to the energy consumption to decide the best management strategies (Kaltsas *et al.* 2007; Guzmán and Alonso, 2008) by comparing between the organic and conventional management systems. Previous studies on Apulia's region (Notarnicola *et al.*, 2004) investigated the economic performance of the organic system of olive farms compared to the conventional systems within the framework of environmental and economic analysis or considered the economic and environmental performance of innovative (intensive) olive growing systems (De Gennaro *et al.*, 2012) with no special focus on the monumental and ancient olive trees that characterise the territory. To date, very few economic studies have investigated the profitability of the ancient olive orchards in general and those under the organic management and their potential alternative incomes in the Apulian context. The current work is a preliminary and not a representative study that identifies the production behaviour and profitability of the organic ancient olive trees under the five existing Apulian ancient olive orchards types within the rural parkland. This study also investigates the factors affecting the production and profitability by determining the effect of the different applied agricultural managements. The analysis gives suggestions on how to improve the organic olive and extra virgin olive oil production and quality of the ancient olive trees, as well as the possibility of reducing their production costs and improving their revenues.

2. Materials and methods

The case study qualitative approach which allows exploring multiple bounded systems over time, through detailed, in-depth data collection (Creswell, 2007) was chosen for this study to investigate the economic performance of the organic ancient olive trees under the five existing types of ancient olive orchards in Apulia region.

2.1. Identification of the five case studies

In olive growing, there are different management methods and a wide range of system variability making the choice of the farms for an economic analysis very complex. For that reason, the choice of our five case studies was done in two stages: a preliminary selection in which we filtered farms which fulfilled four criteria related to the type and the production of the olive orchards and the management of the farm, and a final selection principally based on the availability of both the farmer and the needed historical data.

The preliminary selection was based on four criteria required for each farm: *i)* certified organic olive orchards, preferably in farms fully dedicated to olive growing; *ii)* olive orchards with at least 60% of ancient olive trees; *iii)* production of at least 50% of extra virgin olive oil and *iv)* outstanding entrepreneurship approach (active farms with high annual work hours (> 2300 hour/year) and/or a distinguished general management. With the help of a local expert with good knowledge of the Parkland farms conditions and a friendly relationship with the farmers operating in, we identified a list of twenty-seven farms that fulfil the four pre-established requisites.

Face-to-face interviews with the twenty-seven identified farmers were conducted to choose the five case studies. These interviews were based on a questionnaire about the general characteristics of the farms that allowed drawing a detailed profile for each of them. The accessibility of the complete historical economic data was fundamental for our choice. The farm size was contemplated also to include farms of different size ranges – big (>28ha), average of the area (24ha: 20-28ha), small (< 20 ha) – in an area where organic olive farm surface spectrum widely varies and to take in consideration the availability of resources and the possibility to introduce new technologies which are directly influenced by farm size. The average of organic olive farm area was based on data from the official data of the Italian Ministry of Agriculture (SINAB, 2011) and the project Bio & Tipico.

2.2. Classification of the four existing types of olive orchards within the farms

Four types of olive orchards exist in the parkland area. These types may co-exist within the same farm and are:

- a) ancient: 100% of ancient olive trees;
- b) monumental: at least 60% of ancient olive trees;
- c) mixed: less than 60% of ancient olive trees and
- d) intensive: no ancient olive trees.

Each case study was sub-divided and analysed by type of orchards within it. Considering and analysing the four types of orchards separately within each case study allow understanding the behaviour of the ancient olive trees in the different existing conditions and scenarios within the studied area and evaluating the influence of the ancient olive trees on the farm profitability.

The questionnaire used for the final selection allowed drawing the profiles of the five farms for the case studies illustrating the characteristics of each in terms of surface, type(s) of olive orchards and the percentage of extra virgin olive oil produced. The five case studies were coded as 1MA, 2MG, 3GL, 4UC

Table 1. The five case studies (farms) profiles.

