

Integrating the multi-objective roles of livestock production activities in a policy for sustainable development: the case of the Italian area of “Carso.”

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Summary

The European Union (EU), recognising the specific needs of rural areas characterised by social, economic and territorial marginalisation processes, has been promoting since the 1970s an increasingly integrated development policy, implemented through various instruments such as the Less Favoured Areas Directive, Structural Funds programmes, accompanying measures of the CAP and “Agenda 2000” proposals. In spite of the evidence and the general agreement about these situations, there is no common definition either of rural area or of marginalisation processes: several formulations of these concepts can be found in national and EU laws and in the scientific literature, generally based on socio-economic criteria. But many rural areas, even showing socio-economic marginalisation, are not disadvantaged if their natural resources availability, in the broad sense of the term, is taken into consideration: they often have a wide variety of ecological resources, although accompanied by a fragile equilibrium. Therefore EU policies in many cases are not able to ensure effective development measures for these situations. An example of this is the Carso area, near the city of Trieste (north-east of Italy), where Community measures are mainly addressed to sustain secondary and tertiary activities, while the area has some important rural characteristics according to the new roles of EU agriculture, principally in environmental management. A local authority, following the agri-environmental policy approach of the EU, has proposed an integrated development plan made up of several different projects. One of these concerns the preservation of a local landscape, known as “Landa Carsica”, created by wind erosion and grazing activity. The area is rich in biodiversity, but, as a consequence of the abandonment of livestock activity, this is disappearing with natural and unmanaged succession of woodland and consequent increasing fire risk. The proposal concerns the re-introduction of a rare breed of sheep (“pecora carsolina”) in extensive production systems to preserve “Landa Carsica”, reduce fire risk, improve value-added in livestock enterprises, and satisfy the demand of environmental services and of high quality traditional agri-food products.

Theoretical and institutional framework

Rural areas and marginalisation: two fuzzy definitions

The European rural world, also called rural Europe (including land, people and production systems)¹, extends across wide regions, landscapes of natural countryside, farmland, forest, villages, small towns, neighbourhoods of urban areas and industrial centres, and includes a diverse and complex economic and social fabric of farms, small shops and businesses, commerce and services, and small and medium-sized industries². They are characterised by a great wealth of natural resources, landscapes, habitats, cultural traditions and regional agricultural systems which, in many cases, have worked for a long time in harmony with local environmental conditions. All these elements constitute nowadays important assets for Europe’s natural and cultural heritage and are assuming an increasingly important role for recreational activities.

However, in recent times, the rural world has been undergoing a process of radical transformation in which increasing pressures are being placed on an already fragile equilibrium, and this has consequently resulted in the marginalisation of

agricultural activity in many areas. These pressures, which result from a complex process of evolution of the agricultural sector inside the whole economic, social and environmental system, have not yet come to an end.

In fact, rural societies and areas, as is well known, must deal with some correlated problems: the weakening of the economic and social fabric, the reduction of per capita income and gross value-added (expressed in purchasing power parities) in the agricultural sector, the increase in unemployment, abandonment of agricultural activity, depopulation, emmigration of young people from rural areas and the agricultural sector, increase in the average age of agricultural employees and of the rural population and reduction in the services which are essential to the quality of life and the degradation of natural resources³.

In spite of the evidence and the general agreement about these problems, there is no common definition either of “rural area” nor of “marginalisation”. Several formulations of these concepts can be found in national and European Union (EU) laws and in the scientific literature. The frequent use of terms, such as rurality, rural area, and rural society, is justified by

¹ In this paper we prefer the terms *rural Europe* rather than *rural society*, expression also used in some European Union’s documents to translate the French term *monde rural*, because the former more clearly reflects a broad concept which embraces territories, people and human activities.

² The rural areas of the European Union (EU) account for more than 80 per cent of Community territory and more than a quarter of its population.

³ In the early nineties, agricultural employment in the broad sense of the term, that is agriculture, forestry and fisheries, accounted for 6 per cent of total employment of the European Union; per capita income in rural areas (expressed in purchasing power parities) was only about 80 per cent of the average and the whole primary sector (agriculture, forestry and fisheries) accounted only for 3 per cent of gross value-added at factor cost.

their apparent clarity: they are immediately understood by everybody as something that evokes a physical, social and cultural concept which is a counterpart of urban. But, both in practice and in theory, formulating an unequivocal definition of rurality appears to be an impossible task. So, the different EU Member States have generally developed their own definitions of rural areas, which are often only based on socio-economic criteria (such as agricultural patterns, density of inhabitants per square kilometre or population decline) and are quite heterogeneous and not universally applicable. While at an EU level, there is no common definition of a rural area, similarly there is not a strict definition of marginalisation.

