Evaluating Financing of Forestry:  
Country Report Switzerland

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Abbreviations

BFS Bundesamt für Statistik (Federal Statistics Office)
FC Federal Constitution
FFL Federal Forest Law
FLNP Federal law of the protection of nature and patrimony
FLS Federal Law on Financial contributions
FOF Federal Ordinance on Forests
GDP Gross Domestic Product
I&C Incentives and compensations
KS Kreisschreiben (Administrative Regulations)
OFC Old Federal Constitution
NPM New Public Management
PF Protective function
PFS Project financing share
POIS Phytosanitary observation and information service (PBMD)
R&D Research and development
SAEFL Swiss Agency for the Environment, Forests and Landscape
SF Schutzfunktion
SPF Special protective function
SR Systematische Rechtssammlung des Bundes (Official Collection of Federal laws and ordinances)
SUMMARY

This report on financing forestry in Switzerland is part of the European project “Evaluating the Financing of Forestry in Europe” (EFFE). Its purpose is to provide basic information on forestry conditions and a database on public forestry expenditure for the period 1990-1999. The collection and presentation of data follows the collection framework as agreed upon by the countries participating in the EFFE project. The information provided by the Swiss study is based on available documents and reports and does not claim completeness. However, it illustrates some important aspects of forestry in this country and facilitates comparisons with other countries in the European region.

In Switzerland, more than 50% of the forest is mountain forest and 42% can be found on surfaces steeper than 40%. This explains why non-timber services of the forest, in particular protection, are traditionally of great importance.

In 1995, the forest sector employed 0.2% of the Swiss working population and created an added value of 258 million € i.e. around 0.1% of the Gross Domestic Product. The timber processing industry was a more important employer. In 1995, it employed 2.4% of the working population and created an added value of 2.9 billion € i.e. around 1.5% of the Gross Domestic Product. The Swiss timber industry is heavily engaged in foreign trade. In 1999 about 33% of timber (round wood) production was exported, and 20% imported. In the same year 6.6 million m³ of processed timber was exported and 8.1 million m³ was imported. The most important reason for timber production in Switzerland being of limited economic importance may have to do with the high wages and the general scarcity of productive land in Switzerland.

Two special characteristics of Swiss forestry are the structure of forest ownership and the Swiss political system. In contrast with most other European countries privately owned and state owned forests are the exception: 27% of the forests are privately owned by around 240,000 forest owners, and 6% belong to the 26 Cantons or to the Confederation. Communal ownership is the norm with about 3,000 municipalities, boroughs and corporations owning 67% of Swiss forests (2001). The political system, based on federalism, direct democracy and communal autonomy, leads to a great variety of forest policies and ways of financing forestry (26 Cantons, 2,880 municipalities). These special characteristics add to the complications of collecting data for evaluating the financing of Swiss forestry.

In recent decades timber production became economically more unfavourable due to low timber prices and high wages. This trend prevails especially in the mountains where management conditions are difficult. The decrease in economic profitability together with an increase in public interest in forests during the 1980’s (dying of forests) has led to the fact that financing of forestry has become more of an issue. In 1984, 1988 and 1993 (new Federal Forest Law) a new legal basis for supporting forestry financially to a greater extent was created. Incentives and compensations (I&C) are the main financial instruments for allocating financial contributions to Swiss forest owners. I&C are administered through projects that are co-financed by the Confederation, the Cantons, and the forest owners. Within the last ten years, the Confederation has contributed 49% on average, which is twice as much as the Cantons (27%) and the forest owners (24%). We estimate that most financial contributions (approx. 80%) go to the mountain forests. Indirect measures play a small role and tax concessions are not relevant as long as forest enterprises are not profitable.

As a consequence of new legislation, between the mid 1980’s and the mid 1990’s public expenditure on forestry rose significantly. This can be illustrated for the Confederation. The federal expenditures rose from 36 million € per year (three year average 1984-86) to 115
million € per year (three year average 1994-96) or from 29 € per hectare to 93 € per hectare. The public financial contribution system has, however, been questioned as the state of the Federal budget has worsened. In 1997, the Federal Forest Agency therefore started a pilot project (effor2), aiming at strengthening the principle of subsidiarity, and increasing the effectiveness and efficiency of public contributions to forestry. Effor2 is a New Public Management project with the following principal features: financial contributions are to be reoriented from inputs to outputs; cost-covering financial contributions are to be replaced by lump-sum payments; and, instead of supporting numerous small-scale projects, fewer and larger programmes of the Cantons are to be financed. At present, it is too early to evaluate the effectiveness and efficiency of the present financial instruments or of the pilot project effor2 in particular. Still there is evidence of various shortcomings in the current system of public financial support. Important problems concern the lack of strategic goals, the design of the financial instruments (few incentives for efficient forest management), and the mixing of allocative and distributive objectives.

For the future, we expect a consolidation or even a decrease in public expenditure on forestry. Forest owners, forest services and other forest users will have to join forces if they want to prevent an erosion of the status quo because the state budget remains under pressure. In any case the mechanism for designing financial instruments will have to be improved. The influence of interests and policies originating outside of forestry on shaping and changing forest policy and financial instruments will remain important. In particular nature/landscape, energy and climate/CO2 policies are likely to have more influence, as are financial, budgetary and administrative policies (New Public Management).

Although we still lack exact data on returns (output) from financing forestry, we conclude that Swiss forest policies are basically shaped to foster and secure the interests of the general public. Public funding can mainly be seen as a means of ensuring the continuation of the collective non-timber services of the forest, particularly to provide a variety of protection services and, more recently, of nature conservation and recreation. As a consequence of the recent policy developments, we expect that the financial instruments of Swiss forest policy, to be reformulated in the frame of a National Forest Programme Process, will become more effective and efficient. The most important research gaps concern data on the returns (output) from financing forestry and a better knowledge of the mechanisms of effective and efficient financial instruments.
1 Methodical approach

1.1 Structure of the report

Chapter 1 briefly introduces the methodical approach as well as the sources and databases used for data collection. Chapter 2 describes the context of forest policy, providing basic geographical, economic and political information that is important to understand the design and development of public financial instruments in Swiss forestry. Chapter 3 provides an overview of the instruments used for the allocation of financial contributions (section 3.1) and of the Federal expenditures of the last decades (section 3.2).

The most important financial instruments are incentives & compensations (I&C) which are presented in chapter 4. It starts with principles and general information concerning I&C (section 4.1), describes programmes and beneficiaries, and provides general remarks concerning project inputs (section 4.2). It continues with information on different programmes as I&C are mainly used for forest care and management measures (50%, section 4.3), for structure improvement and access infrastructure (15%, section 4.4), and protection against natural hazards (29%, section 4.5). The remaining financial instruments which are investment credits (section 5.1), taxation (section 5.2) and indirect measures (section 5.3) are discussed in chapter 5.

After commenting on the time horizon of the analysis and the decisive conditions of financing forestry in Switzerland (section 6.1) the findings of data collection are summarized and discussed following the organization given by the EFFE project team (EFFE/Technical Annex 2000:4): costs of intervention (section 6.2), effects (section 6.3), and effectiveness, efficiency and equity (section 6.4). In section 7.1, conclusions are drawn, while section 7.2 outlines recommendations for policy and research. The recommendations postulate to take the fundamentals of a more effective and efficient forest policy serious and to fill the remaining knowledge gaps.

1.2 Adaptation of the EFFE-data-collection framework

The starting point for this project is the “EFFE-data-collection framework” which has been especially developed for countries with a high proportion of private and state forests. As a consequence it was necessary to adapt this framework to the conditions of Switzerland as two thirds of its forests are owned by local authorities. Other specific aspects of Swiss forestry that have to be considered and make it more difficult to record data are the small scale of forest ownership, the federalist nature of politics in Switzerland, and the fact that forest policy is a joint task of the federal authorities and the 26 Cantons. Moreover, due to the high level of local-authority forest ownership, there is need of co-financing and co-design forest policy jointly with these local authorities which number almost 3,000. For this reason, the study focuses on the aggregated inputs (origin of the finance) and the instruments (nature of the finance). With respect to the instruments, special emphasis is placed on “incentives and compensations”. On the other hand it is not possible at the present stage to comment in this report on outputs or benefits. First, hardly any data suitable for analysis exist for Switzerland and, second, due to the multi-functional nature of Swiss forestry, the distinction between private and public goods presents methodological and data-collection difficulties.

1 (Ottitsch 2001).
To provide statements on benefits of public financing in the forestry sector is difficult mainly due to the following reasons:

- The few available studies relate merely to individual benefits such as protection and leisure services, or they are limited to parts of regions or individual Cantons;
- Public finance is usually project-related and not beneficiary or services related. This renders any classification on the basis of benefits more difficult or indiscriminate;
- A mix of administrative and operational tasks represents the rule in the Swiss forestry service. Thus, it is difficult to make clear distinctions with regard to the financing of relevant benefits and services;
- The accounts of public forestry operations do not make a sufficiently clear distinction between “social benefits” and “non-timber services” (in particular protection and leisure services and the forest as a natural environment);
- Although some local and regional studies are currently under way to establish the value of various non-timber services (e.g., the study on the topic of man–society–environment being carried out by the BAUER group at the University of Basel), the completion of a reliable general study on the different situations in Switzerland is neither practically nor financially feasible in the course of current contribution to the EFFE project.

Verified data on the forestry operations’ tax burden are not available, neither for individual regions nor for the whole of Switzerland. This is due *inter alia* to the fact that the tax burden for most Swiss forestry operations has been low in recent years because timber production was in many cases not profitable in the 1990s. The same applies for tax concessions which are similarly based on profit.

### 1.3 Sources and database

Given the limited time available and the multi-faceted and complex structure of the Swiss forestry sector it was not possible to collect all of the data desired for the project. Thus, it was decided not to work with primary data and to rely instead on secondary data completed with information from selected experts. We started by reviewing existing publications and references dealing with financial issues in the context of forestry operations. For this task a review was made of publications and data from the following public bodies and institutions:

- Chair of Forest Policy and Forest Economics, Swiss Federal Institute of Technology Zurich (ETHZ);
- Swiss Research Institute for Forest, Snow and Landscape;
- Swiss federal and cantonal legislation;
- Swiss Agency for the Environment, Forests and Landscape: Swiss Forest Agency;
- Federal Statistics Office: Forest Statistics Department;
- Federal Finance Administration: Financial Statistics and Fiscal Equalization Department and the Finance and Accounting Department;
- Federal Tax Administration: Main Department for Direct Federal Tax, Withholding Tax, Stamp Duty;
- Swiss Association of Public Municipalities and Corporations (Schweizer Verband der Bürgergemeinden und Korporationen);
- Association of the Swiss Forestry Sector (Waldwirtschaftsverband Schweiz [WVS]).

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2 E.g. the dissertations by ALTWEGG (Altwegg 1988) and WILHELM (Wilhelm 1996).
3 E.g. diploma theses by DIETIKER (Dietiker 2000) and SCHMID (Schmid 2000), and the work of SCHELBERT (Schelbert-Syfrid and Maggi 1988).
Additional information was obtained from discussions with selected actors (representatives of the authorities, foresters etc.) and, in particular, the Swiss Forest Agency which is the forestry division of the Swiss Agency for the Environment, Forests and Landscape (SAEFL). The Swiss Forest Agency has compiled data on the number of publicly financed projects, the number of hectares in receipt of forest financial contributions between 1990 and 1999, on the level of the residual costs met by the forest owners, and on the implementation costs incurred by the state. Using this approach, it has been possible to compile data – mainly for the national level.

2 Context of forest policy

2.1 Geography, population and economy

Geography: Switzerland is situated in the central part of the Alps which extend from Southern France to Austria and Slovenia. The Alps and the Jura mountains together with the central Plateau which lies between them, determine the country's broad geographical zoning (Bär 1979: ; BFS 2002, Figure 1). Its surface covers an area of 41,285 square kilometres. It can be divided into five geographical regions (BRP 1998), each covering a certain percentage of the territory: Jura (12%), Plateau (23%), Pre-Alps (16%), Alps (40%) and the Southern Alpine slopes (9%).

Population and language groups: The population (2005) amounts to 7.4 million of whom 16.9% are below 15 years old and 14.4% older than 64 years (BFS 2002: 72). 18.1% of the inhabitants are expatriates. The average population density is 172 persons per square kilometre. However, population density varies considerably among the regions with a large concentration in the Central Plateau, the northern foothills of the Jura Mountains and in the southern parts of the Canton Ticino.

Switzerland is a country with four national languages: German, French, Italian and Romantsch. The main language groups are German (63.7%), French (19.2%) and Italian (7.6%), while the fourth national language (Romantsch) is spoken only by 0.5%. 8.9% of the population give another language as their mother tongue.

Economy: 3.9 million persons are regularly employed in full or part-time positions. 4.5% of the labour force is occupied in the primary sector, 26.4% in the secondary sector and 69.1% in the tertiary sector. In 1990 the unemployment rate was extremely low (0.5%). In the following years (with a peak of 4% in 1995), it oscillated between 2% and 4%. In 2000 the gross domestic product (GDP) at market prices was around 253 billion € (405 billion SFr.).

4 This chapter is based on SCHMITHÜSEN and ZIMMERMANN (Schmithüsen and Zimmermann 1999a, 1999b, 2000).

5 (BFS 2002; Bundeskanzlei 2002) or (http://www.statistics.admin.ch/stat_ch/ber00/vz/cro/dvz-crocapedyn01-01.htm ); 238 persons per productive square kilometre.


2.2 Political system

*The Swiss federal system:* Since 1848, Switzerland has been a federal state with a political structure at three levels: the Confederation, the Cantons and the municipalities.\(^9\) The Federal Constitution (FC) determines the division of powers between the Confederation and the Cantons. Powers which are not constitutionally given to the Confederation are original cantonal competences. Any new transfer of competences to the Confederation requires changing the Federal Constitution (Art. 3 FC). Since 1978, when the Canton Jura was created, the country consists of 23 Cantons. Three of them are divided into two Half-Cantons for historical reasons (Art. 1 FC, *Figure 2*). Each Canton / Half-Canton has its own constitution, parliament, government and courts.

The Cantons are divided into municipalities, where decisions are made by local councils (approx. 80%) or by the assemblies of all citizens (approx. 20%). The degree of autonomy given to local authorities is determined by the cantonal constitutions and varies from Canton to Canton. At present, there are 2873 municipalities. The number is tending to become smaller due to the merging of local units.\(^11\)

*Political organisation of the Confederation:* The members of the Federal Parliament are elected by some 4.6 million citizens. The Federal Assembly (Art. 148 FC) has two chambers: the National Council and the Council of States. The 200 members of the National Council are

\(^9\) (Brassel and Brändli 1999: 32); according to the different growth and production conditions, Switzerland is divided into five “production regions”, which correspond to the geographical division of Switzerland (BFS 2002: 111).
\(^10\) (Bundeskanzlei 2002).
\(^11\) (Bundeskanzlei 2002).
The voters vote not only for the candidates, but also for the associated parties. The total number of votes for the candidates on a parties list determines the number of seats the party may claim. The candidate(s) with the most individual votes on the list gets the seat(s).
and the *popular initiative*. Both instruments are enshrined in the constitution but are currently used in different ways on the three different levels of the political system.

- **A referendum** (popular ballot) is compulsory for all amendments to the Federal Constitution and for international conventions on collective security (Art. 140 FC). For a proposal to be adopted, the majority of the country’s electorate must vote for it as well a majority of the Cantons. Amendments to laws, the promulgation of new laws by Parliament, and certain treaties in international law are subject to an optional referendum (Art. 141 FC). In these cases at least 50,000 valid signatures must be collected from eligible citizens who favour a referendum within 100 days after the official publication of the legal act.

- With a **popular initiative**, citizens may seek a popular vote on an amendment to the Federal Constitution (Art. 138, 139 FC). The initiative may be formulated as a general proposal or as a precise text, the wording of which cannot be influenced by parliament or government. The federal authorities may respond to the proposal of an initiative by a usually less far-reaching counter-proposal. The launching of a popular initiative requires the collection of 100,000 supporting signatures within a time limit of 18 months.

**New laws and amendments**: The process for passing a new law is complex and may take from 12 months to 12 years. Nevertheless, the number of laws has recently increased. Each week a new law or an amendment to a law comes into force. Enacting law includes the following steps:15

1. Initiative: by a citizen, party, member of the parliament, etc.;  
2. First Draft: drawn up by a commission of the Federal Council;  
3. Consultation (*Vernehmlassung*): With Cantons, parties, associations, etc.;  
4. Revision by the Federal Administration;  
5. Revision by the Federal Council. The text goes back to the administration for a further revision or as a “message of the Federal Council” (*Botschaft des Bundesrates*) to the parliament;  
6. First commission: National Council (or Council of States) discusses the text and prepares for the discussion in the Federal Assembly;  
7. Discussion in the National Council (or Council of States): The message can be rejected, returned for further consideration or adopted and forwarded;  
8. Second commission: Council of States (or National Council) discusses the text and prepares it for the discussion in the Council of States (National Council);  
9. Discussion in the Council of States (same procedure as in the National Council);  
10. Adjustment of the differences in the first chamber;  
11. Adjustment of the differences in the second chamber;  
12. Agreement conference;  
13. Final vote of the two chambers;

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15 (Bundeskanzlei 2002).
14. Optional referendum: the new law enters into force if there is no referendum within 100 days;

15. Popular vote: no need for a ballot for new laws, only if there is a referendum or amendment to the constitution;

16. Enactment: if the majority of the citizens say “yes” to the new law it will be adopted. For an amendment to the constitution, not only the approval of the majority of the citizens is important, but also of the majority of the Cantons.

This complicated procedure means that there is broad participation of citizens and interest groups in legislating which facilitates solutions based on consensus.

2.3 Forest policy and forest policy actors

*Constitutional Basis:* The Swiss Federal government has a comprehensive set of constitutional powers with regard to the conservation of natural resources and environmental protection. Some were established in the 2nd Federal Constitution of 1874, in particular with regard to the protection and reestablishment of forests as protection against floods (Art 24 of the old Federal Constitution (OFC)). Others were introduced by constitutional amendments after World War II. The latter refer to the protection of nature and landscape (Art. 24sexies OFC, by popular vote in 1962 and 1987), land-use planning (Art. 22quater OFC, popular vote 1969), environmental protection (Art. 24septies OFC, popular vote 1971) and to economic welfare (Art. 31bis OFC). There are further federal powers that are important for forest protection and forestry development policies. These include training and education, scientific research, regulating commerce, entrepreneurial activities and employment. It also includes policies affecting water protection and management, agriculture and energy.

In 1999 Switzerland has adopted a new Constitution reconfirming in Art. 77 the responsibility of the Confederation to ensure that the forest can maintain its protective, production and recreational functions, to determine principles for forest protection, and to provide measures for maintaining the forest cover. The 3rd Federal Constitution of 1999 also provides a number of articles which are relevant in the context of forest policy making such as the Articles 73 (Sustainability), 74 (Environmental Protection), 75 (Land-Use Planning), 76 (Water Protection and Management), 78 (Nature and Landscape Protection), 79 (Fishing and Hunting), 89 (Energy Policy), 94 Sec. 2 (Economic Welfare and Stability), and 104 (Agriculture).

*The 1993 Federal Forest Law (FFL):* Starting in 1985, the then prevailing forest law of 1902 was totally revised. A new Federal Forest Law was adopted by the two Chambers of the Federal Parliament in 1991 and is in force since 1993. The Law retains the principle of forest protection and conservation, which has so far been successful. Its purpose is to preserve forests as a close to nature habitat and to ensure that the forests are able to fulfil their important functions, in particular to provide protection from natural hazards, recreation, education and timber production. Further, it aims to support and develop forestry and forest-related industries (Art. 1 FFL). Altogether the Federal Forest Law of 1993 reflects important changes in the role of forests in society and focuses on two central issues. First, it aims to balance the interests of forest owners with the increasing and diversified interests of public

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16 (Baur et al. 1995: 60).
17 (Kissling-Näf and Zimmermann 1998).
18 (Zimmermann 1988).
user groups. Second, it tries to establish equilibrium between public demands and public commitments in order to protect forest lands and to maintain a wide range of socially desirable non-timber services.

