

Economy, Demographic Changes and Morphological Transformation of the Agri-Cultural Landscape of Lesvos, Greece

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Abstract

The cultural landscape is a concept that best depicts society and economic changes in an area. Cultural landscapes include more than just morphological characteristics of an area and act as symbolic tanks. The study of the cultural landscape and its transformations in morphological, economic, ecological and symbolic terms can thus provide a comprehensive picture of the social, ecological and productive changes in an area. Such a study can be used for understanding the major driving forces behind the dynamics of the changes and investigate future trends. In this paper the study of the changes of the landscape of Lesvos, a Greek island, is attempted on two levels: an economic level, which refers to land use changes linked to demographic changes and the transformations in landscape characteristics and images that these changes bring; and an ecological level that refers to the ecological consequences of the changes. The time span refers to the 18th to 20th centuries when major changes (local, regional and global) took place. Data come from a variety of published and unpublished local sources. Results indicate that economic and political changes brought forward major demographic changes and transformed the landscape significantly, particularly affecting 'traditional' elements in a typical Mediterranean development.

Keywords: *agricultural landscape, economic and social changes, Lesvos*

Introduction: Agricultural Landscape Transformation and Socioeconomic Changes

Agricultural landscapes can be defined in many ways (Terkenli and Kizos 2002). Most common definitions include the visual element of the landscape. The most common non-metaphorical use of the word is connected with vision, not necessarily only views, but *images* as well. But a landscape has many more meanings than just visual images and is connected with more senses than just vision: it is a production medium; it is the set in which organisms and species survive and reproduce (Wascher and Songman 2004; Forman and Godron 1986) and it is a *cultural image*, a medium of representing, structuring and symbolizing environments through images (Daniels and Cosgrove 1994). This cultural character is the 'key' to unlock landscape experiences, meanings and symbols (Jackson 1984; Appleton 1996; Cosgrove 1998; Terkenli 2001).

Agricultural landscapes represent the spatial specializations of the above definitions for agricultural space. Although common definitions use 'land uses,' (Forman and Godron 1986) they have to be broadened to include two more dimensions: the ecological dimension, as agricultural landscapes are the habitats of many species and every change in farming practices and systems reflects immediately on biodiversity (Forman and Godron 1986; Turner 1990); and the symbolic dimension, which is very important, as they represent wider rural societies' meanings, symbols, and ideologies (Gray 2000) far richer in symbolic content than agricultural land uses are.

Agricultural landscape transformation procedures can generally be divided according to their time scale into “short term,” which refer to months or years (change of production and management practices, fires and other natural disasters, etc.); “medium term,” which refer to decades and centuries (erosion and deposition, population change, technology and transportation changes, etc.); and “long term,” which refer to millennia and geological time (climate change, evolution, continent formation, etc.) (Marcucci 2000; Vos and Meeke 1999). In this paper, all medium and long term procedures are considered constant.

In the conceptual model of landscape transformation (Figure 1) that results for short term procedures, agricultural landscapes are considered as systems witnessed today that are the result of years of interactions between the natural environment (flora, fauna and abiotic resources) and human-driven actions (Naveh and Lieberman 1984; Marcucci 2000; Baudry et al. 2000; Van Mansvelt 1997), or as the macro result of micro and macro actions (CEC 1999; CEC 2000; Defontaines et al. 1995). These actions can refer to a wide variety of interventions such as changes in local soil and water conditions, changes in flora and fauna, changes in input used, and changes in land use, among others (Louloudis 1992; Wascher 1999; Baudry 1993).

In this paper, the above conceptual model is used in order to trace and understand the changes in Lesvos’ agricultural landscape and especially in the landscape of the olive groves area of the island in the last three centuries. The great importance of olives in the economic and social life of the island over the last three centuries led us to choose olive groves’ landscapes as our focus. This importance is depicted in the contemporary Lesvos olive landscape that was formed

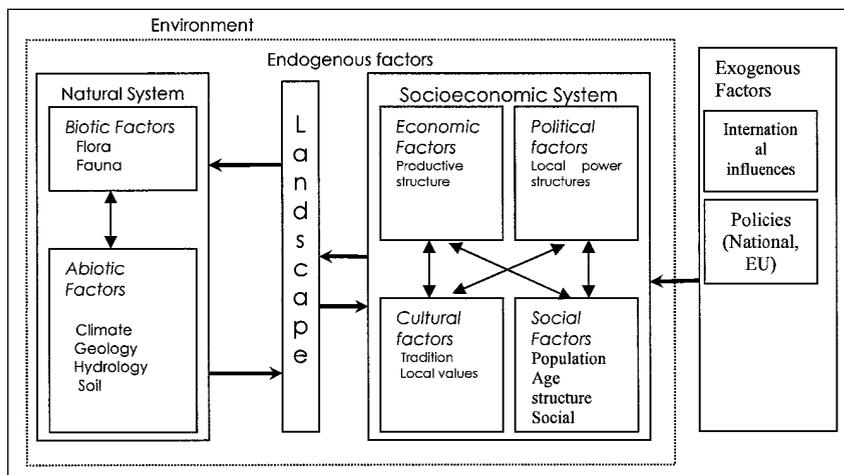
in these centuries, when the island became a very important industrial and commercial center and then witnessed economic and population decline. These changes are typical of many Greek and Mediterranean cases. Before discussing the changes, a short presentation of the terraced olive groves’ agricultural landscape is given along with the terraces ecological and symbolic role. We will also present the main historical facts about olive trees and agriculture in Lesvos in general before the 18th century.

