



**SEMINAR ON ENVIRONMENTAL SERVICES AND
FINANCING FOR THE PROTECTION AND SUSTAINABLE USE OF ECOSYSTEMS
Geneva, 10-11 October 2005**

**NATIONAL REPORT OF SWITZERLAND
ON ENVIRONMENTAL SERVICES AND FINANCING
FOR THE PROTECTION
AND SUSTAINABLE USE OF WATER-RELATED ECOSYSTEMS**

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1. Introduction

In the Federal Constitution of the Swiss Confederation, according to Article 76 on water, the Confederation shall ensure the moderate use and the protection of water resources, and fight harm caused by water. It shall establish principles on the preservation and use of water reserves, on the use of water for the production of energy and for cooling purposes, and on other interventions into the water cycle. It shall legislate on water protection, on securing sufficient residual water, on hydraulic engineering, on the safety of dams and on interventions to influence precipitation.

The objectives for water set by the Federal Constitution of the Swiss Confederation are implemented through legislation and, among others, by economic incentives such as payments for ecosystem services. These payments focus on several sectors, such as forestry, agriculture, hydropower with the view to encourage the protection and sustainable use of aquatic and water-related ecosystems towards an integrated water resources management.

Payments for ecosystem services address both water quality and quantity. All the payments depend on the availability of federal and cantonal funds, pending their approval by their respective parliaments. The system of payments for ecosystem services is assessed on an on-going basis in Switzerland. It is improved through an iterative process.

2. Forestry

According to the Federal Constitution of the Swiss Confederation (art. 77), the Confederation shall ensure that forests may fulfil their protective, economic and social functions. It shall encourage measures for the conservation of forests.

Given that forests represent 31% of the Swiss territory, they are important as a habitat for fauna and flora and as a source of renewable resource with timber. Forests play a key role in terms of climate, drinking water, risk minimization, in particular with respect to protection of settlements, roads, railways against natural hazards.

The Federal Law on Forests has the objective, among others, the protection of forests as a natural environment, to guarantee that forests can fulfil their functions notably their protective, social and

economic functions (Art. 1). It must contribute to the protection of the population and of goods of a certain value against avalanches, landslides, erosion and rockfalls (Art. 2). It includes economic incentives that are given by the federal State on the condition cantons co-finance. The incentives are payments for the performance of tasks required by law or financial assistance in view of certain measures in connection with the Federal Law on Forests.

The federal economic incentives for prevention of natural hazards through protective forests and the restoration of damages to protective forests, including measures for fire protection, diseases and pollutants, cover on an average basis about 48% of the total costs of the measures.

Today, the revenue from timber sales can no longer cover the forest management measures that are necessary to fulfil its multiple functions, including the provision of clean water. Economic incentives from the State are therefore used to partly cover these costs. This means that the Swiss citizens pay for these services through their federal, cantonal and communal taxes. The Swiss Society of the Gas and Water industry (all members being public entities with one exception) prefers to cooperate closely with the forest sector in the form of local or regional partnerships which supports a forest management geared towards an optimal water quality rather than increase the price of water for the users. There are already some examples where forest management is supported by water boards (Annex 1: Examples of cooperation between forest services and water boards

A Swiss National Forest Programme for 2004-2015¹ has been developed. Its main objective is to guarantee sustainable forest management. Some of its priorities are: "The services of the protective forest are guaranteed"; "Biodiversity is conserved"; "Forest soils, trees and drinking water are not at risk" (forests soils, trees and drinking water are not at risk from the input of contaminating substances, inadequate management and the corresponding physical factors). Indeed, around 40% of the water in Swiss taps (400 million m³ per year) comes from forest areas and can be piped directly in the supply network without any need for treatment.

In Switzerland, forests are part of the landscape and of the traditions. Their access is rather unlimited, guaranteed by a general public right of access, thanks to the high quality of topographic maps and to good roads and walking ways. In 1991, the Swiss population was asked about their social preferences about forests and forestry: forests were seen primarily as a space for nature and recreation. Forest services were assessed for their monetary value for the protection against natural hazards (1.6 - 2 billion €) and for recreation (6.5 billion € assessed through a public inquiry).