In the absence of a universally accepted definition of a marginal agricultural area, it is commonly assumed that a marginal agricultural situation is one which is at the margin of economic viability. In this way, the marginalisation phenomena could be considered as a process, guided by a set of social, economic, political and environmental factors, in consequence of which certain agricultural areas (in the broad sense of the term, including all primary activities) cease to be viable under an existing natural resources use and socio-economic structure. So, agricultural marginalisation can take on a variety of forms, occurring at different scales, ranging from the individual patch of land to sizeable regions, and can involve agricultural areas that are quite different according to their proximity to urban centres, their endowment of natural resources, their historical, cultural and socio-economic development, their social fabric and cultural heritage. Nevertheless, they share some common characteristics in their social organisation and economic structure: most importantly the limited possible use of natural resources (first of all, land use). In most cases, these areas, despite strong heterogeneity and wide variation of physical resources, are characterised by poorer quality of productive resources compared to other rural areas, because of different factors, such as altitude, short growing season, steep slopes, infertile soils and low productivity, remoteness and distance from the main population centres. Marginal areas are mostly concentrated in the less fertile and drier zones, hilly and mountainous areas, but in many cases it is possible to find marginal areas located near urban centres or industrial zones.

These definitions of rural areas and marginalisation, taking mainly, and in some cases only, into account socio-economic criteria, appear too restrictive to embrace the wide variety of disadvantaged situations. Following these traditional methods, some areas can be classified as non-rural areas, because they have not got any agricultural productive or social characteristics, but rurality results from the linkage between agricultural activity and the ecological system. In other cases, some rural areas, even showing socio-economic problems, are not disadvantaged, taking into consideration the availability of natural resources, in the broad sense of the term. They have a wide variety of ecological resources, but a fragile equilibrium. Therefore the socio-economic definitions and EU policies are not always able to ensure effective development measures for these situations.

Sustainable development, agricultural externalities and the multi-objective function of livestock farming

The socio-economic marginalisation processes are mainly determined by the considerable gap in economic gains between agricultural and non-agricultural activities, and between disadvantaged and favoured areas. This diverging trend is also compounded by the measures of the Common Agricultural Policy (CAP). The prices and guarantees provided through actions and production aids⁴, stimulated output at a rate increasingly beyond the market's absorption capacity, and, consequently, caused the marginalisation of agriculture in disadvantaged and less productive areas, and an intensification of agricultural activity in more productive zones. This process has implied social, economic and environmental problems.

In fact, the "Old CAP" was a sectoral policy and did not take into account that all production systems always interact with their economic, social and ecological environment. Such interactions are, in general terms, more evident in disadvantaged areas that are experiencing a rapid decline and important adverse changes in their economic and social organisation as well as being areas with high natural values. Moreover, the primary sector has, by definition, a considerable impact on the state of the ecosystem: the very purpose of agriculture activity is to modify natural resources for the purpose of producing food, raw materials and environmental services through land cultivation and animal production.

Agriculture has created, over a long period of time, those cultivated landscapes which are today perceived as desirable. In many areas, the historical development of specific agri-ecosystems has contributed to a biodiversity much richer than that present in formerly more monotonous landscapes. There are many environmentally sensitive sites in the EU where the continuation of agriculture is to be welcomed from an environmental point of view, as their abandonment to nature would be accompanied by land erosion, soil degradation and a loss of biodiversity. But the diffusion of intensive farming, stimulated by technical progress, food demand and agricultural policies, has led to environmental stress⁵. The production of food and raw materials is not always environmentally sound and sometimes clashes with society's desire to preserve natural resources and protect the environment, so contamination of water by pesticides and fertilisers, degradation of the biodiversity, which agriculture helped to create, and the destruction of traditional landscapes, can be treated as a consequence of competing interests. This conflict has undesirable repercussions if a well-defined framework of institutional rules and appropriate incentives is not considered. Where environmental problems occur, appropriate policies, based on a proper investigation as to the nature of those problems or shortcomings, are needed to mitigate them.

In the primary sector, according to the above integrated view, livestock activity can play an important role in the development of marginal areas. Also the new trends of community policies increasingly recognise that traditional husbandry methods have played an essential role in creating

⁴ As well known EU supported internal prices and incomes, either through intervention and/or border protection or, where no border protection existed, by variable aids (deficiency payments) to producers and processors using agricultural products from the Community which had to be paid for at more than the world price.

⁵ Note that in some cases even extensive agriculture may induce environmental damage in vulnerable areas.

and maintaining the characteristic habitats and landscapes of many rural areas, that are, on the one hand, valued by all countryside users, and on the other, threatened by intensive agriculture practices. Policy-makers have to find alternative ways to maintain income levels in rural areas in the longer term. Particularly in marginal areas (Less Favoured Areas) there is a strong need for such alternatives to be compatible with sound environmental management, particularly directed at maintaining floral and faunal diversity, a traditional or/and attractive landscape, low pollution and the public access to the areas.

