

THE EFFECTS OF REVEGETATION IN THE NATURAL ENVIRONMENT AND PERCEPTION OF THE PEOPLE LINKED TO CAMERO VIEJO (IBERIAN SYSTEM)

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I. INTRODUCTION

During the 20th century, Euro-Mediterranean mountains underwent a process of marginalization, with high rates of emigration, land abandonment, reduction of livestock census and poor use of pasture and forest products. Marginalization, with the abandonment of most of the fields and pastures, encouraged secondary succession processes that favored the expansion of shrubs and forests. Simultaneously, the administration encouraged the reforestation of large areas for economic purposes (the increase of wood and paper pulp production) and environmental objectives (the regulation of floods and prevention of soil erosion and degradation). As a result of these changes, Mediterranean mountain landscapes have been simplified and homogenized, fragmentation has been reduced and many of their cultural values are being degraded, a trend that also involves the loss of local knowledge on sustainable land management.

The expansion of vegetation shows other negative effects, including an increase of fire risk, a reduction in water availability, the concentration of sediment sources in ancient agricultural terraces (which maintain the most fertile and deepest soils), loss of biodiversity and problems for the economic sustainability of the mountain, due to pasture degradation, and the loss of an attractive landscape. On the other hand, we must take into account that the impacts of land use changes in mountain areas occur not only at a local scale, but also at regional and global scales, as mountain ecosystems provide a range of goods and services to the society.

The aim of this study is to investigate the diversity of opinions that people linked to Camero Viejo (Iberian Range) present about the major environmental changes since the mid-twentieth century: (i) vegetation cover dynamics, (ii) soil erosion, (iii) water yield and quality, (iv) fire risk, and (v) changes in wildlife and landscape. This perception will be related to current changes, quantified from land cover and land uses maps, information taken in the administration, and literature of the study area. The final objective is to find out which social groups have a closer or unrealistic perception; in that way, decision-makers could obtain more information to develop and implement new public policies.

II. STUDY AREA

The research was carried out in Camero Viejo, a representative area of the Mediterranean mountains. The extension covers 392.67 km², including 15 municipalities with a global census of 1216 inhabitants in 2012.

Between the 12th and 18th centuries, lands were deforested to favor grazing, in order to feed sheep livestock, which were more than 160,000 sheep in the second half of the 17th century. In the 19th century, many slopes were ploughed for cereal cultivation in order to feed the local population and replace livestock and textile economy, which began its decline during the 19th century. Throughout the 20th century, with particular intensity in the 1960's and 1970's, most of the population migrated, agricultural land and sheep livestock were abandoned, and goat livestock was substituted by bovine livestock, which stimulated a very intense process of plant succession.

The highest altitudes are dominated by the forests of *Fagus sylvatica* and *Quercus pyrenaica*, while at lower altitudes *Quercus rotundifolia* sp. *Balota* appears. Some slopes are covered by pine trees, as a result of reforestation after 1940. Scrublands of *Genista scorpius*, *Thymus vulgaris*, *Rosmarinus officinalis* and *Buxus sempervirens* dominate in calcareous soils, while *Cistus laurifolius* is the most representative species in siliceous soils.

III. METHODS

III.1. Interviews

The assessment and perception of the linked population to land cover changes and their impacts was obtained by 40 in-depth semi-structured interviews. People over 40 years old were selected, so that they might have a temporal perspective of changes; they came from various economic sectors, and presented different environmental sensitivities. Their attachment to the local or foreign population was also taken into account. Among the components of the first group (Group A) farmers predominate. Among the second group (Group B) there is a wide range of people: civil servants, former migrants, new residents and second home owners.

Interviews lasted 1 to 2 hours and were conducted in the interviewee's home, in a public place in his town or in the countryside. They were asked about changes in vegetation cover in recent decades (extent and type), and their temporal and spatial extent. A set of questions was pointed to know the potential environmental impacts of revegetation in soil erosion, quantity and quality of water, fire risk, landscape and wildlife.

