

Forests in Sustainable Mountain Development: a State of Knowledge Report for 2000

Task Force on Forests in Sustainable Mountain Development

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risks of a particular intervention. This can be achieved by an instantaneous simulation of the effect produced on the intermediate theme covers and on the final cover, the recreational value matrix, by variations related to land-use changes, such as road or forest road building, the opening of a ski run, etc.

The flexibility of the classification system applied to the Gardena Valley ensures that the system may be used in other locations with different characteristics. Indeed, the type of land-use and forest-cover classification established for this study was created bearing in mind the various aspects of the territory of the Province and of the alpine area, not simply those related to the Gardena Valley. Therefore only little changes in the knowledge tree are required for new areas. A further improvement of the system could be the proposal of solutions to cope with the cases of high tourist use (related to high recreational value), which the local environment is not able to sustain.

7.3 Income from hunting in mountain forests of the Alps

F. Reimoser

In the Alps, multiple use of the land by agriculture, forestry and hunting has a long tradition (Fig. 7.6). The centuries of parallel use require the consideration of stability in long-term interactions: sustainability. Over the past 50 years, tourism has been a steadily growing economic factor. Hunting played a



Fig. 7.6. Typical hunter in mountain-forest regions of the Alps (photo: Helmut Ctverak).

decisive role in the evolution of this mountain region, promoted both through the interest of royalty and the nobility in hunting game, and providing a source of meat for local people, especially in times of crisis. Hunting remains highly economically and socially important in the Alps today, while in the more densely settled plains and lowlands, it has become less significant.

Currently, mountain hunting focuses on ungulates (red deer, roe deer, chamois, ibex and mouflon); grouse and large carnivores are only rarely hunted. Grouse populations have decreased greatly as a result of habitat modification; carnivore populations, almost exterminated, remain unstable. The forest area must not be seen from an isolated perspective with regard to hunting and game animals; the entire landscape must be considered holistically. Most game species use both forested and open area as habitats; a cultivated landscape, with its alternation of forested and non-forested areas, provides ungulates in particular with favourable habitat.

Hunting affects the development of mountain forests in two main ways: business and national-economic values are provided; and game damage forest plants. In particular the ungulates most sought after for hunting can severely damage mountain forests, e.g. by browsing twigs of young trees and by fraying and peeling (bark stripping). This is especially true for protective forests if such damage prevents them from regenerating sufficiently.

The intensity of the game damage does not only depend on factors such as ungulate density and hunting measures, but also very markedly on the predisposition of the forest to game damage, silvicultural management and disturbance of game by tourism (Reimoser and Gossow, 1996). Therefore, when considering the role of the forest in the sustainable development of mountain regions it is important to recognize both the influence of hunting and game on the forest and that of forest management on game and hunting. Three key silvicultural influences on the forest–game–man system are: modification of habitat quality and carrying capacity of the forest for game species; the susceptibility of the forest to game damage; and the suitability of game for hunting. This paper focuses on two questions: How can hunting measures support a suitable development of mountain-forest regions? What problems for mountain forests result from game and hunting?

The economic factors involved in hunting cannot easily be evaluated in concrete terms. In addition to direct income and cost estimates, many indirect profits and costs exist that are not precisely computable. In addition, the economic impacts of hunting depend strongly on the laws and regulations in the different central European countries, particularly whether hunting rights and game belong to the landowner or to the state.

While published information on income from hunting is very rare, there is somewhat more information available about game damage assessment (e.g. Moog and Niebler, 1997; Reimoser *et al.*, 1999). Data were collected primarily from official reports and yearbooks of four countries, as well as personal communications.

7.3.1 Austria

Austria is a largely mountainous country (84,000 km²; 47% forested; 7.9 million inhabitants; 111,000 hunters; district-hunting system, i.e. 11,760 hunting districts with a minimum area of 115 ha each; 1000 full-time professional hunters; 18,000 gamekeepers). The hunting rights belong to the landowner and are linked to the freehold (Reimoser, 1998).

The only available study that attempts an economic estimate of the value of hunting refers to Austria as a whole. The total annual economic value of hunting was estimated at almost 432 million Euro (Lebersorger, 1998). The main components are shown in Table 7.1 (in million Euro).

