

INFERIOR CROP PERFORMANCE IN ORGANIC VINE AND OLIVE SECTOR DUE TO THE POOR IMPLEMENTATION OF QUALITY PROCESSES. THE CASE OF KEFALLINIA.

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Research

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CONFLICTS OF INTEREST

There are no conflicts of interest for any of the authors.

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ABSTRACT

Vines and olives are the prevailing crops in Kefallinia, but there is a concern about the competition of the sector and the adoption of organic farming. A farmer survey was conducted in the major viticulture and olive culture spot to study conventional and organic status for these two crops. Non-existent extension support system is the most important factor for the inferior competition of the sector. Extensive bureaucracy is another factor that prevents farmers to participate in the organic farming scheme. Organic farming is not attractive and many farmers initially motivated to participate in the scheme by the benefit of subsidies, finally abandoned the undertaking after the end of the first phase of the program. Low competition of the sector reduces attractiveness to young farmers. Olive

oil produced is not branded and therefore farmers do not enjoy high product prices. Development of farmer groups and implementation of quality assurance scheme is proposed as a mean to improve competition of the sector.

Keywords: Viticulture, olive culture, organic farming, extension service, quality assurance

INTRODUCTION

Viticulture and olive culture are the most important crops in Kefallinia island. They are perfectly adapted to the Mediterranean basin, both in terms of soil pattern as well as in climate conditions. Vines and olives are perennial plants with deep and extensive root system that exploit soil moisture reserved in soil. Climate

conditions are typical of the Mediterranean area with rainfall events to happen mostly between September and March followed by a dry and warm season between April and August. The importance of crops has been appreciated from ancient times and still today are connected to local society development offering socio-economic and environmental benefits (Sgroi *et al.*, 2015). The whole society and not only the farmers were involved in activities related to these crops (e.g. soil tillage, pruning, harvesting the fruits) transforming them to a significant part of cultural heritage and not simply aspects of crop management. Through time, the uninterrupted interaction among these crops with the environment and the local society has formed unique customs, perspectives and behaviour with respect to the environment. Even today, despite tourism growth and urban expansion that cause great changes in the life pattern, olive groves and vineyards remain dominant in the landscape and in local peoples' lives.

Until the middle of 20th century, significant proportion of wine production was exported to the European market, mostly to Italy. A serious decline in exports was observed due to the strong earthquake of 1953 that devastated agriculture in Kefallinia and led to vineyard abandonment. Production was reduced and home consumption substituted the exports. The wine sector reactivated after 1970, with production and marketing by few private wineries. Key factor for a significant expansion of wine production in Kefallinia was the establishment of Robola Zone and the winemaking cooperative there, as well as the establishment of some private wineries. At the same period, the introduction of Phylloxera in Kefallinia was observed; huge number of dying grapevine plants challenged viticulturists as they were not able to apply any treatment to save or protect them. The causing factor of this phenomenon was quickly identified. The major problem was the sensitivity of indigenous self-rooted *Vitis vinifera* to the aphid of phylloxera feeding on grapevine roots. The solution was to graft local varieties of *V. vinifera* on suitable rootstocks of *V. labrusca* resistant to root feeding phylloxera. Although replanting grapevine plants grafted on rootstocks resistant to phylloxera started soon after the identification of the problem, infestation of vines pushed many farmers to abandon their vineyards. They were already

aged and unwilling to undertake a new start that would begin to pay back their efforts no earlier than 4-5 years. Most of the fields re-planted years later when viticulture began to expand again. A side-effect from replanting of vines was the introduction of virus diseases, not previously recorded in Kefalonia, possibly due to infected propagation plant material.

More recently, the attempt to develop viticulture in the Region of Ionian Islands in accordance with the principles and practices of organic farming started with the activation in force of the EU 2091/92 regulation. Although previously identified to increase farm efficiency and technology improvements (Sauer and Park, 2009), implementation of the relevant regulation and the connection of subsidies with the area cultivated under organic farming as a key incentive combined with the expectation of higher grape prices which was designed to promote the development of sector, finally failed to improve the status of organic viticulture. Initial growth of organic viticulture was finally reversed in Kefallinia but also in the Region of Ionian Islands.

