



ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN OECD COUNTRIES SINCE 1990:

Luxembourg 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.

This text should be cited as follows: OECD (2008), *Environmental Performance of Agriculture in OECD countries since 1990*, Paris, France

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>

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Each of the 30 OECD country reviews (plus a summary for the EU) are structured as follows:

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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The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).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:

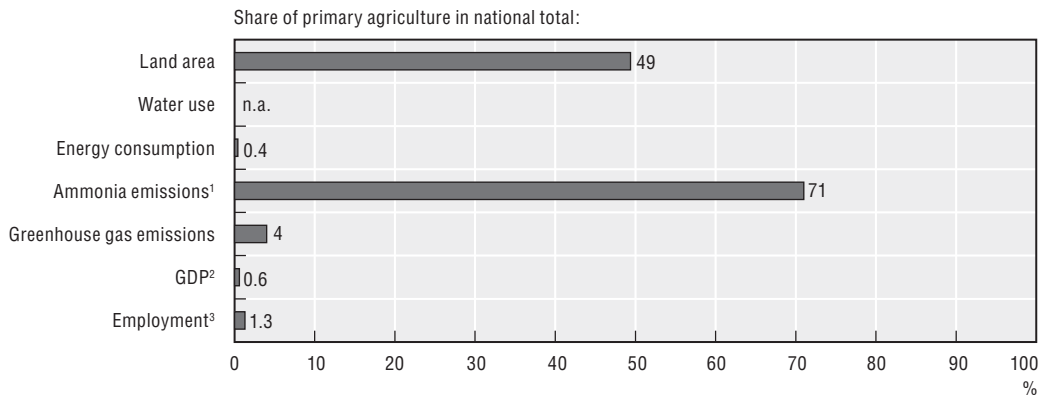
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes 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).

3.17. LUXEMBOURG

Figure 3.17.1. **National agri-environmental and economic profile, 2002-04: Luxembourg**



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

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

3.17.1. Agricultural sector trends and policy context

Agriculture's contribution to the economy has been small but stable in absolute terms since 1990, such that by 2003-05 the sector contributed 0.5% to GDP and 1.3% of employment, among the lowest shares across OECD countries [1] (Figure 3.17.1). While agricultural value added (annual growth at current prices) remained stable over the period 1990 to 2004 (allowing for temporary fluctuations), in real terms it increased over the period 1986 to 1998, but from 1998 to 2003 it was the only sector in the economy where growth declined by nearly 5% per annum [1, 2].

The area farmed increased by about 1.5% from 1990-92 to 2002-04, now accounting for over 50% of the total land area (Figure 3.17.2). Much of the increase in area cultivated was accounted for by the growth in area under pasture and maize silage, with the area under cereals declining [3, 4]. But some of the apparent expansion in area farmed is, in part, due to improvements in the land registration system linked to changes in agricultural policy. There was an increase in the production of bovine animals (for slaughterings and export of live animals) in the first half of the 1990s, and a slight decrease from 1996 onwards, especially in 2001 due to the BSE crisis. The production of pigs (for slaughtering and export as live animals) increased significantly in the 1990s and went through a cyclic variation from 1999 to 2004 reaching a minimum in 2002. Milk production was remarkably stable over the period 1990 to 2004, due to the EU-wide system of limitation of production. As the milk yield per cow has risen considerably during this period, the number of milk cows has declined [1].

Agriculture uses purchased variable inputs intensively, while the average farm size has increased since 1990. With the reduction in the number of farms (over 2 hectares) from about 3 300 in 1990 to 2 200 by 2005, the average farm size has risen sharply over this period from an average of about 38 hectares (1990) to over 70 hectares (2003-05) [3, 4]. Agriculture remains intensive by comparison with most OECD countries, with the use of some purchased variable inputs increasing since 1990, both pesticides and direct on-farm energy consumption (Figure 3.17.2), but the volume of inorganic fertiliser use declined (nitrogen and phosphorus) [4].

Farming is mainly supported under the Common Agricultural Policy, with additional national expenditure within the CAP framework. Support to EU15 agriculture has declined from 39% of farm receipts in the mid-1980s to 34% in 2002-04 (as measured by the OECD Producer Support Estimate) compared to the OECD average of 30% [5]. Nearly 70% of EU15 farm support is output and input linked, falling from over 98% in the mid-1980s. Annual agricultural budgetary expenditure (less CAP payments) was EUR 78 (USD 98) million in 2005, of which about 10% is for agri-environmental measures [1, 5].