Farm	Total farm surface (ha)	Olive surface (ha) by type of orchard					Extra virgin olive oil (>50%)
		Total	Ancient	Monumental	Mixed	Intensive	
1MA	70.15	70.15	10.10	-	60.05	-	73%
2MG	68.02	45.61	2.01	-	32.40	11.20	100%
3GL	26.39	21.71	1.55	0.80	19.36	-	87%
4UC	20.50	12.56	11.46	-	-	1.10	57%
5RV	11.05	7.10	-	7.10	-	-	100%

Table 2. Olive production kg/ha and percentage (%) of extra virgin olive oil in the five case studies.

Olive orchard type	Ancient		Monumental		Mixed		Intensive		
	Farms	kg/ha	Extra virgin olive oil (%)	kg/ha	Extra virgin olive oil (%)	kg/ha	Extra virgin olive oil (%)	kg/ha	Extra virgin olive oil (%)
1MA	6,133	63%	-	-	6,509	75%	-	-	-
2MG	2,220	100%	-	-	4,564	100%	3,237	100%	-
3GL	601	71%	14,358	75%	6,944	90%	-	-	-
4UC	1,280	54%	-	-	-	-	1,818	100%	-
5RV	-	-	3,523	100%	-	-	-	-	-

and 5RV¹ as and their profiles are summarised in Table 1.

The microeconomic analysis of the five selected farms was divided in two steps:

Step 1: Economic data collection

The economic data were collected through a questionnaire conducted between April and June 2009 that allows gathering detailed information on:

- Farm structure (type of orchards)
- Inventory of machines, buildings, improvements and land
- Labour (considered entirely as seasonal labour as well as the opportunity costs)
- Variable costs and outputs by olive orchards type
- Other information (consultancy, insurance, participation to expos, certifications)
- Information on market channels

Collected data were divided by olive orchard type and refer to the last four years accounting period since hard pruning is commonly applied every three to four years for ancient olive trees which highly influences the alternate bearing and the labour.

The family labour was not considered as it is done in all the investigated five cases studies as an additive work for managerial purposes or to assist and guide the seasonal workers. Therefore, it is difficult to allocate this labour to different orchards and different activities, especially that the study refers to the average of 4 years data.

Step 2: Economic data analysis

Appropriate Microsoft Excel sheets were developed for data processing and for the elaboration of the crop gross margin (CGM) by type of orchard.

The profitability measures were evaluated through: *Vari-*

¹ Farm 5RV was the exception made for the selection of the case studies since. It has only one type of olive orchard and did not reach 2,300 working hours/year. However, it has a distinguished management focusing on high quality production and a direct access to foreign markets. It has also a distinguished biodiversity and is situated in a hilly area, limiting the introduction and use of several equipments. Studying the economic sustainability of this farm will help drawing conclusions on small farms within the parkland.

² Values in the tables refer to rounded numbers.

able costs/ha, Fixed costs/ha, Crop Net Margin (CNM) = Gross Margin – Fixed Costs

The efficiency measures considered were: *Gross revenue per hectare, Gross Margin per hectare, Crop Net Margin per hectare.*

3. Results and discussion

Results are presented and commented by orchard types: (i) ancient, (ii) monumental, (iii) mixed and (iv) intensive and refer to the average of four years' values². The following section is divided into three parts.

The first part confers and discusses the results of the computed economic parameters between farms, underlining the effects of the different managements of key agricultural activities: soil management, pruning and harvesting on the profitability and efficiency.

The second part points out and discusses the effects of the types of marketing on farm profitability as market channels confirmed to have a relevant influence on the price of olive and olive oil, and consequently on farm revenues and performance.

The third part illustrates the farmers' point of view towards the parkland idea and perspective for the development and expansion of the tourism in the area, underlining the potential effects and advantages of the parkland in promoting the ancient olive trees and their products.