The implementation of the Swiss National Forest Programme for 2004-2015 and of the planned partial revision of the existing Federal Law on Forests will aim now and in the future at securing the services provided by the forest that serve the common good, and at creating an efficient forest sector with a strong value-added chain. The definition of an ecological standard for forest is being drafted and should be enshrined in the law, defining with criteria the "close to nature forests". In the future, the Swiss Confederation's economic incentives in the forest policy will take the form of target-oriented programme agreements between the Confederation and the Cantons (including co-funding), i. e. creating a new kind of partnership between the Confederation, cantons and forest owners. These agreements, lasting a few years, will link quantified contractual objectives with global budgets and a monitoring system. The incentives will therefore be based on the results of measures rather than their costs. The cantons will have a greater responsibility but will also gain a greater scope of action.

¹ http://www.environment.switzerland.ch/buwal/eng/fachgebiete/fg_wald/rubrik3/uebersicht/projekt_wap/index.html

3. Agriculture

In the article 104, of the Federal Constitution of the Swiss Confederation, agriculture contributes substantially by way of a sustainable and market-oriented production among others, to the conservation of natural resources and the upkeep of rural scenery; the Confederation shall conceive the measures in such a way that agriculture may fulfil its multiple functions by complementing agricultural revenues by direct payments, to secure a fair and adequate remuneration for the services rendered, provided that compliance with ecological requirements is proven. It shall promote, by way of economic incentives, forms of production which are particularly close to nature and friendly to the environment and the animals. It shall protect the environment against pollution due to excessive use of fertilizers, chemicals and other auxiliary substances.

The Article 104 clearly defines the Swiss agriculture as being a key for sustainable development through multifunctionality, i.e. for food production but also a large range of non-commodity outputs such as the maintenance of rural employment and cultural heritage, biological diversity, recreation and tourism, soil and water quality², bioenergy, landscape and animal welfare.

In Switzerland, the share of the land to agriculture is 40%. Until the early 1990s, the agriculture policy was merely driven by product subsidies (price support, trade barriers, quantitative restrictions on outputs, subsidies to inputs, etc.), before it started to change towards direct payments. Since the Second World War, the agriculture intensified, thanks to technological progress, production linked subsidies, a wide use of pesticides and fertilizers. Transformation of the land use for agriculture drove to the drainage of wetlands, the regression of dry meadows, the destruction of hedges. Roads, settlements were built and further land disappeared. In addition, apart of public access to agricultural land and common-property regimes for pasture land Switzerland has far-reaching private rights to agricultural land. Farms were managed in the past only taking into account the farmers' private objectives and their unrestricted use of their lands. Nature protection was mostly confined in nature reserves. Reports such as those on the loss of biodiversity of butterflies triggered the awareness of the public. Further inventories on fauna and flora species showed the vulnerability of the resource base. Farmers started to be perceived by the public as the polluters and destroyers of natural ecosystems.

In 1986, a rejected bill to support domestic sugar production by a popular vote was a turning point towards modern farming internalizing the care of the environment. In 1987, a popular vote drove to the adoption of a new constitution article on the strict protection of wetlands which was followed by adequate regulations for their protection. The Parliament was influenced by the environmental and consumers non government organizations that wanted to tie agriculture production to sufficient public ecological benefits (direct income payments tied to basic ecological management requirements). In 1996, the article 104 of the Swiss Constitution, which asks for a multifunctional and environmentally sustainable agriculture, was adopted by a wide majority of the voters (77.6%), after a previous article was failed for not encompassing enough ecological services³.

Thus, it was made possible by the representative democracy of Switzerland as fundamental decisions on financial incentives for ecological services of farming were made by direct popular decision (referendum). The preferences of the public can be seen by the voting outcomes and showed the population willingness to pay for ecological services. The new Federal Law on Agriculture in 1998 answering to the concerns of the population developed into a proper agri-environmental policy towards more open markets while implementing a system of environmental

² In Switzerland, precipitation generates drinking water to the value of €3,200-4,500 per hectare of agricultural land.