III.2. Information about land cover and the environmental impacts of revegetation

In order to evaluate land use and land cover evolution, land cover maps were derived from aerial photographs from 1956 (scale: 1:33,000), 1981 (scale 1:25,000) and 2006 (scale 1:25,000). From literature, information about soil erosion in the study area is provided. The evolution of the number of fires and the burned area was obtained from the Government of La Rioja. The evolution of the water levels was obtained from the Ebro River Administration Office for the period 1945-2006. To get an estimation of the evolution of big game hunt, information on the number of drives carried out, and wild boar, deer and roe deer captures was compiled from the Government of La Rioja.

IV. RESULTS

All interviewees indicated that a revegetation process has occurred in recent decades, which corresponds closely with the land cover and land uses mapping, where field abandonment and the expansion of shrubs and forests is shown.

The majority of answers, especially of the local population, indicate that scrublands and forests have extended themselves, which is a generalized process throughout the territory. Both answers coincide with the results obtained in the mapping.

Interviewees mainly believe that revegetation involves a decrease both in erosion rates in the slopes and in the concentration of the main sediment sources in some terraces. This coincides with what is stated in the literature. Land abandonment was found to usually imply a decrease in sediment production in relation to cultivation.

Almost all interviewees believe that fire risk is now higher due to the increase of plant biomass and combustibility, as is recorded in statistics and literature.

Responses regarding water yield and water quality were very divided, and answers from local people were the closest to the quantitative results obtained in the study area. These results also coincide with the literature in other areas of the Mediterranean mountains. The expansion of shrubs and forests implies profound changes in the hydrological cycle, having checked the decrease in surface runoff due to the interception processes and the higher water consumption by vegetation.

The interviewees from Group A (mainly farmers), the aging population and the least sensitive to environmental conservation noted that one of the negative effects of revegetation is the expansion of wildlife, which causes damage to livestock and orchards. Official information agrees that wildlife has increased.

Interviewees mainly indicated that revegetation improves the landscape, with regard to diversity and aesthetic quality. The analysis based on landscape ecology indices shows that the landscape is more diverse in 2001 than in 1956.

V. CONCLUSIONS AND IMPLICATIONS

For centuries man remained in the Mediterranean mountains, with a high investment of energy and labor, creating a fairly humanized and very heterogeneous landscape. Agriculture especially contributed to increase the complexity and diversity of the landscape with its

diverse range of cultures, adapting agricultural uses to local microenvironments and the use of different models of fields: terraces, sloping, plains and fields of occasional or itinerant use. With the ending of the energy inputs and labor throughout the 20th century, many landscape units lost their “artificial” stability, activating secondary succession processes, which has gradually led to a vegetated landscape with natural features.

The linked population perceives the change: all interviewees noted an increase in vegetation during the last decades. However, there are different answers about the characteristics of the revegetation process. Usually, local population, which consists of farmers, elderly people, with primary studies and less sensitive with the environment, indicate that it is a process that affects the whole territory, formed by shrubs and trees, which began over 40 years ago. By contrast, among the foreign population (consisting of younger people with secondary or higher education, working in the secondary and tertiary sectors, many of them public employees in positions of responsibility in the study area, and who say they are quite sensitive to the environment), there are people who think that it is an exclusive expansion process of scrubs, which colonize specific areas and that it started more than 40 years ago.

Interviewees agree that the revegetation process involves a better soil conservation against erosion, and a higher fire hazard due to biomass accumulation. They differ in hydrological changes involving the revegetation process; responses reattached to locals in one group and the foreign population in another. The local group appreciates that now there is less water yield, but it is a higher quality water, less sediment-laden. In the second group, there are people who believe that now there is more water than in the past. Some clarifications are also observed about the consequences of revegetation on wildlife, being the local population those who more clearly observe the progression of wildlife. Regarding the landscape, the answers are very coincident: the current landscape is more beautiful, although among local population there are some people who remember the traditional agricultural landscape, playing down beauty to the landscape that they observe now.

Scientific studies carried out in the study area and in other Mediterranean mountain areas show that local population have a better perception than the foreign population on the recent changes in the natural environment. Particularly, it should be remarked that public employees, all of them supporting management functions, have the farthest perception of the results provided by the literature.