

Protected areas, subsistence farming systems and nature conservation

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Abstract: “Serra de Montemuro” is one of the 60 sites in Portugal’s Nature Network Sites national list. It is a classified mountain area of about 39.000 hectares whose territorial dimension and importance as regards nature preservation makes it one of the most relevant nature sites in Northern Portugal. Beef cattle and small ruminants, annual non-irrigated crops and some permanent crops are the basis of both farming systems and the economic activity in general. However, local agriculture and animal production are clearly declining and many traditional activities are at risk of abandonment. This tends to be critical for nature conservation, particularly for maintenance of biodiversity and preservation of typical mountain landscapes. This paper is part of the “Management and Integrated Territorial Development Plan for the Montemuro Site”, elaborate by a U.T.A.D interdisciplinary research team. The preservation of the traditional subsistence farming systems and the conservation of natural values (habitats, fauna and flora), in close articulation with local development, were considered the key issues at stake. So far, farmers have been able to manage the systems so as to cope with adverse conditions, but their future is quite uncertain. The methodology included: 1) Field observation visits and cartographic information analysis of land use; 2) Structured interviews with animal production and agro-forestry specialists and; 3) Meetings with the participation of stakeholders. The paper concludes that depopulation is responsible for the increasing decline of agriculture and livestock. The decrease in agricultural activity in general and the consequent practices and traditional systems of agriculture causes changes in the landscape and has negative effects on nature conservation and biodiversity. Thus, we believe that the preservation and development of traditional economic activities linked to agriculture, agro-forestry and food processing are essential to maintain the typical landscape and to preserve natural values of Montemuro Site’s. The paper will show that in mountain areas, particularly those classified as Nature Network Sites, farming, economic development and nature conservation cannot be seen as antagonistic objectives.

Keywords: farming systems, protected areas, nature conservation, biodiversity, local development

Introduction

Most forestry and agro-forestry landscapes evolve under natural disturbance regimes. Understanding the dynamics of natural disturbances and how these relate themselves both with other disturbances caused by human intervention and management practices becomes paramount in managing human ecosystems and biodiversity in present European agro-forestry landscapes (Bengtsson et al., 2000).

Hubert (1993) considers that some spaces that have been kept open by pastoralism over many centuries have become dense, closed and with a limited diversity as a result of pastoralists having progressively abandoned the activity. Degradation of forestry landscapes for lack of use or even misuse renders them more vulnerable to fire. The increasing area of burned forest has been forcing the authorities in charge of forest administration to change their attitude towards fire use and pastoralism policies regarding forests (Rubino, 1996). Therefore, Rego (1991) suggests that forest management must include the recovery of traditional practices such as pastoralism, cutting of trees and controlled fire. Pastoralism helps reduce biomass and stimulate the formation of vegetation patterns which alternate with tree formations, including clearings dominated by herbaceous communities. Svenning (2002), claims that one of the top priorities of any conservation policy should be promoting native herbivores production as well as the use of controlled fire systems. Telles (2004), however, points out that “the biggest challenge mountain agriculture has to face has not to do with production but rather with creating the necessary conditions for the population to settle there.” But the reality is that there are no such conditions. In general, mountain villages do not have

good accessibility. Orography is rough, the weather harsh, and accommodation is not satisfactory. Economic activity is mostly based on low-profit, traditional, agricultural, and agribusiness activities. In protected areas these activities are often discouraged or even subject to restrictive, “conservationist” legislation. Under these circumstances, populations tend to abandon traditional agricultural systems and leave, thus contributing to the depopulation of these areas. Montemuro Site is no exception.