³ See Managing the farm and the landscape: <http://www.umwelt-schweiz.ch/imperia/md/content/buwalcontent/umweltbericht2002/e/17.pdf>

incentives. In 2000, the willingness to pay for the total of agri.-environmental measures (biodiversity and other environmental goals) amounted to €200 - per inhabitant in Switzerland⁴.

The decade of transition towards a modern and sustainable agricultural policy saw the abolition of state guarantees for prices and sales, the reduction of expenditure for market support by one third along with the stabilization in federal funding for agriculture and food, plus the introduction of proof of ecological performance for entitlements to direct payments (cross-compliance). The Swiss agriculture is based on the concept of decoupling of the income and price policies while increasing payments with eco-conditionalities.

Two main agri-environmental tools i.e. payments for ecosystem services are used in agriculture⁵:

- general direct payments
- direct ecological payments

According to the Federal Law on Agriculture and its ordinance on Direct Payments, general public services are compensated through general direct payments based on the surface area and for roughage consuming livestock units. Additional payments are made for hillside farming, also based on surface area and livestock units.

To be eligible for any direct payments, Swiss farmers must respect the required ecological services (proof of ecological performance/cross-compliance, certified by a control organization authorized by the canton) consisting among others, of the respect of the environmental legislation, specific soil protection measures (crop rotation, soil cover in winter), an appropriate use of plant treatment agents, well-adjusted fertilizer balance and animal-friendly livestock husbandry and an appropriate share in ecological compensation areas (7%).

Ecological compensations are measures that will protect and restore ecosystems close to their natural state, in the middle of intensively cultivated landscapes achieving a sustainable soil management (decreasing nitrate and phosphorus), promoting species diversity, strengthening nature within settlements and vivifying the landscape. The catalogue of ecological compensation areas encompasses semi-natural habitats such as extensively cultivated meadows and pastures, hedges and field wood, with buffer zones, solitary standing trees, traditional orchards, compensation areas in arable land, ponds, stonewalls, etc. In those ecosystems, no fertilizers or controlled manure quantities and no pesticides are allowed. Grass is mown at specific times allowing flowers to turn into seeds. For wooded river banks and hedges, a grass zone of 3 m must be established. The compensation per year/ha can be between € 1000.- (zone of intensive cultivation) and € 300.- (mountains). Payments occur on a yearly basis. The farmers announce their measures to the cantons authorities which subsequently ask for federal funding. There are no contracts. The farms are listed centrally and get their funding through the canton. 90% of farms produce under this regime.

⁴ OECD (2002). Direct payments for biodiversity provided by Swiss farmers: an economic interpretation of direct democratic decision. Case study: Switzerland. ENV/EPOC/GEEI/BIO(2001)9/FINAL
[http://www.oilis.oecd.org/olis/2001doc.nsf/43bb6130e5e86e5fc12569fa005d004c/3cd3160741559559c1256b610047ecde/\\$FILE/JT00120910.PDF](http://www.oilis.oecd.org/olis/2001doc.nsf/43bb6130e5e86e5fc12569fa005d004c/3cd3160741559559c1256b610047ecde/$FILE/JT00120910.PDF)

⁵ Annex 2: Graphs from the Source: Federal Office for Agriculture - Agricultural report 2004 On the increasing amount of proof for ecological performance and of ecological compensations areas between 1993 and 2003

In addition, on a voluntary basis, farmers can receive further funding, for special ecological performances that go further than the proof for ecological performance, i.e. direct ecological payments for production modes that respect the nature and the environment, including organic farming (10 % of farms in Switzerland). It is assessed that 10% of the agricultural surface of Switzerland is under this regime, representing also 6% of the total agricultural budget of the State.

