Switzerland

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Summary

Competitiveness of Swiss public forest enterprises is hampered by the fact that there is, by and large, little economic dependence on timber and wood production. Cross-financing and alternative or other sources of income are more important. Private forest enterprises do well if they are big enough to be economically viable. High level of wages and the low prices in the forest and timber market as compared to other countries is a limiting factor to entrepreneurship. The uncertain development of the forestry sector is not a rewarding perspective for the younger generation to embark on the establishment of forest enterprises. Other sectors of the economy offer better economic alternatives to entrepreneurs. Innovations in the forestry sector bear high uncertainties of success and profit. Externalities of the societal demands in the spheres of recreation, landscape aesthetics and climatic services are taken for granted and are likely not be adequately compensated in future.

1. Consumption

1.1. State of the art and historical development

From 1945 to 1995 the annual wood consumption of about 4 million m^3 was very constant, although there were considerable changes in use. Whereas the need for firewood was highest during the Second World War, it decreased during the subsequent years. There was again a slight increase during the last twenty years. The entire timber industry went through a phase of structural change during the last decades. The portion of pulpwood decreased, since wood of inferior quality was no longer used for reasons of profitability and the industry used to recycle old wood and waste paper. During the last 20 years the overall consumption of board and paper increased by a third.

Over the last 50 years more processed wood was imported than exported and lower quantities of unprocessed wood were exported. High quality roundwood consumption increased and the manufacturing and wood processing industry did well, provided enterprises were big enough to meet the challenges of shrinking profits. In comparison to 1955 only a fourth of the roundwood manufacturing industry, namely 700

enterprises, had survived in 2001 (Swiss Federal Statistical Office (SFSO) and Swiss Agency for the Environment, Forests, and Landscape (SAEFL) 2003), whereas the quantity of harvested wood had increased constantly. Employment in this sector was going down and apart from some big enterprises, only small and one-man carpenter workshops with low fix costs and high production flexibility as far as supply and demand is concerned could survive. Paragraph

There was an increasing demand for services, which formerly used to be provided by public forest enterprises and the question how to compensate them financially in times of decreasing profits in the wood marketing sector became a political issue. A process of rapid urbanisation of the Swiss Low-Plain and the population's rising amount of leisure time led to an increasing demand for recreation. The forest infrastructure used for recreation was expected by the public to be maintained without compensation and was taken for granted. Furthermore there is a general right of access to any forest in Switzerland, whether private or public, and therefore no market for NWFP such as, for instance, mushrooms or berries.

1.2. Forest products' and service consumption

In 2000, the Swiss population was 7.288 Mio., out of which 68% were living in urban areas (SFSO 2003). Less than 2% of the population lived in Bern, the federal capital. During the last 20 years urbanisation led to an enlargement of agglomerations. In terms of commercial relevance and population size Zurich, Basel, Geneva, and Bern are by far the most important (Eisinger 2003). These cities form an agglomeration belt across the midlands from Lake Geneva to Lake Constance.

From 1990 to 2002 the annual Gross Domestic Product (GDP) of Switzerland increased by 65 billion euro from 205.85 to 270.72 billion euro. In 2002, a per capita GDP of 37,096 euro was generated by approximately 60% of the population based on the 2000 census data (SFSO 2003). The primary production sector (forestry and agriculture) accounted only for 2.2%, while the share of the industrial and services' sectors was 29.5% and 66.8%, respectively.
In 2000, 61.5% of the Swiss population was in the most productive age between 20 and 64 years. The share of young people (0-19 years) was approximately 23% and thus below the average of developed countries (25%) (2002 data) (SFSO 2003) (Table 1).

Table 1. Age distribution of the Swiss population in 2000 (SFSO 2003)

Age	**0-19**	**20-39**	**40-59**	**60-79**	**80-**
Number	1,662.13	2,074.79	2,069.65	1,205.44	305.85
(%)	22.7	28.4	28.3	16.5	4.2

The monthly household expenditures increased by 27.2% from 1990 to 2001, whereas the consumer spending increased less (16%) than the transfer costs (50%) (SFSO 2003). In 2001, the share of consumer spending and transfer costs was 63% and 37%, respectively(Table 2).

Table 2. Household expenditure distribution 1990 and 2001 (SFSO 2003)

Household expenditures	**1990**		**2001**	
	€ [1)]	%	€	%
Total monthly household expenditures	4042	100.0	5143	100.0
Total consumer spending	2792	69.1	3258	63.4
Aliments and non alcoholic beverages	451	11.2	433	8.4
Alcoholic beverages	63	1.6	66	1.3
Clothing and shoes	197	4.9	170	3.3
Habitation and energy	699	17.3	910	17.7
Furnishing and running household expenditures	201	5.0	163	3.2
Healthcare	132	3.3	233	4.5
Traffic	308	7.6	376	7.3
Telecommunication	50	1.2	91	1.8
Entertainment, recreation and culture	234	5.8	340	6.6
School and education fees	32	0.8	19	0.4
Public houses and lodging	316	7.8	335	6.5
Other products and services	112	2.8	121	2.4
Total transfer costs	1250	30.9	1885	36.6
Insurance	650	16.1	1074	20.9
Social insurance contributions 2)	346	8.6	488	9.5
Health insurance contributions	170	4.2	345	6.7
Other insurance contributions	134	3.3	241	4.7
Taxes and fees	497	12.3	683	13.3
Contributions, donations and other transfers	103	2.5	127	2.5

1) Exchange rate of 10.08.04 2) Without Health insurance contribution

In contrast to most other private household expenditures which increased over the last decade, the expenditures for furniture have decreased. On the other hand, the growing market of food and cosmetics might open new niches for NWFP, since they are considered as natural alternatives to industrial products.

Furthermore, the technological progress in wood heating systems increases their competitiveness, which could lead to a rising demand for wood-pellets.

1.3. Market demand for forest related products and services by urban population

During the last 20 years, approximately 4.5 million m^3 of wood were used; apart from the increased use in 2000 and 2001 due to the storm "Lothar" in 1999 (Table 3). At present, the major part, namely 67% is roundwood, 22% firewood, and 11% pulpwood (SAEFL and Swiss Forest Agency 2003; SFSO and SAEFL 2003). During the last decade the share of roundwood consumption has increased, with an average of 54% (Table 4).

Table 3. Annual wood harvesting (SFSO and SAEFL 2003) million m^3

	Roundwood production						**Fuel wood**
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2002**
Public	3.2	3.5	3.3	5.4	3.8	3.1	0.6
Private	1.2	1.5	1.4	3.9	1.8	1.4	0.4
Total	4.4	4.9	4.7	9.2	5.7	4.6	1.0

Two thirds of the wood is harvested in the Low Plain and the alpine region and the remaining third is spread over the Jurassic Plateau, the Alps and the southern part of the Alps, which is the smallest fraction.

Out of the total amount of Swiss wood and timber production 28 % is consumed as source of energy, 23 % for construction, 7 % for furniture, 6 % for packing material and 33 % for board and paper (SFSO and SAEFL 2003). According to this yearbook an increase of modern wood burning heating systems in private homes is to be expected during the next years.

Table 4. Average wood consumption during the last decade (thousand m^3)

	Round-wood	**Sawn softwood**	**Sawn hardwood**	**Particle board**	**Plywood**	**Fibre board**
Product	3,100	1,500	250	400	150	300

Source: (UNECE/FAO TIMBER database 2002, SAEFL 1998a)

Switzerland mainly imports semi- and fully fabricated wood products and exports roundwood. In terms of roundwood equivalents the annual wood consumption in Switzerland was 6 to 7 million m^3 during the last ten years[1]. The export of 5 to 6 million m^3 wood mainly consisted of unprocessed wood. Annually, about 4.5 million m^3 wood was cut and 6.5 to 7.5 million m^3 were imported[2] (see Table 11.2, p.121 in SFSO and SAEFL 2003).

