

Landscape quality on organic farms in the Messara valley, Crete

Organic farms as components in the landscape

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Abstract

Two organic farms were evaluated on their landscape value in a broad perspective and compared with the surrounding non-organic farms. Therefore, a checklist with abiotic, social and cultural criteria was used. Firstly, an overview of the qualities of the Cretan landscape is given, which secondly, gives a framework to determine in how far the farms contribute to the landscape qualities. Thirdly, the scoring of the two described organic farms are compared with each other. This leads to the conclusion that the larger organic farm performs better than the smaller, especially concerning the abiotic environment. The cause of this difference in landscape performance may lie in the different social organisation of the two farms. However, when comparing the two farms with the (conventional) surrounding, both farms perform pretty well. ©2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

This article reports on the use of the checklist entitled: 'Criteria for the development of sustainable rural landscapes' (from now on referred to as: checklist) (Van Mansvelt and Stobbelaar, 1997; Stobbelaar and van Mansvelt, 2000) in a specific European landscape, on the island of Crete, Greece. The checklist is a condensation of key issues for the quality of a sustainable landscape. It combines many ideas on landscape (quality), of many landscape experts,

meeting in the framework of an EU AIR-3 Concerted Action (The landscape and nature production capacity of organic/sustainable types of agriculture AIR3 CT94-1296). The checklist has been developed in an iterative process of plenary and subgroup-meetings, during the last 4 years. New in this approach is the comprehensive and integrating concept, merging so called 'hard' and so called 'soft' criteria in one checklist. This new approach is needed to counteract the contraproductive effects of the EU regional measurements that focus on single-issue support. The checklist enables to evaluate the effect of measurements, like EU regulation 2078/92, which includes the stimulation of organic agriculture. The checklist should give general targets, although a local commitment on parameters for reaching these targets is needed. A quick evalua-

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tion of farms in relation to the surrounding landscape, as described in this contribution, can only be done with the help of local experts (among others farmers). In this respect, a clear protocol on how to use the checklist by laymen is needed.

The objective of this paper is to evaluate current land use practises on the island of Crete and to give recommendations for the improvement of land use viz. landscape, both on practical farm level and for regional policy. In other words, to assess the practical use of the checklist. Note that the checklist can be used on several levels (e.g., farm level, regional level), according to the demands of the users (Stobbelaar and van Mansvelt, 2000).

2. Background and method

2.1. *The landscape and agriculture in the Messara valley*

2.1.1. *Agriculture in the Messara valley*

The Messara valley has a semiarid climate with an average annual precipitation of approximately 600 mm and an average precipitation around 1700 mm. Average monthly temperature varies between a maximum of about 25°C in July and August and a minimum of about 10°C in January and February.

Two main agro-ecological zones occur in the Messara region, the hilly zone, surrounding the plain, and the plain (Fig. 1). These zones have got different agro-ecological characteristics (Kabourakis, 1996).

The Messara valley is an alluvial plain mainly composed of quaternary deposits, in the north bordered by a hilly area of silty-marley neogee, and bordered by schist and limestone formations in the south. The soils in the plain belong to the order of Entisols.

The Messara landscape has been in cultivation since thousands of years (Fig. 2). The marshes of the Messara valley however were taken into cultivation only 20 years ago. There is no forest left in the region. About 30% of the flora of Crete is linked to agriculture and around 200 species are imported with agricultural systems from abroad.

Traditional farming systems were mixed systems; the average farmer had olive groves, a vineyard, a horticultural field (garden), arable fields, which were

also used for grazing, and animals. This very much suited the labour-film: olive growing demands labour mainly in wintertime, while in vine growing labour is needed in spring and summertime. Besides, horticultural crops require labour in spring or autumn. Animals were grazing in the fields and in the olive groves, and were used for transportation and land cultivation.

Nowadays Cretan farming systems are specialised monocultures, with olive groves both in the hills and in the plain. Vine growing is loosing importance, as it is labour intensive and because of the low prices achieved by vine products. Still vines remain in limited areas. Some parts, both in the hills and in the valley, are used for horticulture under plastic.

Olive oil is the main product of the island and at the moment the most profitable crop of the farmers. Vegetables need fast transport to the market, which is not always possible from an island. Excellent wines and raisins are produced on the island, but due to harsh competition in the world markets, problems of management and marketing, and the problems of grape phyloxera in the 70s and 80s the production was not too high. In contrast to fresh products, olive oil does not need fast transport, but its price is also under pressure on the saturated European market, while marketing problems have started to appear. This single-commodity approach makes olive growers vulnerable to market fluctuations. This counts for both ecological farmers and conventional farmers, although the ecological market is not so hectic yet.

In Crete, the farmhouses are usually concentrated in the villages. The fields of the farmers are scattered around these villages. In Messara, the average farmer has about 5–10 plots. The average distance from the house to the plots is 3–5 km. This uneconomic situation partly exists due to the Cretan heritage system, where all children receive a part of the farm, and the unwillingness to exchange fields among farmers, due to the difference in fertility of the fields.