In this paper we reflect on the potential effects of depopulation in protected areas in terms of land use, agricultural practices and traditional agricultural systems and its relationship to the preservation of the typical landscape, nature and biodiversity preservation, having Nature Network 2000 Serra de Montemuro Site as our object of study. Grando (2007), states that natural parks are important institutions for the preservation of natural environments and biodiversity. Studying the case of the Aspromonte National Park, this author adds that a national park can encourage sustainable development even in economically backward areas. Analyzing the main lines of development and available options for rural areas in the European Community, taking into account various limitations on agricultural, forestry and nature conservation activities, Conrad (1990) identifies the emergence of three agro-structural regional types: 1) Rural areas with intensive agriculture; 2) Rural areas, constituting mainly agrarian-touristic peripheries, which exploit their endogenous development potentials on the basis of quasi-tourism, 3) Less-favoured areas, with a tendency to depopulation, which may serve as ecological balance areas. The Montemuro Nature Network 2000 fits the latter.

Methodology

Our work methodology consisted of: 1) Field observation visits; 2) Structured interviews with animal production and agro-forestry specialists and; 3) Meetings with the participation of stakeholders.

Field observation visits and cartographic information analysis: During our field visits we have achieved a better understanding of the social and economical dynamics, through in loco observation and through informal contacts with the local people and their representatives. The study was complemented with analysis of cartographic information on the evolution of land use and documented with photographs.

Structured interviews with animal production and agro-forestry specialists: During observation visits, specific actors who are related to animal production and agro-forestry activities were interviewed. A structured technique was chosen since it gives the chance to collect an amount of data in a short time. The aim of these interviews was to understand farm systems, their strengths and weaknesses, by investigating soil use and occupation and studying the technical and economic indicators which characterize the activities.

Meetings with the participation of stakeholders: These meetings were held so as to reinforce the study’s participating approach, by involving local actors in identifying the territory’s main bottlenecks and suggesting intervention solutions that are capable of combining both agricultural practices and nature preservation initiatives in the protected area in question.

Results and discussion

Territory

Montemuro: A typical mountain classified territory

Serra de Montemuro PT CON0025 Site¹ (Figure 1, Annex) is one of the 60 sites that are included in Portugal’s Nature 2000 Network Sites² national list (Figure 2, Annex). It covers an area of

¹ Government Resolution nº 142/97, August, 28.

² Nature 2000 Network is an ecological network operating within the European Union and results from the application of Directives no 79/409/EEC (EU Birds Directive) and no 92/43/EEC (Habitats Directive) and “is meant to assure biodiversity through the preservation of natural habitats and of wild life in State Members of the European Union where the Treaty is applied”. This network consists of

approximately thirty-nine thousand hectares in a transition area between the coast and the hinterland. Its highest point lies at approximately 1300 m high.

It is a typical mountain territory, with a rough orography and steep slopes where most urban agglomerations lie over 800 metres high. Vegetation here consists mostly of non-cultivated bush areas and scattered forest. The highest areas are covered with rock outcrops and low vegetation.

Montemuro: a rural territory facing transformation and demographic fall

It is estimated that the site's resident population reaches up to thirteen thousand inhabitants (ICN, 2006), spread over 34 "freguesias" (Portuguese administrative unit) from 4 "concelhos" (municipalities). It is a markedly rural area³ whose distinctive features are agriculture, animal production and the traditions usually associated with these activities. The biggest population centres are situated in the periphery, near the cities and urban centres that are heads of municipalities. Some of these population centres have peri-urban characteristics. These could be associated to their proximity to urban centres and to the fact that locally agricultural and animal production has no longer a primary role.

Actually, the socioeconomics dynamics in Montemuro are not very different other rural areas. Agriculture is still important, but jobs related to it are less and less available. Young people tend to leave for the cities looking for better job opportunities, better education and leisure, whereas retired people seek to go back to their villages. These two flows entails two negatives consequences (Mafra and Amado da Silva, 2004): 1) aging of the rural population; and 2) creation of a new, temporary, demographic structure not big enough to justify a number of public services. Mafra and Amado da Silva also state that most rural areas are facing particular challenges such as: i) fewer and fewer job opportunities; ii) a steady decline in population which is also becoming older; lack of endogenous critical mass to support and sustain development. These phenomena are especially evident in the region under survey.