The preliminary report of a SNSF (Swiss National Science Foundation) project of Zimmermann and Jakob published in 1990 (final report: Hurst 1991) showed that the most important value adding in wood processing did not happen in Switzerland and that there is a need for the Swiss timber industry to improve the efficacy of its production structures. Furthermore, the report criticises that the services provided by forest enterprises were not compensated as external costs. A survey of the wood marketing branch by the (SAEFL 2001), based on computer simulations, intended to optimise the procedures of logging and wood processing. It could be shown in this survey that an improved economic growth in Switzerland would have positive effects on the national timber industry and it was emphasised that the export of sawn timber should be increased and the domestic demand should be met with Swiss wood products. In a synthesis paper of the "FORUM für HOLZ", this strategy had been already propagated several years before this survey was made (Hofer 2003; SAEFL 1995a); for more details see Hofer 2003). Important political changes happened in the Swiss timber industry during the recent years. In the middle of the 1990s a study on the Swiss timber industry commissioned by the SAEFL (see SAEFL 1998a; SFSO and SAEFL 1998, 1999) was conducted and a support programme was initiated by the Swiss Confederation in co-operation with the Swiss Association of Forestry and Forest industry (LIGNUM). Its aim was to increase the use of domestic wood and timber through sales promotion and to encourage improved competitiveness of the wood chain (see Meuter 2001; Starck 2001). The sustainable management of forests and timber production should be certified by obtaining the FSC (Forest Stewardship Council) label.

[1] Except 2000 and 2001, where production and consumption were higher due to the storm "Lothar" in winter 1999.

[2] Roundwood equivalents

It was thus attempted to raise the consumer's awareness and preference to buy timber that was produced according to principles of sustainability. The sales promotion for timber and wood products and the opening of new markets was recommended by several key players. Recently, the Swiss Forestry Association issued 8 theses to optimise Swiss forestry (WVS 2003). A major point was the restructuring of the entire wood chain. It should become more efficient, for instance, by outsourcing wood harvesting to private forest enterprises or by making legal regulations more flexible and economic, which are sometimes hampering the logging and marketing of timber. Moreover, governmental subsidies were to be phased out for logging and structural changes should replace them by agreements with the owners on the achievements of economic objectives. Similar arguments were raised by forestry experts, who developed visions for a competitive timber industry for the Canton of Berne (Balsiger et al. 2003). One of the favoured approaches in this discussion was the formation of bigger forest clusters by merging small holdings of forest and make forestry more efficient. The Swiss National Forest Programme (WAP-CH) (see SAEFL 2004b) stressed the need for favourable economic and political conditions to support an efficient and innovative forestry and timber industry.

The quantities and the respective economic value of the NWFP were recorded for the first time in 1996 (Alfter 1998; SAEFL 1997b). Only the products which were obtained within the forest area were included (Table 5). Therefore, Christmas trees for instance, which were grown outside the forest, were not considered. The only reliable quantitative data are those from products which are recorded in the hunting statistics annually. Each year, game animals with an average value of 11.3 million euro are shot (Alfter 2004). Compared to the study on NWFP&S in Switzerland in 1996 (Alfter 1998; SAEFL 1997b) the updated version (Alfter 2004) shows some smaller deviations – positive and negative.

The socio-economic non-marketable services of the forests, for instance, recreation and protection forest, are difficult to quantify. The publication of (Kübler *et al.* 2001) contains a selection of studies, which quantify the services of the forests (table 12, p. 84).

The NWFP listed in Table 5 yield about 42 million euro annually (Alfter 1998; SAEFL 1997a). According to Alfter, the annual amount generated from all NWFP and services of Swiss forests is 5 billion CHF. The data of this investigation were obtained by inquiries of enterprises, shops and associations, which are concerned with the commercialisation of NWFP. A study of the SAEFL has shown that welfare amenities provided by forests can be quantified and worked out with adequate methods and made suggestions to internalize these costs (SAEFL 1995b). New forest related services such as adventure parks in treetops (rather small income for forest owners, since the service is provided by third parties) or burials in forests (the forest owner receives up to 20% (3400 euro on average)) can generate some additional income (Alfter 2004).

Table 5. Estimated quantity and value of NWFP (SAEFL 1997b :52)

Product	**Quantity or number**	**Value in €/year**	**Comments**
Chestnuts	12,000 kg	37,300.-	
Mushrooms	735,000 kg	5,400,000.-	includes individual use
Honey	500,000 kg	5,170,000.-	includes individual use
Beeswax	12,800 kg	50,000.-	
Seeds of forest plants	4,200 kg	118,700.-	
Tree nurseries	1,500,000	1,500,000.-	
Christmas trees	400	3,500,000.-	
Decorative materials:			
- pine cones	200 m^3		
- green foliage	8,000 m^3		
- moss	350 m^3		
medicinal use of flowers, roots, herbs berries, moss, lichen	25,000 kg	225,000.-	dry material
bark chips	700,000 m^3	16,300,000.-	
dead leaves	3,200 m^3		for decoration + compost
compost, mould	27,000 m^3	1,440,000.-	
food and fodder:			
- forest pastureland	42,500,000 kg	10,500,000.-	150,000 ha of forest pastures
- meat consumption by wild animals	261,000 kg		only for lynx and boar
- consumption of plants by wild animals	115,000,000 kg	20,800,000.-	

The study of Bieger *et al.* (2003) concludes that for the Swiss alpine regions the wood chain should be more focused on supporting local industries, such as house construction industry, tourism, wood processing enterprises and agriculture. In many studies it was argued that the sales promotion of roundwood and its processing should have priority. According to experts of the Swiss forest business (Arbeitsgruppe Starkholz 1999) large dimension timber (top diameter > 45 cm) is not suitable for bulk processing and is therefore not much in demand. But other authors ((Eschmann et al. 2003)) see no short-term available opportunity to reduce the rotation period, in order to decrease the share of large dimension timber in the near future. Furthermore, according to the latest study about Swiss foreign wood trade (SAEFL 2004a) there are no economic improvements to improve the timber industry. Services provided by forest enterprises should be compensated by applying marketing strategies, be it by outsourcing of forest management to private entrepreneurs or by supplying particular goods or services on demand. The urban forest enterprise of the city of Baden in Switzerland has made successful attempts in marketing nature conservation services in peri-urban forests (Schoop 1997).

1.4. Main problems and research questions in consumption for enterprise development

According to a study of the (SFSO and SAEFL 1998) a main problem of the Swiss timber industry is its dependence on the building industry and its cyclical economic development. In addition, there is a net import of semi-finished and finished products and a net export of raw wood, which allows only small profit margins. To increase its

profitability, the timber industry tries to optimise the wood chain. There are several studies in progress, which try to show how the problem of internalisation of external effects, such as the provision and maintenance of recreational infrastructure by forest enterprises can be solved. This is of great economic importance, since the study of (Schelbert and Maggi 1988) calculated an economic existence value between 1 and 3 billion Swiss Francs just for one of Zurich's peri-urban forests of approximately 800 hectares (Adlisberg, Zurich) in the late 1980s.

Annex A: Organisations studying forest product's consumption and main publications and information sources

Publications

Annual statistical bulletins

SFSO and SAEFL (eds.) 2003. Wald und Holz in der Schweiz: Jahrbuch 2003 / La forêt et le bois en Suisse: Annuaire 2003. Swiss Federal Statistical Office (SFSO), Swiss Agency for the Environment, Forests and Landscape (SAEFL), Neuchâtel. 178 p.

SAEFL and Swiss Forest Agency (eds.) 2003. Holzmarktbericht / Bulletin sur le marché du bois. 36. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Swiss Federal Forest Agency (Eidg. Forstdirektion), Bern. 24 p.

Publications focusing on Swiss forestry

Bieger, T., Bischof, L. and Wittmer, A. 2003. Beitrag zur strukturellen & regionalökonomischen Entwicklung der Forstwirtschaft in Berggebieten: Effektivität und Effizienz der Bewirtschaftung von Schutzwäldern. Institut für Öffentliche Dienstleistungen und Tourismus, Universität St. Gallen, St. Gallen. 75 p.