The protection of nature and landscapes has become a fundamental requirement to be addressed in planning and management regulations. Timber production may be reduced in certain areas if this is compatible with the general objectives of the law. In addition, specific parts of forests may be protected by the Cantons in order to conserve and promote biodiversity (Art. 20 FFL). With regard to forestry development, the law introduces the principle of compensating forest owners if they are required to carry out work or provide services of public interest at costs which cannot be covered otherwise (Art. 36-38 FFL). Furthermore, the law regulates the federal support of education and training as well as of monitoring activities (Art. 29, 33 FFL). It also allows for the possibility of transferring specific tasks to non-governmental organisations, and contains a new article which stipulates that the authorities and the population must be informed regularly (Art. 32, 34 FFL).

**Revision of cantonal forest legislation:** As a consequence of the new federal forest legislations, the Cantons have had to revise their forest legislation. By January 1st 2002, all the Cantons had completed this task. Major issues which require cantonal regulation and which have been the subject of debate during the legal process are the definition of minimum criteria for forest areas, compensation in kind for land for which a clearing permit has been issued, the regulation of access for large-scale events in the forests, forest management planning, public financial transfers to forest owners, and the organisation of cantonal forest services.

**Institutional forest policy actors:** At the federal level the two chambers of Parliament, the Federal Council and the Federal Administration (especially the Swiss Forest Agency) are the principal actors involved in deciding on federal public policy in forestry (Figure 3). They are responsible for programme formulation and annual decisions on public funding. Since 1998, policy implementation has been the task of the Federal Department for the Environment, Transport, Energy and Communication. Within the department, the Swiss Agency for the Environment, Forests and Landscape (SAEFL) is in charge of forest-related matters as well as of game protection and protection against natural hazards.

At the cantonal level, the cantonal parliament and government play an important role in the formulation of new cantonal forest policies. Forest-related matters may be implemented by various departments, such as the departments of agriculture, for public infrastructure and the environment. There is a public forest service with headquarters, field districts and range units in all Cantons. The conference of the cantonal forest directors and of the heads of the cantonal forest services act as liaison units between the Cantons and the federal administration.

In recent years, new actors have participated in the formation of forest policy. Citizens and the mass media have become more interested in the impacts of policies on nature conservation. Various political parties, environmental parliamentary groups and commissions, and non-governmental organisations try to influence forest policy. The Swiss Forestry Association and the Swiss Forest Owner’s Association are the principal representatives in the forestry sector, and a wide range of non-governmental organisations, are engaged in the promotion of nature protection.

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19 (Zimmermann and Seitz 2002).
21 (Schmidhauser et al. 1993; Schmidhauser 1997).
2.4 Land use and forest resources

The last available figures on the overall land use in Switzerland date from 1992/97 (Figure 4). The pattern shown in Figure 4 is typical of an Alpine country with a high proportion of non-productive land including rivers and lakes, vegetation on steep slopes and areas with no vegetation above the timber line. Altogether, the figures show that agricultural areas and high altitude pastures amount to 37%, forest area to 31% and settlements to 7%. Between the data collections of 1980 and 1990 the agricultural area was reduced by 3%, mainly due to expanding settlements, meanwhile the forest area was increasing. Between 1870 and 1996 the country's forest area increased from 770,000 to 1,200,000 hectares or almost 60%. The National Forest Inventory registered an increase of 1.6% within the last 10 years, mainly due to the natural reforestation of fallow land previously used as agricultural land or pastures (Figure 5).

Extent and distribution of the forests: The national forest inventory 1993-1995 shows a total forest area of 1,234,000 hectares. A forest area needs to meet a set of minimum criteria. The forest area extends from 200m altitude in the southern Ticino to 2,300 m at the timber line in the central valleys. Almost half (42%) the forests are on slopes with a gradient over

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Figure 3: Institutional forest policy actors at federal and cantonal level

<table>
<thead>
<tr>
<th></th>
<th>Confederation</th>
<th>Cantons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Executive</strong></td>
<td>Federal Council</td>
<td>Cantonal government</td>
</tr>
<tr>
<td><strong>Legislative</strong></td>
<td>Parliament with 2 chambers</td>
<td>Cantonal parliaments</td>
</tr>
<tr>
<td><strong>Policy implementation</strong></td>
<td>Department for Environment, Transport and Energy</td>
<td>Various Departments, e.g. for Agriculture</td>
</tr>
<tr>
<td></td>
<td>Swiss Agency for the environment, forests and landscape (SAEFL)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Swiss forest agency in charge of forest-related matters, wildlife and protection against natural hazards</td>
<td>Cantonal forest services organised in forest field districts and range units</td>
</tr>
<tr>
<td><strong>Policy coordination units</strong></td>
<td>Conference of cantonal forest directors (Ministry – Department level)</td>
<td>Conference of heads of cantonal forest services (Agency level)</td>
</tr>
</tbody>
</table>

Source: (Schmithüsen and Zimmermann 1999b: 32, modified).
40% and one fifth on slopes steeper than 60%. Three quarters are situated in mountainous areas and half at altitudes higher than 1,000 metres above sea level.

*Figure 4: Land use pattern in Switzerland in 2002*


*Figure 5: Forest expansion in Switzerland according to different data sources*

Source: (Brändli 2000).
Annotation: Datenquellen = Datasources / LFI = Federal Forest Inventory / Arealstatistik = statistic on land use pattern / Forststatistik = Federal forest statistics / Etat Forstbeamte = Etat forest officials / Eidg. Statistik Boden = Federal soil statistic / Historische Statistik = historical statistic / Landolt = name of expert / Forstverein = Swiss Forest Society.
The forest cover amounts to 30% of the Swiss territory, with considerable regional variations. Southern of the Alps nearly half of the land is covered with forest. On the Central Plateau, which is the country's most densely populated region, the forest cover is only 24%. A similar proportion of forest cover exists in the Alps (25%), where unproductive areas at high altitudes are natural barriers to tree growth (Table 1).

### Table 1: Forest area per capita by production region

<table>
<thead>
<tr>
<th></th>
<th>Jura</th>
<th>Plateau</th>
<th>Pre-Alps</th>
<th>Alps</th>
<th>South. Alps</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest area in 1000 hectares</td>
<td>201</td>
<td>227</td>
<td>220</td>
<td>415</td>
<td>171</td>
<td>1,234</td>
</tr>
<tr>
<td>No. of inhabitants in 1000's</td>
<td>1,018</td>
<td>4,091</td>
<td>827</td>
<td>643</td>
<td>293</td>
<td>6,872</td>
</tr>
<tr>
<td>Forest area per capita</td>
<td>0.19</td>
<td>0.05</td>
<td>0.27</td>
<td>0.64</td>
<td>0.58</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Source: (Brassel and Brändli 1999).

**Growing stock and mean annual increment:** Between 1986 and 1996 the total growing stock in stem wood with bark increased by 42 million cubic metres (m$^3$) to a total of 418 million m$^3$ of which two thirds (63%) are in diameter classes between 30 and 60 centimetres (cm). The growing stock in stem wood without bark, excluding dead and down trees is around 388 million m$^3$. In comparison with other European countries the growing stock volume per hectare is exceptionally high. The Swiss average volume per hectare is 362 m$^3$, and has increased by 25 m$^3$ in the last 10 years. Comparison between regions indicates high growing stocks per hectare in the Plateau (433 m$^3$) and the Pre-Alps (461 m$^3$), while growing stocks in the Alps (309 m$^3$) and Southern Alps (215 m$^3$) are below average. The mean annual increment, measured as stem wood with bark at a callipering limit of 12cm is 8.3 m$^3$/ha. The increment rates are high in the Plateau (12.3 m$^3$/ha) and the Pre-Alps (10.4 m$^3$/ha) and below average in the Alps (5.7 m$^3$/ha) and the Southern Alps (4.2 m$^3$/ha).

**Balance between growth and timber exploitation:** A comparison on the basis of stem wood with bark shows that the total annual growth volume of 9.8 million m$^3$ exceeds the combined volume of exploitation and natural losses of 7.2 million m$^3$ by 30%. If the annual growth volume is compared with the yearly exploitation for commercial use of 5.4 million m$^3$ (stem wood with bark) the difference amounts to more than 50%. Regional variations are an indication of differences in the profitability of timber harvesting. Whereas, for instance, in the Plateau and Jura the harvesting rates in relation to growth volume are around 60%, they are about half in the Pre-Alps and Alps, and drop to 16% in the Southern Alps.27

**Ownership patterns:** 328,328 ha or one third of the forests are privately owned (Table 2). There are approximately 246,500 owners, owning an average forest area of 1.3 ha. Over 84% of the private forest owners are non-farmers, owning an area of 66% of the privately owned forest (or 1ha per owner). Farmers own 2.8ha on average (Table 3). Private forests are frequent in the Pre-Alps (45.9%) and the Plateau (40.5%) and of less importance in the other regions.28

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27 (BUWAL/F+D 1997: 45).
28 (BFS/BUWAL 2000: 67; Baur et al. 2003b: 26); Wild-Eck and Zimmermann 2005a: Wild-Eck and Zimmermann 2005b; Wild-Eck et al. 2006)
Table 2: Privately and publicly owned forests (2000)

<table>
<thead>
<tr>
<th>Forest Area (ha)</th>
<th>%</th>
<th>Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privately owned forests</td>
<td>328,328</td>
<td>27</td>
</tr>
<tr>
<td>Publicly owned forests</td>
<td>889,173</td>
<td>73</td>
</tr>
</tbody>
</table>

Source: (BFS / BUWAL 2000).

Table 3: Distribution of forest area between farmers and non-farmers (2000)

<table>
<thead>
<tr>
<th>Owners</th>
<th>Ha</th>
<th>%</th>
<th>Ha/owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>39,263</td>
<td>111,206</td>
<td>34%</td>
</tr>
<tr>
<td>Non-Farmer</td>
<td>207,303</td>
<td>217,122</td>
<td>66%</td>
</tr>
<tr>
<td>Total</td>
<td>246,539</td>
<td>328,328</td>
<td>100%</td>
</tr>
</tbody>
</table>


Publicly owned forests cover some 889,173 ha or two thirds of the country's forest surface. Public tenure dominates in the Alps (84.7%), on the Southern slopes of the Alps (81.2%) and in the Jura mountains (79.2%). In the Pre-Alps and Plateau public ownership varies between 54% and 60%. The average size of holdings is around 220 hectares. 70% of all public owners own less than 100 ha.29

Figure 6: Number and size of publicly owned forest enterprises (1999)


29 (BFS/BUWAL 2000: 82-83); 3372 public forest enterprises owned 744’057 hectares in 1999.
Categories of public forest owners: Over 90% of the publicly owned forests are owned by boroughs, municipalities and local corporations (Figure 7). The boroughs developed as associations of citizens, whose civic entitlements included merely the right to use the timber and pasture in certain forests. In the 19th century, the tenure rights of these associations were recognised in the new forest legislation as owners with full rights. Today 373,500 hectares or around 42% of all public forests belong to this category. A second group of owners are municipalities managing at present 351,000 hectares or 39% of the public forests. Their ownership results from transferring user rights from boroughs to political entities during the 19th century and from buying forests in recent times. The third group, classified as corporations and cooperatives under control of the cantonal government, includes different kinds of associations, which own approximately 100,000 hectares. The Confederation and the Cantons together own only 5% of the Swiss forests.

Figure 7: Forest area by ownership (1996)


2.5 Forest economy

Importance of forestry and the timber industry: The Gross Domestic Product (GDP) in Switzerland in the year 2000 was around 405 billion SFr. (253 billion €). According to new estimates, the timber processing industry contributes an added value of 8.5 billion SFr. (5.3 billion €), which is 2% of the GDP.30

Annual timber production: Annual production of unprocessed wood has oscillated since the nineties between 4.5 and 5 million cubic meters per year, with an exceptional peak of 6.2 million m³ in 1990 (storm Vivian) and 12.8 million m³ in 2000 (storm Lothar) due to wind throw (Figure 8). The distribution of types of production has remained fairly stable over the years with 69.5% being used as saw and veneer logs, 20.8% for energy and 9.7% for other

30 (BFS 2002: 328).
industrial uses. Around three quarters of the annual production is coniferous. The export of coniferous logs has risen from 400,000 m$^3$ in the 80’s to almost 900,000 m$^3$/year. Around 300,000 m$^3$/year of hardwood logs are exported.\footnote{BFS/BUWAL 1980-2002.}

**Timber consumption:** Total timber consumption (in roundwood equivalents) rose from 5 million m$^3$ in 1965 to around 7 million m$^3$ in the early 70’s and has oscillated at a level between 6 and 7 million m$^3$ ever since (Figure 8). The overall consumption pattern corresponds with the increase of the population of one million inhabitants in the same period. The per capita consumption has remained more or less stable at 1 m$^3$, oscillating between 0.9 and 1.3 m$^3$. In 2000, the overall timber consumption is shown in Figure 9, with the major components measured in terms of volume of solid wood. 24% of the timber consumed is used for construction purposes, 8% for furniture, 2% for wooden articles and do-it-yourself, 33% for paper, 6% for packaging material; and 27% for energy production. A comparison with the corresponding figures for 1991 indicates that the consumption of timber for construction and furniture, as well as the use of timber for energy purposes have increased.\footnote{BFS/BUWAL 1980-2002.}

*Figure 8: Quantities of unprocessed wood (for saw and veneer logs, for industrial use and energy purposes) traded in Switzerland 1980-2000*


**Balance sheet for timber:** The balance sheet for timber (in roundwood equivalents) shows that more than two thirds of the Swiss timber consumption has been satisfied in recent years with local timber. The high harvesting volume in 2000 was due to the storm “Lothar” in December 1999 (Figure 10). Imports were around 8.1 million m$^3$ in 1999 and exports around 6.6 million m$^3$.\footnote{BFS/BUWAL 1980-2002.}

\footnotetext[31]{BFS/BUWAL 1980-2002.}
\footnotetext[32]{BFS/BUWAL 1980-2002.}
\footnotetext[33]{BFS/BUWAL 1980-2002.}
Figure 9: Consumption of solid wood according to the type of product (2000)

![Pie chart showing consumption of solid wood by type of product in 2000.](chart.png)


Figure 10: Balance sheet for all timber products traded in Switzerland 1965-2000 (round wood equivalents)

![Bar chart showing imported and exported wood volumes from 1965 to 2000.](chart.png)

Export and import values: In financial terms, exports in 1999 amounted to 722 million SFr. (451 million € or 0.5% of all exports)\textsuperscript{34} and imports to 1,302 million SFr. (814 million € or 0.8% of all imports).\textsuperscript{35} More than 93% of the trade of unprocessed timber, semi-finished products, finished products and cellulose takes place between Switzerland and countries of the European Union (1999). Imports originate mainly from Germany, Austria, France, Italy and Scandinavia. Unprocessed timber and timber products exports go mainly to Italy and Germany and to a lesser extent to France and Austria (Figure 11).\textsuperscript{36}

Figure 11: Total import and export of round wood, semi-processed and processed timber and cellulose (1999)

Employment: Almost 86,500 people were employed in the timber processing industry in 1995. This is almost 8%\textsuperscript{37} of the total of employees in the industrial sector and 2.4% of the national labour force. Approximately 9,000 persons (1995) were employed in the forestry sector, i.e. 0.3% of the Swiss labour force. The total numbers of employed, including forest contractors, has remained stable for the last 20 years.\textsuperscript{38}

Profitability of forest enterprises: The federal forest statistics provides information on 3,300 public forest enterprises with regard to income and expenditure of their production.\textsuperscript{39} The statistics distinguish between management activities related to timber production, other

\textsuperscript{34} Total income from exports from Switzerland 2000: 170,134 Mio. SFr. Source: (BFS 2002: 312ff.) (www.statistics.admin.ch).


\textsuperscript{36} (BFS/BUWAL 1980-2002). Exchange in 1999: 1 € = 1 SFr (see www.snb.ch).


\textsuperscript{38} (BFS/BUWAL 1980-2002).

\textsuperscript{39} (BFS/BUWAL 1980-2002).
production such as tree nursery and smaller timber working units, and services for protection and recreation. The Swiss forest owners association offers an entrepreneurial accounting system (Betriebsabsrechnung [BAR]) which is used by an increasing number of forest owners. Altogether the figures show that from 1987 on that the annual proceeds from timber production and services have not fully covered the expenditures of the public forest enterprises. An exception is the year 1990. In this year, the volume of log production due to wind throw after storm Vivian was exceptionally high (Figure 12).

Figure 12: Public forest enterprises: Income and expenditure (in million SFr.).


(WVS 1996).
3 Overview of financial instruments in Swiss forest policy

3.1 Financial instruments

Financing of forest management activities depends increasingly on public expenditure for securing protection values and other public interests.\(^{41}\) The revenues from timber sales for all public forests are at present at al level of 60%, and at a level of 40% in the Alpine region. Multiple use forest management requires an expanding income basis from public sources. The Federal and cantonal governments, other public entities but also the public forest owners themselves contribute in various combinations (Figure 13).

Figure 13: Use values and financial income for forest land management for forest owners in Switzerland

The origin of financial instruments in Swiss forest policy are to be found in the 19th century, when the first Federal Forest Law was adopted. At present incentives (Finanzhilfen) and compensations (Abgeltungen), as defined by the general subsidy legislation, have become the main instruments for allocating payments to Swiss forest owners. With incentives, voluntarily applied forest tending activities are supported (e.g. measures for thinning young stands and for regeneration) while compensations serve to mitigate or compensate costs that are caused by publicly ordered measures (e.g. minimum tending measures to ensure the stability of forests that have a protective or a special protective function). I&C are administered through projects that are co-financed by the Confederation, the Cantons and the forest owners. 95.4% of the Federal financial contributions during the period 1990-1999 were allocated in form of I&C. Approximately 80% of these financial contributions go to the mountain areas.

Further financial instruments are investments credits and tax concessions. The investment credits increased continuously since 1990 and reached in 1999 a volume of around 33 million €. Tax concessions are not relevant as long as forest enterprises are not profitable.

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\(^{41}\) (Schmithüsen 2000; Schmithüsen and Schmidhauser 1998).
The Federal and cantonal financial contributions for indirect measures (including investment credits) are quite small (around 5%). The financial instruments in this category are contributions (Beiträge), contracts (for example between the Confederation and research institutions) and assignments (Aufträge).

### 3.2 Federal expenditures

Public expenditure for forestry of the Confederation rose from 36 million € per year (three year average 1984-86) to 115 million € per year (three year average 1994-96) or from 29 € per hectare to 93 € per hectare (Figure 14). Altogether, the Confederation spent around 1,223 million € for financial contributions in forestry during the period 1990-1999.

*Figure 14: Public expenditure allocated by the Confederation in million € (nominal, 1965-2000)*

The Federal financial contributions include incentives and compensations allocated for forest care and management measures, structural improvement and access infrastructure, and protection against natural hazards. Also part of the Federal expenditures are other financial contributions used for the forest- and timber research fund, surveys, association for the protection of forests and professional training. Not included in the upper chart are the investment credits reaching a volume of 33.5 million € in 1999.

The most important events to be mentioned are:

- 1984-86: Discussions concerning forest-die back are the beginning of a new forest policy. 42

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• 1990: Storm Vivian causes immense damages in the mountain forests.
• 1993: The new Federal Forest Law is adopted. The Federal financial contributions were reduced due to the low performance of the public financial household.
• 1999/2000: Storm Lothar causes immense damages in the Swiss forests, especially in the Plateau region.

At real prices (basis 2000), the expenditures rose form 50 million € per year (three year average 1984-86) to 120 million € per year (three year average 1994-96). This corresponds to an increase of 140%. Altogether, the Confederation spent around 1,312 million € (at real prices) for financial contributions in forestry in the period of 1990-1999 (Figure 15).

\textit{Figure 15: Financial contributions 1980-200 allocated by the Confederation (at real prices, basis 2000)}

4 Financial incentives and compensations to private and public forest owners

4.1 Principles

4.1.1 Purpose of incentives and compensations

The overall objective of I&C allocated by the Confederation and the Cantons to the forest owners is to meet the demands of the population concerning the forest and its products and services. The principle purposes are defined in Art. 1 of the Federal Forest Law (FFL) stipulating the conservation of forests in their present extent and geographical distribution; their protection as natural environment; the fulfilment of their protective, productive and social forests functions; and the safeguard and development of forestry and forest related industries.