Like other mountain rural territories or Portuguese hinterland areas, Serra de Montemuro Site has been seriously affected by depopulation and demographic aging phenomena. Today, a great number of villages have less than 200 inhabitants.

Nature Conservation and Agriculture

Montemuro: A remarkably interesting territory for nature preservation and protection

Serra de Montemuro Site is one of Nature Network's most important areas in northern Portugal with a strategic importance for the preservation of specific natural and semi-natural habitats of high environmental and landscape value. It is also the natural habitat of the *Canis lupus* (wolf) (ICN, 2006).

The natural values justifying the site's classification in the Nature 2000 include (ICN, 2006): fifteen natural and semi-natural habitats of which four are a top priority: Mediterranean, temporary pools; temperate, damp, Atlantic moors of *Erica ciliares* and *Erica tetralix*; herbaceous formations of *Nardus spp* and *Alnus glutinosa* and *Fraxinus excelsior* alluvial forests; 2) two flora species, *Festuca elegans* and *Narcissus asturiensis*; 3) ten fauna species of which two are a top priority, *Calimorpha quadripunctaria* and *Canis lupus*. There are also several fauna and flora species with a high environmental value. The site has important areas of oak (*Quercus pyrenaica*) and two peat bogs; it is also an important habitat for *Lacerta schreiberi* (Schreiber's green lizard) and *Chioglossa lusitanica*

(<http://portal.icn.pt/ICNPortal/vPT2007/O+ICNB/Rede+Natura+2000/>): **Special Protection Zones (Zonas de protecção Especial – ZPE)**, established under the Birds Directive, and created essentially to guarantee that bird species and their habitats, as well as migrant bird species appearing regularly are preserved; **Special Conservation Zones (Zonas Especiais de Conservação - ZEC)**, created under the Habitats Directive to "ensure Biodiversity through preserving natural habitats as well as wild life habitats, considered under threat in the European Union". Nature 2000 Network is composed of areas with community relevance for the preservation of certain species and habitats in which human activities must uphold this principle in order to achieve a sustainable management both ecologically, economically and socially.

³ Classified as rurally fragile in the whole site area (ICN – Portuguese Nature Conservation Institute -, 2006).

(golden-striped salamander). The rivers Balsemão, Bestança and Cabrum are the ideal habitat for the Pyrenean Desman (*Galemys pyrenaicus*). Some of these habitats are endangered by human depopulation, by the decrease of animal production and associated agricultural practices, and the occurrence of fires.

Forestry aptitude territory, but undergrowth and uncultivated land are predominant

Altitude, orography, type of soil and climate do not lend special agronomic aptitudes to Serra de Montemuro. The Usable Agricultural Area (UAA) is only approximately three thousand hectares, 10% less than the site's total area. The actual forest area represents 73% (ICN, 2006a). The areas with agro-forestry aptitude⁴ are extremely important for bovine, caprine, and ovine cattle fodder. However, given that farming and cattle raising have been progressively abandoned, soil occupation shows how uncultivated areas have been increasing and agricultural areas decreasing (Table 1).

Table 1. Soil occupation evolution in Serra de Montemuro Site.

Classes	1990		2008		VAR
	(ha)	%	(ha)	%	
Agricultural spaces	10 021	25.9	8 200	21.1	-4.8%
Forest settlements	9 582	24.7	7 475	19.2	-5.5%
Uncultivated/Undergrowth areas	18 622	48.0	22 700	58.4	+10%
Other uses (Urban and Non-productive)	537	1.4	475	1.2	-0.2%
TOTAL	38 762	100.0	38 850	100.0	

Soil occupation charts show that undergrowth areas reach over 22 mil hectares and represent about 50% of the site's total area. Between 1990 and 2008 there was also a tendency for decrease of agricultural area and forest spaces and the growth of uncultivated areas. Rural exodus is responsible for the abandonment of agriculture and livestock and for the advancement of the areas of undergrowth and uncultivated areas.