Animal production is one of the principal means by which this environmental management can be achieved, and the role of livestock activity should be examined using a sustainable development model, in the form of a tripartite system: economy, society and environment. The advantage of this conceptual approach is that it provides an understanding of interactions between livestock activity, the primary sector, the overall economy, the social fabric and resource availability. In this way, livestock farming takes a multi-functional role, pursuing a broad range of objectives related to agri-food production, environmental management, farm income and agricultural employment. Consequently, farm efficiency analysis must take into account the multiple objective function of livestock activity, that embraces both private and public aims, and must adopt effective evaluation criteria, not only including economic parameters, but also social and economic aspects.

The EU action from agricultural policy to rural development policy: the new role of livestock activity.

The EU recognises the above mentioned needs, and promotes a rural development policy adopting an integrated and multi-sectoral approach, whose main aims can be identified as follows:

- a) to promote economic and social cohesion, by maintaining and creating jobs,
- b) to overcome barriers to development by encouraging diversification and improving infrastructures and giving facilitating access to new technologies,
- c) to increase the quality of life by preserving the environment and giving access to basic services, and
- d) to maintain viable communities whilst preserving their culture and traditions.

To reach these objectives the EU has made use of different instruments such as:

- a) the Less Favoured Areas Directive (Directive (EEC) 268/75), introducing a regional dimension to EU support measures to sustain farming in areas where production conditions are more difficult,
- b) the Structural Funds programmes to aid structural adjustment (Reg. (EEC) n°2081/93 modifying Reg. (EEC) n°4253/88), both through regionally targeted assistance, through horizontal measures and through the LEADER initiative; in particular Objectives 1, 5 and 6,
- c) the Accompanying Measures of the CAP (Regulations (EEC) 2078/92, 2079/92, 2080/92) which are designed to help the farming community adapt to the consequences of the changes in market regimes (the so-called New CAP or MacSharry reforms), and to provide new sources of income, and

- d) other policies related to forestry and the environment, which also contribute to rural development, agriculture, forestry and rural development research, conservation, characterisation, collection and utilisation of genetic resources in agriculture.

This EU approach is developed in the recent proposals for the future framework of the European Union, "Agenda 2000 - For a Stronger and Wider Europe", that includes the reform of the CAP and rural policy. The proposals follow the route of shifting payments towards objectives favoured by the public (environment, rural development, socially fragile areas) and linking farmers to these objectives, with a reinforcement of agri-environment measures. That choice points out the intention to progressively change the old sectoral agricultural policy into a rural development policy.

In this situation the development of livestock activity in marginal regions (defined as disadvantaged areas, LFAs or others) is necessary to maintain competitiveness with other activities. In particular, extensive livestock production is considered as a potential development option. In fact, the disappearance of extensive grazing systems is endangering biodiversity within numerous interesting environments, such as damp meadows, marshes, dry short grass, prairies etc. In order to restore and preserve these natural and/or semi-natural environments, it is necessary to ensure the survival of the ancient practices that maintain them. They may also be replaced by alternative practices. In this regard, various bodies responsible for the management of conservation areas have set up experiments to study biotope management techniques using extensive grazing. Through these trials, the conservation bodies have accumulated considerable experience in this field. The particular role of livestock in habitat management will depend upon the ecosystem found in the different regions of Europe and the application of the general principles, combined with appropriate site-specific knowledge, can lead to the development of grazing strategies for different farmed species to meet nature conservation and environmental needs. These strategies do not necessarily conflict with animal production objectives and the maintenance of rural human populations.

Marginal agriculture in a peri-urban situation: the case of the Italian area of "Carso"

General description of the area

The Italian area of "Carso" is a small semi-natural upland located in the neighbourhood of the city of Trieste, between the Adriatic Sea and the Republic of Slovenia. The Trieste province covers 212 km² and has a population of 250,000 people, which means a high average density (about 1,200 people/per km²) marked by concentration of this population in the urban centre (Trieste). The local micro-climate can be described as maritime-Mediterranean near the coast and as sub-montane on the higher ground, with varied temperatures and rainfall, and a strong wind from the east-north-east, known as the "bora".

This province presents social, demographic, economic and environmental problems, with an elderly population, a low percentage of working-age inhabitants, a high population density, a high proportion of urban population, industrial and economic decline, and pollution. The Trieste province has, as

a result, the status of Objective 2 with respect to Structural Fund programmes.

