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IN THE FIELD

Olive groves: "The life and identity of the Mediterranean"

Angeliki Loumou and Christina Giourga
Department of Environmental Studies, University of the Aegean, Mytilini, Greece

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Abstract. Olive tree cultivation in the Mediterranean goes back to ancient times. Even since the Roman Age, olive cultivation spread to the entire Mediterranean basin. This longevous tree integrates and identifies economically, socially, and culturally the inhabitants of this basin and determines its rural landscape. For the residents of the Mediterranean, olive oil constituted the main source of nutritional fats, their most valuable export product, and was identified with their culture. Even now, olive cultivation has a multiple importance for the Mediterranean. The olive groves, which grow mostly on inclined, shallow, and low fertility soils, and on hand-made stone terraces, have limited watering requirements and sustain the fragile natural resources of the Mediterranean. Today, olive cultivation in the Mediterranean is an additional income source and supports the population in rural areas during the winter period, which profit from summer and sea tourism activity. Although an agro-ecosystem, the olive grove resembles the natural Mediterranean ecosystem and abandonment transforms them into natural Mediterranean type forests. Their change of use from olive cultivation to pasture degrades the ecosystem and decreases the natural resources, because of over-grazing. At this time, two major factors threaten the traditional olive cultivation (i) the competition of the intensive olive groves in plain and irrigated areas and (ii) the cheaper seed-oils, which intensify the abandonment of traditional olive groves and change them into pasture, resulting in the deterioration of the ecosystem. Olive cultivation has left its mark on life in the Mediterranean and has contributed to the sustainability of natural resources. Nevertheless, it succumbs under the pressure of current socioeconomic situations. Today, the conservation of olives in production constitutes a necessity for the fragile Mediterranean ecosystems and a challenge for everybody involved.

Key words: Olive groves culture, Olive groves environment, Olive oil and nutrition, Mediterranean basin, Sustainable agriculture

Angeliki Loumou *is an agronomist-economist research scientist in the Department of Environmental Studies at the University of the Aegean, working on economic issues of environmental impacts by agriculture. Her research interests include the economic and social conditions needed to sustain the integrated rural development.*

Christina Giourga *is an assistant Professor of agro-ecosystems management in the Department of Environmental Studies at the University of the Aegean, where she teaches both Plant biology and Environmental impact of Agriculture. Her research interests include the conservation of natural resources (soil, water, biodiversity) through agriculture and the use of agricultural practices to sustain soil productivity. She is also head of the Laboratory of Agro-ecosystems management.*

Introduction

The cultivation of olive trees in the Mediterranean basin goes back to ancient times. According to Greek mythology, "morios" Zeus was originally the protector of the holy olive tree, the "moria elaia" (grafted olive tree). The goddess Athena offered it to the city of Athens as a gift by planting the first olive tree in the Acropolis (Citadel). This tree was kept and shown in the Erechtheion temple (Letsas, 1949). The same goddess taught the people the cultivation of the tree and the treatment of the fruit, and she became protector of olive cultivation (Kakridis, 1986).

The cultivation of the olive tree spread quickly to the entire Greek speaking world, as well as throughout the Mediterranean basin. There is evidence of olive cultivation in Greece that dates 3,500 years ago, while the memories of the "Elaion" (Olive Grove) of Athens are lost in the depths of the centuries. The Greeks had used olive oil as a medium of transaction and marketing since the Minoan Times (Romero, 1998). In fact this strengthens the opinion that olive cultivation

was propagated by them (Tsirtsis, 1988). The areas cultivated with olives steadily increased in Greece and, with the support of the Romans, in the entire Mediterranean basin. In the course of time, the requirements of the market and the importance of landed property in the past made the olive the dominant cultivation (Braudel, 1979b). In Marseille and Languedoc there is proof of olive cultivation since the 4th century BC (Garcia, 1992). The Tunisia of Roman times is famous for its olive groves and the region of Djerba, even in the 16th century, was an oasis of olive trees between Tunisia and Tripoli. Since the Renaissance in Lombardy and Lower Andalusia, minor importance is given to the cultivation of wheat, in favor of the olive groves (Braudel, 1979b).

