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Integrated Tools to design and implement Agro Environmental Schemes

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Authors: Kröger L., Lankoski J. and Huhtala A.

Authors' Institution: MTT Agrifood Research Finland

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1 Historical perspective

1.1 Facts about Finland

Finland is one of the northernmost countries in the world. It is located between the 60th and 70th latitudes, and a quarter of the land lies north of the Arctic Circle. The total area of Finland is 337 000 km², which makes it the seventh largest country in Europe. Of the total area, 10 % is covered with inland waters, which consists of nearly 200 000 lakes and 20 000 km of rivers. The land area is 305 000 km² of which 70 % is covered with forest and 8 % or 2.5 million hectares is agricultural land of which about 85 % is under cultivation. Other areas outside settlement, roads and waters are mainly treeless swamps and bare rocks. Due to the climatic conditions swamps are very common in Finland. Its share of the total area is about 11 %, while the share of constructed environment of the total area in Finland is only 3 %.

As Finland is more than 1 100 km long from south to north, there are considerable regional variations in climate. The mean annual temperature in Southern Finland is +4...+5 °C and in Lapland -2...+2 °C. In January, mean temperatures vary between -5 °C and -15 °C, making Finland the coldest country in Europe. The ground is covered with snow for 3-4 months a year in Southern Finland and in Northern Finland for as long as 7 months a year. In the far north, beyond the Arctic Circle, during the dark winter period, the sun remains below the horizon for 51 days. However, in the same region, the sun does not set for about 73 days in the summer, producing the famous white nights.

In terms of their topography the arable land areas in Finland are quite even. The average gradient (m/100m) is 1.6 %, and in only 10 % of the arable area the gradient is more than 5 %, but there is some regional variation. It should be noted, however, that the natural handicap of the Finnish agriculture is not the topography, but it is primarily caused by the northern location. When Finland joined the EU 85 % of the agricultural land was classified as mountain region, because there were no arrangements in the CAP for problems relating to northern location. The harsh climate results in unfavourable production conditions in Finland. The thermal growing season is 110-130 days in Northern Finland and 170-180 days in Southern Finland, while it is about 260 days in continental Europe and more than 300 days in southern parts of the continent. Since the growing season is much shorter in Finland, yield levels are about 40-50 % lower and the range of species and varieties in arable farming is more restricted than in Central Europe e.g. maize cannot be cultivated. As a result, the production costs are much higher than in other areas of Europe.

The situation in Finland also differs from that of the less-favoured areas in the southern Member States because the crops or crop varieties cultivated in those countries do not belong to the dominating crops in the EU and the products have markets of their own. In Finland, however, most of the crops are the same as in the parts of the Union with more favourable production conditions and the products compete on the same market. The role of support in the income formation of agriculture is therefore much more significant in Finland than in many other parts of Europe. The share of support was 44 % (€ 1.8 billion) of the total value of Finnish agriculture (€ 3.9 billion) in 2003 (MTT, 2004). See Figure 1 for total gross return of Finnish agriculture in 2003.

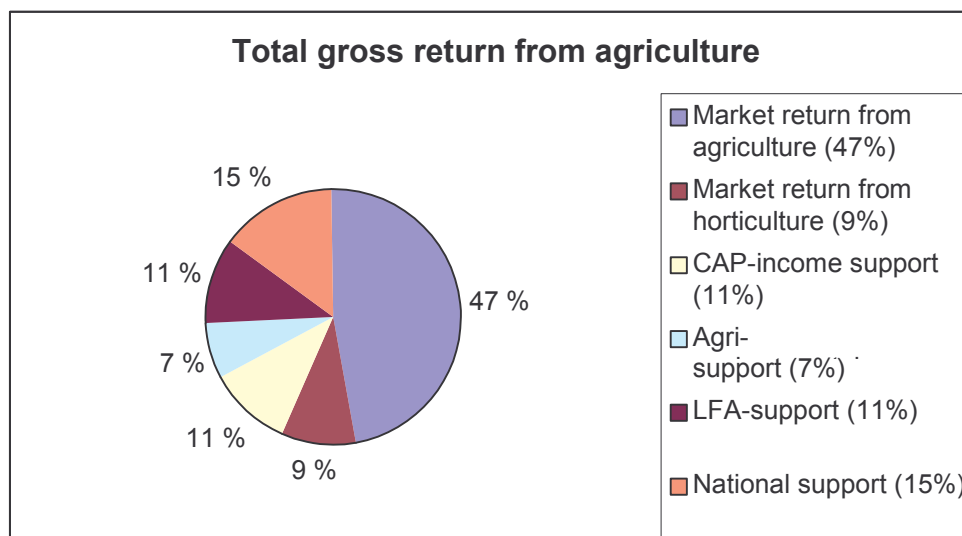


Figure 1. Total gross return of Finnish agriculture in 2003 (MTT, 2004).

For the reason that the agricultural policy of the EU is not well suited to northern conditions, Finland pays 58 % of the support needed in agriculture from national funds, while only 42 % of the support is paid through the EU budget. The CAP support presents only 25 % of the total support, while the compensatory allowances that are paid on the basis of less favoured areas (LFA), agri-environmental programme and national aids represent 75 % of the total support. Figure 2 describes the share of different support payments from total support.

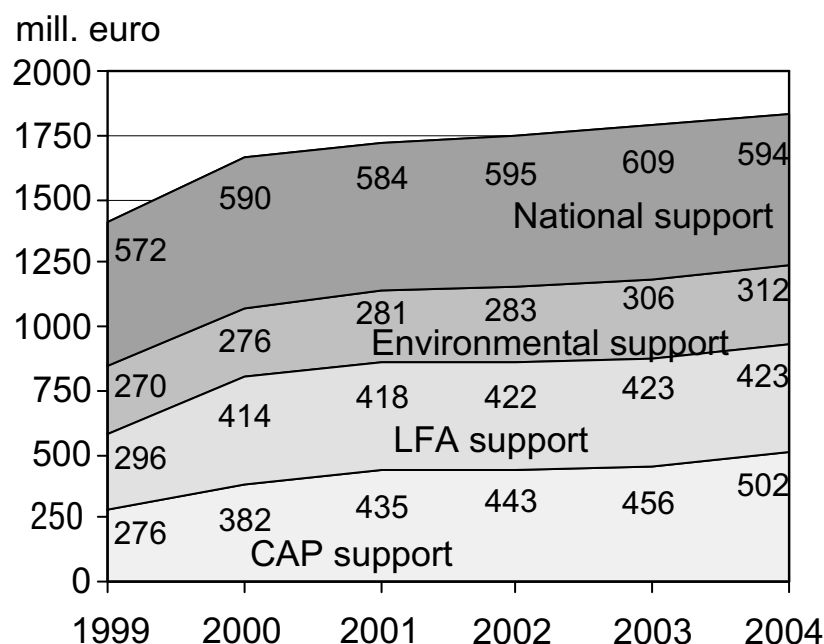


Figure 2. The share of different support payments in the years 1998-2004 (MTT, 2004).

1.2 The structural change in Finnish agriculture

Agriculture in Finland has gone through significant structural changes throughout history. A long time before Finland's independence important decisions were made that had tremendous effects on Finnish agriculture. In the eighteenth century, when Finland was part of Sweden,

the act of the general re-parcelling of farmland was made. In 1848, as a Grand Duchy of Russia, the new distribution of land completed the act. The consequence of these acts was that individual property rights replaced collective land ownership. After independence in 1917, the government of Finland enacted new laws concerning land ownership of tenant farmers and the settlement of the northern and eastern parts of the country. After Second World War, a special trait in Finnish agricultural policy was the settlement of people displaced when 10 % of the Finnish territory was ceded to the Soviet Union. All this fragmented the land into ever smaller units, which increased the number of farms rapidly. As a result, Finnish agriculture was based on small family farms, and it still is since in 2003 the share of privately owned active farms was 89 % and only 11 % were owned by heirs, family companies and corporations (MTT, 2004).

In the post-war agricultural policy the main objective was self-sufficiency, achieved through promoting growth in efficiency of production. The policy was successful, and by the beginning of the 1970's, overproduction had become the major problem in the agricultural sector. The problem of overproduction continued through the 1970's and 1980's and at the same time the economic significance of agriculture decreased rapidly. In 1960 almost 30 % of the labour force were employed in agriculture, in 1990 the share was 7 %. In terms of gross national product, the share of agriculture of the GNP was about 10 % in 1960, but in 1990 it had fallen to 3 %. At the same time period, the number of farms also decreased from 300 000 to 120 000 (MAF). With Finland's membership in the EU in 1995, the time of national agricultural policy ended and a new era of the CAP started. The CAP accelerated the structural changes and by 2003 the number of farms had declined to 72 000.

