Organisation for Economic Co-operation and Development
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ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN OECD COUNTRIES SINCE 1990:

Finland Country Section

This country section is an extract from chapter 3 of the OECD publication (2008) ***Environmental Performance of Agriculture in OECD countries since 1990***, which is available at the OECD website indicated below.

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A summary version of this report is published as ***Environmental Performance of Agriculture: At a Glance***, see the OECD website which also contains the agri-environmental indicator time series database at: http://www.oecd.org/tad/env/indicators

TABLE OF CONTENTS OF THE COMPLETE REPORT

BACKGROUND TO THE COUNTRY SECTIONS

Structure

This chapter provides an analysis of the trends of environmental conditions related to agriculture for each of the 30 OECD member countries since 1990, including an overview of the European Union, and the supporting agri-environmental database can be accessed at *www.oecd.org/tad/env/indicators*. Valuable input for each country section was provided by member countries, in addition to other sources noted below. The country sections are introduced by a figure showing the national agri-environmental and economic profile over the period 2002-04, followed by the text, structured as follows:

- ***Agricultural sector trends and policy context:*** The policy description in this section draws on various OECD policy databases, including the *Inventory of Policy Measures Addressing Environmental Issues in Agriculture* (*www.oecd.org/tad/env*) and the Producer and Consumer Support Estimates (*www.oecd.org/tad.support/pse*).
- ***Environmental performance of agriculture:*** The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).
- ***Overall agri-environmental performance:*** This section gives a summary overview and concluding comments.
- ***Bibliography:*** The OECD Secretariat, with the help of member countries, has made an extensive search of the literature for each country section. While this largely draws on literature available in English and French, in many cases member countries provided translation of relevant literature in other languages.

At the end of each country section a standardised page is provided consisting of three figures. The first figure, which is the same for every country, compares respective national performance against the OECD overall average for the period since 1990. The other two figures focus on specific agri-environmental themes important to each respective country.

Additional information is also provided for each country on the OECD agri-environmental indicator website (see address above) concerning:

- Details of national agri-environmental indicator programmes.
- National databases relevant to agri-environmental indicators.
- Websites relevant to the national agri-environmental indicators (*e.g.* Ministries of Agriculture)
- A translation of the country section into the respective national language, while all 30 countries are available in English and French.

Coverage, caveats and limitations

A number of issues concerning the coverage, caveats and limitations need to be borne in mind when reading the country sections, especially in relation to making comparisons with other countries:

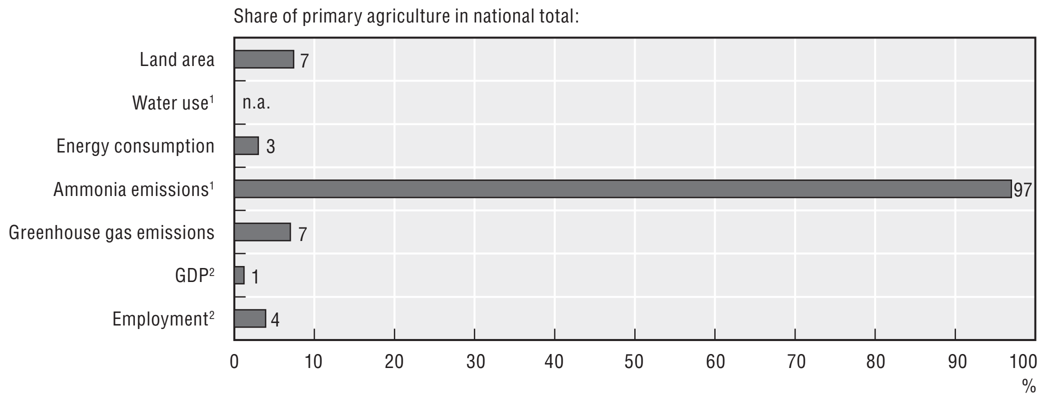
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes in environmental conditions on agriculture (*e.g.* native and non-native wild species, droughts and floods, climate change); the impact of genetically modified organisms on the environment; or human health and welfare consequences of the interaction between agriculture and the environment.

Definitions and methodologies for calculating indicators are standardised in most cases but not all, in particular those for biodiversity and farm management. For some indicators, such as greenhouse gas emissions (GHGs), the OECD and the UNFCCC are working toward further improvement, such as by incorporating agricultural carbon sequestration into a net GHG balance.