The Case of Lesvos from the 18th to the 20th Century

Lesvos Agricultural Landscape

Lesvos is the biggest island in the North Aegean Region (1632,8 km²), with a population of 89,935 (in 2001). Spatially, it is characterized by the presence of the Mytilini urban center with its suburbs (population of 36.196 in 2001, or 40% of the total population of the island) and some important smaller settlements (Plomari, Agiassos, Polihnitos, Kalloni). The number of farms has been significantly reduced recently (20% between 1971-2001, from 22.799 to 18.132), but agriculture is still quite important, especially in rural areas.

An existing typology for distinguishing Lesvos’ agricultural landscape zones uses climatic, geological and land use criteria (Kizos 2003), arriving at three zones: grazelands, olives and intermediate landscapes (Table 1). The visual characteristics of the different zones are also different. In the graze land zone there are many animal husbandry constructions; dry stone walls that separate the relatively large patches; increased presence of wire fences, and scattered tree presence of mainly oak and garigue. Some terraces are still found in grazelands, remnants of agricultural practices that stopped after the 1950s (plowing and harvesting graze cereal and pulses). In the olive tree zone, terraces are the dominant element with significant presence of stone storehouses and fences (dry stonewalls or wire fences). Terrace types and styles are different according to local geology and building tradition. Patches are small and diversity is increased between different olive patches depending on the lower vegetation management techniques; and between olives and forests in mountain areas. In the intermediate zone elements of both the other two zones are found along with increased presence of arable land in plains.



Source: Adapted from Messerli and Messerli in Naveh and Lieberman 1984.

Figure 1. Endogenous and Exogenous Factors of Agricultural Landscape Formation.

Table 1. Lesvos Agricultural Landscape Classification.

Zone	Definition	Criteria used
1st Zone: Grazelands	West and part of the Northwest island. Soils lie on recent lava and other compressed volcanic residuals (tuff); are recent compared to the rest of the island (Higgins and Higgins 1996) and of limited nutrient availability. Mainly barren grazelands.	1. Grazeland >50% of the total settlement area, 2. Cultivated land <30% of the total settlement area.
2nd Zone: Olives	East and Southeast part of the island and Gera gulf. Mainly olives and forests (mainly pine).	1. Cultivated land >40% of the total settlement area, 2. Grazeland <30% of the total settlement area, 3. Groves >50% of Utilized Agricultural Area.
3rd Zone: Intermediate	Almost all the Kalloni gulf catchment area and a small part of the Northeast part of the island. Landscapes include elements of both other zones (grazelands, arable land, olives and forests (pine or oak)).	Rest areas

Source: Kizos 2003

Methodological Note on Data and Analysis

The data used in this paper come from a wide variety of published and unpublished local sources. As the above landscape conceptual model implies, this variety of sources is necessary for the understanding of landscape transformation. In this paper, specific emphasis has been given to economic sources, as they were considered the driving forces of social and production changes. Thus, economic data were sought and when they were not immediately available, they were derived from other available sources. Having said that, it must be noted that reliable data are only available for the 20th century. Nevertheless, we have attempted to combine different data sources and arrive at some conclusions. Further data on economic transactions, land uses, prices, etc. could contribute a lot to this analysis and corroborate its main findings.

Land Use and Landscape Until the End of the 18th Century

All available data on animal husbandry in Lesvos before the 18th century tend to agree on the presence of sheep and goat husbandry throughout its history. Agriculture land uses on the other hand were far more diverse in the past compared with the current landscape (Tragellis 1999; Evagellou 1933; Grigoriou 1952; Settas 1962; Giourga 1991; Anthopoulou 1993; Asdrahas et al. 2003). Before the Genovese Gatellouzi rule (1354 to 1462, Deli, 1997/1901), Lesvos appears to have followed the general tendency of then rural societies of firstly producing food for local consumption and then trade sur-

pluses. Thus, 'trading' agricultural products like grapes, wines, olives and oil, typical of the Mediterranean, were limited (Gasparis 1997; Lock 1998; Braudel 1993; Angold 1997; Pratt and Funell 1997). The Gatellouzi appear to be the first to have introduced significant olive and vine groves (Taxis 1995; Paraskevaidis 1996) for trading purposes, although their actual size is probably small compared to later expansion.

The Ottoman conquest in 1462 marks the initiation of changes in land use. In the first centuries of the Ottoman rule, different land uses included cereals, pulse, 'industrial' plants and sheep and goat grazelands. In 1548 in the Mytilini *kaza* (administrative unit including Agiasos, Gera, present Municipality of Evergetoula, Loutra and Thermi) 16 different products were eligible for taxation: two cereals (wheat and barley), three pulses (beans, chickpeas, and field-beans), three industrial products (sesame, flax, and cotton), must and wine, three fruits- dry nuts (figs, mulberries, and almonds), olives, olive oil, and three animal products (honey, pigs and silk) (Karidis and Kiel 2000). In the Kalloni gulf area, tobacco was cultivated (probably after the end of the 17th century when smoking was spread (Musgrave and Musgrave 2000)). While in the Eressos area, sheep and goat husbandry predominated along with fruits and nuts. Oak and pine forests also existed, but although it is claimed that they held an important part of the uplands, no actual data were recorded (Moutzouri 1986; Sifnaiou 1996; Paraskevaidis 1996; Tsalikis 1998; Tzimis et al. 1996; Karidis and Kiel 2000). For olive groves, all sources agree that the areas of Mytilini and Gera were the main centers of cultivation, although no safe estimations are offered as to their spread (Paraskevaidis 1996; Sifnaiou 1996; Tsalikis 1998; Tzimis et al. 1996; Avagiannos 1995; Papoutsanis 1986; Enepekidis 1997; Kontellis 1985).