In 2001, additional payments for ecological services are given on a voluntary basis according to the new Ordinance on the Regional Promotion of Quality and Interlinking of the Ecological Compensation Areas (zonal-agri-environmental schemes). In order to increase the quality of the ecosystem services, the promotion of the interlinking of ecological compensation areas was deemed necessary. Funding is given for 6 years. Only between 10 to 20% of the farmers adopted this new measure. It needs to contract a biologist that will help build this network of habitats and to have a partnership of some 20 farmers to develop such a network. It remains quite expensive. A 20% co-financing from the canton is necessary to get federal funding.

The impacts of the payments for ecosystem services are monitored through a set of agri-environmental indicators. The results are reported in the yearly agricultural reports. Since general and ecological direct payments were introduced in 1993, ecological performance of agriculture improved dramatically. The use of fertilizers (nitrates and phosphates) fell steadily until 1998. Since then it has stagnated. Phosphates and ammonia in cattle breeding areas still need to be reduced with regional measures.

Further payments for ecosystem services had to be introduced to address nitrates hot spots. As intensive farming, not adapted to the local conditions, was the main cause of groundwater nitrate pollution, further measures (such as voluntary programmes promoting extensification, integrated production with fewer pesticides and fertilizers and organic farming) had to be taken in addition to a strong legislation on water protection and agriculture, and this in addition to the existing above-mentioned payments for ecosystem services. It was made possible by the adoption of the Article 62a of the Federal Law on Water Protection “on measures taken by the agriculture”: The federal State allocates financial incentives for measures in agriculture against run-off and leaching of substances (such as phosphates, nitrates etc.) when this is necessary for the required quality of surface and groundwater, when the canton has delimited the areas in which they should be implemented and when these measures are not bearable economically. This article introduces for the first time the notion of catchment.

The objective is to decrease the nitrate leaking in the groundwater recharge area (or more precisely the area where most - about 90 % - of groundwater extracted at drinking water wells originates) so that water would not contain more than 25 mg NO₃/l. The Federal State fixed the conditions for compensation, while the Cantons apply the relevant measures (contracts with farmers, payments and control/evaluation).

Measures to prevent groundwater pollution include the promotion of extensification and financial compensation. Both the Federal Law on the Protection of Water and the Federal Law on Agriculture were amended, allowing farmers to be compensated for up to 80% of the extra costs (within the credits voted by Parliament to that end) incurred by them when taking preventive measures, which go beyond good agricultural practice (extensification), to guarantee the quality of surface water and groundwater.

Compensation, up to 85% of the extra costs for preventive measures can be given in case of restrictions of exploitation, in case of new/required investments or disinvestments, including income reduction due to the change of practice. The region (commune, canton, association of farmers) must co-finance. Financial support is allocated by a contract and a one-time payment per

year during a maximum of 6 years, after which the farm is evaluated and required follow-up activities/funding are examined. Different amounts will be paid: between € 130.- per hectare and year for measures in arable land and up to €520.- for keeping or enhancing the meadows surface. It is known that the conversion of arable land to meadow can lower the nitrate leaching by 60% (from 50 to 20 kg per hectare and year). To re-enroll farmers into such a scheme, the Swiss Agency for the Environment, Forests and Landscape, the Federal Office of Agriculture and the Federal Office for Public Health carried out an information campaign called “ActionN” from 2002 to 2004. In addition to contacting all institutions, holding farmers’ lobbies, organizing meetings and issuing a newsletter, a website was created (www.nitrat.ch_englisch/frameset_e.html). At present, some 18 regional projects are under way for a total of 3,000 hectares. Such projects could be recommended for a total of 50,000 hectares. More projects are in preparation.

In addition to the Federal Law on Agriculture, through the Federal Law on the Protection of Nature and Cultural Heritage, the Confederation can support financially up to 45% the protection and the maintenance of nature and landscape, biotopes of national, regional importance, protection of species, given that cantons co-finance. These ecological compensations are not restricted only to agricultural surfaces unlike those under the Federal Law on Agriculture. Some ecosystem can even be in urban areas. Landowners and land users are entitled to appropriate compensation if they reduce their former land utilization or perform a service without the corresponding financial yield. Agreements between the landowners/land users are passed with the cantonal authorities and implemented through appropriate agricultural and forestry land use. The protection of wetlands such as fenlands and raised bogs, ecosystems of national importance can even be financed up to 75% by federal funding.