3.1. Economic performance by type of olive orchard

The number of trees per hectare and the percentage of extra virgin olive oil are the two main reasons for high revenues in all the studied types of olive orchards managements. Table 2 details the production average and the percentage of the extra virgin olive oil production in each of the case studies.

In the mixed olive orchards, where young trees prevail, higher percentages of extra virgin olive oil are generally produced (farm 1MA and 3GL), as young trees are exclusively harvested with a shaker and directly collected from the nets. While in the ancient olive orchards, the harvest is made through a combination of shaker and ground collection, reducing the percentage of extra virgin olive oil (farm 1MA and 4UC). The ground collection consists of leaving for several days or weeks unfurled nets under the tree to collect the naturally fallen ripe olives that most commonly are used to produce virgin and lampant olive oil but no extra virgin one. However, ground collection allows producing extra virgin olive oil if the collection from the nets is done frequently (short intervals of 2-3 days) reducing the period of olive under the trees; this is the case for farms 2MG and partially 4UC. Direct collection of olives from the distributed nets under the trees is another type of harvesting management applied by farm 5RV that results in a production of 100% of extra virgin olive oil.

The dimension and shape of the olive tree contribute as well to determine the revenue of the orchards. The large canopy of ancient olive trees increases the unitary production, while y-

young trees with undoubtedly smaller canopy have lower unitary yields. Moreover, the number of ancient olive trees in the monumental and mixed orchards is normally greater or at least the same as the one in the ancient olive orchards. Table 3 summarises the revenues (€) per hectare and type of orchards. In farms with different types of orchards, revenues registered the highest values in monumental orchards and the lowest values in ancient ones with a general tendency of monumental>mixed>intensive>ancient.

Measures of profitability

The total variable costs are the sum of costs resulting from all the applied agricultural activities and their associated inputs.

Labour costs (€/ ha) showed to be the highest in the monumental orchards and the lowest in the intensive ones.

The variable costs of soil management, pruning and harvesting are those that weight the most in olive orchards management (details in Table 4) especially considering the seasonal labour hired for their management. The other agricultural activities and practices such as pest management, milling, transport, irrigation and weeding have a lower impact on the total variable costs and usually have less relevant variability between the different exist-

Table 3 - Revenues of olive orchards by type (€/ha).

Olive orchard type	Ancient	Monumental	Mixed	Intensive
1MA	3,557	-	3,621	-
2MG	4,255	-	7,005	5,447
3GL	5,867	10,595	6,574	-
4UC	2,460	-	-	2,694
5RV	-	5,828	-	-

ing managements in olive orchards.

The highest total variable costs were registered in the monumental orchards while the ancient olive orchards showed the lowest values except for the farm 4UC (Table 4) where the ancient orchard variable costs were much higher than in the intensive one, mainly due to the high number of seasonal labour hired for harvesting.

The highest costs of soil management were registered in the mixed olive orchards of both farms 2MG and 3GL (Table 4) due primarily to the soil levelling under the ancient olive trees. Soil levelling activity in the mixed orchards of farms 2MG and 3GL required more time, more labour and consequently more corresponding inputs than for the ancient olive orchard due to the higher number of ancient trees per hectare and the difficulty of

Table 4 - Variable costs by type of olive orchard (€/ha).

Olive orchard type		Ancient	Monumental	Mixed	Intensive
1MA	Total variable costs	2,751	-	2,716	-
	Soil management costs	52	-	52	-
	Pruning costs	250	-	346	-
	Harvesting costs	1,131	-	949	-
2MG	Total variable costs	802	-	1,627	1,238
	Soil management costs	124	-	172	114
	Pruning costs	229	-	452	317
	Harvesting costs	163	-	429	395
3GL	Total variable costs	2,33	8,649	4,432	-
	Soil management costs	42	66	66	-
	Pruning costs	303	1,066	836	-
	Harvesting costs	1,118	5,95	2,581	-
4UC	Total variable costs	1,196	-	-	730
	Soil management costs	32	-	-	99
	Pruning costs	264	-	-	42
	Harvesting costs	352	-	-	341
5RV	Total variable costs	-	1,903	-	-
	Soil management costs	-	79	-	-
	Pruning costs	-	430	-	-
	Harvesting costs	-	695	-	-

movement of the machines. Soil levelling is more cost efficient in low density orchards with distant trees.