While the number of farms has decreased, the total acreage has remained fairly stable. The average size of active farms has increased from 17 ha to 31 ha in twelve years, and it will continue to do so. The growth is due to both the decrease in the number of small farms and increase in the number of large farms. Yet, most of the farms belong to the small size classes and the number of large farms is relatively small. The number of active farms with over 100 ha of arable land is only about 2 000, i.e. about 3 % of all active farms. The structure of land ownership has also changed as renting has become increasingly common. The share of rented arable land has increased from 10 % in 1990 to 40 % in 2003.

Agricultural production has traditionally been, and still is, mainly based on animal husbandry. If measured by the share of the return at market price, no major change in agricultural production has occurred. The share of livestock production was about 80 % and the share of crop production was about 20 % in 1960 as well as in 2002. However, if measured by the number of farms, the production structure has changed considerably. The share of livestock farms has fallen, while the share of crop farms has increased. Traditionally, there was livestock in almost every farm, but the number has been decreasing since the 1960s. For example, the share of farms having cattle was 80 % in 1960, 50 % in 1990 and by 2003 the share had decreased to 26 %. Yet, as the remaining farms have more milking cows and have been able to raise their average output, the amount of milk delivered to dairies has actually remained fairly stable, at around 2.4 million litres a year. Meanwhile, the share of crop production of the total production has increased from 15 % in 1990 to present 55 %.

Year	Number of farms	Average farm size	Rented arable land	Farms having cattle	Farm labour	GDP
1960	300 000	9 ha	5 %	80 %	30 %	10 %
1990	120 000	17 ha	10 %	50 %	7 %	3 %
2000	78 000	28 ha	31 %	29 %	5 %	1 %
2003	72 000	31 ha	40 %	26 %	4 %	1 %

Table 1. The structural change in Finnish agriculture

The main characteristic of the structural change in agriculture, besides the decreasing number and increasing size of farms, is the polarisation of the production. On the farm level, this means that intensive differentiated production is replacing mixed production. On the national level, the production is concentrating in the southern and western parts of the country. The northern and eastern parts are becoming less intensive production areas. The decrease in agricultural production or even ceasing of production in peripheral areas of the country has significant impact on the socio-economic vitality of these areas.

1.3 Environmental impacts of agriculture

Due to highly varying natural conditions and stochastic factors the relationship between agriculture and environment is complex. Agriculture has both negative and positive impacts on the environment. Negative environmental impacts are mainly caused by intensification, rationalisation and mechanisation of production. The positive impacts, in turn, are rural landscapes and agro-biodiversity that have been produced as side-effects of centuries of agricultural production. Once these semi-natural areas and their associated habitats and wildlife have been established, continuation of agricultural production is precondition for maintaining them.

Water quality problems caused by agriculture are the major environmental policy issue in many countries, also in Finland. In fact, the issues that are related to water protection have gained most of the attention in Finnish agri-environmental policy (Jokinen 1995; 2000; Kaljonen, 2003). Even if, only 8 % of the land area is cultivated, agriculture comprises a major source of nutrient loads into water courses, as various studies (e.g. Rekolainen et al., 1992; Kauppi, 1997; Vuorenmaa et al., 2002; Granlund et al., 2002) also indicate. According to Valpasvuo-Jaatinen et al. (1997) agriculture is the main source of both nitrogen (43%) and phosphorus (62%) runoffs into surface waters. Due to nutrient runoffs, the eutrophication of surface waters has become the most serious environmental problem caused by Finnish agriculture. While some improvements have taken place, the problem is far from solved. The proportion of slightly eutrophic waters has increased and signs of early eutrophication have been pronounced in many lakes (Lepistö et al. 1998; Vuorenmaa et al. 2002). Since the mid 90's the problem have also taken a visible form: during summer months eutrophication of water causes blooming algae in the Baltic Sea and in small agriculturally polluted lakes.

Emissions from agriculture into the air are mainly ammonia emissions. The total ammonia emissions in 1995 in Finland were 35 000 tons of which about 80 % was caused by agriculture, mainly from manure storing and spreading. However, the past 20-25 years the ammonia emissions from agriculture have decreased mostly as a result of the decrease in the number of animals and changes in the handling of animal manure. In recent years more

efficient utilisation of the protein in fodder has also reduced ammonia emissions. However, agriculture is still clearly the most important source of ammonia emissions in Finland. The most important gases involved in causing the greenhouse effect are carbon dioxide, nitrous oxides and methane. According to research on greenhouse gas emissions caused by agriculture (see e.g. Kulmala and Esala, 2000; Ripatti et al. 2000) carbon dioxide emissions from agriculture are mainly due to the cultivation of peatlands. The total carbon dioxide emissions caused by agriculture was estimated to be around 5 million tons, which is 8 % of the total carbon dioxide emissions in Finland. Nitrous oxide emissions from agriculture are caused by fertilisation, spreading of manure and soil tillage. The total nitrous oxide emissions caused by agriculture was estimated at 8,400 tons, which is 20 % of the total nitrous oxide emissions in Finland. Methane emissions in agriculture mainly come from the digestion of animals and animal manure. The digestion is clearly a more significant source of emissions, while the emissions from the handling and storage of manure are smaller. The methane emissions from agriculture was estimated about 90,000 tons, which is about 8 % of all the methane emissions in Finland. Methane emissions from agriculture are likely to have fallen along with the decrease in the number of cattle in the past couple of decades.

The use of pesticides in Finland is very low compared to other European countries (Miettinen, 1996). Pesticides are used in the most EU countries 3-4 times more than in Finland. In the most intensive production areas the use can be even more than 10 times higher. Calculated per hectare of cultivated arable land, the use of pesticides and growth regulations in Finland is only about 0.5 kg/ha of active ingredients. This very low rate is mostly due to the climatic conditions, particularly the harsh winters, which limit the growth of the pest populations. Pesticide products used in agriculture has been found in the Finnish watercourses extremely infrequently. It has been estimated that on average 0.1-1 % of the active substances runs off to water courses. Most of the runoff occurs in the spring when the water quantities are high, and thus the very small contents are difficult to observe.

Agricultural production is highly significant in creating and maintaining the rural landscape with special historical, cultural and landscape values. Open cultivated landscape is particularly important in a country dominated by forests, such as Finland. Rural landscape in Finland consists of many small features and it is diversified in its details. Fields are often located like mosaics on lake shores or in the middle of forests. Traditional landscapes include constructed landscapes as well as traditional biotopes, such as meadows and forest pastures. Most of the changes affecting the diversity of the landscape occurred before the end of the 1980s. The harmonisation of the production practices is also reflected in the use of arable land and buildings. The decline in the number of small farms, and especially animal husbandry farms, has caused various kinds of changes at the level of villages and regions. The greatest threats to rural landscapes are caused by discontinuing cultivation, depopulation of rural areas and closing of the open cultivated landscape. As arable land is left out of cultivation, bushes grow on these areas, and they may become completely overgrown. This may cause serious damages to the open landscape, since the area of open cultivated landscape is only 8 % of the total land area in Finland, which is a very low share compared to other European countries.

Agriculture maintains a significant share of the diversity of plant and animal species. It has created diversified environments, which provide suitable habitats for a wide range of species. Plants and animals that favour these semi-natural habitats constitute a considerable share of species in Finland. In addition to more than 3 000 species or varieties of plants and tens of species or breeds of domestic animals that are used in agriculture, there are 500-600 species of wild plants that benefit from the habitats created by agriculture. Apart from wild plants,

managed natural meadows and pastures are important for butterflies and other insects. However, many of the species that used to benefit from farming have not survived the changes in agriculture in recent decades. The mechanisation, rationalisation, specialisation and intensification of agriculture have led to disappearance of these special environments and habitats and associated wildlife (Pitkänen and Tianen, 2001; ME 1985, 1991, 2000). The number of species has declined, and many species have become endangered. It is estimated that nearly 30 % of the endangered species of plants and animals live in the traditional habitats.

Figure 3 summarises some key data on the environmental and socio-economic significance of Finnish agriculture. The economic significance of agriculture is small from the national perspective, although its local socio-economic importance in rural areas is vital. At the same time, the environmental significance of agriculture is in many respects large.