2.1.2. *Landscape quality at regional and local level*

In our opinion, the landscape should reflect its natural and cultural heritage and present meaning for society of today and future generations (Kuiper, 1997, 1998; Van Mansvelt and Kuiper, 1998; Hendriks et al., 1999). The different features of the abiotic environment should be reflected and even accentuated (by

	southern hilly zone	plain zone	northern hilly zone
Soil:	terraced Entisols eutric regosols and inceptisols on flysh and schists high desertification risk partly irreversible stony, calcareous, sandy loam, sandy clay loam	alluvial deposits loamy to moderately-fine well drained calcaric fluvisols sandy clay, clay loam, loam, sandy loam	terraced Entisols calcaric regosols inceptisols and calcic inceptisols on marl high reversible desertification risk stony, sandy loam, sandy clay loam
Water:	rainfed, drip irrigation	irrigation: drip, sprinklers	rainfed, drip irrigation
Micro-climate:	moderate cold winter moderate cool summer higher rainfall than the plain	cold, frosty winter dry summer lower rainfall	moderate cold winter moderate cool summer high rainfall
Vegetation:	high flora diversity	originally high, now low flora diversity	high flora diversity
Animals:	many species of fauna	originally many, now few species of fauna	many species of fauna
Livestock:	originally goats and sheep, now little livestock	cows	goats and sheep
Crops:	olives, vines, prunes, wheat, vetch, water melon	mainly olives, locally vines, citrus, hot house cucumber, tomatoes, water melon, pepper, strawberries, outdoor vegetables, pasture vetch, roses, cornflowers	olives, vines, prunes, wheat, vetch
Pastures:	extensive grazing	intensive grazing	extensive - intensive grazing
Problems:	eroded poor soil water shortages	decreased biodiversity	eroded poor soil water shortages
Opportunities:	improve soil fertility extend rational irrigation conserve diversity	maintain soil fertility rationalise irrigation increase diversity	improve soil fertility extend rational irrigation conserve diversity

Fig. 1. Transect of agro-ecological zones in Western Messara.

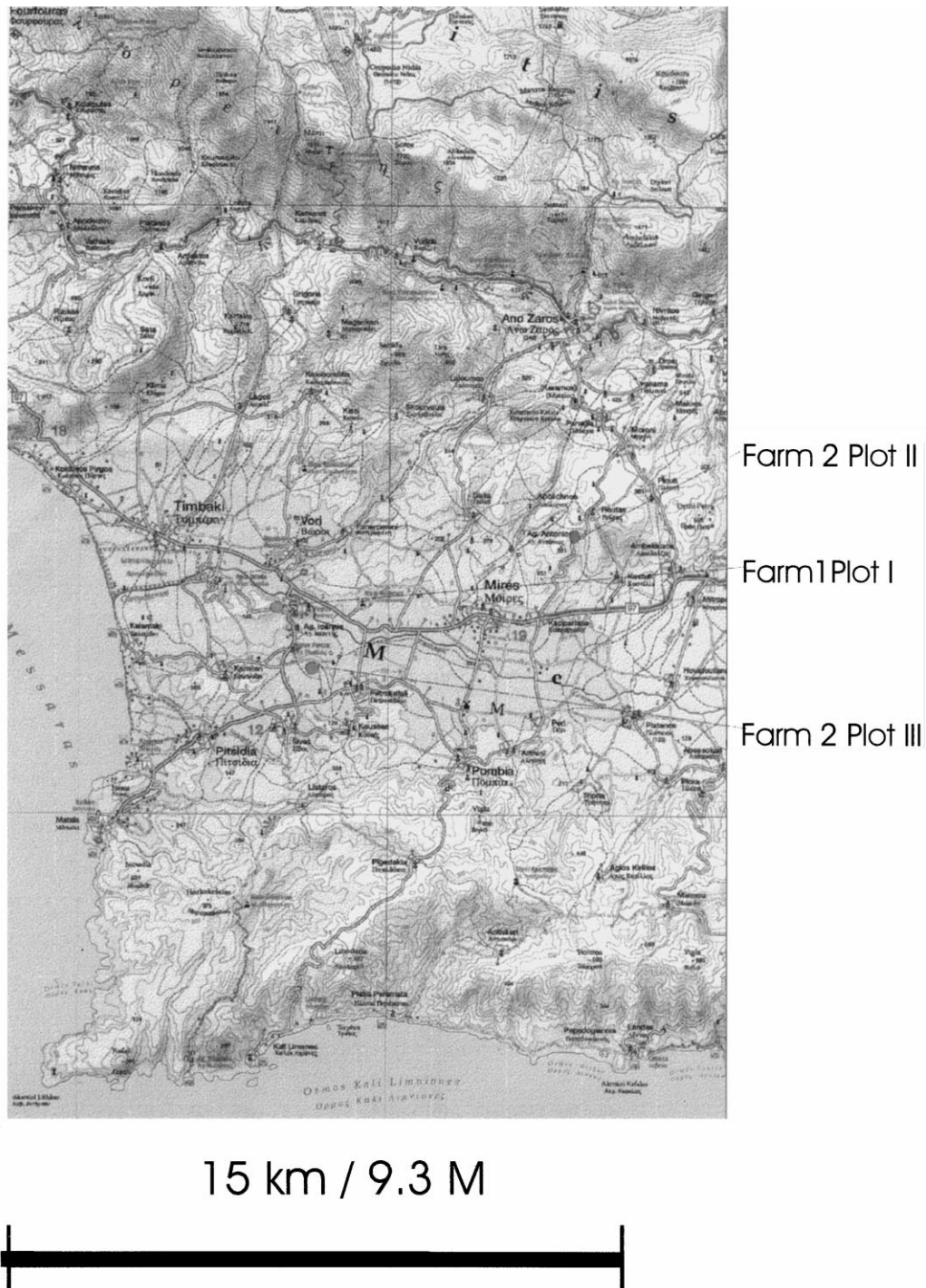


Fig. 2. Map of the Messara region, including the researched plots.

the farming system) to contribute to the aesthetic and ecological qualities. It should be possible for people to orientate themselves in space and time.