Bürgi, M. and Schuler, A. (2003): Driving forces of forest management - an analysis of regeneration practices in the forests of the Swiss Central Plateau during 19th and 20th century. Forest Ecology and Management 176 173-183.

holz 21 (eds.) (2004): Resultate. Bulletin Förderprogramm holz 21 des BUWAL März 2004. Geschäftsstelle holz 21, Bern. 15 p.

Hurst, A. 1991. Das Nationale Forschungsprogramm 12 "Holz, erneuerbare Rohstoff- und Energiequelle" : Schlussbericht der Programmleitung. SAH-Bulletin 1/1999, Bern. 220 p.

Oswald, K., Thees, O., Lemm, R. and Riechsteiner, D. (2003): Verbesserung von organisatorischen Strukturen und betrieblichen Abläufen in der Holzproduktion: Fallbeispiel Kanton Solothurn, Forstkreis Bucheggberg / Lebern West. Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Section Forest Use Management, Birmensdorf. http://e-collection.ethbib.ethz.ch/show?type=bericht&nr=293. 198 p.

SAEFL (eds.) 1995. Regionalwirtschaftliche und ökologische Effekte der Wald- und Holzwirtschaft. Umwelt-Materialien 35. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 90 p.

SAEFL (eds.) 1995. Holz - Rohstoff mit Zukunft: Ziele und Strategien zur Holzförderung. Umwelt-Materialien 33. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 23 p.

SAEFL (eds.) 1997. Holzaussenhandel der Schweiz 1985-1995. Umwelt-Materialien Nr. 71. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 70 p.

SAEFL (eds.) 1997. Ökosystem Wald - Rohstoff Holz - Prinzip Nachhaltigkeit: Kongress Wald und Holz vom 22./23. Oktober 1996 in Biel / Ecosystème: forêt - Matière première: bois - Principe: durabilité: Congrès Forêts et Bois du 22/23 octobre 1996 à Bienne. Umwelt-Materialien Nr. 67. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 251 p.

SAEFL (eds.) 1998. Endverbrauch des Holzes in der Schweiz 1996. Umwelt-Materialien 94. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 106 p.

SAEFL (eds.) 2001. Ökonomische Branchenstudie der Wald- und Holzwirtschaft. Umwelt-Materialien 138. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 109 p.

SAH (eds.) 1998. ETH Kolloquium: Schweizer Holzwirtschaft im Spiegel der Zahlen. SAH Bulletin CSRB 2/1998. Schweizerische Arbeitsgemeinschaft für Holzforschung (SAH) % Lignum, Zürich. 28 p.

SFSO and SAEFL (eds.) 1998. Profil Schweizer Wald- und Holzwirtschaft 1995 / Profil de l'économie suisse des forêts et du bois en 1995. Swiss Federal Statistical Office (SFSO), Neuchâtel. 134 p.

SFSO and SAEFL (eds.) 1999. Holzverarbeitung in der Schweiz 1996: Studien über den Holzfluss 1991-1996 / La transformation du bois en Suisse. Swiss Federal Statistical Office, Neuchâtel. 51 p.

WSL and SAEFL (eds.) 1999. Schweizerisches Landesforstinventar: Ergebnisse der Zweitaufnahme 1993 - 1995. Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) and Swiss Agency for the Environment, Forests and Landscape (SAEFL) (eds.) Haupt, Bern [etc.]. 442 p.

Zimmermann, A.J. and Jakob, R. 1990. Neuorientierung der schweizerischen Wald- und Holzwirtschaft. Nationales Forschungsprogramm 12 "Holz, erneuerbare Rohstoff- und Energiequelle" des Schweizerischen Nationalfonds Paul Haupt, Bern. 347 p.

NWFP&S

Alfter, P. 1998. Recherche sur les biens et services non-bois de la forêt suisse: Quantification et essai de valorisation dans le cadre d'un projet de l'OFEFP. Schweizerische Zeitschrift für Forstwesen 149:87-104.

Alfter, P. (2004): Biens non-bois et services de la forêt Suisse: Mise à jour partielle des données. Ingénieur forestier diplômé EPF-Z / CRIFOR, Fresens / NE. 24 p.

SAEFL (eds.) 1997. Criteria and indicators for sustainable forest management in Switzerland. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 80 p.

SAEFL (eds.) 1997. Bewertung und Honorierung von Waldleistungen (VAFOR): Orientierungshilfe. Umwelt-Materialien 64. Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 52 p.

SAEFL (eds.) 1998. Überprüfung der Marktfähigkeit von forstbetrieblichen Leistungen. Praxishilfe. Vollzug Umwelt Swiss Agency for the Environment, Forests and Landscape (SAEFL), Bern. 122 p.

Table 6. List of organisations studying forest product's consumption and their corresponding web-pages

Name	**URL**	**Field of work**
Swiss Agency for the Environment, Forests and Landscape (SAEFL) (Bundesamt für Umwelt, Wald und Landschaft (BUWAL)), Bern.	www.environment-switzerland.ch	Support in working out basic elements
Swiss Forest Agency (Eidgenössische Forstdirektion), Bern	www.forstdirektion-schweiz.ch	Forest statistics, information
Swiss Federal Statistical Office (SFSO) (Bundesamt für Statistik (BFS)), Neuchâtel	www.statistik.admin.ch	Forest- and timber industry statistics
Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) (Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft (WSL)), Birmensdorf, Zürich.	www.wsl.ch	Sense-making processes Chestnut production and processing (Marco Conedera, FNP Sottostazione, south of the Alps, Bellinzona-Ravecchia).
Swiss Federal Institute of Technology (ETH) (Eidgenössische Technische Hochschule (ETH)), Zürich. Department of Environmental Sciences (D-UWIS)	www.env.ethz.ch	Urban demand for NWFP&S Labelling in developing countries (FSC)
Hochschule für Architektur, Bau und Holz (HSB) – Fachbereich Holz, Biel/Bienne.	www.hsb.bfh.ch	Innovations in the field of wood
Swiss Federal Laboratories for Materials Testing and Research (Empa) (Eidgenössische Materialprüfungs- und Forschungsanstalt (EMPA)), Dübendorf	www.empa.ch	Development of new resources
Lignum / Timber Industry Switzerland, Zürich. Cédotec / Lignum (office romand), Le Mont sur Lausanne	www.lignum.ch	Represents the interests of the forest- and timber industry. Commercialisation

4. Non-wood forest products and services

4.1. State of the art and historical development

Swiss forests were always used in manifold ways. Be it to protect people from stone and snow avalanches or simply to meet their needs for wood supply. Also the agricultural usage was very important until the fifties of the last century. The development of agroforestry use is described extensively in several sources (Bürgi and Stuber 2003; Stuber and Bürgi 2001; Stuber and Bürgi 2002).
During the middle ages until the age of industrialisation, the combination of forestry and agriculture, some sort of slash-and-burn cultivation, was quite widespread. In the 18th and the 19th century it developed into agroforestry. Following a clearing, an area was temporally used for agriculture. Subsequently it was sowed with tree seeds (Bürgi and Stuber 2003). Until the late 18th century the forests were usually grazed. In particular, pig rearing and fattening was very common. In the beginning of the 20th century grazing in forests was still widespread on the Jurassic Plateau and in the alpine region. At that time, about a fourth of the forests of the Bernese Oberland and parts of the Valais, Grisons, and Ticino were grazed (Stuber and Bürgi 2001). In addition, forest litter was withdrawn, which was used as bedding for cattle and humans. By the advent of stable feeding during summer, the need for forest litter increased dramatically in the second half of the 20th century. At the same time, the local production of straw decreased, which lead to an additional shortage of bedding. As soon as train transportation enabled the import of straw over far distances, the collection of forest litter decreased tremendously (Stuber and Bürgi 2001, 2002).