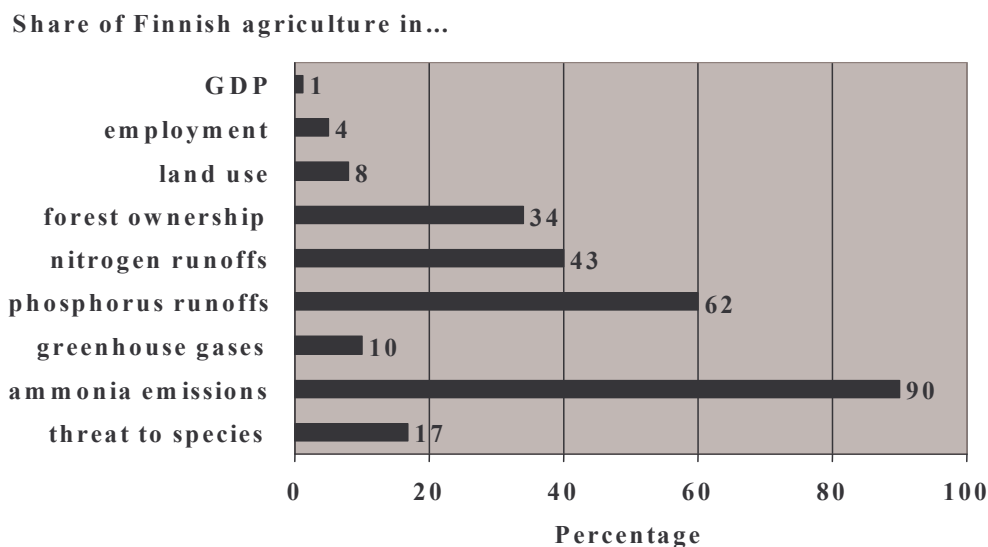


Figure 3. Selected indicators on the significance of Finnish agriculture (Lankoski, 2003).

1.4 Demand for countryside and environment

Finland is the most rural country in Europe: more than 90 % of the land area is classified as rural areas and about a third of the population still live in the rural regions. The Finnish countryside is characterised by a sparse population, long distances and low intensity of land use. The socio-economic structure of the countryside consists of agriculture together with other related occupations and small-scale industries. The migration of the population from the sparsely populated areas and small population centres to towns and cities has been very strong in recent decades. The abandonment of agricultural land linked to rural depopulation and economic difficulties of agriculture have been a major concern of rural areas in Finland.

Apart from agriculture and forestry, one of the most significant rural industries is tourism. Countryside offers excellent opportunities for free-time activities and enjoying the nature. Rural tourism started in Finland in the beginning of the 20th century, when boarding houses were established in connection with farms. Farm holidays were rediscovered a little more than

30 years ago, when efforts started to be made to obtain additional income to farms from farm holidays and renting of cottages. At present, there are about 2100 enterprises offering rural holiday services and the number of bed places totals 45 000. The number of visitors was estimated at 670 000 in 1998 (MTT, 2003).

In general, it is forecasted that the demand for rural and wildlife tourism services produced in small family companies will grow in the future. In many cases the demand for tourism services is also dependent on the characteristics and well-managed rural landscape and traditional biotopes, since consumers appreciate especially open and managed farming landscapes. Aakkula (1999) estimated the economic value of pro-environmental farming in Finland. Pro-environmental farming was defined as an economic activity that enhances the environmental and ecological quality of the rural environment. In this study, the contingent valuation method was used to elicit a monetary value for the conversion from conventional agriculture to pro-environmental farming. Taking certain reservations into account, the conclusion was that the estimated total willingness to pay, ranging from FIM¹ 0.541 to 2.216 billion, can be interpreted as the maximum amount of money which society can spend on the socially acceptable conversion from conventional agriculture to pro-environmental farming. Interestingly, the magnitudes of the total WTP estimated in this study and the annual expenses of the Finnish agri-environmental program were detected to be equal. Moreover, a demand function for acreage under pro-environmental farming was derived in the study. For the first 50% of acreage under pro-environmental farming, the cumulative total WTP was FIM 1.462 billion. For the other 50%, the increase was only FIM 162 million. A fifty-percent increment in the total acreage raised the cumulative total WTP less than 10%. 50% of the cumulative total WTP was accumulated when the acreage under pro-environmental farming reached 398,000 hectares. The corresponding average WTP/ha was FIM 1,423.

The creation of markets or quasi-markets (rural tourism) for rural and environmental amenities and public goods may, however, be difficult in Finland. This is because in Finland there is a common right of access, so called everyman's right, to all natural (undeveloped) areas. It gives everyone the right to roam freely in the countryside without obtaining permission, no matter who owns or occupies the land. Hence, anyone may walk, ski, cycle or ride freely in the countryside, provided that no harm is caused to property or nature. Moreover, one may pick wild berries, mushrooms, and flowers that do not belong to any protected species. The common right of access is, however, limited in cultivated fields so that in the summer, hikers must go around fields or use tracks or ditches to cross them, but during the winter fields may be crossed freely by skiers. Hence, common right of access basically reduces the degree of excludability so that, for example, landscape, wildlife, and biodiversity within agricultural and forested landscapes are non-excludable and thus the creation of markets or quasi-markets is difficult in practice. However, exclusion mechanisms for cultural heritage may be established.

¹ 1 euro = 5.94573 FIM

2 Assessment of 2078/92

2.1 Agri-environmental policy before the membership of the EU

Traditionally, as in many other western countries, agricultural administration and farmers' unions have been able to formulate the agricultural policy in Finland. To refer to this kind of policy making the concept of 'agricultural policy community' is often used. The Finnish agricultural policy community had the definitive decision-making power over agriculture (Jokinen, 1995). There were not even remarkable political or parliamentary disputes over the agricultural policy principles. Agricultural policy making was in many cases depoliticised since opposing interest had been excluded from participating in agricultural policy processes. The agricultural policy community was almost in isolation from the rest of the political system. The agri-environmental policy was also in the hands of agricultural policy community. They emphasised the importance of economically profitable production and were favouring subsidies, voluntary measures and information guidance.

At the beginning of the 1990's, the only pieces of legislation concerning environmental impacts of agriculture were the pesticide, fertiliser and water acts, in which neither of them had any specific regulations for agriculture. The way of thinking was that the best way to protect the environment is to leave it in the hands of the farmers, and with the help of right information and advices they will start using good farming practices. However, from the environmental policy perspective, some of the measures to decrease overproduction, such as set-aside scheme, fertiliser tax and afforestation scheme, can be seen as environmental instruments. The set-aside scheme was at the beginning voluntary, and farmers were offered economic incentives to encourage joining, but it became compulsory in 1991. Farmers had to set-aside at least 15 per cent of their cultivated area. Yet, they were compensated. There was also a possibility for farmers to make an agreement on plant-cover for set-aside area, an additional measure with additional compensation. Tax on nitrogen fertiliser was collected in 1976-1994 as a means to raise funds for export subsidies and in 1990 environmental tax on phosphorus fertiliser was introduced. In 1994 fertiliser taxes were abolished in order to facilitate Finland's membership in the EU.

The relationship between agriculture and nature was considered environmentally sound until the mid 1980s when people became aware of the negative environmental impacts caused by agriculture (Jokinen, 2000). In fact, the recognition of environmental problems began already in the early 1970s, though the magnitude of problems was considered unimportant. The need to get knowledge on environmental effects caused by agriculture increased in the late 1980s, and a wide research project was set up by the Ministry of Agriculture and Forestry. The results of the project showed that agriculture is as serious a polluter as many other industries (Niemi-Iilahti and Jokinen, 1999). These results provided a basis for the first national Environmental Programme for Rural Areas that was approved in 1992 (ME, 1992). The emphasis of the Programme was mostly on the issues of water pollution. The Programme was based on voluntary instruments, regulations were neglected. The measures included information guidance, support for farmers to start using good farming practices and special subsidies to environmental investments.

The Environmental Programme for Rural Areas changed the agri-environmental policy in Finland. The most significant change did not concern the content of the policy, but the policy-making style. For the first time environmental problems of agriculture were taken into

account at the central governmental level by starting co-operation between the Ministry of Agriculture and Forestry and the Ministry of Environment. This co-operation has become more and more important, especially since the EU membership in 1995.