As concerns forest settlements there has been an increase of the eucalyptus cultivation area and the area of broadleaves namely oaks, chestnuts and riparian species (Table 1, Annex). These species tend to concentrate along the main agricultural valleys. Three different situations may be described here: 1) water lines and vegetation associated, consisting of exuberant and dense leaved trees; 2) oak areas, located at a high altitude, with excellent post-fire regenerative capacity; and 3) agro-forestry mosaics.

From what has been said so far it is clear that Nature 2000 Network Serra de Montemuro Site shows a strong tendency for deforestation; therefore, it is necessary to pay special attention to protecting and developing oak areas while making the most of its regenerative capacity. This can be achieved by promoting and implementing agro-forestry activities. Fire,⁵ along with an ineffective management of forest spaces,⁶ and the depopulation and progressive abandonment of agricultural activity have led to i) the disappearance of typical habitats and biotypes which were at the basis of the territory's classification; ii) the progressive invasion by bush species of lower biological value; iii) increase of erosion; and iv) bad and irreversible changes in typical landscape.

Strong decline in agriculture and animal production

Autochthonous beef cattle production, small ruminants and annual non-irrigated and irrigated crops are the basis of the local economic activity. However, both agriculture and animal production are experiencing a strong decline in Montemuro. Here are some of the tendencies that mark local agriculture and animal production dynamics (Tibério *et al*, 2008a):

⁴ It is the result of a combination of agricultural, animal production and forestry activities and refers to natural or semi-natural spaces that are not cultivated or harvested for fodder but likely to be used regularly as pastures.

⁵ Although the burned areas register a clear negative evolution, Montemuro's fire risk assessment chart shows that the territory is still exposed to a high or even very high fire risk .

⁶ Lack of new settlements, an ineffective species selection and the systematic and incorrect use of controlled fire.

- The number of farms and the Usable Agricultural Area (UAA) have evolved quite negatively with an annual variation rate of – 4%, between 1989 and 1999;
- The farm size structure is dominated by small farms (3.6 ha per farm), with a high land parcelling level (9 parcels per farm);
- Permanent pastures for transhumant pastoralism occupy the biggest part of the UAA. However, as the UAA and animal production decrease there is also a significant reduction of the areas allocated to this type of pasture which are being replaced by bushes and undergrowth.
- Vineyards and fresh fruit orchards, although also decreasing, are the most significant permanent crops;
- Grain cereals, especially corn and rye, potatoes, temporary meadows and fodder are the most important annual crops. They too have been facing a particularly negative evolution.
- Farms and animal stock have suffered a strong decrease, but animal production still remains the populations' main source of income;
- The extensive production system and transhumant pastoralism are being given up; instead cattle are kept in “modern” stables built on the outskirts of villages with negative visual and environmental impacts on the landscape;
- The low profitability of animal production and its consequent abandonment put at risk ancient practices such as the clearing of marshy land, extensive pastoralism in fallow land (*vezeira*⁷) and the irrigation with river water (*rega de lima*⁸). The abandonment of these practices has had extremely negative consequences on nature and biodiversity preservation.

Although the negative trend in population and farming activity, the study area also has a whole set of diversified agricultural and typical agro-food products. Potatoes, corn, beans, beef cattle, sheep and goat cheese and aromatic and medicinal plants are the most important. It should value this kind of production in order to promote economic activity and job creation, ensuring a minimum population threshold necessary to preserve the environment, biodiversity and sustainability of the zone.

Promoting typical local agribusiness products as a means to ensure the territory's sustainability

Local transformation and trade of typical agricultural and agribusiness products are two aspects that are not particularly developed in Montemuro. There is no local agribusiness filiere and the local people refer problems related with commercialization issues: “farmers produce but have no way of putting their products on the market.” The commercialisation of agricultural products, such as potatoes and other horticultural products, vegetables, fruits, mushrooms, aromatic and medicinal plants faces serious problems. The same holds for animal products with the exception of beef-derived ones. Although certain local products have been often referred to, like the goat and sheep cheese, the traditional sausages, the maize and rye bread, these products' filiere never got past the level of local production for self consumption. Licensed traditional transformation units (cheese-dairies, bakeries and regional cuisine) do not exist in Montemuro.