The extraction of resin was in most cases not commercially viable and declined in the 19th century. Resin was used for shipbuilding, by cellarmen and tanners, and for domestic purposes (Bürgi and Stuber 2003). Forest fruits, such as berries, nuts, fir cones, and mushrooms were also used. But in the beginning of the 20th century they lost their importance even for the rural and poor people. Whilst berries were mainly used as food for self consumption and partially for commercial purposes, acorns, beech-nuts, and chestnuts were primary used for pig fattening. In addition, oil extracted from beech-nuts and chestnuts served as food for humans and cattle. Until the beginning of the 20th century fir cones, mainly stone-pine nuts, were regarded as delicacy in the alpine region (Bürgi and Stuber 2003). Apart from forest pasture and some gathering activities, the agrarian usage of forests disappeared almost completely from the memory of the people. This strongly contrasts with its earlier meaning, mostly for the poor, and its impact on the development and structure of the Swiss forests. A present study ("Austragswald") of the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) investigates the impact of the reintroduction of forest litter collection on soil and vegetation.

In 1994, the SAEFL launched the project VAFOR (Valorisation des Forêts) to inform forest owners and enterprises about the potential of commercialisation of NWFP, since the expenses for forest cultivation were no more covered by wood and forest products and services (SAEFL 1997a, 1998b). Within the framework of this project a list of the socio-economic products and services from and by forests as NWFP&S, was compiled. On this basis, an internal internet survey of the Chair of Forest Policy and Economics (ETH Zurich) was conducted (Berger and Seeland 2004), and a list of existing NWFP&S in Switzerland was produced.

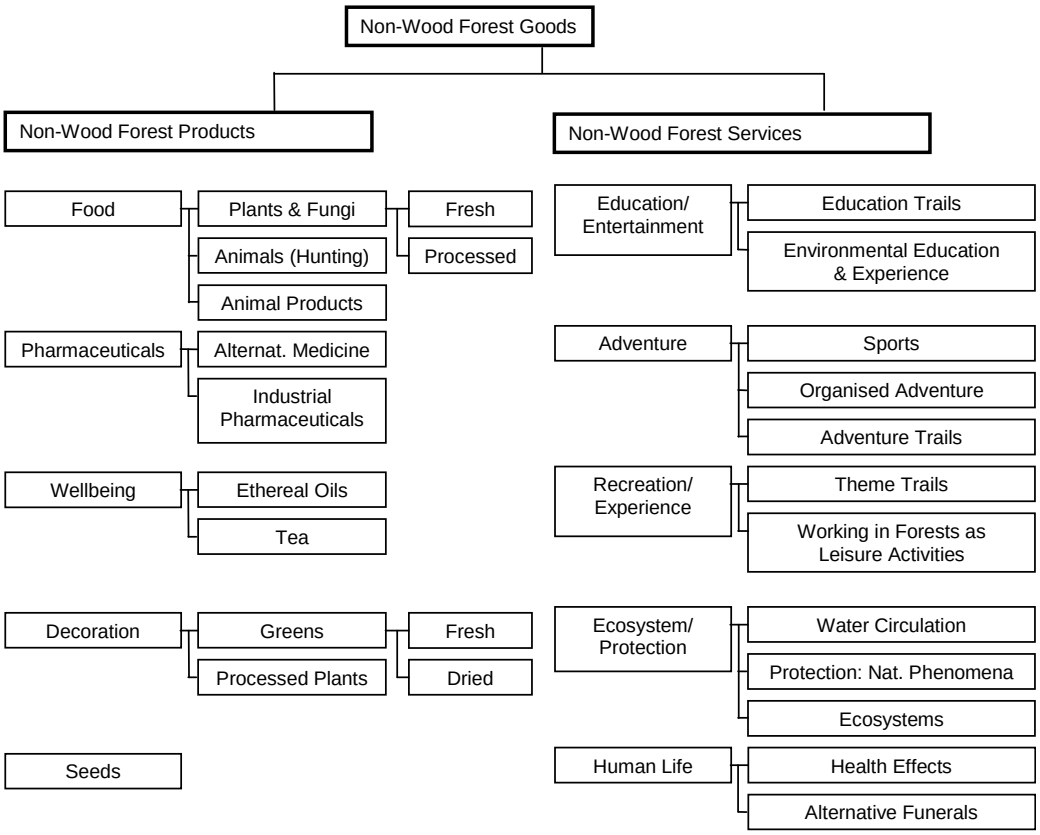

Figure 1. Diagram of actual NFWP&S in Switzerland (Berger and Seeland 2004)

According to Alfter (1998), NWFP are defined as products including animals and vegetation, which are to be found inside forests, except wood and timber. The NWF services are subdivided into environmental services, which serve the whole natural environment (biodiversity, noise control, water supply, etc.) and in social and cultural services, such as recreation. See chapter 1.3 for more information about the value of these NWFP&S. Forest enterprises are of considerable importance in rural areas as employers. Due to structural adjustments in forestry and agriculture, marketable NWFP would have an important potential as well.

According to article 699 of the Swiss Federal Civil Code, the public has the general right of access to pasture and forest. The same article says that the collection of wild-growing berries, mushrooms, herbs etc. is allowed in reasonable amounts. The various cantonal laws have their distinct regulations as far as the collection of NWFP are concerned (season, amount, etc.). With respect to non-marketable goods and services of the Swiss forest with regard to NWFP some references are given in (Kübler *et al.* 2001): 84). Despite several efforts of the federation during the last years (e.g. VAFOR) NWFP are still economically unimportant. Wood products are still dominant in the forest sector. Apart from some exceptions, NWFS such as the function of recreation and protection have not yet been internalised.

Table 7 lists national and local organisations studying non-wood forest products. Statistical information sources and web sites at national, local and enterprise level are listed in Table 8.

Table 7. List of organisations studying NWFP&S and their corresponding web-pages

Name of institution	URL	Field of work
Swiss Agency for the Environment, Forests and Landscape (SAEFL) (Bundesamt für Umwelt, Wald und Landschaft (BUWAL)), Bern.	www.environment-switzerland.ch	Executive function, forest policy, developing basic knowledge.
Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) (Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft (WSL)), Birmensdorf, Zürich.	www.wsl.ch	Future oriented management of forest use. Land resources in peri-urban environments
Swiss Federal Institute of Technology (ETH) Eidgenössische Technische Hochschule (ETH), Zürich. Department of Environmental Sciences (D-UWIS)	www.env.ethz.ch	Attitude and perception of urban dwellers towards green spaces. The meaning of forest services to people
Swiss Forest Agency (Eidgenössische Forstdirektion), Bern	www.forstdirektion-schweiz.ch	Forest statistics, general information
Federal Institute for Fruit, Wine and Garden Cultivation (FAW, Agroscope) Eidg. Forschungsanstalt für Obst-, Wein- und Gartenbau, Wädenswil	www.faw.ch	Cultivation of agricultural products including forest related products such as chestnuts
SILVIVA – union for environmental education and forest SILVIVA – Verein für Umweltbildung und Wald, Birmensdorf, Zürich	www.silviva.ch	NWFS: Forest- and nature-pedagogy, environmental education
Protection.Forest.Man – a collaboration of SILVIVA, GOWN and the Swiss underwriting association Wald.Schutz.Mensch – eine Zusammenarbeit von SILVIVA, GOWN und ASA (Elementarschadenpool)	www.schutz-wald-mensch.ch	Educational trails concerning protection forest and other forest services
Link Institute – bureau for market and socoal research Link Institut – Markt- und Sozialforschungsbüro, Luzern	www.link.ch	Research activites: Perception of urban dwellers towards forests and their services, activities in forests

Table 8. List of statistical information sources, databases. Web sites at national/local/enterprise level

Name	URL	Information
Swiss Federal Statistical Office (SFSO) (Bundesamt für Statistik (BFS)), Neuchâtel	www.agr-bfs.ch	Statistical information
Interest Group Pro-Chestnut Central Switzerland and Murg IG Pro-Kastanie Zentralschweiz und Pro-Kastanie Murg	www.kastanien.net	General information about chestnut cultivation and consumption and about the activities of IG Pro-Chestnut
Friedwald GmbH Switzerland	www.friedwald.ch	Information about locations of forest funerals
GrünStadtZürich, department for civil engineering and disposal of Zurich	www3.stzh.ch/content/internet/gsz/home.html	Range of NWFP&S in Zurich
GrünStadtZürich, Tiefbau- und Entsorgungsdepartement Zürich		
Forest Economy Switzerland Verband Waldwirtschaft Schweiz	http://www.wvs.ch/de/waldwirt/fuchs.html	Information about innovative projects in the field of NWFP&S
Association of the Communities of the Region Malcantone Associazione dei Comuni Regione Malcantone, Tessin	http://www.regionemalcantone.ch	Informatin about a chestnut trail
Local Autorities Association UNESCO Biosphere Gemeindeverband UNESCO Biosphäre, Luzern	http://www.biosphaere.ch	Value of NWFP, sustainability, trails for information and recreation
Association Nature-School St. Gallen Verein Naturschule St. Gallen	http://www.naturschule.ch/index.htm	Education in frorests and trails