The objective of this article is to reveal the perennial economic, cultural, and ecological importance of olive groves in the Mediterranean. Furthermore, it identifies the problem of its maintenance in the context of sustainable agriculture and sustainable development.

Cultivation area

It is not coincidental that, as far as the geographers are concerned, the Mediterranean expands from the most northern point of the olive growth down to the big palm tree groves in the south (Figure 1). According to them, the first olive tree one meets when moving southbound coming from the north, is the proof of one's entry in the Mediterranean region. It is assumed by this definition that the cultivation of the olive identifies the climate (Angles, 1999), which one way or another is a determinative factor in people's lives in the Mediterranean (Polunin and Huxley, 1987) and thus to the basin itself. The origin of *Olea europea* in Mediterranean is complex and associated with a multilocal domestication of its cultivated forms, as recent researches with molecular markers have indicated (Besnard and Berville, 2000; Besnard et al., 2001).

In the Mediterranean basin, there are many varieties of olive trees and this region alone produces 99% and consumes 87% of the world's olive oils. Specifically, the Mediterranean countries of the E.C. produce and consume 70% of the world's olive oils (IOOC, 2000). Olive oil has only a 4% share of the world vegetable oil production. However, thanks to its high value per unit, olive oil accounts for 19% of the value of world trade in edible vegetable oils (Luchetti, 1993).

Recently, between 1986 and 1994, the area under olives in EU grew by some 100,000 Ha split between Greece, Spain, and Portugal, promoted by the EU common olive oil policy (Drogue, 2000). Most of the new olive orchards use new olive cultivation methods: they expand in irrigated areas (Guzman Alvarez, 1999) and the traditional farming system has changed to semi intensive and intensive systems (Graaff de and Eppink, 1999). Nowadays, three main groups of olive-farming systems can be observed. (Beaufoy, 1998; Guzman Alvarez, 1999):

- Intensive plantations, which are irrigated with mechanical harvesting, these are the new orchards.
- Semi-intensive plantations, which are in the hills and where rational production criteria are being applied.
- Traditional plantations, which are common in terraces and which are gradually being abandoned on more or less marginal land.

These three groups are characterized by different economic and environmental features. The irrigated olive orchards have quintupled production in comparison to the dry orchards (Romero, 1998). So, the traditional olive farming in sloppy or fairly rugged land is threatened by the new intensive olive-orchards.

During the last few years some trading partners, which have regions with Mediterranean type climate such Australia and the US, looked at the possibility of becoming self-sufficient on olive oil (Drogue, 2000).

Landscape

The olive is the emblematic tree of the Mediterranean regions. Along with vine and cereal growing, it represents their most traditional agricultural activity and the most striking feature of their agricultural landscape (Angles, 1999).

Olive farming trends are confined to slopes or fairly ragged land (Romero, 1998), so the olive occupies important parts of mountains and hills and is characteristic of the Mediterranean landscape. In these regions the hostile bas-relief of the soil is converted with the use of terraces into productive land, which reveals the strength of life in the Mediterranean and the endurance of the cultivators, who try hard for the earning of their daily bread. These terraces are the kingdoms of olive groves, vineyard and citrus trees. However, the extent and the dimension of the olive trees gives explicit sovereignty to the tree cultivation. A distinct rural landscape is thus shaped in the Mediterranean and differentiates the zone from Central and Northern Europe with the arable cultivation and widespread pasture areas (Lebeau, 1991).

