A landscape in transition: an historical perspective on a Spanish latifundist farm

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Abstract

An agricultural landscape, as a social construction, is not static, but a reflection of the balance of social forces which influence the way in which the natural resources of the site are combined. To understand and evaluate the current configuration of a landscape, and to define and understand criteria according to which a future landscape may be designed, it is necessary to analyse its historical construction. In this paper we follow these steps, taking as a point of reference a farm in one of the most important agricultural regions of Spain, the Guadalquivir river valley in Andalucía. This region stands out for its high production potential, social inequity and environmental degradation. The paper describes global changes in the use of the land in this river valley over the past 3 centuries, and uses aerial photographs from 1956 and 1990 to outline changes on the 1150-ha Los Humosos farm, recently granted to a co-operative of land labourers after years of struggle for land. Through this change in tenure the criteria 'control' and 'distribution of benefits' are achieved. Nine other criteria derived from the historical analysis were used to compare four different farm design scenarios through multi-criteria programming, which was preceded by an assessment of the biogeophysical characteristics of the land. However, this appeared to be insufficient to cope with essential criteria such as landscape architecture and biodiversity, because minor landscape elements were neglected which are important starters for the design of an ecological infrastructure. Water, a problematic resource in Mediterranean agriculture, paradoxically turned out to be an important characteristic of these landscape elements. From historical, ecological and social perspectives, new proposals for farm landscape design must necessarily and radically break with the recent past. It appears, however, that to produce agricultural landscapes of quality in the Guadalquivir river valley would involve tough social struggle, that nonetheless is found to use the margins left over by the dominant socio-economic, cultural and political structures. Finally, an agro-ecological option is proposed as a transitional design. © 1997 Elsevier Science B.V.

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1. Introduction

An agricultural landscape, as a social construction, is not a static entity, but is a reflection of the balance of social forces exercising influence upon the articulation of the natural resources offered by the site. To understand and evaluate the current configuration of a landscape, as well as to define and
understand criteria according to which a future landscape may be designed, it is necessary to analyse its historical social construction.

In this paper, we propose to follow these steps, taking as a point of reference the Los Humosos farm situated in one of the most important agricultural regions of Spain, the Guadalquivir river valley in Andalucía. This region stands out for its high production potential, social inequity and environmental degradation.

First, biogeophysical conditions of the Guadalquivir river valley are presented, as well as an historical overview of changes in the use of the land over the past 3 centuries. From this, criteria are derived for new proposals for farm design. Then, the Los Humosos farm is taken as a case study. First, recent changes in landuse are pointed out comparing aerial photographs of 1956 and 1990. Then methodology is described by which the criteria discussed earlier have been translated into a proposal for future farm design. The paper ends with conclusions.

2. Biogeophysical features of the Guadalquivir river valley

The Guadalquivir river valley (GRV) covers the central part of Andalucía, the most southern Spanish autonomous community. It is blocked to the north by the Sierra Morena mountains and to the south by the Sierra Subbética mountains and comprises parts of the provinces of Cádiz, Sevilla, Córdoba and Jaén (see Fig. 1). Usually two areas are distinguished within the GRV: the campiña, which is historically a rainfed area ‘secano’ for extensive cropping, and the ‘valle’, which is an irrigated area for extensive horticulture (cotton, maize, sunflower, beets). In this paper we deal with the campiña areas. Its climate, according to Köppen (1948), is medium-Mediterranean. Annual precipitation oscillates around 600 mm, with peaks up to 300 and 800 in some places. Rains fall basically in autumn and spring. This leads to a cropping season that runs approximately from October to May, when evapotranspiration losses are also less than in summer.

The valley presents an orography with smooth slopes (maximum 20%), although there is a gradient in geofoms, with almost flat land close to Sevilla, and a more hilly environment close to the mountainous ridges that border the valley to the north and the south, as well as in the province of Jaén in the east. All of the valley has its origin in fluvial depositions that formed several terraces of different ages and mother material. The soils are usually heavy (between loam and clay), with a pH of 7–8 and a high content in carbonate. The most frequent soils in the campiña of Córdoba and Seville are alfisols, entisols, inceptisols and vertisols. Soils can be very deep (up to 2 m) and in general are fertile, having a high production potential.