A rising awareness of the importance of local typical agribusiness products and the promotion of traditional agricultural and agro-forestry systems are prerequisites for sustainability of the territory, the preservation of landscape, environment and biodiversity. Implementing those mechanisms implies meeting with some conditions that must be taken into account (Tibério *et al.*, 2005: 179): 1) socio-economic and agroecological factors: it is a geographical space aged and devitalized with agro-ecological conditions unfavourable to agriculture; 2) productive and organizational limitations: we are dealing with small-scale products, that which in some cases are next to extinction, without support organizations; and 3) commercial limitations: most of these products reveal a weak commercial orientation. The production and marketing of local products not meeting the quality requirements of the market, particularly in tourism demand.

⁷ A pastoralist practice by which cattle owners take their herds to common pastures and take turns at tending them.

⁸ Consisting of using water from rivers for irrigation.

Preserving the typical landscape and favouring the biodiversity by making traditional agricultural systems sustainable

In Serra de Montemuro Site, the mountain villages which are far from urban centres are characterized by their cultural heritage, their rural traditions and their typical landscapes. They are also the habitat for many wildlife species, as well as for a number of bovine, ovine and caprine stock. Traditional agricultural systems are responsible for a typical rural landscape. These agricultural practices are extremely important to preserve the landscape and the biodiversity of sensitive essential ecosystems which have determined the site's classification. In this context, it becomes clear, that abandoning agro-forestry systems has serious repercussions at all levels, especially social, economical and environmental.

In his "Contributions for an Intervention Strategy in Mountain Zones", Miranda (2000) emphasizes that to preserve this type of rural areas, it no longer suffices to deal solely the problem of their accessibility, , their infra-structures or housing, but is necessary to fixate young people, through activities that generate employment and income and the rejuvenation of agri-silvopasture. Rendering local typical products more attractive is certainly an aspect that deserves consideration.

Local populations often do not fully grasp the orientations contained in management plans for classified areas. The main management guidelines established by the PSRN, Plano Sectorial da Rede Natura (Nature Network Sector Plan) (ICN, 2006; Tibério *et al.*, 2009) aim at: 1) reducing fire risks; 2) developing the economic sustainability of activities that are relevant for the preservation of ecosystems; 3) preserving extensive pastoralist practices and pressure resulting from pastoralism; 4) adopting specific agro-forestry practices; 5) restricting the use of agrochemicals and promoting alternative techniques; 6) keeping and reviving riparian vegetation and autochthonous forest settlements; 7) promoting natural regeneration; 8) limiting forestation; 9) limiting the use of fire and; 10) ensuring the existence of an diversified habitat mosaic.

These general guidelines stress the idea that it is possible to develop local agriculture while still preserving nature. They also stress the need for measures that will help develop this rural area and preserve traditional agricultural systems and ancient agro-forestry practices. Still, social and economical feasibility of agro-forestry activities, as well as their sustainability and adequacy to preserve nature, require that information is provided and that there is an effort on the part of authorities to make the people aware of and ready for the various stages of the development process.

Local agro-forestry systems influence local land use and have effect on biodiversity preservation⁹. Farmers are giving up agriculture and pastoralism. Fields and marshy land are being neglected and covered by bushes and undergrowth, resulting in loss of biodiversity and increase of fire risk. In the opinion of the local population, fires in summer are a direct consequence of the decrease of agriculture and livestock, which grazed on the mountain and kept it clean. Maintaining agricultural and animal production activities is, therefore, essential for guaranteeing land use management.

