

## CHAPTER 12. EVALUATION OF AGRI-ENVIRONMENTAL MEASURES IN SWITZERLAND

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### **Abstract**

*In 1994, Switzerland launched an extensive evaluation of agri-environmental measures that will be completed in 2005. Over time, various scientific studies commenced to analyse the effects of these measures on biodiversity; nitrogen, phosphorus and pesticide use; and the farm economic situation. A system of agri-environmental indicators is being established. Every four years, Switzerland decides on important modifications in agricultural policy. The various projects have to be finished and exploited in such a way that they can be used in the next round of agricultural policy modification.*

### **Agri-environmental policy development, measures and objectives**

According to the Swiss constitution, agriculture has to contribute substantially by way of a sustainable and market-oriented production to the secure provisioning of the population, to a decentralised inhabitation of the country, and to the conservation of natural resources and the upkeep of rural scenery. The emphasis of Swiss agricultural policy on the environment began in the early 1990s (Table 1).

The most important measures to promote an environmentally friendly agriculture in Switzerland are the proof of ecological performance (cross-compliance) and ecological payments (RS 910.13). The proof of ecological performance is a precondition for all direct payments. The specific objectives, measurement and target goals for agri-environmental policy in Switzerland are set out in Table 2.

The cross-compliance conditions focus on the protection of animals, water, nature and environment:

- Balanced use of nutrients.
- Required share of semi-natural habitats.
- Crop rotation.
- Soil protection measures.
- Selected and risk-guided use of plant protection substances.

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1. Federal Office for Agriculture, Switzerland.

**Table 1. Agri-environmental policy development in Switzerland**

1992	The federal parliament adopted the revision of the Federal Law on Agriculture, introducing a legal basis for substantially increasing direct payments not linked to production, and leading to a clear separation between policy on prices and on incomes.
1993	Introduction of direct payments for certain types of ecological compensation.
1994	Start of the evaluation process.
1996	The Swiss electorate accepts a new article at the constitutional level, expressing its willingness to support agriculture by means of direct payments, provided that specific ecological practices are applied.
1998	The Law on Agriculture is completely revised.
1999	All direct payments are bound to the proof of ecological performance (cross-compliance).
2001	A new programme allows compensations for areas, which fulfil the conditions for special ecological quality and for projects, which link semi-natural habitats.
2002	Agri-environmental goals are set for the year 2005.
2004-2006	The agricultural policy for the period 2008-11 is worked out in several steps: (a) Proposal of the Federal Office for Agriculture, (b) consultation of other offices of the federal administration, (c) consultation of interested organisations, (d) elaboration of the final proposal, (e) decision in the parliament.

**Table 2. Agri-environmental objectives for Swiss agriculture**

Issue	Measurement	Base	Goal 2005
Agricultural process: ecological compatibility	N balance	96 000 tonnes N (1994)	74 000 tonnes N (23% reduction)
	P balance	20 000 tonnes P (1990/92)	10 000 tonnes P (50% reduction)
Agricultural practice	Pesticides	2 200 tonnes active ingredient (1990/92)	1 500 tonnes active ingredient (32% reduction)
Effects of agriculture on the environment	Ammonia	53 500 tonnes N (1990)	Reduction of 9 %
	Biodiversity	1 080 000 ha agricultural area (1990/92)	10% set as ecological compensation areas, including 65 000 ha in the valley region.
	Nitrate		90% of catchments for drinking water with agricultural used watershed below 40 mg/l.
Behaviour of farmers	Use of the agricultural area	1 080 000 ha agricultural area (1990/92)	98% of the area used according to the proof of ecological compliance or organic farming

Ecological payments exist for the following ecological performances:

- Extensively used meadows
- Meadow used with low intensity
- Litter meadows
- Hedges, bushes and undergrowth
- Mixed and rotational fallow land
- Arable crop preservation strips
- High-stem fruit trees
- Areas with special ecological quality
- Linking of semi-natural habitats.

In addition to these ecological payments, payments for enhancing animal welfare are also provided:

- Special animal-friendly housing systems
- Regular access to outdoor runs.