- ***Data availability, quality and comparability*** are as far as possible complete, consistent and harmonised across the various indicators and countries. But deficiencies remain such as the absence of data series (*e.g.* biodiversity), variability in coverage (*e.g.* pesticide use), and differences related to data collection methods (*e.g.* the use of surveys, census and models).
- ***Spatial aggregation*** of indicators is given at the national level, but for some indicators (*e.g.* water quality) this can mask significant variations at the regional level, although where available the text provides information on regionally disaggregated data.
- ***Trends and ranges in indicators***, rather than absolute levels, enable comparisons to be made across countries in many cases, especially as local site specific conditions can vary considerably. But absolute levels are of significance where: limits are defined by governments (*e.g.* nitrates in water); targets agreed under national and international agreements (*e.g.* ammonia emissions); or where the contribution to global pollution is important (*e.g.* greenhouse gases).
- ***Agriculture's contribution to specific environmental impacts*** is sometimes difficult to isolate, especially for areas such as soil and water quality, where the impact of other economic activities is important (*e.g.* forestry) or the "natural" state of the environment itself contributes to pollutant loadings (*e.g.* water may contain high levels of naturally occurring salts), or invasive species that may have upset the "natural" state of biodiversity.
- ***Environmental improvement or deterioration*** is in most individual indicator cases clearly revealed by the direction of change in the indicators but is more difficult when considering a set of indicators. For example, the greater uptake of conservation tillage can lower soil erosion rates and energy consumption (from less ploughing), but at the same time may result in an increase in the use of herbicides to combat weeds.
- ***Baselines, threshold levels or targets for indicators*** are generally not appropriate to assess indicator trends as these may vary between countries and regions due to difference in environmental and climatic conditions, as well as national regulations. But for some indicators threshold levels are used to assess indicator change (*e.g.* drinking water standards) or internationally agreed targets compared against indicators trends (*e.g.* ammonia emissions and methyl bromide use).

3.7. FINLAND

Figure 3.7.1. **National agri-environmental and economic profile, 2002-04: Finland**



StatLink http://dx.doi.org/10.1787/300081400114

1. Data refer to the period 2001-03.
2. Data refer to the year 2004.

Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

3.7.1. Agricultural sector trends and policy context

Primary agriculture's contribution to the economy is small and declining, accounting for 1.2% of GDP and 3.9% of employment in 2004 [1] (Figure 3.7.1). Agricultural productivity improved at around 1% annually between 1992 and 2003, with production remaining about stable (reflecting rising crop production largely offset by declining livestock output) and reduced input use [1, 2, 3, 4]. The intensity of farming has diminished with the area farmed over the period 1990-92 to 2002-04 declining by 12%, one of the largest decreases across the OECD, with even larger reductions in purchased farm input use: nitrogen (–20%) and phosphorus (–60%) inorganic fertilisers; pesticides (–9%); and on-farm direct energy consumption fell by 12% (Figure 3.7.2).

Finland's accession to the EU in 1995 brought major price and structural changes to farming [1, 2, 3, 4]. In 1995 while producer prices declined by 40-50%, although for milk the reduction was 15%, the decrease in input prices was less dramatic [1, 3, 4]. Also the average farm size has increased as their number declined, and a third of farmers are full time. The climate limits farm production, and the share of agricultural land is only 7% of the total land area, among the lowest share across the OECD, with crop production largely in the south, whereas livestock farming is concentrated in the central, eastern and northern regions [1, 5]. As agriculture is largely rain-fed, use of total water resources is extremely limited with irrigation, mainly for vegetables, accounting for only 4% of total farmland in 2000 [6, 7].

Farming is mainly supported under the Common Agricultural Policy (CAP) with support also provided through national expenditure within the CAP framework. Support to EU farmers has on average declined from 41% of farm receipts in the mid-1980s to 34% in 2002-04 (as measured by the OECD Producer Support Estimate – PSE) compared to the 31% OECD average. Nearly 70% of EU support to farmers is still output and input linked (compared to over 90% in the mid-1980s), which are the forms of support that most encourage production intensity. Finnish accession to the EU brought a considerable reduction in farm support with the EU PSE 50% compared to 67% for Finland in 1994 [8]. Finland's national expenditure to support farming was around EUR 1.0 (USD 1.25) billion and in conjunction with EU co-financing amounted to EUR 1.8 (USD 2.25) billion in 2004 of which about a third is allocated to agri-environmental schemes [1]. Agri-environmental support accounted for a third of total government environmental expenditure in 2004 [9].