Climax vegetation is a Mediterranean forest dominated by *Quercus* spp. Man has transformed this vegetation by selective clearing of the forest and selective protection of trees, creating pastures that

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Fig. 1. Geographical location of the Guadalquivir river valley and the Los Humosos farm in the autonomous community of Andalucía.
usually have the appearance of a savannah landscape with dotted trees in different densities, called dehesa. The dehesa is an agro-silvopastoral system that has shown to be remarkably adapted to the Mediterranean ecological conditions (Campos Palaclín, 1984). The main difference with the climax vegetation that can be found in the dehesa area in the nearby Sierra Morena is originated by the soil pH, which modifies basically the species composition of the herb layer. At present, almost all of the dehesa in the Guadalquivir river valley has been lost.

Erosion processes in this area are severe. The province of Sevilla has 32.1% of its area affected by a moderate erosion and 19.1% by severe erosion, whereas figures for the province of Córdoba are 17.0% and 40.7%, respectively (Instituto de Conservación de la Naturaleza, 1980).

The heavy texture of the soils originates occasionally, when combined with presence of water of bad quality, salty-sodic soils with a bad structure. These soils then give way to the existence of temporary lagoons. Many of them have been drained for agricultural use, and are to be found throughout the campiña, and some have the status of a protected ecological reserve because of their faunistical, and specially their ornithological, values.

3. Changes in the landscape of the campiña of the Guadalquivir river valley from an historical perspective

Land tenure has strongly marked the history of the Guadalquivir river valley during the past 500 years (Artola et al., 1978). The biggest part of the land, and that of the best quality, has been and still is in the hands of big latifundist estates. Minifundism (small farms) represents a very small percentage of the land, although it has been the subsistence basis of many small farmers.

At the end of the 17th century, land was basically in the hands of the church, the crown and the nobility. The lands in the possession of the church were known as ‘bienes de manos muertas’ (dead hand’s goods); and those in the possession of the crown as ‘tierra de realengo’. The land that was granted through time by the crown to the nobility came to constitute the ‘señoríos’, or more precisely, the ‘tierras señoriales’ (land of the land lords). Furthermore, there were two classes of land that belonged to the villages: the ‘tierras comunales’ (communal lands) that were exploited by the inhabitants of the town to their own benefit, and the ‘bienes de propio’ (land/goods of one’s own) whose user rights pertained to the municipality. Finally, there were the so-called ‘baldíos’ (fallow land), owned by the villages although submitted to some extent to the control of the crown; these were lands that during the greater part of the 19th century were hardly used for agricultural purposes. By the beginning of the 19th century this structure of land tenancy had evolved towards an enlargement of the land of the church and the nobility, in detriment of the ‘tierras de baldíos’ and the other lands of the villages. The agricultural labourers usually had no land, although occasionally some could convert themselves into temporary peasants when they were lucky in acquiring, for some period of time, the rights to work a small parcel through the periodical auctions of village land.

During the past 150 years, this situation changed dramatically, and land passed on to other owners. This was due to several decrees. First, by the decree known as the ‘desamortización eclesiástica’ the lands of the church (‘bienes de manos muertas’) were expropriated and auctioned in public (1837–1838). The ‘de señoríos’ decree, by which this administrative category disappeared, emerged to settle disputes advanced by the villages claiming collective land occupied illegally by the big landowners. In the third place, the changes in the tenancy structure were due to the ‘desamortización civil’ (1855–1836), a decree that authorized the villages to sell the ‘tierras de propios’ and the ‘tierras de baldíos’. Even the communal lands (‘tierras comunales’) were auctioned at this occasion, although officially this was forbidden.

Both ‘desamortización’ decrees also mark the major deforestation in Spanish history, the forests being cut by wood traders. At the same time, the auctions of the land of the church and nobility, on which numerous agricultural labourers used to find a small complement for their subsistence, facilitated the appearance of a movement of agricultural labourers, which had elements of class struggle (Sevilla Guzmán, 1991).

Through these changes, the bourgeoisie managed to consolidate its position, as great parts of the land
of the church and nobility were bought by the contemporary traders. This enabled their rise as protagonists on the Andalusian countryside (Bernal, 1974). At the same time, the claims of the villages and later those of the agricultural labourers and the peasantry radicalized; finally, they led to a climate of strong tension at the end of the 19th century that marked the social life of that period.

The fact that the production systems demanded labour only in certain periods of the year, and the existence of a large population of agricultural labourers, created a little-habited rural landscape, with the population concentrated in big agro-cities like Carmona, Ecija and Lucena.