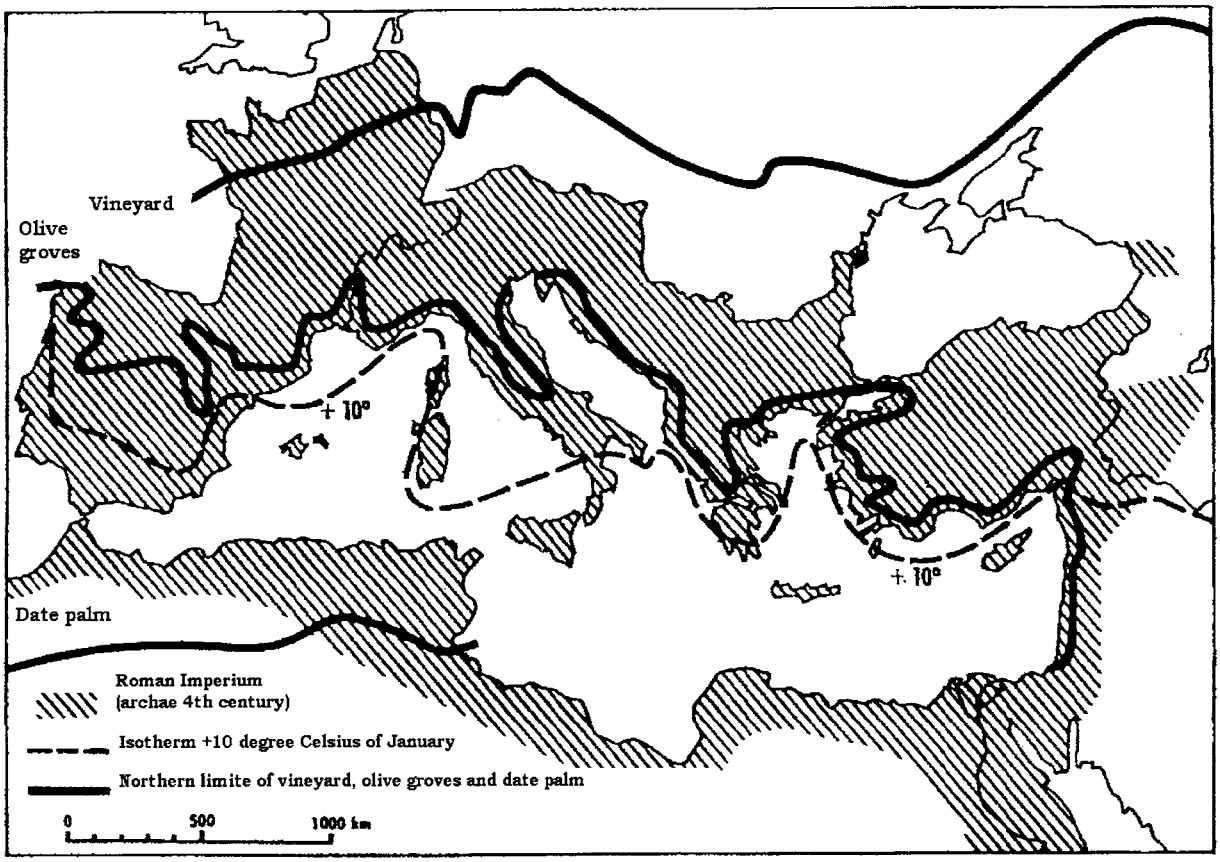

Figure 1. Roman Imperium and northern limit of vineyard, olive groves, and date palm.

Cultural importance

The "Mediterranean of the olive tree" is limited naturally to certain narrow bands of soil in the coastland and does not necessarily coincide with the "Mediterranean in History." In the heart of the anthropographical unity of the Mediterranean, one would observe a powerful physicogeographical unity, a certain atmosphere that acts as a unifying factor in the landscape and the manners of life. Thereupon, the genuine Mediterranean Sea is a system controlled by a uniform extent of life and climate so unique that it is usually the only inland referred to as Mediterranean. Thus, as early as in the 16th century, the inhabitants of the Mediterranean, no matter their origin, never feel like strangers on any of the coasts. In fact, what they do is a change of residence rather than a migration, since what they keep in front of their eyes are the same trees, the same flora, the same landscape, and primarily the same dishes on their tables. Consequently they live under the same sky and are accustomed to their familiar seasons of the year (Braudel, 1979a).

The Mediterranean climate is not only identified along the narrow strips of land but also in the big water areas, this immense medium of communication that expands its radiation much further than its natural limits. These regions include the Apennines and the Kyrinean peninsula, and Greece and Tunisia, but also certain different narrow bands of ground that never exceed a 200 km distance from the coastline. The presence of similar realms in different countries, such as Greece, Italy, Spain, and northern Africa, where societies have lived in the same rhythms, exchange of people and goods with no feelings of different identities or isolation, proves that there have been variant living units that were by no means superficial, and it reveals the powerful unity of the sea (Braudel, 1979a).