Unlike the industrial and commercial activities of the urban centre, the district around the city of Trieste presents some important rural characteristics. Most of the area lies on a karst plateau with specific climatic, hydrological, geological and edaphic aspects, a wide variety of ecological resources and several natural and historical endowments. The Carso area has many of the phenomena associated with “karst” regions, and also many of the hypogean forms that occur in fissured, mostly calcareous, rocks. The main characteristics are the absence of a superficial hydrographic web, the partial or total lack of soil forms caused by running water, an irregular plateau with steeply undulating morphology, the presence of closed depressions, basin-shaped karst pits, swallow-holes, caves, underground watercourses, karst springs and lakes. Therefore, the more widespread landscape of Carso is one studded with impressively furrowed stony fields and blocks of any size with the comparatively soft calcareous stone unevenly eroded by water over millennia.

These natural characteristics of upland Carso extend over the frontier with Slovenia. At present some small but significant areas are protected at a municipality level. Moreover, there is a plan for the institution of a Natural Park at a provincial level (named “*Parco Intercomunale del Carso*”) and a proposal for the institution of an international Natural Park across the Italian-Slovenian frontier (“*Parco Internazionale del Carso*”). Moreover in the coastal zone of the province there is a Marine Reserve (“*Riserva Marina di Miramare*”): a protected areas in which, in general, natural resource use (fishing and swimming) is not permitted. These measures and future projects are a reflection of a double aspect: on one hand, there is a high demand for environmental services and on the other there is the conviction that formal protective status is necessary to preserve these areas. This underlines (1) the so-called market failure and the importance of the public role in natural resource management and (2) the important role of agriculture in environmental management.

In Carso, different habitats are present, such as woodland, pinewood, scrub, underbrush and a local type of heathland, called *Landa Carsica*.

The “Landa Carsica”

The “*Landa Carsica*” is one of the most important habitats of the Carso upland. In the last century, deforestation turned some areas of Carso into a heathland swept by the strong “*bora*” wind, where only few plants can endure the summer aridity. The natural evolution of this habitat is the transformation into bush and then to woodland, but traditional grazing activities (above all with sheep, but also cows and horses) managed the landscape, stabilising the vegetation state in a situation of transition from the grassland to the forest.

This habitat, even in its degraded state is one of the most representative aspects of Carso with a high biodiversity and landscape value (plants, flowers and insects). The more widespread plant species are: *Centaurea cristata*, *Iris illyrica*, *Potentilla tommasiniana*, *Gentiana tergestina*, *Jurinea mollis*,

Onosma javorkoe, and *Carex humilis* that together with *Centaurea rupestris* has created the local grassland called *Carici-Centaureetum rupestris*. The animal species living in *Landa Carsica* are Greek partridge (*Alectoris graeca*), hare (*Lepus europeus*), partridge (*Perdix perdix*) and woodcock (*Scolopax rusticola*).

Note that some *Landa Carsica* areas, on Monte Stena, are included in the “Val Rosandra” Natural Park, a protected area (434 hectares) created in 1984, located in the south-east part of Trieste province.

The rurality of Carso

Agriculture in Carso is an activity which adopts traditional production systems and shows the features of (a) the agriculture of marginal areas (limited possible land uses because of steep slopes, infertile soil, low productivity); (b) suburban agriculture (high demand of environmental services and traditional products, local markets, increasing demand of non-agricultural land uses) and (c) agriculture in areas with environmental conservation problems.

The extent of the agri-forest area is about 16,000 hectares and the extent of utilised agricultural area is only about 7,000 hectares. During the last thirty years, agriculture has lost a significant proportion of land to non-agricultural productive use (roads, factories, infrastructures) and to the building trade for new residential zones in the “green area” of Carso. This evolution of land use is shaped by the local development policies which consider agriculture as a marginal activity. The town-planning and regional-planning schemes have therefore permitted this reduction.

There are about 1,700 small-sized farms, with an average farm area of 4 hectares, most of them subdivided into separate small parcels, like a chessboard. In this situation, the mechanisation of agricultural activities is difficult to achieve. Almost all farms are managed by the land owner and his family. Pluri-activity is a significant characteristic, as farmers undertake a range of activities: livestock, crop and tree production, as well as, above all, work in industry or services. The most important agricultural products are milk, grapes (D.O.C.⁶), vegetables, olive and honey. The primary sector accounted less than one per cent of the total gross value added at factor cost.

A local example of agri-tourism is found in the Slovenian-speaking ethnic community, which maintains an important cultural identity and rural tradition. The practice of “*osmize*”, a word derived from the Slovenian “*osem*” (eight), takes its name from the permits issued since the eighteenth century, to sell wine and other home-made or small farm products freely for no longer than eight days each year.