This compares with 218 million Euro year⁻¹ of game damage to the forest (Reimoser, 1991) – based on average damage of approximately 218 Euro damaged ha⁻¹ year⁻¹. About one-quarter of Austria's forest area (about 1 million ha) is damaged by ungulates each year. Hunters compensate for only a small part of this damage.

The average annual income of hunt-lease proceeds for landowners amounts to 12.3 Euro ha⁻¹ in privately owned hunting districts (land ownership of at least 115 ha), and 5.1 Euro ha⁻¹ in hunting districts with shooting rights belonging to a cooperative of small landowners. Annual lease proceeds can exceed 70 Euro ha⁻¹ in mountain hunting districts with several ungulate species. In recent years in Austria approximately 304,000 head of ungulates were culled (225,000 roe deer; 37,000 red deer; 26,000 chamois; 13,000 wild boar; some mouflon, ibex, sika deer and fallow deer). Additionally about 630,000 head of small game were shot.

Economic values of hunting were derived (in Euro year⁻¹) related to different bases: 51 ha⁻¹ hunting area; 109 ha⁻¹ forest area; 55 per inhabitant; 3890 per hunter; 1420 per culled ungulate; and 685 per all culled animals. Ecological values deriving from establishment and care of habitats, hedges, mountain meadows, etc. (Lebersorger, 1998) could not be evaluated.

Table 7.1. Hunting economics, Austria, 1998 (in million Euros).

Hunt leasing, shooting charges	49.1
Added value venison, game-meat supply	26.2
Taxes, charges, insurances, research	23.6
Wages, salaries (professional hunters, gamekeepers, hunt-related employees)	180.2
Hunt-operating costs, hunting weapons, hunting optics, ammunition, customs, clothing, education	152.6
Total	431.7

Austrian state forest

The Österreichische Bundesforste AG (OeBF – Austrian Forestry Commission, a limited company) covers an area of 850,000 ha (about 10% of the national area). Of these, 525,000 ha are forest (15% of Austria's total forest area), mainly in the mountains while the remainder are mainly high-mountain areas above the timber line. The OeBF is the largest national hunting provider; hunting contributes 12.8 million Euro to the enterprise (1998). Leases are the main source of hunting income, which is increasing annually, and OeBF plans to enlarge this business sector.

The 'Mayr Melnhof Saurau' private forest enterprise

The largest private forest owner in Austria manages 32,000 ha (28,000 ha exclusively mountain forest). Forestry and game management are well coordinated; game (red deer, roe deer, chamois, ibex) is welcome, and clear tolerance limits have been defined for game damage. In crucial, game-damage sensitive areas, hunting is not leased but managed by specialists from the enterprise. The income from long-term leasing (9 years) amounts to 15–20% of the income from timber production of the whole enterprise (timber-production average annual operating income 109 Euro ha⁻¹; timber increment approx. 5 m³ ha⁻¹ year⁻¹; hunting operating income 14.5–25.4 Euro ha⁻¹ annually). In addition to the hunting leases, the hunt leaseholder has to pay the costs of district supervision, game tending, supplemental game feeding, a 25% hunting tax to the province and a 20% national tax (VAT). Income is reduced by 60–70% where short-term shooting permits (compared with long-term) are issued. Income from timber production is burdened with a much greater risk (impact of tempest, snow, bark beetle etc.) than income from hunt lease.

Forest estates in extreme mountain situations

In steep mountain-forest districts with a small timber increment and difficult terrain for timber extraction, no profit results from timber production as costs are higher than earnings. These forests, often classed as protective forests by the province, can have a high hunting value (more than 36 Euro ha⁻¹ yearly) and therefore serve farmers as a major source of income. However, the danger of unacceptable game damage is mostly very high, and damaged protective forests must then be rehabilitated, at a cost set by the Federal Ministry concerned.