The tenancy structure described was strongly linked to the uses of the land that were conditioned basically by the existing technology. In the campiña, there were three most important uses: olive growing, cereal cropping and dehesa. In these systems, livestock was fundamental, as it allowed to benefit from the dehesa pastures and it provided animal traction for ploughing the heavy campiña soils. While doing this, the livestock fed on harvest remains and at the same time fertilized the fields.

The diversity of the farming system can be considered as the main characteristic of the big estates during the ‘Antiguo Régimen’ (Old Regime, the period before 1832, when the absolute monarchy was abolished). Usually, from the 16th through the 18th (and even in the early 19th) century, these estates were mixed farms, combining agriculture (mainly cereals and some legumes) with livestock rearing, although the first activity dominated notoriously over the second. The system was born out of a necessity to work with the contemporary crops of the time and to make use of the fallow lands. However, commonly the ‘dehesilla’ (small dehesa) or ‘majada’ (open place in dehesa or forested land in general) supported the livestock rearing on the farm, as they generated additional forage (acorns, pastures). The need for a lot of animals for traction definitely assured the maintenance of livestock as part of the farming system.

In the 18th century, a latifundist farm could typically consist of olive groves, fallow land, some arable land close to the farm stead (‘el ruedo’), sometimes a small dehesa used by different species of domestic livestock, a vegetable garden and fruit trees. The material dependencies created at the farm level responded to the multiple use strategy of the latifundio.

Other mixed exploitations which occurred between the 16th and the 18th centuries were the big estates dedicated to cereals and olives at the same time, but without livestock. These estates gradually substituted cereals for olives and evolved in the 18th and 19th centuries towards specialized olive farms.

During the Antiguo Régimen, unlike the current situation in which it is confined to land of inferior quality, the dehesa was to be found also on excellent soils that, when deforested, could support very productive farms.

There were two types of dehesa. One functioned as a ‘support’ system of the latifundios, as it was able to absorb the livestock population of the farm providing it with forage. The other type of dehesa figured as the main activity of the latifundio, focusing on the production of pigs and sheep. The first type disappeared slowly due to demographic pressure and the huge hunger for land in the later part of the 18th century.

Currently, the farms in the campiña of the Guadalquivir river valley, which have a mean size of approximately 100 ha, predominantly grow cereals (wheat), rotated with sunflower. To a minor extent olives and wine are grown. The major part of these crops are rainfed, but in recent years the area under irrigation has importantly increased, which, in its turn, allowed for the inclusion of other crops in the rotation, like cotton, beets (these crops dominate), rape, potatoes, etc.

Recently, due to market conditions and EU regulations, the area associated with sunflower and olives (often drip-irrigated) has increased tremendously, converting the landscape into a uniform blanket of two mono-crops. Livestock has disappeared almost completely and only isolated herds of sheep and mostly goats remain. These animals feed basically on wild plants and harvest remains, even when some pass part of their time in stables. Forests and trees and, consequently, also the uses made of them, have disappeared almost completely, as they disturbed mechanization and expansion of the area dedicated to growth of arable crops. The latter was enhanced by the development of agricultural machinery and favourable market prices. Labour is increasingly ex-
pelled from agriculture. The Los Humosos farm, the case study in this paper, is a typical rainfed farm of the Sevilla campiña that attains completely to this general description of the campiña.

4. Criteria for farm design and evaluation

From Sections 2 and 3 it is clear that the greater part of the Guadalquivir river valley has been tremendously misused from an ecological point of view during the past 40–100 years, guided almost exclusively by economic criteria. Forest cover, of both the closed Mediterranean forest and the open dehesa type, almost completely disappeared. Autochthonous germplasm of crops such as bitter vetch, rainfed lucerne, rainfed maize and winter wheat was lost (at least locally; at present, no seeds can be obtained of the varieties sown in the 50s, according to personal comments from former employees of the Los Humosos farm) and soil erosion is and continues to be severe. This situation is aggravated by the fact that water is becoming an increasingly scarce good; as agriculture currently consumes 80% of the available water resources in Andalucía (Ruiz, 1993), it is clear that its truly rational use is very important. The landscape of the Guadalquivir river valley has been homogenized, and needs to be built up again. On the other hand, a great part of the approximately 300,000 land labourers, which used to work in the valley, has been condemned to unemployment as a result of agricultural modernization. New proposals that regenerate rural Andalusian life and agricultural environment through new farm designs are thus in great need. We think that these should be established bearing in mind the following criteria.