The Carso upland is characterised by the high natural and landscape value and extensive recreational use by local people and tourists. Nevertheless, only a part of the Carso area is included in the Less Favoured Areas zone by the national legislation that implemented the EU Directive (EEC) 268/75. However, it is important to remark that all of Carso and particularly some areas with environmentally sensitive conditions, such as “*Landa Carsica*”, clearly shows multiple-use of natural resources.

⁶ D.O.C. is the abbreviation of “Denominazione di origine controllata” in Italy, that is, “Denomination of Origin” in England or Appellation d’Origine Contrôlée in France.

SHEEP LIVESTOCK					
↓					
		Sheep breeding	Grazing	Milk, cheese and meat production	Farm work
		↓	↓	↓	↓
O B J E C T I V E S	Biodiversity	+	+	+	
		(pecora carsolina” preservation)	(flora and fauna preservation)	(variety of traditional agri-food products)	
	Landscape	+	+		
		(variety landscape with animal)	(“Landa Carsica” preservation)		
	Rural incomes	+	+	+	+
	(indirect increase - sheep supplier)	(indirect increase - - feeds supplier)	(milk, cheese and meat sale)	(farm incomes)	
	Employment	+	+	+	+
		(indirect increase - sheep supplier)	(indirect increase - - feeds supplier)	(milking, cheese and meat production, and others agri-food chain activities)	(farm and extra- farm work)
	Quality of life	+	+	+	+
		(environmental improvement)	(environmental improvement)	(improvement of quantity and quality of agri-food products)	(cultural and rural identity)

Figure 1. The multi-objective roles of sheep livestock activity.

The case study: a sheep breeding project for landscape management

Description of the project

Because of its rural and ecological characteristics, the Carso area needs a specific economic, environmental and social policy different from the policies considered in the Objective 2 of the EU Structural Fund programmes. So the local authority (Provincia di Trieste) proposed, in 1997, an agri-forestry development plan made up of different projects⁷: one of these concerns the preservation of “*Landa Carsica*” and the development of other livestock activities with positive environmental externalities.

At present, as a consequence of the abandonment of livestock production activity, “*Landa Carsica*” is disappearing

with natural and unmanaged succession of woodland and consequently increasing fire risk and biodiversity reduction. Fires slow down the transformation process of “*Landa Carsica*” into wood and bush land, but at the same time result in a deterioration of vegetation. The livestock systems have changed considerably in the last thirty years. Traditional livestock management, using natural grassland and extensive or semi-extensive grazing, has been replaced by intensive production systems using commercial feeds (instead of farm-produced feeds). In any case the Carso area is characterised by low incidence of livestock activity in general and the sheep are at present less than 100 head.

The project, following the agri-environmental policy approach of the EU, integrates the multiple objective roles of livestock production activities, and it is been developed in a

⁷ The other projects concern: agricultural infrastructures; wine, flower, olive and vegetable production; forest management; agri-tourist activity. The project analyzed in this paper, includes apart from the most complete proposal regarding “*Landa Carsica*” preservation and sheep breeding, a study about the livestock-environment relation in general. The specific agronomical and zootechnical aspects of the project have been studied by Roberta Leonarduzzi. Gianluigi Gallenti worked on the whole plan.

multi-criteria and multi-disciplinary framework, taking into account ecological, animal husbandry, productive, financial and social issues and pursuing the following objectives: fire risk prevention, farm income support, landscape and biodiversity preservation, traditional agri-food product quality improvement, rural employment, and the conservation of cultural identity (Figure 1).

Farm incomes can derive from private income and public subsidies: the former derives from milk, cheese and meat production and the latter regards regional, national and community support measures.

Livestock characteristics

The project involves the re-introduction of a local rare breed of sheep (“*pecora carsolina*”, also called “*pecora istriana*”), for which Regione Autonoma Friuli-Venezia Giulia (regional authority at NUTS 2 level) provided financial support, inside the zoned programmes implementing the agri-environmental accompanying measures (Reg. (EEC) 2078/92) of the New CAP. This breed of sheep is at present in danger of extinction, but in the past it was widespread not only in the Carso area, but also in the nearby area of Istria (a territory now included in the Republics of Slovenia and Croatia). The characteristics of this animal seem very suited for an area with many environmental constraints: steeply undulating ground, scarcity of water, summer drought and poor grazings. The “*pecora carsolina*” is also included in the official list of Italian breeds, compiled by AIMA (*Azienda Italiana di Intervento sui Mercati Agricoli*), a national authority that works in the agricultural sector, mainly for the application of CAP measures in Italy.