2.2 The Finnish agri-environmental Programme 1995-1999

When Finland joined the EU in 1995, national agricultural policy ended and a new era of Common Agricultural Policy and accompanied measures began. The first Finnish Agri-environmental Programme 1995-1999 was a response to the Council Regulation No. 2078/92. The Programme introduced new kinds of economic policy instruments, such as voluntary contracts and subsidies, and its implementation relied on the co-operation between agricultural and environmental sectors. Since both policy content and style were new to agricultural and environmental administration, the policy formation and implementation presented a real challenge. As a result of the policy process, substantial changes took place in both hard institutional structures, such as new decision-making processes, administrative structures and legislation, and in soft institutions such as networks, co-operation and policy measures. However, the most remarkable change from the earlier national agricultural and environmental policies was that onwards Finnish agri-environmental policy is partly based on principles and policy objectives of the EU.

The Finnish Agri-environmental Programme 1995-99 was prepared in 1994 by a working group consisting of agricultural and environmental authorities, mostly of government officials. In addition to regional authorities, who were given an opportunity to comment on the draft version of the Programme, the group was consulted by representatives from the Farmers' Union, the Association of Rural Advisory Centres, environmental NGOs, researchers and other experts. During the preparation of the Agri-environmental Programme the regional programmes were also prepared by each Regional Employment and Economic Development Centre. The regional programmes presented detailed descriptions on the natural conditions, structure of agriculture in the region, state of the environment and environmental problems related to agriculture in the region. Regional programmes were used as a base for the preparation of the national programme.

The objectives and the content of the Finnish Agri-environmental Programme were comprehensive and ambitious. The overall objective was to provide an incentive to develop agriculture towards practices that are less harmful to the environment. It aimed to reduce the load on water courses caused by agriculture, protect groundwater, reduce the atmospheric emissions, manage the rural landscape and preserve the biodiversity in the nature of rural areas. The Programme also aimed to compensating the farmers for the extra costs or income losses caused by measures to protect environment or landscape management, and to secure the income of farmers in the changing conditions.

The Agri-environmental Programme was divided into two schemes: the *General Protection Scheme* that targeted all farmers, whereas the *Supplementary Protection Scheme* including more specialised and environmentally effective measures targeted only a limited number of farmers. In addition to these two schemes, there was a small amount of support available for training of farmers, advisory services and experimental projects. The General Protection Scheme was intended to cover as large share of the total agricultural area as possible, while the Supplementary Scheme was meant to provide compensation for more effective measures of environmental protection.

The General Protection Scheme consisted of support for basic measures. The basic mandatory measures included environmental planning and monitoring, upper limits for fertiliser use, plant protection, filter strips, plant cover during wintertime, and maintenance of biodiversity and landscape management. The Supplementary Protection Scheme, i.e. special support was paid to farmers who, in addition to basic measures, committed themselves to implementing one or several of the environmentally more effective measures on their farms. These measures included organic production and conversion to organic production, establishment and management of riparian zones, sedimentation ponds or wetlands, promotion of biodiversity, management of traditional biotopes, management and development of landscapes, extensification of production, regulated subsurface drainage and lime filter drainage, increasing efficiency in the use of manure, liming of acid sulphate soil, raising of native breeds.

Agri-environmental support based on the Finnish Agri-environmental Programme 1995-99 was paid in the whole country. The aid gave farmers compensation for the increased costs and income losses resulting from the measures laid down in the Programme. Joining the Programme was voluntary for farmers, but the commitment required a farmer to undertake agri-environmental measures in the whole arable land area of the farm for five years. In order to obtain aid under the General Protection Scheme, the following requirements had to be fulfilled. The farmers, who met all these requirements, were paid an annual premium per hectare. The amount of support varied according to support area and cultivated crops.

- A farm environmental management plan must be prepared.
- A certain base level of fertilising must not be exceeded.
- Manure must be appropriately stored and spread.
- Stocking density must be below 1.5 LU/ha.
- Buffer strips (3 meters) must be left on the sides of main ditches or water courses.
- At least 30 per cent of arable land must have plant cover during winter.
- Landscape and biodiversity must be appropriately maintained on the farm.
- Spraying device (plant protection sprayer) must be tested and pesticides may be applied only by a person who has completed training on pesticide use.

In addition to the general scheme, a farmer could commit to implement one or several of the more specialized measures. The Supplementary Protection Scheme includes an incentive of close to 20 per cent to facilitate the necessary uptake, with the exception of riparian zones where the incentive is 30 per cent. Commitments concerning special measures are made between the farmer and the state for the following measures:

- Establishment and management of riparian zones
- Establishment and management of wetlands and sedimentation ponds
- Other methods for the treatment of runoff water
- Organic production and conversion to it
- Arable farming in groundwater areas
- Efficient use of manure
- Traditional biotopes
- Other measure to enhance biodiversity
- Improvement and management of landscape
- Raising of local breeds
- Cultivation of local crops
- Reduction of acidity in certain areas

The most important of these in monetary terms was the organic production. The conversion period to organic production is three years, and during this period the farmer received support to compensate for the lower yields and lower income. From the third year onwards the crops can be labelled as organic and sold at a premium price. More than half of the total supplementary support was spent on the organic farming measures, e.g. in 1996 the share of organic support was about 58 per cent of total support. During the Agri-environmental Programme 1995-99 the share of organic production increased from 2.1 per cent of arable land in 1995 to 6.2 per cent of arable land in 1999.

According to the original plan, 80 per cent of the total support was reserved for the basic support and 20 per cent for the special support. However, approximately 94 per cent was spent on the basic support. Since the scope of the basic support was so broad, the programme made up about half of all national costs of all environmental protection.

2.3 Implementation of the Finnish Agri-environmental Programme

The agricultural administration at the central, regional and local levels has been given the formal power in agri-environmental issues as the EU Regulation 2078/92 was applied in Finland. The ministry of Agriculture and Forestry was responsible for design and preparation of the agri-environmental programme referred to the Regulation 2078/92. The preparation was carried out in co-operation between the ministry of Agriculture and Forestry and the Ministry of Environment. The Ministry of Agriculture and Forestry was also responsible for the implementation of the Programme, but the practical implementation, administration and controlling was left to regional and local levels.

At the regional level the Rural Departments of the Regional Employment and Economic Development Centres (tot. 15) are part of the integrated agricultural administration and supervision system (Integrated Agricultural Control System, IACS). They are responsible for the practical implementation, administration and monitoring of the Agri-environmental Programme. The Rural Departments concentrate on the feasibility of the implementation procedures and they take care of the allocation of the money and compliance of the rules. They are also responsible for the practical monitoring and controlling of all EU-support to agriculture, including the agri-environmental support. As regards to the Supplementary Protection Scheme the Regional Environmental Centres are responsible for determining the target areas and, when necessary, for the planning of the projects e.g. establishment of riparian zones and traditional biotopes. Together regional agricultural and environmental administration are in charge of the allocation and decision-making of the environmental management contracts, which are a part of the General Scheme.

The co-operation between regional agricultural and environmental administration has been a new feature that the agri-environmental policy has brought. Agricultural and environmental sectors have established a division of work and co-operational routines. In addition to informal meeting and seminars, each region organises a cross-sectoral annual meeting relating to administration and control of the Agri-environmental Programme. The representatives from the Ministry of Agriculture and Forestry and the Ministry of Environment also attend to these meetings. The co-operation is a feature that both parties appreciate highly, even though the intensity of the co-operation varies a lot between the different regions.

At the local level municipalities are autonomous, democratic units within the public administration system. The municipalities have only executive tasks in implementation of agri-environmental policies. Although the local agricultural authorities actually make the decisions on granting the agri-environmental support, the decision is based only on information received from the control unit. If the control of a certain farm or form of support is not completed, the payment is blocked by the regional authorities. The payments are approved according to provisions of the Ministry of Agriculture and Forestry. The other problem is that agricultural and environmental issues in the municipalities are usually handled separately by different sectoral bodies. In most of the 444 municipality in Finland, the agri-environmental issues are dealt only in agricultural sector.

2.4 Follow-up

The Ministry of Agriculture and Forestry started a follow-up working group in 1995 in order to assess the impacts and to make proposals for improvements. A broad representation of stakeholders was invited as members of this group. The members included representatives from different levels of agricultural and environmental administration, the Farmers' Union, the Association of Rural Advisory Centres and the Finnish Association for Nature Conservation. The follow-up group prepared a mid-term report (MAF, 1996), in which they made proposals to develop the control system and to postpone deadlines for certain measures. These proposals were also taken into account and changes were made to the Programme respectively. The follow-up group concluded in their final report (MAF, 1998) that the Finnish Agri-environmental Programme 1995-99 has been very suitable and it has well exceeded the target of the scale and scope. However, they continue, that the conditions for subsidies must be re-evaluated and that there is need for more research on the outcome of the programme.