Agri-environmental policies seek to reduce environmental damage and promote biodiversity and landscape conservation. The main agri-environmental measure is the Horizontal Rural Development Programme (HRDP, 2000-06) based on the EU Rural Development Programme [10, 11], with a new *Rural Development Strategy and Programme for 2007-13* approved by the EU Commission in June 2007. The key emphasis of the HRDP is on water protection, but measures also aim to limit air pollution, reduce pesticide risks, and promote conservation of biodiversity and cultural landscapes [12]. The HRDP consists of mandatory basic and additional measures (*general schemes*) and special measures (*specific schemes*). *General schemes* provide payments (EUR 259 [USD 324] million in 2004) for the adoption of nationwide agri-environmental practices, such as nutrient and pesticide management plans, creation of filter strips, and biodiversity and landscape conservation, with payments varying per hectare per year from EUR 93 (USD 116) for arable crops, EUR 117 (USD 146) for livestock farms, and EUR 333-484 (USD 416-605) for horticultural crops. Over 90% of working farms and cultivated area were covered by general schemes in 2004 [1], with 5% of farms receiving this support monitored to verify that the required measures are being adopted by farmers [6]. *Specific schemes* are more focused and are only provided if commitments under the general schemes have been applied by a given farmer. They provide payments (EUR 39 [USD 49] million in 2004) for covering investment and maintenance costs, such as the establishment of riparian buffer zones and wetlands, and promoting organic farming. The government has set a target to increase the area under organic farming to 15% of farmland by 2010, with 7% of agricultural land under organic management by 2004 [5].

Agriculture is influenced by national environmental and taxation policies. There are a number of measures that have economy-wide objectives to reduce eutrophication of water courses [13]. *Water Protection Targets* for 2005 set a 50% reduction target from 1991-95 levels for both nitrogen and phosphorus loads from agriculture. As these targets were not met, a new target for 2015 was agreed in 2007, seeking to reduce nitrogen and phosphorus loads from agriculture by 30% from 2002-05 levels. Under the *Environmental Protection Act* (2000) large-scale agricultural activities may undergo an Environmental Impact Assessment (EIA). The *Water Services Act* (2004) implements the EU *Water Framework Directive*, which for farming involves control of nutrient emissions under the EU *Nitrates Directive*, with action plans established at the water catchment level [1, 14]. A pesticide tax is levied on the pesticide industry, rather than farmers, averaging EUR 2 (USD 2.5) million annually to cover the administrative costs of registering new pesticides and improving pesticide productivity [9, 15, 16]. A tax on phosphorus fertiliser was introduced in 1990, but abolished in 1994 in preparation for entry into the EU [10]. Policies promoting wood fuel production and agri-environmental management were implemented jointly in the early 1990s to assist rural areas and increase bioenergy production, especially as forestry is an integral part of farming with 95% of working farms having forests [17]. Payments are provided for production of energy crops (*e.g.* reed canary grass – *Phalaris arundinacea*) at EUR 45 (USD 56) per hectare [1]. Producers receiving farm support are entitled to reimbursement of energy (including fuel and electricity) and carbon dioxide taxes [16, 18], which was around EUR 245 (USD 304) per farm, equal to nearly EUR 16 (USD 20) million of budget revenue forgone in 2005.

International environmental agreements important to farming include [9]: those seeking to curb nutrient emissions and pesticides into the Baltic Sea (*HELCOM Convention*) [13]; the *Gothenburg Protocol* concerning ammonia emissions; greenhouse gases (*Kyoto Protocol*); and commitments under the *Convention of Biological Diversity*.

3.7.2. Environmental performance of agriculture

The main agri-environmental issues are water pollution and biodiversity conservation. Water pollution from the run-off and leaching of excess farm nutrients is a major source of degradation of aquatic ecosystems in both inland surface water and marine waters, and to a much lesser extent pesticides. Other agri-environmental issues of importance, include soil quality, emissions of ammonia and greenhouse gases, and conservation of cultural features in agricultural landscapes.

