

Forests and rural development in the light of global change - a perspective of mountain forests

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ABSTRACT

Mountain forests are facing substantial changes. The need to adapt forest management to climate change is overlaid by the consequences of demographic changes that alter the form of land use profoundly. The European policy is aware of the challenges and supports mountain regions by the Regulation for Rural Developments and other strategies. Regional efforts of the Forest Authorities account for the changing ownership structure in order to ensure sustainable forest management and the provision of the dependent ecosystem services.

KEY WORDS

forestry, mountain region, ecosystem services

INTRODUCTION

Global change consists of climate change, demographic changes and land-use change. Climate change in mountain regions manifests itself as an above-average warming with numerous consequences to the water cycle and to biodiversity. Climate change has a strong impact on ecosystem services (Schröter *et al.* 2005). Mountain regions are sources for drinking water, host ecosystems with a high biodiversity and play an important role for carbon sequestration (Beniston 2006, Fischlin *et al.* 2007, Raupach *et al.* 2007). In European mountains forestry is a common form of land use. The productivity of forests will likely be improved due to a longer growing season and higher temperatures, however the risk of production will rise considerably (Fuhrer *et al.* 2006) – Demographic change is evident from the increased

tendency towards urbanization. In mountain regions a typical phenomenon is micro-urbanization, i.e. the development of few villages into units with the typical urban infrastructure.

Forest management is affected by societal changes. Rural areas in mountain regions often offer a limited range of job opportunities. Employment can be found in tourism, in the quite limited administrative jobs, and in the tertiary sector of the economy. The globalisation of the market of agricultural and forestry products has long ago led to the mechanization of land management. Therefore, the job opportunities in agriculture and forestry are scarce. A migration process is often initiated during the higher education of young people, considering that ample options for an education are offered in regional centers. Business opportunities are often linked to tourism.

The Millenium Assessment (Körner and Ohsawa 2007) notes a world-wide decline in mountain forests. In temperate regions, however, the area of forests in mountains is increasing (FAO 2001). This increase is mostly driven by the above mentioned societal changes: High altitude pasture land is under the current market conditions of only marginal economic relevance and is not necessarily maintained. In recognition of the importance of a viable primary sector of the economy for the regional landscape ecology and infrastructure the European Union offers substantial incentives for the continuation of agricultural land management within the Rural Development Programme.

AGRICULTURE AND FORESTRY IN MOUNTAIN REGIONS

In the 19th century forests were an all important source of materials. The resources ranged from timber as raw material, food from fruits and game to energy from wood. Forestry was also the main source of goods that are now provided by the chemical industry (Glatzel 1994). An important resource of forests was also the provision of nutrients for agricultural land that led in many mountain regions to obvious indications of forest degradation (Farrell *et al.* 2000). In the 20th century the picture has profoundly changed. Timber is still a major material for construction purposes, however, readily substitutable by other materials. Forests are no longer crucial for the nutrition of the population, given that we consume mostly cultivated food. Energy comes mostly from fossil fuels. In the later, the role of forests is currently changing. Fuel from renewable resources plays an increasing role, driven by the objectives of the European policy. A major role of forests derives from its ecosystem services.

The use of forests for the production of biofuels requires closer inspection. The European Union imports 70% of its raw oil and thereby uses an unsustainable resource. Technically, biomass and waste can substitute for oil and the biofuel/bioproduct industry is certainly growing. Nevertheless, the significance of forests and especially mountain forests for the production of biofuel should not be over-estimated. In order to have a meaningful role in the production of biofuels the site productivity needs to be high. The productivity of mountain

forests may often be too low and mountain forests may at best play a regionally relevant role as a resource for biofuels. Other adverse factors for biofuels are the demand for nutrients that quickly may exploit a mountain soil, and the recognized limits of available land.

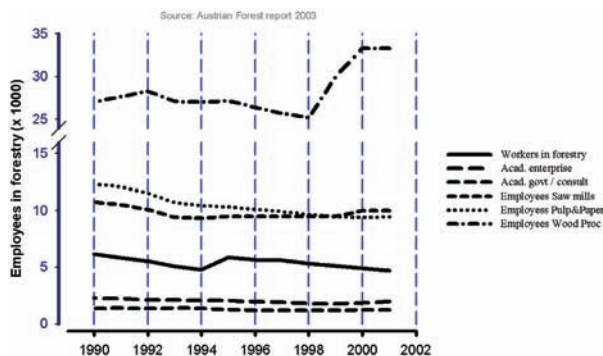


Fig. 1. Employment in the Austrian Forest Sector (Austrian Forest Report 2003)