The Federal Forest Agency stipulates the following more detailed purposes concerning the Federal promotion policy and practice for the allocation of financial contributions (Förderungspolitik und -praxis):

- An extensive tending of the forests is necessary in order to ensure that they are able to fulfil their functions, in particular their protective, social and economic functions.
- The forest is to be protected and maintained as a nature-oriented biocoenosis (especially taking into account the different Federal inventories).
- Humans and asset values, threatened by natural hazards like avalanches, landslides, erosion or rockslides, must be protected and the remaining risk must be known.
- The organisational, technical and management structures have to be improved in order to ensure the existence of efficient forestry practices in economic terms.
- Forestry planning (planning of the forest functions, establishment of maps of danger zones) has to provide the basis for maintaining and protecting the forest and its diversity as a habitat and part of the natural landscape. The goal is to utilize the financial contributions efficiently.
- The production and utilisation of timber should be increased to realize a better use of the increment of forests, to secure income to forest owners, and to ensure market-driven supply to the economy with the ecologically friendly wood resource.
- Education and training as well as research are to be fostered.

4.1.2 Legal bases

The main articles on this subject can be found in the section “Financing” of the FFL and in particular in Art. 35 FFL.

Art. 35 FFL Principles

Within the limits of the credits allocated, the Confederation shall promote: measures to conserve the forests and to protect the population and valuable property against natural hazards including the necessary training, research and data collection.

43 This translation as well as the following references to the text of relevant articles of the forest law or of other legislation is informal and not an official translation.
44 See also Federal Constitution 1999, Art. 77; Forests: It determines that the Confederation has to ensure that the forests fulfil their functions (protective, social and economic = forest functions) and that guidelines for the protection and measures for the conservation of the forests are established.
45 Federal Forest Law [SR 921.0].
The Confederation may make its financing activities dependent on the following conditions:

a) the Canton’s participation in the financing to the limit of their ability;
b) the recipient must in each case directly provide services in a measure that corresponds to the recipient’s own financial resources, any other sources of financing and the personal commitment one may expect;
c) third parties, and in particular beneficiaries and persons responsible for damage, must participate in the financing;
d) all measures must be carried out in a cost-effective manner by competent persons;
e) lasting solutions, which are in the interests of forest conservation, must be found for all conflicts that arise.

The Federal Council may require that certain financial contributions go only to recipients who are applying self-help measures in forestry management and the timber industry.

4.1.3 Definitions
Elements of financial support are incentives (Finanzhilfen) and compensations (Abgeltungen).

- According to Art. 3 Para. 1 of the Federal Law on Subventions (FLS) incentives are monetary advantages, given to beneficiaries outside the Federal administration, to foster and support the completion of a task chosen by the beneficiary. “Monetary advantages” are especially non-repayable money, loans with preferential terms, first demand bonds (Bürgschaften), provision of services, and contributions in kind (Sachleistungen) at reduced prices or for free.\(^{46}\)

- According to Art. 3 Para. 2 FLS compensations are benefits for beneficiaries outside the Federal administration to mitigate or compensate financial burdens caused by (a) measures ordered by the Federal law (bundesrechtliche Aufgaben) or (b) measures subject to public law (öffentlich-rechtliche Aufgaben) delegated to the beneficiary by the Confederation.

Compensations are only paid if the measures have been ordered by the Canton and if they were approved by the Confederation in advance (Art. 39 Para. 2 of the Federal ordinance on forests [FOF]).\(^{47}\) I&C are project oriented. This means that it is hard to distinguish between public and private benefits because projects are implemented in certain regions where public as well as private forest owners may benefit. However, the experience shows clearly that most of the beneficiaries are public forest owners\(^{48}\) despite the fact that private and public forest owners have the same rights in front of the FFL since its revision in 1991. There are several reasons to explain this phenomenon. First, most of the I&C are paid in mountainous regions where the share of private forest owners is lower than in the Plateau; second because the average surface of the private forests is too small to implement a project; and third because private forest owner do not know the regulations or do not want the state to interfere in their autonomy of decision.

4.1.4 Project financing share (Subventionssatz)

The allocation of Federal financial contributions is strongly related to the financial capacity of the respective Canton and its rate of contribution (Beitragssatz). The maximum Federal rate of financial commitment is identically with the reference rate (Referenzwert) of the Federation.

\(^{46}\) Bundesgesetz über Finanzhilfen und Abgeltungen (Subventionsgesetz, SuG), 1990 (SR 616.1).
\(^{47}\) (Forstdirektion 1993-2002: KS 6).
\(^{48}\) According to the project database of the Federal Forest Agency.
determining the financial capacity in the various groups of Cantons (Table 4). The Confederation shall not accord to financial contributions for amounts of less than 10% of the approved costs\(^49\) (Art. 54, Sec. 5 FOF).

### Table 4: Federal contributions related to Cantonal financial capacity

<table>
<thead>
<tr>
<th>Ability to pay</th>
<th>Great &gt;120</th>
<th>Average 120…index …60</th>
<th>Limited &lt;60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CH</td>
<td>Canton</td>
<td>CH</td>
</tr>
<tr>
<td>Reference Value</td>
<td>30%</td>
<td>50%</td>
<td>70%</td>
</tr>
<tr>
<td>60% of Ref. Value</td>
<td>[20%]</td>
<td>[50%]</td>
<td>[50%]</td>
</tr>
<tr>
<td>18%</td>
<td>30%</td>
<td>Reference value = UR+ (120-Index)/60x (OR-UR)</td>
<td>42%</td>
</tr>
<tr>
<td>(12%)</td>
<td>[30%]</td>
<td></td>
<td>[30%]</td>
</tr>
</tbody>
</table>

UR = reference value for the Confederation, with financial capacity of 120; OR = reference value for the Confederation, with financial capacity of 60.

Source: (Table 1 Annex FOF / [50%]; Table 2 Annex FOF)

The cantonal project financing share (PFS) is graded in each Canton differently according to a cantonal “points-system”. The margins, in which the Cantons have to define their contributions, are stipulated in Art. 40 FOF. The Cantons have to take into account regional differences and difficulties in implementing the planned measures, the financial capacity of the beneficiaries of the project, and the public interest of the measures to be implemented. However, the Cantons are free to set their contribution above or below the mentioned margins.

The PFS is calculated on the basis of approved costs. If the total of Federal and cantonal financial contributions should be in excess of approved costs the Confederation shall reduce its contribution in proportion (Art. 54 FOF). In projects with revenue from timber selling, it may be possible that the values indicated in Table 4 must be interpolated (Table 1 and 2 Annex FOF).\(^50\) According to the FFL federal and cantonal financial contributions are subsidiary and strongly related (Art. 38 and 40 FOF). Federal financial contributions are only allocated if cantonal financial contributions are accorded as well. The average PFS 1990-1999 shows that the Confederation contributes with 49% twice as much as the Cantons with 27% and the forest owners with 24% (Table 5). One of the main reasons for the high proportion of federal contributions is the fact that the financial capacity of the Alpine Cantons is in general rather low.

\(^{49}\) Approved costs (Art. 41. FOF) are direct costs, emerged by measures stipulated by the FFL (Forstdirektion 1993-2002: KS 6).

\(^{50}\) In projects with revenues from timber selling, the project financing share is defined according to the estimated amount of timber. After finishing the project, the definitive project financing share is calculated on the real amount of timber harvested. If a forest enterprise can sell the harvested timber for a higher price than budgeted, or if they can diminish the costs, the realized financial advantages is in favour of the enterprise.
Table 5: Average project financing share (1990-1999)

<table>
<thead>
<tr>
<th></th>
<th>Confederation</th>
<th>Cantons</th>
<th>Forest Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFS</td>
<td>49 %</td>
<td>27 %</td>
<td>24 %</td>
</tr>
</tbody>
</table>


4.2 Programme categories, beneficiaries and programme inputs

Five different programmes receive financial contributions. Concerning the characteristics and number of beneficiaries only general remarks can be made due to missing data. The financial and administrative input was and is not treated separately in the Federal forest statistics, but the Federal Forest Agency has provided an estimate concerning the administrative input.

4.2.1 Programme categories

Over 90% of the Federal and cantonal incentives and compensations have been allocated to the following three categories:

- Forest care and management measures (54%, 1706 projects)
- Structural improvement and access infrastructure (17%, 1220 projects)
- Protection against natural hazards (24%, 911 projects)

Small contributions (5%) have been made to finance activities such as professional training, forest research fund etc. (3%) and investment credits (2%)\(^{51}\)

Figure 16 shows that since the storm Vivian in 1990 the I&C paid for forest care and management measures are slightly decreasing while the expenditures for structural improvements and access infrastructure as well as for protection against natural hazards are stable. The peak in 1993 can be explained with the introduction of the new categories of Federal financing after adoption of the new FFL.

Since 1995 the financial contributions allocated by the Confederation and the Cantons are stable. The Confederation allocated each year around 100 million €, while the Cantons contribute around 55 million € (Figure 17).

4.2.2 Characteristics and number of beneficiaries

The Swiss forest legislation (FFL) does not distinguish between public and private forests since its revision in 1993. Beneficiaries of supported projects can thus be private or public forest owners (Cantons, municipalities, boroughs, and corporations). Federal forests do not receive any incentives or compensations. Exceptions are the forests owned by the state railway company.

Incentives and compensations serve to finance projects. 3,837 projects were authorized during the years 1990-1999. It would be an enormous work to distinguish on a project level between private and public forest owners and estimate their benefit. However, it is likely that most of I&C have been paid to public forest owners.

\(^{51}\) These 5% represent only the Federal expenditures. The investment credits are mentioned here to give an overview of all the existing financial instruments, but they are neither incentives nor compensations.
Figure 16: Expenditures in form of I&C for the three main categories by the Confederation and Cantons (1990-1999)


Figure 17: Expenditures in form of I&C (total) by Confederation and Cantons (1990-1999)

4.2.3 Financial and administrative input

The financial input is the amount of I&C allocated by Confederation and the Cantons. The administrative inputs are the direct labour costs emerged managing the projects receiving financial contributions (productive process). The calculations are based on the assumption that an employee in the Federal Forest Agency gains SFr. 130,000 per year (€ 81,250.-, SFr. 62.- per hour and 2100 hours per year). According to an estimation of the Federal Forest Agency, 6.2 persons were fully employed in managing the projects funded by the government within 1990-1999 (Table 6). Thus, the administrative costs for the period 1990-1999 were SFr. 8,060,000 (€ 5,037,500.-).

Table 6: Estimated administrative costs on Federal and cantonal level (1990-1999)

<table>
<thead>
<tr>
<th></th>
<th>Confederation</th>
<th></th>
<th></th>
<th>Cantons</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;C and indirect measures (1)</td>
<td>1,222.9</td>
<td>49</td>
<td></td>
<td>642.2</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Administrative input</td>
<td>5.1</td>
<td>0.42</td>
<td></td>
<td>2.7</td>
<td>0.42</td>
<td></td>
</tr>
</tbody>
</table>

Source: (BFS/BUWAL 1980-2002). Comment: (1) Data on indirect measures exists only on the Federal level.

Assuming that the administrative costs on the cantonal level are similar to the costs on the Federal level (0.42%), the administrative input on the cantonal level can be estimated. According to this calculations the total administrative costs for the Confederation and the Cantons were around 8 million € for the period 1990-1999.

With the coming into force of the new FFL in 1993 project components (projects of one or several years) and global components are distinguished (annual programmes, see Table 7). Project components are publicly financed according to approved costs or actual costs, while global components are financed annually according to the current projected requirements of the Cantons (Art. 59 para. 1 FOF).

4.3 Forest care and management measures

4.3.1 Overview

Around 50% of I&C were used for forest care and management measures in 1995-1999. These measures have been divided into two categories. Measures grouped under silviculture A refer to sustainability of timber production. Measures grouped under silviculture B/C refer to the preservation of forest with protective functions; to forest reserves, to the establishment of forest areas with a special treatment; to compensations for storm and bark beetle damages; for the preparation of basic documents for forestry planning and management plans; and to the provision of reproduction material and adequate plant protection.
<table>
<thead>
<tr>
<th>Component</th>
<th>Financial instrument (1)</th>
<th>Type of component (2)</th>
<th>Project surface (ha) (2)</th>
<th>Number of projects (2)</th>
<th>Project financing share (3)</th>
<th>Confederation Mio. €</th>
<th>%</th>
<th>Cantons Mio. €</th>
<th>%</th>
<th>Total (4) Mio. €</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silviculture A</td>
<td>Incentives</td>
<td>Project c.</td>
<td>1,700,000</td>
<td>509</td>
<td>132.3</td>
<td>56.4</td>
<td>102.1</td>
<td>43.6</td>
<td>234.5</td>
<td>13.0</td>
<td></td>
</tr>
<tr>
<td>Silviculture B/C</td>
<td>Compensations</td>
<td>Project c.</td>
<td>260,000</td>
<td>137/ 431</td>
<td>242.5</td>
<td>75.3</td>
<td>79.8</td>
<td>24.7</td>
<td>322.3</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Forest reserves</td>
<td>Incentives</td>
<td>Global c.</td>
<td></td>
<td>106</td>
<td>1.2</td>
<td>44.0</td>
<td>1.5</td>
<td>56.0</td>
<td>2.7</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Damage to forests</td>
<td>Compensations</td>
<td>Global c.</td>
<td></td>
<td>259</td>
<td>252.3</td>
<td>62.3</td>
<td>152.7</td>
<td>37.7</td>
<td>405.0</td>
<td>22.4</td>
<td></td>
</tr>
<tr>
<td>Basic documents for planning</td>
<td>Incentives</td>
<td>Global c.</td>
<td></td>
<td>250</td>
<td>24.1</td>
<td>45.5</td>
<td>29.0</td>
<td>54.5</td>
<td>53.1</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>Reproduction material, advertising and sales promotion</td>
<td>Incentives</td>
<td>Global c.</td>
<td></td>
<td>14</td>
<td>3.0</td>
<td>48.8</td>
<td>3.2</td>
<td>51.2</td>
<td>6.2</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Total forest care and management measures</td>
<td></td>
<td></td>
<td>1,960,000</td>
<td>1,706</td>
<td>655.4</td>
<td>64.0</td>
<td>368.2</td>
<td>36.0</td>
<td>1023.7</td>
<td>56.6</td>
<td></td>
</tr>
<tr>
<td>Access infrastructure</td>
<td>Incentives</td>
<td>Project c.</td>
<td>220,000</td>
<td>1,043</td>
<td>139.3</td>
<td>56.5</td>
<td>107.1</td>
<td>43.5</td>
<td>246.4</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>Improvement of management conditions</td>
<td>Incentives</td>
<td>Project c.</td>
<td>313,000</td>
<td>177</td>
<td>43.8</td>
<td>54.7</td>
<td>36.3</td>
<td>45.3</td>
<td>80.1</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Total structure improvement and management conditions</td>
<td></td>
<td></td>
<td>533,000</td>
<td>1,220</td>
<td>183.1</td>
<td>56.1</td>
<td>143.4</td>
<td>43.9</td>
<td>326.5</td>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td>Protection works and installations</td>
<td>Compensations</td>
<td>Project c.</td>
<td>94,000</td>
<td>749</td>
<td>316.6</td>
<td>71.8</td>
<td>124.3</td>
<td>28.2</td>
<td>440.9</td>
<td>24.4</td>
<td></td>
</tr>
<tr>
<td>Establishment and tending of forests with a special protective function</td>
<td>Compensations</td>
<td>Project c.</td>
<td>11,000</td>
<td>31</td>
<td>1.3</td>
<td>71.3</td>
<td>0.5</td>
<td>28.7</td>
<td>1.8</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Maps of danger zones, measuring stations and early warning systems</td>
<td>Compensations</td>
<td>Global c.</td>
<td></td>
<td>131</td>
<td>10.9</td>
<td>65.3</td>
<td>5.8</td>
<td>34.7</td>
<td>16.7</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Total protection against natural hazards</td>
<td></td>
<td></td>
<td>105,000</td>
<td>911</td>
<td>328.8</td>
<td>71.6</td>
<td>130.6</td>
<td>28.4</td>
<td>459.3</td>
<td>25.4</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL**                                      |                          |                       | 2,597,000                | 3,837                  | 1,167.3                      | 64.5                 | 642.2| 35.5           | 1,809.5| 100.0          |     |

Source: (BFS/BUWAL 1980-2002): (1) Overview financial rubrics and subsidy components of the Federal Forest Agency/ (2) F&D 2002: L. Peter/ (3) BFS/BUWAL 1980-2002. These columns show the total of financial contributions allocated by the Confederation and the Cantons in the period 1990-1999. The forest owners bear the rest-costs. They are not considered here/ (4) % of the total (1,809.5 million €).
Figure 18 indicates the financial contributions of the Confederation and the Cantons that have been made for the category forest care and management measures. The contributions for compensating damages to the forest fluctuate strongly during the period 1990-1994. This is a result of 1990 storm Vivian which threw 5 million m³ of timber. Clearing up the storm damages together with the subsequent damages from bark beetles in the following years caused high expenditures in this category. From 1995 to 1999 the expenditure of the two categories has remained stable and amounted to and average of 85 million € per year.

4.3.2 Legal bases

The regulation concerning forest care and management can be found in the Articles 37 and 38 FFL.

Art. 37 Prevention and repair of damage to the forests

The Confederation shall provide incentives of up to 50% of the costs incurred form the introduction of measures required for the prevention and repair of damage to the forests, such as:

a. measures aimed at the prevention of exceptional damage which fire, disease, parasites or pollutants might cause in the forests and which could jeopardise their conservation;

b. repair of such damage, and of damage due to natural hazards, and for the forced utilisation of timber which is a result.
Art. 38 FFL Forest management

1 The Confederation shall provide compensations of up to 70% for costs incurred by:
   a) the minimum tending measures within a set term required by the authorities for the
      conservation of the forests’ protective function;
   b) silvicultural measures required by the authorities in open, instable or devastated
      forests which have a particular protective function, when not all the cost are covered.

2 The Confederation shall allocate financial support amounting to as much as 50% of the costs
   incurred in executing such measures as:
   a) preparation of basic documents necessary for forestry planning;
   b) measures within a set term such as the tending of the forests, harvesting and hauling,
      when the total costs incurred are not covered or are exceptionally high for the reasons
      to do with the protection of nature;
   c) production of forest reproduction material;
   d) (...);
   e) (...);
   f) temporary advertising and sales promotion measures adopted jointly by forestry
      management and the timber industry, at times of exceptional timber harvest.

3 The Confederation shall provide financial support of up to 50% of the costs incurred for
   protective measures for the upkeep of forest reserves.

4.3.3 Silviculture A projects

Objectives: The aim of this project category is to guarantee the wood production function of
the forests. Silvicultural measures must be efficient and contribute to the stability of the
forests, the production of high quality stands and to the protection of nature and landscape.

Legal regulations: Art. 38 (2) lit. b FFL;
   Art. 19 (1-3) and Art. 47 (1-2) FOF;
   Administration regulation number 7.

Economic instruments: Silviculture A projects are supported by the Confederation and the
Cantons with incentives. Incentives are allocated in form of lump sum payments or according
to real costs. The Confederation allocates financial support until a maximum of 50% (in
Cantons with low financial capacity) of the costs incurred for silvicultural measures, such as
tending of forests, harvesting and hauling provided that total costs are not covered or are
exceptionally high for reasons related with the protection of nature (Art. 38 (2) lit. b FFL).
The Cantons support the projects with up to 50% of the approved costs (for Cantons with high
financial capacity; see Table 4 and Table 2 Annex FOF).

Incentives are paid by the Confederation in cases of special measures with duration of 10
years, together with an estimate and financing guarantees provided that neither the
commercial value of the timber nor third part services are able to cover the total costs of the
measures. The financial contributions are only allocated if the beneficiary participates with
mutual self-help measures. Special expenditures incurred to do with nature protection which
are certified, shall be taken into account (Art. 47 (1-2) FOF).

Measures funded: Measures in forests where the timber production function prevails relate to
forest tending, thinning and regeneration (Art. 47 (1). FOF). Funded are all measures which
contribute to the maintenance or restoration of the stability or quality of stands. Tending
measures in young stands include the tending of recruitment and thickets and thinning pole

52 (Forstdirektion 1993-2002: KS 7).
timber, to create stable stands. Further measures are special tending of young growth in selection forests and other storied forests, coppices with standards and simple coppices as well as storied forest edges, protection against game damage and creation of footpaths in areas of difficult access. Measures for thinning young stands and for regeneration include clearance of felling areas, and forest replanting (Art. 19 (1) FOF). No support is paid for plain cuts in young stands and thickets, for timber yards and processing of timber.