Nevertheless, the spread of olive groves can be deduced from indirect sources, like the number of olive mills and the price of olive oil. From 1548 until 1671 in Mytilini *kaza*, flourmills were reduced from 99 to 40, while olive mills were increased from 10 to 116 (Karidis and Kiel 2000). Olive oil prices rose continuously over a 120 years period (from 0.75 *grosia* in 1780 to 30 *grosia* in 1840 (Papoutsanis 1986) and they reached 36.8 *grosia* in 1912 (Sifnaiou 1996, not-deflated prices), probably leading to land expansion as well. Eighteenth century evidence reveals the cereal deficit and the olive oil surplus that was used to meet dietary needs with cereal purchase (Karidis and Kiel 2000). It is not clear however if the increase in olive groves refers to land conversion or the introduction of new lands.

Population estimates before and during the 18th century are fragmentary and uncertain, but some tendencies can be deduced. It appears thus that the Ottoman rule peace resulted in the doubling of population between 1488 and 1521

(Table 2). This increase probably continued throughout the 18th century, although different estimations are found: some present a decrease until the middle of the 19th century, while others give a different picture of small but steady increase throughout the 18th century for Mytilini and other major settlements (Table 2).

The agricultural landscape of Lesvos until the end of the 18th century presents most of the then Mediterranean characteristics (Grove and Rackham 1998; Rackham and Moody 1996), namely mixed land uses on small parcels and the predominance of cereal. Terraces surely appeared, although probably for cereals and grazelands along with the cultivation of groves. The slow but steady rise of olive groves with the expansion of agricultural land and the conversion of arable land for the cultivation of olive trees marked the gradual landscape transformation with groves' terraces expanding, stone construction building for olives storage, olive mills' numbers increasing and forests decreasing, as terraced olive grove parcels began to 'climb' upward on the mountain sides replacing forests.

The 19th Century: Economic Development and Population Increase

The 19th century is in many ways the key to understanding the present agricultural landscape of Lesvos. All available evidence points to rapid economic development and population increase in the end of the century after a rather slow start. Population data are more reliable (especially after the 1835 Ottoman census) and reveal that although before the 1830s the population was increasing, afterward the increase is explosive (from 1800 to 1890 the population increased by

152%, and from 1840 to 1890 by 90%). The exception of the 2nd decade could be attributed to a mistaken estimate as no other evidence justifies such a development and the 1835 data are more reliable.

Economic development was based onto two facts: Lesvos' position in the Mediterranean and Black Sea trade and the industrial development on the island. The position of the island offered opportunities for trade and soon a wealthy trading class was established, while the industry was developed around olive oil, soap and leather processing (Sifnaiou 1996). All three branches were based on local resources (with the exception of leathers, which were imported, processed and exported).

The development of the locally oriented industry branches began back in the 18th century with four interacting factors: the increase in olive production; the prosperity of the olive mills' owners and the traders and their willingness to invest in new technologies; the Ottoman state reforms (Savorianakis 2000; Sifnaiou 1996); and the high international olive oil prices. The 1880s marked the creation of steam olive-presses in the place of olive mills. By the end of the decade Lesvos was fourth in steam engines investments in the Aegean (Sifnaiou 1996) and by 1888, 12 steam olive-presses in the island produced 60% of the total olive oil and 190 olive mills produced the remaining 40%. In 1908, 113 steam olive-presses produced 95% of the total olive oil and 79 olive mills produced the remaining 6% (Sifnaiou 1996). Similar developments took place in the soap industry (in 1885, 36 units operated, while by 1909, 34 simple and eight steam units operated (Sifnaiou 1996). The basic exports of the island in the end of the century were 10.000.000 kgr olive oil annually (about present production of a good year), 3.800.000 kgr soap and 200.000 kgr figs (Karidis and Kiel 2000); while the imports were cereals and other food.

This increase of olive oil in present levels safely leads to the assumption of olive groves' expansion. Although land use data are not immediately available, in 1892 up to 64% of the total Ottoman tax came from olive oil, 19% from cereals and 13% from sheep (Karidis and Kiel 2000). The same year crops were 25.000.000 kgr olives (corresponding to a good year today), 4.000.000 kgr soap, 3.000.000 kgr acorns and 1.500.000 kgr figs. Finally, a major natural disaster (freezing of olive trees) occurred in the winter of 1951 (Sifnaiou 1996; Kabouris 1978; Avagianos 1995).

The 19th century economic changes stabilized and reinforced the landscape transformations that had begun in the 18th century. Terrace olive groves continued to expand and replace forests and other land uses, olive mills and presses increased as well, the population increased, settlements were expanded and new ones were founded (Karidis and Kiel 2000). It appears thus, that the 19th century transformations

Table 2. Estimates and Censuses for Lesvos' Population (16th -20th centuries).

Year	Mytilini	Lesvos	Year	Mytilini	Lesvos
1521	3.500	36.000	1867	100.000	
1548	2.900		1874	15.000	120.000
1581	4.000		1890	15.000	101.000
1601	4.500		1908	17.000	138.538
1644	5.200		1913*		140.846
1678	5.000		1920*		113.368
1709	5.600		1928**		137.160
1729		60.000	1940*		134.058
1800		40.000	1951**		129.926
1816		28.000	1961**		117.371
1835		60.000	1971**		97.008
1840	7.500	72.776	1981**		88.601
1850		80-85.000	1991**	32.146	87.151
1854-1858	11.000	80.000	2001**	36.196	89.935

Source: Sifnaiou 1996, 55; Kai, Karidis, and Kiel 2000

*Source: Houliarakis 1973; Settas 1962, 18; Gougoulas 1991, 167

**Greek State Census

can be held responsible for a major part of the current landscape's characteristics and appearance.

The 20th Century: Political Changes, Economic Crisis, Rural Exodus and Abandonment

The end of the 19th century was very promising for Lesvos. The 20th century began in the same way, but soon it gave way to a deep crisis. Its first quarter marked two major wars (the Balkan wars and the First World War), annexation in the Greek state and the major catastrophe of 1922 that resulted in the refugees' arrival. Lesvos' economic crisis began in the new century when political struggle between the collapsing Ottoman Empire and the rest of the European countries produced obstacles in trade and some of the wealthiest traders moved their businesses to other ports. Annexation in the Greek state (1912) did not radically alter economic structures, as movements of people, goods and capital were still easy with Asia Minor (Sifnaiou 1996).