The variable costs of pruning were the highest in the monumental 3GL farm and the lowest in the intensive 4UC (Table 4) where the trees are relatively young and the pruning is done in a traditional way with no machines and inputs use. The pruning costs tended to increase for four main reasons: *i*) the frequency of pruning (every two years for young trees and every four for ancient trees); *ii*) the type of pruning (mechanized with rented or owned machineries or traditional with basically human labour) applied within the 4 years cycle and therefore strictly related to the management of the orchards; *iii*) the number of trees per hectare and *iv*) the age and canopy of the trees.

The notably high variable costs of pruning in the monumental olive orchard of the farm 3GL are due to the aforementioned reasons: the mechanised pruning (applied every two years also for ancient trees alternating between light and heavy pruning), the large number of trees per hectare particularly the number of ancient olive trees. While in the mixed olive orchard of the same farm the number of young trees is higher than the ancient and there is a very special circumstance that consists in the absence of any costs for pruning residues collection as an external person collects them for free for his private personal use.

The mixed olive orchard of farm 1MA registered higher pruning costs than those of the ancient one (Table 4) due to the higher number of trees per hectare as well as to the higher frequency of pruning in the mixed orchard. Pruning is carried out in a traditional way every two years for the young trees in the mixed olive orchard while it is mechanized every four years in the ancient olive orchard. The same situation of pruning costs is observed in farm 2MG and 3GL.

In an overall consideration of the results, pruning variable costs values showed to be higher in monumental >mixed >intensive>ancient.

The variable costs of harvesting showed the same tendency as the variable costs of pruning (monumental>mixed >intensive>ancient) with the highest value registered in the monumental orchard of farm 3GL (Table 4). Again, this high value is mainly due to the large number of ancient trees per hectare in this orchard and also to the high rent cost of a shaker to harvest the entire orchard.

The outstanding exception to this tendency was registered in farm 1MA (Table 4), where the variable costs of harvesting were higher in the ancient olive orchard compared to the intensive one. In this farm, the harvesting of the ancient olive trees was carried out in several steps employing each six workers plus the necessary machinery (hydraulic shaker) to be completed. While the young trees of the intensive orchard are harvested by one worker equipped with a shaker and an integrated reverse umbrella. As a result, the input and labour costs for this activity in the ancient olive orchard were higher than those of the mixed olive orchard. In farm 4UC, variable costs of harvesting were slightly higher in the ancient olive orchard where the collection of olives from the ground is practiced, but not in the intensive one.

It is noteworthy to mention that the variable costs of harvest-

ing of the mixed olive orchard of farm 2MG were the highest compared to the other mixed orchards due not only to the large number of trees per hectare but mostly to the high input and labour costs owing to the rent of a shaker with umbrella for 50% of the young trees and of a mounted shaker for the others. While in the ancient olive orchard, the trees are harvested only by means of a shaker mounted on a tractor.

Fixed costs showed to have the same general tendency as the total variable costs, the harvesting and the pruning costs are decreasing in values from monumental>mixed>intensive> ancient (Table 5). These values are the results of the depreciation of machines and the integration of new trees to thicken the orchards especially where ancient trees are very distant and have very low density. One exception of this tendency is in the farm 4UC due to the absence of fertilization, pest management and olive collection from the ground (Table 5).