4.2. Case studies of successful marketing strategies

Case study 1: Alternative funerals in forests

(a) NWFP & S definition, area of production, harvesting level, technical characteristics of production

Alternative funerals in forests are a relatively new forest related service that first occurred in Switzerland in 1994. It is an unconventional option to bury the ashes of the deceased under trees, which are purchased by a person and will be protected by law for 99 years (entry in the cadastral register of the corresponding municipality). The service was first provided and patented by the Swiss entrepreneur Ueli Sauter who founded the company “Friedwald GmbH” in 1994. Apart from some slight deviations, the same service is provided by the municipal office “GrünStadtZürich” (GSZ), a division of the department for civil engineering of Zurich, in collaboration with the municipal office for funerals and cemeteries (Bestattungs- und Friedhofsamt). In some very few cases, this service is also provided by some other municipalities.

Since in most Cantons of Switzerland people are free where to bury the ashes of family members this service remains a rather small business. Nevertheless, the sales of Friedwald GmbH grew from 2000 up to 20% per year and reached in 2003 an amount of 600'000 euro with nearly 100 funerals. GSZ provides the service since early 2003 and made about 40'000 euro with 60 funerals.

Today, Friedwald GmbH provides 50 locations which serve as burial grounds, most of them in the northern part of Switzerland in the regions of Basel, Berne, Zurich, Aargau, Lucerne and St. Gallen. New locations are in preparation and others are planned. GSZ offers its services on two small forest patches near a municipal graveyard.

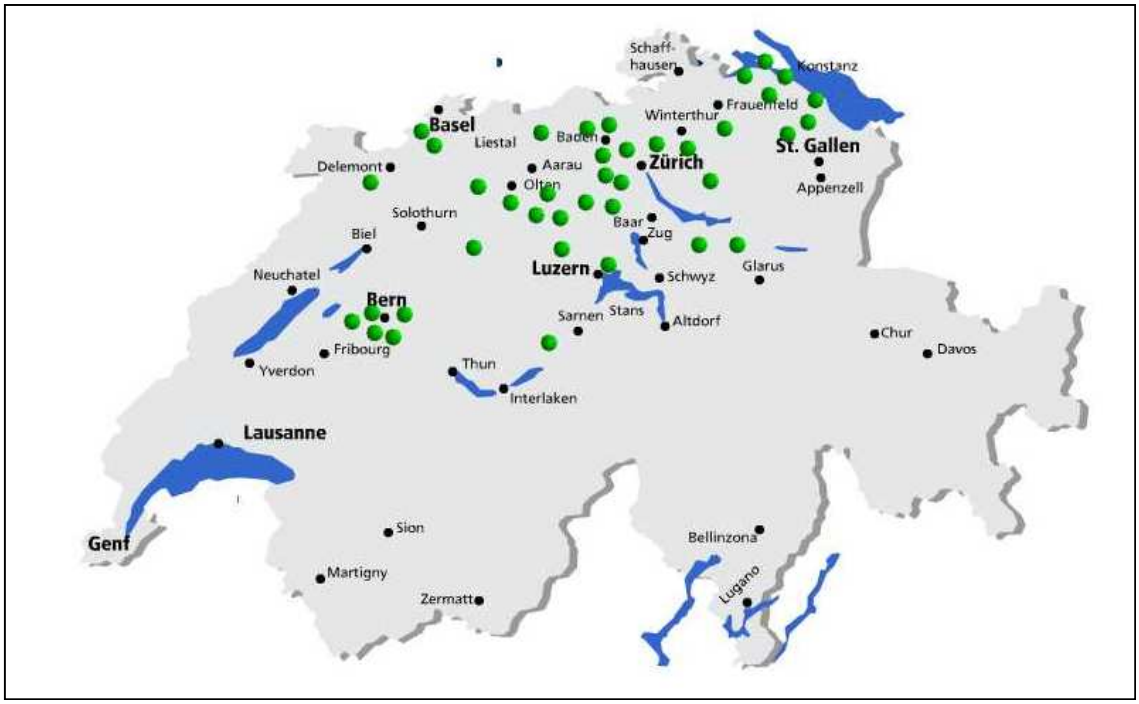

Figure 1. Locations of the company Friedwald GmbH without locations of the agent "Forêt Dernier Repos" in western Switzerland

(b) Description of the product chain organisation

The service provided by Friedwald GmbH comprises only a few activities. There are no contracts or agreements with crematories, since cases of death have to be announced at the office of civic affairs (Zivilstandsamt) of the respective municipality, which automatically organises the burial or cremation with the office for funerals and cemeteries (Bestattungs- und Friedhofsamt). In the latter case the ashes of the deceased are treated according to their last will. The deceased either contacted Friedwald GmbH in their lifetime or – if there is no other order by them – their families can get in touch with the company after death. In some rare cases interested people are mediated by offices of civic affairs (Zivilstandsämter) or urns are sent from undertakers from Germany near Konstanz to locations in the canton Thurgau. In the case of an agreement, the clients choose their last resting-place under a young tree in one of the 50 locations. The ashes are then buried at the foot of this tree.

At the location in the canton Biel the opening of the hole has to be done by a forester, whereas at the other locations the involvement of foresters or other employees of forest enterprises are facultative. There are several partners for mental support (one-man business) to the relatives, which are provided by Friedwald GmbH on request. There is no contractual agreement. Apart from some undertakers in Germany there are no foreign companies involved in any aspects of the service provided by Friedwald GmbH. The municipal supplier in Zurich, GSZ, directly collaborates with the office for funerals and cemeteries (Bestattungs- und Friedhofsamt), with which the clients directly arrange the funeral which will then be accompanied by GSZ.

(c) Policy framework
Funerals of deceased persons' ashes in forests need no official permission. They are, however, limited to defined forest patches, which have to be granted by the forest office of the respective canton. The crucial criterion is whether such a region has to be defined as graveyard or not. In the latter case, the purpose of the forest patch is alienated according to the federal law about the forest Art. 4. A permission of the forest office is therefore linked to three conditions. Firstly, the forest law (WaG) applies to the concerned forest, secondly, the public has the right of access according to article 699 of the Swiss Federal Civil Code and thirdly, neither gravestones nor plates, candles or flowerpots are allowed in the location where the ashes have been buried.

In most parts of Switzerland, the funeral of the ashes of deceased is not limited to official graveyards, which is regulated by cantonal law. Family members of the deceased often organise the funerals by themselves, which reduces the margin of suppliers of this service. One of the major differences of private funerals to the service provided by Friedwald and GSZ is the protection by law of a chosen family tree for 99 and 30 years, respectively.

Municipalities do not have any regulatory influence on the services provided by Friedwald GmbH or GSZ, since there are no specific laws. There are neither trainings nor courses to train the personnel to support this special kind of forest related service. On an academic level, there is only one semester-thesis in Germany that has treated some aspects of this topic.

(d) Profit appropriation by the landowner/contractor/manufacturer/dealer/seller
Friedwald GmbH and GSZ charge different services: while the former bill the customers for the funeral itself (100-150 euro), GSZ raises a general commission for the fostering of the forest (130 euro). The price for family trees varies widely and ranges at GSZ from 650 euro (residents of the canton of Zurich) to 1'300 euro (clients from outside the canton) and at Friedwald GmbH from 3'200 euro to 5'750 euro (depending on the position of the trees).

Forest owners receive about 33% of the margin of Friedwald GmbH. Another third is administration fees. The last third is mostly reinvested in new locations. Undertakers from Germany receive 5% of the margin of Friedwald GmbH for procuring clients.