The crisis burst out after 1922. The military loss of the Greek army in Turkey and the refugees' arrival also marked the closing of the borders with Asia Minor for all transactions and investments and the increase of transportation and food costs. These developments should not be examined alone, as greater socioeconomic changes occurred at the same time and deepened the crisis. Such changes included the transportation improvement to steam and oil boats that made stops in intermediate ports (like the port of Mytilini) unnecessary. Besides new boats, transportation improvement also included land transportation and the development of rail transportation in Eastern Europe, and eventually roads (Anogiatis-Pele 1993). This meant that areas in the mainland could now participate in national and international trade. All these developments resulted in the reversal of the competitive advantages that small islands in the Mediterranean trade and exchange network shared in favor of continental areas (Braudel 1993). The economic result for Lesvos was the stopping of innovations and the moving of almost all industrial and trading activities to the mainland. The demographic outcome was the, slow at first, beginning of the rural exodus, which was more rapid after the 1940s (the population of the island was reduced by 35% between 1940 and 1981, Table 2).

Another major change that the 20th century brought was the Greek agricultural reformation, which was completed throughout Greece in 1932 (Vergopoulos 1975; Varvaresos 1949). The evidence from Lesvos is contradictory: on one hand, it was claimed that groves were excluded and therefore Lesvos was hardly affected (Anthopoulou 1993) and the large farms that were created before the annexation to the Greek state were retained. On the other hand, it has also been claimed that the land that was given to small farmers reached almost 50% of the olive groves of 1918 (22.900 stremmas, 1

stremma= 0,1 ha) (Varvaresos 1949; Vergopoulos 1975). Today, the greater part of the large farms is owned by charity organizations, the church, the Mytilini Hospital or banks. The making of these large farms has many different stories to tell: buying cheap from Muslims who foresaw the Empire's collapse, to confiscations and/or usury and investments in land from factory owners or traders.

Table 3 outlines land uses and livestock in the 20th century. Although the data come from different sources and sometimes measure different entities, they can provide a rough picture of land use and livestock changes. The most important changes refer to the significant decline of the groves, except olives, after the 1930s, as by 1959, olives represented almost 96% of the total groves' area as compared to 88% in 1933. The actual olives' area changes are unclear, although their reduction between 1933 and 1971 appear to correspond to the rural exodus, while the 1971 areas are probably overestimated. Vines were also significantly reduced and almost disappeared, settlement areas increased significantly along with grazelands and sheep, which have more than doubled in 80 years.

These changes indicate a deeper and more fundamental change of Lesvos' agriculture, a gradual stop of practices that combined different land uses and also agriculture and animal husbandry. Seasonal livestock movement stopped (Anthopoulou 1993; Kizos 2003). Along with the disappearance of cereals, fallow practices stopped and most areas were used as grazelands for the increasing livestock in a typical Mediterranean development of less land use diversity (Braudel 1993). This change was due more to the decline of the rest of land uses than to the expansion of olives and grazelands. Data for these land use changes and the abandonment of agricultural land uses in the last 30 years reveal that (Giourga 1998; Kizos 2003) most areas that were abandoned were olives (in total 11% of the sample of Kizos' research (2003) abandoned an olive grove), but comparatively small fields and in mountainous or isolated areas, where cultivation and transportation of the olives is not profitable anymore. Agricultural land uses were also abandoned in favor of housing, especially in coastal tourist development areas.

Landscape changes are therefore significant. On one hand, it appears that agricultural land is 'rationalized' in the sense that isolated, mountainous and/or less productive fields, which were cultivated only when the olive oil prices were high, were abandoned again and forest areas are spreading again. On the other hand, in the plains, agriculture is intensified and in coastal areas housing and tourist uses compete for the land. In any case, the 'traditional' characteristics (terraces, stone walls, paths, constructions and buildings) are either destroyed or abandoned and their quality is deteriorating.

Table 3. Land Uses and Animals in Lesvos (areas in stremmas = 0,1 ha).

Land Use	1918	1933	1952	1959	1971	1991
Olive groves	460.000	500.310	389.000	398.000	551.047++	465.459++
Groves		571.310	404.800	418.200	380.964	404.146
Arable land	118.835	134.468	186.070*	219.300*	119.705**	356.794+
Vines	5.886	10.827	8.130	8.700	5.222	2.186
UAA					506.476**	763.126+
Agricultural Land		716.605	599.000	646.200	622.100	604.900
Graze land		285.000	620.000	543.000	596.600	627.400
Pine Forests		137.000	343.000	340.000	324.700	309.000
Oaks		20.000				
Fallow and cultivated areas		120.000				
Rest areas		471.395	51.000	33.500	38.500	43.400
Settlements				67.500	53.900	48.300
Total areas		1.750.000	1.613.000	1.630.200	1.634.000	1.632.800
Livestock	1918	1933	1952	1959	1971	1991
Goat	33.221		32.800	31.460	19.997	31.680
Sheep	70.127		110.000	153.100	167.599	267.132
Sheep and Goat	103.348	128.060	142.800	184.560	187.596	298.812
Cattle	6.571		7.320	8.568	5.430	4.075

* Includes fallow, ** Includes fallow and grasslands

+ Includes categories *Annuals* and *Rest Areas* (meadows, grazelands, family yards and fallow).

++ Includes olive groves in Lemnos and Ag. Efstratios

Sources: 1918: Tsalikis 1998, 147-50; 1931-1933: Evaggelou 1933, 95 and 106; 1952: Grigoriou 1952, 13 and 34; 1959: Settas 1962, 12-13; 1971, 1991: Official Data (ESYE).