7.3.2 Bavaria, Germany

The Federal State of Bavaria (70,552 km², 11 million inhabitants) is the German state with the most mountains and includes parts of the Alps. The hunting law is similar to the law in Austria (district system, hunting rights linked to the freehold); the hunting area is 6.4 million ha, with 35% forest. The average annual hunting-lease prices for large-game districts in the mountains is 6.65 Euro ha⁻¹ (1997), and 4.6 Euro ha⁻¹ for small game districts in the plains. Timber production provides 79.3 Euro ha⁻¹ (allowing for forest protection measures against game damage) and 102.3 Euro ha⁻¹ (without game-damage protection) annually.

Income from leasing of hunting districts by hunting cooperatives and privately owned hunting districts was 26.6 million Euro in the hunting year 1996/97. In 64% of all hunts, the level of browsing damage by ungulate game is not acceptable from the viewpoint of forestry. No monetary evaluation of the game damage has been made. The hunting tax income for the Federal State, depending on the hunting lease, was 920,000 Euro in 1997, and together with a further state government subsidy of 51,000 Euro, was spent on hunting support.

Bavarian State forest administration

The entire hunting area of Bavarian State forests is 830,000 ha. Some hunting is leased, and the remaining area managed by the State forest administration, with short-term shooting permits issued to increasing numbers of private hunters. In 1997, about 50,500 ungulates were culled (39,400 roe deer, 3100 red deer, 3400 chamois, 4400 wild boar, 70 fallow deer, 70 mouflon). The average price for a hunting-district lease was 11.8 Euro ha⁻¹; operating income was 3.37 million Euro (6.85 million income less 3.48 million costs). Protection against game damage totalled about 5.93 million Euro, primarily for fences. The average income from hunting was 9.7 Euro ha⁻¹.

7.3.3 Switzerland

Hunting rights are not freehold-linked. Of Switzerland's 26 Cantons, nine have district hunt systems and 17 licence-hunt systems.

District hunt, Canton of St Gallen

St Gallen is a mountainous Canton (2014 km²; 26% forest; 430,000 inhabitants; 1648 hunters in 1997; eight full-time official game wardens; 42

gamekeepers). Hunting rights are not included in land ownership; a district hunting system is operated (total hunting area 184,000 ha). The Canton owns the hunting rights and receives the income from hunting. The Canton gives 40% of receipts to the municipalities (communes); landowners (private and State) do not share the profits. This income may be used only to cover Canton costs, and is used to pay staff costs, 50% of the costs of game damage and game-damage prevention (the remainder paid by hunters), and infrastructure and other costs.

The total receipts for hunting leases for the whole Canton in 1998 were 1.19 million Euro; the average lease 6.43 Euro ha⁻¹ (Table 7.2). Lease differences between cheap and expensive hunting districts are considerable. Accordingly, net costs were 370,000 Euro for the whole Canton; about 2.0 Euro ha⁻¹ average. Previously, one hunting leaseholder per 200 ha cost 402 Euro on average. The costs of game-damage prevention in the forest (fences, chemical and mechanical protection) in 1997 amounted to 7000 Euro while no compensation was paid for game damage (by ungulates).

Licence hunt, Canton of Graubünden

Graubünden is a very mountainous Canton (7019 km²; 22% forest; 170,000 inhabitants, 5990 hunters in 1997; 21 full-time official game wardens, 58 gamekeepers). Hunting rights are not included in land ownership but a hunt licence system is operated (no district division, licensed hunters may hunt in the whole Canton).

The hunting inspectorate of the Canton has overall control, and landowners do not profit from hunting. For 1998, an earnings surplus of 150,000 Euro resulted (total earnings of 3.98, costs of 3.83 million Euro). About 72% of income (2.85 million Euro) results from the sale of hunt licences while salaries of the supervisory personnel account for the greatest part of the costs (64%, 2.43 million Euro). In 1998, the value of game shot by the hunters (the game belongs to the hunter) amounted to 2.88 million Euro (4274 red deer, 5061 roe deer, 4229 chamois and 754 ibex). The cost of the game-damage prevention in 1997 was 71,000 Euro. There was no compensation for game

Table 7.2. Hunting data, St Gallen, Switzerland.

	Number shot	Specific profit (Euro)	Earnings total (Euro)
Red deer	488	330	161,000
Chamois	1610	95	153,000
Roe deer	4824	105	506,000
Total			820,000

Based on official mean weights and prices, 1998.

damage caused by ungulate game to the forest; damage to agriculture was estimated to be 37,000 Euro.