_Financial inputs_: The annual financial inputs of the Confederation were between 10 and 16 million €. With the introduction of the forest law 1993 the financial inputs rose significantly for the Cantons up to 14 million € in 1997 and decreased to 11 million during the following 2 years. Altogether, 234.4 million € were allocated in the nineties (_Figure 19_). The Federal financial contributions diminished from 68% in 1990-1992 to 53% after 1993.

_Figure 19: Incentives for silviculture A projects (Confederation and Cantons, 1990-1999)_


### 4.3.4 Silviculture B and C projects

_Objectives_: The aim of silviculture B and C projects is to reach stable forests, to reduce the danger of natural hazards in the project perimeter and with it the risks for humans and real assets. The Cantons have to ensure a minimal level of tending in order to maintain the forest’s protective function (Art. 20 (5) FFL). Silviculture B and C projects may differ with regard to the following points:

- Priority and commensurability of the forest tending measures;
- Intensity of the measures;
- Extraction of timber;
- Measures against damages from wild animals.

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53 (Forstdirektion 1993-2002: KS 8).
Legal Regulations:
- Silviculture B: Art. 20 (5) and Art. 38 (1) lit. a FFL;
  Art. 19 (1-4) and Art. 47 (3) lit. a FOF;
  Administration regulation number 8.
- Silviculture C: Art. 38 (1) lit. b FFL;
  Art. 47 (3) lit. b and Art. 19 (1-3) FOF;
  Administration regulation number 8.

Economic instruments: Silvicultural measures required by the authorities in open, instable or devastated forests with a special protective function, are subsidised by the Confederation. The Confederation allocates compensation of up to 70% for the costs incurred. Compensations are allocated according to reference costs (Pauschalanansätze) or real costs. The project financing share depends on the financial power of the Cantons (see above).

Measures funded: Precondition for financing silvicultural measures of the category B/C is that they have a “Protective Function” (PF) or a “Special Protective Function” (SPF). The Confederation allocates financial contributions for minimum tending measures and measures in open, instable or devastated forests.

Financial inputs: Federal expenditures increased in 1993 (new FFL) remarkably from less then 20 million € up to 30 million € and stabilized later on. In the same period cantonal compensation payments (1/3 of the Federal ones) increased from less then 6 million to around 9 million €. The peak of the combined compensations payments was reached in 1994 with total of 40 million €. In the following years the compensations were stable, around 26 million € by the Confederation and 9 million € by the Cantons. Altogether, 322.3 million € of compensations were allocated in the nineties.

4.3.5 Forest reserves

Objectives: Aim is the protection and preservation of forest reserves on a contractual basis. The Federal forest law stipulates that the Cantons have to define forest reserves large enough to ensure the conservation of the species diversity of flora and fauna. Forest reserves must help to fulfil one of the following goals:
- Conservation of ecologically especially valuable forest areas and their protection against further changes;
- Protection and conservation of examples of all kind of formations of forests and their natural dynamics;
- Protection and conservation of rare plants and animals or in danger of extinction;
- Protection and conservation of formations of forests evolved under different (ancient) types of management (Niederwald = coppice forest, Hochwald = storied forest, Mittelwald = mix between storied and coppice forest);
- Enable research on environmental topics and silviculture.

54 Schutzfunktion (SF)
55 Besondere Schutzfunktion (BSF)
The following categories of forest reserves may be established:

1. *Gen reserves* (Genreservat) are generally not treated as forest reserves, but they receive financial support according to Art. 50 (2) lit. d FOF.

2. *Total reserve* (Totalreservat); no human activities are allowed in such reserves. If at all feasible they should be surrounded by buffer zones.

3. *Reserves with special treatment*:
   - Mix of tending and conservation measures with the goal to preserve an ecologically valuable bioecosystem;
   - Special treatment with regard to a special silvicultural management system.

**Legal regulations:**  Art. 20 (4), Art. 38 (2-3) FFL;
Art. 47 (2), Art. 49 and Art. 59 FOF.

**Economic instruments:** The Confederation allocates financial contributions in form of *incentives* (globally) for preserving forest reserves. Once a year, the Cantons shall send to the Federal Forest Agency a summary of the planned measures indicating the reasons for new forest reserves and of the projected financial requirements. The Federal Forest Agency decides on the distribution of the means available among the Cantons having applied for financial support. Attention must be paid to the surface of the areas; station conditions and importance of the concerned forest ecosystems; natural hazards of regional or supra-regional importance; to the relevant area planning documents; and to the Cantons financial capabilities. The Confederation allocates formally each year the amount to each Canton (Art. 59 (1-3) FOF).
The Confederation provides financial support of up to 50% of the costs incurred for protective measures for the upkeep of forest reserves (Art. 38 (3) FFL). The support of the Confederation and the Cantons is calculated according to Table 4 and under the condition that the existence of the forest reserves is ensured in zoning plans and by means of contracts (Art. 49 (1) FOF). The support is paid if the beneficiary participates in mutual self-help measures. Special expenditures incurred for reasons to do with nature protection and which are certified, shall be taken into account (Art. 47 (2) FOF).

Silvicultural measures outside of forest reserves, which are especially difficult for reasons of nature protection, may be subsidised by silviculture A projects (Art. 38 (2) lit. b FFL). Additional measures to be implemented mainly in non-forest areas may be financially supported according to Art. 18 of the Federal law of the protection of nature and patrimony (FLNP).

Measures funded: As mentioned the upkeep of forests reserves and silvicultural measures like the tending, thinning and regeneration of young stands are funded (Art. (2)-3 FOF). Approved costs, are costs incurred by the supervision for the achievement of the objectives, measures for protection and maintenance and compensations for an effective reduction of income.

Figure 21: Incentives for forest reserves (Confederation and Cantons, 1990-1999)


Financial inputs: Incentives for forest reserves have been paid since 1992. During 1994-1996 the combined payments of the Confederation and the Cantons were stable on a level of around 0.26 million €. In the following years, the financial support increased to 0.7 million €. The importance of forest reserves is increasing but still quite small. Altogether, 2.7 million € have been allocated in 1993-1999. The Federal contribution was around 75% (Figure 21).

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57 Natur- und Heimatschutzgesetz [SR 451.0].
4.3.6 Damage to forests

Objectives: The aim is to prevent and repair forest damages, especially in forests with protective functions (PF and SPF). The Federal Forest Agency publishes in cooperation with the phytosanitary observation and information service (POIS) periodically lists of harmful pests. Quarantine measures to control the organisms listed in the annex of the Federal ordinance for the protection of plants in forest are admitted in all forests and entitled to receive compensations. Forest owner who receive financial contributions have to establish nature oriented stands. Measures for the establishment of young stand may be supported according administration regulation nr. 7.

Legal instruments: Art. 26, Art. 27 and 37 FFL; Art. 28-29, Art. 44-45 FOF; Art. 26ff. of the Federal ordinance for the protection of plants in forests; Administration regulation number 9.

Economic instruments: Compensation payments are paid on the total costs of the prevention and reparation of damages calculated with reference costs. From the total costs timber revenue is subtracted. The reference costs are defined by the Cantons and approved by the Federal Forest Agency. The PFS is defined in Table 4 (Table 2 FOF). It is based on the global brutto costs and covers together with the cantonal contribution the deficit of the measure at most. Decisive is the financial power of the Cantons at the time of the collocation of the measure (Art. 36 FLS).

Measures funded: Financial contributions are paid for two categories of measures:

1) Prevention of damages in forests:
   - Acquisition, handling, supervision and maintenance of equipment and infrastructure like beetle pitfalls to control calamities;
   - Exceptional efforts for the intensive supervision of all forests for an early recognizing of the development of diseases and pests if they are dangerous for the forests;
   - Clearance of felling area in normal cuts if the danger of spreading of diseases or pests exists;
   - The construction of infrastructure for the prevention and abatement of fire. Precondition is the definition of risk zones and their consideration in planning documents by the Cantons.

2) Reparation of damages in forests:
Financial contributions are paid to remove damaged trees (by storm, disease or pests) which threaten real assets, people or the forest itself. Financial contributions are paid for the following measures:
   - Cutting and clearance of area with damaged stands;
   - Setting up damaged trees;
   - Debarkment and abatement of pests and diseases by burning (or other methods) of the bark if the danger of dispersion exists;

59 Phytosanitärer Beobachtungs- und Meldedienst PBMD (www.pbmd.ch).
60 (Forstdirektion 1993-2002: KS 7).
61 Pflanzenschutzverordnung [SR 921.541].
62 Subventionsgesetz [SR 616.1].
• Clearance of felling area and abatement of pests and diseases in areas with damaged forests by burning (or other methods);
• Transport of timber to the next timber yard;
• Clearance of damaged young stands regardless of the phytosanitary importance;
• Elimination of Abies alba attacked by the Pityokeins curvidens (Krummzähniger Weisstannenborkenkäfer), if this measure is important for phytosanitary reasons.

Figure 22: Compensations for damages in forests (Confederation and Cantons, 1990-1999).

Financial contributions cannot be paid for:
• The felling, setting up, debarking, clearance of felling areas and transport of damaged trees to the next timber yard if the income generated by selling the timber covers the costs;
• Setting up and transport of timber in normal felling;
• Setting up and transport of undamaged trees in areas of damage;
• Setting up and transport of damaged trees which are not an immediate danger to the affected stand (like dead standing trees);
• Removal of floating timber from rivers and lakes is part of the maintenance of water sources. According to Art. 3 Para. 1 and Art. 6 Para. 3 of the Federal law on hydraulic engineering the Cantons are responsible for maintenance of rivers and lakes and no financial contributions are foreseen under the Federal law;
• Storage of timber (inclusive wet storage);
• Unnecessary work on damaged trees against diseases and pests;

63 Wasserbaugesetz [SR 721.10].
• Measures for the protection of the forests with the aim of producing high quality timber;
• Compulsory felling (Zwangsnutzung) of trees with thinned canopy and other symptoms of “novel diseases in forests” (neuartige Waldkrankheiten), which are not infected by contagious diseases or beetles;
• The quenching of forest fires.

The total cost calculated with reference costs and the real deficit of the harvesting are relevant for the calculation of the compensations.

Financial inputs: The financial contributions for damages of forest were quite high in 1990 due to the storm Vivian in the Alps and Pre-Alps. In the following years the expenditures decreased to less then 20 million €. Since 1993, plantations are subsidised. The peak can be explained with the cost incurred by the plantations on the areas of damage caused by storm Vivian. During 1995-1999 no major natural hazards occurred. The expenditures remained stable. The Cantons allocated around 5 and the Confederation around 9 million €. Altogether, 405 million € of compensations were allocated in 1990-1999. After 1993 the Federal contributions have been reduced from over 68% to 53% (Figure 22)

4.3.7 Forestry planning documents 64

Objectives: The Cantons are responsible to issue planning and management regulations, to reach an appropriate timber supply, taking into account the requirements of close to nature silviculture and of the protection of nature and landscape (Art. 20 (2) FFL). Basic documents for forestry planning must be set up and updated for the whole managed area. Federal financial contributions are allocated if the measures are in accordance with forestry planning, are necessary and appropriate, meet all technical, economic and ecological requirements as well as all other Federal and cantonal legal requirements (Art. 39 (1) lit. a FOF).

Legal instruments: Art. 38 (2) lit. a and Art. 52 FFL;
Art. 18, Art. 31 (3), Art. 39 (1) lit. a and Art. 46 FOF;
Administration regulation number 10.

Economic instruments: The preparation of basic management plans are supported by incentives. The project financing share is defined in Table 4 (Table 2 FOF). The Confederation allocates financial support amounting up to 50% of the cost incurred for the preparation of documents necessary for forestry planning (Art. 38 (2) lit. a FFL).

The forest owners receive for the planning with medium- and long term impact financial contributions within the limits of a global budget. Project related surveys concerning forest functions and site conditions should be charged to the global budget for the establishment of management plans, and not to different project components (e.g. silviculture A projects).

Measures funded: Incentives are allocated for:
• Surveys on the forest functions and their importance;
• Surveys on the site conditions;
• Surveys on the development of the forests:
• Forest inventories;
• Maps indicating the stands;
• Preparation of medium and long term management plans;
• Surveys on damages in forests;

64 (Forstdirektion 1993-2002: KS 10).
Surveys concerning the fauna and the definition of game reserves;
Analysis on the regional demand for timber;
Implementation, maintenance and running of accounting systems;
Concepts concerning damages of wildlife in forests. Only the concepts are subsidised;
Definition of forest reserves and reserves for genetic purposes.

No financial contributions are made for:
- Establishment of short term plans;
- Guidance of constructions (Bauleitung);
- Annual silvicultural programmes;
- Preparation of cantonal planning and management regulations;
- Preparation of cantonal laws, ordinances and other works concerning legal regulations.

Figure 23: Incentives for planning in forestry (Confederation and Cantons, 1990-1999).

Financial inputs: With the new forest legislation (1993), incentives were paid for the preparation of documents for forestry planning. The expenditures remained since the introduction of these incentives on a level of around 3.5 million € for the Cantons and 4.5 million € for the Confederation. With the increasing importance of the forest as a recreation area for the population, an adequate planning and coordination of the different forest function became very important. Altogether, 53.1 million € were spent on payments of incentives in 1990-1999. The Federal contribution was around 45% (Figure 23).
4.3.8 Forest reproduction material, advertising, sales promotion and plant protection

Objectives: The Confederation and the Cantons allocate financial support for the production of forest reproduction material, advertising and sales promotion in cases of exceptional timber harvest and the establishment of a plant protection service with the parties concerned (Art. 26 para. 3 FFL).

The Cantons ensure the production of sufficient suitable reproductive material. The forest reproduction material must be healthy and adapted to the station. The seed crop stands must be selected by the responsible cantonal forest authority which has to inform the Federal Forest Agency. The authority supervises the commercialisation of seeds and cuttings, and issues certificates of origin (Art. 24 FFL). Only reproduction material with certified origin may be used for forestry purposes. The Federal Forest Agency runs a register of seed stocks and a register of gene reserves and advises the Canton on all matters concerning production, supply and utilisation of forest reproduction material ensuring genetic diversity (Art. 21 FOF). The Federal Forest Agency authorizes import and export as well as the management of forest reproduction material (Art. 22-23 FOF).

Legal instruments: Art. 24, Art. 26 (3), Art. 38 (2) lit. c and f FFL; Art. 21-24 and Art. 50 FOF.

Economic instruments: The allocated payments are incentives. The Confederation provides financial support up to 50% (in accordance with Table 4 (Table 2 Annex FOF)) of the costs incurred for measures concerning the production of forest reproduction material. Also supported are advertising and sales promotion measures adopted jointly by forest management and the timber industry, at times of exceptional timber harvest (Art. 38 (2) lit. c and f FFL). Further, financial support is allocated for the conservation of genetic diversity (Art. 50 FOF). The financial instrument for setting up a plant protection service by the Confederation, Cantons and third parties concerned, is the “assignment” (Auftrag).

Measures funded: Incentives are allocated for measures such as (Art. 50 (2) FOF):

- The construction work in the seed extractories;
- The purchase of technical equipment, machinery and instruments required for the production and treatment of seeds;
- The operation of seed orchards and services for the supply of approved seeds;
- The management of gene reserves, specified in management plans and part of the Federal concept for the conservation of genetic diversity of forest vegetation.

Financial inputs: Financial support shall be allocated once a construction project or an utilisation concept approved by the Canton has been submitted, together with an estimate and financing guarantees. The first payments in these categories were made in 1993 (new FFL). The expenditures increased in the following years and reached a peak in 1997 of 1 million €. Then the payments dropped to 0.2 million € each in 1999. Altogether, 6.2 million € were spent in the nineties. The Federal contribution was 50% (Figure 24).
4.4 Structure improvement and access infrastructure

4.4.1 Overview

15% of I&C were used for structure improvement and access infrastructure in 1990-1999. This category contains the two components improvement of management conditions and access infrastructure. The first one aims to improve the management conditions and increase efficiency while the second one aims the developing and construction of access infrastructure.

The financial contributions for the improvement of the management conditions are around 9 million € throughout the 90’s, while the financial contributions for access infrastructure dropped from over 35 million € below 12 million € in 1995. According to the LFI the coverage with forest roads in Switzerland is good with over 58m/ha in the Plateau, 39.5m/ha in the Jura, 16.6 m/ha in the Pre-Alps. The coverage in the Alps with 11.6 m/ha and the Southern Alps with 7.8 m/ha on the other hand is below average.

Since 1985 two important changes happened concerning the harvesting of timber. First, the constructions of access infrastructure (forest roads, skidding paths etc.) in forests were more and more criticised. This led to the introduction of an environmental impact assessment (Umweltverträglichkeitsprüfung) for projects covering an area (forest and agricultural land) of more than 400 hectares. And second, the harvesting technologies have been developed during the 80’s and 90’s. The use of mobile cable way (Seilkran) in forests steeper than 40% is more
frequent nowadays.\textsuperscript{65} The expenditures are increased slightly after 1995 and amounted in 1999 23 million € (Figure 25).

\textit{Figure 25: Financial contributions for structure improvement and access infrastructure (Confederation and Cantons, 1990-1999)}


\subsection*{4.4.2 Legal bases}

The legal regulations concerning structure improvement and access infrastructure can be found in Art. 38 FFL, Forest management, Paragraph 2:

\begin{itemize}
  \item The Confederation allocates financial support amounting to as much as 50\% of the costs incurred in executing such measures as:
  \begin{itemize}
    \item construction, acquisition or renovation of access infrastructure in cases where this is indispensable for management of the forest and insofar as it does not represent a threat to the forest as a living community;
    \item measures aimed at improving management conditions with the exception of reallocations, the creation of forest management cooperatives, and regulation of grazing;
  \end{itemize}
\end{itemize}

\subsection*{4.4.3 Access infrastructure\textsuperscript{66}}

\textit{Objectives:} The purpose is to build, extend and reconstruct access infrastructure, as far as it is necessary for the management of the forests and as long as it respects the forest as a natural biocoenosis.

\textsuperscript{65} (Brassel and Brändli 1999: 235-236).

\textsuperscript{66} (Forstdirektion 1993-2002: KS 11).
Legal instruments: Art. 38 para. 2 lit. d FFL; Art. 48 para. 1 lit. a FOF; Administration regulation number 11.

Economic instruments: Incentives are allocated in form of lump sum payments or according to real costs. The PFS is related to the project and is defined in Table 4 (Table 2 Annex FOF).

Measures funded: Access infrastructures being supported are forest roads, logging trails, permanent funiculars or permanent constructions for funiculars, and timber yards as part of the access infrastructure. Necessary infrastructures to access constructions against natural hazards are supported under the component “constructions against natural hazards” (Schutzbauten und Anlagen).

Important principles according to the Federal Forest Agency are:
- The need for access infrastructure must be proved. Most important bases are the forest management planning and the agricultural management planning.
- The planning of access infrastructure has to consider the present techniques for harvesting and logging.
- Cost-benefit calculation must be made, looking at the direct and indirect components (investment calculations). Important is to make a clear difference between the financial consequences for the enterprise and the economic consequences on a regional or national level. Large projects with major impact have priority. Normally only projects making accessible at least 10 hectares are approved by the Swiss Forest Agency.
- Before starting a new project the existing infrastructure must be reconstructed.

Measures are funded according to approved costs, including direct costs and the share of overheads (umgelagerte Kosten) corresponding to the work at hand (according to the accounting record). In case of small firms or private forest owners it is an amount calculated as a percentage of the direct costs (indirect cost assessment) (Art. 41 FOF, administration regulation number 6).

The following measures are contributed to:
- The establishment and realisation of the project within the authorized budget;
- Reparation of damages caused by the construction-traffic on the construction site (authorized project);
- Project-related updating of the official surveying and its registration in the land register;
- Purchase of land for the construction of forest roads according to its harvesting capacity value (at the most SFr. 10.-/m²).

No financial contributions are made for annual or periodic maintenance.

Until the 1980’s the construction of forest roads in the Alpine and the Pre-Alpine regions was important and the contributions accordingly high. In the 1980’s the environmental topic and the protection of nature became more important and affected the design of the new FFL. Altogether, 246.4 million € were spent in the nineties. The Federal contribution was over 56% (Figure 26).
4.4.4 Improvement of management conditions

Objectives: Purposes are the improvement of the management conditions for a sustainable management of the forests and increase the added value of the products and services of the forests. Such an improvement may be reached by the constitution of structures for a more efficient management, collaboration between forest owners and a better marketing of the products and services of the forests.