Figure 1 shows the employment in forestry on the example of Austria. Similar trends have been documented for other countries in Central Europe. The number of employees in the forestry sector is slowly declining. This applies especially for forest workers. Forest enterprises have several decades ago faced the need to mechanize the entire production line and are no longer providers of local employment in mountain regions. Farmers and forest owners are no longer the majority in many villages in mountain regions. Forests are not necessarily sold, when their owners work in other professions. However, the region needs to offer alternative employment options in order to ensure that forestry can be pursued as a secondary profession. The employment in the wood processing industry is stable or even increasing. Accordingly, the wood-processing industry is a great opportunity for the rural development. Wood processing is increasingly developing into a high-tech industry. That implies that it provides employment opportunities for many professions, ranging from forestry, wood technology, chemistry, business administration to all the supporting professions. The challenge for politicians is to create a convincing environment with respect to the regional infrastructure so that the wood-processing industry is kept in the region.

Forestry and agriculture are directly linked. One reason is that farmers in mountain regions often also own

forest land for historic reasons. Agriculture in mountain regions is increasingly getting marginal. The crop production is mostly a remnant of times when local food production was a requirement. Often the site conditions limited the agricultural use to grassland and pastures. Several times in history the deforestation has reached a dangerous level and brought in its wake natural disasters such as flooding, erosion, and avalanches. In many regions a wealth of experience on the virtues of a high forest cover has been collected. It is now the foundation of forest sciences and civil engineering. The land used for agriculture had a significant on the landscape and even has an impact on tourism by shaping the expectation of tourists towards the appearance of the land. During the last century a continuous migration from employment in agriculture to tourism has taken place and agriculture is now confined to the more productive sites. Reforestation of the unmanaged agricultural land was an obvious choice and has occurred to a certain extent, but did often not create the desired landscape.

Forest management is in a precarious situation. Forests are capable of protection against the above mentioned natural hazards. However, one can not rely on a form of biological automatism in order to exploit the protection potential of forests. Instead, it is required to manage the forests insightfully, with the objective of protection against natural hazards, even at the expense of wood production (Bebi 1999). The strategies are regionally different, but involve the choice of tree species (retaining precipitation in the canopy; transpiration of soil water; longevity) and the maintenance of an optimised stand structure (spatial distribution of trees, age structure). An example of such a stand structure is given in Figure 2.

Forestry in mountain regions requires skilful management in order to be economically worthwhile. Forest owners claim compensation for the numerous ecosystem services they are providing for the society. Until now these compensations did not materialize for several reasons. One obstacle is that forest science has so far not offered a translucent scheme for the financial evaluation of the ecosystem services they are providing. An even stronger obstacle is that the ecosystem services come in the wake of forest management. Although many are benefiting directly, it is difficult to single an economically potent group of beneficiaries out from whom monetary compensations can be claimed. The concise economic

evaluation of ecosystem services is a rather young field of research. A recent survey has shown that the ecosystem services in descending order of esteem are biodiversity, scenic beauty, timber production, watershed protection, and carbon sequestration. When asked for which of these ecosystem services would be willing to pay directly, the sequence is changed to carbon sequestration, watershed protection, biodiversity, and scenic beauty (Joachim Sell – personal communication, Koellner and Scholz 2007).

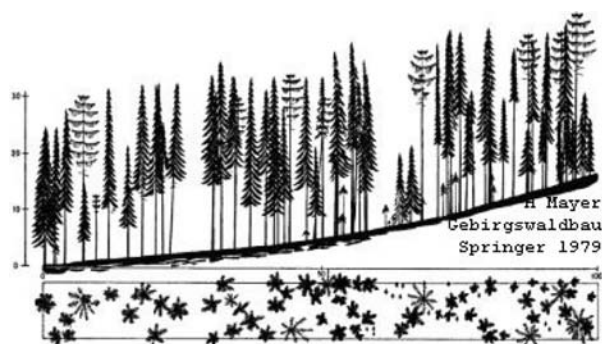


Fig. 2. Forest stand structure in a montane forest in the Alps. The uneven aged stand consists of different tree species (Mayer 1979)

EUROPEAN POLICY WITH RESPECT TO MOUNTAIN FORESTS

The support structure for owners of mountain forests is divided in several strategies. Most policies have their foundation in agriculture and are applicable for forestry. Given that many farmers in Europe also own forests a strict distinction seems not critical. However, especially in mountain regions many enterprises are solely based on forestry. Examples are property of the Confessional Groups such as the Catholic Church or the tracts of land owned by the former Austrian nobility.

Specifically geared towards forestry are the European Forestry Strategy and the Forest Action Plan. In recognition of the need of concerted actions the Ministerial Conference for the Protection of Forests in Europe (MCPFE) was formed. In an ongoing discussion process it issues resolution on all aspects of forestry. Mountain forestry is commonly recognized challenge. Therefore, issues regarding mountain forests can be found in many regulations, often as a cross-cutting issue.

