Millennium Ecosystem Assessment

Portuguese Sub-Global Assessment

Report on the User Needs and Response Options

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Contents

Section 1

Introduction

The Millennium Ecosystem Assessment (MA) is an international initiative designed to answer the need for scientific information about the consequences of ecosystems changes for human well-being. The MA was created to provide part of the scientific information needed for the implementation of the Convention on Biological Diversity, the Convention to Combat Desertification and the Wetlands Convention. The MA was launched by the United Nations General-Secretary in June 2001.

The Millennium Ecosystem Assessment is a multi-scale assessment, consisting on interconnected assessments at the global, sub-global and local levels. There are about 25 sub-global and local assessments, such as Sweden, Southern Africa, Chile and China. Portugal has joined this group of sub-global assessments in May 2003, in an initiative lead by the Centro de Biologia Ambiental of the University of Lisbon. The Portuguese Millennium Assessment (ptMA) is analyzing the condition of ecosystem services (ES) in Portugal, recent trends in those services and scenarios for the next 50 years. The ptMA is assessing both extractive services such as fiber production and agricultural production, as well as non-extractive services such as biodiversity and recreation.

The Portuguese Assessment is composed by a research team and by a group of users which are both the primary receivers of the information to be produced and stakeholders of the ecosystems to be assessed. The research team is composed by over thirty scientists from several fields, including economics, sociology, biology and forest science. The users represent different sectors of the society, including national and local government, non-governmental organizations, agriculture and industry.

The users are:

- Paper Industry Association (CELPA)
- National Confederation of Portuguese Agricultural Cooperatives and Credit, CCRL (CONFAGRI)
- Institute for the Conservation of Nature (ICN)
- Institute of Water (INAG)

- League for the Protection of Nature (LPN)
- Ministry of Agriculture, Rural Development and Fisheries (MADRP)
- Ministry of Public Works, Transports and Housing (MOPTH)
- ExtEnSity Project - local user
- National Park of Peneda-Gerês[1] (local user)(PNPG) - local user.

Therefore, sub-global assessments are designed not only to contribute to a local level validation of the global assessment methodologies, but also to answer to the needs of national and local users. This report is a compilation of the information needs on ecosystem services for each user of the Portuguese Assessment. In some cases, users also face alternative options to the management of ecosystems. Those response options are also presented in this document, whenever the user thought that the study of those management strategies should be assessed by the ptMA.

The Portuguese Assessment is like the global assessment, a multi-scale assessment, including national, regional and local scales. There are two local users which are responsible for the management of areas that are study cases of the ptMA at the local level. The remaining users are national users, but in some instances they also have made suggestions about assessments that should be performed at the local scale.

This report has two main goals. On the one hand, this document aims at guiding the work of the scientific team, both in the choice of ecosystem services and the regions/areas to study, and in the way that data should be presented to the users. On the other hand, this report aims at a general survey of the information voids on ecosystem services, even the ones that cannot be fulfilled with the time and limited resources of the ptMA.

The texts prepared by the Portuguese Assessment users are presented in the next section. Each text begins with a short description of the user activity and the scope of its participation on the ptMA and finishes with specific information needs. Some users have emphasized in italic the questions that they classify as being particularly prioritary for the ptMA.

The last section of this report presents a summary of these texts and of the information discussed in the meetings with the users, stressing common points between the users.

[1]The National Park of Peneda-Gerês was not able to contribute with their user needs text in time for this report. Nevertheless, in the Conclusions section we include results from the meetings with Park representatives.

Section 2

Information needs and response options for each user

2.1 CELPA, Paper Industry Association[1]

2.1.1 Background

CELPA is an industrial association which represents the main Portuguese paper producers. CELPA associates represent 100% of the paper pulp production in Portugal, and about 80% of the paper production and they directly manage about 200.000 ha of forest.

The Portuguese paper industry bases the production of paper pulp in wood of national origin, which comes in majority from planted forests of eucalyptus and pine. This wood supply is assured in about 80% by private forests and in about 20% by forests owned by CELPA.

Therefore, and due to the national dimension of this industry, the CELPA associates are simultaneously the major consumer and the major private producer of wood in Portugal.

The forest plantations are, all over the world, a target of controversies due to the way they are managed. However, it is important to note that, under the designation of "forest plantation", there are important management differences according to the forest species, the region of the world where they are grown and the aspects related with the insertion of these forests in the local communities and the activities of the places where they are installed.

World's consumption of products with origin in forest commodities, paper products included, has registered a growing pattern during the last decades. The predictions for the next few years indicate that this pattern will be maintained.

Forest plantations are praised by their capacity to produce high quality forest commodities, in a relatively short amount of time and with technological characteristics which permit their optimized use by industries downstream. Also it is many times referred that forest plantations contribute to alleviate the production

[1] Associação da Indústria Papeleira

pressure on natural forests[2].

Forest plantations are criticized by the environmental impacts observed in some areas and/or regions. Some of the most referred impacts are the increase of soil erosion, the perturbation of the hydrological cycle, nutrient depletion and the low diversity and abundance of animal and plant species. However, it must be noted that these impacts are more associated with the type of forest management than with the type of forest (i.e natural versus planted).

Considering this short background, the fundamental question about forest plantations is not, to CELPA, in the utility or the reason for existence of forest plantations, but in the quality of forest management.

CELPA has been reacting to the pressure and criticism about forest plantations, particularly eucalyptus plantations, with differentiated strategies for the areas under CELPA's direct management and the areas under independent private management. In the latter areas, CELPA has mainly invested in building the capacity of service providers and forest owner associations and in providing technical support. For areas under CELPA's direct management, action focuses on two principal vectors: improvement of the selection criteria of the areas to be explored; and improving the quality of silviculture.

The improvement of silviculture quality, particularly in what is related with the so called "environmental care", has been obtained by experimentation and development of less aggressive techniques; by attempts to reduce the intensity of the various cultivation techniques; and by the constant training, education and sensitization of CELPA's collaborators and service providers. An expression of these initiatives is the development and application of environmental procedures which make part of the so called "Environmental Management Systems" or "Sustainable Forest Management Systems". One of these systems is already certified according to international norms, and the others are in the certification process.

2.1.2 Instruments and response options

A sound forest management, including a sound management of the environmental aspects, has necessarily to be supported on a basis of credible information. CELPA associates have an outstanding information record about the areas under their management, which is largely based on their own forest inventories, that are updated annually. These inventories were initially designed to answer to relevant variables for the evaluation of the volumes and the quality of woody material, but today they are changing deeply to answer to new challenges, namely environmental questions and, within these, questions about biological diversity. The information to assemble in this new context has two principal objectives: to give information that could support management decisions; to give information that could elucidate the public about the quality of the management being practiced.

Therefore, the information to assemble should obey the following criteria:

[2]Naturally, this can only be invoked when forest plantations are not grown over natural forests. This "virtue" is usually pointed out when the planted forests replace uncultivated fields, marginal agricultural areas or shrubland.