Although there is uneven geographical distribution in the island, vines are evenly distributed among the lowland, semi-mountainous and mountainous regions, with a slight tendency to concentrate in the mountainous areas, probably due to more favorable climatic conditions (Fernando *et al.*, 2018). Mountainous viticulture stands out from the others for various reasons, such as the lack of mechanization, the low yield per hectare and the strong links with the surrounding territory. These links are so strong that finally viticulture is considered as a mean for protection of natural heritage and preservation of cultural heritage (Cichielli *et al.*, 2016). Major production areas are formed in the limestone center of the island, where the zone of Robola exists. The most important area for the organic production of vineyards is the area "Omala", where a significant cluster is formed in Robola zone and consists of 21 farms of vineyards and olives. Within the same zone, a second area is developed around the village of Trojanata with 6 farms. Prevailing variety is Robola that predominates in the majority of vines, followed by Tsaousi, Mavrodaphne, Vostylidi, Moschato, Zakyntino, Moschatela, Scylopniktes and Mothonios. Significant spot of vines is also located in Paliki (in west side of Kefallinia),

where viticulture still is an important crop despite strong reduction in area cultivated. In south Kefallinia the remains of an earlier major viticulture center is recorded. The northern part of the Eryssus Peninsula is of no interest since viticulture has been abandoned and only a small spot of "Mavrodaphne Kefallinia", a Product of Geographical Indication, still exists. Vines of Kefalonia could be described as wine vines, as almost as 80% of the total area is dedicated for wine production, while only 20% of total area is dedicated for raisins. Most of the vines are older than 30 years. Replanting of vines is very slow. Overall, vineyard for conventional and organic production total area in Kefallinia is of 180 ha, from which only of 12 ha under organic management. The increasingly complicated procedures for implementing the relevant EU regulation, the total certification cost for the producer, the lack of a reliable mechanism to support the whole undertaking combined with the small size of the vineyard farms led to a significant reduction of 50% in the initial number of producers who have vineyards under certification schemes following the initial period of the program.

There is the misconception that when transitioning from conventional to organic farming it is sufficient only to implement some traditional practices and not necessarily to add any inputs which results in inferior competition of the sector. There is a tendency among growers to include in the scheme sloppy and marginal land, vulnerable to erosion (Comino *et al.*, 2016; Costantini and Barbetti, 2007) with limited or no inputs but also without any preventing measures to soil erosion. Therefore important issues for organic farming such as plant protection or plant nutrition do not attract serious attention and no special care is taken to prevent any damages in the crop or the environment. Also, the support from central administration is inefficient whereas the private sector represents only the provision of plant protection products and fertilizers. Farmers also face bureaucracy when interfering with public sector, which is a prevailing factor that finally influences adversely adoption of new practices by farmers (Kuehne *et al.*, 2017). The option of farmers' group and subsequently the implementation of Decision Support Systems would be an excellent alternative in order to provide elementary support to farm-

ers and to work on issues arising from the implementation of organic farming (Terribile *et al.*, 2017).

Olives is also a prevailing crop in the Ionian Islands and subsequently in Kefallinia. Olive oil, a major national product, corresponds to 14.49% of the total value of primary sector and 20.27% of the total value of plant production in National Level. Although olives is an important crop in the primary sector of Kefallinia, the product is not branded. This is mainly attributed to the parallel network that exists which is used for marketing with no control olive oil outside the formal network. Currently more than 1,000,000 olive trees are growing in Kefallinia. Most important varieties are Koroneiki and Thiako. Other varieties are Manaki, Mouzolia and Dopia (Local). The size of olive orchards in Kefallinia can be classified small to medium, because most olive groves occupy 1-4 hectares, while few olive groves are sized between 4-10 hectares. Most of olive orchards (60-70%) fall to the small size, 20% to medium size and only 10% are large.

Most of the olive trees planted in Kefallinia were produced in local plant nurseries. The imports of olive trees in Kefallinia began after 1980. Today, no plant propagation material is being produced in the island of Kefallinia. All propagation material is imported from mainland.

Olives are found throughout the island, either in olive orchards or individual trees. In recent years the planting of dwarf olive trees has began. These are trees that are planted at very short distances, thus making better use of the available space. If this attempt continues, it will cause serious changes in Kefallinia's olive grove, as it will change dramatically olive crop in the form it has been known. A significant challenge for the success of this undertaking is the development of enough expertise and experience to ensure that these plants will be managed properly and profitably.