Legal instruments:  
Art. 38 para. 2 lit. e FFL;  
Art. 48 FOF;  
Administration regulation number 12.

Economic instruments: Incentives are allocated in form of lump sum payments or according to the actual costs. If lump sum payments are made, no additional costs are accepted. The project financing share is calculated according to Table 4 (Table 2 Annex FOF). The financing may be realized partially by investment credits.

Measures funded: Incentives are allocated for the improvement of (1) ownership structures, (2) management conditions, (3) construction of depots and (4) regulation of grazing and forest pasturing.

1. Improvement of ownership structures: The reorganisation of ownership structures concerning only single forest owners are not funded anymore. Only the merging of forest land for a collective management of at least 20 hectares receive financial support.

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2. Under the component “improvement of management conditions” the following measures are funded:
   - Promotion of the application of rational timber harvesting methods;
   - Promotion of establishing cooperative management structures;
   - Promotion of better timber supply;
   - Promotion of the use of cable cars.

3. Depots: They are the logistic heart of each forest enterprise. The constructions of depots are funded as far as it is necessary for the management of the forests.

4. Regulation of grazing and forest-pastures: Demarcation of forest and grazing land. Part of this is the construction of fences and reforestations. Measures for the improvement of the management of the Alps (grazing) are part of the improvement of soils in the Alps (alpwirtschaftliche Bodenverbesserungen).

*Figure 27: Incentives for the improvement of management conditions (Confederation and Cantons, 1990-1999).*


The expenditures of the Cantons has exceeded in the early 1990’s the Federal expenditures slightly. The new FFL introduces a new proportion of the expenditures for this component. The Confederation now bears around 60% of the expenditures. In 1994 the total expenditures dropped to 5.7 million €, increased to a peak of 10 million € in 1997 and dropped again to 7.2 million € in 1999. Comparing to the investments in access infrastructure, the expenditures for the improvement of management conditions are quite stable. Altogether, 80.1 million € were spent for the improvement of management conditions in the nineties. After 1992 the Federal contribution increased from around 48% to 58% (*Figure 27*).
4.5 Protection against natural hazards

4.5.1 Overview

29% of I&C were used for protection against natural hazards during the period 1990-1999. This category contains the following three components: maps of danger zones, measuring stations and early warning systems; establishment and tending of forests with a special protective function; and protection work and installations for the protection of the population from natural hazards.

More than 90% of the expenditures are used for protection work and installations. In 1993 the two other components were introduced by the new Federal forest law, FFL. The expenditures for the establishment of forests with a special protective function have been rather small (max. 0.4 million € in 1995 and 1998), while the setting up of maps, measuring stations and warning systems became more important in 1996-1999 (max. 3.6 million € in 1999).

4.5.2 Legal bases

The legal regulations concerning protection against natural hazards can be found in Art. 36 FFL:

Art. 36 FFL Protection against natural hazards

The Confederation allocates compensations for up to 70% of the expenses due to the application of measures required for the protection of the population and of property of great value against natural catastrophes, such as:

a) the construction and reparation of protective works and installations;

b) the creation of forests for protective purposes and the tending of young stands;

c) the creation of cadastral surveys and maps showing danger zones, and the installation and operation of measuring stations as well as of early warning services to guarantee the security of built-up areas and communication lines.

4.5.3 Protection work and installations

Objectives: The purpose is to protect the population and substantial infrastructure (settlements, roads and other constructions) from natural hazards (avalanches, landslides, rockslide, erosion). For this purpose, the construction and reconstruction of installations of protection work, installations to trigger of avalanches and rocks, and the relocation of endangered buildings and infrastructure are subsidised by the Confederation. The Cantons must ensure that any zones required to protect the population and property of great value against avalanches, landslides, erosion or rock fall are in good condition, and that streams through the forest are suitably embanked (Art. 19 FFL). The methods used for such measures must be nature oriented (Art. 19 FFL).

At present, research, forest authorities and forest services establish basic guidelines for decision making concerning risk-analysis and the design of measures. Until the necessary results are available the required measures must be based on qualitative and as far as possible on quantitative risk-analysis. The following factors must be evaluated: potential of danger; potential of damages; probability of the occurrence of dangerous processes; scale of damages; goals of protection, and remaining risks.

**Figure 28: Expenditures for protection against natural hazards (Confederation and the Cantons, 1990-1999)**

![Expenditures for protection against natural hazards (Confederation and the Cantons, 1990-1999)](image)


**Legal regulations:**  Art. 1 (2), Art. 19, Art. 35, Art. 36 lit. a FFL;
Art. 17 and Art. 42 FOF;
Administration regulation number 20.

**Economic instruments:** Compensations are paid in form of lump sum payments or according to real costs. The PFS is defined in *Table 4* (Table 1 Annex FOF). For the construction of galleries for the protection of non-forest roads the PFS indicated in *Table 4* (Table 2 Annex FOF) is valid. The Confederation supports projects for protection work and installations of up to 70% of the costs incurred.

**Measures funded:** Compensations are paid for the following measures (Art. 17 and 42 FOF):
- Construction and refurbishment of protective works and installations (installation to trigger of avalanches as preventive measure, blasting of instable rock structures etc.);
- The creation of cadastral surveys and maps showing danger zones;
- The installation and operation of measuring stations as well as of early warning services to guarantee the security of built-up areas and communication lines;
- The embankment of streams, landslide and gully work, drainage and erosion control.

No compensations are paid for (Art. 42 (4) FOF):
- Measures aimed at protecting buildings or installations build without any absolute need in danger zones or areas considered as dangerous;
- Measures aimed at protecting tourism installations such as railways, ski lifts, ski slopes or cross-country ski circuits.

**Financial inputs:** Storm Vivian caused in 1990 extraordinary contributions which were reduced in the following two years. New guidelines were introduced with the new FFL in
1993. The total expenditures increased from 36.1 million € in 1992 to a peak of 46.7 million € in 1995. In the following years the amount decreased to around 36 million € in 1999. Altogether, 440.9 million € were spent during the nineties. The Confederation contributed around 70% of the compensations allocated (Figure 29).

Figure 29: Compensations for protection works and installations (Confederation and Cantons, 1990-1999)


4.5.4 Establishment and tending of forests with a special protective functions\(^{69}\)

Objectives: The purpose is to guarantee the security of the people and substantial infrastructure.

Legal regulations: Art. 1. (2)., Art. 19., Art. 35., Art. 36. lit. b. FFL; Art. 17. and Art. 42. FOF; Administration regulation number 20.

Economic instruments: The Confederation allocates compensations of up to 70% of the expenses for the establishment of forests for protective purposes and the tending of young stands.

Measures funded: Costs for reforestation and the tending of young stands on slopes with a direct risk of avalanches, landslides, erosion, debris flow or rockslide, endangering persons or real assets of great value (forest fulfilling a particular protective function) are compensated (Art. 17 (1) lit. a. FOF). Measures concerning protection work and installations must be combined as far as possible with bioengineering and silvicultural measures (Art. 19 (2) FOF).

\(^{69}\) (Forstdirektion 1993-2002: KS 20).
Financial inputs: Since 1993 there are compensations for the establishment and tending of forests with a special protective function. The peak was reached in 1998 with expenditures of 0.44 million €. Altogether, the expenditures in the nineties were 2.75 million €. The contributions of the Confederation were around 70% (Figure 30).

Figure 30: Compensations for the establishment and tending of forests with a special protective function (Confederation and Cantons, 1990-1999).

4.5.5 Maps of danger zones, measuring stations, and early warning services

Objectives: The Cantons are responsible for preparing basic documents for protection against natural hazards, and in particular land registers and maps of danger zones. When setting up the documents, the Cantons have to take into account the work already carried out by specialised services of the Confederation and the technical guidelines (Art. 15ff. FFL).

The purpose of maps of danger zones, measuring stations and warning services is to protect the population, communities, traffic and other infrastructure by early detection and analysis of potential natural dangers like avalanches, rock slides, debris flow, landslides etc. The goal is to ensure and optimize an integral risk management by elaborating incidence registers of natural hazards (Ereigniskataster), registers of constructions against natural hazards (Schutzbautenkataster), maps indicating natural hazards (Gefahrenhinweiskarten and Gefahrenkarten), assessments of natural perils (Gefahrenbeurteilungen), risk-analysis, the establishment of early warning systems and services, and automatic warning systems.

Of prime importance is the application of danger-maps and early warning systems for the protection of the population and infrastructure. For an efficient and effective integrated risk-

70 (Forstdirektion 1993-2002: KS 13).
management the works of the cantonal agencies for natural hazards and protection against floods need to be coordinated.

*Legal instruments:* Art. 19 and Art. 36 lit. c FFL; Art. 15ff. and Art. 43 FOF; Administration regulation number 13.

*Economic instruments:* *Compensations* are paid for the preparation of the above mentioned maps and assessment systems. The project financing share is defined according to Table 4 (Table 1 Annex FOF). The Confederation allocates compensations of up to 70% of the expenses incurred for the preparation of cadastral surveys and maps showing danger zones, and the installation and operation of measuring stations as well as of early warning services, to guarantee the security of urban areas and infrastructure (Art. 36 lit. c FFL).

*Measures funded:* Generally funded are collection and storage of data; establishing of interfaces between the Federal and the cantonal software programmes (StorMe, ProtectMe etc.); support of data processing, training to secure a consistent data collection; data interpretations support and meta data collections. The Cantons have to consult the Federal Forest Agency before purchasing software. No contributions are paid for hardware and general office and GIS software, measuring instruments and permanent operating of early warning systems (personal, administration etc.).

*Financial inputs:* The expenditures for this component are increasing since 1993 when it was created by the new FFL. The peak was reached in 1999 with an amount of 3.7 million €. Altogether, the expenditure in the nineties was 16.7 million €. The Confederation contributed a share of 65% (*Figure 31*).

*Figure 31: Compensations for the establishing of maps of danger zones, measuring systems and early warning systems (Confederation and Cantons, 1990-1999)*

5 Investment credits, tax concessions and indirect measures

5.1 Investment credits

**Legal instruments:** Art. 40 FFL; Art. 60-64 FOF; Art. 36 of the Federal law on the Federal financial household;\(^{71}\) Administration regulation number 17. The aim of investment credits is to create an incentive to improve the management of forests and services, and to assure the medium and long term existence of the forests. According to article 53 FFL the Cantons have to define the implementation regulations and communicate them to the Federal Forest Agency.

**Economic instruments:** The Confederation grants repayable loans, either at no interest or at a reduced rate of interest with a maximum duration of 20 years. Fix-term loans are granted on the request of the Cantons. If the recipient of the loan fails to repay it, it is up to the Canton to repay it instead (Art. 40 FFL). The Confederation allocates global loans to the Cantons for the allocation of the investment credits to interested third parties. The Cantons administer and manage the received funds. This means that funds which are not being used are invested at market-driven rates of interest. Repayments have to be used in the same Canton again as investment credits, and must be taken into account for the annual requirements for loans for the next year sent to the Federal Forest Agency. The available funds are distributed among the Cantons according to their requirements (Art. 61 (2-3) FOF).

**Measures funded:** The Confederation supports innovative projects. In case of doubt the loan application may be revised by the Federal Forest Agency to prevent a payback process. Credits are foreseen for the following subjects (Art. 40 FFL, Art. 63, Art. 64 FOF):

- Construction loans (up to 80% of the costs);
- The payment of residual costs emerged in projects in accordance with Art. 36 (protection against natural catastrophes) and Art. 38 (1) and (2) lit. d-e FFL (forest management);
- The purchase of forestry vehicles, machinery and tools and for the building of installations required for tending, harvesting and logging.

Investment credits are allocated if necessary and appropriate for protection against natural hazards or for the management of forests, only if the financial situation of the applicants requires it. They may not to be cumulated with credits allocated according to the Federal law on investment and credits in agriculture and emergency relief for farmers [SR 914.1], or with credits allocated under the Federal law on investment aid for mountainous regions [SR 901.1] (Art. 60 FOF). Companies with an assignment to tend stands and harvest timber on a contractual basis may receive investment credits (Art. 62 (3) FOF). The total investment credits in circulation increased continuously since 1990 and reached in 1999 around 33 million €. During 1994-1998 the annual credits and repayments were around 4.5 respectively 4 million € (Figure 32). Calculating with the average interest rate of federal bonds (1990-1999) their rate was between 3-6.4%. The financial costs were between 0.9 (1998) and 1.7 (1992) million € or over 13 million € within the period of investigation (Figure 33).

\(^{71}\) (Forstdirektion 1993-2002: KS 17).

\(^{72}\) Finanzhaushaltgesetz [SR 611.0].
Figure 32: Investment credits by the Confederation (1990-1999)

Comment: There was no data available for the years 1990-1991 concerning the annual credits allocated. In 1992 no credits were paid.

Figure 33: Financial costs of the investment credits for the Confederation (1990-1999)

5.2 Overview of the Swiss taxation system

5.2.1 Characteristics

The taxation system reflects the federalist structure of the Swiss Confederation. Indeed, Switzerland only had a uniform tax system for the brief period between 1798 and 1803. Since the late 19th century the Confederation, Cantons and local authorities have enjoyed fiscal sovereignty to be able to fulfil the public tasks assigned to them.

Thus, the main characteristic of the prevailing tax system is that taxes are paid at all three state levels. The main emphasis within the system is on income tax and capital tax. In addition, various other taxes are charged at the different levels, for example value-added tax at federal level, and inheritance, capital, property and expenditure taxes at cantonal and local-authority levels. Furthermore, there are various non-regular taxes (excise taxes), the proceeds of which are used for specific national tasks (e.g. the health system, road-building etc.). Thus, overall, the Swiss tax system is characterized by its federalist structure and the significant variations that result from this structure. Figure 34 shows a simplified diagram of the basic structure of the Swiss tax system.

Figure 34: Basic structure of the Swiss tax system

5.2.2 Significance of taxes for Swiss forestry operations

It may be assumed that in terms of tax law forest operations are treated in the same way as all other production and service operations. This means that forest owners and forest enterprises, as individuals or legal entities, are liable to income and capital taxes charged at federal, cantonal and local authority levels. In the case of both individuals and legal entities, tax liability is only incurred if profit or capital exists. The majority of public forest enterprises are not profitable anymore since the 1980’s, so they generally pay very little or no income tax. In the case of capital taxes, the Cantons and local authorities have relatively high tax-free

73 (IKS 2000: 5ff.).
thresholds (e.g. up to 200,000 CHF) which often exceed the estimated value of the forests. For this reason, it may be assumed that most of the public and private forestry operations and forest owners pay little or no income and capital taxes. Thus, in the overall Swiss context, the tax revenue from forestry can be classified as small.

Like other operations of considered as of public interest forestry operations, in certain cases, are entitled to tax relief and even tax exemptions. Such concessions exist for example in the case of Value Added Tax (VAT) (Mehrwertsteuer – MWST). This tax was introduced on January 1st 1995 as a general consumption tax and is an all-stage tax with deduction of input.74 Accordingly, based on their primary production activity, forestry operations are exempt from VAT if their products originate from their own or leased forests. This would be the case for the majority of Swiss forestry operations. However, forestry operations are liable for VAT for services to third parties. In this case, the forestry operations must pay the standard VAT rate which is currently 7.6 % with a reduced rate of 2.4% applied for trade in seeds and living plants. There is a possibility to opt for balance-based taxation (Saldobesteuerung) whereby flat rates of VAT are levied. These rates currently range from 0.6% to 6%.75

5.2.3 Results of the expert survey

Complementary to general information on the federalist structure of the Swiss tax system provided above and its implications for forestry operations additional information has been collected by telephone interviews with selected individuals. Of the telephone interviewees, eleven were senior employees of public forestry operations, one was a representative of the Federal Tax Administration, one was a representative of the Zurich cantonal tax administration, and one was a tax expert from the Association of the Swiss Forestry Sector (Waldwirtschaftsverband Schweiz [WVS]).

As a basis for these discussions, a survey of the tax regulations for forestry operations was carried out with the help of the Federal Tax Administration. Based on the information obtained, a questionnaire was compiled which could then be used to obtain information about the situation prevailing in individual forestry operations with respect to income, capital and value-added tax. The interviewees were selected on the basis of personal information.

The information obtained from these discussions corresponds to that given in the previous section. Thus, according to the telephone survey, for the above-mentioned reasons, most forestry operations are not liable for VAT. Based on cantonal regulations, some of the public forest enterprises do not have to pay income tax, even if they report a profit.

For reasons of confidentiality, the tax authorities would not provide figures on total tax returns (with the exception of VAT) and on tax relief. Statistical data are merely available on VAT returns since 1995. This data reveals that in the period from 1995 to 1999, the forestry sector paid a total sum of CHF 28.8 million in VAT which represents around 0.1% of the total VAT paid in Switzerland in this period, or around 1.3% of value added for the forestry sector in 1999.76

74 (IKS 2000: 40).
75 (WVS 2002).
5.3 Indirect measures

5.3.1 Overview

In comparison with the I&C paid by the Confederation and the Cantons, the financial support for indirect measures seems relatively low with less than 10 million € p.a.

Over 65% of the expenditure for indirect measures has been used for training in forestry, reaching a peak in 1995 with 7 million €. Surveys in forestry were supported with over 27% of the expenditures. The forest and timber research fund already existed in the beginning of the 90’s, while the payments to associations for forest conservation were initiated in 1993 with the new FFL (Figure 35). The yearly fluctuations seem considerable, but compared to the total amount of I&C the expenditures are relatively small.

*Figure 35: Expenditures for forest timber and research funds, surveys in forestry, associations for forest conservation and training in forestry (Confederation, 1990-1999)*


5.3.2 Forest and timber research fund

*Objectives:* Based on the decision of the Federal Council from January 16th 1991, the reorganisation and promotion of the research fund in the forest and the timber processing sector was initiated. The purpose of this fund is to support research on forests for the development of measures to protect the forest from destructive impacts, to protect the population and property of great value from natural hazards and to increase the utilisation of

wood products. Important is the exchange of knowledge, scientific results and experience between professional education facilities, research institutions and the forestry and timber processing sector (Art. 31 FLF). Possible applicants are the enterprises and associations of the forestry and the timber processing sector with an infrastructure suitable for research and development, further, and scientists in collaboration with an institution, an enterprise or an association ready to apply the results.

**Legal instruments:** Art. 31 (1) lit. d FFL; Art. 52 (2) FOF; Administration regulation number 14.

**Economic instruments:** The economic instrument is a financial “contribution” (Beitrag) for the approved activity. The Confederation allocates support of up to 50% of the costs for joint research and development (R&D) projects. It may support organisations which promote or coordinate R&D, up to the amount invested by third parties, insofar as the Confederation receives an adequate right of co-determination within these organisations (Art. 52 FOF). The funding may be undertaken by annual Federal contributions, annual contributions of the Cantons according to guidelines established by the Conference of cantonal Forest Directors, and by contributions of third parties.

**Measures funded:** The measures funded are R&D projects related to forestry, timber processing and protection against natural hazards.

**Financial inputs:** The expenditures increased slightly in the early 90’s to 0.25 million € in 1995-1996 and dropped again during the following years. Altogether, 1.75 million € were spent in 1990-1999 (Figure 36).

### 5.3.3 Surveys in forestry

**Objectives:** The aim of such surveys is to collect data for monitoring and decision making with regard to an optimal management of the forests. The Confederation and the Cantons need these surveys to keep the authorities and the population informed on the forest functions and on the general condition for the development of forestry and the timber industry (Art. 34 FFL). Forest owners and those responsible for forestry and timber industry activities must accept the need for such investigations and provide the relevant information to the authorities. Those responsible for carrying out the inquiries or interpreting their results are bound to respect their confidential nature (Art. 33 FFL).

**Economic instruments:** The economic instrument is a “contract” between the research institutions or forest enterprises and the Confederation or the Cantons.

**Measures funded:** Surveys have been carried out on the following topics: site conditions in forests, forest functions and forest health, production and sale of timber, forestry and timber processing industries and the economic situation (Art. 33 FFL). The national forest inventory (Landesforstinventar) is the most important of the surveys in the forest sector. Up to now, two national surveys were realized and the next has been planned for 2004-2006.