Soil erosion is primarily a concern for its off-farm impacts as a carrier of nutrients to water bodies. Soil water erosion is within the tolerable range and is usually under 1 tonne/hectare/year, reaching a maximum of 3 tonnes/hectare/year in some south-western areas [6, 19]. Although erosion rates are low it is a key factor affecting the quality of water as soil particles transport nutrients, especially phosphorus, to water bodies causing eutrophication and algal blooms [6, 19, 20]. With about 30% of arable land under plant cover or reduced tillage this has led to a decrease in the areas with the highest rates of erosion [6]. But research has shown that with mild winters over the past 20 years in Finland, nutrient loadings into water bodies were substantial and tended to override load reductions from decreased autumn tillage and increased use of green cover [20]. Greater adoption of low till has led to a rise in pesticide use, and potentially an increase in water pollution from their use, because of the need to use pesticides (Glyphosate), as perennial weeds are more abundant under low till than conventional tillage. However, besides reducing soil erosion and sediment bound nutrients, there are other environmental benefits from low till, such as greater soil carbon sequestration and habitat conservation for wild species [21].

The main focus on controlling water pollution has been on agriculture recently, since the control of urban and industrial pollution is well developed. For example, over 95% of phosphorus is removed from wastewater treatment plants [19]. Overall environmental pressure on inland and marine water quality has eased as there has been a substantial reduction of farm pollutants, largely nutrients (nitrogen and phosphorus) and pesticides. But while emissions have been lowered eutrophication of water continues and the state of water bodies has not improved over the past decade [1, 10].

There has been a substantial reduction over the past 15 years in agricultural nutrient surpluses (input minus output of nutrients, nitrogen – N – and phosphorus – P), among the highest reduction across OECD countries. The decrease in the quantity of nutrient surpluses was more significant for P (–65%) compared to N (–42%), with nutrient surpluses per hectare of agricultural land now below both EU15 and OECD average levels (Figure 3.7.2). As a result of these changes there has been a considerable improvement in nutrient use efficiency (*i.e.* ratio of N/P output to N/P input), and while N use efficiency is now similar to the EU15 and OECD averages, for P use efficiency it is lower. The reduction in nutrient surpluses has been mainly due to the large reduction in nutrient inputs – inorganic fertiliser use and livestock numbers (*i.e.* less manure) – compared to a much smaller rise in nutrient uptake from crops and pasture. Over 90% of agricultural land was under a nutrient management plan in 2001-04, which includes conducting a soil nutrient test on farms once every 4 to 5 years.

Eutrophication of water has become the most serious environmental problem caused by agriculture [10]. Farming remains the single most important source of nutrient loading into water bodies, accounting for around 50% of N and 60% of P [1, 9]. A study for the period 1993 to 1998 estimated that agriculture's N contribution to river catchments varied from 35-85% in the intensively farmed south-west to 0-25% in the north [22]. The proportion of slightly eutrophic waters has increased and signs of early eutrophication have been pronounced in many small rivers, lakes and the Baltic Sea [9, 10, 23]. A study concluded that, annual variation notwithstanding, there has been little or no decrease in nutrient loadings into lakes from agriculture in southern Finland during the period 1976 to 2002 [23]. It is estimated that around 2% of shallow wells (and 1.5% of aquifers) in agricultural regions contained nitrates in excess of drinking water standards in 2002 [6]. The Gulf of Finland is one of the most eutrophied sub-basins of the Baltic Sea with a marked increase in algal blooms and dead zones, and nutrient loadings 2-3 times above that of the Baltic Sea average, although Finland is not among the major polluters of the Baltic Sea [10, 24, 25]. The share of Finnish agriculture in the total Finnish N (P) load into the Gulf of Finland rose from 31% (35%) in 1986-90 to 35% (48%) by 1997-2001, and while the quantity of agricultural N has increased over this period, for P it has declined [6].

Despite large reductions in nutrient surpluses this has not yet led to improvements in water quality (Figure 3.7.3). One reason for this is that caution is required in linking changes in nutrient balances to loading of nutrients into water, because of the importance of other factors, for example, nutrient management, crop rotations, and soil drainage systems [26]. Another reason is the long time lags of reductions in external nutrient loads showing up in changes in water quality because of the accumulation of nutrients in soils, especially for P [27]. Moreover, an increasing share of green set aside land has been converted to cereal production which has resulted in higher P losses [28], and there has been a decrease in the area of perennial vegetation from 34% to 28% of farmland between 1995 and 2002, which is important to slow soil erosion and the transport of nutrients into water [6, 28]. Also restrictions on the timing of manure applications and the pressure of time for farmers in the spring has led to them to spread manure on fields close to the farm, which already have high nutrient levels, rather than more distant fields with lower nutrient levels [17]. This problem is being accentuated with the trend toward the regional concentration of livestock production [17].