The Messara landscape contains outstanding landscape elements like the snowy hills (Ida mountain) and the archaeological site of Phaistos. These elements form the framework of the landscape and certainly add to the possibility to orientate in space and time. Also in the hills some landmarks can be found (typical hill-tops or views), this in contrast to the plain. Within the large plain, covered with young olive yards, the main brooks and minor ditches are not visible from a distance and hardly distinguishable at all. Also, the main roads cannot be distinguished from minor roads. This means that the coherence or order between landscape components is hardly legible. If some wet sites had been conserved it would have been better for the legibility of the landscape and the biodiversity. The change in time from marshland to olive production area was very abrupt.

In the hills, the changes in the landscape have been more gradual. Nevertheless, the levelling of many terraces decreased the natural elements and had a disastrous effect on the cultural heritage and visual aspects of the Messara valley. Some of the old high stem olive groves have been converted into low stem ones. The sustainability of the olive groves on steep slopes, with bare land underneath, is endangered by erosion of the fertile topsoil and the monoculture of olive groves is vulnerable to pest and diseases and to economic changes in the oil world markets. In the eyes of the European landscape experts the landscape looked worn out.

The differences of soil quality between the hills and the plain are no longer reflected in the land use and therefore neither in the landscape. The wider variety of crops that is possible in the plain is not exploited; the long-term investment of the olive production makes it difficult to follow the market, if necessary. Landscape diversity is therefore less than it could be. Also nowadays landscape elements like forest, old trees and wet situations or water surfaces are missing in the western part of Messara.

2.1.3. Landscape quality at farm level

On the visited organic olive farms different types of management were distinguished:



Fig. 3. High stem olive grove with short grass and herb vegetation as undergrowth. There is a clear distinction between the grass layer and the tree layer.

1. A short sheep grazed vegetation below high stem trees (Fig. 3);
2. Ploughed land below high or low stem trees;
3. High spontaneous herb vegetation of different species below high or low stem trees;
4. Seeded cover crops in high stem groves (Fig. 4) and in low stem groves (Fig. 5).

These different kinds of management effect erosion, species richness, social life and visual experiences.

The traditional way of combining high stem olive trees and husbandry (type 1), which have the best effects for the checklist criteria soil quality, biodiversity, visual experiences tends to vanish. The farmers are very content not to have the continuous care for the grazing animals anymore. Mixed farming systems are more demanding in labour and management skills, while the current structure of the agricultural sector does not favour them. Besides, the social life of farmers improved by applying less labour demanding techniques.

The different types of olive groves have different effects on the visual quality of the landscape. In olive grove types no. 1 and no. 2 the geomorphologic relief forms, the characteristic old stems and the shadow contrasts of the olive trees on the soil are visible. The tree crown, the stems and the grass form three distinguishing layers. In olive grove types no. 3 and no. 4 the herb vegetation layer merges with the tree crown layer and the above given perceptions are impossible.



Fig. 4. High stem olive grove with herb layer as undergrowth at farm '2'.

2.2. Cretan landscape policy

Cretan landscape policy does not really function. This is mainly due to the absence of interest. Next to this other reasons are a lack of knowledge and the large number of organisations (Development agencies) and state services responsible for management of environment and landscape, without much co-ordination (Region of Crete, Forest service, Agricultural service, Water resources development service, National tourist organisation, Archaeological service, Service for the environment, Spatial planning and Public works). Besides, all these organisations do not have common policy but even contradictory policies aiming on the one hand, to the development of the island through exploitation of its resources, and on the other hand, to the protection and conservation of these resources.



Fig. 5. Low stem olive grove with (high) grasses as undergrowth at farm '2'. There is no clear distinction between the grass layer and the tree layer.

2.3. Assessment procedure

In the assessment procedure, the knowledge and expertise of European (landscape) experts were combined with that of local expertise's key persons. Here, the 'Cretan agro-environmental group' (CAEG) and the members of the EU-network, visited some randomly selected farms in the Messara region, from 4 to 8 May 1997. They were asked to apply the checklist, comparing the strong and weak points in the 'sustainable landscape production' of these farms with those of the surrounding region.

Key questions were:

How does the farm contribute to the (landscape) quality of the region?

How does the farm solve regional land-scape viz. land-use problems?

To answer these questions, information on both the farms and the region was needed. The landscape experts observed the farm and its surrounding, following the checklist. The local experts provided the group with additional information.

The assessment of a landscape's qualities according to the checklist as proposed, is meant to be relative within an area with similar landscape features. That means that farms' landscape quality cannot be assessed disregarding the specific qualities of its area. The idea is that there is no such thing as 'neutral' or 'objective' globally definable landscape goals on the level of quantitative parameters, like for example: 1 cow per hectare, 10 labourers per farm, 300 m hedges per square kilometre. However, general, qualitative

targets like those of the checklist are indispensable to set the locally relevant quantitative targets, in a consistent, inter-regionally compatible way (e.g., Rossi et al., 1997).

