

Mab
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ECOLOGICAL PERSPECTIVES ON MEDITERRANEAN FORESTRY*

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Summary.— A. Foreword. B. Main ecological features of mediterranean environment: 1. Dinamicity. 2. Human settlement and exploitation. 3. Cultural aspects. C. The W-Mediterranean situation. D. Main ecological areas of research: 1. Inventory. 2. Functional studies. 3. Modeling. E. Forest management: 1. Afforestation. 2. Forest policy and management for timber. 3. Forest policy and management for grazing. 4. Forest policy and management for recreation.

A - Foreword

Although the authors were not present at the previous Expert Panels on Project 2, after a review of the documentation issued by them, believe it could be interesting to contribute, with some synthetic effort, to the ordering of problems in mediterranean forestry, mainly from a west-mediterranean point of view, centered in the particular ethnic and sociological conditions of the Iberian peninsula.

With this goal in mind, we present this paper, beginning with a survey on the main features of the mediterranean extra-agrarian ecosystems, followed by a selection of research areas and some ideas on problems linked with forest environment management.

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B - Main ecological features of mediterranean environment

All the extra-agrarian systems are connected with human activity, now and before; also with grazing and browsing animals at least from Miocen. The mediterranean landscape is a result of discriminate activity, from poor grasslands, "matorral", "chaparral-maquis", to natural forest to be found only in very restricted areas. The old mediterranean forest, is traditionally grazed, remaining very far from the climax everywhere.

We will put emphasis on several outstanding aspects:

1. *Dinamicity*. Climatic seasonal oscilations, with difficult periods for plants and soil organisms, are responsible of slow succession, with immature states dominant. From a practical point of view, favouring mature strates of seral succession is very often too expensive, mainly on eroded fossil soils.

2. *Human settlement and exploitation*. We have inherited such systems including men (trophically integrated), with their cultural patterns allowing conservation of a differentiated landscape. This closed system is more and more open now, offering also opportunities for external influences. In order to ensure the continuity of this discriminate exploitation we are facing two possibilities, the intrinsic and extrinsic one.

a) The common approach is the direct external intervention, like: afforestation, dams, national parks, recreative settlements, etc. Owing to our scarce knowledge of the whole system, the impacts of these actions are largely imprevisible, inducing a disorder (noise) that overruns its absorbing capacity.

b) The cheapest will be the intrinsic one, promoting autochthonous actions to improve rural life conditions, ensuring spontaneous adjustments with evolution of these cultural patterns and preserving the ancient gradients of exploitation, from village-farm versus the more buffered natural reserves.

Obviously the last approach, with internalization of foreign actions, will allow an increase of the homeostatic mechanisms, diversity, persistence, hardiness against fire and pests, etc., providing also very plastic systems producing to men (high quality food, timber, nature conservation), without large subsidiary energy.

3. *Cultural aspects*. We are working in a country with a very old culture, providing a lot of behavioural patterns (routines) wich ensure persistence of diversified social structures.

Now, with a more opened systems, the ancestral routines are in the way of collapse. In our meaning that is the first problem: it is necessary to save the valuable adjustments (like biological clocks).

In order to achieve this goal the first step is the whole knowledge of these routines, not only from a social point of view but integrated in a very complex rural system. The second step is prevision of impact from several extrinsic actions and the assimilation capacity for every rural system, often very low. With this basic knowledge it is possible the planning of educational programmes embodied in pilot farms, villages or rural districts, coupling the extrinsic information input with the autochthonous cultural patterns.

1. *Afforestation.* Trees with their deep roots can hasten the soil regeneration, specially when indigenous pines are seeded or planted, among *rests of natural vegetation*.

Often the afforestation projects embrace large areas with uniform treatment, favouring the outburst of pests; extensive soil labour induce weed invasion liable to fire; in some cases, the viability of very old rural communities has been destroyed. To attain an adequate afforestation policy it is urgent a better knowledge on:

- a) The results and ecological status of the afforested areas in the Mediterranean.
- b) The choice of landscape types whose reclamation requires afforestation
- c) Methods of tree installation without soil disturbances.
- d) The effects on the ecosystem of planting exotic trees.