Pesticide use rose from the mid-1990s to 2003, although over the period 1990-92 to 2001-03 use declined by 9% (Figure 3.7.2) [1, 9]. The main reasons for the increase in pesticide use is due to the: wider adoption of reduced tillage and direct sowing; an increase in the arable area since the mid-1990s; establishment of buffer strips (and enlarged field boundaries); and a shift to pesticides that are used in larger doses [1, 9, 10, 21]. This trend has to some extent been offset by the major increase in the area under organic farming rising from a share in agricultural land area of less than 2% in the mid-1990s to over 7% in 2004, among the highest share across OECD countries. The intensity of pesticide use is low compared to many OECD countries, mainly because of climatic conditions, especially colder winters, which limit pest populations. As a result the detection of pesticides in watercourses is infrequent and low, with an estimated 0.1-1% of active substances causing water pollution [10], although there is not yet regular monitoring of pesticides in water courses.

Agricultural ammonia emissions decreased by 13% between 1990-92 and 2001-03, a rate of reduction higher than achieved for the EU15 on average (–7%) (Figure 3.7.2). Farming accounts for almost all ammonia emissions (97% in 2001-03), largely from manure management and inorganic fertiliser use. The reduction of nitrogen fertilisers and livestock numbers over the past 15 years has been the main reasons for the decline in emissions. Finland has agreed to cut total ammonia emissions to 31 000 tonnes by 2010 under the *Gothenburg Protocol*, and by 2001-03 emissions totalled 33 000 tonnes, so a further 7% cut will be required to meet the target. While it is likely that the reduction in farm ammonia emissions has contributed to an overall decline in acidifying pollutants, easing pressure on ecosystems (terrestrial and aquatic) sensitive to excess acidity, there is little research or data on this issue.

There was a 14% decline in agricultural greenhouse gas (GHG) emissions between 1990-92 and 2002-04 (Figure 3.7.2). This compares to the 12% growth in GHG emissions from other sources across the country over this period, and a reduction in EU15 agricultural GHG emissions of 7%. The Kyoto commitment requires Finland under the EU *Burden Sharing Agreement* to stabilise total GHG emissions at 0% by 2008-12. In 2000-02 farming accounted for 10% of total GHG emissions, mainly methane and nitrous oxide [1, 29]. Agricultural emissions reductions are largely a co-benefit from decreasing nutrient loadings into the environment, including lower livestock numbers, reduced use of fertilisers, and improved manure management [29]. Even so, the increase in livestock numbers reared in slurry-based manure management systems, compared to solid storage or pasture, has led to a slight rise in methane but a reduction in nitrous oxide emissions. With the projected continued contraction of farming, the downward trend of agricultural GHGs is expected to persist up to 2010 [29]. ***Carbon sequestration in agricultural soils*** has the potential to reduce GHG emissions. With the increase in low tillage on cropland there was a small rise in GHG removals between 1990 and 2003 [29].

The reduction in on-farm energy consumption of –12% compared to a rise of 18% across the economy over the period 1990-92 to 2002-04 has also helped to lower GHG emissions, with agriculture accounting for 3% of total energy consumption (Figure 3.7.2). In 2005 the first large-scale agricultural biogas power plant was opened in Vehmaa, processing liquid manure from 20 pig farms [1]. In 2006 there were 17 000 hectares of energy crops, which is less than 0.5% of total arable land, but the area is expanding rapidly. Research suggests that production of reed canary grass for bioenergy, for example, is only profitable if located between 50-100 kilometres from the energy plant, but could provide environmental benefits not only in terms of lower GHG emissions, but also by reducing nutrient run-off and by replacing the use of peat for energy [3, 30].

The state of farmland biodiversity deteriorated over the period 1990 to 2004 [1, 31, 32, 33, 34]. There are, however, positive signs that recently the pressure from farming on biodiversity are easing, for example, for butterfly species (see below). Protection of Finnish ***agricultural genetic resource diversity***, domestic plants and livestock breeds, combines both *in situ* and *ex situ* conservation [34, 35]. The diversity of most crop varieties and livestock breeds used in

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production increased over the period 1990 to 2002. All nine "endangered" and "critical" livestock breeds (cattle, poultry and sheep breeds) were by 2004 maintained under *in situ* conservation programmes, compared with only two in 1985, while for crops there are limited areas of *in situ* conservation for certain fruit, berries, cereals and grass varieties [34]. Finland contributes plant material to the Nordic Gene Bank, while the *National Animal Genetic Resources Programme* finalised in 2004, covers *ex situ* conservation for livestock [34, 35].