In contrast to Friedwald GmbH, which makes profits, the margin of GSZ and the office for funerals and cemeteries (Bestattungs- und Friedhofsamt) just cover the costs. The

margin from the provision of family trees are transferred to the city treasury through the office for funerals and cemeteries (Bestattungs- und Friedhofsamt), while GSZ receives the general commission for the fostering of the forest. The forest patches used by GSZ are the property of the city.

(e) Contractual agreements between landowner and resource manager; networking and joint ventures between non-wood processing and service industries
Friedwald GmbH has made contracts with private and public forest owners, which regulate the share of the profit, the rights and the form of usage.

GSZ, the office for funerals and cemeteries (Bestattungs- und Friedhofsamt) and other involved offices of the city of Zurich have made written statements of cooperation.

Friedwald has a loose network of partners for mental support, which are recommended on request. They do not with a contractual agreement. None of the suppliers has joint-ventures with other companies, but Friedwald has an agent in western Switzerland (French speaking) called “Forêt Dernier Repos”, that works on a commission basis.

Purchased (Friedwald GmbH) or leased (GSZ) family trees are protected by law with a registration in the cadastral register of the respective municipality.

(f) Characteristics of technological or organizational innovation behaviour in non-wood production, processing and service industries
Since the work of both suppliers of this service is based on existing infrastructures, methods and techniques, neither organisational nor technological innovations have been developed.

(g) Territorial marketing (i.e.: integration of the NWFP&S to other services and products offered by the local community)
Friedwald GmbH advertises in local newspapers. In addition, the offices for civic affairs and offices for funerals and cemeteries inform clients about the different forms of funerals, including those in forests.

(h) Lessons learned/driving forces/factors affecting competitiveness (SWOT analysis)
The most crucial strength of this service is its novelty. According to Friedwald GmbH no weaknesses are known. As threats are seen poor co-operation by the municipalities or churches and the cantonal laws that allow people to bury the ashes of their deceased family members on their own. The increasing demand for this service is the most important opportunity.

(i) Open questions (barriers to entrepreneurship) and related research needs
A market survey to identify the actual demand and the needs of potential clients would be helpful in planning further locations.

(j) Recommendations, proposals for documentation

Table 9. Information sources

Name of Institution	URL (http://www.)	Information
Friedwald GmbH	www.friedwald.ch	Contact, information about the company, the locations and services
GrünStadtZürich	www3.stzh.ch/content/internet/gsz/home.html	Information about the service provided, and the locations
Waldesruh	www.waldesruh.ch	Contact, information about the company, the locations and services
Office for cemetery and sepulture of the municipality of Zurch	www.bestattungsamt.stzh.ch	Information about the service provided

Case study 2: Chestnuts

(a) NWFP & S definition, area of production, harvesting level, technical characteristics of production

The chestnut culture as it exists nowadays in Switzerland emerged after the year 1000 A.D. (Conedera 1996) and was the major food source of the mountain population south of the alps (Lurati 1971) that depended on it during four to six months per year. The importance of chestnuts decreased mainly with the introduction of other food items in the 19th century. Today, the chestnut has been rediscovered as traditional, healthy and a biological valuable alternative to conventional food.

There are two different kinds of chestnut with different market values (Conedera 1996): “marroni” and “common” chestnuts. This difference is rather of commercial than of biological nature and can vary from country to country. In southern Switzerland and Italy, marroni are distinguished from common chestnuts as they have easier-to-peel fruits, finer skin and less fruits in their husk.

Chestnuts occur also in Northern Switzerland but the commercial cultivation is mainly concentrated on the Ticino and to a smaller extent on the canton Grisons. In central Switzerland a chestnut culture has emerged in the late 14th century and the production reached a similar importance as in southern Switzerland. It has been revitalised in recent years after the importance of chestnuts decreased substantially over the last 200 years. However, in terms of harvested amounts, the canton Ticino is the main chestnut producer in Switzerland today, and the only region with reliable data on official harvesting data.

In Switzerland 200 tons of chestnuts were produced in 1999 with a share of 0.04% in international production (FAO 2001). The largest portion of collected chestnuts is used for private consumption (Moretti 2004).

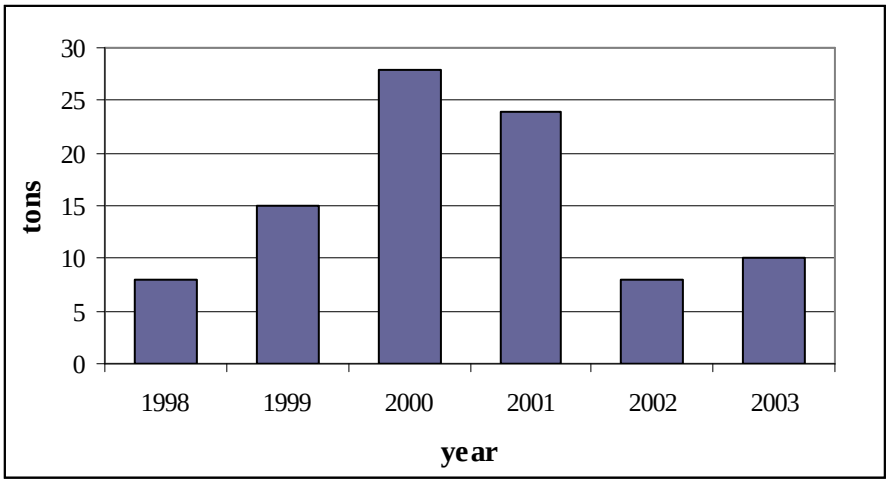

Figure 2. Quantities of chestnuts delivered to the three collection centres in the canton Ticino (Moretti 2004).

To strengthen the chestnut market in the canton Ticino several attempts have been made to establish collection centres. In 1998, three distributors have agreed to do the collection and selling. The amount of chestnuts delivered to and distributed from the three collection centres increased in the first three years from 8 tons to almost 30 tons per year, but fell to the level of 1998 in 2002 again (Moretti 2004) (Figure 2). Since chestnut production is strongly influenced by climatic conditions, heavy fluctuations of the amounts traded are not uncommon. But there might be two other reasons for the decline from 2000 to 2003: first, private parallel markets might have emerged, where the collectors sell their harvest directly to the consumers. Secondly, since the quantities of collected chestnuts do not reach the critical mass to be profitable for the collection centres, they tend to do the obligatory treatment for the elimination of pathogens with less care than private sellers. Therefore, the customer's trust in the collection centres might have declined. The collected fruits have to be treated immediately. In commercial processing classical techniques to kill pathogens and to reduce the metabolism of the chestnuts have been replaced by modern methods such as the cold or warm hydrotherapy. Most of the harvest is done by hand (Conedera *et al.* 2004). The productivity varies considerably (from 5 to 30 kg/h), depending on the size of the fruits and the terrain (Breisch 1993).

(b) Description of the product chain organisation

Because of the low market prices the gathering of chestnuts is not a cost-effective business. Therefore, the commercial harvesting is done by private people such as pensioners and unemployed, who intend to generate an additional income. The use of harvester to increase the efficiency is limited by the properties of the terrain (steep slopes, unevenness, distribution of the chestnut trees, etc.).

The collected chestnuts are either sold directly to the consumers or to one of the three collection centres in the canton Ticino, which sort the chestnuts by size. Chestnuts of lager size are then treated as described above and sold to groceries or directly to consumers. The smaller chestnuts are sold untreated to companies, which make beer, pasta, cookies, jam, etc. out of it. Because of the low quantities, the commerce and manufacturing of chestnuts is in most cases only an additional activity of the involved

companies. One of the biggest buyers of small chestnuts in the canton Ticino is a two-man company called “La Pinca SA”, which manufactures them into chestnut-beer.

Switzerland imports large quantities of chestnuts from Italy, France and Portugal and exports smaller amounts mainly to Germany and Austria (FCA 2004) (Table 10).