## **Evaluation process**

The evaluation process started in 1994 at a time where important changes in agricultural policy were going on. During the nineties, a comprehensive evaluation plan was developed. Several research institutes started about 40 scientific projects in the following areas: biodiversity, nitrogen, phosphorus, pesticides and animal welfare. For each area, projects are analysing farmer participation in the measures, selective analysis of the impacts, and analysis of sectoral developments. An additional project examined the efficiency of the measures.

As part of the evaluation process, a system of agri-environmental indicators is being developed (Table 3). In addition, to facilitate the synthesis of the different results, the project “*Greifensee*” was started (FOA, 2004) which incorporated the results of the various disciplines in an economic model for the region Greifensee.

In 2003, the original date for completion of the evaluation, questions had to be answered which were not part of the evaluation’s design, *e.g.* Are the agri-environmental goals being met? Are the agri-environmental measures, including the ones started after 1994, effective and efficient? It was a challenge to exploit the existing data to answer these questions.

The solution was found in adopting the method of policy evaluation, which had undergone substantial development in the past years. In 1987, a national research programme started with the goal to improve the methodology for the evaluation of the effects of public policy. The research programme, with 20 scientific projects, was completed 1997 (Bussmann, *et al.*, 1997). This was one based on an external expert, who developed the instructions for the completion of the evaluation. She developed a questionnaire based on a model of impacts, of the policy cycle and the analysis of policy programmes. These questions will be answered drawing on the results of the forty-odd research

projects, as well as the knowledge of the involved specialists. Certain gaps will remain, mainly concerning the programmes introduced since 1999 and the cause-effect chain of the measures.

**Table 3. Agri-environmental indicators**

Issues	Driving forces: Farming practices	Effects on the environment: Agricultural processes	State of the environment
Nitrogen	N balance in agriculture (1)	Potential nitrogen loss (emission of nitrates, ammonia, nitrous oxide) (2a)	Level of nitrates of agricultural origin in underground water (3)
		Emission of ammonia (2b)	
Phosphorus	P balance in agriculture (4)	Level of phosphorus in the soil (5)	Level of phosphorus of agricultural origin in lakes (6)
Energy / climate	Energy consumption in agriculture (7)	Energy efficiency (8a)	Not feasible
		Emission of greenhouse gases (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O) (8b)	
Water	Use of pesticides (9a)	Risk of environmental toxicity in water (10)	Level of pesticides in underground water (11a)
	Use of veterinary medicines (9b)		Veterinary medication: still open (11b)
Soils	Still open (12)	Risk of erosion (13)	State of the soil: still open (14)
Biodiversity / landscape	Ecological compensation area (incl. Quality) <sup>1</sup> (15)	Potential impact of farming on biodiversity (16)	Diversity of wild species (17a)
			Diversity of habitats and landscape: still open (17b)

**Key:** Principal indicators representing sustainability in agriculture

*Note:*

1. Indicators of sustainability of biodiversity: 15 or 16. Final selection will be made when indicator 16 has been further developed.

## Results

Although the evaluation process is not yet completed, with the final report now expected in autumn 2005, there are number of intermediate results that can be reported.

### *Participation in the agri-environmental and animal welfare measures*

Farmer participation in agri-environmental and animal welfare measures has grown constantly since they began to be introduced in the early 1990s (Table 4).

**Table 4. Participation in agri-environmental and animal welfare measures**

Measure	Area, trees, animals in 2002	% of agricultural used area/livestock units
Proof of ecological compliance	1 034 470 ha	97 %
Extensively used meadows	46 071 ha	} <span style="border: 1px solid black; padding: 2px;">9 %</span>
Meadow used with low intensity	36 928 ha	
Litter meadows	6 571 ha	
Hedges, bushes and undergrowth	2 317 ha	
Mixed and rotational fallow land	3 608 ha	
Arable crop preservation strips	35 ha	
Areas with special ecological quality, linking of semi-natural habitats	15 552 ha	1.5 %
High-stem fruit trees	2 420 000 trees	
Special animal-friendly housing systems	345 763 livestock units	26 %
Regular access to outdoor runs	742 993 livestock units	57 %

**Biodiversity**

- Nine per cent of the used agricultural area is set as ecological compensation area, including 50 060 hectares (ha) in the valley region. Thus, the goal of 10% of ecological compensation areas is nearly achieved, while there are problems with the ecological compensation area in the valley region.
- Ecological compensation areas are specific habitats for species of spiders, arthropods and carabid beetles. They also serve as interconnection between habitats. No difference between ecological compensation areas and other areas was found for the occurrence of grasshoppers. However, it was shown that ecological compensation areas serve as interconnections between habitats of certain species and that ecological compensation areas near hideaways of rare species can enhance their occurrence. (Eidg. Forschungsanstalt für Agrarökologie und Landbau, 2002).