The first farm and the two plots of the second farm are compared within the framework of the checklist. For an extensive explanation of the criteria and parameters used in this checklist, see Van Mansvelt and van der Lubbe (1998) and Stobbelaar and van Mansvelt (2000). The numbers in the tables and lists refer to the mentioned checklist. The idea is to find the strong and weak points of the farms, related to the surrounding landscape, in order to value the farms and to have a starting point for giving recommendations. An overview of the results is given in the concluding paragraph. Counting is done as follows: –, 0, +, ++, from low quality to high quality.

The information on the abiotic and cultural environment is gathered during the fieldtrips. The shown socio-economic information was abstracted from the farmers and Cretan agri-environmental group. Part 5 of the checklist (Psychology) is mainly used to structure the (subjective) observations and thoughts of the users of the checklist. This part describes the subjective appreciation of the farm and the landscape it belongs to. It is used to become aware of the landscape qualities. This is the reason that we show the results of part 5 only in the text, and that we use the results of part 6, which is the 'objective' quality of the cultural realm, for the valuation. The three criteria used here, diversity, coherence and continuity are interrelated and inseparable (Kuiper, 1997, 1998). Main questions are: does the arrangement of the landscape components express the natural and cultural heritage and present meaning? Can people orientate themselves in space and time?

2.4. Cretan agri-environmental group and research on ecological olive production systems

Members of the Cretan agri-environmental group (CAEG) managed the two researched farms. CAEG was established in 1993 in the Messara plain (Fig. 2), at the beginning of the innovative research project for prototyping Ecological Olive Production Systems (EOPS) (Kabourakis, 1996). The main objective of the EOPS research was to design, test, improve and

disseminate prototypes of ecological olive production. Within this objective it was attempted to improve:

1. sustainability and stability of olive production and
2. growers' perspectives and regional development.

Since 1993, the CAEG has been fast growing in participants and expertise. Its farmer's members (organic farmers of Messara) have accumulated experiences both in organic olive cultivation and processing techniques and in marketing of the organic olive products. Extension is done by showing visitors around on the farms.

Comparing the approach of the EOPS research and the concerted action reported on, it was found that the EOPS research used a quite similar system wherein the member farmers prioritised their aims for sustainable olive production and development of the area, within the standards of Organic Agriculture (IFOAM, 1996). This can be seen as a mixed top down/bottom up/top down approach, in that, given the organic standards (top down) the aims of the members were collected (bottom up), and translated into appropriate objectives for the ecological production by the researchers (top down). The objectives of EOPS were then quantified by appropriate indicators (parameters). Farmers meet these objectives by using ecological farming methods. The research is done in co-operation with a pilot group of farmers, and with the contribution of the rest of the organic farmers in Messara.

All farmer members of the CAEG are regularly being trained through study/discussion meetings.

2.5. The farms

2.5.1. Farm '1'

Farm '1' is 35 ha large. It is situated on the top of a hill (Fig. 1). There is a building functioning as shelter for the labourers. Farm '1' was established, in its current form, at end of the 60s. At that time, high stem olive trees were replaced by low stem (Koroneiki variety). Mid 70s the mixed farming system was left, because the sheep had been stolen. In 1993, the farm was converted into organic farming. Parts of the farm have been burnt two times in the last two decades. The farm is special for the Cretan situation because it is 35 ha large, with 28 ha in one piece, not scattered like other Cretan farms. The family decided to keep the farm intact and even enlarge it by buying extra land.



Fig. 6. Flower rich meadow at farm '1'. This meadow is part of the ecological infrastructure of farm '1'.

Now two families live from the farm and also a next generation (coming up) may live from the farm.

The farm has some rocky outcrops and flowers rich meadows (Fig. 6) that serve as part of an ecological infrastructure (Vereijken et al., 1995). Other more natural parts are meadows on the steeper parts, the cliff and the (rows of) trees planted through the olive groves. One of the rows of Cypresses is a former boundary of the farm, which says something about the administrative history of the farm, but has no real connection with the natural underground, so it does not show (vertical) landscape coherence. The scattered planting of a few fruit trees between the olive yards did not result in a distinctive landscape element that reflects the natural or cultural history (see Kuiper, 2000).

2.5.2. Farm '2'

Farm '2' has 11 ha of land. It is scattered through the area (Fig. 1). The research group has visited two parcels of this farm, one situated in the hills with high stem olive trees (Fig. 4, from now on called plot II), one situated in the planes, with low stem trees (Fig. 5, from now on called plot III). Plot II consists of only one landscape element, namely the grove with herbs in the undergrowth. Plot III consists of the grove, a ditch and a surrounding row of native fruit trees and shrubs. The natural grasses and herbs in the undergrowth were already mown when we visited the plot. They were not so colourful as the herbs in the mountains, probably owing to a much more fertile soil in the floodplain. The herbs and trees were introduced by the organic farmers in accordance the ecological in-

frastructure management method (Kabourakis, 1996). They can function as ecological reservoirs for predators, to preserve the soil and to improve the ecological quality of the area.

3. Results

3.1. The quality of the abiotic environment

In Table 1 an overview is given of the scores on the abiotic realm of the three plots. On all three plots the ecological olive production system (Kabourakis, 1996) is being used. As described in Section 2.1, the agricultural landscape of Crete has become more and more monotonous over the past decades. The ecological olive production system tries to stop this trend. Although, the environmental situation of plot II and III is a little better than on plot I, this is not elaborated in the ecology of the farm. This might be a management effect, but is certainly a result of the larger surface reserved for semi-natural elements on plot I.