- Relevant. The indicators should give relevant information. For the case of biological diversity, we would be looking for the organisms or group of organisms which indicate the quality and functioning of forest ecosystems.
- Causal. The indicators should reflect a causal relation with the management being practiced. For the case of biological diversity we would be looking for the organisms or group of organisms whose presence or abundance is related with the quality of the forest management being practiced. Organisms that react to pressures beyond the direct sphere of management (ex.: that disappear with high levels of atmospheric pollution) should not be considered in this context.
- Interpretable #1. The obtained information should be interpretable in terms of management decisions. It should be possible from the presence or absence of certain organisms to confirm a desired trend or, on the contrary, to suggest changes in the management to reverse an undesired tendency.
- Interpretable #2. Given that equilibria between species are dynamic, as are the ecosystems that support them, it should be possible to determine the appropriate target level of diversity in each phase of the plantation development.
- Interpretable #3. The information should be interpretable at the scale in which the forest projects are developed, given that there are organisms which are sensitive to the presence of particular ecosystems and/or management practices at different scales of intervention. The level of requirements for small forest areas cannot be the same as for large forest areas.
- Easy to measure. The actual forest inventories are conducted by teams with training on a limited number of variables. The expansion of the universe of measures to perform will, consequently, favor the variables that are simpler to measure and that could be, more easily, integrated in the conventional inventory models.
- Low cost. The measure of environmental variables is a part of a larger plan of assembling and processing forest information. The sum of the costs of sampling all these variables cannot reach a significant proportion of the economic value of forests, under the risk of turning the sampling financially unfeasible.

The information assembled at a national level has, usually, the objective of characterizing the diversity, and less frequently the abundance, of certain organisms in specific moments (rarely with continuity). It has, therefore, a limited utility in the context mentioned above.

2.1.3 Information needs

The main need of users that, like the CELPA associates have direct responsibilities in the daily management of the territory, is finding the variables of biological

diversity that satisfy the conditions explained on the previous section. In summary, there is a need for information about the best way of measuring and interpreting the condition of an ecosystem.

The risk of carrying out information collection that is not goal driven is to incur potentially elevated costs without acquiring neither better capabilities of forest management neither efficient tools for communication with the public.

2.2 National Confederation of Agricultural Cooperatives and Credit of Portugal, CONFAGRI[3].

2.2.1 Background

CONFAGRI as a National Confederation of Agricultural Cooperatives and Credit has the objective of organizing, representing, defending and contributing, by itself or in cooperation with other national and international entities, for the balanced and efficient growth and development of the Cooperative Sector in Portugal, and particularly, of the Portuguese Agriculture.

CONFAGRI includes 363 Cooperatives of Agriculture and of Agricultural Credit, representing about four hundred thousand farms, which gives CONFAGRI a large capacity of information diffusion: through its homepage (`www.confagri.pt`); through the production of documents and training sessions, namely in the agro-environmental area.

Furthermore, and given that CONFAGRI's network of cooperatives and agricultural credit unions is distributed over the entire country, CONFAGRI has the ability of transmitting information to its associates rapidly, adapting the language according to the target public. Therefore, CONFAGRI intends to use this ability to communicate the findings from the ptMA.

2.2.2 Information needs

Influence of instruments and policies on agriculture/forest/livestock production

In view of the growing pressure that has been exerted on agriculture, namely in terms of environmental legislatives impositions, the critical factor for our associates has been the availability of financial mechanisms that can be used to improve environmental performance without making the activity itself economically impracticable. Therefore, CONFAGRI thinks that it is important to approach the following issues in the ptMA:

- How can global priorities be conciliated with national, regional and local priorities?

[3] Confederação Nacional de Cooperativas Agrícolas e do Crédito Agrícola de Portugal, CCRL.

- How do different ecosystem management policies affect farmers and who pays the costs associated with the goods and services from ecosystems?

- How can the benefits and costs provided by ecosystem services of agriculture and forest be measured in an efficient way?

- *In which way the political and legislative instruments (particularly the CAP and the Nitrates Directive) have influenced and could influence the economical activities (agriculture and forest)?*

Management impacts and options

One of the principal challenges that our associates face is knowing the environmental impacts of their activities and the best options for the future. CONFAGRI considers this knowledge to be necessary in all of its components (environmental, social and economic):

- What options and agricultural practices have helped agro-services to support food production and security?

- What is the role played by agriculture in wetlands?

- What is the impact of agriculture in areas of the Natura 2000 Network?

- What is the efficiency of the water use by agriculture? In which way could it be improved?

- How to optimize local and national benefits to populations from agriculture and forest and to reduce the vulnerability of these sectors?

Land Use

In recent times, there have been agricultural practice changes, a growing abandonment of farm land and its conversion to other uses. CONFAGRI thinks that it is important for the ptMA to study the reason for those changes in land-use and what are the influences of those changes on the different ecosystem services. Specifically, the following questions are asked:

- What is the national distribution of land use, of water availability and of the principal agricultural activities, including historical evolution over the last 100 years and the explanation for the changes which occurred?

- What is the relation between that distribution with the current population needs and with farm land abandonment?

- What is the capability of the different regions and ecosystems to provide food (quantity and quality) and eco-tourism? Where is food produced, by who and where are the producers? Who are the principal consumers?

- *What is the impact of different agricultural practices/land uses on biodiversity (species extinction rates), water, nitrogen and phosphorus cycle, carbon sequestration, tourism, soil degradation and contamination (use of fertilizers and phyto-pharmaceutic products)?*

- What is the best methodology to determine the maximum amount of fertilizers and phyto-pharmaceutics that can be applied to the soil?

- What are the costs and the benefits of the different agricultural/land use practices (public health, agricultural investment, produced goods,. . .)?

- What policies and actions related with land use could contribute for the alleviation of poverty and desertification? How could agriculture be used to achieve that goal?

- What is the importance of Natural Parks to the Portuguese people?

Traditional, biological and transgenic agriculture

The products from biological farms have been steadily gaining a share of the diet preferences of the Portuguese population, which has become progressively more concerned with food safety. Currently, CONFAGRI has invested in training and information initiatives related with the promotion of biological agricultural practices, mainly through partnerships established with AGROBIO - Portuguese Association of Bio-agriculture. Furthermore, the use of genetic modified organisms (GMO's) in agriculture has caused a big controversy. CONFAGRI thinks that it is important to do a comparative study of traditional, biological and transgenic agriculture. The most relevant questions are:

- *What are the impacts on the soil, water, security, food quality and quantity and human well-being of the different types of agriculture (traditional; biological; transgenic) alone and in coexistence? Which are their costs and benefits?*

- *Could it be possible to assure the non-propagation of GMOs to lands that do not adopt that kind of agriculture?*

Climate change and its mitigation

The majority of national and international studies of the scientific community forecast a global warming of the planet during the current century, which will contribute for ecosystem changes, namely changes in the geographic distribution of fauna and flora species. The ratification of the Kyoto Protocol as a member state by Portugal, implies the fulfillment of certain targets of greenhouse gases emission, such as methane. Therefore it is unavoidable to incorporate those target concerns in the agriculture, forest and livestock production sectors. CONFAGRI would like to obtain answers to the following questions:

- What are the potential climate changes in Portuguese ecosystems and what will be their effects on biodiversity, water and soil availability, agriculture, etc? In which ways could climate changes affect different society sectors and different regions?
- What should be the criteria for the selection of agriculture and forest species and for the selection of the most appropriate land uses to face the expected changes?
- In which way could agricultural and forest practices contribute to the mitigation of the climate changes? In which way could the agricultural and forest producers be compensated for those mitigations?

2.3 Institute for the Conservation of Nature, ICN [4]

2.3.1 Background

The Institute for the Conservation of Nature is the organism of the Ministry of Cities, Territory Planning and Environment in charge of the policies of nature and biodiversity conservation, natural patrimony protection, integrated management of coastal zones, and it has the responsibility of carrying out the national strategy for nature and biodiversity conservation.