Table 10. Foreign commerce of chestnuts in 2003

	Italy		**France**		**Germany**		**Total EU**	
	tons	€	tons	€	tons	€	tons	€
Import	2,296.4	7,789,992	222.3	392,043	1.7	5,508	2,683.3	8,634,414
Export	1.8	5,724	0	0	22.8	46,533	45.3	92,084

Source: (Federal Customs Administration, FCA 2004)

(c) Policy framework

Chestnut orchards are considered as ecological buffer areas and their restoration is therefore subsidised by the cantonal forest office and by the Swiss Landscape Fond (to about 70 to 80% of the costs). The financial contributions to the ecological cultivation are then supplied by the Federal government (Swiss federal office for agriculture via the cantonal agricultural office: 1040 euro per ha and 13 euro per tree). The ecological standards, which have to be met in order to receive financial contributions, are regulated on the cantonal level by laws and regulations. The grant for recultivation of ecological chestnut orchards basically depends on the structure, size, coherence and the form of cultivation, which has to be sustainable.

In accordance with article 699 of the Swiss Federal Civil Code, which regulates the access of forests and pastures, the canton Ticino bans the general public from chestnut collection on orchards by law, to protect the interest of the chestnut orchard managers and owners. In regions where chestnut trees are not managed, the gathering is granted to the public.

The Swiss federal institute for forest, snow and landscape research (WSL) or the forest office of the canton Ticino offer chestnut processing courses to the public. Research on cultivation and processing is done by the agricultural research station (RAC, Station fédérale de recherches agronomiques de Changins) in Cadenazzo and the WSL.

(d) Profit appropriation by the landowner/contractor/ manufacturer/dealer/seller

The market distinguishes four sizes of chestnuts. When sold to a distributor the large-sized fruits (best) fetch with 2 euro/kg the highest yield, whereas small-sized chestnuts can be sold for only 0.5 euro/kg. Direct marketing of large-sized fruits yields on average 3.2 euro/kg. Distributors (collection centres) buy all sizes of chestnuts, separate them and sell those with the best quality for 3.2 euro/kg on average, whereas the smaller fruits are sold without margin to manufacturers.

Since distributive trade with chestnuts is only a side-business of the distributors, the profit is rarely reinvested in the product chain. As the collection of chestnuts is not a profitable business, the margin is generally not invested in the cultivation of chestnut trees.

(e) Contractual agreements between landowner and resource manager; networking and joint ventures between non-wood processing and service industries
Normally, chestnut orchards are managed by their owners. In some cases, cultivation and harvest are done by third parties that have lease contracts with the owners, whereas only a few hectares are managed this way. In either case, the managers have the control over the harvest and can exclude other parties. The public is permitted to gather in regions where there are no cultivated chestnut orchards. There are no networks or joint-ventures between harvesters, managers or collection centres. Contrary to the recent years, collection centres do not guarantee anymore to buy all chestnuts delivered to them, since their sales have been decreasing since 2000 (see Figure 2).

(f) Characteristics of technological or organizational innovation behaviour in non-wood production, processing and service industries
In recent years, there have been hardly any technical or organisational innovations in the field of harvesting and processing of raw chestnuts. In contrast, many methods in the sector of other products have been adapted and are now used for the manufacturing of chestnuts, such as brewing beer or the production of cookies.

(g) Territorial marketing (i.e.: integration of the NWFP&S to other services and products offered by the local community)
The local press is the main channel to advertise chestnuts and their products. In the chestnut season, many articles are written, which inform about their cultivation, the harvest, new companies in this sector and about old and new products. Furthermore, there are two periodicals on chestnuts, one in the canton Ticino (Il Castagno) and one in the German speaking central Switzerland (Chestene Zytig). Many cooking books have taken up chestnut recipes.

(h) Lessons learned/driving forces/factors affecting competitiveness (SWOT analysis)
The cultivation and consumption of chestnuts has a long standing tradition in some regions of Switzerland, such as the cantons Ticino and Grison and some Cantons in central Switzerland, which has a considerable influence on the marketability of this product. Furthermore, the commercial food market has rediscovered it as a healthy and biological valuable product. Chestnuts and their products have become popular again.

The profitability of the chestnut market is rather limited by many different varieties and sizes, which hamper an efficient processing. Missing quality standards and low profitability cause a disregardful treatment of the chestnuts after collection, which reduces the quality of these fruits. In addition, traditional knowledge gets lost or is already missing and the manufacturing of chestnut products is in most cases not very professional. Since the introduction of the three collection centres, the chestnut market got a certain stimulation, which seems to disappear again already.

Chestnuts imported from Italy are generally of better quality than those in Switzerland, for the reasons mentioned above. Since they are sold in different markets, they do not directly threat the Swiss sales, but disappointed consumers may loose their trust in this product. In general, the Swiss chestnut market is dominated by Italian imports, especially in autumn, the peak season, when freshly roasted marroni are sold in the streets.

(i) Open questions (barriers to entrepreneurship) and related research needs
For historical reasons, chestnut breeding resulted in a product quality, which hampers their commercialisation, since many varieties and sizes are mixed. Homogeneous chestnut orchards of varieties with large-sized fruits would improve the profitability. Research on new harvesting techniques and on the special needs of certain varieties would be helpful in increasing the productivity.

4.3 Conclusions: Supporting and limiting factors for enterprise development in non-wood forest products and services production and barriers to entrepreneurship

The economic relevance of NWFP&S is rather limited in Switzerland and forest enterprises rarely trade in these resources. The main factors limiting the competitiveness of Swiss forest enterprises in this field are

- Low harvesting levels of NWFP
- High costs of harvesting and/or treatment
- Low levels of networking with processing industry, tourism, merchants, etc.
- Missing knowledge (know-how and competence)
- Laws and regulations
- Conservative attitude and a lack of innovation.

The entrepreneurship in the forest industry is partly hampered by federal, cantonal and municipal laws and regulations, such as article 699 of the Swiss Federal Civil Code, which permits public access to the forests and the gathering of a variety of forest products. This is mainly relevant in densely populated regions. The cultivation of NWFP is restricted by the Swiss federal forest legislation, in order to maintain the functions of the forests (sustainability). Thus, forest enterprises are faced with restricted usage rights, low harvesting levels and high harvesting costs. The commercialisation of NWFS is limited by the fact that most services are provided by the mere access to the forests (e.g. recreation) and the need for skilled labour to provide additional services, such as education or adventure events, impedes the competitiveness of forest enterprises in this field. A lack of innovation and low levels of networking with industry, tourism, merchants, etc. are relevant factors as well. However, NWFP that are hardly available in urban areas, such as decorative articles (fir cones, chestnut husks, greens, etc.), can seasonally be sold at high prices. But the markets for many NWFP&S are rather small and overhead costs can lead to unprofitable market prices. A major barrier to entrepreneurship is the missing information on potential markets in urban areas. Thus, forest enterprises need incentives to develop new NWFP&S that centre around the needs of the urban population as the core customer potential.

The main problems and research questions for enterprise development in the field of NWFP&S are on the one hand selling conditions, which hinder them from developing and offering well directed NWFP&S, and on the other hand low levels of innovation, know-how or competence to offer profit-yielding products and services (e.g. lacking pedagogic skills required for outdoor education services). Most services, which are provided by forest enterprises to the public, are hardly marketable or unprofitable. Since the economic rate of return from wood sales is decreasing, an increase in collective financial compensation for the provision of these services could become a positive policy achievement.

5. Forests and ownership

5.1. State of the art and historical development

During the Middle Ages the use of mountainous forests was banned, i.e. any use was strictly forbidden and severely punished. In the first half of the 19th century natural calamities became frequent which were widely claimed to be caused by deforestation. This raised political initiatives to promulgate the first Swiss Forest Police Law in 1876 and, among many other restrictions, clear cutting of forests were prohibited. In the Forest Police Law of 1902 more responsibility for the maintenance of the forest was transferred to private forest owners. (Schuler *et al.* 2000) refer to several aspects of historical forest use and the respective change in forest aesthetics over the last centuries. In the 1970s the most important stakeholders in the field of forest- and timber industry participated in forest policy, which reflected the urgent problems of this sector at that time. Major topics were the reduction of forests in urban areas, problems arising from inadequate game animal populations and natural disasters. In the course of the debate about the forest dieback, the promotion of a new federal forest law was launched (Zimmermann 1988), which was implemented on the first January 1993. Important elements of this law are conservation and fostering of forests in the light of sustainability. The future development in the forest sector is inter alia strongly influenced by sector-related political processes.