2. *Forest policy and management for timber.* The Mediterranean region was largely destroyed and now the emphasis should be put on reconstruction and conservation of remnants that persist by a discriminate exploitation. The actual and future management should then maintain and favour this discrimination. To attain this goal, small areas of null exploitation should be embeded in the forest and buffered by a gradient of intervention. This type of policy requires a knowledge on:

- a) Forest types to be conserved, relative dimensions of reserved areas and magnitude of exploitation gradients.
- b) Types of protective forests and their effect on the landscape complex (improving water regime, buffering soil-climatic fluctuations, erosion control, etc.).
- c) Development of management for timber technics suited to the mediterranean environments. The often used centroeuropean criteria (clear cutting systems) have noxious effects on the soil.
- d) Effects of heavy machinery use on the ecosystems (forest roads, soil disturbances, fire lanes, etc.) and its minimization.

3. *Forest policy and management for grazing.* In our meaning, no large scale forest management planning can be made, in the Mediterranean without livestock. With timber alone it is not possible to keep a diversified human community. Moreover grazing ensures a greater dinamicity in the cycling elements and the transfer of fertility. However, the grazing of forests includes many unsolved problems:

- a) Livestock effect on soil compacity, regeneration processes. Forest types more adapted to grazing.
- b) Game and livestock interactions, mainly based on their behaviour.
- c) Hedges as a control structure, excluding forest of clearings; their dinamicity; their possibilities against fire; browsers as hedge promoting agents.

Some types of grazed mediterranean forests, near the villages, used for wintering cattle-horses, offer now many possibilities for studying all these problems. In the subpyrenean region this type of forest is called "boalar"

C - The W-Mediterranean situation

Spain, like similar countries, has several bioclimatic modalities, from the subtropical-desert (Almería) to subatlantic (Extremadura) or oromediterranean ones ("Erinacetalia" Quézel, "Astragaletalia" Barbero). Also the continental-mediterranean (Meseta), is typified by the *Juniperus-Pinus* formation or many chaparral modalities in the Meseta and the Ebro valley.

Grazing pressure is very old, beginning probably on Neolithic in restricted areas, increasing after roman pacification. The plow -agriculture is also very old, with the main regional modalities: "Dehesa" or *Quercus* - pig system in the West part, olive-vineyard in the warmer Center, S, SE and E part. The forest remnants are restricted to poor soils and mountains, entoured by degraded shrubs ("yermos", "tomillares", "romerales", "atochales", etc) or recently afforested lands.

Fire and shifting agriculture ("artigüeo") together with heavy grazing, firewood and charcoal obtention, promoted heavy soil erosion and valley sedimentation ("vega" soils formation) in some parts of Spain, favouring also weeds and grassland invasion, dry in summer, liable to burn and modelling also many types of mediterranean fire-forests.

D - Main ecological areas of research.

In the scope of this phylosophy, after our experience and without aiming to give a complete review of the problems envisaged by this MaB project 2, we try to list the outstanding areas of rechearch.

1. *Inventory.* Connected with *floristic and faunistic works*, mainly on ecological indicators, plants and animals. Its insertion into the multinational work programme "Ecotheca mediterranea" is desirable.

Botanical cartography made on a phytotopographical basis (complexes of communities in thopographic sequences), completed with teledetection; cartographic methods explaining human action, the oldest and the recent one, will be desiderable. Special phytosociological works are desired for solving local problems in connection with animals and men pressure, syndinamics, etc.

Ecological cartography integrating the outstanding properties of woodland ecosystems (soil maps, geological and geomorphological maps, patterns of human activities, etc).

2. *Functional studies.* The forest system is characterized by its ability for energy and materials incorporation, supporting a finely diversified structure, suitable for completing the mineral cycles by a predominant vertical transport. This is true in a mature community (climax) on flat soil, but in slopes the gravity determines a continuous lateral export (natural exploitation) preventing high maturity (permanent communities). In open grazed forests, the large herbivores induce also a biotic lateral transport.