The crop net margin per hectare was positive for all the orchards types in all the farms with values from 405 euro for the ancient orchard in farm 1MA up to 5,180 euro in the mixed orchard of farm 2MG (Table 6). The overall tendency obtained was mixed>intensive>ancient, except for the farm 3GL where the high weight of high harvesting costs related to the use of a rented shaker inverted the tendency showing the best crop net margin in the ancient orchard. Considering that in this farm the costs of the shaker rent has always affected the results (as previously noticed for variable costs of harvesting), a simulation has been made on that farm considering that the shaker is owned by the farmer and not rented, taking in consideration all the variables of this change (depreciation, labour and input costs). The results of this simulation showed that the crop net margin of the monumental olive orchard was the highest among all types of orchards in all the studied farms (Table 6). After the simulation the observed tendency of the crop net margin was changed in monumental>mixed >intensive>ancient.

Measures of efficiency

Table 7 summarises the relevant efficiency indexes calculated for each farm by type of olive orchard.

The **gross revenue per hectare** of all farms showed a monu-

mental>mixed >intensive>ancient tendency. The highest gross revenue per hectare was registered for the monumental orchard of farm 3GL, while the lowest for the ancient orchard of farm 4UC (Table 7).

The **gross margin per hectare** values tend to be the highest in the mixed orchards followed by the intensive and finally the ancient ones (except in the farm 3GL due to the high weight of harvesting costs as previously explained). However, after recalculating the gross margin per hectare in farm 3GL simulating that the shaker for harvesting is owned, the tendency became monumental>mixed >intensive>ancient with the highest value in the monumental orchard of farm 3GL and the lowest in the ancient orchard of farm 1MA (Table 7).

The **crop net margin per revenue** of the studied types of orchards showed high values in the ancient orchards of farms 2MG (0.79) and 3GL (0.57) compared to the other orchards of the same farms, while in farm 4UC it showed lower value than the intensive orchard due to the high weight of the variable costs of the ancient olive orchard. In a general outlook to the results, the tendency of the crop net margin per revenue was ancient>mixed>intensive>monumental. This means that the ancient olive orchards showed to be more efficient among the other types of olive orchards in terms of converting their revenue into profit.

3.2. Market channels of the studied farms

Marketing any type of product or production is considered a critical point for the success of the firm and a good marketing strategy induces to higher selling prices and therefore to increase the profit. At present, markets competitiveness is very strong and good organic produce does not assure a good price for the organic products. Producers must plan a marketing strategy to sell all their products at the best price possible. Two out of five of the studied farms had developed a marketing strategy with specific distribution channels as shown in Table 8; however, the other farms had their own satisfying channels of markets with no pre-established strategy.

The agritourism activity on farm 1MA plays a key and successful role in promoting and selling most of the farm production (olives and olive oil) inside the farm.

The olive oil of farm 2MG is mainly sold through the internet which resulted in this case a very good strategy as these products have the organic, the private and the PDO labels, offering a positive image and high credibility as well as good prices. The e-commerce in this farm largely contributed to its high revenue. As such, the farmer has direct contact with his consumers either on farm gate or through the internet at local, national and international level. The products of the farm 3GL are exclusively sold through a local cooperative with no marketing strategy elaborated by the farmer, who considers his channel the best to avoid intermediaries.

The farmer in 4UC seems satisfied with his current channels and does not think of developing any specific marketing strategy.

The farm 5RV is a very special farm case whose aim is to produce premium quality extra virgin and virgin olive oil with a

Table 5. Fixed costs by type olive orchard (€/ha).

Olive orchard type	Ancient	Monumental	Mixed	Intensive
1MA	401	-	467	-
2MG	95	-	197	178
3GL	189	317	226	-
4UC	402	-	-	400
5RV	-	1,747	-	-

Table 6 - Crop net margin by type of olive orchard (€/ha).

Olive orchard type	Ancient	Monumental	Mixed	Intensive
1MA	405	-	438	-
2MG	3,358	-	5,180	4,030
3GL	3,348	1,629	1,916	-
3GL with simulation	3,798	5,681	3,782	-
4UC	862	-	-	1,564
5RV	-	2,178	-	-

Table 7 - Efficiency indexes by type of olive orchard.