Olive oil production data appear to verify, up to a point, these landscape changes. Production appears to decrease after the 1930s through the 1950s, then it increases until the end of 1970s, only to be reduced again in the 1980s and 1990s (reduction that would be far greater if not for a year in

the end of the 1990s where production was three times the decade average, Table 4). Reduction until the 1950s can probably be blamed on the rural exodus and the demographic decline (Figure 2), while the consequent increase despite population shrinkage, resulted from intensification (fertilizing, ir-

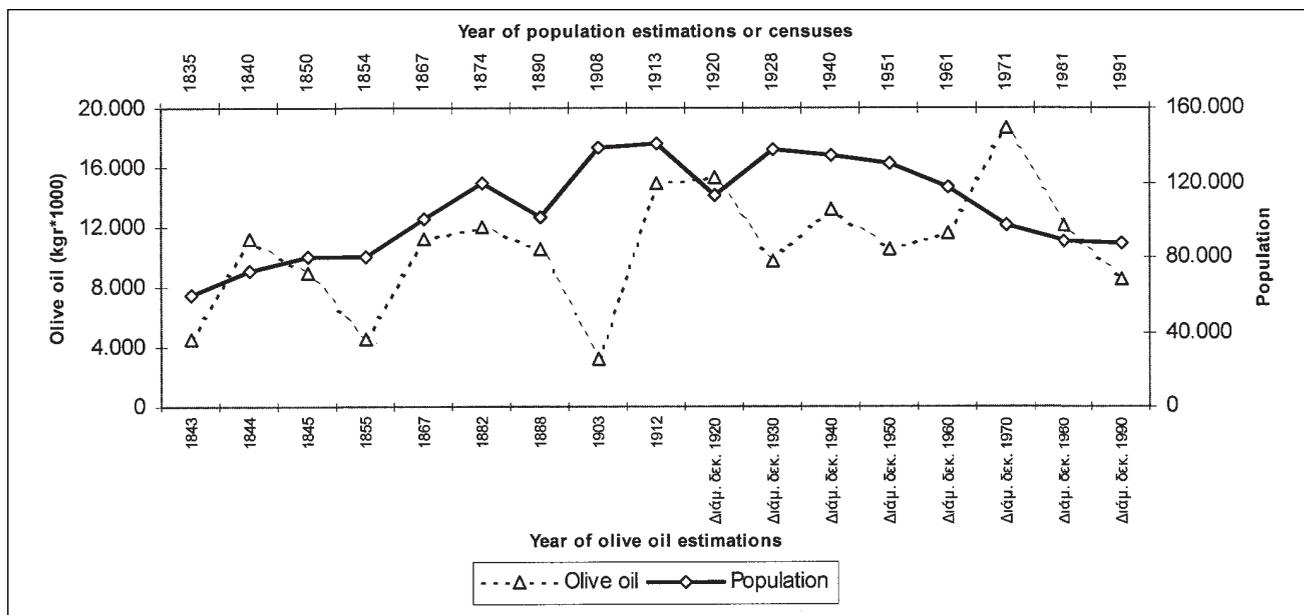


Figure 2. Olive oil production and population change in Lesvos, 19th and 20th centuries.

Table 4. Lesvos Olive Oil Production Statistics for years 1926/27 to 1997/98 (kgr*1000).

	Total quantities	Quantities in maxouli*	Quantities in reduced prod. years*	1926/27 to 1929/30	1930/31 to 1939/40	1940/41 to 1949/50	1950/51 to 1959/60	1960/61 to 1969/70	1970/71 to 1979/80	1980/81 to 1989/90	1990/91 to 1997/98
Number of olive oil years	72	36	36	4	10	10	10	10	10	10	8
Average olive oil produced	14890,6	23049,4	6731,8	15525	14130	12595	12705	16785	18710	15843	12794
Median	11352	22750	6927,5	15350	9750	13150	10500	11575	18650	12188	8471
S	9997	7600,3	2834,7	9113,8	10087	9181	6493,5	12833	12201	9775,7	10531
Minimum	500	11653	500	5800	2300	500	3500	4100	4200	6855	1973
Maximum	37500	37500	11051	25600	32500	30000	23000	37000	37500	35000	32352

Source: Kizos 2003.

*Calculations based on the assumption that the median (11.352 kgr) is the limit between years with increased production (*maxouli* or *maxoulohronia*) and years of reduced production.

rigation) that was initiated in the 1960s. This increase reached its peak in the beginning of the 1980s and since then the trend has been reversing, despite the Common Market Organization for olive oil (Greece joined the EU in 1981). Today, many fields are 'mildly abandoned' (Kizos 2003), which means that only when production is satisfactory are the olives collected and little other cultivation management is practiced. Anthopoulou (1993, 318-21) calculates revenues of 22 € per *modi* (local measurement unit that stands for approximately 500 Kgr of olives) and 9,9 € for 1987 and 1992 correspondingly in groves on plains, while for mountainous ones the calculations give deficits of 0,9 € and 42,25 € for the same years, but it is not noted whether these are increased production years or not.

The cross tabulation of all available data of population and olive oil production offers more insight on the landscape transformation processes. Although before the 1920s, olive oil production data refer to years and not medians of decades and this could cause inconsistencies, the broad picture is depicted (Figure 2). There is no significant statistical correlation (Spearman's $r = 0,25$, $a = 0,32$), but data seem to indicate that olive oil production 'follows' population changes with a time lag. The assumption of such a time lag, offers better correlation results, although they still are not statistically significant (Spearman's $r = 0,48$, $a = 0,06$).