Forestry in mountain regions is greatly affected by the Common Agricultural Policy (CAP). Until its reform in 2003 land owners received direct payments. Since then the support of agriculture rests on two pillars, the direct payments, and the rural development policy. The peculiarity of the rural development policy is the support of local initiatives rather than the persecution of centralized programmes. This policy has proved to be highly successful and is much envied by non-European communities, such as the United States of America. The Regulation for Rural Development recognizes the need to support of communities in areas with economic difficult conditions due to limitations that are base in ecological factors. It is a clear European objective to redistribute financial means in order to ensure a sustainable land management and in order to give incentives to strengthen the economic power of such regions. The target is give incentives that counteract the migration away from rural regions into cities.

The European policy on agriculture is supported by the Standing Committee of Agricultural Research (SCAR). As its name indicates, this committee deals with all aspects of agriculture and forestry is not necessarily the biggest issue. Nevertheless, the committee states that wood is recognized as Strategic Material for Europe. Wood is currently amply available because the European forests cover is high and further expanding and the periodic harvest is substantially below the increment. The strategy is to utilize forest, instead of protecting it. That means that less emphasis is on the creation of natural reserve. Instead, the role of wood and wood products in a knowledge-based bioeconomy is sought. The objectives are:

- To meet the multifunctional demands on forest resources and their sustainable management,
- To enhance the availability and the use of forest biomass for wood products and energy,
- The development of intelligent and efficient manufacturing processes,
- The development of innovative products for changing markets and customer needs,
- The deepening of the forestry sectors' scientific basis,
- To take advantage of emerging sciences.

Many of these claims are commonly expressed and are not necessarily new.

REGIONAL INITIATIVES – CASE STUDY PROVINCE OF TYROL

The mountain-dominated province Tyrol in Western Austria has faced unprecedented changes in the last century. In the past in many valleys agriculture and forestry have been providing most of the income for the population. Accordingly, the inhabitants were traditionally closely linked to land management and to forestry in particular. Now, tourism is the strongest pillar of the economy and the people are directing their efforts there. A professional career in forestry is now the exception. The forest authority faces the challenge to ensure the refined way of forest management that ensures the provision of the above mentioned ecosystem services, most notable the protection against natural hazards. However, the forest authorities can no longer approach the expert forest owner. Less than half of the forests are managed by forest enterprises. Instead, many forests belong to persons who work in other professions, in large distance from their forest property, and who devote only little time to the inspection of their forests. Under these circumstances a sustainable forest management is not ensured and the provision of ecosystem services is jeopardized. The revenue from harvesting operations is only a small incentive for forest owners, given that the productivity of the forests in mountain regions is low and that the costs of a logging operation in difficult terrain are considerable.

The strategy of the Tyrolean Forest Authority is to supply the forest owner with sufficient information to make management decisions easy. The Forest Administration has created a comprehensive data set on their forests, that is easily accessible to the forest owner and that is supported by a Geographic Information Systems. Employees of the Forest Administration work in the field and have an overview on the status of the forest. Their level of information and expertise is often higher than that of the forest owners. Accordingly, the Forest Administration takes over the role of the silviculturist. It identifies sites where management activities are recommended and suggests contractors for the practical work. Thereby, the Forest Authority uses its knowledge on the market situation and facilitates even complex logging operations. On demand, even case studies for cost-efficient logging operations are elaborated. The foreseen sequence of events for an

expert-supported management operation is the following:

- The forest owner announces plan for harvest at local forest authority; the location of the harvest operation is selected from database via GIS or directly in the field,
- The forest authority enters the planned operation into a WEBGIS and adds parameters such as area, standing crop, expected volume of harvested wood; a program checks for legal constraints for the logging operation, such as whether or not the chosen is a protection forest,
- The forest owner identifies, based on the available data, for potential contractors and for potential customers,
- The forest authority enters data on the logistics of the operation such as tree species, desired wood assortments, type of harvest operation, transport of harvested wood off the site,
- Potential contractors can access the database, can identify the planned harvest operation and can provide a quote,
- The contractor directly approaches the forest owner,
- The forest authority oversees the operation.

SUMMARY

Climate change alters the condition for forestry in mountain regions substantially. Adaptation to the new conditions is more important than the mitigation potential of forests towards climate change. Demographic changes such as urbanization overlay climate change and have a strong effect on land management. The form of forest management is strongly influenced by actions outside of the forest sector. Forestry and the associated wood industry are still important employers. Headquarters of wood processing enterprises can be attractive nuclei for the regional development. The European policy supports regional initiatives within the Regulation for Rural Development. The sustainable management of forests can be maintained in the future, when the local economic infrastructure allows running small forestry enterprises as a secondary profession. Areas with tourism have an advantage. Active forest management is preferred over the mere conservation of forests in natural reserves.

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