**Financial inputs:** The expenditures for surveys in forestry amount to around 2 million € per year. Altogether, 15.4 million € were spent in 1990-1999 (Figure 37).
Figure 36: Expenditures for the forest and timber research fund (Confederation, 1990-1999).


Figure 37: Expenditures for surveys in forestry (Confederation, 1990-1999).

5.3.4 Associations for forestry preservation

*Objectives:* The Confederation may entrust certain tasks which are in the interest of forest preservation to associations of national importance, and provide them with the necessary financial support. It may also confer tasks of special importance to certain regions, particularly in mountainous areas, to cantonal or regional associations (Art. 32 FFL).

*Economic instruments:* The economic instrument is the “assignment” (Auftrag), which is used to delegate certain tasks to associations.

*Measures funded:* Measures may refer, for instance to planting and tending of forest, construction of installations as protection from natural hazards, collection of data for surveys, or to the preparation of pedagogical material.

*Financial inputs:* This category was established with the new FFL and the contributions ever since are around 0.3 million €. Altogether, 2.2 million € were spent in 1990-1999.

*Figure 38:* Expenditures for associations for forestry preservation (Confederation, 1990-1999).

![Expenditures for associations for forestry preservation](image)


5.3.5 Training in forestry

*Objectives:* The purpose of training in forestry is to establish a pool of forest professionals needed for an adequate management of the forests. The Confederation is responsible for training and education and supervises, coordinates and encourages it.

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78 (Forstdirektion 1993-2002: KS 3 and 5).
Legal instruments: Art. 29-32, 35 and 39 FFL; Art. 1, 14, 14a, 25 and 25a Federal law on the protection of nature and patrimony; Art. 6, 42, 43 and 49 Federal law on the protection of the environment; Art. 49, 50 and 64 of the Federal law on the protection of water sources.

Economic instruments: The Confederation encourages the training of forestry workers through the allocation of financial support by virtue of articles 63 and 64 of the Federal law on professional training.

Figure 39: Expenditures for training in forestry (Confederation, 1990-1999)

Measure funded: The Confederation is responsible that forestry engineers receive an advanced training and regulates the qualification for senior level positions in the public forestry service (Art. 29 (2), (3) FFL). The Cantons ensure that forestry workers receive adequate training and that the forest owners receive adequate counselling (Art. 30 FFL). The Confederation allocates financial support of up to 50% for specifically job-related expenditures, and notably for on-the-job trainings and the preparation of pedagogical materials aimed at forestry workers. Financial support of up to 50% for the approved costs for professional training of forestry workers and for field training of forestry engineers, who want like to qualify for senior level positions within the public forestry service are provided as well (Art. 39 FFL).

79 Natur- & Heimatschutzgesetz [SR 451.0].
80 Umweltschutzgesetz [SR 814.01].
81 Gewässerschutzgesetz [SR 814.20].
82 Berufsbildungsgesetz [SR 412.10].
Financial inputs: There are two reasons to explain the increase of expenditure until 1995 and the later decrease. In 1992, the Confederation launched a programme called “Profor”, which aims at adjusting and simplifying the training in forestry on different levels. At the same time, the Confederation was involved in the building of a second inter-cantonal forestry school. Altogether, 36.3 million € were spent during the period 1990-1999 (Figure 39).

6 Discussion

The EFFE-project concentrates on the political economy of forestry and aims to ensure evaluation research of forestry funding in EU and other European countries. The results of the project should contribute:

− To increase the understanding and transparency of government actions in forestry;
− To provide information for designing public intervention policies in forestry;
− To decrease the social costs by establishing policy recommendations in order to avoid intervention failures.83

The following sections comment on the time horizon and the conditions of financing forestry in Switzerland, and summarize the findings of the study according to the general EFFE data collection format.84

6.1 General remarks

6.1.1 Adequate time horizon of the analysis

The EFFE-project focuses on the time period 1990-1999. However, in order to understand and interpret the development of financial contributions to Swiss forestry between 1990 and 1999 it is necessary to consider a longer period such as at least 1980-2000. First, major changes in the Swiss forest policy, in particular concerning the categories and the design of financial instruments to support forestry, occurred in the 1980’s. Second, because of the storm Vivian in 1990 expenditures on forestry of the Confederation and the Cantons doubled between 1989 and 1990. If the period of analysis is restricted to 1990-1999, the impression results that financial contributions have decreased. Third, the storm Lothar in 1999 caused again a doubling of the expenditures of the Confederation and the Cantons between 1999 and 2000 which has revived the discussion about the effects, the costs and benefits of financial instruments to support forestry.85

6.1.2 Conditions influencing the development of forest related financial instruments

In Switzerland, more than 50% of the forest is mountain forest and 42% is on slopes steeper than 40%. This explains why non-timber services of the forest, in particular its protection function, are of great importance. The Swiss economy is highly developed. Direct results are the high labour costs on the one hand and a high demand (willingness-to-pay) for non-timber services of the forest on the other hand. Land is scarce which leads to high opportunity costs of land used for timber production. At the same time the Swiss timber processing industry is strongly connected to international markets and dependant on foreign trade. In 1999, about 33% of the roundwood production was exported and 20% was imported. 6.6 million m³ of processed timber was exported and 8.1 million m³ imported.

83 (EFI 2001).
84 (EFI 2001).
Altogether, the unfavourable natural conditions, the scarcity of land, the highly developed economy, and the strong connection to international trade is responsible for the marginal economic significance of timber production, while the timber processing industry is more important. In 1995, 0.2% of the working population was employed in the forest sector and 2.4% in the timber processing industry. While forestry created an added value of 0.1 % of the Gross Domestic Product the share of the timber processing industry was 1.5 %.

Communal forestry in Switzerland is very important compared to other countries. Moreover, small scale forest ownership is the norm. This ownership pattern has consequences for the economic value of timber production in comparison with non-timber services. Losses arising at timber production have so far been compensated to a considerable extent by extra income from other businesses or reserve funds of the public forest owners (boroughs, corporations) or through financial support from municipalities, Cantons and the Confederations. In public forests (communal and state forests), we thus presume that the economic interests (production of marketable timber) are balanced by other interests (provision of non-marketable non-timber services). With regard to private forests one has to state that there are about 240,000 private land owners and these forests are very fragmented with an average size of 1.3 ha. They may provide extra income or useful supplies, in particular where forestry is integrated in agriculture. However, for many private forest owners other aspects than the generation of income may be more important.87

Another point to be considered is the Swiss political system. It is based on federalism, direct democracy and communal autonomy.88 For forest policy, this has two consequences: First, it means that there is a wide variety of forest policies and ways of financing forestry (26 Cantons, approx. 2,880 municipalities) which makes it difficult to evaluate how Swiss forestry is financed. Second, we assume that the political system tends to promote forest policies and a set of financial instruments that reflect public interests. The cantonal forest authorities largely plan and conduct forest maintenance and timber production. Like other public entities they have to deal with mixed public and private interests including timber and non-timber services. In general they have followed multifunctional management policies with a minimum level of tending and harvesting activities in order to maintain protective and social forest functions even under unfavourable conditions for commercial wood production. With the decrease in economic profitability on the one hand, and the increase of public interests in forests especially during the 1980’s (“dying of the forests”) on the other hand, financing of forestry activities with the explicit goal to guarantee non-timber services of forests has become more important during the last twenty years.

6.2 Costs of intervention

One has to distinguish between financial and economic costs of intervention. The present report looks at the financial costs of intervention for the Confederation and the Cantons and partly for the forest owners while economic costs are not considered. The concept of economic costs and benefits relies on the use of shadow prices and consumer’s surplus as well as on the inclusion of public goods and services without market prices.89 Thus, the study does not provide adequate data for a cost-benefit analysis.

86 (Ley 1981).
87 (Wild-Eck and Zimmermann 2005a: 13 ff.)
88 (Linder 1999).
89 (Sugden and Williams 1978: vi).
6.2.1 Overview about direct costs of intervention

*Development of intervention costs between mid 1980’s and mid 1990’s:* Current forest policy dates back to the year 1984 when the Federal parliament passed a Resolution to finance measures against forest damages. In the following years, the legal bases for financing tending activities in forests were prepared. This process was completed in 1991, when the Federal parliament passed the revised Federal Forest Law which was enacted in 1993.90

As a consequence of the new policy orientation public expenditures on forestry rose significantly between the mid 1980’s and the mid 1990’s. This can be illustrated for the Confederation the expenditures of which rose from 36 million € per year (three year average 1984-86) to 115 million € per year (three year average 1994-96) or from 29 € per hectare to 93 € per hectare. During this period, policy shifted from financing extraordinary measures to preserve forests (forest damages) to ordinary measures (tending of young stands, minimum tending activities in forests that have a protective function).91 In the years 1990 and 2000 when the storm Vivian and Lothar had to be managed the expenditures were considerably higher.

*Design of forest policy and of financial instruments:* Forest policy is a joint task of the Confederation and the Cantons. Incentives (Finanzhilfen) and compensations (Abgeltungen) are the main financial instruments for allocating payments to Swiss forest owners. With incentives, voluntarily applied forest tending activities are supported (e.g. measures for thinning young stands and for regeneration), while compensations serve to mitigate or compensate for costs that are caused by ordered measures (e.g. minimum tending measures to ensure the stability of forests that have a protective function). At present, about half of the financial contributions are financed by lump-sum payments and about half are financed in relation to the actual costs.92

The project financing share of the Cantons is defined according to their financial power. The cantonal share of the financially weakest Cantons is at most 30% and that of the financially strongest Cantons 70%. Between 1990 and 1999, the Confederation contributed, with an estimated aggregate share of 65%, almost twice as much as the Cantons, who contributed with 35%.

Between 1990 and 1999 the Confederation and the Cantons spent together approximately 1,810 million €, whereof more than 90% in form of financial incentives and compensations. This means an average of 1,500 € / ha of forest (incentives and compensations). The greatest part went into forest care and management measures, followed by protection measures against natural hazards and measures to improve structures and management conditions (*Figure 40*).

*Projects:* Financial incentives and compensations are bound to projects. Between 1990 and 1999, a total of 3,837 projects were approved by the responsible authority, the Swiss Forest Agency (*Table 8*). The financial contributions 1990-1999 of the Confederation and the Cantons to these projects amounted to approximately 1,810 million €, which corresponds to an average of 470,000 €/project or 150 € per ha and year.

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90 (Zimmermann 1988: ; Schmithüsen and Zimmermann 2000).
91 (Poffet 1997: 251).
92 Personal communication, Larissa Peter and Rolf Manser, Swiss Forest Agency (27.1.2003).
Figure 40: Financial incentives and compensations of the Confederation and the Cantons 1990-1999 (100%=1809 Mio. €)

Forest care and management measures; 57%
Protection against natural hazards; 25%
Structure improvement and access infrastructure; 18%

Table 8: Financial contributions and projects 1990-1999

<table>
<thead>
<tr>
<th>Financial Contribution</th>
<th>Number of projects</th>
<th>Contribution / project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mio. €</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Forest care and management</td>
<td>1,023.7</td>
<td>57%</td>
</tr>
<tr>
<td>Improvement of structures</td>
<td>326.5</td>
<td>18%</td>
</tr>
<tr>
<td>Protection against nat. hazards</td>
<td>459.3</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>1,809.5</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Estimations of the Swiss Forest Agency (2002).

Implementation: JENNI (1993)\(^{93}\) has observed that with the enactment of the new Federal Forest Law in 1993 the Confederation has renounced of a centralistic allocation of financial contributions and delegated the implementation to a large extent to the Cantons. The Cantons are responsible that the measures are carried out efficiently, professionally, taking care of the environment and in accordance with the legal regulations.\(^{94}\) This means that in principle the controlling is in the competence of the Cantons while the Confederation focuses on random tests (Stichprobenkontrollen).

According to an estimate of the Swiss Forest Agency, the administrative costs (labour costs) for the Confederation in this time period amounted to around 5 million €. Assuming the

\(^{93}\) Cited in; (Schmid 2000: 16, 21).

\(^{94}\) The legal bases are Art. 35 FFL, Art. 56 FFL and Art. 57 FOF.
administrative costs of the Cantons were comparable (ca. 0.5%), the total direct implementation costs of the Confederation and the Cantons were 7.8 million € or around 6.5 € per ha (1990-1999). Altogether, there is little information about the implementation of the financial instruments of forest policy. The great number of projects illustrates the difficulties of implementation controls and evaluation of results.

**Differences between public and private costs:** Since communal forestry is predominant in Switzerland, it is difficult to distinguish between public and private action. Are communal forest owners, i.e. boroughs, municipalities and corporations, to be treated as private or public actors? According to our estimate on the basis of information made available by the Swiss Forest Agency the forest owners bore between 1990 and 1999 a quarter of the project costs (Figure 41).

*Figure 41: Project costs: aggregate shares of the Confederation, the Cantons and the forest owners 1990-1999 (100%=2,370 million €)*

Since 1987 the aggregated financial performance of public forest enterprises was negative with the exception in 1990 as a result of storm Vivian (Figure 42). For the time period 1990-1999 the financial loss that had to be financed from other funds of the public forest owners (forest reserve funds, taxes, other business activities, fortune etc.) amounted to around 250 million €. This means that the public forest owners financed their forests with about 810 million € between 1990 and 1999. This support corresponds to 90 € per ha and year. Figure 42 shows that the forest owner’s willingness-to-pay for the maintenance of tending and harvesting activities in their forests is considerable. We interpret this willingness-to-pay as a strong argument that the economic (financial and non-financial) benefits are higher than the economic (financial and non-financial) costs for the forests owners.

95 810 million € = 250 million € (economic losses according to the forest statistics) + 560 million € (share of project costs according to estimations of Larissa Peter, Swiss Forest Agency, 7.11.2002).
Figure 42: Financial performance of public forest enterprises 1970-2001 (million SFr.)


6.2.2 Regional distribution of financial contributions

High share of mountain forests – high financial contribution per ha: There is a positive correlation ($r=0.77$) between the financial contributions of the Confederation per ha and the share of mountain forests in the 26 Cantons (Figure 43). In this table the Cantons have been sorted in an ascending order according to the share of mountain forests (1.key) and the surface of mountain forests in ha (2. key). The statistic correlation between Federal contributions per ha and share of mountain forests is 0.77. The deviations can be explained by the size of mountain forests. Bern, Vaud, Ticino, Valais and Graubünden are the Cantons with the largest forest areas (Figure 44). Together they combine 59% of the total forest area and 76% of the mountain forests. If these Cantons would have to pay high contributions per hectare, the total costs for them would be considerable higher than the expenditure of other Cantons.

The greater share of the financial contributions of the Confederation goes consequently to Cantons with mountain forests. In 1998 the five Cantons Bern, Vaud, Ticino, Valais and Graubünden with the largest mountain forests received 64% of the financial contributions of the Confederation (Figure 45). If we look at the different programmes this relationship is even clearer. In 1998, these five Cantons obtained 57% of the financial contributions for forest care and management measures, 66% of the financial contributions for measures to improve structures and access infrastructure, and 74% of the financial contributions for measures of protection against natural hazards.
Figure 43: Relationship between financial contributions of the Confederation per ha and share of mountain forests (% forests higher than 1000 m a.s.l.) (1998)


Figure 44: Surface of mountain forests (higher than 1000m a.s.l.) in the Cantons

Altogether we estimate that approximately 80% of the financial contributions of the Confederation and the Cantons go to the mountain forests (Table 9). The assumptions for this statement are as follows:

- The funds for the components silviculture A, forest reserves, damage to forests, basic documents for planning, reproduction material, and improvement of management conditions go to mountain forests according to the overall proportion of mountain forests in Switzerland (53% of forests higher than 1000 m a.s.l.).
- The funds for the components silviculture B/C, protections works and installations, establishment and tending of forests with a special protective function, and for maps of danger zones, measuring stations and early warning systems go with a share of 100% to mountain forests.
- The funds for access infrastructure go with a share of 80% to mountain forests because the road infrastructure in the Plateau region is already more developed.
### Table 9: Estimated share of funds that went to the mountain forests 1990-1999

<table>
<thead>
<tr>
<th>Component</th>
<th>Incentives / compensations Total(1)</th>
<th>Estimated area share of mountain forests (2)</th>
<th>Estimated share of incentives and compensations for mountain forests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mio. €</td>
<td>%</td>
<td>Mio. €</td>
</tr>
<tr>
<td>Silviculture A</td>
<td>234.5</td>
<td>53.0</td>
<td>124.3</td>
</tr>
<tr>
<td>Silviculture B/C</td>
<td>322.3</td>
<td>100.0</td>
<td>322.3</td>
</tr>
<tr>
<td>Forest reserves</td>
<td>2.7</td>
<td>53.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Damage to forests</td>
<td>405.0</td>
<td>53.0</td>
<td>214.7</td>
</tr>
<tr>
<td>Basic documents for planning</td>
<td>53.1</td>
<td>53.0</td>
<td>28.1</td>
</tr>
<tr>
<td>Reproduction material, advertising and sales promotion</td>
<td>6.2</td>
<td>53.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Total forest care and management measures</td>
<td>1,023.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access infrastructure</td>
<td>246.4</td>
<td>80.0</td>
<td>197.1</td>
</tr>
<tr>
<td>Improvement of management conditions</td>
<td>80.1</td>
<td>53.0</td>
<td>42.5</td>
</tr>
<tr>
<td>Total structure improvement and management conditions</td>
<td>326.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection works and installations</td>
<td>440.9</td>
<td>100.0</td>
<td>440.9</td>
</tr>
<tr>
<td>Establishment and tending of forests with a special protective function</td>
<td>1.8</td>
<td>100.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Maps of danger zones, measuring stations and early warning systems</td>
<td>16.7</td>
<td>100.0</td>
<td>16.7</td>
</tr>
<tr>
<td>Total protection against natural hazards</td>
<td>459.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,809.5</td>
<td></td>
<td>1,393.1</td>
</tr>
<tr>
<td>Share of incentives / compensations to mountain forests</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


(1) See Table 6; (2) See assumptions in the text.
6.3 Effects of financing Swiss forestry

From the point of view of an economic decision model public financial incentives and compensations affect the cost structure and consequently the inputs (production factors), the behaviour of the addressees, and the prevailing forest management practices (timber and non-timber goods and services).96

6.3.1 Development of variables related to inputs

Managed forest surfaces: According to the forest statistics the productive forest surfaces increased between 1965 and 2001 about 10% (Figure 46).97 This increase occurred mainly on marginal lands in the mountainous areas as the consequence of spontaneous reforestation of abandoned agricultural land. According to the National Forest Inventory in the mid 1990’s 14% of Swiss forests were not and 19% rarely managed.98 While in the Alps 20% and in the Southern Alps even 42% of forests were not managed this is only the case for 3% of forests in the Plateau, 5% in the Jura and 8% in the Pre-Alps.

Figure 46: Statistical development of the productive forests 1965-2001 (ha)

Forest owners: According to the forest statistics the total private forest area increased between 1985 and 2000 less then 10%, while the number of forest owners slightly decreased (Figure 47). Although a statistical survey on public forest owners is conducted every year, we lack data about the labour forces in public forest enterprises. If we look at the number of public forest owners we observe a slight decrease between 1985 and 2000 while the number of forest apprentices remained about the same (Figure 48).

96 (Varian 1996).
98 (Brassel and Brändli 1999).
Figure 47: Private forest owners: number and forest surface 1980-2000.


Figure 48: Public forest owners: number and apprentices 1985-2000

Labour intensity: From the statistics of forest owners with book-keeping\textsuperscript{99} we know that the labour intensity (hours/ha) continuously decreased, in the Plateau and in the Alps as a result of rationalization efforts and technical progress (Figure 49). Because of the increased support to mountain forests since the 1980’s we would rather expect an increase of forest activities in the mountain regions. Such a development took place, for instance, in the Canton Valais, where the forest labour inputs increased considerably between 1979 and 1989 (Table 10). The financial contributions have thus influenced the input factor labour especially in the mountainous areas. The hypothesis is further supported by the fact that during the 1980’s the timber harvesting costs in the Alps increased significantly.

Figure 49: Decrease of the labour intensity in the Plateau and in the Alps 1970-2001 (hours/ha)

Source: (BFS/BUWAL 1980-2002) (BAR; public and private forest enterprises with bookkeeping).