Overall there has been a reduction in the abundance and richness of wild species associated with agriculture [1]. Around 25% of Finnish wild flora and fauna species use agricultural land as habitat, with nearly 30% of endangered species found in farmed habitats [36]. A comprehensive evaluation of threatened species associated with farmland habitats in 1985, 1990 and 2000, showed an increasing number of species under threat across five taxonomic groups – *Lepidoptera* (*e.g.* butterflies and moths), *Coleoptera* (*e.g.* beetles), *Hymenoptera* (*e.g.* bees, ants), vascular plants (*e.g.* ferns) and macro-fungi – although the increase was partly due to improved monitoring [31]. Moreover, the latest survey in 2000 showed a rise in the number of threatened species that was higher than in earlier years [37]. There is, however, great variation in the numbers of threatened species across different types of farmland habitats, with almost 50% of them species of dry meadows, and a further 25% found on marginal agricultural habitats, such as field boundaries and field and forest margins [31]. About 20% of all endangered plant species are found in agricultural habitats, but around 60% of these species are threatened by the disappearance of pasture or forest pastures following the cessation of grazing and mowing [33, 38].

Overall populations of many farmland birds also declined from the late 1970s to 2005, although this masks trends of individual species, as some bird species numbers have risen [33, 37]. The decrease in numbers of certain bird species is of particular importance as Finland is host to some of the largest European populations of the threatened ortolan bunting (*Emberiza hortulana*), northern wheatear (*Oenanthe oenanthe*) and whinchat (*Saxicola rubetra*) [39]. The deteriorating trend in bird populations on farmland habitats is also apparent for other species, including insect pollinators, and dung beetles [33, 40]. For butterflies, however, monitoring data for the period 1999 to 2006 indicate an increase in grassland and field margin butterfly species (Figure 3.7.4).

Changes in the quality of semi-natural farmed habitats is a key reason for the decline in wild species linked to agriculture [1, 31, 33]. But other factors are also important in leading to adverse impacts on wild species including: changes in cropping patterns (*e.g.* increase in the area of spring cereals and reduction of winter cereals); greater use of sub-surface drainage which has led to the removal of ditches [1, 39]; effects of pesticides; and the lack of economic incentives for farmers to provide ecosystem services [41]. During the 1990s up to 2004 the area of ***semi-natural extensive pasture*** increased by about 15 000 hectares less than 1% of the total agricultural land area in 2004, largely because agri-environmental payments have encouraged their conservation [6, 36]. But while the total area of pasture has expanded, there are concerns that its quality has diminished, including the fragmentation of pasture into patches, and diminution in the diversity of different types of pasture (*e.g.* loss of fen meadows, forested pasture) [36]. There has been a decrease in the area (number/length) of ***small scale habitats*** on farmland which serve as important habitats for wild species and can provide benefits in terms of the visual landscape. In particular, the loss of open ditches (due to the expansion of sub-surface drainage), small woodland patches within fields, and field boundaries (due to larger field sizes), have had adverse impacts on biodiversity and landscape [42, 43]. However, farmers have been given incentives since 1995 to maintain and develop buffer strips in agricultural landscapes [43, 44, 45]. It is estimated that around 60-90 000 hectares of ***peatland*** are currently in agricultural use, or about 4% of the farmland area [46, 47], with Finland one of the world's richest countries in terms of peatlands [48].

Cultural agricultural landscapes and agri-biodiversity have in general been adversely affected by a lack of grazing of extensive pastures [1, 33, 49]. Research has shown that there are positive effects from low intensity grazing for many plant species in semi-natural pastures in Finland compared to either discontinuing grazing or subjecting these habitats to high intensity stocking levels [50, 51]. For some plant species, including certain rare species, other factors were also important for their survival, such as mowing rather than grazing pasture, the timing of grazing, and the type and breed of grazing livestock [50, 52, 53]. But the increase in tree cover where grazing is discontinued can also be detrimental to plant species rather than the lack of grazing *per se* [51]. However, changes in the grazing system or its abandonment seem less important for bird than plant species [49]. For butterflies and moths where grazing was restored on abandoned pasture, there was little evidence of the colonisation of old pasture species in restored sites. Moreover, species richness and abundance of butterflies and moths was found to be greatest in abandoned pastures [54], and higher with low intensity compared to high intensity grazed pasture [55].