1. Soil conservation: Under this heading we group the use of mechanisms that prevent wind erosion (windbreaks, hedgerows or other vegetative formations that increase the fragmentation of the vegetative surface), hillside erosion (contour ploughing, avoiding the use of steep slopes and fragile land in general) and chemical erosion (no irrigation of salty land, for in the end it will exhaust its production capacity).

2. Water conservation: With this item we refer to mechanisms that enhance an optimum use and conservation of the available water.

2.1. ‘Water harvesting areas’ (vegetative (forest) cover on strategic points, vegetated watercourses, vegetated riparian areas and depressions, creation of more humid microclimates through scattered vegetation or windbreaks for the reduction of wind speed).

2.2. Cultivation techniques (crops that need a minimum water supply (dry land crops), winter sowing).

3. Biodiversity: This refers to the number of plant and animal species. As a derived criterion we mention crop diversity, defined as the number of different crops managed in a rotation.

4. Resource efficiency: Here we refer to as great as possible an integration of farm activities as to avoid unproductive loss of nutrients (use of cattle for manuring arable land, integration of pastures and fodder crops in crop rotation), and to the adaptation of the use to a certain site (e.g. use regularly inundating soils as pasture land, instead of converting them into arable land).

5. Use of external control mechanisms: The fewer external control mechanisms (pesticides, fertilizers, etc.) used, the better. Here the management can draw upon the pest-prevention and nutrient-recycling experiences of organic agriculture and local knowledge.

6. Landscape architecture: A heterogenous landscape architecture, from a functional (ecological infrastructure: windbreaks, forest belts, riparian areas) and an aesthetic perspective, is desirable.

7. Economic diversification: Economic diversification is measured as the number of economic products that can be sold (the more, the better). Unsustainable fluctuations are buffered.

8. Profitability: Merging all before-mentioned criteria, the farm should yield enough benefit to enable a living for those who exploit it. In other words, the farm landscape must have the capacity to enable its own reproduction.

9. Labour: The more labour a farm can absorb, the better. This point is obviously closely related to Points 8 and 11.

10. Participation: Those who depend for their living on the farm landscape should have access to decision making about its use and management. This also includes direct access to the land.
11. Distribution of benefits: The benefits of the farming activity should be fairly distributed among those who work the farm.

Historical continuity, a criterion suggested by Van Mansvelt (1997) in his integrated table included in this volume, is in this Andalusian case considered undesirable. This is because the current landscape implies a continuation of uneven access to land (social inequity) and a not sustainable use of the land. New farm designs must radically break with the present situation. In this paper then we will generate such a farm design, taking the Los Humosos estate, currently run by a co-operative of land labourers, as a case study.

5. The Los Humosos farm

Upon the arrival of democracy in Spain, the movement of land labourers intensified its activities to claim a renewed agrarian reform. This was initiated during the Second Republic (1930–1936) but was blocked by the Spanish Civil War and, consequently, by the Franco regime. It is under these conditions that the delegation of the SOC (union of land labourers) of the village of Marinaleda started mobilizations and claimed the Los Humosos (LH) farm, which at that time was still in the hands of a member of the nobility. Today, Marinaleda is a village of some 2500 inhabitants; 65% of the professionally active population is unemployed, and of these almost 90% is ‘jornalero’ (land labourer). Finally, after many years of land occupations and manifestations, in 1986, the Autonomous Government of Andalucía gave in and approved an irrigation project for the area, which is the only legal resource available to enable the expropriation of the farm. Nevertheless, it took up until 1991 before the land was officially handed over to the jornaleros of Marinaleda, who had constituted a co-operative of 95 members to collectively work the land. With this change in tenureship and the establishment of the co-operative Criteria 10 and 11 are thus achieved. Up until the present, the irrigation network has not yet been completely installed. The process of the acquisition of the land in Marinaleda has been documented by Amián Novales (1991) and Tálego Vázquez (1994). Sevilla Guzmán and Heisel (1988) provide a general analysis of the significance of the land labourers’ movement in Andalucía in general. The jornaleros have two basic aims with the land: maximize economic returns so that as many people as possible can live from the farm’s income, but this in such a way that the farm absorbs a maximum amount of labour.