3.2. The quality of the social environment

The hill plot and valley plot are part of one economic unit, and because of that treated together here.

3.2.1. Economic factors

The organic farmers on the island may make good profit from their work. The number of farmers members of organic farmers of Messara — is increasing, as a sign that conventional production faces increasing agronomic problems while organic olive production pays off. However, this is mainly due to the success of the EOPS project initially at agronomic level, and later at management and economic level. Other important factors are the increasing problems of conventional production, and the increased awareness of the farmers of the effect of conventional farming on health and environment.

The productivity of the organic farmers (kilogram's per hectare) is almost as high as conventional, which means that the gross revenue per hectare counted in Drachmas is higher. Besides, the premium prices of olive oil overwrite the extra costs rising from addi-

Table 1
Abiotic scoring of the researched plots

Parameters	(I) Farm '1'	(II) Hill plot of farm '2'	(III) Valley plot of farm '2'
1. Environment			
1.1 Clean environment			
1.1.1 Soil conservation	erosion due to neglect of terraces and lack of trees on uncultivated slope (–)	no problems, although it is undulating (++)	even on flat soil conservation practise was applied (++)
1.1.2 Clean water	EOPS nutrient management (0)	EOPS nutrient management (++)	EOPS nutrient management (+)
1.1.3 Air quality	no spraying (0)	no spraying (0)	no spraying (0)
1.1.4 Wildfire control	two uncontrolled fires over the last time (–)	no fire problems (+)	no fire problems (+)
1.2 Food/fibre efficiency and quality	high quality ecological food production, well balanced between nature and food production (++)	high quality ecological food production, less balanced between nature and food production (+)	high quality ecological food production, least balanced between nature and food production (+)
1.3 Carrying capacity	EOPS ecological management practises (0)	EOPS ecological management practise; high organic matter content (+)	EOPS ecological management practise; good annual/poly annual crop area (++)
1.4 Resource efficiency: input–output balance	good nutrient balance (++)	reasonable nutrient balance (+)	
1.5 Side adapted production system	no production on steep or rocky areas; local varieties and specialities (++)	olive grooves in hilly area, local varieties (+)	olives grove on very fertile soil, international varieties (–)
2. Ecology			
2.1 Biodiversity			
2.1.1 Species with minimal population	rare species in orchard (orchids) (++)	sown herbs and common wild herb species (+)	very common species (nutrient rich plot) (–)
2.1.2 Biotopes with minimal area	semi-natural habitats: rocky outcrops and flower rich meadows (+)	no biotopes except the fields itself (–)	no biotopes except the fields itself (–)
2.1.3 Ecosystems with minimal complexity and function	high age (stability), quality and quantity of biotopes and species (+)	high age (stability) of the biotope (–)	low age (stability), quality and quantity of biotopes and species (–)
2.2 Ecological coherence			
2.2.1 On site	biotopes express the natural circumstances of the site (+)	mainly herbs that express disturbance (field herbs) (0)	mainly herbs that express disturbance (field herbs) (0)
2.2.2 In the landscape	ecological infrastructure on farm level (+)	no real ecological infrastructure (–)	ecological infrastructure (indigenous trees), but the plot is too small to speak from a real network (–)
2.2.3 In time	full live cycles in semi-natural elements (+)	live cycles in field disturbed by ploughing (–)	live cycles disturbed by mowing (+)
2.3 Eco regulation	suffered heavily from a pest (–)	no problems (+)	no problems (+)
2.4 Animal welfare	no livestock, but good living conditions for wildlife (++)	no livestock, medium living conditions for wildlife (+)	no livestock, medium living conditions for wildlife (+)
Total score	12	8	5

tional labour that ecological olive production requires (Vassiliou, 1999).

Both farms are not heavily depending on external inputs. Farmers are purchasing the required manure for fertilisation from the area. Legumes in the undergrowth provide the most required nitrogen. Sometimes, seeds for the cover crops are bought. The main

external input to the agro-ecosystem is traps for the olive fly protection.

There is limited direct marketing. This is due to the lack of organisation and experience by the farmers. Things would be worse if it was horticulture or staple food instead of a highly appreciated additive to food, like oil.

Table 2
Social scoring of the researched farms

Parameters	(I) Farm '1'	Farm '2' (II, III)
3 Sociology		
3.1 Farm subsistence	Organic olive production pays of which can be seen in the rapid growth of the number of organic farmers. The productivity of organic olives (kg/ha) is as high as conventional, which means that the gross revenue is higher (++)	
3.2 Green economy	not much external inputs (technical autonomy). The environment is internalised in the higher prices for organic products (++)	
3.3 Regional subsistence	limited direct marketing. Producing for the export market, but only 10% of the olive (= oil) is transported (minimise transport energy). The Cretan olive oil is a regional speciality (0)	
4 Economy		
4.1 Social reproduction	many types of work (labour diversity and satisfaction) managed by a extended family without possibilities of splitting up through heritage. Regular training by CAEG (education and awareness). Regular visits by groups (dissemination) (++)	regular training by CAEG (education and awareness). Regular visits by groups (dissemination) (+)
4.2 Local participation	no direct link with consumers (–)	no direct link with consumers (–)
4.3 Accessibility of the landscape	excursions, but no public roads through the farm, nor ecotourism, selfpicking etc. (0)	excursions, but no public roads through the farm, nor ecotourism, selfpicking etc. (0)
Total score	5	4

Because the oil is mainly not sold on the local market the energy used for transport is quite high. On the other hand, only the end product (oil) is transported, which is less than 10% of the olive's weight.