Land availability

Land availability varies from 19 to 107 ha, according to different geographical locations and the planning of the local Forestry authority (*Ispettorato provinciale delle Foreste*): these zones include healthland, woodland and wooded heath (lands in transition state). Because of this, the grazing system must be a multi-use system, the best solution for the management of possible mix systems (silvopastoral, agropastoral, agrosilvopastoral) in the Carso area; the silvopastoral system appears to be the more flexible solution. This solution is similar to the *dehesas* in Spain.

A significant proportion of the agricultural area of Carso, and also of the land considered in this project, is commonly-owned property or public (regional) areas.

Sheep

As far as possible, animals use grass production by direct grazing. The vegetation and climatic characteristics in the Carso area are of the Mediterranean type with discontinuous grass production available for 7-8 months, with two production peaks in winter-spring and autumn, and a lack of pasture during the summer months. In this period, three alternative feeding strategies for sheep are possible: (1) to use purchased feeds; (2) to use grass production from other Carso areas; and (3) to move sheep from “*Landa Carsica*” to upland or mountain areas. Two periods of grazing can clearly be identified: the

grazing on the Carso upland and the movement to the mountain pastures (*transhumance*) with a complementary use of valley-mountain resources. The balance between the intensity of hill and upland grazing and the conservation value of livestock farming has been acknowledged for some time. It is also possible to use some concentrates mainly during the last part of the pregnancy and during the whole milking period.

Note that, in general, vegetation production in the Carso area can be considered as being quite limited and not intensive and therefore, the expenditure and utilisation of chemical fertilisers is at a level too low to pose any environmental risk. Moreover, as the characteristics of the land (sloping, small size parcels) interfere with the use of agricultural machinery, and the application of N fertiliser, considering all kinds of pastures, is negligible. This low environmental impact ensures good quality of grass and, above-all, of feed produced in the Carso area. The *carsolina* sheep produces a lamb in winter that is slaughtered in spring, while milk production takes place in the spring and summer months. Sheep remain at the farm during the lactation period, and they are fed using on-farm feeds.

Husbandry

Sheep can provide different sources of income for the farmer: milk, cheese and meat. The sheep’s milk can be sold or used for the production of a cheese with typical characteristics and high-quality. To add value to the produce, all milk production is transformed into cheese. This breed of sheep produces a lamb, sold at 30-40 days of age with a live weight⁸ of 12-18 kg, during Easter, when the demand is very high because it is traditional to eat this meat at this feast. The lamb meat can be sold through local restaurants, agri-tourist structures and some shops in the urban centre or in other cities in shops specialising in typical products.

Environmental interaction

Sheep can interact in a positive way with the “*Landa Carsica*” landscape, and with the ecological system, if the grazing system avoids overgrazing.

EU regulation 2078/92, in the Regione Autonoma Friuli-Venezia Giulia, with the objectives of encouraging the extensification of production methods, and preserving the landscape and the ecosystem, has fixed a maximum stocking rate per hectare linked with compensatory payments. This threshold is equal to 9.3 ewes per hectare. Taking into account this constraint, the goal of land management and the natural resource situation in the availability areas, the project has a target stocking density of about 3-4 ewes per hectare.

Market policies

In certain cases, the quality of an area is identified by a mark, i.e. the “D.O.C.” (see note 6). In the case of areas with high ecological and landscape value, the mark links the goods produced in these areas with the fundamental values of the area, i.e. the “regional”, “natural”, “authentic” and “non-industrial” characteristics, so that these products seem to incorporate the ecological and landscape characteristics of the area. Therefore, it is possible to link products strongly to their origin and the

⁸ In Italy the weight of the meat and consequently the meat price is usually evaluated when the animal is still alive, and therefore it is the live weight, and not carcass weight that is described.

Table 1. Fixed costs of establishing a sheep enterprise (1 Euro = 1,936 Italian Lire).

Fixed Costs		Euro
A	Farm building	69,731
B	Milking facilities	61,983
C	Dairy - building	25,826
D	Dairy - equipment	33,058
E	Fencing	5,156
F	TOTAL-I(from A to E)	195,764
G	Sheep purchase (129 Euro per head)	25,826
H	TOTAL-II (F+G)	221,591

Table 2. Annual costs of sheep production.

Annual Cost	Euro
Cheese production	1,653
Veterinary, medicine and others	1,033
TOTAL	2,686
Labour (farm labour)	19,835
TOTAL (with extra-farm work)	22,521

quality of the area. As far as animal husbandry is concerned, the marked products incorporate the concept of outdoor management. The market strategy can be successful only if the area is well known to the consumer and he knows and appreciates its characteristics: as for example in the case of a natural park.

However, it is necessary to ensure the intrinsic quality of the products resulting from sheep production, such as cheese and meat, not only in the eyes of the consumer but also by all the actors in the agri-food chain (filière): slaughter-house, butcher, restaurant, agri-tourism and shop.