Further payments for ecosystem services are made for the restoration of rivers for ecology and flood control. Since 1999, river and stream morphology have been recorded in many parts of Switzerland, identifying any eco-morphological deficiencies, to establish priorities for restoring rivers, and to carry out monitoring. The restoration of a part of the 12'000 km of Swiss rivers and streams to their natural state, reversing artificial corrections that have been carried out in the past for flood protection is underway, to provide more room for flood plains or to reinstate previous ones, thus improving ecological status of the waterways and preventing damage from flooding. The cantons are obliged to designate and establish the necessary amount of land for rivers and streams, to ensure that they can function naturally (width of the river corridor, i.e. river banks and the strips beside the river). These areas must be reserved in the cantonal spatial plans. The federal government makes financial resources available through the Federal Law on Agriculture, the Federal Law on the Protection of Nature and Cultural Heritage as well as through the Federal Law and Ordinance on Flood Protection. These last pieces of legislation have for objective the protection of persons and goods of a certain value from damages by surface water such as floods and erosion. It designates the cantons as the responsible authorities for its implementation. Under the condition of cantonal co-financing, payments for ecosystem services for ecological restoration of watercourses are given through federal funds to the cantons. The “Rhine 2020” program contributes to restoring the natural state of the upper reaches of the Rhine. The “Third Correction of the Rhone” project makes an important contribution to restoring the natural state of that river. Both projects are being financed by the Federal and cantonal levels.

In conclusion, the agricultural policy of Switzerland is composed by a mix of measures through the implementation of an extensive legislation: to weaken the support of agricultural production without impacting on the livelihood of farmers, to avoid the impacts of agricultural production on the environment, and to raise the number of extensively managed plots and “ecological compensation areas”. As most farms receive direct payments, and as the condition for that is to make proof of ecological performance, most Swiss farms are increasingly providing public services.

The future of the Swiss agricultural policy is now discussed among all concerned sector as the documentation for the new Agricultural Policy 2011 has been sent for their consultation. The reform is being pursued with the decrease of subsidies, such as those supporting prices and lowering customs rights for animal feed, towards an increase of the direct payments not linked to production but linked to environmental services. This will enable to tackle the problem of exceeding nitrates and will increase the compensations areas in the plain areas.

4. Hydropower

Switzerland relies on hydropower for 60 % of its electricity. As written down in the Federal Constitution of the Swiss Confederation (see Introduction), the residual water flows of rivers downstream from dams shall be increased to a minimal discharge that still ensures the sustainability of aquatic and water-related ecosystems. The Federal Law on Water Protection introduced a regulation at two levels: the law sets minimum water flows and the cantons may set higher minimum flows after weighing up the economic and ecological interests on a case-by-case basis.

However, concessions granted before 1991 for periods of up to 80 years only have to be rehabilitated ecologically if the measures are economically bearable for the concessionary, without a subsidy. In the case of a watercourse, passing through a dam, flowing thereafter through landscapes or biotopes included in a federal or cantonal inventory (according to the Federal Law on the Protection of Nature and Cultural Heritage) , or for reasons of public interest, the concessionary (canton, commune, etc.) can be compensated by federal and cantonal funding if it decreases its energy production by letting more water to the river, provisioning thereby a higher residual water flow. Since cantons have to co-finance, and given their actual difficult financial situations, only 2 projects of that kind are on their way.

All hydropower concessionaries pay a tax into a Federal Trust fund which is used to compensate cantons that protect areas, by renouncing to exploit the potential hydropower of their region if these sites are of national importance according to the Federal Law on the Protection of Nature and Cultural Heritage. The compensation, regulated by the Ordinance on the Compensation of Losses through the Non Use of Hydropower, is settled through a public contract, extends over 40 years, and is paid annually.