2.3.2 Attributions and management instruments

The main ICN attributions are:

a) To assure the preservation of the biodiversity and the genetic patrimony and to assure the sustainable management of species and natural habitats;

b) To promote the sustainable management of the coast in order to assure the conservation of environmental and landscape values, the security of people and goods, and its economic and social valorization;

c) To promote the economic and social valorization of natural patrimony and landscape values, in an environmentally sustainable way;

d) To assure the management of areas classified as of national interest and to collaborate in the management of areas with regional or local interest;

e) To promote the elaboration, systematic evaluation and revision of the land use plans of protected areas and the coast;

f) To promote the planning of nature conservation and the monitoring of species, habitats and ecosystems;

[4] Instituto de Conservação da Natureza

g) To promote the articulation and integration of the objectives of conservation and of valorization of the natural and landscape patrimony as a structural factor of the different sectors of economic and social activity and of the territory planning processes;

h) To promote the design and implementation of a basic ecological network through the sustainable management of the National Ecological Reserve and of other areas of interest for nature conservation, namely the Natura 2000 Network and the special conservation zones or any other area with protection status by national or international norms;

i) To suggest the creation of protected areas, and to define, at the national level, objectives, means and ways of managing the national system of classified areas and to evaluate that management;

j) To develop information systems and to assure the monitoring of nature conservation, biodiversity, natural patrimony and protected areas;

k) To promote and implement information and training programs on nature conservation for populations, agents and organizations, with the aim of creating a collective awareness of the importance of the protection of biodiversity and natural resources;

l) To perform, without detriment of other authorities, the State powers over the marine domain in the terms that become defined on the respective organic law;

m) To assure, in cooperation with the qualified authorities, the accompanying of the questions and the fulfillment of the agreements related with biodiversity, natural patrimony and the coast at the bilateral, European and international levels.

2.3.3 Information needs

Management of water resources

One of the areas with major needs of information is the management of water resources, specifically the licensing regime of the water domain use. The Decreto-Lei n°.46/94 of February 22^{nd} authorizes sustainable uses of the water domain. However, there is a need to evaluate the services and the ecosystems that allow such uses.

As established in the 3rd article of the referred law, the following uses of the water domain require an authorization title, whatever the nature and juridical personality of the user: water caption; residual waters output; hydraulic infrastructures; cleaning and clearing of water lines; inert extraction; constructions; support buildings and equipment on beaches; parking areas and their accesses; biogenetic crops; sailing and sport competitions; floating structures; seeding, planting and tree cutting. The value of the services provided by water (quantity and quality)

and by riparian and autochthonous vegetation of the surrounding area are not economically valued yet, considering the uses allowed by the water domain.

Due to the short time of the ptMA execution, and considering the relevance that water resources have in Alentejo, the ICN sees with great interest the assessment of the ecosystems and the associated services (water domain uses) of a river basin in that region.

- *What is the importance of the ecosystems in each of the services and vice-versa?*

- What is the importance of each of the possible uses (services) of the water domain for biodiversity? And in the long term maintenance of the water resource itself?

- What are the effects of indiscriminate licensing (fulfillment of the law but without an integrated management of the entire basin) on each of the services of the river basin?

Natura 2000 Network

The Natura 2000 Network is one of the goals established from the application of two European directives: the Habitats Directive and the Birds Directive. Both contribute to assure biodiversity through the conservation of natural habitats and of wild species of flora and fauna considered to be endangered in the European Union territory.

To protect natural resources it is urgent to define measures that guarantee the valorization and conservation of habitats and species, and to develop the typology of restrictions to land use, considering the distribution of the habitats to be protected.

Given that there is insufficient knowledge related with ecosystem services in the Classified Areas (National Network of Protected Areas and Natura 2000 Network), the ptMA is certainly important to obtain useful information for the management of these areas.

There are several vulnerable habitats (dunes, peat-bogs, oak forests, Mediterranean shrublands, marshes, salt marshes, estuaries, caves, etc.) and species ("Saramugo"[5], Common Crane, Iberian Desman, Iberian Lynx, Wolf, etc.) that require a more profound assessment of their value.

- What are the quantitative effects of the reduction and/or fragmentation of priority habitats on biodiversity and endangered species conservation?

- *And on the economy of the Portuguese population on a short, medium and large term?*

[5] *Anaecypris hispanica.*

2.4 Institute of Water, INAG[6]

2.4.1 Background

The Institute of Water is the organism of the Ministry of Cities, Territory Planning and Environment responsible for implementing the policies on the domains of water resources and sanitation.

2.4.2 Attributions and management instruments

The main attributions of INAG are:

- Establishing objectives and strategies for an integrated management policy of water resources;
- Development of integrated plans for each river basin;
- Assessment of water resources availability and needs at a national level;
- Development of conservation of the national water resources, both in quantity and quality of their physical and ecological aspects;
- Elaboration of studies and proposals of technical, economic and legislative measures needed for improving the management of national water resources;
- Guarantee and control of the safety of dams according to the terms of the law;
- Development of new hydraulic infrastructures of national or regional scope or with a high level of socio-economic and environmental interest.

The main instruments of the Water Resources Policy are:

- National Water Plan
- River Basin Plans

2.4.3 Information needs

These are some examples of information needs:

- What are the natural processes and characteristics that support the integrity of aquatic ecosystems (ex.: magnitude and temporal variability of drainage flows, nutrient cycles)?
- What is the relationship between the characteristics of the river basin and the functioning and structure of aquatic ecosystems?

[6]INAG – Instituto da Água

- How to apply the approaches, methods and instruments of integrated assessments of aquatic ecosystems?

- Which criteria and evaluation methods can be used to evaluate the efficiency of nature conservation and water resources policies on environment protection, including cost-benefit analysis?

- What is the economic value of the losses of ecosystem productivity associated with the degradation of the aquatic environment?

- Which criteria can be used for the economic valuation of wetlands, in particular on the perspective of the water resources management?

- What is the methodology to define targets of ecological quality for modified or artificial water bodies such as dams?

- How can the estuarine and coastal sedimentology be used to analyze the recycling processes of specific chemical pollutants?

- What methods can be used to forecast the effects of climate change on the structure and functioning of aquatic ecosystems, namely coastal lagoons and estuaries?

- What are the implications of the hydrological regime on the maintenance of the physical structure of the environment and on the composition of communities?

- How to differentiate between natural and human induced variability of the properties of aquatic ecosystems?

- What methodology can be used to determine the reference conditions of aquatic systems, both in terms of physical-chemical characteristics and of the biological component?

- What tools are available to quantify significant pressures and impacts on aquatic ecosystems, in the context of defining management priorities?

- How can the environmental and resource costs be evaluated on the context of establishing a policy of water prices?

- How to apply existing methods to evaluate environmental costs?

- What approaches are available to integrate uncertainty in the decision process on the scope of water resources management?

- What criteria can be used to evaluate the economic impact of the management measures of the water sector on the other economy sectors?

2.5 LPN – League for the Protection of Nature[7]

2.5.1 Background

LPN is an non-governmental organization (NGO) dedicated to the environment. LPN is a non-profit organization with a national scope, with about 7000 members, and its main area of intervention is the conservation of nature and biodiversity.