In this scope two leading lines of research emerge clearly:

a) The study of processes linked to succession: biomass increase, productivity trends and its allocation by structures, reproductive strategies and mechanisms of regeneration, development of endogenous rhythms, small scale cycles of senescence-rejuvenation, adaptations to a low level of soil fertility, to local climates, etc.

b) The study of lateral transport in all its modalities, mainly the colluvial ones (soil, water-minerals, organic matter, etc), this subject is poorly studied and, in our meaning, very important in order to understand the theory of forest conservation.

The mediterranean climate induce many ecophysiological adaptations to survive periods of stress, increase of albedo (gray color dominant), photosyntetic and respiratory pathways, water economy, that are also important research lines.

In the forest ecosystems, the cycling of materials follows mainly a detritic way (litterfall), feeding decomposer populations; the modalities of descomposition linked with succession, litter persistence (fire liability) and mycotrophic nutrition, are very important subjects of study.

Arthropods and bird communities are in fact controlling agents that ensure a diversified structure. Knowing mutual adjustments of populations would clarify the causes of imbalances, forestry pests, etc.

Game and domestic mammals are integrated in many types of mediterranean forests; their actions, clearing, soil mixing, trampling, browsing and grazing, determine fertility transfers, growth of forest hedges and a patterning of the ecosystems, which are to be studied on the background of animal behaviour.

3. *Modeling.* The MaB programme characterizes a systems approach linked to the great complexity of man and biosphere relationships. This requires a considerable effort in modeling methodologies, which should be fed with data and conceptual schemes coming from the fields of every project.

In relation to the forest project, it is interesting to point out, that large scale actions are being made (afforestation, dams, roads, etc) whose results and impacts have not been systematically observed. Many modeling possibilities, useful to foresee the impacts of such actions, are so being lost. In our meaning, such reasons justify a monitoring programme following every large scale modification.

Our present state of knowledge allows the building of broad, conceptual models, at high abstraction level, suitable to locate the outstanding driving forces and information loads put in the ecosystem.

This paper tends to be a contribution in this framework, offering possibilities for ulterior insertion of more detailed and formal models that represent particular subsystems.

E. FOREST MANAGEMENT

Forest exploitation is a compromise between capitalization and actualization; in mediterranean environment the first should predominate over the second. Moreover, the actions implicated in management and big modifications should be undertaken very cautiously, *in an ordered fashion*, as they are part of large scale experiments. The results should be observed in order to shift adequately the input actions if necessary, and eventually be incorporated in a system analysis research.

Some of the outstanding problems related to the rational exploitation of forests ressources, in the mediterranean environment, are the following.

4. *Forest policy and management for recreation.* The recreation needs are increasing fastly, radiating from urban areas and causing a large impact on extra-agrarian systems. In our meaning the background phylosophy of recreation policy, should be to succeed in *the internalization* of these foreign actions, in such a manner that serve to increase the organization of autochthonous rural systems. Otherwise, as they are many evidences, a rapid decay is induced because this type of actions are the main source of inexperienced and fluctuating perturbations.

The Public Reserve concept embodie the main actions and problems just stated. The null exploitation on large areas is unrealistic, even the Reserves require a discriminated intervention, in order to cheeply drive visitors through natural structures versus areas preadapted to trampling. As there are many similarities between livestock and mass tourist behaviour, it seems urgent a better knowledge of:

- a) People behaviour in Nature and its pattern of landscape choice
- b) Methods of creating infrastructures taking advantage of ecosystem reactions (hedges, paths, picnics and camping areas, etc.)
- c) Interactions between grazing and the areas most heavily used for recreation, as they have the common denominator of resistance to trampling and adaptation to eutrophization.
- d) All the problems before stated in relation to timber, and grazing policies should be had in mind, including the use of fire as a tool for conservation, since fire has modeled many types of actual forests.

Parks and zonal reserves shoul be planned in order to highen the educational level in field ecology of scientificists, managers, rural communities and urban people. The showing of explotation gradients, if persistent enough, will aid very much in attaining this goal, because they *materialize in space the timing* of different treatments.

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