Management history from the farm and its neighbouring region was recovered with the help of former employees of the farm and with aerial photographs from 1956. First, when we compare Figs. 2 and 3, we can see that in 1956 landuse was more fragmented; parcels were smaller and some at a present size of 100 ha were, at that time, divided into over seven different plots. Second, crop diversity was higher. Main crops were dry land maize, barley, wheat, chick peas, broad beans, in rotation with a sown fallow. Crops of lesser importance were garlic, dinkel (*Triticum spelta*), dry land cotton, lucerne, several forage vetches such as common vetch and bitter vetch, durum wheat, flax and knapweed, totalling 16 different crops. Close to the Los Humosos farm, on a farm called El Ciervo, a vegetable garden existed with numerous fruit trees and horticultural crops. Third, a considerable amount of land (a fifth of the original farm, which had slightly different limits) was dedicated to dehesa. Trees were well formed, with a tree density varying according to the soil.

This fine grained and diversified landscape contrasts strongly with the current monotonous one, which is, as elsewhere in the campiña, not very attractive. This is especially the case in summer, when the appearance is that of an ‘agro-desert’, with woody vegetation almost absent, and the huge parcels of extensive crops harvested. Crop diversity is extremely low; only wheat and sunflower. Only the areas close to the natural watercourses offer some biological diversity, with a climax vegetation characterized by *Tamarix* spp. It is these hydro-structural elements that generate a break in the otherwise totally homogeneous landscape.

The size of the farm is 1150 ha. Annual precipitation is 625 mm. Two geological zones can be distinguished. The first one covers the terrace soils, formed by depositions of the Blanco brook (see Fig. 4), an affluent of the Genil river, which in turn is the main affluent of the Guadalquivir river. The quaternary
parent material gives way to predominantly alfisols. The second zone is characterized by soils of Triassic parent material and originates vertisols and inceptisols with salt at greater depths, a high content of carbonate and in some places active CaCO₃ and a high clay content (expansive, vermiculite clays in the vertisols). The soils that developed on the second parent material have a more rugged relief, with slopes up to 20%; their slopes bear mostly inceptisols whereas in the depressions the heavier soils can be found, in general with vermiculite clay (vertisols).

The production potential of the soils of this farm...
is high, especially for rainfed cropping. For irrigation they are somewhat problematic, as they are heavy soils that drain slowly and occasionally present hydromorphism. Moreover, their high content of salts is unfavourable to irrigation, and at least severe precautions should be taken with regard to the water quantity and quality. The availability of the latter is also problematic in the area, as water in the wells is too salty and not fit for use as irrigation water. Therefore, the irrigation scheme needed to expropri-
ate the farm is highly disputable. However, irrigation water will be tapped from the Genil river and although of a low quality, especially in summer, is acceptable for irrigation.

The Los Humosos farm is crossed by several brooks, although most of them only carry water seasonally, except for the Blanco brook and the Zarza brook, both affluents of the Genil river. It also has 7.2-ha seasonal pool; however, this is currently drained. The farm has two wells and one drinking place for animals. The drainage network currently is 1.32 km long, although it will be drastically increased when the irrigation plan is finished. At present the farm has 18.3 km of dirt roads, and is

Fig. 4. Infrastructure and geographical indications on the Los Humosos farm; location of points of departure for the creation of an ecological infrastructure.
crossed by the provincial road Ecija–Marinaleda–
Estepa, which unites the motorways between
Sevilla–Córdoba and Sevilla–Málaga. On the farm
land there is a rural building (cortijo) suited for
stocking products, but it is less well equipped for
living or administrative activities. The animal stables
are in bad condition (see Fig. 4).

6. Towards a new farm design for the Los Hu-
mosos farm

The generation of proposals for a new farm de-
sign consisted of three phases following the method-
ology of the “Clinical Analysis of the Territory” as
proposed by Gastó Coderch et al. (1987). First, a
base-line study ‘examen’ of the farm is carried out,
and comprises a collection of basic data on biophys-
ical resources and the social environment. Then, a
diagnosis is made, in which the ‘ecosystem diseases’
are determined, defined as the differences between
the current and the ideal state. In this phase, different
scenarios for the future are compared with the help
of multi-criteria programming (MCP; Romero and
Rehman, 1984), while linking the scenarios to the
biophysical information generated in the examination
phase. Finally, a treatment is worked out, that con-
stitutes of the design of a proposal for architecture and
functioning of the agro-ecosystem.