The uniformity of the climate had many consequences on the people of the Mediterranean. Since the early days, it prepared the ground for the consolidation of identical agricultural cultivation. Already in the first millennium B.C. the culture of the olive exceeded the eastern boundaries of the sea and expanded to the west. This initial homogenization took place in the depths of centuries, with the collaboration of humans and nature (Braudel, 1979a). Nature provided the similar territorial and climatic conditions on the cultivation that characterizes almost the entire Mediterranean and humans made use of them in the

best possible way, developing a remarkable culture surrounding the agricultural activity.

The cultivation of the olive tree is of great importance for the Mediterranean in the passage of time and Jesus Christ, head of the new religion when it started, consecrated the principal alimentary Mediterranean products, such as wheat, wine, and oil.

Olive groves give a character to the rural cultivation and identify the conquest of the inhabitants over their natural environment (Braudel, 1979a). The connection of olive oils to religions in the region, from antiquity up to today shows the everlasting great importance that the cultivation of olive has had on Mediterranean life.

And indeed, in modern times, despite the growth of a number of substitutes, olive oil remains for the Mediterranean, *the oil*, a cultural element, and it is tightly connected with the palatal requirements of the inhabitant of this part of the planet. The nutrition of the population from the eastern Mediterranean to the western one uses the olive oil to cover their alimentation needs in fat (Jacotot, 2001).

Economic importance

In the Mediterranean basin, the olive along with the vine constituted the equivalent of the rural industries of the North. This equivalence is important, if not for the volume of income, at least for the number of people they engaged, since the 16th century and on, whenever an increase of the cultivation of the olive is observed. Olive oil is one of the basic commercial goods of the time and it takes a great part at the exchanges between North and South (Braudel, 1997b).

At the same time the possibility of exploitation of the soil that olive groves occupy for the production of different agricultural products under the olive trees, mainly with cereals and legumes for the alimentation of people and cattle (Sereni, 1964; Lebeau, 1991) increases the economical importance of these certain areas. Over the centuries, olive trees have played an important role in rural development as one of the major sources of income and employment in the Mediterranean's relatively poor rain fed areas (Graaff de and Eppink, 1999).

The wide use of treated products from the olive fruit (oil as food and soap for cleaning purposes), contributes to the increase of cultivated areas, and, in the frame of a commercial economy, the olive-growing regions (as the Lesvos) bloom economically, socially, and culturally (Sifnaiou, 1996). The importance of cereal cultivating regions decreases while the value of olive growing regions increases.

However, the mechanization of agriculture with the consecutive introduction of cheaper olive oil substitutes decreased the importance of olive cultivation and led to an economic and consequent cultural decline in the regions that had supported their development by the cultivation of the olive (Margaris, 1988; Guzman Alvarez, 1999). At the present time, olive oil has only a 4% share of the world vegetable oil production, which is dominated by soybean and palm oil (Luchetti, 1993). The maintenance of olive orchards depends on the consumption level that is determined by the price ratio between olive and seed oil (Mili, 1999). A price ratio of approximately 1:2 between olive oil and seed oils was considered necessary to guarantee consumption levels (Cilenti, 1998).

Ecological importance

It is obvious that the cultivation of the olive has left its trace on the physiognomy, the economy, and Mediterranean life itself. When we speak of life, we usually refer to humans and forget its relation to the rest of the creatures and systems of the planet.

The cultivation of the olive, even if it constitutes a form of exploitation of the soil by man, is nevertheless a cultivation that distinctively marks the life and the ecosystems of the entire region where it grows. Olive groves constitute an integral and significant part of the Mediterranean environment and culture, however, their ecological importance has only recently been acknowledged.

All the literature references agree that the ecosystem of the olive is quite stable when compared with other agricultural ecosystems. Cirio (1997) believes that this may be due to the stability of the environment itself, the trend of production, the small number of really pernicious pests, the tolerance of pest damage, and the abundant beneficial arthropod fauna. Alvarado et al. (1997) state that it is a crop that shows little imbalance, since the number of treatments applied is still very low. Crovetti (1996) ascribes the stability of the agricultural ecosystem to the marked complexity in the intraspecific and interspecific relationships between the insects associated with the olive resulting primarily from the lengthy growing period.