Similarly to viticulture, the introduction of subsidies depending on the area cultivated in combination with the increased farmer prices expected resulted in the expansion of organic olive culture but the initial enthusiasm was followed by a disappointment due to unfulfilled expectations. Olive culture in Kefallinia is of traditional type and therefore subsidies are neces-

sary to keep olive farming financially viable (Graaff *et al.*, 2011) but this deviates farmers from the targets of the program of organic farming. Farmers used to assign in the program marginal olive orchards similarly to the vines. Farmers believe that transition to organic farming requires only implementation of some traditional practices with the exclusion of unauthorized pesticides and fertilizers.

In Kefallinia the total of production of olives is processed to produce olive oil. No table olives are produced in Kefallinia, except of very small quantities for family consumption. Contrary to the grapes, olive fruits are processed and olive oil which is the final product is marketed by farmers themselves. Growers trade olive oil through the informal distribution networks which appear to be stable despite changes in standardization process. Thus, official processors and traders of olive oil cannot directly control the quality of olive oil produced. This is an important element with significant implications on the general operation of the olive oil industry (filière).

Organic olive culture and organic viticulture had common development within the same frame of EU policy for organic farming. Thus, several of the socio and economic characteristics of farmers are common or at least similar in both crops.

In order to study the situation of viticulture and olive culture in Kefallinia, an on-site survey based on farmers interviews through fixed questionnaires was performed. Totally 298 farmers (132 farmers from the vine sector and 166 farmers from the olive sector), were interviewed. The age of farmers was between 19-67 years old. 275 farmers were graduated from the elementary education and 23 farmers had a degree from an academic institute of higher education. The survey tackled issues as the qualifications of farmers, the reasons for implementing conventional or organic farming, the structural characteristics of farms, the economic returns for implementing organic farming in olives and vines, the involvement of farmers in the process of product and the future attitude towards the undertaking of organic culture.

RESULTS

2.1 Current situation. It is confirmed that viticulture

either conventional or organic is a complementary activity for vine growers. For only half of the farmers, farming is the main occupation by means of income earned by viticulture. A significant percentage (23%) of farmers interviewed are retired from their main occupation. Part of farmers are engaged in viticulture although they are mainly activating in other sectors as trade, industry, or in private sector. Only a few farmers (11% of the total) activate also in livestock production. Contrary to livestock production where clusters with economic power and influence within decision making system exist, viticulture is not a so attractive occupation for young people. Obviously, small attractiveness and low interest for viticulture pose high risk for the future to viticulture. For olive sector, on-site survey revealed that for 79% of farmers, farming is their main occupation in terms of time devoted. For 60% of farmers, agriculture provides more than 50% of their income. But comparing with viticulture it appears that olive growers have a stronger agricultural profile. Only a small part of them activate in public sector (5.6%) or as freelancers (5.6%). Only 10% of olive growers questioned activate also in livestock production.

It is very interesting to observe what motivates vine growers to adopt organic farming. A percentage of 26% of vine growers declare that they decided to implement organic farming for its eco-friendly profile, 25% of farmers to take advantage of the benefit of subsidies and 25% of farmers to achieve higher product quality and the prospect of higher price expected, whereas the rest of farmers implemented organic farming as they consider it "traditional agriculture". It appears that organic farming is considered more as a defensive action and less as a transition towards quality production (Honig *et al.*, 2015).

Different approach is observed by olive growers. Most of farmers (70%) included all of their fields under organic farming scheme. Increased product quality and higher market prices is the motive for 28% of farmers questioned, whereas the benefit of subsidies motivated a smaller proportion of farmers (20%) to participate. The rest of farmers consider organic farming as an extension of traditional agriculture. Organic farming is considered as a defensive move, especially from those growers who consider organic

farming as an environmental friendly agriculture rather than the transition to a more demanding farming. These differences reflect also their opinions on how alternative agriculture has an impact on the environment as well as society (Pinna, 2017).