Olive oil is, in general, a speciality of the Mediterranean area. However, Cretan olive oil is of high quality (90% of the olive oil produced in Crete has the highest quality: extra virgin). Next to this, olive oil of the area has specific organoleptic characteristics, e.g. aroma and taste. Cretan olive oil characteristics are since antiquity appreciated by consumers all over the world. Olive oil produced by organic farmers of Mes-sara is appreciated abroad as a speciality product of the area.

3.2.2. Social factors

Organic farming provides more types of work, because of a more diversified farming system. This work, although it often is more and heavier work, could supply more satisfaction to the farmer and in that way could contribute to keeping the land populated. Perhaps even more important is the fact that more labour per hectare is needed in organic agriculture. This also might keep the land populated. Note that ecological olive production does overall not require more labour inputs than the conventional intensive olive produc-

tion (Vassiliou, 1999). The large farm (I) is special in this respect. The farm is owned by an extended family, instead of a small household. The farm will not be split up by partible inheritance. This gives a solid base for sustainable land use in the sense of long lasting management by providing the possibilities (space) to make a real effort for ecological networking. This on its turn is an important basis for labour satisfaction.

There is no direct link to consumers that would like to participate either financially or physically to maintain the farms. This is to a large extend due to the fact that the group has recently been established (during 1994), and partly due to the fact that there is no tradition, as there is in the Northern European countries with e.g. 'community based agriculture'. There happen to be some excursions (for farmers and retailers) to the farms, but there are no public roads through the farms, nor ecotourism, self-picking, etc.; there is no real direct contact of visitors with the land, which can establish an emotional bond with the place.

As can be seen in Table 2, both farms do contribute to the quality of the social environment rather well, which is largely due to the fact that they are organic farms: they provide labour, do more inspiring work, they are better organised, accessible for visits, and the

Table 3
Cultural scoring of the researched plots

Parameters	(I) Farm '1'	(II) Hill plot of farm '2'	(III) Valley plot of farm '2'
6.1 Diversity			
6.1.1 Reflection of the different geomorphologic units in the land (use)	rocky outcrops are used as natural elements, shallow or steep areas are used as meadows (++)	one landuse type (highstem olive grove) on one landunit (slope) (++)	one landuse type (lowstem olive grove) on one landunit. However, this landunit has the potential to show much more crops (0)
6.1.2 Reflection of biotic diversity	top of hill and steep slopes are not planted with olives and show a high diversity of plants (++)	olive trees with herb undergrowth (+)	olive trees with grass undergrowth. Ditch with wet species (+)
6.1.3 Differences between fields of a similar landuse type	different ages of plots, experiments with (fruit) trees among the olives or trees along the plots (+)	hill plot differs from valley plot in varieties, age, etc (+)	valley plot differs from hill plot in varieties, age, etc (+)
6.1.4 Diversity of visual information in one field	tree crown layer, the stems, geomorphologic forms and earth are visible (+)	with a low leguminous vegetation as undergrowth, the visual information is rather good (+)	merging of undergrowth and the tree layer; they are not separately visible and neither is the earth or shades (–)
6.2 Coherence			
6.2.1 Coherence among landscape elements	the fragmented planting of Cypressess does not reflect a sustainable landscape element like a brook or a path. The labourers refuge is functionally build on the top of the hill (+)	no arrangements of elements (0)	the fruit trees are arranged along the dry ditch. They emphasise a line in the landscape (+)
6.3 Continuity			
6.3.1 Cultural history	the terraces of former ages were levelled. The nut trees on the terrace slopes disappeared. The mixed farming system was left. There had been a dominant abrupt change by converting from mixed farming into the specialised organic farming. Fires caused the disappearance of other fruit trees and shrubs. Only the rare species on the road virgins express continuity of their location and of management (0)	the plot is still quite the same as in the past; perhaps more fieldherbs instead of meadow herbs now (++)	a drastic change from swamp to olive groves took place. The past can not be recognised anymore (0)
6.3.2 Visibility of natural processes	the season was visible in the road verges and the flowering olive trees (++)	flowering herbs and trees (++)	flowering herbs and trees (++)
6.3.3 Visibility of maintenance cycles	pruning and harvesting etc. but quit simple system; could be more complex with undergrowth and/or grazing (+)	pruning and harvesting etc. but quit simple system; could be more complex with grazing (+)	pruning and harvesting etc. but quit simple system; could be more complex with grazing (+)
6.3.4 Future sustainability	rather sustainable (+)	perhaps too small to be really sustainable in an area of conventional farmers (toxic wind drift). Good soil protection (+)	perhaps too small to be really sustainable in an area of conventional farmers (toxic wind drift). Good soil protection (+)
Total score	11	11	6

consumers pay for green agriculture. The large farm is more progressive in the way it is socially organised, run by an extended family as a whole and not divided among the heirs.

3.3. The quality of the cultural environment

Although the plots differ a lot in appearance relatively, all three of them score rather well on the cul-

tural parameters Table 3. This is partly related to the fact that the plots are situated in different parts of the landscape. Their landscape appearance is subsequently also different. Nevertheless, plot III lacks behind in the scoring because of its abrupt changes in the landscape history and the weak reflection of the potential landscape diversity. In contrast, plot I has the highest score because of a high landscape diversity (on several levels).