In the base-line study the farm is described in
landscape units, that are defined as areas homoge-
nous for the variables soil, cover, use, condition and
tendency. The last two variables refer to a subjective
technical judgement regarding the current state of a
piece of land (the condition: bad, regular or good)
and its tendency (improving, stable or deteriorating).
A plot on a slope may be in a good condition (e.g.
with respect to soil fertility), but deteriorating, as it
is unprotected by woody elements and so exposed to
erosion. Those landscape units that share the basic
variables district (geoform), soil texture and depth,
as well as hydromorphism, constitute a site. The sites
in turn are grouped according to their proximity as
related with their productive potential. So, 140 land-
scape units were reduced to 30 sites, that in turn
were summarized into nine zones (see Table 1 and
Fig. 5). This exercise is done with the help of aerial
photographs and a control of the obtained data in the
field.

Four scenarios for farm development have been
compared. The first one covered the continuity of the
current non-irrigated landuse with wheat and sun-
flower. Scenario number two is the ‘official pro-
posal’, and refers to a plan elaborated by a private
consultancy on behalf of the administration. This
plan aimed basically to arrive at an intensive use of
the territory so as to comply with the expectations of
the land labourers’ collective of Marinaleda, which
are maximization of the economic returns as well as
the labour employed (Criteria 8 and 9 from Section
4). The rainfed areas that occupied the most hilly
areas would be transformed into olive groves with
drip irrigation; the inclusion of olives is in response
to the explicit wish of the collective, as it concerns a
traditional crop of the area and is very labour de-
manding. The rest of the estate would be dedicated
to herbaceous crops commonly found in the exten-
sive irrigation schemes of the Campiña, like tomato
for industrial processing, beets, cotton, broad bean,
melon, watermelon, potatoes, garlic, onions and sun-

<table>
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<th>Slope (%)</th>
<th>Texture</th>
<th>Soil depth</th>
<th>Hydromorphism</th>
<th>Area (ha)</th>
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flower etc., except for 135 ha where intensive horticultural crops such as asparagus, artichoke, tomato, lettuce, paprika, French beans, potatoes, courgette, broccoli, cauliflower and aubergine would be grown. Scenarios 3 and 4 were our own proposals. Number three comprises the same crops as Scenario 2, but extends the area dedicated to dry land cropping with species such as sunflower and broad beans, and introduces two more rainfed crops: wheat and chick peas. Also an area for forest use would be included. So, Criteria 2 (water conservation) and 4 (resource efficiency—adaptation to the site) were implicitly
improved for Scenarios 3 and 4 in comparison with Scenario 2, that homogenizes growing conditions by allowing extended irrigation practices almost regardless of soil conditions.

The fourth scenario is the so-called agro-ecological option, and was the core of the study on which this paper draws (Santos Pérez, 1994). The crops are the same as those in Scenario 3, but it also considered the inclusion of forage crops such as maize, sorghum, lucerne and common vetch, thus emphasizing even stronger than in Scenario 3 the relevance of legume species, assuming that they are indicators for sustainability (Caporali and Onnis, 1992). It emphasizes the criteria resource efficiency (4) and economic diversification (7) through the integration of livestock and forest land in an otherwise arable and horticultural farm, and another preference of the co-operative collective: the reforestation of road and field borders. Food self sufficiency was advanced by a part of the collective as a desirable goal; we considered this important from an agro-ecological perspective, and operationalized it under Criterion 8, profitability. This is of relevance for the approximately 450 people depending directly on the co-operative (members and their family).

These scenarios have been compared using MCP. In this exercise only Criteria 1, 2, 8 and 9 could be evaluated. First Criteria 8 and 9 were compared. With respect to labour, at least so much work should be generated (per month, per crop) that all of the co-operative members could make a living on that. In all four scenarios several possible solutions could be arrived at; this then formed the basis to optimize the ecological Criteria 1 and 2. From the body of solutions left by optimizing Criteria 8 and 9, those were selected that presented minimum soil loss (calculated with the USLE equation; Moreira, 1991) and minimum water use for irrigation purposes. Both the third and fourth scenarios performed better than 1 and 2; they were even able to produce solutions in which soil erosion was equal to soil regeneration capacity.