The Ministry of Agriculture and Forestry also launched a research programme on monitoring the impact of the Finnish Agri-environmental Programme 1995-1999 (so called MYTVAS study). The study directed to four target areas to monitor how the measures and objectives of the programme were implemented. The data was collected by interviewing about 400 farmers in four different areas of the country. The variables monitored included e.g. fertilisation, storage and spreading of manure, winter green coverage, and animal density, use of pesticides, soil tillage methods and management of set-aside and filter strips. The MYTVAS study assessed the effects of the agri-environmental programme on waterways, biodiversity and landscape. The follow-up study still continues (as so called MYTVAS II study) to monitor the impact of the Finnish Agri-environmental Programme 2000-2006.

3 Rural development programme

The decision concerning the Finnish proposal for the Horizontal Rural Development Programme according to the Council Regulation N:o 1257/1999 was made by the Finnish Government in 1999. The Horizontal Rural Development Programme covers the whole of Finland. It is targeted only at farming, i.e. it does not concern the other rural activities or rural communities. The measures are aimed to create a well-functioning entity, which provides good preconditions for agriculture and for the continuation of production in the whole country. The continuation of agricultural production also forms the basis for settlement of

rural areas, which in turn maintains the vitality of rural areas and the preservation of managed cultural landscapes and biodiversity

The Horizontal Rural Development Programme comprises the compensatory allowances paid for the less-favoured farming regions and agri-environmental support. The main purpose of the Compensatory Allowance Scheme (LFA-support) is to compensate for less-favoured areas for the handicap due to the northern production conditions. It aims at securing the continuation of environmentally friendly agriculture in less-favoured natural circumstances. The Compensatory Allowance Scheme covers the whole area of Finland, but the amount of compensation is differentiated so that it increases from the south to north. The condition for compensatory allowances is the compliance with the 'usual good farming practice'. In 2003 the Scheme covered about 96 % of active farms and 94 % of the utilised agricultural land in Finland. The LFA-support constitutes a significant share of farmers' income, e.g. the share was 11 % in 2003.

The agri-environmental support enables more demanding environmental measures than the 'usual good farming practise'. The General Protection Scheme has been formulated so that all farmers have the possibility to apply and receive compensation for carrying out environmental measures, whereas the Supplementary Protection Scheme concern a smaller group of farmers and more limited areas. However, the share of support paid for the special measures has been very low, e.g. in 2002 it was about 11 % of the total environmental support. The purpose of the environmental support is to reduce the load on the environment and to compensate farmers for the costs and income losses due to the environmental protection measures they have taken. The gross support also includes an incentive. In 2002 the basic measures covered about 92 % of the active farms and 93 % of the arable area. Environmental support represents about 17 % of all the agricultural support, thus it covers a significant share of farmers' income, e.g. in 2003 the share was 7 %. At least part of the support can be considered as direct income payments to farmers.

3.1 The Finnish Agri-environmental Programme for 2000-2006

The Finnish Agri-environmental Programme 2000-06 was prepared by the working group that consisted mostly of the same persons who were members of the previous follow-up group of the Programme for 1995-99. In fact, some of the members had been working together since preparing the first Rural Environmental Programme (1992) nearly a decade earlier. This interaction in addition to ten years of policy experience and accumulation of information concerning agri-environmental issues affected significantly the policy formation. During the former policy process interaction between different stakeholders has increased considerably and common practices have become established. As a result, the preparing process of the new Programme occurred without any major disagreements.

The draft version of the Agri-environmental Programme was commented by nearly one hundred actors from regional and local level administration, different organisations and businesses. Furthermore, their comments were actually taken into account in the final version of the Programme. Since there was no pressure for major changes, the Agri-environmental Programme 2000-06 differs from the Programme for 1995-99 only in some small details. Policy principles, objectives and most of the measures remained the same.

The policy formation and implementation processes are a continuum of the previous Agri-environmental Programme. The agricultural administration at the central, regional and local levels has been given the formal power in agri-environmental issues in Finland. The Ministry of Agriculture and Forestry is responsible for the Programme, which is administered, implemented and controlled at the regional districts and to some degree by municipal authorities. In addition, the Ministry of Environment and regional environmental administration are also involved in the formation, implementation, supervision and monitoring of the Programme.

Policy design and formulation of the Finnish Agri-environmental Programme occur at the NUTS1 level i.e. national level. Implementation and monitoring of the Programme is mainly organised at the NUTS3 level, however, the activities are monitored, supervised and evaluated at the NUTS1 level. Regarding agricultural policy the NUTS2 level is irrelevant in Finland.

Stages	Activities	Organisations
Policy formation	Scheme design	Ministry of Agriculture and Forestry (responsible authority) Ministry of Environment Farmers' Union Association of Rural Advisory Centres Finnish Association for Nature Conservation MTT Agrifood Research Finland Finnish Environment Institute
	Administration	The integrated administration and supervision system (IACS) of the agricultural administration (governmental, regional and local level) Statements of the Ministry of Environment (consultation procedures)
Implementation	Regional level	Agricultural administration: Rural Departments of the Regional Employment and Economic Development Centres (total 15) Environmental administration: Regional Environmental Centres (certain planning procedures and consultation)
	Local level	Municipal agricultural authorities (executive tasks inc. decision-making) Farmers
Enforcement	Monitoring	Rural Departments (practical responsibility under MAF) Regional Environmental Centres (the Supplementary Scheme) Municipal authorities
	Control	The integrated administration and supervision system (IACS) Ministry of Agriculture and Forestry (responsibility, reporting to EU) Rural Departments (practical responsibility)
Follow-up	Administrative	Follow-up group set by the Ministry of Agriculture and Forestry with a broad representation of stakeholders.
	Research	MYTVAS I and MYTVAS II studies on monitoring the impacts Research financing to MTT, Environmental Institute, Universities etc.

Table 2. Governance organisation for the Finnish Agri-environmental Programme

3.2 The structure of the Finnish Agri-environmental Programme

The agri-environmental support compensates farmers the costs and losses of income caused by measures of environmental protection and landscape management. A farmer gives a commitment to the basic and additional measures of the agri-environmental support for five years. Contracts concerning the special measures can be made for five or ten years, depending on the contract. Aid includes also an incentive that is about 20 % depending on the measure. At the same time, the objective of the support is to continue agricultural production and adapt

productions methods to meet environmental requirements. All the measures of the agri-environmental Programme are implemented in the whole country.

The Finnish Agri-environmental Programme is divided into two schemes: the General Protection Scheme that targets all farmers, whereas the Supplementary Protection Scheme including more specialised and effective measures targets only a limited number of farmers. Agri-environmental support in the General Protection Scheme consists of basic measures and additional measures and the Supplementary Scheme consists of special measures. Basic measures are designed to secure the implementation of agri-environmental measures as expansively as possible in varying conditions all around the country. Additional measures help to take into account the special conditions of different types of farms. Both additional and special measures take into account regional conditions. The structure of agri-environmental measures takes the adjustment at the farm level to some extent possible and as a consequence the environmental protection can be enhanced.

There are five basic mandatory measures for farmers who have committed themselves to environmental support. These concern environmental planning and monitoring of farm, fertilization base levels for arable crops, plant protection, headlands and filter strips, maintenance of biodiversity and landscape management. In addition to these, there is a sixth basic measure for livestock farms concerning the handling of animal manure.

Besides the mandatory basic measures, each farmer has to select one additional measure. The measures available for crop farms are more accurate fertilization, plant cover during winter and reduced tillage on arable land and farm biodiversity. Livestock farms have to select either one of these, or one of the following measures: reducing ammonia emissions from manure stores, collection of gases from manure, promoting the welfare of production animals and treatment of washing water from the milking room. Additional measures for horticulture are more accurate monitoring of nutrients, more accurate/precise nitrogen fertilisation through measurement of soluble nitrogen. Farmers have to implement the additional measure selected in the first year after making the commitment to agri-environmental support for five years. When making the commitment for the first time a farmer must choose the measures for either crop production farms or livestock farms.

Special support is paid to farmers who commit themselves to implementing one or several of the special measures of the Supplementary Protection Scheme. Commitments concerning the special measures are made for 5 or 10 years. In order to be eligible for support based on such commitments farmer must also implement the basic measures. The special measures include establishment and management of riparian zones, establishment and management of wetlands and sedimentation ponds, other methods for treating run-off water, organic production, arable farming in groundwater areas, increased efficiency in the use of animal manure, traditional biotopes, promotion of biodiversity, development and management of landscapes, raising of local breeds, cultivation of local crops and reduction of acidity in certain regions.