The principal activities of the association are:

- Direct intervention in environmental causes with national and international importance, through recommendations, audiences with the administration, campaigns, legal actions in national and communitarian instances and representation in accompanying commissions;

- Projects of conservation and research: the most important project occurs in the region of Castro Verde, the most important zone of pseudo-steppe for steppe birds in Portugal. In this region LPN has acquired and currently manages 5 farms, with a total area of 1700ha. LPN has been receiving support for this conservation project from financing programs of the European Union;

- Education and environmental training, through courses, seminars, expositions, nature walks, publications and loan of didactic material.

LPN was associated with the creation of several protected areas in Portugal, and its technical staff has a profound knowledge and experience about conservation and natural patrimony management, and particularly on several of these protected areas.

LPN is a member of several international organisms, as the IUCN- The World Conservation Union, the WWF (World Wildlife Found), the EEB (European Environmental Bureau) and the CIDN (Iberian Council for the Nature Defense).

To summarize, LPN functions as a complement and counterbalance of the official organisms in the implementation of conservation policies, taking part in the political discussion at several levels (world, European, national, regional, local) and implementing demonstrative actions and projects.

2.5.2 Objectives of the participation of LPN in the ptMA

The activity of LPN is based on the defense of political options in favor of the conservation and valorization of the natural patrimony. These options are, in most cases, contentious with other developing strategies and imply the discussion of values and priorities with people with diverse technical backgrounds. The presentation of economic and social data and, to a lesser or greater extent, the quantification of the economic and social benefits of the defended values is fundamental.

[7]LPN – Liga para a Protecção da Natureza

The technical staff of LPN has a deficit of expertise in social and human sciences, which limits the development of arguments for the conservation options supported by LPN.

Given that the Portuguese Millennium Ecosystem Assessment aims to quantify ecosystems services and, based on management options, to predict the evolution of those services, the results of the Portuguese Assessment will be an extremely valuable tool for LPN.

2.5.3 Information needs

The information needs are divided in two sections:

- General Needs: structured according to the ecosystem typology defined in the ptMA methodology, they refer to general information about these ecosystems, without explicitly considering alternative management options;
- Needs considering management options: structured according to national and European policies that could influence decisively biodiversity. We also enumerate local and regional management options, which could have significant impacts on ecosystems at this level.

According to LPN, the subjects that should receive the highest priority in the ptMA are:

- Generic Needs: agricultural areas and wetlands;
- Needs considering management options: Nature Conservation Policy/ Natura 2000 Network, CAP/ Zonal Plan of Castro Verde and Energetic Policy.

General needs

LPN feels the need of general information about the services provided by Portuguese ecosystems and about the major options for those ecosystems. An effort of information systematization that aggregates the studies already made and the ones being made, could contribute significantly to provide that general information.

It could also be useful, in the absence of quantitative data, to assemble historical information about the evolution of ecosystems from their traditional users (fishermen, farmers, hunters, etc.)

Agricultural Areas A significant portion of Portuguese biodiversity (and a significant portion of the protected areas) is associated with agricultural land (ex.: pastures, pseudo-steppes, "lameiros"). However, Portuguese agriculture has been under major change since Portugal joined the European Union (EU) in 1986. Those changes can be generally characterized as the abandonment of the agricultural land in the less productive areas and the intensification of agricultural practices in the most productive areas, through increases in irrigation area and pesticide use.

Currently, Portuguese agriculture is being the object of a particular analysis in the Common Agriculture Policy (CAP) Reform, taking into account the next EU enlargement, and from this analysis there certainly will be new guidelines for the next years, knowing that the report prepared by the European Commission refers the necessity of reinforcing the agro-environmental and rural development policies to assure a sound development of the Portuguese agricultural sector.

Thus, the following questions are important to LPN:

- *What is the importance of agricultural areas for ecosystem services, in particular for biodiversity conservation, when compared with other habitats?*
- *What is the importance for biodiversity of the maintenance of extensive agricultural systems?*
- *What would be the strategic importance for Portugal of an investment in extensive agriculture, high quality products, rural development and rural tourism, in opposition with an investment in intensive agriculture and in the increase of production quotas?*
- *What is the impact of the intensification of agriculture and the conversion of agricultural land to other uses (such as forest) in the services of agricultural ecosystems, such as biodiversity preservation, soil and water conservation, and in population settlement patterns and job creation?*
- *In which way does biological agriculture contributes to biodiversity? Are there differences in that contribution if the biological agriculture is practiced in rainfed fields or in irrigated fields?*
- *What is the geographical intervention scale needed to detect the global effects caused by biological agriculture, intensive agriculture and irrigation-based agriculture?*
- *The genetic patrimony of the autochthonous varieties used in agriculture has been evaluated?*
- In what way did the infrastructures created to support agricultural activity (such as the improvement of existing irrigation areas and the creation of new irrigation areas), that were extremely supported by European Union, through FEDER (and through the AGRO program), had the expected result? What was the global impact of those infrastructures on the biodiversity of agricultural ecosystems?

Wetlands The inland waters and estuaries/marshes have high biodiversity and have been subjected to several attacks, mostly from urban construction and tourism interests. In the national legislative framework the protection of wetlands is scattered over several instruments, as the Land-Use Plan for the Coast[8] and the Land-

[8]Plano de Ordenamento da Orla Costeira.

Use Plan for Protected Areas[9]. The Ramsar Convention is the only legal instrument that is specifically dedicated to wetlands, and it was ratified by Portugal a long time ago (1981). Although the Water Framework Directive (approved in 2000) does not include any specific measures for the wetlands, the Directive establishes as a goal achieving the good condition of aquatic ecosystems to assure qualitative and quantitative water standards.

The construction of dams also implies potential negative impacts of great magnitude: destruction of habitats with conservation importance, loss of water quality, sediment retention, barriers to the passage of migratory aquatic species, etc. This question is very actual, because of cases as those of the Alqueva dam and the Odelouca dam, already in construction, and the Alto Sabor dam, which is in the planning stage. The arguments in favor of the construction of dams are focused mainly on the agricultural development, availability of water for human consumption and on the production of electric energy.

Dams are sometimes associated with basin diversions which can hold serious risks for biodiversity, especially when the two basins have very different biota, since the introduction of new species in a basin can provoke the disappearance of other species.

The planned diversions between the Douro and Tejo basins and between the Sado and the Guadiana basins puts this problem on the order of the day.

So, it is necessary to evaluate the following questions:

- *What are the changes in ecosystems associated with these two options: increasing the water supply for human and agricultural consumption and increasing the electricity production, through dams and basin diversions vs. rationalization of water and energy consumption, sustainable agriculture and preservation of natural ecosystems?*

- *What are the changes in ecosystems associated with these two options of irrigation water availability: water diversion from a different basin vs. using the water resources of the same basin?*

- *What are the consequences of large dams for ecosystem services?*

- *What would be the consequences of the Alto Sabor dam for ecosystem services?*

- *What are the impacts of dams on the productivity of estuaries and adjacent coastal zones and what are the consequences for the fishing industry?*

- What are the impacts of dams on coastal erosion?

- What are the costs of maintaining the good functioning of estuaries and rivers in comparison with the current trend of occupation with urban developments and of discharges of domestic, industrial and agricultural effluents?

[9]Plano de Ordenamento das Áreas Protegidas.

- What is the value of dams for the production of water for human consumption?

- What benefits can be expected from the maintenance of coastal lagoons, in contrast with the urbanization of lagoon borders and the agricultural intensification around them, considering the economic needs and demographic trends of the country?