3.7.3. Overall agri-environmental performance

Despite the significant reduction in pollution from agriculture over the period since 1990, this has not been yet reflected in an overall improvement in the state of environment [1]. From 1990 to 2004 there were substantial reductions in nutrient surpluses and ammonia and GHG emissions, in most cases well below the changes for the EU15 and OECD average. While this has helped ease pressure on the environment, the quality of water in rivers, lakes and the Baltic Sea has not improved, but it must be noted, however, that Finland is only one of a number of countries polluting the Baltic. There has been an increase in pesticide use since the mid-1990s, but because of a lack of monitoring the potential impact of greater pesticide loadings on the environment is unclear, although the intensity of pesticide use remains low compared to many OECD countries. There has been a deterioration in the quality and quantity of wild species, and the habitats important to them, in agricultural landscapes, notably semi-natural grassland.

Environmental monitoring has a long history in Finland but tracking agri-environmental performance is more recent [56]. Indicators are used to evaluate the effectiveness of the *Strategy for the Sustainable Use of Renewable Natural Resources*, which encompasses agriculture [57, 58, 59].

Since joining the EU agri-environmental policies have been strengthened. A new agri-environmental support scheme for the period 2007-13 was approved by the EU Commission in June 2007 as part of the 2007-13 *Rural Development Strategy and Programme*. ***Changes in farming practices*** have brought various environmental benefits, such as low tillage helping to reduce nutrient pollution through lowering rates of soil erosion, and improvements in manure management leading to reduced nutrient loadings, ammonia and greenhouse gas emissions. Improved manure management practices has been a factor raising the efficiency of nutrient use, nevertheless, phosphorus use efficiency remains lower than that of many OECD countries. Deterioration of ***biodiversity*** in farming environments has continued, although there does appear to be some recent success in

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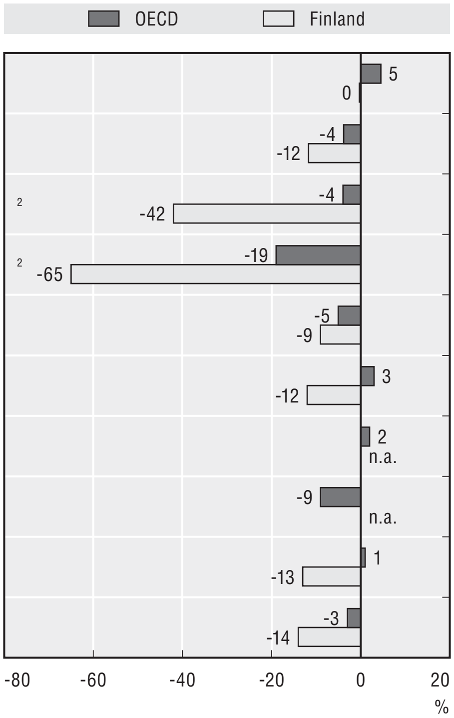
increasing the area of extensive semi-natural grasslands, towards the goal of 60 000 ha by 2010 [1]. But the trend toward greater sub-surface drainage has lead to the removal of ditches, which has been harmful for biodiversity dependent on small scale habitats.

While further improvements in agri-environmental performance are likely some environmental concerns remain. Projections of the agricultural sector to 2013 suggest a further contraction of sector, which is expected to lead to a further concentration of production on fewer and larger farms, while productivity will increase [60]. Some researchers consider there could be trade-offs between fewer but more concentrated and intensive agricultural production and environmental quality, especially stemming from the loss of semi-natural grasslands to non-agricultural uses [61, 62, 63]. Hence, a major challenge facing Finnish policy makers is the conservation of semi-natural grazed grasslands which are recognised as providing biodiversity and cultural landscape benefits.