Considering the biotic forms, the flora in the olive grove ecosystem presents an exceptional resemblance to the flora of Mediterranean type ecosystems (Margaris, 1980). Consequently, the artificial system of an olive grove, as opposed to what stands in other agroecosystems, is very similar to the natural mediterranean ecosystems, even in its functional, efficient condition. This claim is proved by a number of researches. The cultivated olive tree is the grafted form of a wild olive tree, which is a basic element of evergreen (maquis) vegetation, one of the prin-

cipal types of mediterranean ecosystems. Many olive groves have substantially resulted from the vaccination of the wild olive tree that already existed there. According to phytogeographers one of the main flora communities with one of the widest expansion in the Mediterranean space is the Oleo-Ceratonion, which, as its name suggests, is characterized by the presence of olive tree.

The existence of a significant number of diverse plants of the Mediterranean flora in cultivated olive groves (Oikonomidou, 1969; Pavlidis, 1976; Giourga et al., 1994), ensures the conditions for the creation of a multitude of habitats for animals. The olive has a wealth of arthropod fauna, comprising one hundred or so phytophagous species in addition to others described as being useful or indifferent (Arambourg, 1986). Indeed, there have been identified 15 insect classes, which include from 94 to 125 families. The large number of insects and the rich flora ensure food to an important number of birds: 31 species have been located in olive groves (Giourga et al. 1994; Theodorakakis, 1995). It is inhabited both by winter birds (Suarez and Munoz-Cobo, 1984) and nesting ones (Munoz-Cobo, 1990). Fruit-eating birds have been noted over the winter season. The existence of the olive is, consequently, of the highest importance for many types of fauna that survive during the winter (Niethammer, 1966), such as blackbirds (*Turdus merula*) and starlings (*Sturnus vulgaris*) (Debusshe and Isenmann, 1985; Jordano and Herrera, 1981) and for migratory *birds en route* (Finlayson, 1981). The ecological effects of olive growing are also international, since they are related with the migration of birds from North Europe (Guzman Alvarez, 1999). Further, a relatively large number of mammals has also been located there, more than 12 species. Naturally, it is not possible to fully identify all preceding animal species that depend on the grove on an annual basis. It should be stressed, however, that olive trees are evergreen trees and produce fruit with high energy content, which are available during the winter period (Giourga et al., 1994; Theodorakakis, 1995).

As early as 1929, Turril, after observations on the Dalmatic coasts, realized the rich flora and vegetation of the abandoned olive groves and he rightfully described them as "olive grove-forests." These "forests," as functioning eco-systems, are indeed superior to the cultivated pinewoods often found in the Mediterranean region, since their biodiversity is clearly greater than that of pinewoods. In the case where olive groves are abandoned for a long period of time, they convert in cistusshrubs where the following species prevail: *Cistus creticus, Cistus salviaefolius, Erica verticillata, Anthillis hermaniae, Genista acanthoclados, Plantago beilardi, Trifolium stellatum, Trifolium campestre, Asphodelus microcarpus, Tuberaria guttata, Fillago gallica, Hypochoeris aetnensis, Tolpis virgata*, and *Hymenocarpus circinatus*. These cistusshrubs are enriched continuously with new species and the wider system tends to return to its original condition. It appears that through the process of ecological succession, the abandoned olive groves tend to turn into natural forests of the Mediterranean type, depending on the climatic and territorial conditions of each region (Vokou, 1988).