Lack of training is of great concern for farmers. A majority of 66.7% of farmers that participate in organic farming have never attended any training course. Nevertheless, only 20% of farmers interviewed expressed their interest to attend a training seminar. Farmers are trying to improve farm management by searching in the web or looking for support from each other or from the market network. Obviously continuous training is required. The various co-funded EU programs, when done in occasional base do not offer reliable support. Farmers appear to be cautious concerning the attempt to implement the rules of organic farming in their fields. This could possibly reflect uncertainty about the future and eventual discouragement of expectations, contrary to other regions of Greece but also of neighboring Italy where effort is given to the transition towards organic farming.

2.2 Farm management modifications due to the implementation of organic farming. For the vine sector findings of the onsite survey clearly show that there no substantial differences between organic and conventional viticulture. Plant protection products often used is copper for the control of downy mildew and sulfur for the control of powdery mildew. In both organic and conventional viticulture, farmers use low-power soil cultivation machinery, while hand-held lawnmowers are widely used for weed control. Vines are rarely irrigated although that even in small quantities it would be very helpful to alleviate stress suffered during the long and dry summer period. Organic nutrition is considered very important in the survey area as soil is poor and with low profile, specifically in slopes. Inorganic fertilizers mainly nitrogen based, were extensively used in the vines but after implementation of organic farming, manure and compost are used to provide nutrients for the crop.

Perhaps the fact that the introduction of organic farming, at least at the early stages, was considered as a system related to traditional cultivation helped

(along with the subsidies provided) to its initial spread. For almost half of farmers (48%) nothing has changed since the introduction of organic farming, whereas only a part of 14% of farmers find a change in the inputs applied. For these farmers, organic farming requires more work which is probably expected because it introduces alternative plant protection methods and non-chemical weed management. Indeed the fact that extra cost appears not to be significant can be attributed on small size of vines, the limited and highly seasonal field workers demands and the availability field workers. This is also confirmed by the fact that most farmers (77%) believe that organic farming does not introduce new cultivation techniques whereas some farmers (17%) believe that organic farming introduces modifications in nutrient management and only few producers (6%) believe that organic farming demands changes in plant protection management. In conclusion, introduction of organic farming did not radically affect already implemented cultivation practices in viticulture, rather it is seen by producers as an opportunity to return to improved traditional practices.

Implementation of rules and principles of organic farming also influenced olive culture. Implementation of organic farming in olive culture, in the initial phase at least, was presented as relative to traditional farming and in combination to subsidies helped to be adopted by farmers. Only a part of 36% of farmers questioned believe that organic olive culture requires extra labor demand. Probably most of the olive growers do not invest at all in the crop but they only collect olive fruits. Thus they do not identify any increase in cost production. Interestingly a small part (12%) of farmers questioned believe that organic olive culture requires less inputs than conventional crop. Concerning labor force required, this is not considered as a limited factor for the majority of farmers. Most of farmers (70%) use their private machinery, mainly for soil cultivation. They also use small lawnmowers suitable for weed control, as well as knapsacks for pesticide application. Annual cost for machinery maintenance is small, of 100-150 Euros, which implies that machinery is of small or medium horsepower. Similarly to vines, olives are not irrigated. Olives cover their needs mostly from the winter rains. Dry season is long, from April to August in which period water is

scarce. There is no surface sources of water to support irrigation at all. This imposes high stress to olive trees which causes a reduction of 60-70% in fruit yield. Manure returns as an important fertilizer for organic farming. Manure from adjacent livestock units is used to cover nutrient requirements for olives but also to improve soil condition. However, specific needs of olive trees (mostly for potassium) are covered by inorganic fertilizers as used to be in the past. Plant protection is the second aspect of olive culture that was significantly influenced by the introduction of organic farming. Biological control of pests using pheromone traps is well adopted and implemented.

Packaging and transport of olive fruits from the field to the olive mill is an issue with major impact on the quality of olive oil. Even with the implementation of organic farming, farmers still use plastic sacks with a capacity of 40kg each. These sacks can be used for more than 10 years. For most of farmers (more than 80%) olive fruits remain in these sacks for longer than 3 days before they will be processed in the olive mill. This is the stage where fruit and olive oil quality decreases dramatically.