Conclusions

Serra de Montemuro Nature Network Site's main features, its traditional agricultural systems and its nature preservation goals may be described as follows:

- A fragile, unpopulated mountains area in the of which the main characteristics are agriculture, animal production, and cultural traditions;
- An aging, scattered population living in small villages which, in some cases, show clear signs of abandonment;
- Lack of a large population centre capable of attracting more people to come and settle there;

⁹ See for example a study carried out in Parque Natural do Alvão (Pereira, 2006), which shows that the population of choughs (*Pyrrhocorax Pyrrhocorax*) is now smaller due to the abandonment of animal production and the consequent loss of biodiversity.

- The youngsters leave the region. While retired people chose to come back to it, in some cases for short periods. These trends are negative for local development;
- Agroecological conditions are not particularly favourable to agriculture which is facing a deep recession;
- Animal production is the main source of income, but also experiencing a setback, though;
- Commercial promotion of agricultural products is only in its primary stage;
- Very diverse landscapes and environment which is particularly relevant for nature preservation;
- Traditional agro-forestry systems are undergoing major changes with implications on the environment and typical landscape, namely for what concerns in priority natural values at the basis of the territory's classification;
- Abandonment of agriculture and animal production put at risk ancient practices such as the clearing of marshy land, extensive pastoralism in fallow land and the irrigation with river water. The abandonment of these practices has had extremely negative consequences on nature and biodiversity preservation.
- Depopulation, progressive giving up of agriculture and an ineffective management of forest spaces result in 1) loss of typical habitats and biotypes which were at the basis of the territory's classification, 2) the progressive invasion of bush species of less biological value, iii) an increase of erosion, and iv) bad and irreversible changes in typical landscape.

Recommendations

In spite of negative development of population and agriculture and livestock, the area also has several typical agricultural and food products. These products are important for local economic activity and ensure a minimum population threshold necessary to preserve the environment and biodiversity. The sustainability of agro-forestry requires measures the level of enhancement of production sectors, namely: 1) diversification of productive activities and promote the multifunctionality of agriculture; 2) affirm the specificity and quality of typical products, by local processing and use PDO, PGI, TSG qualifications and organic farm; 3) promoting innovation and diversification of marketing strategies. The valuation of agricultural and typical food products can to contribute: 1) create jobs and revitalize the local economy, 2) preserve the typical farming systems and agro-forestry; and 3) maintain the typical agrarian landscape and biodiversity of the site network nature concerned.

Holistically, sustainability (economic, social and environmental) is the challenge of the study area and must: 1) development strategies based on the assertion of their specificities, 2) begin to diversify their activities, rediscovering the multifunctionality of agriculture, oriented for quality of regional products, 3) invest in agro-tourism and active tourism, linked to the agricultural and agro-processing products, 4) promote the use of heritage and landscape.

In summary, the conservation of agro-forestry production systems and typical processing practices must be understood from socio-economic perspective viability and their contribution to the preservation of biodiversity. In mountain areas classified within the Nature network, economic development and nature preservation cannot and should not be seen as antagonistic. Maintaining and developing traditional agriculture, agro-forestry and food-processing related economic activities is essential to preserve environment and natural values. However, social and economic sustainability of agricultural and agribusiness systems still remains a challenge.