The mid-term assessment of the Water Protection Targets concluded that even with the implementation of agri-environmental measures the nutrient reduction targets for 2005 could not be reached, despite progress in lowering agricultural nutrient surpluses [7, 25]. As a result of the 2005 target not being reached a new reduction target to 2015 was approved in 2007, seeking to reduce nitrogen and phosphorus loads from agriculture by 30% from 2002-05 levels. Moreover, the nutrients now stored in water bodies will continue to deteriorate water quality for many years, suggesting that action may be required for their recovery [1, 23], especially if Finland is to meet its international commitment to reduce nutrient loadings into the Baltic Sea. Exemptions for farmers from ***energy and climate change taxes*** act as disincentives to further limit on-farm energy consumption, improve energy efficiency and reduce GHG emissions [18]. Given the continuing deterioration of ***biodiversity*** for both flora and fauna [1], some researchers have noted that the uptake of biodiversity conservation by farmers under agri-environmental schemes has been low and the share of government agri-environmental expenditure (12%, between 2000 and 2003) is too low to adequately improve agri-biodiversity [64]. While on the one hand peat production and use of peatlands can have harmful impacts on biodiversity, GHG emissions and water systems, they can on the other hand provide economic and social benefits. The agricultural sector makes a positive contribution to meeting international environment agreement commitments to reduce *ammonia and greenhouse gas emissions*. The contribution of farming in cutting GHG emissions might be further enhanced with the cessation of the agricultural use of peatlands, which potentially could decrease agricultural sector GHG emissions by up to 10% [46].

Figure 3.7.2. **National agri-environmental performance compared to the OECD average**

Percentage change 1990-92 to 2002-04[1]



Absolute and economy-wide change/level

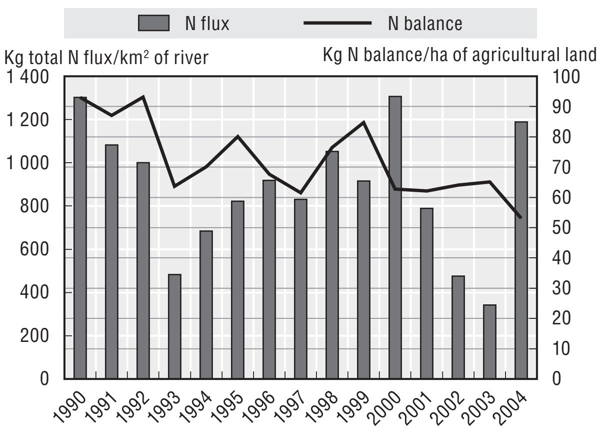
Variable	Unit		Finland	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	100	105
Agricultural land area	000 hectares	1990-92 to 2002-04	–298	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	55	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	8	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	–157	–46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	–104	+1 997
Agricultural water use	Million m^3	1990-92 to 2001-03	n.a.	+8 102
Irrigation water application rates	Megalitres/ha of irrigated land	2001-03	n.a.	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	–5	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	–922	–30 462

n.a.: Data not available. Zero equals value between –0.5% to < +0.5%.

1. For agricultural water use, pesticide use, irrigation water application rates, and agricultural ammonia emissions the % change is over the period 1990-92 to 2001-03.
2. Percentage change in nitrogen and phosphorus balances in tonnes.

Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

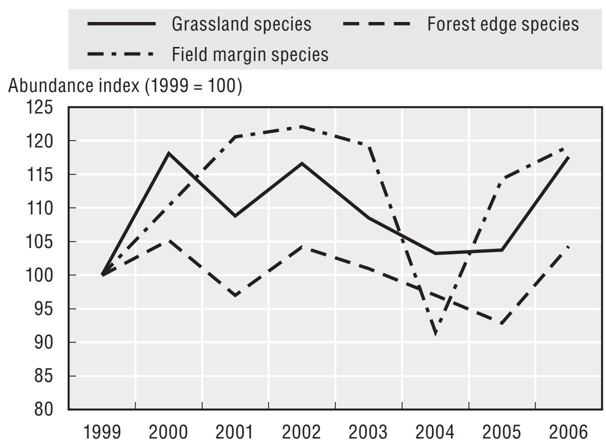
Figure 3.7.3. **Nitrogen fluxes in the Paimionjoki river[1] and agricultural nitrogen balances**



1. The Paimionjoki river is situated in the main agricultural area of Finland.

Source: Ministry of Agriculture and Forestry, Finland.

Figure 3.7.4. **Population trends of Finnish farmland butterflies in three ecological species groups**



Source: Heliola, J., M. Kuussaari and I. Niininen (2007), "Results of the butterfly monitoring scheme in Finnish agricultural landscapes for the year 2005", *Baptria*, Vol. 32 (in press).

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