Table 10: Forest labour and timber production in the Canton Valais 1979 and 1989

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full time forest managers (n)</td>
<td>22</td>
<td>47</td>
<td>+113.64%</td>
</tr>
<tr>
<td>Forest apprentices (n)</td>
<td>31</td>
<td>70</td>
<td>+125.81%</td>
</tr>
<tr>
<td>Employees in the forest enterprises (n)</td>
<td>60</td>
<td>428</td>
<td>+613.33%</td>
</tr>
<tr>
<td>Private forest engineers (n)</td>
<td>4</td>
<td>12</td>
<td>+200.00%</td>
</tr>
<tr>
<td>Employees of cantonal forest service (n)</td>
<td>13</td>
<td>16</td>
<td>+23.08%</td>
</tr>
<tr>
<td>Timber production (m³)</td>
<td>71,000</td>
<td>144,000</td>
<td>+102.82%</td>
</tr>
</tbody>
</table>

Source: (Bloetzer 1990).

\textsuperscript{99} These accounting data are not fully representative but they provide valuable complementary information to the forests statistics (Schmidhauser and Schmithüsen 1999: 423).
6.3.2 Development of timber production and timber price

Despite sinking prices wood production has remained more or less the same during the last 20 years with an average of 4.3 million m\(^3\) per year (without the storm years 1990 and 2000). This phenomenon is illustrated in Figure 50 taking the data of conifers production (>90% spruce) and the price for spruce. There is evidence for the restricted influence of timber prices on timber production in Switzerland. In the Canton Valais, between 1979 and 1989, the timber production doubled from 71,000 m\(^3\) to 144,000 m\(^3\) as a consequence of the introduction of new financial instruments.\(^{100}\)

SCHWARZBAUER (2001) showed with his econometric estimations for the supply of spruce that timber supply in Switzerland is price inelastic and with decreasing prices elasticity is even less than with increasing prices.\(^{101}\) In an empirical survey that was conducted after the storm Lothar, 70% of the responding public forest owners said that the (very negative) price development did not have an important influence on their decision to remove the thrown timber.\(^{102}\)

Figure 50: Development of Swiss conifers production 1965-2001 and spruce price 1989-2001 (1000 m\(^3\) )

The following arguments contribute to explain this price inelasticity. First, the financial contributions of the Confederation and the Cantons lead to a shift of the timber supply function, i.e. for an equal price the supply is increased. This effect has been confirmed by the Swiss Forest Agency. As timber production is linked to tending measures in protection forests, financial contributions contribute to increasing or at least to maintaining the level of

\(^{100}\) (Bloetzer 1990).
\(^{101}\) (Schwarzbauer 2001).
\(^{102}\) (Baur et al. 2003b).
wood production in mountain forests. Second, a considerable part of wood is compulsorily harvested due to disturbances and stresses by biotic and abiotic factors. According to the 2nd National Forest Inventory a total of 17.2 million m³ was compulsorily harvested between 1986 and 1995. This corresponds to a third of the total timber harvest in this time period. Compulsory harvesting thus leads to a shift of the timber supply function. Third, during the 1990’s harvesting costs decreased in the favourable production region, the Plateau (Figure 51). This again has had an impact on a shift of the supply function. Forth, since many public forest owners in the mountainous regions can draw on additional public funding they tend to maintain timber production even under increasingly unfavourable economic conditions. There are certain empirical indications for this argument as mentioned in Section 6.3.4.

Figure 51: Timber harvesting costs in the Plateau and in the Alps 1970-2001 (SFr./m³)

Source: (BFS/BUWAL 1980-2002) (BAR; public and private forest enterprises with bookkeeping).

6.3.3 Provision of non-timber goods and services

Few data are available on non-timber goods and services, especially on the development of their importance in time. The following section can thus provide only a general idea of the kinds of non-timber goods and services at stake, and their importance with respect to the presently available financial instruments of forest policy. The following aspects will be discussed: non-timber goods, managed forest area and management plans, infrastructure, close-to nature forests and biodiversity, water production, protection against natural hazards, recreation, and financial appraisal of non-timber goods and services.

103 Manser 1999, cited in (Limacher et al. 1999).
104 (Brassel and Brändli 1999: 268).
Non-timber goods: Except for hunting, no regular data collection took place on a national level.\textsuperscript{105} In a first study, mandated by the Swiss Forest Agency, about 20 non-timber goods were identified and where feasible quantified (kg, m\textsuperscript{3} etc.) and assessed in monetary terms.\textsuperscript{106} On the basis of this study ALFTER (1998) estimates that the financial value of non-timber goods amounts to about 20\% of the financial value of all goods (timber and non-timber goods) harvested from the forests.\textsuperscript{107} We presume that until today the provision of non-timber goods is not directly affected by the financial contributions to forestry.

Managed forest area and management plans: According to the 2\textsuperscript{nd} National Forest Inventory the managed forest area has declined between 1986 and 1995 in all regions of Switzerland. Despite the incentives for maintaining tending activities the available information shows that forest management measures have been reduced gradually to a considerable extent in mountainous forest areas.\textsuperscript{108} In forests with protective functions 54\% of the forests area has been left without management interventions during the last 20 years. Despite financial incentives supporting forest planning on 38\% of the total forest area there has been no planning at all. In private forests even 82\% of the area has been without planning whereas the comparable figure in public forests amounts to only 17\%.\textsuperscript{109}

Infrastructure: In 1995, the forest road density was 26 m/ha but varied considerably amongst the different regions with a density of 58 m/ha in the Plateau and of 11.6 m/ha in the Alps.\textsuperscript{110} In the Plateau road density exceeds the recommended value while in the Alps, on average, it corresponds to the recommended value.\textsuperscript{111} In private forests the road density is smaller than in the public forests. This is especially true for the Plateau where in the public forests the road intensity is 67.5 m/ha, while in the private forests it is 44.8 m/ha. The good infrastructure in Swiss forests is the effect of more than 100 years of promotion with financial instruments.

Close-to nature forests and biodiversity: Switzerland does not have any old-growth forests defined as climax forests that have never been disturbed by human causes.\textsuperscript{112} In the 2\textsuperscript{nd} National Forest Inventory 58\% of the forests are classified as “close to nature” while 40\% are classified as “far from nature”.\textsuperscript{113} This classification is also reflected in the timber assortment of the harvested timber: In Switzerland, the share of conifers, whereof more than 90\% is spruce, is traditionally high (Figure 52). Between 1965 and 2001 the share of conifers was on average 74\%. Further, according to the experts that conducted the sustainability assessment of Swiss forest policy, species richness in the plots that were analyzed in the 2\textsuperscript{nd} National Forest Inventory is too low.\textsuperscript{114} And finally, also following the above experts, the surface of strictly protected forests areas in Switzerland is notably low.

The promotion of close to nature forests and biodiversity is an explicit goal of the public financial contributions to forestry. Although it is too early to draw conclusions about the effects of the present financial contributions on close to nature forests and biodiversity, we

\textsuperscript{105} (Limacher et al. 1999: 83).
\textsuperscript{106} COLEMAN 1996 cited in (Limacher et al. 1999: 85).
\textsuperscript{107} (Alfter 1998: 101).
\textsuperscript{108} (Brassel and Brändli 1999: 352).
\textsuperscript{109} (Brassel and Brändli 1999: 202).
\textsuperscript{110} (Brassel and Brändli 1999: 236).
\textsuperscript{111} ABEGG (1978) cited in (Brassel and Brändli 1999: 236). Abegg recommends a road density of 30-50 m/ha in forest areas with slopes <30\%, and of 10-15 m/ha in areas with slopes >30\%.
\textsuperscript{112} DUNSTER \& DUNSTER (1996) cited in (Limacher et al. 1999: 104).
\textsuperscript{113} This classification is based on the share of conifers in areas where naturally deciduous forests would be dominant.
\textsuperscript{114} (Limacher et al. 1999: 114).
presume that the effects are rather weak. This assumption is supported by two arguments. First, the financial contributions paid to forest enterprises in case that tending costs are exceptionally high for reasons of nature protection, are less than 5% of all financial contributions allocated for silvicultural projects.\(^{115}\) Second, the share of forest reserves is with 1% (protected with long-term contracts) still low.

*Figure 52: Harvested coniferous and deciduous timber 1965-2001*

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Water production: We find differing data about the importance of forests for water production. According to GUHL (1996) 48% of 134,300 ha of the water protection zones in Switzerland are covered by forests.\(^{116}\) These 65,000 ha correspond to 5% of the total forest surface. Following the UN-ECE/FAO (1993), the importance of forests for the conservation, protection and supply of water is high on 10%, medium on 50% and low on 40% of the total forest area.\(^{117}\) High is defined as “designated for water supply and other uses restricted”, medium as “area with importance for protection of water collection areas but no restrictions on other uses”, and low as “area not currently used for water collection or supply”.

Protection against natural hazards: We also find differing data concerning the importance of forests for protection against natural hazards. To date no nation-wide survey of all protection forests in Switzerland exists and the existing estimates differ considerably.\(^{118}\)

- According to the tentative model calculations based on the 2. National Forest Inventory, 8% of the total forest area is protection forests.\(^{119}\)

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\(^{115}\) Personal communication Rolf Manser, Swiss Forest Agency, 9.5.1999 (cit. in Limacher et al. 1999: 106).
\(^{118}\) (Limacher et al. 1999: 130).
\(^{119}\) (Brassel and Brändli 1999: 338).
Following the UN-ECE/FAO (1993), the importance of forests for protection against natural hazard is very high on 35%, medium on 50% and low on 15% of the total forest area.\textsuperscript{120}

Since 1993 the Cantons have been working on a register of forest areas with a “special protective function”. The provisional results indicate that 30-40% of the total forest area has such a special protective function.\textsuperscript{121}

According to estimations of the Swiss Forest Agency about 130,000 buildings and hundreds of kilometres of roads, railway and energy infrastructure is protected by forests.\textsuperscript{122}

Concerning the quality of protection services model calculations based on the 2\textsuperscript{nd} National Forest Inventory show that on the middle term protection appears sufficient only on 42% of the forest protecting against avalanches, and on 11% of the forests protecting against rock fall.\textsuperscript{123} We conclude that, despite of the traditionally high priority of this kind of services, the measures actually taken cannot ensure fully the required protection with the present system of financial contributions.

Recreation: The importance of forests for recreation is high, in particular in the densely populated Plateau where the forest area is only 0.05 hectares per capita.\textsuperscript{124} 1998, a representative opinion poll of the Swiss population on attitudes towards environment, nature and forests was conducted. The poll shows that during the summer 58% and during the winter 38% of the population visit a forest at least once a weak and only 4% (summer) respectively 12% (winter) never visit a forest at all.\textsuperscript{125} The comparison with a similar study carried out in 1978 indicates that the frequency of forest visits has not changed and has remained on a high level.\textsuperscript{126} The authors of the study conclude that the recreation services of the forest are of outstanding importance.\textsuperscript{127}

One important effect of public support to forestry has been the planning and expansion of forest road infrastructure that allows access to all kinds of leisure activities. Since free access to forests is legally guaranteed since 1907, the population can fully profit from this infrastructure as well as from other forest owner’s management activities that increase the recreational quality of the forests (e.g. installations of benches, fireplaces, etc. or removal of thrown timber).

Financial appraisal of non-timber services: There are some case studies assessing the benefit of those non-timber services that are not valued at market prices.\textsuperscript{128} Different methods were applied such as contingent valuation (benefit of recreation), travel cost (benefit of recreation), or substitution costs (benefit of protection forests, benefit of water production). Despite the known methodical problems of such an exercise two authors have tried to assess the aggregate

\textsuperscript{120} UN-ECE/FAO (1993) cited in (Limacher et al. 1999: 130).
\textsuperscript{121} (BUWAL/F+D 1997: 65).
\textsuperscript{123} (Brassel and Brändli 1999: 332).
\textsuperscript{124} (Brassel and Brändli 1999: 332).
\textsuperscript{125} (SAEFL 2000: 45).
\textsuperscript{126} Hertig (1979) cited in (SAEFL 2000).
\textsuperscript{127} (SAEFL 2000: 111).
\textsuperscript{128} For an overview see (Limacher et al. 1999: 152).
benefits of Swiss forests. The aggregate benefits per year were estimated at a level of 5,500 respectively of 9,000 million SFr. This corresponds to about 3400-5600 € per hectare and year, which seems extraordinarily high. Considering the methodical reservations of such computations, these estimates have to be interpreted with great caution.

Still, the assumption that the non-timber benefits of the Swiss forests are much higher than the market value of timber or the financial contributions of the Confederation, the Cantons and the forest owners is reasonable. What we need to know is which non-timber services depend on any human intervention at all, and in particular, on what kind of forest management. Only those services have to be considered in a cost-benefit assessment. Exactly this information is missing at the present.

6.3.4 Development of variables related to the financial performance of public forest enterprises

Total costs and returns (million SFr.): Since 1987 the financial performance of the public forest enterprises was negative. Despite the introduction of financial instruments the returns raised less than the costs (Figure 53). Looking at the previously described developments (section 6.3.1) this is not surprising. The maintenance or even increase of forest labour and of timber production despite decreasing prices and high labour costs explain why forest management has been accompanied by a worsening of the financial performance. Leaving out the storms Vivian and Lothar the financial situation became stabilized in the 1990’s. The costs did not further increase but neither did the returns.

Costs of timber production (SFr./m³): Until 1983, the total costs of wood production (SFr./m³) were almost the same in the Plateau and in the Alps (Figure 54). Since 1984, with the introduction of financial instruments to support forestry, timber production costs in the Alps grew faster than in the Plateau. In 1990 this trend was stopped (Alps) respectively reversed (Plateau). The different developments between the Alps and the Plateau can be explained by the financial support of forestry in particular in the mountain forests. According to the Swiss Forest Agency, about 15% of all financial contributions to forestry respectively 35% of all contributions for silvicultural projects (Silviculture A, C/B; see chapter 4) are paid to support harvesting, when costs for harvesting are exceptionally high.

Costs for protection and welfare compared to timber production (SFr./ha): Since 1970, accounting statistics distinguish between costs for timber production and costs for protection and welfare. Looking at the development of these costs in the Alps (Figure 55) and in the Plateau (Figure 56), we can observe that between 1970 and 2001 the total costs per hectare were in the Plateau 2-3 times as high as in the Alps. The share of costs for protection and welfare was in both regions rather small (Alps: 3-12%, Plateau: 3-9%). In the Alps costs continued to increase after the introduction of financial instruments to support forestry until the beginning of the 1990’s. In the Plateau costs first rather decreased (until 1988), then again increased (until 1994), and since then went back again.

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130 Personal communication Rolf Manser, Swiss Forest Agency, 7.5.1999 cited in (Limacher et al. 1999: 76).
Figure 53: Total costs and returns 1965-2001 (million SFr.)

Figure 54: Costs of timber production 1970-2001 (SFr./m³)


Figure 55: Costs for timber production and protection and welfare in the Alps 1970-2001 (SFr./ha)


Figure 56: Costs for timber production and protection and welfare in the Plateau 1970-2001 (SFr./ha)

Composition of returns: While the total returns of the public forest enterprises increased between 1980 and 2001, the returns from timber production decreased from 360 to 220 million SFr. (-38%), and the share of returns on timber production on the total returns even decreased from 92% to around 50% (Figure 57). This means that the increase of returns from additional business activities (Nebenbetriebe) and of financial contributions could not compensate the diminishing returns on wood production.

Differences in the financial performance of public forest enterprises: It can be shown that the financial performance of public owners with tax income, i.e. the Cantons and the municipalities, has been less favourable than that of the other public owners: While the forest enterprises of the Cantons and the municipalities showed losses in every single year between 1990 and 1999 the financial result of the forest enterprises without tax income (boroughs and of corporations) are in most years (boroughs) or always (corporations) positive or balanced (Figure 58).

6.3.5 Open questions
Concerning the effects of public financing measures in forestry there are considerable knowledge gaps. We have identified the following questions that need further investigation.

1. Did the financial contributions of the Confederation and the Cantons lead to a higher demand for forest labour especially in the mountain regions?
2. Did the incentives and compensations contribute to maintaining the timber supply despite unfavourable economic conditions (high labour costs, low timber prices)?
3. Did the present system of financial contributions contribute to a decrease of local prices by increasing the willingness-to-sell timber?
4. Did the present system of financial contributions slow down the structural change in forestry by mitigating the economic pressure on forest enterprises?
5. Did the financing of forestry contribute to the increasing financial losses of public forest enterprises by inciting forest owners to increase their activities in order to get hold of additional funds beyond the additional benefits (fiscal illusion)?
6. Did the contributions promote non-timber services, which ones and to what extent?
7. Which non-timber goods and services of the Swiss forests depend on specific forest management interventions?
8. What kind of forest management interventions are necessary to provide the desired services and how much do they cost?
9. And in particular: What kind of tending activities are necessary to maintain and improve protection services of forests against natural hazards?
10. What is the role of the forest services in producing different combinations of timber and non-timber services?
11. What is the value of non-timber services generated by private and public forest owners in monetary terms?

131 (Frey and Spillmann 1994; Poffet 1997).
Figure 57: Composition of returns 1980-2001 (million SFr.)


Figure 58: Differences in the financial performance of the public forest enterprises 1990-1999 (million €)

6.4 Effectiveness, efficiency and equity

Due to a lack of empirical data on the effects of the present system of public financial contributions to Swiss forestry it is also not possible to truly evaluate their effectiveness, efficiency and equity. Still, we can reflect upon these issues from a theoretical point of view and illustrate these reflections by selected examples and references to the existing literature. We start with a summary of the general criticism of the Swiss subsidy system by a group of Swiss economists in 1994 and continue with the sustainability assessment of Swiss forest policy, carried out by a group of international experts in 1999. We look then at the present efforts to improve the financial contributions to forestry and conclude with some general aspects of financing multifunctional forestry practices that need to be further investigated.

6.4.1 General criticism of the Swiss subsidy system

*Identified problems of the Swiss system of public financial transfers*: Concurrent with the reorientation of the forest policy of the Confederation between 1984 and 1993, a political process was launched to reform financial transfers between the Confederation and the Cantons (project “New Financial Adjustment”). The prevailing Swiss system was analysed economically and the following basic shortcomings identified.132

- Most financial incentives and compensations serve allocative (incentives) and distributive (financial adjustment) purposes simultaneously. Since the financial share contributed by the Cantons depends on their financial power the allocative effects are mitigated and, to achieve the objectives, the expenditure is often higher than necessary.

- Most transfer payments are financed by the Confederation, i.e. vertically. The lack of horizontal transfers means that taxpayers co-finance services from which they hardly benefit.

- The usual mechanism for transfer payments tend to be inefficient. This refers to the objectives, the financial share of the Confederation, the regulations, the size of the projects, the procedures, and to the evaluation and monitoring efforts.
  - Often there are no objectives at all respectively the objectives of the transfer payments are not made clear enough.
  - The financial share of the Confederation appears to be often too high.
  - There are often too many detailed regulations.
  - Too many small projects are financially supported.
  - The administrative procedures are often complicated.
  - The effects of transfer payments are insufficiently evaluated.
  - Generally, there is no systematic monitoring of the results (Erfolgskontrolle) that have been obtained by transfer payments.

*Identified problems of the financial contributions to Swiss forestry*: These criticisms appear to a considerable extent relevant to forest policy issues and this judgement was, for instance, shared by a group of international experts that undertook a sustainability assessment of Swiss forest policy in 1999.133

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132 (Frey and Kirchgässner 1994: 3).
133 (Limacher et al. 1999: 148).
The main features of current policy which are subject to criticism can be summarized as follows:134

- **Determining the contributions of the Cantons according to their financial power:** This approach leads to a mixing of the objectives of forest policy (allocative objectives) and of financial policy (distributive objectives).

- **Wrong incentives:** The financial contributions are high and depend in general on real costs. Consequently, there is no direct incentive to decrease costs and it is thus possible that projects are realized with an unfavourable cost-benefit ratio.

- **Strategies are largely absent:** In Swiss forest policy a comprehensive long-term strategy with clear goals and priorities is still lacking, in particular, on the level of the Confederation.

- **Too many detailed regulations:** The Confederation issues too many overly detailed regulations that restrict the Cantons and inhibit the development of efficient and locally appropriate solutions.

- **High administrative costs:** The distribution of financial contributions to many relatively small projects increases administrative costs. Moreover, many projects are assessed two or three times by both the Confederation, the Cantons, and to a certain extent by forest owners.