Natural resources

When the cultivation of olive trees is abandoned, the land use changes, and usually becomes pasture for sheep and goats, since the land is not suitable for any other kind of cultivation. In this case, the environment is adversely affected. Soon after the land's abandonment, the land shows an increased production of biomas, annual vegetation, as compared to the pasturelands, and forms preferential regions for grazing (Margaris, 1987). Therefore its exploitation is intense, having as a consequence the productivity degradation of its soil, because of the intensity of the erosive phenomena, while at the same time the natural regeneration of vegetation is impeded (Chatteron and Chatteron, 1981; Warren, 1986; Margaris, 1987; Giourga et al., 1998). As a result of the change of use to pasturage land, it has been determined that there is a significant decrease of plant coverage and a limited number of woody plant species in abandoned olive groves. Thus, a cultivated olive grove presented plant coverage of 81.2% by 11 woody types. After twenty or thirty years since the change of use of the land, the percentage of plant coverage was decreased to 33.2% and 29.6% respectively, while the number of woody species was limited to only five. The consequences do not concern just biodiversity and plant coverage but the soil's depth as well, which lacks the protection from the erosion provided by the rhizome of the plants and plant coverage. The intensity of the erosive phenomena in the case of an abandoned olive grove turned into a pastureland is obvious, since the depth of the grove's soil is reduced from 30 cm to 10 cm and 6 cm after twenty and thirty years of abandonment, respectively (Margaris et al., 1988).

The maintenance of the traditional olive grove is benign for the environment, since these show low soil erosion rates and a high bio-diversity. The importance of olive cultivation is becoming even more important if one considers that the olive grove exploits marginal productivity inclining soils that run the increased danger of deterioration. In these areas, traditional plantations in terraces' slopes show low soil erosion

rates (Graaff de and Eppink, 1999). Really, who's not thinking of the terraces across the Mediterranean, on hearing the word "olive grove"?

The conservation of the olive grove system, in productive condition, contributes to the sustainability of the natural resources through their preservation by the maintenance of the soil, the reduction of rainfall's losses, and their exploitation. Olive trees are drought-resistant and because of their extensive rooting system are some of the few crops that can survive on only 200–300 mm of annual rainfall (Fresco, 1996).

Throughout the centuries, the traditional olive plantations are the kind of cultivation that maintained the productive possibility in the barren and dry Mediterranean soils, with very high erosion levels. In these terraced areas, the erosion is decreasing with the protection of the minimal soil, and the reduction of the outflow and nutrient losses, since they elongate the remaining time of rainfalls on the surface of the soil (Graaff de and Eppink, 1999). Consequently, the terraces favor the percolation of the water in the underground waters and its appearance in lower altitude regions, in the form of spring water (Katakouzinos, 1957; Warren, 1986; Giourga, 1991).

Contemporary economic and environmental importance

Nowadays, olive cultivation is still the basic tree cultivation in the Mediterranean and dominates its rural landscape. Its predominance in almost the entirety of regions with inclining soils with marginal productivity keeps these areas productive. Indeed, it is a cultivation that requires limited or no machinery at all. It is something that would not be possible in an arable cultivation, which in inclining areas has in many cases replaced it. In such a manner, the olive cultivation contributes to the increase of employment and the conservation of the natural resources. Olive cultivation, in the contemporary Mediterranean of aestival and marine tourism, is presented as a rural activity combined with tourism. Since the need for hand labor appears during the harvest period (Graaff de and Eppink, 1999), namely in winter, which is an inactive time for tourism (Iakovidou, 1988), the maintenance of cultivation is compatible with this activity and so prevents environmental deterioration. In these terms, olive cultivation is still present in regions where it would potentially be abandoned, because it takes advantage of the inhabitant's free time and constitutes a secondary source of income. In present day, the cultivation of olives constitutes the sovereign manner of a multiactivity example in agriculture and more specifically in small farms. The occupation with the cultivation of the olive deters the winter depopulation of the regions developed for the tourist trade, and it thus maintains their rural landscape, which usually gives them the distinctive character of their natural surroundings (Loumou et al., 2000). Thus, olive cultivation and tourism are strongly connected in the Mediterranean in an interactive and mutual dependence relation that is expressed in the population, the culture, the rural landscape, the economy, and the natural environment.

The olive and the vineyard are both cultivations that represent adaptations in the different social and economic changes through history. This cultivation is completely adapted in the climatic and territorial conditions of the Mediterranean (Mazoyer and Roudart, 1998), so for their production, limited input is needed. Specifically, the cultivation of olive in semi-intensive systems presents low requirements in chemical inputs and machinery in comparison to other agricultural crops (Loumou, 1994). Olive cultivation even in intensive farming can be described as not being very unbalanced (Alvarado, 1998).