5. Conclusion

The payments for ecosystem services were introduced in Switzerland with the view to achieve an overall better and more efficient environmental protection after the inventories of species (butterflies, meadows diversity) from research and non governmental organisations (NGOs) as well as the monitoring of water quality by public authorities showed degrading conditions.

The growing awareness of the population on the state of the environment encouraged such an approach. In addition, in 1977, through the adoption of popular initiative for the wetlands of Rothenthurm, the Swiss population refused to have an exercise army territory built on the wetland, thus introducing a new article in the Swiss Federal Constitution for the protection of wetlands of national importance.

The implementation of payments for ecosystem services also allowed a quicker recovery of some ecosystems that were previously seriously impacted. Up to now, the ecosystem services were not looked on an individual basis, with the exception of the nitrates hot spots usually based on a groundwater basin. It is the general state of the environment that has been considered. Some payments are based on livelihood acquirement (opportunity costs): i.e. land owners have to restrict their use of their own land through different management practice, this induces a loss of revenue which is compensated by the payments for ecosystem services. The payments for results rather than

for technical practices are beginning to be introduced. Such a system of payments has also been made possible through the coordination between the federal and cantonal levels and within cantons.

The Swiss citizens have showed their willingness to pay. The information on economic incentives has been widely distributed by the different public authorities, the professional associations (forestry-agriculture-hydropower) and through the NGOs.

Nevertheless, the whole system of payments relies on the health of the federal and cantonal finances, which are regularly adopted by the federal and cantonal parliaments. This means that the funding basis might not be secured at the same level for every cycle of decision. It would be therefore important for Switzerland to develop further the valuation of the services of its ecosystems. By raising the awareness, this could help securing the payments for ecosystem services on longer term basis.

Annex 1

Examples of cooperation between forest services and water boards

The Winterthur city forest:

The commune of Winterthur is covered by 39% of forests of which 25 % (19 km²) belong to the city and are managed by the forest service of the City along the criteria of the Forest Stewardship Council. The city of Winterthur extracts yearly about 10 million m³ of groundwater to serve some 90'000 inhabitants (60'000 households). Eight of the 9 groundwater extraction points are located in the City's forests. A protection zone of 1 km² is managed in order to obtain groundwater of high quality which does not need any treatment before being distributed in the water supply network (no clear-cuts, selective forest management, natural regeneration, if possible under the umbrella of older trees). The stands are transformed from mixtures with a high amount of coniferous species to more or less pure broadleaved forests. Timber harvesting must be accompanied by additional measures, such as restriction of circulation of forestry engines on forest roads and extraction tracks. Biodegradable lubricants for chain saws and hydraulic oil are compulsory, and their storage and handling are restricted to certain areas. Alluvial forests and river beds in the forests have been restored so as to protect the city from floods and erosion. This is expensive and is not covered by the benefits from timber sales. It is financed under a different budget line called "Nature, landscape and water protection". The inhabitants' taxes are covering the expenses. Inhabitants are given wide information on the multifunctional role of forests through an excellent website. The forests management costs about €15.-/year/inhabitant.

The Lausanne city forest:

Lausanne city owns some 16 km² of forests that provide about 8% of its drinking water. As in other locations, the timber sales of the forests do not cover the management expenses. The forests management costs about € 15.-/year/inhabitant. To cover these costs, a communal fund for sustainable development was established in 2001 with an initial fund of CHF 5 million with further funding coming from 0.1 cents per kWh sold on the electricity network, 0.035 cents per kWh from the benefits of gas sales and 0.7 cents per m³ of water as well as 1% of annual benefits the industrial services of the city, without increasing the bills for the consumers. Only a certain amount of the fund is used to promote and manage the forest. The rest of the costs are covered by subsidies and inhabitants' taxes. Both forest and water supply services work very closely together.

Annex 2

Graphs from the Source: Federal Office for Agriculture - Agricultural report 2004

On the increasing amount of proof for ecological performance and of ecological compensations areas between 1993 and 2003