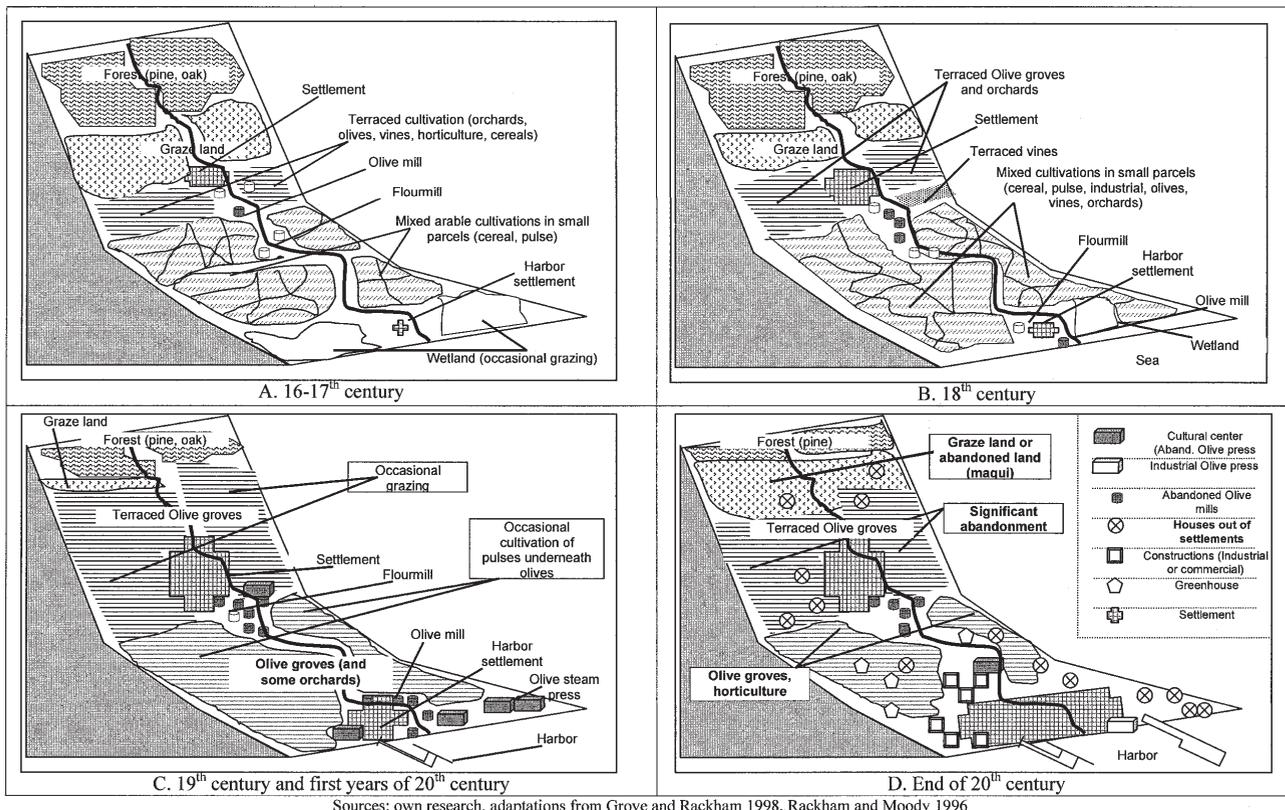
Conclusion: Economy, Population Change and Landscape Transformation

This paper has attempted a first approach at accessing landscape changes from changes in local and global economic, social, political and cultural conditions through a specific conceptual model. The case of Lesvos' landscape, although typical of the general Mediterranean trend in landscape changes, has offered only indirect and partial implementation of this model, due to the fragmentary and insufficient evi-

dence before the middle of the 20th century. Nevertheless, this indirect implementation has offered some insight into the transformation processes.

This model can also work the other way around, from landscape images and characteristics to social and economic changes, which can shed light on current and future developments that are not touched by the first approach. The current Lesvos landscape picture is complex. On one hand the abandonment of olive groves in mountainous and isolated areas is a reality and in many areas vegetation in the groves indicates 15 years or more of abandonment (Giourga 1998; Koulouri 2004). This trend results in pine and maqui forests' spread, especially in areas (zone 2 and some areas of zone 3) where sheep husbandry is reduced or has stopped. In areas where sheep husbandry is the main economic activity (zone 1 and zone 2), the landscape is characterized by conversion to grazing lands and reduction of land use diversity. On the other hand, the 1990's marked the availability of cheap labor from migrant workers and this labor force helped significantly in the preservation of a large part of the olive groves. These two cases will coexist in the future with the olives' land uses limited in areas where access is easy and fields are fertile and productive. In both cases though, the 'traditional' characteristics of the landscape (terraces, constructions, fences, etc.) are not maintained and this rich cultural and ecological potential is gradually lost (Kizos 2003).

These major changes in the morphology have brought major changes in the symbolic structure of the agricultural landscape. Indeed, it appears that the modernization of agriculture and society has brought nostalgia for traditional landscapes and their characteristics. This nostalgia refers especially to farmers who are older or have important off-agriculture incomes and can 'afford' form over function (Terkenli 1996), meaning that they care for the way the fields and the characteristics *look* (form), while farmers that are interested in making a living off of the olive groves are more interested



Sources: own research, adaptations from Grove and Rackham 1998, Rackham and Moody 1996

Figure 3. Ideal Lesvos Landscape Types (17th–end of 20th century).

in the *productivity* (function). So, it seems that traditional characteristics of the landscape of Lesvos’ economic prime and population maximum, are today seen as remnants and monuments of a ‘golden,’ wealthy and ‘traditional’ age when not only landscapes but also society in general was ‘better’ than today (Kizos 2003).