The majority of farmers (64.5%) declare that there is a particular demand for organic grapes whereas 35.5% of farmers do not see any change in demand between conventional and organic grapes. This point, indirectly, could be considered as an element related to the commercial policy of wineries. Usually wine-makers in Kefallinia complain for the high cost they have to pay for organically produced grapes compare to the low cost paid by wine-makers in other regions, which finally makes wine produced in Kefallinia more expensive and less competitive. However, it is noted that the area yields are low (350-500 kg/ha) and the small size of vineyards results in higher cost production. Clearly there is a need to improve crop methods, increase the quality of products and reduce cost production. From a wider point of view, it seems that the initial dynamics of the sector has been followed by a slowdown, with the exception of few small wineries that aim to promote their placement into the markets while safeguarding a high-quality profile for their products. This is in accordance with Abraben *et al.* (2017) that showed that as wine quality rating increases, the positive effects of organic practices and certifi-

cation on price decrease.

Similarly to other regions, wineries consist the driving force of viticulture in Kefallinia. The end of the decade of 1980 was crucial for the development of the sector as it was marked by the establishment of the winery of Robola Cooperative and the shutdown of the two major wineries that had been operating until that period. Further, smaller but competitive wineries also established leading to the continuous diversification and quality improvement of production.

For olive sector, contrary to what would be expected, olive oil produced in organic fields is not of higher demand from olive produced in conventional fields. Probably there is not a significant market for the organically produced olive oil. The low economic returns observed at the filière level attribute the difficulties in producing high level quality branded organic olive oil. It is also crucial, in order to attribute the low demand for biological olive oil, to point that at least half of the olive oil production is marketed through the informal market networks.

Olives are processed in the mills. Mills are industrial units of medium economic potential, of private or cooperative legal form. Their seasonal operation begins at the end of October and ends in early March. Essentially, the mills process the olive fruit for the reception of olive oil. The basic stages of processing are: a) receipt of the olives in the mill, b) feeding production line and defoliation, c) washing the olives fruits, d) breaking the fruits and milling, e) kneading of the olive oil, f) removal of olive oil from the olive paste (by pressuring and centrifugation) and g) the final separation and purification of the olive oil. Today, in Kefallinia activate 9 olive mills, very few compare to 200 olives mills that were operating until 1953. Olive mills, which are generally the processor of the olive oil are paid by the olive growers in two ways: a) directly, for the services provided or b) indirectly, by withholding a retention which refers to the total olive oil production produced by each grower. Retention, is a percentage that varies from region to region but generally ranges between 6% to 10% of total production. Unlike in the case of wineries, the owners of olive mills are not necessarily traders of olive oil which decreases the importance of processing

the olive fruits since olive oil returns as a final product to the producer. In the case of organic olive oil there are only some rare cases of high quality olive oil as the long process of the olives in the mill degrades the quality of the final product.

CONCLUSIONS

Implementation of organic farming in two major crops in Kefallinia, generates expectations and opens new perspectives, but in a contradictory and confusing way. While organic farming compare to conventional farming is considered to be an innovative practice that offers more promising long term prospects (Mohamad *et al.*, 2014), significant part of farmers in Kefallinia consider that is a re-emergence of the practices of traditional viticulture and olive culture. The lack or incompleteness of an information and technical support system for young organic farmers may explain such attitudes of farmers (Ahmed *et al.*, 2018). The total absence of producer organizations combined with the inability of individual agronomists to provide support, makes the situation uncertain. The producer feels isolated and has to deal with complex issues that often go beyond his experience and expertise. Very soon gets disappointed and loses interest for implementing organic farming.

Organic farms also suffer from structural weaknesses such as the high age of farmers or the poor prospects for the future. Specifically for viticulture, shrinkage can create significant threats in the near future, even for grapes that currently enjoy the status of Origin Product Designation and finally lose the strategic comparative advantage for the respective production zone areas and the local process.

Despite the efforts made to improve marketing conditions, a significant part of the production of olive oil is circulated through informal networks, without enjoying the decisive advantage of selling particularly as a certified organic product. Also, olive oil sold as certified do not appear to have established a commercial profile as of higher quality product. Thus, the producer enjoys only a small part of the total net value added to the product and doesn't obtain a significant advantage from being integrated into production system of certified organic products. The production of

higher quality certified product also depends on the ability of the processing enterprises to evolve into actual vertically integrated units and take advantage of the opportunities to market a branded product of higher quality (Du *et al.*, 2017), or to guarantee the status of a high quality and reputation product assigned with a designation of origin. Perhaps it is not excessive to state that the take-over of a large part of the total organic production chain by local businesses is a key prerequisite for the success of the undertaking, in order to secure a larger share of the net added value per product bottle to the local grower.