**Nitrogen**

- Between 1990 and 1997, the nitrogen surplus decreased considerably, but since then it has increased. One reason is the increasing importation of animal feed following the ban of certain feedstuff during the BSE crisis. The agri-environmental goal to reduce the nitrogen surplus to 74 000 tonnes N will not be achieved.
- Ammonia emissions depend largely on animal husbandry. Between 1990 and 2002, ammonia emissions were substantially reduced, but problems remain in certain areas.
- High nitrate content in water is mainly a problem in areas dominated by arable farming. Studies suggest that the concentration of nitrate has decreased over the last decade and that the agri-environmental goal has been achieved. However, the database does not prove this conclusively.
- The sales potential of milk, meat and crops determine how many animals are kept and how many crops are produced. In turn, these, together with the regulations for nutrient use, determine the level of nitrogen emissions (FOA, 2004).

## ***Phosphorus***

- The phosphorus surplus has decreased by a third since 1990, ensuring that the agri-environmental goal is more than achieved.
- Erosion is a main way phosphorus enters the water. The proof of ecological compliance demands a certain level of the soil protection index. The soil protection index has risen, mainly due to an increase in soil cover during winter.
- The reduced input of phosphorus and better soil protection is reflected in an essential reduction of phosphorus in water.
- Regional problems with phosphorus remain in areas with a high animal density (FOA, 2002; Eidg. Forschungsanstalt für Agrarökologie und Landbau, 2001).

## ***Pesticides***

- The agri-environmental goal of decreasing the quantity of active ingredients to 1 500 tonnes has been achieved.
- A main cause of pesticides in water is the use of land for cereal and corn production which is not suited for this use because of the soil type, *e.g.* water logging or slope (Stamm, *et al.*, 2004).

## ***Animal welfare***

Dairy cows on farms participating in the two programmes for animal welfare had, on average, fewer injuries around the hocks and fewer callosities at the carpal joints than cows in farms that did not participate. Lameness was more frequent in cows of farms not participating in the programmes, followed by cows in tie-stalls in the programme “regular access to outdoor runs”, and then cows in loose housing systems in both programmes. There were fewer antibiotic treatments in farms in both programmes compared to the other farms.

Fattening pigs on farms participating in the two programmes for animal welfare had fewer problems with tail biting, and fewer joint problems and skin lesions than others (Danuser and Regula, 2003). The fattening period was shorter in farms participating in the two programmes, the daily weight gain higher and the animal loss rate lower, whereas the feed conversion was worse and the veterinarian costs higher than in farms not participating (Schnider, 2002).