It is remarkable that olive groves have existed on barren, shallow, and inclining soils of marginal productivity since the ancient times (Katakouzinos, 1968, 1969; Romero, 1998; Guzman Alvarez, 1999) because the olive is a tree of minimal requirements in water. All over the world, olives have proven to grow successfully in marginal and less favorable areas (Bonazzi, 1997; Spennemann and Allen, 2000).

Within the scope of sustainable agriculture, contemporary perceptions promote environmentally friendly agricultural practices. In this scope, no tillage is encouraged, which, in the case of olive cultivation, finds an already existing practice through tradition and necessity (Guzman-Alvarez, 1999), since in one way or another, in this cultivation, limited mechanical interventions take place (Romero, 1998). The trend for quality products is satisfied in this certain cultivation, since the chemical substances used for the production of olive oil are the lowest possible among not only its competitive products but among all other agricultural products of the Mediterranean (Giourga et al., 1994; Civantos, 1995; Civantos, 1998). From this point, the cultivation of the olive is compatible with sustainable agriculture, and it neither consumes the natural resources, nor depreciates them (Arhonditsis et al., 2000). A productive olive grove is still closer to the natural eco-systems, because the interventions taking place during cultivation are very limited.

Aside from the purely economic aspect, olive farming has a heavy social and environmental significance, which is important when drawing up any regional development policy. This is very important for marginal orchards, which are threatened up to elimina-

tion through the high productivity (improvement in cultural and harvesting practices, use of irrigation) in the extensive orchards (Mili, 1999). However, globalization, which equates above all with deregulation and the lowering of protectionist barriers (Levitt, 1983), will certainly change the normative and competitive setting of the olive oil sector in the coming years. First, world supply and demand is gradually growing, and second, the economic players in the sector will have to operate in an intensified process of globalization. The possibilities for olive oil, which can only compete on its qualities not on its price, are to expand into new markets apart from the traditional ones (Mili, 1999). This expansion can rest not only on its nutritional and health properties. It is also because it is a basic ingredient of the Mediterranean diet, which is healthier and more balanced than other kinds of diets (Ferro-Lazzi and Sere, 1989; Grigg, 1995). Overall, olive oil is produced with environmentally friendly practices in relation to other crops and improves agricultural sustainability.

Conclusions

Olive cultivation has a multiple importance for the Mediterranean. The olive tree is indissolubly linked from antiquity up to present times with the culture, the nutrition, and the economy of this region. Being selected for cultivation, it mandates knowledge of environmental conditions as well as the alimentary needs of humans. Through the centuries, its distribution, expansion, and, finally, its dominance, has given the distinctive character of the Mediterranean landscape and has supported the equilibrium of the ecosystems via the formulation of an admirable biodiversity. Thanks to the conservation of the soils and the limited inputs that it requires, olive cultivation contributes to the sustainability of natural resources. In the frame of modern perceptions, the olive cultivator constitutes a real model of a farmer who is not only a producer of goods but also a preserver of the environment.

Considering the above, who would dispute the importance of the olive grove in the life of the Mediterranean? Nowadays however, under the pressure of the economic situation in agriculture and globalization, the olive groves tend to carry over from traditional incline, shallow, arid, and barren areas into plain and irrigated areas, where its mechanization is possible. In this way the cultivation of the olive is being pushed out in the most fragile and poor areas of the Mediterranean. This traditional cultivation is in danger of being abandoned in these regions, resulting in devastating consequences for the environment and the economy of these areas, especially in the case of a change in the use of the land into pastures.

However, the importance of the olive grove as an element of identity and conservation of life for all the beings in the Mediterranean basin necessitates its maintenance in activity. Farmer multiactivity allows the maintenance of traditional olive orchards and promotes the sustainable rural development. In this way, olives can continue to offer the gifts that they have given for centuries as a benediction to the Mediterranean.

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Addresses for correspondence: Dr. Angeliki Loumou, Department of Environmental Studies, University of the Aegean, Xenia Building, University Hill, Mytilini 81100, Greece
Phone: +30-22510-36210; Fax: +30-22510-36099;
E-mail: alou@aegean.gr