Type	Measure	Budget /2003	Number of particip.	Area covered
General Protection Scheme				
Basic mandatory measures	5 measures	211 M €	63 370	2,1 M
Additional measures	More accurate fertilisation	4,80	13 485	357 000
	Plant cover in winter and reduced tillage	21,27	35 800	904 000
	Additional measures on livestock farms	14,55	18 300	657 000
	Additional Measures on horticultural farms	2,0	2 340	11 400
	Biodiversity on farms	0,10	340	7 600
	tot.	42 721		
	Total	254 M €	63 370	2,1 M ha
Supplementary Protection Scheme				
	Riparian zones	2,64	2 097	5 408
	Wetlands and sedimentation ponds	1,09	425	4 808
	Treatment of runoff water	4,99	2 300	34 310
	Organic production	17,60	7 782	149 721
	Arable farming in groundwater areas	0,098	100	977
	Efficient use of manure	7,94	4 685	125 487
	Traditional biotopes	6,03	2 538	23 653
	Other measures to enhance biodiversity	1,16	846	3 643
	Management of landscape	1,13	1 052	3 996
	Raising of local breeds	0,304	753	
	Cultivation of local crops	0,004	8	
	Reduction of acidity in certain areas	0,116	117	1 392
	Total	34 M €	17 000	350 000
	Total budget 2003	306 M €		
	Total budget 2000-2006	1,73 billion €		

Table 3. Finnish Agri-environmental Programme: schemes, measures, budget and areas

3.3 Agri-environmental measures

3.3.1 Basic measures

Environmental planning and monitoring in farming

The objective is to establish a planning and monitoring system for the planning and recording of cultivation measures on farm in order to maximise the efficiency in directing the different kinds of environmental protection measures. The planning and monitoring system makes it easier for farmers to take the regional, local and farm-level needs and requirements better into account in the planning and implementing the cultivation measures. In addition to the planning, the system serves both annual and long-term monitoring of the environmental management measures.

To be eligible for the support, farmer has to draw up a cultivation plan each year. The written plan presents the plant species or varieties to be cultivated on each parcel, fertilisation plan and plant protection plan. Farmers must keep records on the basic data on the parcels and annual cultivation measures. For the planning and monitoring, fertility studies must be made on farms at least every five years. A farmer, who has made the commitment to join the agri-environmental support, must also participate twice during the commitment period in farmer training concerning the agri-environmental support.

Basic fertilisation levels of arable crops

The objective is to reduce the nutrient load to surface waters, ground waters and to the air by reducing the average use of fertilisers. Reduction is done through increased precision in the application of fertilisers on different parcels, cutting peak quantities of fertilisation or continuing fertiliser use that is already low enough from the viewpoint of the environment. In order for a farm to receive support, fertilisation quantities including both artificial fertilisers and manure may not exceed the quantities given in the regulation. Fertilisation must be based on soil analysis that are made frequently enough, nutrient analysis of manure and written cultivation plans.

Plant protection

The objective is to reduce the quantities of pesticides, emissions into surface water and ground water, air and soil. An attempt is made to improve the accuracy in the application of plant protection products by means of training, cultivation techniques and crop rotation. Plant protection products should be used according to the verified need only, which guarantees the good quality of the crop and more efficient utilisation of nutrients. The equipment used in spreading of plant protection products must fulfil the EU standards and carry a written certificate. Plant protection products may be spread only by a person, who has participated in a basic training in the use of plant protection every five years.

Headlands and filter strips

The objective is to prevent and reduce the discharge of nutrients or soil particles that end up in water courses, in addition to preventing the risk of polluting household wells. A filter strip stops the runoff from arable land before it enters the ditches and water courses. Even narrow filter strips are efficient means of water protection on arable land areas and at the same time they form ecological pathways that enhance biodiversity in the agricultural environments. Headland of at least one meter wide covered by perennial vegetation must be left on the sides of main ditches. The headland is included in the agricultural parcel where it is located. Filter strips of the average width of three meters covered by perennial vegetation must be left on the sides of brooks and other watercourses and around household wells. The filter strip is included in the parcel where it is located. No mowing is required on the headlands or filter strips. If they are mown, the plant remains must be removed. They may be pastured.

Maintaining biodiversity and landscape

The objective of landscape management is to preserve open agricultural landscapes and to keep the surrounding clean and well-managed. An attempt is made to maintain biodiversity by preserving the biotopes shaped by agriculture and the species and varieties that are characteristic to agricultural environments. In order to receive the support farmers have to preserve open arable areas and to take care of the farming landscape. The surroundings of residential and production building must be kept clean and machinery must be appropriately stored. Valuable sites from the point of view of biodiversity must be preserved and maintained on the farm. This concerns in particular marginal zones between arable land and

forest, islets of trees, bushes or stones in arable land areas. These biotopes must not be endangered by the use of plant protection products or fertilisers.

3.3.2 Additional measures

More accurate/precise fertilisation

The objective is to reduce nutrient load on surface waters and ground water resulted from fertilisation by increasing the accuracy in the use of fertilisers taking into account the plant species and individual parcels. The accuracy in the combined use of manure and artificial fertilisers is increased and the quantities of nutrients applied are used on the basis of the plant species, conditions in the growing sites and yield levels. The balanced environmentally friendly fertilisation is based on regular liming of arable land in order to keep phosphorus fertilisation at a reasonable level. The fertilisers quantities (nitrogen and phosphorus) used per hectare may not exceed the amounts determined by plant species, conditions in the growing sites and yield levels.

Plant cover in winter and reduced tillage

The objective is to protect the surface of the arable land from the erosion caused by rain, melting water and surface runoff. This also prevents the runoff of phosphorus bound into soil particles and dissolved nitrogen into surface water and ground water. Increase in plant cover is particularly important in groundwater areas as well as in the southernmost part of Finland where most of the field used for cereal or special crop production are bare in winter. The minimum of 30 per cent of the arable land must be covered by plants or plant residues outside the growing season, or an approved method of reduced tillage must be used. Parcels with plant cover should be located in important water protection areas, such as steep arable land areas close to shores.

Biodiversity on farms

The objective is to increase the awareness and knowledge on the wild plants and animals living on the farms, their habitats and the possibilities to make a positive contribution to their preservation. Efforts are also made to increase the biodiversity and variability of landscape in farming areas by means of long-term set-aside commitments. In order to get support a farmer has to participate in two-days training on the maintenance and preservation of biodiversity on the farm scale. As a part of this training the farmer draws up a brief plan concerning important aspects of biodiversity on their farms and the appropriate management measures. According to the plan a farmer is able to establish five-year game pastures or biodiversity areas based on the support for arable crops.

Additional measures on livestock farms and horticultural farms

The objectives of additional measures on livestock farm include reducing the ammonia emissions from storing the manure, treating waste waters from washing the milk equipment and promoting the welfare of production animals. The objective of additional measures on horticultural farms are reducing the leaching of nutrients by more accurate fertilisation and reducing the health risks caused by plant protection products in the production of perennial horticultural plants.

3.3.3 *Special Measures*

Riparian zones

The objective of establishing riparian zones with perennial vegetation in arable land is to prevent the losses of nutrients into water courses. Riparian zones also increase biodiversity and make landscape more diversified. Riparian zone is a managed area covered by perennial vegetation, trees or bushes between a field and a river, lake or groundwater area. It must be at least 15 meters wide or more. The zones are designed, established and managed in a way approved by the (environmental) authorities. Riparian zones are especially necessary on fields that steeply slope down towards watercourses, on easily collapsing fields on the shores as well as fields on the shores that are frequently under the flood. In order to receive a premium, a farmer makes a contract of 5 or 10 years concerning the whole of the area. The compensation is determined according to the actual costs and income losses, in addition to compensation farmer gets an incentive of 30 %.

Wetlands and sedimentation ponds

The purpose of the establishment and management of wetlands and the flood areas connected to these as well as sedimentation ponds is to slow down the water flow and increase the delay resulting in better in sedimentation. This also reduces the erosion of the beds of ditches and brooks and contributes to the sedimentation and removal of soil particles and nutrients in water. The measure also enhances biodiversity and diversity of landscapes, helps to restore biotopes that have disappeared from arable areas due to drainage measures. The establishment of sedimentation ponds, wetlands and flood meadows must be based on a special plan. The support for the management of existing sedimentation ponds, wetlands and flood meadows is based on commitments made for 5 or 10 years, in which the amount of support is established according to the type and amount of the management measures.