In parallel, testing the concept of associating consumable goods (meat and cheese) with landscape, appears a useful opportunity, especially nowadays, when consumers are placing a higher importance on the origin and the quality of the products which they buy and consume. Local people usually appreciate some landscape features, like woodland, and pine forests, but do not know or appreciate others like “Landa Carsica”. It is becoming increasingly important to create a more widespread awareness of this landscape.

Above all, it is necessary to give a widespread support to this operation. The consumers’ appreciation can be expressed within the framework of a questionnaire given to them after the meal. The association of two concepts - product quality and landscape - is sufficiently deep to permit the prediction that in the future, a large proportion of consumers will not be indifferent to the idea that such products contribute to a pleasurable lifestyle, and in addition guarantee a quality product and preserve the landscape.

Incomes and costs of farming - public financial support

Calculations of economic parameters have been made for a pilot farm setting up for sheep production within the region. The farm uses 68 hectares (“Landa Carsica” and woodland) for sheep grazing and therefore considers semi-extensive livestock with a flock size of about 200 head, of whom 180-190 are ewes and among them about 80 per cent are of reproductive age. Some 85-95 per cent of these last ewes produce a single lamb; the twin births can vary from 0 per cent to 10 per cent, and the death rate of lambs can vary from 5 per cent to 20 per cent. Therefore, lamb production can vary from 80 to 108 heads, which have a live weight from 12 to 15 kg at the time of sale. The milk production per ewe varies from 60 to 80 kg.

The costs relate to the building of a sheep shed and of a small dairy, and sheep purchase (Table 1); then there are annual costs that concern off-farm feeds, veterinary expenses, farm labour and other additional costs (Table 2).

Incomes include market incomes and public support through compensation payments or other financial supports. The former regard cheese and meat selling. In the following analysis we have considered a “worst case” (with the lowest prices), a “best case” (with the most favourable values) and an “average case” (the average of the two extreme cases) (Table 3).

Public support includes: financial support for the buildings, milking and cheese facilities, a payment per head from AIMA and from EU for purchase of the sheep, and a payment per year for grassland conservation (Reg. (EEC) 2078/92) (Table 4).

Table 3. Structure, production and incomes of the sheep flock.

	Worst case	Best case	Average case
Number of sheep	200	200	200
Number of productive ewes	121	153	137
Number of lambs	103	135	122
Lamb price (Euro/head)	46	67	57
Lamb income (Euro)	4786	9,065	7,066
Cheese production (kg)	1,600	2,490	1,990
Cheese price (Euro/kg)	5	7	6
Cheese income (Euro)	8,280	17,986	12,634
TOTAL INCOME (Euro)	13,068	27,051	19,700

Table 4. Public support for sheep flock.

Public support	Euro
Financial support for building, milking and cheese facility	39,385
Sheep purchase support (52 Euro per head)	10,331
Reg. (EEC) 2078/92:	
Support for rare breed (200 head per year)	164,220
Grassland conservation (68 hectares, per year)	8,373
Maximum compensation payment per farm	30,775

Table 5. Annual capital depreciation/replacement of fixed costs.

Fixed costs	%	Depreciation (replacement cost) without public support (Euro)	Depreciation (replacement cost) with public support (Euro)
Buildings	4	2,789	
Milking facilities	12	7,438	
Dairy - building	5	1,291	
Dairy - equipment	12	3,967	
Fencing	15	775	
Total		16,260	12,991
Sheep purchase	15	3,874	2,324
Total		20,134	15,315

Gross margin (Euro)		Worst case	Best case	Average case
A	Income	9,814	35,480	22,650
B	Annual cost	3,616	3,616	3,616
C	Gross margin I (A-B)	6,198	31,968	19,034
D	Depreciation (Total I - table 5)	16,260	16,260	16,260
E	Gross margin II (C-D)	-10,062	+15,604	-2,774
F	Quota (Total II - table 5)	3,874	3,874	3,874
G	Gross margin III (E-F)	-13,936	11,730	-1,100
H	Labour cost	19,628	19,628	19,628
I	Gross margin IV (G-H)	-33,564	-7,898	-20,728

Table 6. Gross margin analysis - without public support.

Gross margin (Euro)		Worst case	Best case	Average case
A1	Income	9,814	35,480	22,650
A2	Compensation payment	30,780	30,780	30,780
A	Total Income (A1 + A2)	40,594	66,260	53,430
B	Annual cost	3,616	3,616	3,616
C	Gross margin I (A-B)	36,978	62,645	49,814
D	Depreciation (Total I - table 5)	12,991	12,991	12,991
E	Gross margin II (C-D)	23,988	49,654	36,823
F	Depreciation (Total II - table 5)	2,324	2,324	2,324
G	Gross margin III (E-F)	34,654	60,320	47,490
H	Labour cost	19,628	19,628	19,628
I	Gross margin IV (G-H)	15,026	40,692	27,862

Table 7. Gross margin analysis - with public support.*Economic evaluation*

To evaluate this project we calculated, first of all, the annual costs of capital depreciation and replacement costs (Table 5). Then we calculated the gross margin in the three situations, “worst”, “best” and “average”, with and without public support.