In order to elaborate instruments and measures to implement key points of the Swiss forest policy, a forest program (WAP-CH) was launched in 2001. Five prioritized aims have been defined by it (SAEFL 2004b): maintenance of the services provided by protection forests, preservation of biodiversity, protection of the natural resources provided by forests (water, soil, etc.), strengthening of the value added chain of wood and increasing the efficiency of forestry.

In the near future, the forestry sector will be confronted with several important challenges: since wood production is not profitable without financial contributions, structural changes have become necessary. The preservation of forest areas, mainly in mountainous areas, is discussed (see Bebi and Baur 2002). Furthermore, the large wood stocks and the therefore increasing amount of large dimensioned timber are very cost-intensive for wood processing companies.

5.2. Forest resources

Almost one third of the Swiss territory is covered with forests. Another third comprises agricultural land, one fifth is unproductive rock area, and 7% is covered with buildings and infrastructure (SFSO and SAEFL 2003). The distribution of the forest area depends on the geographical region (Figure 3). Forests cover about a fourth of the midlands, 41% of the Jurassic Plateau, 33% of the alpine region, and 48% of the southern part of the Alps (WSL and SAEFL 1999).

Source: (SFSO and SAEFL 2003: 9)

Figure 3. Share of forest area in Switzerland

The distribution of the predominant tree species varies between the regions. Norway spruce is the most common species in the entire accessible forest area with a share of 43.1% (47.6% of the total biomass), followed by beech (*Fagus sylvatica L.*) (17.9%/17.1%). Further common tree species are (with decreasing abundance) the silver fir (*Abies alba Mill.*), European larch (*Larix decidua* Mill.), common pine (*Pinus sylvestris* L.), ash (*Fraxinus excelsior* L.), chestnut (*Castanea sativa* Mill.), the oak (*Quercus robur* L. and *Quercus petraea* Liebl.), sycamore maple (*Acer pseudoplatanus* L.) and the Swiss stone pine (*Pinus cembra* L.) (Brändli 1996; WSL and SAEFL 1999). Coniferous forests are most frequent, followed by mixed forests (Table 11). They constitute the main portion of the growing stock of Switzerland's forests (Table 12).

Table 11. Forest area

Land categories	**Area (1000 ha)**
Land area	4128.4
Forest and other wooden land	1234
Forest	1173
Predomi-nantly coniferous forest	522
Predomi-nately broadleaved forest	221
Mixed forest	383
Share of forest in total land area	31%
Forest available for wood supply	92.4%

Source: (WSL and SAEFL 1999)

The dominant forest type is the high forest with a share of 80%. 85% of the trees are even-aged. Coppice with standards and coppice forests make up only 2% in each area. Wooded pastures and the few orchards (mainly chestnut or walnut), but also non-overgrown surfaces such as forest roads and timber yards are counted as forest area.

Table 12. Growing stock

Forest not available for wood supply	For economic reasons	0%
	For conservation/ protection reasons	0%
Mean net annual increment	Forest	9.2 m^3/a/year
Growing stock	Other wooded land and trees outside forest	?
	Broadleaved forest	116,059 thousand m^3
	Coniferous forest	287,448 thousand m^3
	Total forest	403,507 thousand m^3

Source: (WSL and SAEFL 1999)

On average 2.5 million tree saplings per year were provided for afforestation during the last 5 years (SFSO and SAEFL 2003). The forestry sector mainly sets on artificial regeneration. Therefore, plantations on large areas usually are not necessary, except in certain cases, such as storm loss areas.

With regard to the midlands, there are limiting factors for forest development apart from economic considerations. Swiss forests have a high amount of standing tree stock and even with an increased usage, Swiss forestry would still be in accord with the criteria of sustainability.

5.3. Forest ownership

Less than a third of the Swiss forests are private property. The average forest area per owner is 1.35 ha (SFSO and SAEFL 2003). Over two thirds of the forest area is publicly owned. Out of these, almost half belongs to public municipalities (see Table 13). The portion of public forest varies between the cantons and ranges from about one fourth to almost 90%.

Table 13. Forest ownership

Property categories		**[%]**
Public forest	Public municipalities (Bürgergemeinde)	32.9
	Political municipalities (politische Gemeinde)	21.3
	Corporations (Korporationen)	8.0
	Cantons (Kantone)	4.8
	Confederation	0.8
	Total public forest	93
Private forest	Privately-owned forest	28.8
	Companies	3.4
	Total private forest	43
Total		100

Source: (WSL and SAEFL 1999: 44)

The highest portion of private owners is to be found in the plains and the pre-Alps. Their approximate number in Switzerland is about 250,000 with an average property size of 1.3 ha (Table 14). Only 3.4% of the total forest area is owned by private companies, and no information about their land tenure is available.

Table 14. Forest holdings (SFSO and SAEFL 2003)

	Public ownership	**Private ownership**
Area of holdings of forest and other wooded land (1000 ha)	878	326
Number of holdings (number)	3503	257700
Average size of holdings (ha)	250.6	1.3

The size of public holdings ranges from less than 10 ha to 100,000 ha with an average size of 250 ha (Table 15).
Article 699 of the Swiss Federal Civil Code grants the right of access to pasture and forest to the general public. This regulation is supported by the Swiss Federal Forest Law (art. 14) which states that walking, running, horse riding (in most cases), as well as picking berries, mushrooms and collecting dead wood are permitted in public and private forests (Jenni 1993). In case of negative consequences for the forest owners, measures can be taken. Big events within forests need a special permit and motor vehicle traffic inside forests is, with certain exemptions, generally banned.

Table 15. Number of holdings in public ownership

Number of holdings in public ownership in size classes	**%**
<10 ha	4.9
11-20 ha	9.7
21-50 ha	16.9
51-100 ha	15.4
101-500 ha	32.3
501-10,000 ha	7.1
10,001-100,000 ha	3.8

Non-wood forest product usages such as the use of grass and litter and forest grazing which may have negative effects on the forest are prohibited (art. 16 Federal Forest Law). This restriction may be mitigated by a demarcation of forest grazing grounds were grazing is allowed. Recreation facilities, such as fire places, sports and education trails are legally regarded a disadvantage to the forest (Jenni 1993), but can be sanctioned with certain injunctions by the Cantons.

The collection of wild-growing berries, mushrooms, herbs etc. for private consumption is allowed in reasonable quantities (art. 699 Federal Civil Code), provided these are not protected species (arts. 19, 20 Federal Law on the Protection of Nature and Cultural Heritage). The collection for sale requires sanctioning by the respective Cantonal authority (art. 19 Federal Law on the Protection of Nature and Cultural Heritage). There are Cantonal rules and regulations for hunting and all hunters have to have a hunting license. Due to the vast amount of private forest smallholders, there is only small scale forest management and for economic reasons there is only occasional forest tending and wood harvesting. Public forest enterprises are not in a position to cover their costs because of low wood prices. A planned major sawmill of the Austrian company Josef Kogler GmbH, which may possibly be built at the end of 2005, having a capacity to process about 1 million m^3 of wood per year, would have an influence on the whole trading area of this sawmill (Hofer 2001). The forest owners would be committed to sell their wood for a relatively low and fixed price to this mill.

5.4. Main problems and research questions in forest resources and ownership for enterprise development in the forest sector

The following main problems and research questions have to be tackled in future:

- What motivation do forest enterprises have to embark on **new products and services?**
- What are the perceived **import and export potentials** of Swiss forest enterprises after the enlargement of the European Union with new and more wood and timber supplying countries?
- **How can the external costs** for the provision of recreation amenities, health and wellbeing which are burdening Swiss forest enterprises **be internalized** in a sustainable way?
- What potentials are there to motivate small and medium forest enterprises to cooperate and possibly merge to **larger and economically more efficient units**?

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