All the morphological changes that are presented in this paper are depicted in Figure 3, where four different ideal ‘images’ of olive landscapes in Lesvos are drawn. The first period (Figure 3, A) represents the mixed cultivation systems era (agriculture of cereals, pulse and fruits with livestock of sheep and house animals), with limited ‘commercial’ cultivations (olives, vines) and the self-sufficient society and rural household. The second period (Figure 3, B) is that of the end of the 17th and the 18th century, with the increasing dependence on olive oil and the decline of cereal importance. The same period is that of moderate population increase and the increase of small manufacturing units. The third period (Figure 3, C) is that of the Lesvos’ economic prime with industry development in the coastal areas in the place of the scattered and small manufacturing units, increase of olive groves in almost all available areas, decrease of all other land uses, pop-

ulation increase, development of an urban society and a wealthy merchant class. The fourth and last period (Figure 3, D) is that of the last quarter of the 20th century with abandonment of many olives and other uses, forest and maqui expansion, housing expansion in the coastal zone, many abandoned industrial buildings and horticulture increase near major settlements.

Out of these ideal images, the third appears to be the one with the greatest ‘symbolic value’ for current rural and urban Lesvos society. Kizos (2003) distinguishes three social farmer groups, out of which older and richer farmers attach great symbolic value to the ‘traditional’ characteristics and land uses of the agricultural landscape and they maintain these characteristics, although they are not of immediate economic value for them or their land. These characteristics represent a wider notion of a past of ‘traditional’ values and social behaviors. This past is a mere construction, but it is quite important for future landscape developments in Lesvos and other places with significant historical landscape characteristics. This paper cannot offer more insight into this development and can only highlight some important aspects for future research.

Endnotes

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References

- Angold, M. 1997. *The Byzantine Empire from 1025 to 1204*. Athens: Pappadima Press (Greek Translation).
- Anogiatis-Pele, D. 1993. *Roads and transportation in Greek space during the 18th century*. Athens: Papazisi (in Greek).
- Anthopoulou, T. 1993. *Systemes de production agricole insulaires et developpement local: L' exemple de l' olivier et de l' elevage ovin dans l'ile de Lesbos mer d' Egee orientale, Greece*. These de Doctorat en Geographie, University de Paris X - Nanterre.
- Appleton, J. 1996. *The Experience of Landscape*. Chisester: John Wiley & sons.
- Asdrahas, S., N.E. Karapidaki, O. Katsiardi-Hering, E. Liata, A. Matthaïou, M. Sivignon, T. Stoianovich. 2003. *Greek Economic History: 15th–19th centuries*, Peiraios Bank Cultural Foundation, Athens (in Greek).
- Avagianos, G.N. 1995. *The Napi of Lesbos: Kouloumdados*, Mytilini: Napi Community (in Greek).
- Baudry, J. 1993. Landscape dynamics and farming systems: problems of relating patterns and predicting ecological changes. In *Landscape Ecology and Agroecosystems*, edited by R.G.H. Bunce, L. Ryszkowski M. Paoletti. Florida: Lewis Publishers.
- Baudry, J., F. Burel, C. Thenail, D. LeCoeur. 2000. A holistic landscape ecological study of the interactions between farming activities and ecological patters in Brittany, France. *Landscape and Urban Planning* 50, 119-128.
- Braudel, F. 1993. *The Mediterranean*, Volume A, Athens: M.I.E.T. Press (Greek Translation).
- Commission of the European Communities. 1999. Agriculture, Environment, Rural Development: Facts and Figures. Luxembourg: Office for official publications of the European Communities.
- Commission of the European Communities. 2000. From Land Cover to Landscape Diversity in the European Union, Report from EC DG VI, EUROSTAT, Joint Research Center, EEA.
- Cosgrove, D. 1998. Cultural Landscape., In *A European Geographiy*, edited by T. Unwin. Edinburgh Gate: Longman.
- Daniels, S. and D. Cosgrove. 1994. Introduction: iconography and landscape. In *The Iconography of the landscape: Essays on the symbolic representation design and use of past environments*, edited by S. Daniels and D. Cosgrove. Cambridge: Cambridge University Press.
- Deffontaines, J.P., C. Thenail, and J. Baudry. 1995. Agricultural systems and landscape patterns: how can we build a relationship?. *Landscape and Urban Planning* 31, 3-10.
- Delis, G.N. 1997 [1901] *The Gatelouzi in Lesbos: 1355-1462*, Edeleheia, Lesbos (in Greek).
- Enepekidis, P.K. 1997. *Archipelagos: Imvros, Tenedos, Lemnos, Lesbos, Hios, Samos, Patmos*. Athens: Estia (in Greek).
- Evagellou, B.D., 1933, *A Agricultural Economy view of Mytilini*. Mytilini: Finix Book store (in Greek).
- Forman, R.T.T. and M. Godron. 1986. *Landscape Ecology*. New York: John Wiley & Sons Inc.
- Gasparis, H. 1997. *Land and Farmers in Medieval Crete: 13th–14th centuries*. Athens: National Research Foundation (in Greek).
- Giourga, H. 1991. *The Change of the Traditional Land Management Systems in the Aegean Archipelago: Impacts on Island Ecosystems*, Unpublished Ph.D. Thesis, University of the Aegean, Department of Environmental Studies, Mytilini (in Greek).
- Giourga, H. 1998. Lesbos' Grazing lands. In *Sheep Husbandry in the North Aegean, Problems and Prospects*, Conference Proceedings. Lesbos: GEOTEE (in Greek).
- Gougoulas, I. 1991. Lesbos in the global population map. *Lesviaka*, Volume 13. Mytilini (in Greek).
- Gray, J. 2000. The Re-invention of the Rural. *Sociologia Ruralis* 40, 30-52.
- Grigoriou, G.E. 1952. *Present Situation and Development Possibilities of Lesbos' Agricultural Economy*. Mytilini: Kapsimali Book store (in Greek).
- Grove, A.T. and O. Rackham. 1998. *History of Mediterranean Land Use*. In P. Mairota, J.B. Thornes, and N Geeson (eds.) *Atlas of Mediterranean Environments in Europe: the Desertification Context*. Chisester: Wiley & Sons.
- Higgins, M. and R. Higgins. 1996. *A Geological Companion to Greece and the Aegean*. London: Duckworth.
- Houliarakis, M.G. 1973. *Geographical, Administrative and Population Change in Greece, 1821-1971: Volume 1*. Athens: EKKE.
- Jackson, J.B. 1984. *Discovering the Vernacular Landscape*. New Haven: Yale University Press.
- Kabouris, Z. 1978. *Natural Disasters in Lesbos during the 19th century*. Mytilini.
- Karidis, D.N. and M. Kiel. 2000. *Mytilini Urban Structure and Lesbos' Spatial Analysis 15th-19th centuries*. Athens: Olkos (in Greek).
- Kizos, T. 2003. *Agricultural Landscape Dynamics: Estimation of Spatial Impacts of CAP in rural Aegean islands*. Ph.D. thesis, University of the Aegean, (in Greek).
- Kontellis, P.I. 1985. *The world...the small...the great*. Athens: Brotherhood of Mesotopos' inhabitants in Athens (in Greek).
- Koulouri, M. 2004. *Soil Water Erosion and Land Use Change in the Mediterranean: Abandonment of Traditional Extensive Cultivation*. Ph.D. thesis, University of the Aegean, (in Greek).
- Krumbacher, K. 1994. *Greek Travel: Pages from the journal of a journey in Greece and Turkey*. Athens: Istoritis Press (Greek Translation).
- Lock, P. 1998. *The Franks in the Aegean: 1204-1500*. Athens: Enalios Press (Greek Translation).
- Louloudis, L. 1992. *Agricultural modernization and agricultural landscape change*. *Topos* 92,4, 35-55 (in Greek).
- Marcucci, D.J. 2000. Landscape history as a planning tool. *Landscape and Urban Planning* 49, 67-81.
- Moutzouri, I. 1986. *The Ploumaria: Settlements of the Middle Ages and Turkey Rule. In Memory and Tradition: Historic and Folklore Studies of Plomari Area*, Volume 1. Athens: Plomarites living in Athens (in Greek).
- Musgrave, T. and W. Musgrave. 2000. *An Empire of Plants: People and Plants that Changed the World*. London: Cassel Illustrated.
- Naveh, Z. and A. Lieberman. 1984. *Landscape Ecology: theory and application*. New York: Springer-Verlag.