4. Discussion

4.1. Discussion of the results of the farm comparison

In Table 4 an overview of the scores on the sets of parameters is given. An overall score is added by counting up the separate scores. The scoring of the hill plot and valley plot on sociology is taken together, because the assessment was based on the performance of the whole farm.

Both farms contribute to the landscape quality of the region, the large farm (I) even more than the scattered farm (II, III). The scattered farm performs better on environmental issues, but this is not translated in a high score on ecological qualities. On the contrary, the main difference between the farms is that the larger farm scores much better on ecological qualities. The lower score on ecological parameters of the scattered farm is due to the small size of the plots. This can not be changed easily, whereas the improvement of environmental qualities of farms, which is a task for the larger farm, is (just) a matter of changing farming style. Especially conserving the soil by undersowing grasses and herbs, and by planting trees on steep slopes would help a lot (e.g. against erosion).

Both farms do score reasonably well on the sociological realm. This is largely due to the fact that the farmers work according to the standards for organic farming. The scoring on cultural parameters is good for both farms, although it must be mentioned that the difference between the large farm (I) and the valley plot (III) is still rather large. This difference can mainly be explained out of the fact that the scoring of the large farm (I) is absolutely very high. Another factor is that, in our opinion, the land use of the valley plot (III) is not the most wanted for the legibility of the landscape.

Note that the scores of the scattered farm on ecology and the larger farm on environment are only relatively bad: the ecological farms in general are much ahead of the average Cretan olive farm, where e.g. soil, flora and fauna erosion are severe problems (Kabourakis, 1996). It could be argued that the larger farm its higher landscape and ecological score is indebted to its social organisation. By keeping the land as a unit through the generations of farmers a more stable management can be reached on a larger surface.

4.2. Solving the Cretan landscape problems

The Island of Crete is (still) famous for its landscape and nature. In the Messara valley the surrounding hills and mountains and elements such as Phestos ruins are strong landmarks that make the framework of the landscape. The shoulders of the roads in the area are flowering of numerous herb species and the Garigue is interesting for its landscape both as its natural values. Although the natural situation of the island is unclear yet (Rackham and Moody, 1996), one could easily state that the Messara landscape expresses itself mainly through agricultural use. Owing mainly to olive oil prices and competition problems in the international markets, this landscape image has become rather monotonous, with olive groves everywhere. The legibility of the Messara landscape is low. The different geomorphologic and abiotic units are not reflected anymore in the land use nor in the natural vegetation. By regularly ploughing and spraying on the olive plots, the vegetation cover has been reduced to almost nothing. This also causes erosion problems.

Some of the organic farmers in the region tackle this problem by under sowing the groves and/or the establishment of natural habitats. This allows the abiotic and biotic conditions to express itself. The ecological farms in this respect are the core elements for an ecological infrastructure in the area. Nevertheless, no solution has been found yet for the problem that, on the one hand, the ecological plots in itself are mostly too small to have an internal ecological network and, on the other hand, are too insulated to function as a stepping stone in the ecological network. The same counts for the landscape impact of the added natural elements; they disappear in the (visual) impact of the surrounding land use. Summarising can be concluded that the organic olive farmers have made a start in

Table 4
Total score of the two researched farms^a

Total score	Environment	Ecology	Sociology	Culture	Total
I Large farm	4 (25)	8 (50)	5 (42)	11 (61)	28 (45)
II Hill plot	9 (56)	–1 (0)	4 (33)	11 (61)	19 (30)
III Valley plot	6 (37)	–1 (0)		7 (38)	12 (19)
	maximum: 16	maximum: 16	maximum: 12	maximum: 18	maximum: 62

^a The values in the parentheses are given in % score.

solving regional (landscape) problems, but that a real solution needs a large step forward both in policy supporting landscape development and organic farming, and in the growth of the amount of organic farmers.

4.3. Discussion on the method

The method applied can be characterised as some sort of ‘rapid rural appraisal’: (only) a first impression of qualities and problems, in the eyes of a group of experts is given. However, this visit can hopefully imply a renewed start for local discussion, both within the organic agricultural movement as between farmers and politicians/local inhabitants.

4.4. The role of the Cretan agri-environmental group

The history of CAEG taught us about the importance of social structures in progressive movements: social structures give the possibility to learn from each other, to reach political goals, to set common (ecological) goals, and to promote products (e.g. on international exhibitions).

4.5. Recommendations to improve the landscape quality of the Messara valley, Crete

4.5.1. Landscape on regional and local level

- Create an ecological network, which fits into the landscape structure and underlines the identity of the landscape types (Fig. 7). The ecological network should be a guide for farmers in telling them for which ecosystem and species their farm is important and how they can contribute to the landscape quality. Initiate the implementation of the ecological network in those landscape units that already have the highest landscape quality.
- Emphasise in the Messara valley the difference between the plains and the hills. The difference in fertility and possibilities for land use should be ex-

ploited. The land use of the plains should reflect the fertility and potentials for many different kinds of land use and should be able to follow the market. The olive yards on the hills should reflect the difficult circumstances and the rationality of a long-term investment.