In this way, room for manoeuvre was created for optimizing Criteria 3 and 4. Criterion 3 was operationalized as crop diversity. Evidently, Scenario 4 performed better than Scenario 3 as regards this criterion. It also scored better with respect to resource efficiency (Criterion 4: more legume species, better adaptation to the site through a better use of marginal areas) and economic diversification (Criterion 7), in which also forests could have a place, provided that the administration would collaborate economically.

However, this first exercise only achieves an optimization of the number of hectares dedicated to certain crops within each of the nine zones that were distinguished in the base-line study. It does not generate information with respect to their spatial organization, nor about the introduction and use and management of hedgerows, riparian areas, pools, etc. In brief, it generates insufficient information to come to a proposal for design (treatment phase), specially with regard to Criterion 3, biodiversity, and 6, architecture. In order to meet those criteria as well, it was proposed to elaborate on Scenario 4, making use of the marginal areas on the farm. Fig. 4 shows where these areas are located.

6.1. Ecological corridors

The importance of ecological corridors, apart from their aesthetic value, as stabilizers and diversifiers of the agricultural systems (host areas for climax vegetation, beneficial entomofauna, birds, etc.; erosion control, microclimate regulation) is evident in numerous studies (Van Emden, 1965; Park, 1988; Alberti, 1992; Lägerlöf and Wallin, 1993). In Andalucía, however, there is little research being done that seeks to generate clear criteria for their design in the specific Spanish Mediterranean conditions. However, some potential options show up, among which the restoration of the so-called ‘cañada ganadera’ (historical livestock trails) stands out (Ruiz and Ruiz, 1986). In the case of the Los Humosos farm, we have focused, however, on the use of marginal pieces of land for the creation of an ecological infrastructure, strengthening Criteria 1, 2 and 6.

6.2. Structural elements

In the first place, the farm presents several hydro-structural elements that have great value from an aesthetic point of view; moreover, they are important as part of the water drainage system and as a refuge for animal wildlife. Seasonal water courses are to be found all over the farm, as well as pools of
different sizes, small springs and wells. These constitute today the only safeguard for biodiversity in the farm. The areas close to the brooks (with salts at the surface due to the presence of bad quality subsoil water), commonly flooded during parts of the year, can also contribute significantly to this ecological infrastructure. The recuperation of these areas for cultivation while draining and washing them with irrigation water of good quality, would imply the canalization of the brooks and drains. As the total area covered by these areas on the farm does not exceed 1 ha (less than 0.1% of the farm surface), it is possibly more rewarding to convert them into natural pastures for livestock that tolerate the seasonal floodings. The conservation of wells is also important as they are resting places for livestock.

Secondly, the road network will be intensified with the implementation of the irrigation scheme. As the co-operative is in favour of reforestation by road plantations, this network offers a great opportunity to convert them into important elements of the before-mentioned ecological infrastructure.

In the third place, the irrigation scheme will also lead to an increased parcellation of the farm. Some of the newly created parcels had, by the edaphological study that preceded the elaboration of the irrigation scheme (Torrent et al., 1986), been identified as unsuited for irrigation and of potential use as forest areas (Class IV according to the FAO classification). The multi-criteria programming for Scenarios 3 and 4 showed that, from an economic point of view, it is not necessary to cultivate these parcels. They might thus be of considerable importance as ecological refuges. The same applies for other small pieces of land with rock outcroppings or bad soils unsuited for cultivation.

As we see, water is a central and troublesome element in Mediterranean agriculture. However, and paradoxically, when wisely planned without interfering too drastically in economic needs, it offers at the same time important points of departure for the creation of an ecological infrastructure and thus for the enhancement of a quality landscape.

6.3. External control

One could wonder why Criterion 5 (use of external control mechanisms) was not considered in the comparison between scenarios, although definitely esteemed important for the future. Scenario 4, the agro-ecological option, was seen as a transitional scenario. In the MCP exercise, it was assumed that all crops were managed in a conventional way. This had good reasons. The market for ecological products is still very incipient in Spain. Secondly, there are no reliable data as of yet on yields or cropping techniques for a farm of the size we are dealing with. Thirdly, conversion of 1150 ha to ecological agriculture run by a collective that has little experience in managing a farm should take place in a gradual manner anyway (Remmers et al., 1994), including a transition period of considerable length. In fact, a small experiment with ecological agriculture on 10 ha was initiated by the co-operative in the autumn of 1991 (see Fig. 4). However, Scenario 4 is an agro-ecological option in the sense that it generates basic conditions that allow for the design of an organic farm, that would be in accordance with the norms established by the International Federation of Organic Agriculture Movements (1990).