Public sector and private agronomists support farmers only on administration issues but failed to provide technical support or advice on marketing issues. Small size of olive farms combined with exhaustive bureaucracy shifted attention of farmers from important technical and financial issues to administrative issues in order to guarantee subsidies payment.

Farmers' groups on organic olive culture and organic viticulture would be very useful in order to provide elementary, at least, support to producers and shift the burden to issues that may arise from the transition from conventional to organic farming. Farmers group will definitely contribute to an end product of higher quality.

In addition to everything else, there seems to be a failure to accept and implement effectively the EC 834/2007 European Regulation on Organic Agriculture. Thus, while several farmers declare that they comply with the requirements of the relevant regulation, this is done to a very limited degree and mainly concerns the exclusion of non-registered pesticides for organic farming, which is very far from the aim of the relevant regulation to provide the basis for the sustainable development of organic production while ensuring the consumer confidence and protection of consumer interests. In the case of Kefallinia, the fact is that not only there is no sustainable development of the sector, but even the farmers who initially joined the scheme, finally abandon the undertaking.

The establishment of a sustainable management system that could be seen as an innovation solution towards sustainability (Luca De *et al.*, 2018) is the main subject of this regulation and may result on the

production of high quality products. But although implementation of the relevant EC 834/2007 regulation is finally confirmed and products certified, taking into account aspects of organic viticulture and organic olive culture, it is clear that not any management system is followed. The issue of soil cultivation is very characteristic. Although crops are growing in slopes, farmers use to plough for weed management. Slopes are vulnerable to erosion and soil cultivation aggravates soil erosion. Soil cultivation is not prohibited according to the relevant regulation where merely is stated only the need to avoid compaction and soil erosion. However, since this cannot be controlled when implementing the regulation, farmers continue to cultivate the land as this is a traditional practice, even though they pose high risk to the environment in long term. Finally, the farmers obtain low quality finally product.

It is also important to stress the absence of technical and scientific support during the production process. Both wine growers and olive growers develop their activity based on their knowledge or the information they receive from their colleagues or the traditional technique applied in the area, usually not based on scientific research. Thus, the final outcome of the production process is not what farmers expect, since the final product is of low quality and with a negative impact on the environment due to non justified farmers' decisions. The most common mistakes are observed in the implementation of plant protection, fertilization, pruning and soil management: For example, in both olives and vines it was observed that no monitoring methods are applied by farmers to determine optimal point for intervention (except the case of olive fly). The result is poor plant protection in combination with an unreasonable load in the environment with chemicals and a significant risk for pesticide residues in agricultural products, including higher risk to farmers' health since farmers do not apply the appropriate Personal Protective Measures. Concerning plant nutrition, soil analysis or leaf analysis are rarely performed. Plant nutrition is based on macroscopic leaf symptoms, which is indicative and therefore not reliable. Thus poor nutrition and load of the environment with fertilizers is observed. The pruning of the olive trees does not take place every year. Plants are pruned every three to four years or even more. Pruning is per-

formed to thin leaf canopy of the trees and reduce levels of relative humidity and to get wood for house heating. However, accidents are very often. Inferior competitiveness of the sector in general is the ultimate result. Small and distant fields increase difficulties to implement common rules so that the final product become homogeneous and better negotiated in market. The co-ordination of farmers could be done by already fixed structures, such as Producer Cooperatives but there does not seem to be such a movement towards this target. The result is the degradation of organic olive culture and organic viticulture, unlike the trend in other regions of Greece and neighboring Italy where the sector is thriving.

Overall, the majority of farmers (69%) are not willing to increase field area and it is a minority of farmers (31%) willing to establish new plantations. In case of viticulture these farmers are connected to the small wineries and wineries are benefited as they secure their operation. The relative reluctance that is currently being recorded and the uncertainty about the future of organic wine production combined with the non-verification of initial expectations is compounded by one more reason: the observed trends in the demand for wine products in Kefallinia continue to be guided by the classical quality characteristics of grapes. Concerning olive culture, significant efforts will be required by all stakeholders for the improvement of the sector and increase profit that will motivate farmers to invest more efforts.

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