- Papoutsanis, T. 1986. *Information on the economy of old Plomari*. In *Memory and Tradition: Historic and Folklore Studies of Plomari Area*, Volume 1. Athens: Plomarites living in Athens (in Greek).
- Paraskevaïdis, P.S. 1996. *The travellers for Lesvos*. Mytilini (in Greek).
- Pratt, J. and D. Funell. 1997. *The Modernization of Mediterranean Agriculture*. In R. King, L. Proudfoot, and B Smith (eds.) *The Mediterranean: Environment and Society*. London: Arnold.
- Rackham, O. and J. Moody. 1996. *The making of the Cretan landscape*. Manchester: Manchester University Press.
- Savorianakis, P. 2000. *Island Societies in the Aegean Before and After the Ottoman Reforms: The Case of Greeks in Rhodos and Kos 18th-19th centuries*. Athens: Trohalia (in Greek).
- Settas, N.H. 1962. *Agricultural Economy of Lesvos*. Athens: Ministry for Agriculture (in Greek).
- Sifnaiou, E. 1996. *Lesvos: Economic and Social History 1840-1912*. Athens: Trohalia (in Greek).
- Taxis, O.E. 1995 (reprint). *Concise History and Topography of Lesvos*. Mytilini: University of the Aegean (in Greek).
- Terkenli, T.S. 2001. Towards a theory of the landscape: The Aegean landscape as a cultural image. *Landscape and Urban Planning* 57, 197-208.
- Terkenli, T. and T. Kizos. 2002. A System of Agricultural Landscape Indicators for Greece. In NIJOS/OECD Workshop on Agricultural Landscape Indicators. Paris: OECD.
- Tragellis, H.I. 1999. *The Agriculture of Lesvos: The Kalloni plain*. Athens: Kalloni Municipality (in Greek).
- Tsalikis, G. 1998. *Lesvos in the passage of time*. Mytilini: Hristopoulos Book store, (in Greek).
- Turner, M.G. 1990. *Landscape Ecology: Living in a mosaic*. In M. Turner (ed.) *Quantitative methods in landscape ecology: the analysis and interpretation of landscape heterogeneity*. Springer-Verlag.
- Tzimis, S., S. Giannakas, P. Paraskevaïdis, P. Kourvaniou, B. Komaitis, G. Didigikis. 1996. *History of Lesvos*. Mytilini: Association of Lesvos' Literature Teachers (in Greek).
- Van Mansvelt, J.D. 1997. An interdisciplinary approach to integrate a range of agro-landscape values as proposed by representatives of various disciplines. *Agriculture, Ecosystems and Environment* 63, 233-250.
- Varvaresos, A. 1949. *The Completion of the Agricultural Reform*. Athens: Ministry for Agriculture (in Greek).
- Vergopoulos, K. 1975. *The Farms matter in Greece: the social embodiment of agriculture*. Athens: Exantas (in Greek).
- Vos, W. and H. Meekes. 1999. Trends in European cultural landscape development: perspectives for a sustainable future. *Landscape and Urban Planning* 46, 3-14.
- Wacsher, D.M. 1999. *Agri-Environmental Indicators for Sustainable Agriculture in Europe*. ECNC.
- Washer, D.M. and R.H.G. (eds.). 2004. *European landscapes: Classification, evaluation and conservation*. Report submitted to the EEA, by Landscape Europe in collatoration with the European Centre for Nature Conservation: Tilberg.