Olive orchard type		Ancient	Monumental	Mixed	Intensive
1MA	Gross revenue (€)/ha	3,557	-	3,621	-
	Gross margin (€)/ha	805	-	905	-
	Crop net margin (€)/revenue (€)	0.11	-	0.12	-
2MG	Gross revenue (€)/ha	4,255	-	7,005	5,447
	Gross margin (€)/ha	3,452	-	5,377	4,209
	Crop net margin (€)/revenue (€)	0.79	-	0.74	0.74
3GL	Gross revenue (€)/ha	5,867	10,595	6,574	-
	Gross margin (€)/ha	3,537	1,947	2,142	-
	Gross margin (€)/ha (after the simulation)	4,002	6,022	4,021	-
	Crop net margin (€)/revenue (€)	0.57	0.15	0.29	-
4UC	Gross revenue (€)/ha	2,460	-	-	2,694
	Gross margin (€)/ha	1,264	-	-	1,964
	Crop net margin (€)/revenue (€)	0.35	-	-	0.58
5RV	Gross revenue (€)/ha	-	5,828	-	-
	Gross margin (€)/ha	-	3,925	-	-
	Crop net margin (€)/revenue (€)	-	0.37	-	-

marketing strategy primarily targeting the international markets with special focus on northern European countries through personal contacts.

3.3. The farmers' point of view towards the parkland idea

None of the interviewed farmers is a member of the association of the parkland project, but all intend to make part of it in the near future. They all express their good will and intention to participate in any activity aiming at promoting the ancient olive trees and ancient olive trees products. Two of the farmers have already undertaken a step toward promoting the ancient olive trees products. One of the initiatives is a leaflet attached to the olive oil bottle introducing the ancient olive tree, its origins and its importance to the local community. The second initiative is the undertaken efforts to get a certification of ancient olive trees.

All the interviewed farmers look at the parkland project as a positive idea aiming to maintain and preserve the ancient olive trees in the area in particular and in Apulia region as a whole. They expressed some ideas and concerns towards the setting up of the parkland and especially regarding the foreseen proposal, within the parkland project, for the valorisation of the extra virgin olive oil from ancient trees.

Most people agreed that the creation of a designation or label of "olive oil from ancient olive trees" could largely contribute to get premium prices for the product and positively impact the image of the olive oil produced in the area especially on the very competitive markets of olive oil in the Mediterranean region. However, they underline the necessity of working on improving the quality of the olive oils from ancient trees to have competitive products and gain more market shares.

Table 8 - Effect of marketing and promotion activities on farm profitability.

Farm	Promotion activities	Label types	Marketing strategy	Distribution channels	Market types
1MA	No	Private	No	Personal contact on farm	Agritourism Local
2MG	No	Organic PDO Private	Yes	E-commerce on farm	Local National International
3GL	No	Organic PDO	No	Cooperative	Local National
4UC	No	PDO Private	No	on farm	Local International
5RV	No	PDO Private	Yes	on farm	National International

Due to their negative previous experiences and perceptions with proposals for regional and local projects for rural development and protection, the farmers expressed a major concern regarding the management and leadership of the parkland project. They dreaded ambiguity and confusion of the subsidies distribution especially that so far there is no plain idea in the proposed parkland project about this issue. They are alarmed by the risk of creating the parkland for political rather than entrepreneurial purposes and aims.

Some of them consider the parkland establishment as a territorial responsibility of the public sector to which producers may collaborate by selecting active entrepreneurs, members of local farmers cooperatives and assign them the management of the parkland.

4. Conclusions

Conclusions take into account two main features, i.e. the main measures calculated by olive orchard type and those concerning the agricultural activities.

The five studied organic olive farms in the rural parkland with the presence of ancient olive trees proved to be profitable enterprises. This profitability differs between farms and between different olive orchards types within each farm chiefly according to the type of management applied.