- What mitigation measures of the negative environmental impacts should be required for the promoters of the construction of large dams?

- What is the effect of wetlands loss or degradation on the condition of the aquifers that depend on them?

Coast and coastal waters There has been an increase of threats and damages in coastal areas, mostly due to tourism (construction of infrastructures in sensitive areas, recreational navigation, etc.), the presence of large urban centers and non-regulated fishing. The sea advance in some coastal zones is becoming quite serious, as well as the degradation of dune systems and cliffs.

With relation to marine areas, the recent creation of two protected marine areas was not supported by a management plan of those areas, resulting in a empty legal background for the implementation of protective measures.

The Water Framework Directive introduces protection measures for the coastal zones adjacent to river basins, integrating them on the scope of the hydrographic region. This measure compels the Member States to apply integrated measures for the totality of river basins, including also the environmental objectives for coastal zones. Additionally, the New European Fishing Policy puts on the order of the day the Determination of the Environmental Impact of Fishing, in a systematic and encompassing way, which can lead to fishing moratoriums in certain areas. The main questions are:

- *What are the services currently provided by marine coastal zones in terms of biodiversity and fishing resources?*

- *Considering the serious situation of some of our coastal zones (coast retreat, dune erosion, etc.), what are the advantages and disadvantages of rigorous restrictions to construction on those zones and the investment in restoration actions vs. the continuation of the current investment trend in tourism infrastructures?*

- What are the implications for ecosystems and their users of the application of fishing restrictions in marine zones of great importance to biodiversity and the recovery of fish stocks?

- What would be the advantages and disadvantages of compensatory benefits for fisherman populations in areas where fishing restriction measures are implemented, such as financial supports to conversion to certified fishing?

Needs considering management options

Nature Conservation Policy/ Natura 2000 Network The Natura 2000 Network is a legislative instrument of EU that in Portugal has resulted, until now, in the classification of 21% of the territory. It implies the application of conservation measures for endangered species and habitats and the restriction in the areas of the network of the activities that can be detrimental for those species and habitats.

Considering the large proportion of national territory that is classified, and that the populations of the areas that belong to the network have many restrictions but, until now, felt few advantages, the following questions must be made:

- *What benefits does the Natura 2000 Network bring for biodiversity in Portugal?*

- *One recommendation of the Habitats Directive is the preservation of the connectivity between habitats and ecosystems. How would the application of that recommendation influence biodiversity in Portugal?*

- *What could be the effects on ecosystems of creating specific financing lines for regions in the Natura 2000 Network, in contrast with the actual policy of having only instruments for conservation being exclusive in those regions (LIFE-Nature)?*

- *What would be the implications for biodiversity conservation and for the social acceptance of the Network of an increase in national and communitarian investments in the Natura 2000 areas?*

- *What would be the effects on ecosystems of two alternative financing policies for Natura 2000 areas: financing directed for managing and law enforcement institutions vs. financing directed for territory managers, such as farmers and forest producers?*

- *What would be the influence on ecosystems of three options related with whom will be responsible for the elaboration and application of management plans for Natura 200 areas: 1 – The central administration; 2- The municipalities; 3 – These two entities together?*

- *What are the damages caused by exotic species to Portuguese ecosystems?*

- Considering the opportunities and the constraints that the creation of the Natura 2000 Network presents to the economic and social development of the areas included in the network, what are the advantages and the disadvantages of the classification of an area in the network?

- What policies should be implemented for a better acceptance of the network by the populations of the protected areas?

Common Agriculture Policy The evaluation of the impact of the Common Agriculture Policy Reform on ecosystems is one of the major priorities of LPN, for the reasons referred on the introduction.

The Reform measure that should have more impact is the decoupling of the subsidies from the production, which means that subsidies given to the farmers will no longer depend on the agricultural and livestock production (number of animals, number of farming hectares, etc.), being substituted by a payment according to historic production levels, as long as agricultural/livestock production is maintained and the local eco-conditionalisms are respected. In extreme cases this measure can lead to the abandonment of farm fields and to the raising of crops according to a market logic.

Other major possible change is the increase of almost 30% of the Portuguese quota of meat producing cows, which combined with the previous measure could lead to the conversion of significant parts of arable cultures into zones of extensive livestock production. The cereal fields on the South of Portugal would, probably be the most liable to this conversion.

One of the accompanying measures of CAP, the anticipated retirement, could also lead to the concentration of ownership of farm land in a few individuals, since that with the aging of agricultural population, the fields left by the older farmers are bought by farmers with high financial capacity, and start being managed in great properties.

Thus, the following questions are important:

- *What will be the impact of the decoupling measure of the CAP reform on the biodiversity of agricultural and socio-economic systems? And the impact on land planning, considering ecosystems which are complementary to agriculture?*

- *In which way the conversion of arable cultures to extensive livestock production could affect ecosystems?*

- *In which way the accompanying measures of the CAP, as the anticipated farmer retirement, can affect the biodiversity of agricultural ecosystems?*

- *What will be the impact of CAP agro-environmental measures on biodiversity (integrated protection; Zonal Plans; support of rainfed agriculture, rainfed olive groves, "lameiros" etc.)?*

- *What is the model of agro-environmental measures that would best fit our rural areas (measures with a national scope vs. specific measures for similar regions)?*

- *In which way are the Birds and Habitats Directives being respected with the application of the CAP Reform (does the legal normative of the Reform compel the fulfillment of these directives)?*

- *In which way the increase of majoration measures of rural development from 75% to 85% could affect Portuguese ecosystems?*

European and National Energetic Policies The application of the Kyoto Protocol, the National Plan of Climate Change, the guidelines of the Portuguese Energetic Policy and the Communitarian Directive on Electricity Production from Renewable Sources implies targets for the national energetic policy. Namely:

- Until 2010, 30% of the national electric energy must have origin in renewable sources;
- Portugal has already exceeded its CO_2 emissions increase limit of 40% till 2010. If this value is not reduced, the country risks the payment of a fine.
- The measures planned by the administration to accomplish these goals include the construction of large hydroelectric infrastructures (dams) and wind farms. These infrastructures have potential negative impacts in natural areas, thus their effect on ecosystem services should be analyzed (in relation to the negative impacts of dams; the wind farms can cause loss of landscape value, bird mortality and soil erosion in the access areas to the generators).

Thus, the following questions are important:

- *What are the consequences for ecosystems of three alternative policies to accomplish these goals: one based on hydro-power, other based on wind power and the other based on other kinds of renewable energy and in the global increase of energetic efficiency?*
- *Is it possible to accomplish the 30% renewable target without large dams, resorting to energetic rationalization and to the investment in renewable energies of low environmental impact? What would be the economic, social and environmental costs of this alternative approach?*
- *What cumulative impacts are associated with the construction of wind farms in mountain ridges of natural areas?*
- What would be the consequences of the application of energy efficiency measures in order to diminish emissions, in contrast to the payment of the referred fine?

Castro Verde Zonal Plan; LPN Biological Reserves Management The pseudo-steppes of Alentejo are one of priority intervention habitats for LPN, considering the history of conservation projects effectuated in these areas, namely Castro Verde. The fauna conservation actions in the LPN Biological Reserves, where the biggest concentrations of endangered species are localized, are having a great success, as well, at the scale of the Castro Verde ZPE, the Zonal Plan, which has permitted to associate biodiversity conservation with the maintenance of the incomes of the farmers in the region, and is the only Zonal Plan in Portugal that is being applied.