7.3.4 Province of Bolzano, South Tyrol, Italy

The province of Bolzano is mountainous (7400 km²; 430,000 inhabitants; 84% of the area is hunted; 144 hunting districts defined by law; game belongs to the province; 85 gamekeepers; 51 additional private hunting districts). Hunting rights are not generally included in land ownership; a district hunt system is operated. Landowners do not receive any income from hunting; the State receives revenue from hunt licences (134 Euro per hunter year⁻¹). In 1998, some 5500 hunters purchased licences. In the 51 private hunting districts, the landowner may derive income from hunting (as in Austria and Germany).

While the Province of Bolzano has a good game-damage monitoring system, it does not provide monetary evaluation of the damage, 27% of which is caused by browsing. Further state protection measures cost some 670,000 Euro year⁻¹.

7.3.5 Conclusions and perspectives

Hunt income can provide an essential contribution to the long-term conservation and development of mountain forest regions, particularly if hunting and ownership rights are combined and game damage minimized. The leasing of hunting districts is normally the most lucrative form of management. Hunting has great ecological, economic and social importance for mountain regions. In addition to business income for landowners (with hunting rights), hunting provides revenue for the province and/or state (hunt licences, hunting taxes, value-added tax). When the earnings of the industry sectors associated with equipping and serving hunters are considered, hunting becomes a significant economic factor.

Ungulate game in mountain-forest regions must be properly managed in order to conserve wildlife populations and minimize damage to vegetation. Such management regimes include culling; hunters willing to undertake and pay for this clearly represent considerable income potential. While professional planning and control are required for sustainability, the necessary data are presently inadequate; a precise account of income and expenditure in relation to hunting is not available. Existing data are hardly comparable for different areas within the countries, let alone between countries and there is no homogeneous system for data acquisition. Hunting is often included as part of forestry income statistics without clear delimitation of the hunt-related earnings and costs. The intrinsic economic value of hunting is thus, to a large

extent, unknown. Concrete numbers are mostly available only in respect of hunt licences and leases, animals bagged, and game sold; actual hunting lease figures are not always provided for tax reasons.

In order to obtain a better understanding of game management and the income from hunting in alpine forests the following research needs have been identified:

- development of common, comparable national systems for the economic evaluation of hunting;
- definition of sustainability criteria for hunting;
- operational loading limits for mountain-forest ecosystems related to ungulate impact;
- development of fundamental precepts for coordinated management of forest, game and hunting, accounting for agriculture and tourism.

Data were made available by: H.-J. Blankenthorn (CH); C. Ruehle (St Gallen/CH); H. Jenny (Graubünden/CH); H. Erhart (South Tyrol/I); J. Reddemann and P. Lconhart (Bavaria/D); A. Fuerst (Mayr Melnhof Saurau/A); A. Wahl and B. Funcke (OeBf/A).

7.4 Recreation and tourism in Asian mountain forests

S.K. Nepal

7.4.1 Background

Knowledge is limited with regard to the extent, conditions, and use of mountain forests in Asia. While there are data on the status of recreation and tourism in protected mountain areas, information for forests remaining outside protected areas is significantly lacking. Moreover, even in protected areas, there is no information on types of specific impacts, the location of impacted areas, and the degree and severity of the effects of recreation and tourism. Owing to this lack of knowledge and information, the following account of recreation and tourism in mountain forests in Asia refers both to protected areas and forests in general.

Asia is a major centre of biological and cultural diversity. It has the world's highest mountain systems, the second largest expanse of rainforests, remarkable species richness and high levels of endemism. China, Indonesia, India, Malaysia and Thailand have some of the highest plant species richness. The first four countries are among the 12 so-called 'megadiversity' countries, which together account for 60% of the world's species (Singh, 1995). Two-thirds of the 3.6 billion people in Asia live in rural areas and are directly dependent on natural resources such as land and forests.

Mountain forests in Asia are threatened by commercial logging (Malaysia), extension of upland agriculture (Indonesia, Thailand), firewood gathering