The ancient olive orchards have a positive net margin, although lower than the monumental, mixed (both thickened) and intensive ones where the number of trees by hectare is higher.

Even if the monumental and mixed olive orchards are more efficient in terms of using the land, the ancient olive orchards are slightly more efficient than the other orchard types in terms of converting their revenue into profit.

The fixed costs in the monumental, mixed and intensive orchards are increased per hectare due to the depreciation of new trees establishment, while they are also due to machine costs only in monumental and mixed.

The costs of soil management increase by increasing the number of trees per hectare. They are also increased by some essential activities such as cleaning and compacting the soil under ancient olive trees to increase efficiency of collecting olive from the soil and to reduce the problems of weeds especially in organic farms, in which herbicides are prohibited.

Mechanized pruning, collecting and crashing pruning residues activities of ancient olive trees are more efficient than the traditional ones. This result is compatible with what was found by Leone *et al.* (2008) who compared manual and mechanized pruning of ancient olive trees and demonstrated that the labour productivity of mechanical pruning is 4 times greater than in the traditional one. The use of the elevator with motor saws and pneumatic shears are the most recommended since they reduce the labour working risks and tiredness, as confirmed by Gabrielli *et al.* (2008), and reduce the total hours of labour specially because qualified workers for pruning are scarce.

Concerning harvesting, a relevant part of olive production of ancient olive trees is collected from the soil; the longer olives stay on the ground, the lower their quality. This period can be shortened by collecting olives from the ground several times per

year before and after harvesting from the tree by using a shaker. The ancient olive trees could involve three steps, (i) ground picking, concerning the olives dropped spontaneously before the full maturation of the fruit, (ii) tree picking, (iii) final ground picking of the olives left. These harvesting steps have also been reported by Leone *et al.* (2008). In the case of high bearing years, a fourth picking from the ground is done to avoid the deterioration of the olive quality. Even if these steps amplify variable and fixed costs, the quality of olive and olive oil increases further and consequently the revenues increase. Harvesting from the trees by using a shaker mounted on a tractor is a successful choice in medium and large size farms where it is more profitable to own the machines instead of renting them. This shaker easily ensures harvesting of the upper parts of the ancient olive tree, but the trees should be pruned in appropriate way to avoid branches fragility, facilitate the harvesting activity and make it more efficient. This result is compatible with a study made by Gabrielli *et al.* (2008) and by Bellomo and D'Antonio (2009) that proved higher efficiency of using a shaker for harvesting the ancient olive trees than the other methods in terms of increasing the production and costs reduction. On the other hand, harvesting ancient olive trees by using compressor with pneumatic kits and applying nets under the trees is appropriate for the small farms situated in hilly areas with difficulties in integrating technology, and they also preserve the quality of the olives.

Increasing the quality of olive oil increases the selling price and promotes this olive oil in the national and international markets; consequently the revenues of the ancient olive trees increase.

The good management of agricultural activities in olive orchards contributes to reducing the production costs and increasing the revenues. Soil management activity under the ancient trees should be done to increase the efficiency of collecting olive from the soil, and the mechanized pruning is recommended to increase the efficiency of labour and reduce the costs of pruning. Moreover, mechanized harvesting of ancient trees by using shaker and harvesting many times from the soil in short intervals is also recommended to increase the olive production and increase the quality of olive oil.

In other words, a better management and an optimization of agricultural practices of ancient trees can reduce the production/management costs, increase the production quantity and improve the quality of olives leading to better quality and more quantity of extra virgin olive oil, rather than lampant and virgin olive oil; thus they can help decreasing the net margin gap in the ancient orchards compared to the other ones.