However, the problems of soil erosion and desertification in the region have not been solved yet, problems that the actual agricultural system aggravates. Thus, the following questions are made:

- *What are the services provided by the Castro Verde pseudo-steppes? What would be the advantages and disadvantages of their reconversion to zones of "Montado"[10] ?*
- *What are the negative and positive impacts of the land uses allowed by the Castro Verde Zonal Plan?*
- *What is the reproducibility, considering the scale of the area of the Castro Verde Zonal Plan, of soil and water conservation measures applied on the demonstration and research projects developed by LPN?*

Turism Policy Tourism is one of the most important economic sectors in Portugal. However, the tourism expansion has caused serious problems on coastal ecosystems, and the industry starts to feel the negative effects of the loss of competitiveness, due to the absence of quality derived from the massification and the degradation of the supporting ecosystems. On the other hand, rural and nature tourism have a great potential, but they do not contribute yet significantly to the economic development of the country and represent a small parcel of the touristic offer.

- *What is the value of two options: development of environmental tourism certification and rural and nature tourism vs. the increase of the quality of the mass tourism, based on large accommodation and sport infrastructures (hotels, marinas, golf fields)?*
- *What is the value of areas in the National Protected Areas System and in Natura 2000 Network for leisure activities of rural and nature tourism?*
- What would imply for Portugal the investment on environmental quality of the touristic enterprizes and the enforcement of the Land Use Plans on those enterprizes?

Water National Plan/ River Basin Plans/ Classified Lagoon Land-Use Plans /Coast Land-Use Plans The Water Resources Plans were recently approved, but some of these plans have not yet been put to practice. These plans must be revised and integrated in the perspective of the Water Framework Directive (WFD), because the Directive demands the integration of all the river basin components (rivers, lakes, estuaries, coastal zones and subterranean waters) and a management by a National Authority and Regional Authorities. This organic reorganization is already occurring in Portugal, with the first results appearing on the new project of the Water Law.

- *What will be the ecosystem consequences of the application of the principle of the recovery of the total costs (including environmental costs) of the use of the resource "water"?*

[10] "Montado" is a woodland managed for agroforestry, where the predominant tree species are cork-trees or holm-oaks. Typical uses are: cereal crop production, cork production and livestock production.

- *How the environmental costs of the use of the resource "water" will be calculated?*

- *How will water prices be established, considering not only the principle of the recovery of total costs, but also the socio-economic differences of the different regions of the country and the consequences for ecosystem services?*

- *Will water prices for agriculture, calculated according to the WFD (integrating the costs of the environmental impacts), be compatible with the present models of agricultural development?*

- How will the WFD objectives be articulated with the priorities of the Water Resources Plans, considering that some of the priorities consigned on the present plans are not totally compatible with the maintenance of the good condition of ecosystems?

- How the water resources planning will be articulated with land use planning, considering that the most significant pressures and impacts are a result of planning options?

- What water bodies will be classified as artificial or strongly modified, being subjected for that reason to less demanding requirements and what are the consequences for the ecosystems in which those water bodies are integrated?

- What definition of good ecological condition will be adopted by Portugal, and how will it be a guarantee of the non-deterioration and recovery of the freshwater supplies?

- What will be the consequences for the services of the ecosystem "Inland Waters" of the restriction of motorized activities in dams, being discussed on the context of the preparation of the Land-Use Plans for Classified Lagoons?

- In what measure does the application of the polluter-payer and user-payer principles will be a guarantee of the protection of ecosystems and not only a revenue source for the managing entities?

Local and regional management options

- *What are the expected impacts on ecosystems services from the river basin diversions between Douro and Tejo, through the sub-system Sabugal-Meimoa? What would be the impacts on biodiversity of the alternative of irrigating Cova da Beira with water from other sources and/or the channelling of the water from Douro directly to the irrigation pipes, without placing the water in the Tejo basin streams?*

- *In the case of the Odelouca dam, what would be the costs and benefits, of opting for the use of aquiferous resources to satisfy water needs, as an alternative to the construction of the dam?*

- What is the predicted economic, social and environmental outcome for the Multiple Purpose Enterprize of the Alqueva?
- In the Multiple Purpose Enterprize of the Alqueva, what would be the consequences for ecosystem services of the implementation of the planned 110.000ha for irrigation?
- What are the potential impacts on ecosystem services that would result from the planned diversion between the Tejo and Guadiana rivers, associated with the Multiple Purpose Enterprize of the Alqueva?

2.6 Ministry of Agriculture, Rural Development and Fisheries - Office of Environmental Audit [11]

2.6.1 Background

The Environmental Audit Service of the Ministry of Agriculture, Rural Development and Fisheries has its genesis on a new framework of political orientation in which it is considered that the development of the sectors tutored by this Ministry could not be dissociated of their environmental dimension, implying that farming practices must safeguard natural resources and the quality of rural and natural areas.

Ecosystems assure different functions essential for the environmental equilibrium: production of market goods, landscape, biodiversity, soil protection, hydrological cycle regulation, air quality and cultural patrimony.

Agriculture and forest occupy 71% of the territory and use 73% of the captured water, and therefore they interact with the remaining ecosystems in a particularly relevant way. This interaction is influenced by the adoption of political measures with affect management options at the level of the agricultural and forest producers.

On the other hand, the structural and edaphic-climatic conditions vary substantially in the territory, resulting in a great diversity of situations of ecosystem functioning.

2.6.2 Information needs

From the point of view of the design of sectorial policies it would be interesting to investigate for the agricultural and forest ecosystems the following issues:

- What has been the evolution of the services of the main ecosystems and of the respective drivers?
- What is the economic value of the services provided by ecosystems?

[11] Auditoria Ambiental do Ministério da Agricultura, Desenvolvimento Rural e Pescas

- What are the effects of the evolution of agricultural and forest ecosystems on other ecosystems?
- In terms of the landscape service, what are the principal ecosystems that should be maintained in the national territory, what is their characterization and what monitoring indicators should be used?
- In terms of the biodiversity service, what are the principal ecosystems for the preservation of the wild and domestic biodiversity (habitats and wild species, autochthonous races, regional plant species), what is their characterization and what monitoring indicators should be used?

2.7 Ministry of Public Works, Transportation and Housing - Office of Environmental Audit[12]

2.7.1 Background

The Environmental Audit Office depends directly on the cabinet of the Minister for Public Works, Transports and Housing and it is responsible for the support, consultation, coordination and supervision of the environmental impact of the actions developed by the Ministry.

The activity of this office consists of, among other actions, giving advices relatively to environmental questions; maintaining updated information about technical, economic, scientific and legal aspects related with the sustainable development and environmental valuation; communicating actualized information about environmental technical and legal matters to the ministry services responsible for studies and works with environmental impacts; collaborating with national and foreign organisms in its area of jurisdiction.

2.7.2 Instruments and response options

The Ministry of Public Works, Transports and Housing, through the Environmental Audit, has joined the assessment process according to the following facts:

- The transports sector either through the implementation of infrastructures, or through the management of transports systems affects ecosystems significantly;
- The Environmental Impact Studies developed during the decision process on the principal linear infrastructures (roadways and railways), have allowed the MOPTH to identify some of the most direct impacts on habitats (with habitat fragmentation ranking probably as the most significant). However, the evolution of those impacts after the implementation of the infrastructures, given that there are no systematic monitoring programs;

[12] Auditoria Ambiental do Ministério das Obras Públicas, Transportes e Habitação

- Moreover, with the implementation of Natura 2000 Network, the necessity of evaluating the impacts of infrastructures on the Natura 2000 Network arises, and also the necessity of ecosystem valuation so that compensation with areas of the same conservationist value can be implemented, in the fulfillment of the European directive.