Without public support (Table 6), the gross margins, taking into account annual costs and incomes, are positive in each

case, with 19,034 Euro (1 Euro = 1,936 Italian Lire) in the “average” case, but the economic result becomes always negative if we include the annual capital costs. With public support (Table 7) the gross margins are positive in all cases. Note that compensation payments, in the “average” case, are greater than market income. Therefore, the annual gross margin creates a viable farm, but it is necessary that the public authority supports the project to cover the capital expenses.

Another important public action concerns the marketing policy and the agri-food chain (filière) policy which will increase the value-added of the activity. Moreover, the farm management should be without additional farm labour because of the very high cost for this factor (19,628 Euro), while if the farmer works on the farm this amount becomes a part of his gross margin. The labour requirement (1,600 man-hours per year) produces a part-time farm with pluriactivity, i.e. agri-tourist activity or others, with income integration.

At present we have no complete economic evaluation of the ecological and natural aspects of this project, but the annual public support is equal to 30,780 Euro, in an area with a high demand for environmental services, above all for recreational activities. The most appropriate valuation technique appears to be the Contingent Evaluation Method (CEM) that estimates the “willingness to pay” for the environmental benefits in a direct way. As a real estimate is lacking, we can suppose that different percentages, from 0.5 to 100 per cent, of the local people pay the costs of this project, so we can calculate the per capita average costs (Table 8).

Table 8. Hypothetical pro-capita average costs (Euro) of the project.

People	Pro-capita expenditure
250,000	0.12
225,000	0.14
200,000	0.15
175,000	0.18
150,000	0.21
125,000	0.25
100,000	0.31
75,000	0.41
50,000	0.62
25,000	1.23
12,500	2.46
6,250	4.92
2,500	12.31
1,250	24.62

Note that the pro-capita expenditure varies from 0.12 Euro (100 per cent of the population) to 24.62 Euro (0.5 per cent of the population). If we consider about 5,000-6,000 people, the per-capita cost is equal to about 5.17 Euro, which at first sight seems a low level. The annual cost of this project thus appears probably justified. Considering also the annual subsidy, the public support increases by about 50 per cent, but the total value calculated in Table 8 remains low. But we must take into account that this is only a single project and not a complete environmental plan, i.e. for the preservation of the whole Carso area. Therefore it is necessary to evaluate the effective willingness to pay, considering also other similar options and their cost, and then compare the result with this simulation and with the real cost of the project.

Conclusions

The Carso area is a typical example of a multiple use management area, where the agriculture activities have the double roles of physical goods, agri-food and raw material production, and, above all, the supply of environmental services. The last is assuming an increasing importance according to the general aims of improvement of quality of life, and of social welfare. In this context, livestock production can assume a central function.

The special development plan proposal by Provincia di Trieste includes a project in which different goals are integrated: preservation of “Landa Carsica”, biodiversity conservation, farm income support, and the rare “*pecora carsolina*” sheep. The project can pursue these objectives without trade-off effects among these elements.

The project shows some positive aspects. First of all a multiple objective framework that reflects a sustainable approach embracing economic, social and environmental elements. Then the “bottom up” approach compatible with the most recent statements of EU policy.

The negative aspect and the weakness of the project concern the risk that it remains a public project without producer participation. In general, today, it is extremely difficult to persuade young people to practice livestock farming in marginal areas where there is no social life, but this, because of the semi-urban situation of agricultural activity in the Carso area, is not a problem. The real problem is to change the preference for other agricultural products, such as wine and vegetable production, and to promote a new type of activity: the re-introduction of a traditional activity with new objectives.

Moreover this activity has a public interest, but it remains an entrepreneurial activity with the connected element of risk. So a farm must pursue value-added objectives and not only survive thanks to public support. Therefore it is necessary that this activity has entrepreneurial characteristics, otherwise there is the risk that it will become a public activity or be abandoned if the public support should decrease. Note that the public support seems justified by the high demand for environmental services.

Finally, it is necessary to remark that the definition of Less Favoured Areas in Italy has damaged the Carso area and a recent proposal to change these areas does not improve this situation, because it continues to adopt physical criteria, such as the average slope and altitude of the areas, that reflect production limitations. While environmental criteria are excluded once again, no sustainable approach is effectively considered.

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