## **Lessons learned**

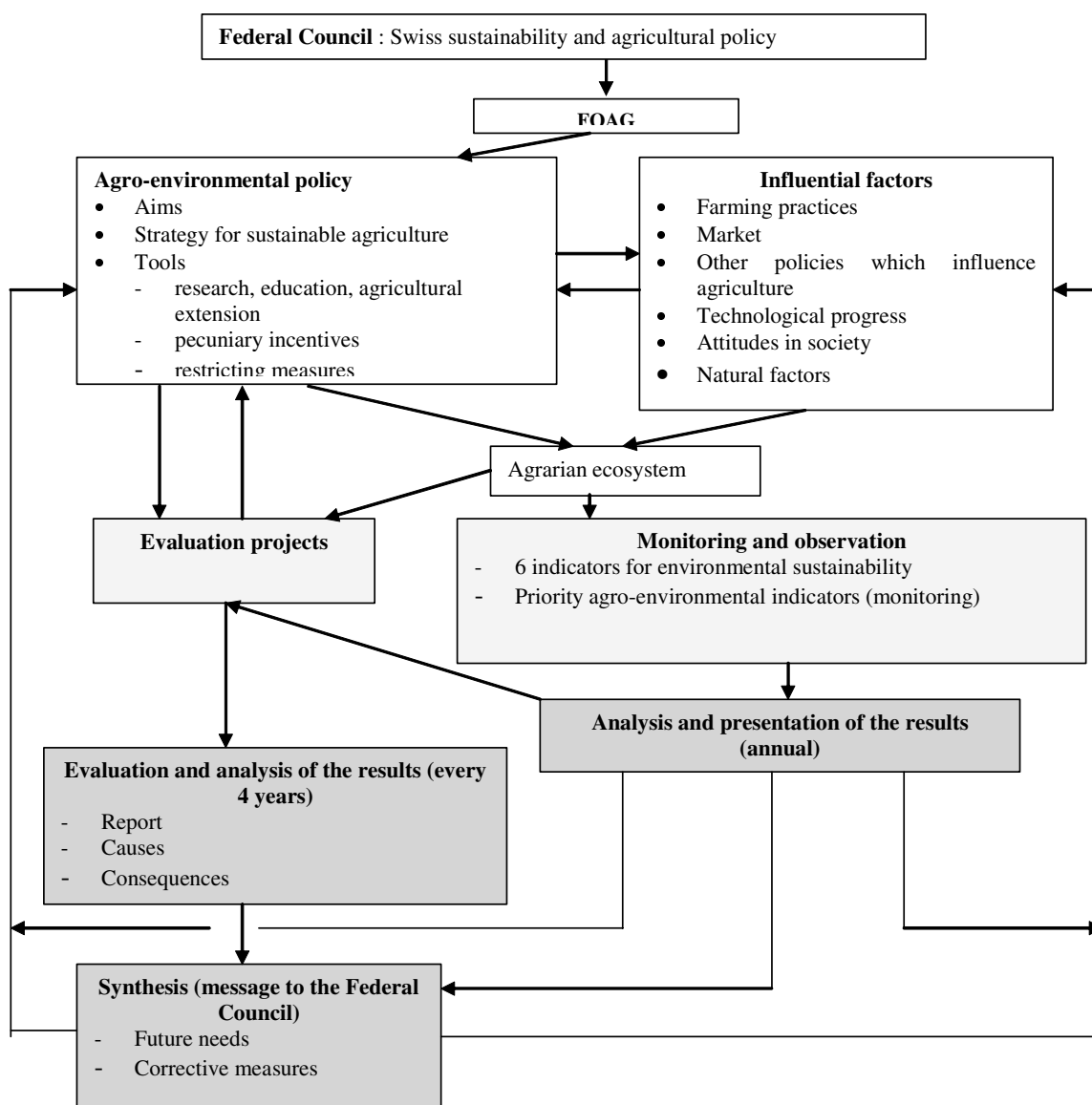
- Certain types of ecological compensation areas are more favourable to biodiversity than others. Besides the type of habitats a minimal abundance, the interconnectedness of the areas and the proximity to habitats with rare species is also important for biodiversity. This favours measures that promote special ecological quality and the linking of semi-natural habitats.
- The input of nitrogen, phosphorus and pesticides has decreased substantially during the last decade. In the last years no or few further improvements are visible. The present agri-environmental measures do not incite the farmers to further improve the efficiency of nutrient inputs.
- Research on the effects of farm management on the environmental situation is very cost intensive. Many cause-effect chains are very complex (*e.g.* pesticide use – pesticide content in water) or need a long time to be verifiable (*e.g.* biodiversity). The most interesting questions for research do not coincide with the most interesting questions of the

administration. For these reasons, a deliberate research plan, with explicit questions, which also takes into account the existing knowledge and the financial resources, is indispensable.

- Knowledge about policy evaluation has grown substantially during the last decade. The Federal Office for Agriculture has developed a manual for evaluations and established a group with representatives of all divisions to ensure the co-ordination and the quality of evaluations.
- Time series on key indicators help to define the subjects, which need a detailed evaluation. Thus they reduce the costs for evaluations.

### Further development

The following illustration shows the integration of evaluation and monitoring in the process of agricultural policy making.



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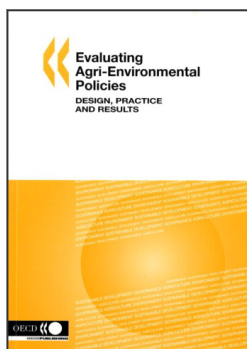
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