To conclude, it would be of great importance to assess whether the public intervention for the area development should be directed towards the improvement of technical and economic aspects to reduce the costs of production, or to a policy of product differentiation (label, certifications, etc...) able to generate a market for extra virgin olive oils of the parkland. The second pathway should ensure a premium price of the product to cover the higher production costs in the ancient trees orchards. Therefore, the productivity issue may be preserved by the role of the public sector in terms of subsidies and premium prices given for

the olive oil production, as well as the role of private sector by sharing the responsibility of the whole community in helping the farmers to get extra prices through a recognised added value or the design of a new label "extra virgin of ancient olive oil" specially dedicated to their product.

References

- Bellomo F. and D'Antonio P., 2009. Come meccanizzare l'olivo- to per avere più reddito, *L'informatore Agrario*, 28: 36-45.
- Ciola G. and Tanzarella F., 2003. La piana degli ulivi secolari tra tutela del paesaggio e prospettive economiche. In: Selicato F. (ed.) *Il parco agrario degli ulivi secolari, la piana costiera tra Bari e Brindisi*. Fasano: Schena.
- Creswell J.W., 2007. *Qualitative inquiry and research design: choosing among five approaches*. 2nd ed. Thousand Oaks, CA: Sage Publications.
- De Gennaro B., Notarnicola B., Roselli L. and Tassielli G., 2012. Innovative olive-growing models: an environmental and economic assessment. *Journal of Cleaner Production*, 28: 70-80.
- EC-DGAGRI, European Commission Directorate-General for Agriculture and Rural Development, 2012. Economic analysis of the olive sector. [http://ec.europa.eu/agriculture/olive-oil/economic-analysis_en.pdf]. Latest update: July 2012.
- Gabrielli F., Gucci R., Polidori R., Vieri M. and Zammarchi L., 2008. Riduzione dei costi in olivicoltura, soluzioni tecnico-economiche, *L'informatore Agrario*, 37: 27-44.
- Guzmán G.I. and Alonso A.M., 2008. A comparison of energy use in conventional and organic olive oil production in Spain. *Agricultural Systems* 98: 167-176.
- ISTAT, Istituto di Statistica, 2013. Banche dati, <http://dati.istat.it/>
- Kaltsas A.M., Mamolos A.P., Tsatsarelis C.A., Nanos G.D. and Kalburtji K.L. (2007). Energy budget in organic and conventional olive groves. *Agriculture, Ecosystems and Environment*, 122: 243-251.
- Leone A., Tamborrino A., Clodoveo M.L. and Amirante P., 2008. Valorizzare l'extravergine da ulivi secolari in Puglia. *L'informatore Agrario*, 28: 47-52.
- Mili S., 2006. Olive oil marketing on non-traditional markets: prospects and strategies. *New Medit*, 5 (1): 27-37.
- Notarnicola B., Tassielli G. and Martino Nicoletti G., 2004. Environmental and economic analysis of the organic and conventional extra-virgin olive oil. *New Medit*, 2: 28-34.
- Regione Puglia, 2007. Tutela e valorizzazione del paesaggio degli ulivi monumentali della puglia. Legge Regionale, 4 Giugno 2007, n. 14. In: *Bollettino Ufficiale della Regione Puglia*, 83, suppl. del 7-6-2007.
- Regione Puglia, 2013. Integrazioni alla legge regionale 4 giugno 2007, n. 14 (Tutela e valorizzazione del paesaggio degli ulivi monumentali). Legge Regionale, 11 Aprile 2013, n. 12. In: *Bollettino Ufficiale della Regione Puglia*, 54, del 17-4-2013.
- Salomone R. and Ioppolo G., 2012. Environmental impacts of olive oil production: a life cycle assessment case study in the province of Messina (Sicily). *Journal of Cleaner Production*, 28: 88-100.
- Selicato F., 2001. *Un parco per una monumentalità sacrale. Puglia in tavola tradizione e cultura*. Progress communication.
- SINAB - Sistema Informativo Nazionale Agricoltura Biologica, 2011. *Biostatistiche: Bio in cifre*, http://www.sinab.it/share/img_lib_files/1966_bio-in-cifre-2011-pubblcazione.pdf. Accessed April 2013.