Other methods for the treatment of runoff water

The objective is to recycle the ditch water flowing from arable areas back to the fields to be utilised by the plants. This prevents the leaching of nutrients to watercourses and returns the nutrients dissolved in the water back to the soil where they are again available for the plant roots. The measures that are eligible for the support are controlled subsurface drainage, controlled irrigation and recycling of drainage water. Controlled subsurface drainage refers to subsurface drainage where the efficiency of the drainage can be regulated. The control mechanism is usually installed in a control well in the collecting ditch. Controlled irrigation is a combined irrigation and drainage method, utilising the open and subsurface drainage systems. Recycling of drainage water refers to the storage of runoff water from the arable area during the spring runoff and heavy rains into a special reservoir, from which it is again conducted to the arable land during dry periods. The measure is implemented on the basis of a special plan.

Organic production

The organic production and conversion into it is supported in order to increase the share of the organic production to meet the demand for organic produced products. As a result of more accurate collection and utilisation of nutrients and the prohibition on the use of chemical fertilisers and plant protection products, the environmental load from organic production is lower than in conventional agricultural production. Support is paid to a farmer who has registered in the inspection system for organic production and has participated in the required training on organic production, provided that the farm has passed the first inspection and the

farmer follows the terms for organic production laid down in the Council Regulation (EEC) 2092/91. The support is paid on the basis of the commitment area.

Arable farming in groundwater areas

The objective is to reduce the use of nutrients, especially nitrogen, in groundwater areas. The measure is implemented in the whole country in parcels of arable land located in groundwater areas designated in classes I, II and III. The commitment period is 5 years. In order to receive the support a farmer has to practice arable farming in groundwater areas according to a separate plan. The restrictions on the cultivation are established by a commitment, depending on the conditions in the specific groundwater area. The restrictions may concern tillage, fertilisation and use of manure, use of plant protection products, set-aside and grazing.

Efficient use of manure

The objective of the measure is to increase the area used in manure application. This support is concentrated in regions of high livestock density. A farmer is eligible for support for receiving, handling and animal manure originating from another farm utilising in an environmentally appropriate manner, i.e. the provisions on the storage and use of animal manure must be complied with. Manure The amount of compensation is based on the arable area used for applying manure. The received manure must be spread on arable land as a fertiliser according to the eligibility criteria for agri-environmental support.

Traditional biotopes

The purpose of the management of traditional biotopes is to preserve and enhance the biodiversity of the flora and fauna in traditional biotopes and to maintain the rural cultural heritage and landscape values. Traditional biotopes have got rich biodiversity created by traditional land use, mainly mowing and grazing. The management and restoration of traditional biotopes is considered vital in order to maintain the biodiversity of the agricultural environments. The areas covered by the commitments must be well-managed and the measure should comprise as large a share as possible of the traditional biotopes classified as nationally or provincially valuable. A farmer has to manage and restore traditional biotopes located on the farm as laid down by a separate plan. The management measures may include mowing, grazing, pollarding and coppicing as well as clearing of trees and bushes. In addition to management measures concerning the vegetation the plan may include preservation and restoration of constructions related to animal husbandry located in the area concerned. Traditional biotopes may not be tilled, fertilised or treated with plant protection products.

Other measures to enhance biodiversity

The objective is to enhance biodiversity related to farming through preservation and management of animal and plant species and ecosystems characteristic of farming environments, genetic diversity of species as well as different types of natural habitats. The habitats of endangered species and other important sites in terms of the biodiversity in farming environments are of primary importance. Efforts are also made to increase the typical plants and animals in farming environments, promote game populations, and increase the number of valuable natural areas and improve their quality.

Improvement and management of landscape

The objective of the improvement and management of landscape is to increase the openness and diversity of farming landscapes, reinforce the special features of agricultural landscape as well as maintain and improve landscapes with particular historical, cultural and landscape values. A farmer has to manage and improve the farming landscape according to a separate

plan. The plan must include the special features and possible landscape damages in the area as well as the necessary measures for maintaining the openness and diversity of the landscape and for improving the special features. The measures may include thinning or removal of trees and bushes to open up the landscape, establishment of small wetlands, repair of landscape damages, improvement of the margin areas between arable land and forest, cultivation of landscape plants, restoration of constructions related to traditional agriculture (barn, stone wall etc.), or small-scale plantings.

Raising of local breeds

The objective is to secure the preservation of economically, scientifically and historically valuable local breeds, their special characteristics and the genetic variation of these characteristics. This also contributes to the maintenance of the biodiversity of the species of domestic animals.

Cultivation of local crops

The objective is to promote the *in situ* conservation of the genetic material of threatened and durable landraces and old cultivars, adapted to the Finnish climate, and the preservation of Finnish cultural heritage by supporting varietals research and maintenance of cereal and forage plant landraces and old cultivars.

Reduction of acidity in certain areas

The objective is to reduce the damages to watercourses caused by acid sulphate soil in designated water protection areas. Efforts are made, in particular, to reduce the acid runoff from arable areas, which cause serious damages to the fisheries, prevent the spawning of fish and crayfish as well as the normal development of the young, cause harmful changes in the water ecosystem and reduce its biodiversity.

4 Results of the research

4.1 Environmental impacts of the Agri-environmental Programmes

The need to get knowledge on environmental impacts caused by agriculture increased in the late 1980s, and an extensive research project called MAVERO was launch. Since then, there have been two large research projects MYTVAS 1 (1995-2000) and MYTVAS 2 (2000-06), which have analysed in detail the environmental effectiveness of Finnish agri-environmental programme. The results of the MYTVAS studies were also used in the Mid-term evaluation of the Horizontal Rural Development Programme.

One of the main focuses of MYTVAS was to analyse the changes in cultivation practices in Finnish agriculture resulting from the Agri-environmental Support Scheme. Detailed data was collected by interviewing about four hundred farmers in four different areas of the county. The variable monitored were fertilization, storage and spreading of manure, winter green coverage, animal density, use of pesticides, soil tillage methods in autumn, management of set-a-side and filter strips, and recoverage of silage compressing liquids. The potential impact of changes in cultivation practices on nutrient loading was assessed by mathematical simulation model called ICECREAM model (Tattari et. al 2001). The results of the MYTVAS1 study have been reported in two intermediate reports (Grönroos et al., 1997; 1998) and in the final report (Palva et al., 2001). The MYTVAS2 study continued the previous study. The data is also collected by interviewing the farmers and on the parcel

specific book-keeping of the study farms. The first two reports have just been published: Cultivation measures in 2000-2003 and their effects to the nutrient runoff to the waters in the farms committed to the Agri-environmental Programme (Pyykkönen et al., 2004) and Significance of the Finnish agri-environmental support scheme for biodiversity and landscape (Kuussaari et al. 2004). The latter report consists of results of 10 projects that focused on 58 agricultural landscapes in southern Finland. Sampling of the occurrence of plants, insects and birds produced a large quantitative dataset concerning variations of species and habitat diversity. The above mentioned MYTVAS publications are available (in Finnish with English abstract) in the internet: www.ymparisto.fi/julkaisut.

The most important issue in water protection is the reduction of nutrient runoffs, which is implemented by reducing the use of nutrients and preventing soil erosion. According to MYTVAS1 study the Agri-environmental Programme has developed the farming practices towards more environmentally sound practices. The use of fertilizers has decreased, especially in the case of phosphorus. In addition, livestock densities have decreased. It has been estimated that the use of nitrogen fertilisers has decreased 10 % and phosphorus fertilisers 15-45 % in 1995-99. As a result nitrogen runoffs have decreased 4-15 % and phosphorus runoffs 5-13 %. As regards to nutrient balances there has been a clear positive trend. However, the reduction of nutrient (fertiliser and manure) use is not only because of agri-environmental program. The decrease of agricultural product prices has also reduced the economic profitability of using fertilisers. Furthermore, the greatest reduction in the use of fertilisers occurred already in the beginning of the 1990s and during the previous program period in 1995-1999.