- During the operation phase of a transport system, questions arise on how ecosystems are impacted, namely with respect to air quality, greenhouse gases emissions, noise, etc.

In synthesis, the creation of criteria for ecosystem valuation is of interest to the transportation sector, with the goal of better implementing:

- The internalization of environmental costs in the project value – compensation of the changes to ecosystem stability and of ecosystem degradation to be caused by an infrastructure.

- To prepare a way to the acceptability of the "Environmental Responsibility" and "Polluter/User/Payer" principles.

2.7.3 Information needs

Land use

The national road network implemented by the National Highway Plan 2000 (PRN[13]) has changed land use and has induced major changes, along the zones parallel to the roads, because of the attractiveness of those infrastructures for populations:

- What is the importance of those changes in terms of the national territory?

- What knowledge exists about the most significant services provided by ecosystems that are affected by roadways and railways?

Biodiversity

- Recognizing the construction of linear structures as elements that contribute for the fragmentation of habitats, what is the impact of the PRN on biodiversity at the national level?

Economic Valuation Instruments

One of the questions raised currently is how to finance the conservation of built infrastructures (roads and railways). In order to answer these question, several studies are underway comparing different ways of financing conservation (tolls, taxes on the sale of equipments, fuels, etc.)

[13]Plano Rodoviário Nacional

- How can ecosystems be evaluated and how to internalize the impacts of infrastructures on ecosystems in taxes aiming to finance conservation of those infrastructures?

- What criteria should be considered in the economic valuation of habitats affected by the implementation of linear infrastructures?

2.8 ExtEnSity Project

2.8.1 Background

The ExtEnSity Project – Environmental and Sustainability Management Systems in Extensive Agriculture, is promoted by Instituto Superior Técnico (IST) and is financed by the Life Program of the European Commission.

Objectives of ExtEnSity

- Create a sustainable management system (SMS), simple and with low costs, for extensive agriculture, comprising environmental, social, economic, operational and food security aspects, integrating progressive levels of demand.

- Develop an iterative approach for the SMS, including, as possible intermediate steps, integrated agriculture, organic farming, certification of origin, green accounts, ISO 14001 and EMAS.

- Obtain farm level indicators of sustainability for the SMS, by re-scaling from the national and European scales.

- Develop specific criteria for the regions of Dão-Lafões, Beira Serra, Serra da Estrela, Cova da Beira, Beira Interior Sul, Alto Alentejo, Alentejo Central, Baixo Alentejo, and for the following agro-ecosystems: mountain; irrigated pasture; pasture under olive groves; *Montado*; cereal pseudo-steppe.

- Apply innovative aggregation methods to evaluate tradeoffs between sustainability indicators. Contribute to the test of their applicability for the Resource Strategy of the 6^{th} Environmental Action Program of the EU.

- Promote the economic viability of the SMS for farmers.

- Promote the SMS to consumers, increasing their interest in sustainable products.

Actions and Means Involved in ExtEnSity

ExtEnSity project is developed in two main phases. During the pilot phase, the first version of SMS is developed and implemented, intervening on a pilot set of farmers, their commercialization chains and their consumers. In this process, support is given to the farmers in agronomy, management, distribution and

marketing, and dissemination to consumers is carried out. The environmental, economic and social results of the pilot phase are evaluated, using the information obtained for the SMS and additional monitoring of the farms, the transformation and commercialization chains. Based on these results and on a characterization of the farmers in the project intervention area (the south half of interior Portugal), the generalized phase adapts the SMS, disseminates it to the farmers and implements it in a large group of farmers. The results of this stage are also evaluated and based on them the project is disseminated in Portugal and the EU.

The ExtEnSity project guarantees that the SMS offers multiple economic benefits for the farmers: reduction in implementation costs (due to the application to multiple farmers); fulfillment of legal norms; reduction in operational costs (through reduction in resource use and improvements in management techniques); better prices at the consumer (through the dissemination to consumers); improvement in agri-environmental subsidies; revenues from other activities (namely tourism).

The ExtEnSity project involves environmental (LPN – League for the Protection of Nature), consumer (DECO – Portuguese Consumer Defence Association) and farmer NGO's (CAP – Confederation of Portuguese Farmers; ANCOSE – National Association of Serra da Estrela Sheep Breeders), public authorities (IDHRa – Institute of Rural Development and Hydraulics; Environmental Auditor of the Ministry of Agriculture, Rural Development and Fisheries), research organisms (AESBUC – Industrial Association for the School of Biotechnology, INIAP – National Institute for Agricultural and Fisheries Research), a control and certification company (SGS Portugal), a pasture and fodder seeds commercialization company (Fertiprado – Seeds and Nutrients), and a marketing, tourism and environment consulting company (DECOECO – Environmental Projects).

For the pilot stage, the Project has assured the participation of 8 agricultural companies (5 with their own commercialization chains; Terraprima which manages Quinta da França is included in this group).

2.8.2 Information needs and response options

It is necessary generic information, in order to establish management goals and to calculate costs and benefits, and it is necessary information to support concrete management options: permanent pasture vs. forest (non-irrigated areas); level of irrigation use; organic vs. "sustainable" animal husbandry; cattle stocking rates. The concrete management options are presented according to a hierarchy, beginning with planning questions and proceeding successively to more technical and operational questions.

What criteria and sustainability goals should be used?

The ExtEnSity project requires the definition of criteria and sustainability goals discriminated by geographic area and agro-ecosystem, as was described above. These criteria and goals will be the basis of the norm that will be used to certify farmers and to guarantee to consumers their performance with respect to

sustainability.

What are the environmental costs and benefits?

Additionally, it is necessary to calculate the environmental benefits and costs of farmers' activity, identifying the private and social costs/benefits, and permitting the calculation, on an accurate and fair base, of the reward for the social benefits (that should occur through the agro-environmental subsidies).

What kind of system should be used in dryland areas: permanent pasture or forest?

In a global perspective, the fundamental question for the sustainability of animal production is the possibility that it could be more sustainable to induce a transition in human food consumption towards a much higher proportion of plant products. However, considering the conditions where extensive animal production appears in Portugal, the alternative of production of food directly for human consumption in general does not exist. In fact, agricultural policy in Portugal is now encouraging the transition from rainfed cereal crop systems to extensive animal production based on rainfed permanent pastures. However, there would also be the possibility of conversion to forest systems, naturally subjected to longer transition periods and possibly incompatible with the climatic and edaphic conditions (in the latter case, highly degraded due to the cultural systems used in rainfed cereal crops). The forest systems would be more favorable in terms of carbon retention and possibly of soil protection and regulation of the water cycle. In terms of biodiversity, the relative performance of each system will probably be much dependent on the specific conditions of each place.

What should be the level of irrigation use?

The optimization of the economic results of extensive animal production, associated to more dynamic companies, namely in areas such as steer finishing or sheep for milk production, in general results in an increase in the use of nutritional sources coming from irrigated areas (namely irrigated pastures, alfalfa, maize and soybean). Now two successive questions appear: whether to convert rainfed areas to irrigated areas; having done that conversion, whether to use those irrigated areas for animal nutrition or directly for human nutrition.