### 6.4.2 Lessons from the sustainability assessment of Swiss forest policy

The Swiss Forest Agency mandated a group of international experts135 to assess Switzerland’s national forest policy with the purpose to provide inputs for elaborating a National Forest Programme.136

The assessment is based on the policy cycle model of JONES (1984)137 and the concept of administrative programmes by KNOEPFEL (1997)138 and KNOEPFEL ET AL. (1997).139 It is important to know, that at stake was *not* the achievement of policy goals but the assessment of the goal orientation of the Swiss forest policy. In choosing the criteria and indicators for the assessment, the experts leaned on the Pan-European criteria and indicators. The goal orientation of the Swiss forest policy was described and evaluated applying 6 criteria and 47 indicators. The conclusions of the assessment were summarized under “major strengths” and “major areas of concern” whereof we take up those relating to the topic of the present study, i.e. the financing of forestry.140

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135 To the group belonged the following experts: Prof. Dr. Peter Glück (Institut für Sozioökonomik der Forst- und Holzwirtschaft, Universität für Bodenkultur, Vienna), Jean-Marie Barbier (Directeur Général Adjoint de la Fédération Nationale des Syndicats des Propriétaires Forestiers Sylviculteurs, Paris), Stefan Leiner (European Forest Policy Office, WWF, Brussels), Dr. Jag Maini (Secretary of the Intergovernmental Forum on Forests, Division of Sustainable Development, U.N., New York), Pekka Patosaari (Counselor for Forestry and Agriculture, Embassy of Finland, London), Dr. Davide Pettenella (Dipartimento Territorio e Sistemi Agro-Forestali, Università di Padova).
136 (Glück et al. 1999; Limacher et al. 1999).
137 Cited in (Limacher et al. 1999: 27).
138 Cited in (Limacher et al. 1999: 27).
139 Cited in (Limacher et al. 1999: 27).
140 (Glück et al. 1999: 51; Limacher et al. 1999: 181).
Major strengths of Swiss forest policy: Three of four major areas of strengths relate directly or indirectly to the system and design of the financial contributions to forestry.\textsuperscript{141}

- “There is a comprehensive set of policy goals and instruments for producing non-market benefits and services of forests, especially the protection of landscape, human settlements and infrastructures in the mountainous areas.”
- “The strong focus on promotion of ecologically sound forest management (‘naturnaher Waldbau’) should help to ensure a balanced provision of economic, ecological and social benefits.”
- “Swiss forest policy has benefited from the broad involvement of the public and from consultation between various levels of government based on direct democratic institutions as stated in the Federal Constitution.”

Major areas of concern: Four of six major areas of concern relate directly or indirectly to the system and design of the financial contributions to forestry.\textsuperscript{142}

- “Due to their strong dependence on subsidies, forest enterprises lack economic efficiency. Entrepreneurial action should be promoted and the establishment of economically viable units should be encouraged.”
- “The current subsidy system should be streamlined and reformulated to focus on current priority areas of concern. The shortcoming in the current system include: absence of clear goals and measurable outputs, too many as well as too detailed regulations, too high indemnities for incurred costs. Forest operations which strictly focus on commercial timber production should not be subsidised.”
- “The number and size of protected forest areas should be increased. The current initiatives for the development of a national concept for a network of ecologically representative and unique protected forest areas should be finished. Instruments for effective protection management should be reinforced.”
- “Inadequate regeneration of mountain forests, associated with multiple factors (e.g. lack of harvesting and appropriate management, game, grazing, etc.) has led to the ageing and homogenisation of the forest stands. The current instruments for regenerating over-aged mountain forests appear to be ineffective. Addressing the issue would require innovative approaches.”

6.4.3 The present efforts to improve the system of financial contributions to forestry

FREY (1997) has made three general recommendations for improving the Swiss system of public transfer payments:\textsuperscript{143}

- Making transfer payments independent of the financial means of the Cantons and extending the distributive vertical transfers from the Confederation to the Cantons: As a result of making the contributions of the Cantons independent of their financial means, the allocative effects of the transfer payments, i.e. their incentive character, will be intensified. The cantonal share still may vary, but according to criteria other than financial means. To increase the financial means of weak Cantons, the distributive vertical transfers from the

\textsuperscript{141} The following citations are taken from the original text.
\textsuperscript{142} The following citations are taken from the original text.
\textsuperscript{143} (Frey 1997: 3 ff.).
Confederation have to be extended. It should, however, be left to the Cantons to decide how they want to use their additional financial input.

- **Extending the horizontal transfer payments (inter- and intra-cantonal financial adjustment):** This reform is intended to strengthen the subsidiarity principle. It should prevent shifting those public responsibilities that can be better resolved by inter-cantonal cooperation and horizontal payments to the Confederation. The extension of horizontal transfer payments creates incentives for “functional regions” (territorial authorities) that can meet public needs efficiently.

- **Improving the mechanisms for financial incentives and compensations:**
  - Replacing payments that relate to actual costs with lump-sum payments: To prevent wrong incentives, transfer payments should be paid globally or in lump-sums and be reoriented from inputs to outputs.
  - Reducing the number of transfers: Instead of supporting numerous small-scale projects, a few global programmes should be financed.
  - Replacing decrees/orders with agreements: Where feasible, decrees and orders, in particular concerning compensation, should be replaced with agreements.
  - Clarifying objectives, regulations, and administrative procedures: The objectives of transfer payments should be clarified, regulations decreased and administrative procedures reduced.
  - Setting time-limits: Transfers should be paid for a fixed period.
  - Restricting the contribution of the Confederation in financing incentives: Confederation incentives should not be too high.
  - Evaluating and monitoring: The evaluation of the effects of the transfer payments should be intensified as well as the systematic monitoring of results (meeting of objectives).

The criticisms of the subsidy system have early been taken up and translated into action by the Swiss Forest Agency. In agreement with the general recommendations for improving the Swiss subsidy system the Swiss Forest Agency initiated a process of reforming the financial instruments of forest policy. In 1997 it launched the New Public Management Project **Effor2**.

**Effor2** is based on a new approach that aims to strengthen the subsidiarity principle, and increase effectiveness and efficiency of financial contributions to forestry.144

- **Subsidiarity:** The Confederation and Cantons are partners. The Confederation concentrates on strategic responsibilities, while the Cantons are free on the operative level (implementation and realization).

- **Effectiveness:** Strategic goals and priorities are defined and quantified by both partners in an agreement. Measures and projects are integrated in long-term programmes with clear objectives. Their implementation is monitored by the Confederation and the Cantons.

- **Efficiency:** Allocating the financial contributions of the Confederation globally and as lump-sum payments increases the incentives for implementing forest policy efficiently. Further, cost-savings can be made by integrating numerous small projects in few long-term programmes.

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144 (Haering et al. 2002: 19 ff.).
In summary, the basic features of this new approach are:

- Transfers are allocated by lump-sum payments, and not according to the real costs.
- Transfers are allocated globally for continuing programmes and relate to outputs (results, impacts) rather than to inputs. The responsibility for running programmes is delegated to the Cantons.

The new approach to forest policy has been tested since 1997 in the effor2 project. Five integrated programmes were established based on agreements between the Confederation and the Canton(s). In 2001, effor2 has been evaluated by a private consulting firm on behalf of the Swiss Forest Agency. The terms of reference of the study were:

- To evaluate the present activities of effor2 and assess the extent to which the aims have been met (subsidiarity, effectivity, efficiency and administrative improvements);
- To identify gaps, so as to improve/complete instruments and procedures;
- To provide practical guidance in the further development process;
- To come up with clear statements about the success and failure.

The authors of the evaluation have stated that effor2’s theoretical framework has met the requirements of an effective and efficient transfer policy. However, it has so far only partly been implemented. It has initiated a process but did not produce yet substantial results. One criticism in particular was that the Confederation does not have strategic goals and long-term visions for the development of Swiss forests. Another criticism was that the transfer payments relate to inputs (cost share) instead to outputs (remunerating services), and had still been paid according to the former practice “costs = prices”. Further, the authors noted that there were no indicators to measure the effects of the transfer payments that would allow consistent quality-control and evaluation. Finally, they concluded that there is no alternative to effor2 and that the reform process has to continue.

On the basis of this evaluation and the final report of the project effor2, the Swiss Forest Agency decided to continue the policy reform process that had been initiated. In 2007, it is planned to introduce the new transfer payment strategy which will make a revision of the Federal Forest Law necessary. In the next few years, the new instruments will be further developed. Moreover, in 2002, the Swiss Forest Agency started the “Swiss National Forest Programme” (Waldprogramm Schweiz) as a participatory process that includes politicians, scientists and various stakeholders. The objective of the “Forest Programme” is to define strategic goals for Swiss forest policy up to the year 2015.

### 6.4.4 Effectiveness, efficiency and equity of financing forestry in Switzerland

**Effectiveness**: At present it is thus not feasible to assess the effectiveness of policy, except on a rather highly aggregated and abstract level, and we have to conclude that it is not possible to make final statements on the effectiveness of financing forestry. What we can say is that the orientation of the goals of the policy and the existing instruments are basically adequate.

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145 (Haering et al. 2002).
146 (Stähelin- Witt et al. 2003).
147 (Haering et al. 2002).
149 (BUWAL 2002).
150 (Glück et al. 1999: 51).
and that the population seem satisfied with the quality of forests.\textsuperscript{151} On the other hand, it is evident that many of these goals – as in particular the maintenance of protection services or the enhancement of close to nature forestry – are at risk.\textsuperscript{152}

\textit{Efficiency}: There must be made a distinction between goal-efficiency and instrumental efficiency of financial contributions to forestry: While goal-efficiency assesses whether an appointed goal is reached at minimal costs, instrumental efficiency relates to the mechanism design of political instruments and in particular to their incentive character. Do financial contributions animate the recipients to choose cost saving methods?

With respect to the general criticisms about the design of financial contributions by various authors\textsuperscript{153} we conclude that the prerequisites for instrumental efficiency are not fulfilled. Since the instrumental efficiency is a necessary (but not sufficient) condition for goal-efficiency we also conclude that the financial contributions are to a considerable extent not goal-efficient.

\textit{Equity}: We do not have data to identify the direct beneficiaries of the financial contributions. However, given the actual design of forest policy measures we presume that the typical beneficiary is a public forest owner in a mountain area. Two arguments support this. First, the average area of the private forests is 1.3 ha, which is too small to implement a project. Second, according to an approximate estimation about 80\% of the public financial incentives and compensations go to mountain forests.

This does not mean that private forest owners do not benefit from public financing forestry. First, the Swiss forest law does not differentiate between private and public forest owners, i.e. concerning the legal bases an equal treatment is guaranteed. Second, there is evidence from a case study in two Cantons that private forest owners may get less frequently financial contributions. However, in the reviewed case, the amount per hectare allocated to the owners has been higher than average.\textsuperscript{154}

Further, since the financial contributions depend on the financial power of the Cantons, “poor” Cantons get more than “rich” Cantons. Although this mixing of allocative and distributive elements in policy goals is debatable from an economic point of view, it may appear as the fairer solution from a political point of view.

The indirect beneficiaries are all those persons benefiting in one way or another from positive effects of forest management that are triggered by public financial contributions. Thus, we conclude that potentially the whole population belongs to the beneficiaries. This is a general argument suggesting that the distributional effects of financing forestry tend to be fair. Further evidence for this argument is given by the general and broad acceptance of the population with regard to financial contributions paid to forestry.\textsuperscript{155}

\begin{flushleft}
\textsuperscript{151} (SAEFL 1999: 6).
\textsuperscript{152} (Glück et al. 1999: 51).
\textsuperscript{153} (Frey and Kirchgässner 1994; Glück et al. 1999; Stähelin- Witt et al. 2003; Haering et al. 2002).
\textsuperscript{154} (Schmid 2000: Anhang 1:3, 9).)
\textsuperscript{155} (SAEFL 1999: 6).
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7 Conclusions and recommendations

7.1 Conclusions

Public funding can be seen as a means of guaranteeing the collective non-timber services of the forest, particularly a variety of protection services (against floods, avalanches, falling stones, landslides etc.). More recently nature conservation (close to nature silviculture, forest reserves) and recreation have also been recognized as important forest services.

Several arguments support this claim:

- The property and user rights of forest owners have become gradually more restricted since the 19th century. These restrictions generally serve public interests but the costs for ensuring appropriate management practices to maintain or increase environmental services have to be borne to a large extent by forest owners.

- Two thirds of Swiss forests are owned by corporate entities (boroughs, municipalities, corporations). Short-term economic interests (income from the production of marketable timber) are balanced by countervailing interests (performing non-marketable, non-timber services).

- The Swiss political system is based on federalism, direct democracy and communal autonomy and facilitates the participation of the various stakeholders in the development of forest policy at the institutional level, as well as in the management of forests at the operational level.

- Surveys and polls show that a large majority of Swiss are satisfied with the quality of the Swiss forest and with the implementation of forest policy.

At the same time, there is evidence of various shortcomings in Swiss forest policy which suggests that the current system of financial instruments sometimes results in higher costs than necessary. The most important problems concern the lack of strategic goals, the design of the financial instruments (few incentives for efficient forest management), the mixing of allocative and distributive objectives and the simultaneous assignment of economic and sovereign functions to forest authorities. These problems are identified but it remains open if the policy reform initiated (New Public Management project effor2, Swiss National Forest Programme) will be sufficient to resolve them and to improve the performance of financial instruments of Swiss forest policy.

Although the fundamentals of designing more effective and efficient financial instruments in forest policy are theoretically known, important gaps remain. On the one hand, these gaps refer to the forthcoming political decisions; on the other hand, we lack relevant knowledge. It is important to consider more explicitly and more systematically the fundamentals of a more effective and efficient forest policy, to continue the now initiated process of institutional reform of the public funding system to forestry, and to fill the important knowledge gaps that still subsist.
7.2 Recommendations

Fundamentals of a more effective and efficient forest policy: There seems to be a broad consensus that the reform of Swiss forest policy already initiated should be continued. This becomes evident from the general recommendations made by FREY AND KIRCHGÄSSNER\textsuperscript{156}, the specific recommendations on forest policy made by GLÜCK ET AL.\textsuperscript{157}, by STÄHELIN-WITT ET AL.\textsuperscript{158} as well as shown by the actual goals of the Federal Forest Agency and the reform steps that have been undertaken so far.\textsuperscript{159}

Important points to be taken into consideration in developing and adapting Swiss forest policy to the economic necessities and to new political and social demands are:

- Forest policy is a joint task of the Confederation and the Cantons. They are partners;
- The Confederation and the Cantons have to define goals and priorities in forest policy. While the Confederation should focus on strategic goals of national importance, the Cantons should concentrate on objectives of regional importance and on operational aspects.
- Instead of supporting numerous small-scale projects, the Confederation should finance fewer but more integrative programmes of the Cantons with a less complicated implementation design.
- Transfer payments of the Confederation should not necessarily be linked to the financial means of each Canton. They should rather be connected with the goals of forest policy of national importance.
- Transfer payments should be allocated by lump-sum payments, and not according to the real costs.
- Indicators to measure the outputs need to be defined. Indicators on the strategic level (Confederation) should be distinct from those on the operational level (Cantons).
- As a matter of principle agreements with forest owners should be cantonal and not Federal matters.
- Administrative regulations should be decreased, but monitoring of results increased. While the Cantons should monitor implementation of agreements on the cantonal and local level, the Confederation should focus on monitoring the overall results related to the strategic goals of forest policy at the national level.
- The general effects of forest policy and the efficiency and effectiveness of the chosen policy instruments should be periodically analyzed and evaluated.

Forthcoming political decisions concerning financial instruments: In Swiss forest policy, various strategic political decisions will have to be made in the near future. Given the different interests of the many stakeholders and pressure groups we find naturally a variety of points of view making compromises necessary. With respect to the development and design of financial instruments the following issues seem of particular relevance.

\textsuperscript{156} (Frey and Kirchgässner 1994).
\textsuperscript{157} (Glück et al. 1999).
\textsuperscript{158} (Stähelin-Witt et al. 2003).
\textsuperscript{159} (Poffet 1997; BUWAL 2002; Haering et al. 2002)
• **Priority setting:** Which strategic goals in Swiss forest policy should have priority? Where and why should the Confederation and the Cantons intervene? Which tasks should be left to the forest owners that are often public forest owners? In particular, is the promotion of timber production a governmental responsibility?

• **Allocation of the costs of forest policy:** How should costs be allocated and who should pay how much? At present we estimate that approximately 80% of the Federal and cantonal financial transfers are paid to (public) forest owners in mountain regions, mostly for protection purposes. According to the estimates of the Federal Forest Agency, 49% of the costs of forest policy are born by the Confederation, 27% by the Cantons and 24% by the forest owners. Are these proportions right? How much should each party pay for each service?

• **Management of extraordinary events:** After the two storms Vivian (1990) and Lothar (1999) public expenditures on the forest rose dramatically. Studies on the financial effects of storm Lothar showed that the usual forest policy measures and instruments are not necessarily appropriate for such emergency situations. Should the financial instruments be adjusted to such exceptional situations?

• **Powers and duties of the forest authorities:** In Switzerland, cantonal forest authorities perform both economic and sovereign functions. To what extent should their sovereign functions be separated from their economic functions? To what extent should forest authorities be concerned with wood production and forest tending? Should they focus primarily protective functions and maintaining biodiversity or on the fostering of multifunctional forest management practices?

• **Forest owners’ property and user rights:** Should there be more emphasis on the responsibilities as well as on the property and user rights of forest owners? Should restrictions be loosened and to what extent?

In order to develop financial instruments of Swiss forest policy further and take into account the aspects listed above so as to make “good” political decisions several knowledge gaps have to be filled:

• **Assessment of the inputs of forest policy:** In this study, only aggregate data for the whole country have been collected. To understand better the effects of financing one needs to collect spatially differentiated data at least at the cantonal level (26 Cantons). Representative data from both public (municipalities, boroughs, corporations) and private forest owners are also required.

• **Assessment of the outputs of financing forestry:** What are the outputs of forest policy concerning the politically desired goods and services (wood production, protection, recreation and biodiversity)? Which indicators are suitable to measure them and how can they be assessed in quantitative respectively qualitative terms?

• **Controlling the results of financing forestry:** Until today, the results of financing forest management have not been systematically evaluated and controlled. We do not know to what extent each of the almost 4,000 publicly financed projects has met its goals.

• **Improving the design of financial instruments:** How should financial instruments be designed to provide a more pronounced incentive character, and how can one increase

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their effectiveness and efficiency? How should the instruments be adjusted to manage extraordinary situations (e.g. in case of extraordinary calamities such as storms like Vivian and Lothar)?

- **Correlations between ownership category, financial performance and non-timber services**: We need comparative analysis of the state of the forest and the provision of non-timber services according to the various categories of forest ownership.

- **Structural change**: There is little information about structural changes in Swiss forestry in recent years. Although there is some evidence that forest enterprises have recently been restructured or have merged, the official figures indicate that the number of public forest enterprises over the past few years has remained rather constant. This suggests that the figures may not reflect the real development. More information about structural change is required.

- **Influence of financial contributions on Swiss timber markets**: From a theoretical point of view (economic production theory) some of the financial contributions to forest owners should lead to an increase in the timber supply. This happens either by reducing production costs or, more likely, by directly promoting the timber that is harvested as the result of tending activities, in particular, in the mountain forests. A careful economic analysis of the influence of financial contributions on prices and quantities of Swiss timber should be conducted.

- **Distributing the responsibilities of forest authorities**: What would happen if the sovereign powers of the forest authorities were separated from their economic powers? What would happen, if the forest authorities withdrew from timber production and forest tending and only represented the state vis à vis the forest owner? Which kind of new institutions would have to be established (e.g. invitation to bid)?

- **Increasing forest owners’ property and user rights and responsibilities**: What would happen, if forest owners’ property and user rights as well as their responsibilities were increased? How could these be altered so as to make the provision of non-timber services more attractive?

In summary, for a thorough evaluation of financing Swiss forestry and in order to understand fully its economic, ecological and social effects, its effectiveness (meeting goals) and efficiency (reasonable cost-benefit ratio), and the winners and the losers, more work remains to be done. And if forest policy is to be improved we need to know even more.
Legal Instruments

Federal Law on Professional Training: Bundesgesetz über die Berufsbildung (Berufsbildungsgesetz, BBG) vom 19. April 1978 [SR 412.10].


BUWAL / F&D: Kreisschreiben (Administration Regulation) 6–17, 19, 20.
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