According the MYTVAS2 study, many of the environmentally positive changes in cultivation practices were maintained in 2000-2002. Fertilizers were used complying with the rules of the Scheme. However, manure was mainly applied according to its nitrogen concentration and therefore in many cases the amount of phosphorus applied exceeded the maximum levels. Also it was quite common to use fertilizers based on the oversized yield estimates. As regards to nutrient balances, surpluses are still considerable. It is estimated that nitrogen surplus is 50-70 kg/ha. In 2002 the average use of nitrogen was 138 kg/ha and that of phosphorus was 10 kg/ha. In the current program period the use of nitrogen has fallen by 2.6 % and that of phosphorus by 7.1%. As a part of MYTVAS2 study, potential nutrient runoff to the waters from the fields in several study areas was assessed by an expert team. They did not observe any significant decrease on potential nutrient loading in 2000-2002.

The erosion of soil particles occurs mainly as surface runoff. The means to prevent erosion include headlands, filter strips and riparian zones covered by permanent crops, plant cover on cultivated area outside the growing season and cultivation of perennial crops. Permanent plant cover is highly efficient in preventing the movement of the soil particles. The effectiveness of filter strips and riparian zones in reducing erosion and nutrient runoffs depends on the relative width of the filter strip and cultivated land above it, the susceptibility of the soil to erosion and the slope of the field. The width of the filter strips and riparian zones should be increased considerably. For example, in 2002 the sufficient riparian zones in some of the catchment areas were only 26 % of the observed needs. The average width of riparian zones, to sufficiently cover the need, was estimated to be 25 metres, while the average width is currently 15 meters.

Cultivation of permanent crops would be important for preventing soil erosion. However, their share has been decreasing steadily. In year 1995 the share was 34 %. In 2002 perennial

crops were cultivated on only 29 % of the area covered by the agri-environmental program. Instead, the plant cover outside the growing season -measure has become increasingly popular. In preventing erosion, however, this is not the best possible development because the measure can be implemented by reduced tillage.

According to the MYTVAS2 study, the use of herbicides has increased in current program period. There are several reasons for this. The need for weed control has increased due to e.g. reduced tillage, decrease in the grass area and establishment of filter strips. The use of no-till or direct sowing method is likely to increase both the use of herbicides and fungicides in the future.

Although, the main emphasis of the agri-environmental support is on water protection, measures are also targeted at preserving biodiversity and cultural landscapes. According to MYTVAS 2 study, measures introduced under the agri-environmental Schemes have contributed to the preservation of farmland biodiversity, but current measures are not likely to be sufficient to stop the negative effects caused by the long continued development towards less and less diverse farming practices. With regard to landscape, the environmental support measures have significant impacts on the landscape as they ensure the preservation of open farming landscape and continuation of agriculture.

During the Programme, at least 5 000 manure containers have been built. Manure container investments as well as more careful handling of manure, covering of manure heaps, and increased precision in manure application have decreased ammonium emissions. The decrease of nitrogen fertilization may have reduced nitrous oxide emissions. Efforts have also been made to increase the area used for manure spreading. The number of manure spreading contracts has more than doubled from the end of the previous program period. However, the contracts have not always been targeted to areas where the need would be the greatest. Livestock production is concentrated to certain regions and as a result there have been manure surpluses.

4.2 Socio-economic issues

Willingness of farmers to participate in agri-environmental programmes

The General Protection Scheme of the 1995-1999 Programme became the most important environmental policy measure in agriculture. Since 90 % of farmers joined the Programme and it covered over 95 % of agricultural land, the participation well exceeded the target. However, farmers' interest in joining the Scheme was not due to changes in their environmental values, but rather Programme's function as a support system compensating farmers for the lower prices of agricultural products (see e.g. Kaljonen, 2000; Kröger, 2002; Tamminen, 1997). According to Siikamäki's study (1996: 28) farmers consider the environmental subsidies as an important source of income, in fact, for some farmers the agri-environmental support is a prerequisite for the continuation of farming. According to Tauriala's study (1995), the majority of farmers considered the requirements for receiving environmental subsidies to be moderate. Furthermore, 27 per cent of the respondents said that the costs and loss of income due to the environmental requirements had been larger than the sum of environmental support they received.

Farmers' profitability

The 1995-1999 agri-environmental program had a significant economic impact on the Finnish agriculture, especially in Southern Finland (support regions A and B, in which LFA support was not paid in programme period 1995-1999). For example, in 1996 and 1997 in support region A (Southern Finland) the share of agri-environmental support of farm income in cereal farms was 50 % and 70 %, respectively (Siikamäki, 1997).

Economic significance of the current (2000-2006) agri-environmental program differs from the previous one in the sense that the payment level for basic measures is same throughout the country and it is differentiated only between crop farms and animal husbandry farms. In the previous program payment levels were differentiated between regions.

Koikkalainen and Lankoski (2004) have analysed the economic significance of agri-environmental support in different support areas and production lines based on FADN bookkeeping data in the years 2000 and 2001. Their study assesses the share of basic environmental support and the share of special environmental support of total return, total support and farm income. Their results regarding year 2001 show that in total return the basic environmental support constitutes 8-11% in cereal farms, 3-4% in hog farms, 5-6% in dairy and cattle farms, and 8% in horticultural farms. The share of basic environmental support in farm income is the highest in horticultural (67.5%) and cereal farms (35.8%). Special environmental support represents 1-5% in total return and 3-23% in farm income in those farms, which participate in special environmental support program.

Social profitability

In addition to farm level economic significance the agri-environmental support has been profitable at the society level. According to Vehkasalo (1999) the overall benefits of the programme outweigh the costs with benefit-cost ratio 2. The current value of the benefit brought to the society by the agri-environmental programme of 1995-1999 has been estimated to be FIM 11.6-17.6 billion, depending on the reduction in nutrient load, and the costs has been estimated to be FIM 5.5 – 7.7 billion (see Vehkasalo 1999).

By using farm level model Lankoski et al. (2004) compare the social returns of alternative farm income support, environmental cross-compliance as well as agri-environmental payments based on Finnish agricultural and environmental conditions. Their analysis shows that current agri-environmental program performs quite well in terms of social welfare. However, uniform fertilizer restrictions that do not take into account the productivity differences between different production regions reduce the social welfare estimate of current program in comparison to social optimum. Moreover, their analysis shows that environmental cross-compliance measures perform even better in terms of social welfare estimate (and with less budget outlays than in the case of current agri-environmental program).

Transaction costs

To date there is no estimation of administrative costs related to Finnish agri-environmental program. However, the aim in the ongoing research project “Multifunctional agriculture and policies” (which is financed by the Ministry of Agriculture and Forestry) is to assess both the administrative costs and farmers’ transaction costs related to multifunctional policies and agri-environmental payments.

Contract analysis

Vehkasalo et al. (1999) have analysed Finnish agri-environmental program from the viewpoints of imperfect and asymmetric information. According to their results the standard agency problems of adverse selection and moral hazard are present in the voluntary environmental program such as Finnish agri-environmental program. They propose that agri-environmental payments should be differentiated on the basis of the potential environmental benefits provided by different field parcels so that e.g. parcels located near watercourses face stricter fertilization requirements but also higher payments. They conclude that a more auction-based contracting system would be more efficient in this respect.

Kröger (2002) analysed Farmers’ views on participation and environmental policy instruments with a survey research that was based on the theoretical framework of participatory planning. The purpose of the study was to find new kinds of voluntary co-operative and participatory practices. The results show that farmers consider co-operation and local level decision-making as very important elements in successful agri-environmental policy implementation.

4.3 Other research

In the early 1990s several studies on agri-environmental policy issues were carried out. These studies concerned, for example, environmental issues in Finnish national agricultural policy (Vainio-Mattila, 1990), environmental policy instruments in agriculture (Sumelius, 1992; 1994; Miettinen 1994; Aakkula and Lankoski, 1994), farmers’ attitudes towards nature (Pirttijärvi, 1992), research approaches for agriculture and environment (Luoma, 1993) and agricultural policy planning processes and the environmental impact assessment (Valve, 1995). A comprehensive sociological research on the Finnish agri-environmental policy in 1970-1994 was carried out by Jokinen (1995). Since the membership of the EU numerous studies have been carried out on different aspects of the Finnish Agri-environmental Scheme. For example, while Jokinen focused on the policy formation at the central governmental level (Jokinen, 1997, 2000, 2002; Niemi-Iilahti and Jokinen, 1999) and Soini and Tuuri (2000) on implementation at the regional level, Kaljonen (2000, 2002) analysed the Finnish agri-environmental policy from the local level dimension. The challenges of the integration of biodiversity issues into agri-environmental schemes have been analysed by Aakkula (1996), Heikkilä (2001) and Yliskylä-Peuralahti (2003).

5 References

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