7. Concluding remarks

The “Clinical Analysis of the Territory” methodology we departed from methodology as applied in this study is of interest when the amount of information to be managed is high. Therefore, it is not very appropriate for designing nor for evaluating small farms; in the examination phase, the use of aerial photographs (scale 1:25 000) for the elaboration of thematic maps does not provide relevant information, especially with respect to those landscape elements that appear to be vital for the reconstruction of an ecological infrastructure. In the diagnostic phase, the use of multi-criteria programming proved useful, as it allows for the management of a lot of information and so facilitates the identification of the space for solutions.

Moreover, we think that the methodology is too scientist biased, and that it should and can be improved by complementing the current way of data gathering by more participatory techniques. In our case, the contribution of the farming collective was important with respect to the basic criteria for a well-functioning farm: profitability and labour. How-
ever, they did not provide essential information on land qualities. Nonetheless, this is an issue that should never be over looked; farmers or local inhabitants usually know very well the qualities of their land and their judgement can be integrated in the examination phase (Hiemstra et al., 1992). However, even in the MCP exercise it is possible to use iterative methods for the resolution of the models, in which the farmer (or a farming collective) can value the different solutions that are generated and introduce modifications. Finally, in the treatment phase when the final farm has to be designed, the farmer has an important say as regards aesthetics, spatial organization of the crops, etc.

The agro-ecological design we described in the previous section is not the ideal type of landuse we would recommend for the area. The installation of the irrigation scheme, nowadays a legal necessity to acquire the land and thus a necessary means to elevate the local control, or accessibility of the land (Criterion 10), causes a negative trade-off with water and soil conservation. More sustainable would be a rainfed system with a more important recuperation of the dehesa agro-silvopastoral system. However, in that case complying to the criterion profitability would be more uncertain. It would at least take more time.

This makes us all the more aware of the fact that ideal landscapes are difficult to realize, and that use must be made of the fissures left over by a dominant political, economical and cultural system. This is also evident for the creation of an ecological infrastructure. Although water is one of the most pressing factors in Mediterranean agriculture, paradoxically it offers interesting points of departure for improvements. The proposed infrastructural points are not enough, but in the present economic circumstances they are deemed the most that can be achieved.

The establishment of a ‘green economy’, a criterion put forward by Van Mansvelt (1997) in the integrated table included in this volume, up until now has been of lesser importance to our case study than the establishment of a ‘red’ economy. The land will be cultivated in a co-operative way, aiming at the establishment of derived enterprises at the village level (product transformation), allowing a more equal distribution of the profits. The valuation of the landscape by the Marinaleda jornaleros has been as such much more related with economic motives than with ecological ones. The current landscape is associated by them with periods of exploitation and misery. Once the property of the land passes on from the patron’s hands to theirs, this same land is seen a guarantee for freedom, in which even the continuity of a latifundist (industrial) way of farming (considered in its agronomical aspects) may be conceived of as a victory. For example, and as a consequence, the Marinaleda jornaleros were explicitly in favour of the establishment of the irrigation scheme as irrigation is associated with progress, although irrigated agriculture was not advisable at all in several parts of the farm due to soil salinity. Currently, however, the jornalero movement is adopting, through its increased affiliation with urban ecologist movements, a more ecological point of view. Especially other cooperatives of the SOC, in Villamartin and Los Corrales, have a clearer vocation for ecological agriculture and participate in the set-up and supply of ecological consumer associations in big Andalusian cities, as well as in the establishment of local markets. They even consider ecologist discourse and practices to be strategically allied with their own class interests (Avila Cano, 1991). It is the articulation of these social forces that will eventually achieve the necessary break with the past and arrive at a new social construction of a landscape of greater quality.

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References

Altieri, M.A., 1992. Biodiversidad, Agroecología y Manejo de Plagas. CETAL, Chile.
Amián Novales, I., 1991. Marinaleda: symbol and protagonist of the historical struggles for land among andalusian agricultural day-workers In: H. de Haan and J.D. van der Ploeg (Editors), Endogenous Regional Development in Europe: Theory,