Organic animal husbandry or "sustainable" animal husbandry?

An important component of the discussion about sustainable agriculture is related to the role of organic farming. It is necessary to determine what are the situations in which this is the most sustainable solution, and what are the situations in which other systems, with characteristics to be defined, would be more sustainable.

What should be the cattle stocking rate?

Within the ExtEnSity framework, the optimization of extensive animal production is done through the installation of biodiverse pastures with an adequate balance between legumes and grasses, allowing large eco-efficient gains in production and increases in soil fertility (leading to a larger capacity for water and nutrient retention). However, this increase in animal pressure leads simultaneously to a reduction in the services of biodiversity protection.

Section 3

Conclusions

In this chapter we make an overview of the information needs and response options of the Portuguese Assessment users. The user contributions are summarized in tables 3.1 to 3.4.

3.1 General user needs

All users stressed the need for tools for economic evaluation of ecosystem services and for assessing the condition of ecosystem services (Table 3.1). Economic evaluation of ecosystem services has received some attention over the last decade, but a wider application of that methodology will depend on developing ready-to-use tools for users. One problem that arises in the evaluation of the the condition of ecosystem services is how to define the reference condition. Other problem is how to use the condition of an indicator, such as the diversity of a taxon, to infer the condition of the services that an ecosystem provides.

A problem raised by some users is the the equity of environmental benefits. For instance if a farmer protects an ecosystem service that benefits people in a city several kilometers away, how can we ensure that the farmer is compensated? Another example would be the inhabitant of a Natural Park that is not allowed to

	Economic Evaluation of ES	Assessing Condition of ES	Equity of environmental benefits	PAC and Nitrate Directive	History of land-use	Natural Parks and Natura 2000	Agro-environmental measures
CONFAGRI	x		x	x	x	x	x
ICN	x					x	
MOPTH	x					x	
MADRP	x	x			x		
LPN	x	x	x	x	x	x	x
CELPA		x					
INAG	x	x					
EXTENSITY	x	x	x				x
PNPG	x	x					

Table 3.1: General user needs

build a certain infrastructure because of Park regulations protecting an ecosystem service that benefits the population at a national level.

The Small Farmers Confederation and the League for the Protection of Nature raised questions on what will be the impact of European Union Directives on ecosystems and on the livelihood of the farmers. There also questions about how to implement at the local level some of the measures of those directives.

Spatially explicit information on the history of land-use change over the last century is virtually non-existent. Even for the last decade, spatially explicit data on land-use change has not been systematized. Users feel that it would be extremely important to systematize data on land-use change and to make that data available.

Natura 2000 is a network designed to protect area that represent unique ecosystems of the European Union, and is now starting to be implemented. Questions have been raised on the socio-economic impacts of the implementation of these new protected areas, and on how infrastructure and agricultural development can be made compatible with the goals of Natura 2000.

One component of the Common Agricultural Police is the implementation of agro-environmental measures, this is, subsidies for agricultural practices that are friendly to the environment. The Confederation of Farmers would like to know what is the economic value of the ecosystem services provided by small farmers, so that it could use those values as indicators in the negotiation of agro-environmental measures with the national government.

3.2 Prioritary ecosystems and regions

Forest and Agriculture are indicate as prioritary ecosystems to assess by most users (Table 3.2). Ecosystems that are next in the scale of priorities are Oceans & Coast and Inland Waters (including wetlands). These four ecosystems are being assessed in the pilot study of the ptMA. Finally, a few locals and regions have also been suggested for assessment, and those areas have been incorporate in the ptMA as study cases.

	Forest	Agriculture	Oceans & Coast	Inland Waters	Other
CONFAGRI	x	x			
ICN	x	x	x	x	River Basin in Alentejo
MOPTH	x		x		
MADRP	x	x	x		
LPN		x	x	x	Farm in Castro Verde
CELPA	x				
INAG			x	x	
EXTENSITY	x	x			Farm in Beira Interior
PNPG	x	x			Sistelo region

Table 3.2: Prioritary ecosystems and regions.

	Consumer behavior	Legislation	Agricultural practice and land-use change	Resource and nutrient consumption	Erosion & Pollution	Species Introductions	Climate Change	Infrastructure construction
CONFAGRI		x	x			x	x	
ICN		x	x	x				x
MOPTH			x		x		x	x
MADRP			x					
LPN	x	x	x		x	x		x
CELPA	x		x	x	x			
INAG		x	x	x	x		x	
EXTENSITY			x					
PNPG		x	x					

Table 3.3: Prioritary drivers and response options.

3.3 Response options and prioritary drivers

Agricultural practice and land-use change are the most important drivers to assess according to the users (Table 3.3). Furthermore, we are now facing a few management options in agriculture and forestry including:

- Choice between intensification of agriculture and forest plantations versus extensive land use pratices
- Choice between biological agriculture and traditional agriculture
- Introduction or not of GMO's and exotic forest species

Users would like to see assessed the impact of several pieces of legislation on ecosystem services, including the Common Agricultural Policy, the Nitrate Directive and Natura 2000 Protected Areas Network. Users are also concerned about the effect of erosion, pollution, and resource consumption on ecosystem on their services. The fragmentation of habitats and the direct impacts caused by infrastructure construction, particularly highways, railways, and urban development, also rank high on the concern of users. Finally, climate change, consumer behavior and species introductions are indicated as other drivers worth studying.

Both the Ministry of Public Works and the League for the Protection of Nature have raised questions on the best approach to comply with the Kyoto Protocol. At least two response options have been equationed:

1. Development of wind farms and other alternative energy sources
2. Reduction of energy consumption

3.4 Prioritary ecosystem services

All users suggest that biodiversity should be assessed by the ptMA (Table 3.4). The ecosystem services ranking next in the users priorities are: Recreation & Culture; Soil Protection & Flood Protection; and Primary Productivity & Climate

Regulation. Tourism contributes to about 1/5 of the national gross product (direct+indirect contribution)[1], therefore is not surprising that it ranks very high in the user concerns. An important component of the Recreation & Culture service mentioned by the users is the landscape value. This is, many people place a high value on the conservation of a given type of landscape, for instance the agricultural landscape "socalcos", where a mountain slope is divided in agricultural terraces at successive heights. The role of the Portuguese forest and other ecosystems as carbon sinks, and the ways in which the climate regulation service may be improved is important in order to Portugal fulfill its Kyoto Protocol requirements. The role of forest and of different agricultural practices in soil and flood protection has recently gained even more importance, after the largest wildfires in recent Portuguese history affected an area of more than 330 00 ha. Among the provisioning services, users prioritize food and water production. Among provisioning services, users give priority to Food and Water.

	Food	Water	Fiber	Biodiversity	Primary Productivity & Climate Regulation	Soil and Flood Protection	Recreation & Culture
CONFAGRI	x	x		x	x	x	x
ICN	x	x	x	x	x	x	x
MOPTH	x	x	x	x	x	x	x
MADRP				x			x
LPN	x	x		x	x	x	x
CELPA			x	x	x	x	
INAG		x		x	x	x	
EXTENSITY	x			x	x	x	x
PNPG				x			x

Table 3.4: Prioritary ecosystem services

[1]WTTC, Year 2001, Tourism Satellite Accounting Research.