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ANNEXES

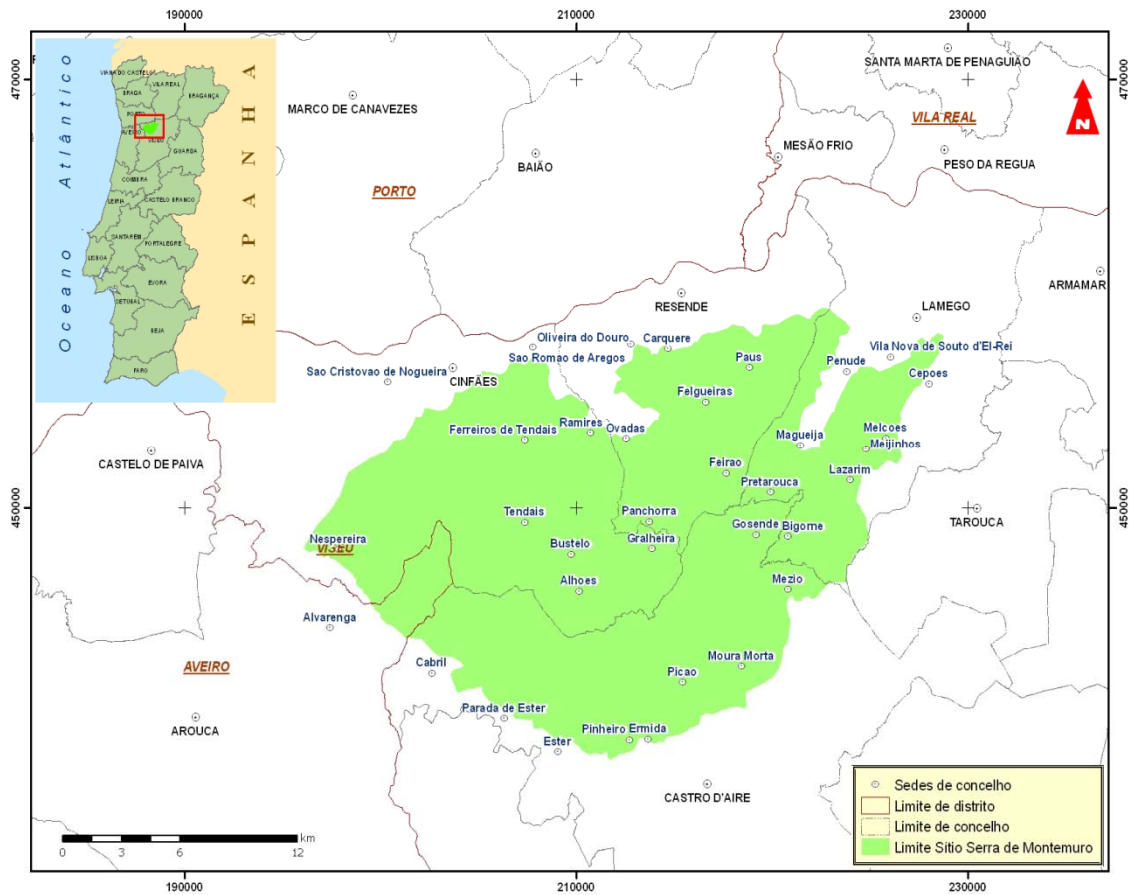


Figure 1. General Location of Serra de Montemuro Site

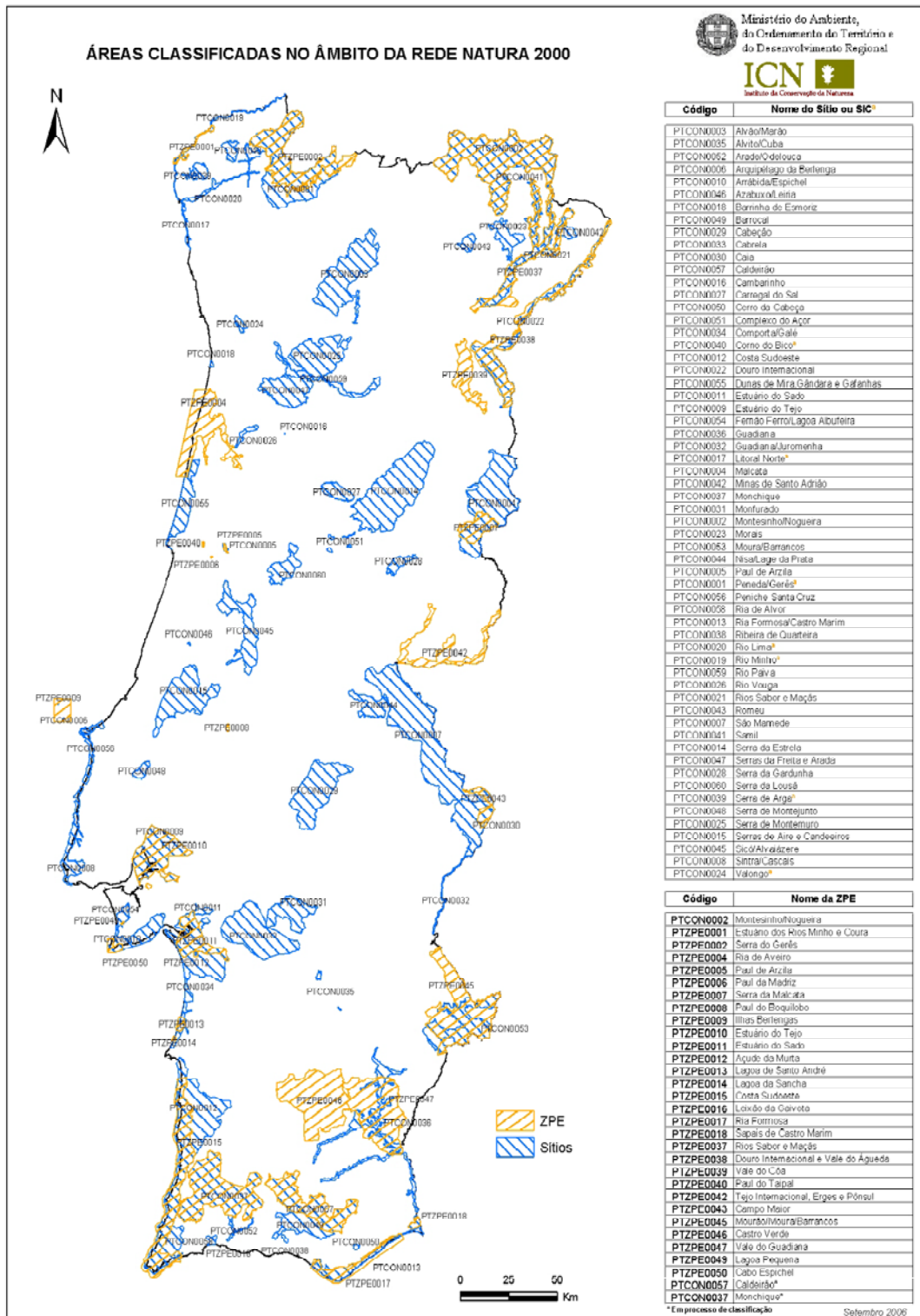


Figure 2. Portuguese Nature 2000 Network Site National List

Table 1. Soil Occupation Evolution

Classes	Area (1990)		Area (2000)		Variation (%)
	(ha)	%	(ha)	%	1990-2000
Annual non-irrigated crops	1690.83	4.36	1678.27	4.33	-1
Annual irrigated crops	75.41	0.19	75.41	0.19	0
Vineyards	114.96	0.30	119.90	0.31	4
Orchards	201.71	0.52	223.63	0.58	11
Pastures	293.88	0.76	293.88	0.76	0
Permanent crop associated annual crops	2840.21	7.33	2846.62	7.34	0
Agriculture with natural spaces	5344.71	13.79	5359.25	13.83	0
Leaved tree Forest	777.43	2.01	811.72	2.09	4
Resinous Tree Forest	1935.98	4.99	1430.21	3.69	-26
Mixed Forests	2035.22	5.25	1680.98	4.34	-17
Natural Pastures	2697.60	6.96	2699.95	6.97	0
Undergrowth	10191.33	26.29	11217.75	28.94	10
Degraded Forest Spaces, Cuts and Plantations	4628.14	11.94	6007.48	15.50	30
Scarce Vegetation	3341.88	8.62	3341.88	8.62	0
Burned Areas	1745.54	4.50	127.73	0.33	-93