- Initiate sustainable planting, adjacent to still existing natural elements (woods). This planting can consist of linear elements aligning important landscape elements like the hydrological system or the road system, or of woodlots or natural sites, which emphasise a special geomorphologic form.
- Strengthen education on landscape and ecological farming. At the first place, educate teachers, promote educational activities and create appropriate curriculum and material.

4.5.2. The landscape on farm level

- Convince the farmer that he and his neighbours can improve landscape quality in ecological and aesthetic sense, that his farm is part of an ecological network and part of a landscape with its own identity.
- Reintroducing grazing in the olive yards would be important for a healthy soil, for biodiversity, for appreciation of perceptions, for a distinguishable tree layer (high stem is necessary), shadow, geomorphologic forms, and to broaden the economy of the farmers.
- Add additional planting (fruit trees or natural planting) that fits in the landscape structure, for instance linear planting along the hydrological system or the path system. Other natural elements (woodlots) can be planted on sites with special features, like a crest or steep slope,
- Restore, reintroduce and extend field margins with natural herb vegetation and stone walls preferably visible from public paths.
- No levelling of terraces should be allowed anymore.

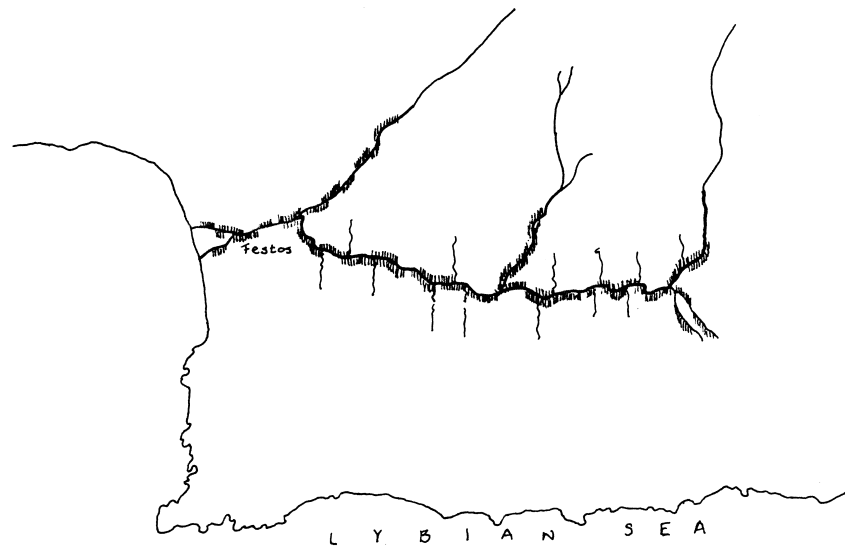


Fig. 7. Proposed ecological and visual network on regional level: planting along the main water courses enlarges the ecological quality and the landscape structure of the area.

- Increase the year-round diversity of annual and perennial vegetation (fragrance, flowers).
- Start a landconsolidation to get larger farms, in order to improve the ecological infrastructure. Also the landconsolidation should be tested by the checklist. The change may not lead to more land degradation.
- Let the system be tested by farmers. They can apply it on other farms, in other areas. It would be very interesting to see what their farmers' eyes see while using the checklist. In this way they learn to value other impressions at the same time.

4.5.3. Policy on the Cretan landscape

- A discussion platform should be developed for eliminating and restoring negative effects on the Cretan landscape. All organisations involved in landscape policies should be invited as well as non-governmental organisations, existing and emerging ones. In this platform should be aimed at a balance between the islands' development using its natural resources and the conservation and protection of these resource in long term.
- There should be aimed at project payment (e.g. a farm), not at animal or field payment as was common practise in the EU (see as an example the cross compliance in Switzerland, Bosshard, 2000). Even

better: first enrol process funding (e.g. platform discussions like CAEG), to come to targets that later on can be funded (target funding). A target can for example be a better farm structure.

A policy plan to reduce the agro-chemical for the health of the farmers and to avoid wind drift to organic farms is needed.

4.5.4. Policy on Cretan organic agriculture

- Farmers as a team overstepping the membership limit of CAEG (0.6 ha) should be accepted by CAEG. This will improve social and (in the long run) ecological networks.
- Modification of EU organic regulation to Crete is necessary. At the moment small farmers do not have a reason to become organic, because they do not fit in the regulations. Switzerland and Scotland can be seen as examples that show how (small) farmers can be helped by applying for a licence (Farmers Advisory Group). Perhaps the CAEG can pick up this task. It may play a role in the collection of the ideas of the farmers and channelling these to the regional authorities and ministry. They could even make a convention on landscape development with the authorities, like the systems that are being developed in the Netherlands at the moment (e.g. Vereniging Agrarisch Natuurbeheer

Waterland, 1997). NGO's definitely can support the ministry in developing ecological agriculture. They may give pressure against non-willing administration and are often aware of what is living in an area.

5. Conclusions

The checklist is a condensation of key issues for landscape quality, based on an iterative process among international experts, local informants and experts and the landscape itself. By applying the checklist at the farms in western Messara valley, we had an instrument to improve the checklist in direct contact with reality. The checklist has to be as complete as possible to serve as a starting point for landscape improvement projects.

The two researched organic farms contribute to the landscape quality of Crete by their ecological and social sound management. They provide, among others, less erosion, a higher biodiversity, additional labour, surplus values for their products and a higher landscape diversity. Increasing the application of organic agriculture could at least partly, solve the detected landscape and landuse problems on the island.

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