Agri-environmental policies are mainly focused on reducing the intensity of farming and protecting biodiversity [1]. Nutrient policy under the EU Nitrate Directive started in 1997, with Luxembourg among the first of EU15 countries to develop an action plan to help those farmers to control nitrate pollution in Nitrate Vulnerable Zones. Under the *National Plan for Sustainable Development* (2001), the government established two key goals for agri-environmental policy up to 2010: first, to increase the area under organic management to 4 000 hectares or 5% of total agricultural land area; and second, to expand the area under agri-environmental schemes to 16 000 hectares or 20% of the total agricultural land area [6, 7]. The latter scheme includes measures for livestock extensification, establishing riparian buffer strips along stream and river courses, and biodiversity conservation, such as preserving hedges and hay meadows [1, 4].

Agriculture is impacted by national environmental and taxation policies. Under the *National Plan for Sustainable Development* (2001), the Plan recognises the need to protect soils (including in agriculture) against degradation, and restore the ecological functions of rivers [4, 8]. Farmers are provided an exemption on diesel fuel tax, but the budget revenue forgone from the concession is unknown [9]. To promote renewable energy production from agricultural biomass production, energy crops are provided support of EUR 45 (USD 56) per hectare, while investment grants are available to farmers for construction of biogas facilities of up to 60% of the total investment costs [1, 10, 11]. In addition, feed-in tariffs for electricity and heat produced from agricultural biomass are above average electricity tariff rates [10].

Some international environmental agreements have implications for agriculture. Agriculture is implicated by Luxembourg's commitment to reduce nutrients into the North Sea (*OSPAR Convention*), ammonia emissions (*Gothenburg Protocol*), and greenhouse gases (*Kyoto Protocol*), and also make commitments for biodiversity conservation under the *Convention on Biological Diversity* [4].

3.17.2. Environmental performance of agriculture

Overall the environmental pressure from agricultural activities have eased since 1990, but the intensity of farming remains high and pesticide and energy use have been rising. The key environmental challenges are to: continue to reduce water pollution from farm nutrients and pesticides; maintain soil quality; further reduce ammonia and greenhouse

gas emissions; and enhance biodiversity conservation efforts. As agriculture is largely rain-fed there is little use of irrigation.

In general soil erosion is not a concern across agricultural land, except for a few problem areas [8]. Current levels of soil erosion rates and other forms of soil degradation, however, are not very well known due to the lack of a national soil monitoring network, [8]. Overall soil erosion levels are low to moderate [8], while under agri-environmental measures the area under soil conservation practices (e.g. reduced tillage, erosion strips) has been increasing, reaching about 2% of agricultural land by 2003 [12].

The overall pressure from farming activities on water quality has been mixed since 1990. This is because agricultural nutrient surpluses have sharply declined, but pesticide use significantly increased since 1990. But determining the extent of agricultural water pollution is difficult due to the absence of pollutant monitoring stations in rivers, lakes and groundwater in predominantly agricultural areas. Some limited national data, however, indicates that over the period 1996-99 to 2000-03 eutrophication of surface water has deteriorated for nitrates but improved for phosphorus (Figure 3.17.3) [4, 7].

Agricultural nutrient surpluses decreased between 1990-92 and 2002-04, but surpluses per hectare of farmland remain amongst the highest in the OECD (Figure 3.17.2). Over this period surpluses (tonnes) of nitrogen fell by 43% and for phosphorus by 76%, mainly because of a reduction in inorganic fertiliser use (nitrogen and phosphorus) and livestock numbers (i.e. lower manure output); and the higher uptake of nutrients, largely because of the increase in fodder maize and pasture production. Despite the reduction in the total volume of nutrient surpluses, the intensity (kg of nutrient per hectare of agricultural land) remains high compared to EU15 and OECD averages. This is mainly due to the elevated livestock density and the high ratio of grassland in comparison to arable land in Luxembourg. Organic fertilisers (on grassland) have a lower efficiency than mineral fertilisers used in regions with a higher ratio of arable crops. By 2002-04 nitrogen surpluses were over 50% above the EU15 average and for phosphorus 10% higher, probably reflecting the orientation of agriculture towards animal production, compared to less intensive nutrient surpluses often associated with arable farming systems. Moreover, the efficiency of nitrogen use (based on the balance volume ratio of inputs to outputs) is below the OECD and EU15 averages, and for phosphorus slightly above.

Given the growth in pesticide use since 1990 environmental risks are likely to have increased. Pesticide use (in volume terms of active ingredients) rose by nearly 70% between 1990 and 1999. The rising use of pesticides in the 1990s can be explained partially by the fact that up to 2002 the level of Value Added Tax (VAT) was particularly low in Luxembourg compared to neighbouring countries, and as a result some pesticides were not correctly reported in national statistics. With the increasing area under agri-environmental schemes (85% of the farms and 89% of the utilised agricultural area in 2005), however, this is helping to encourage farmers to use pesticides and fertilisers more efficiently. Additionally, the increasing area under **organic management** also limits the use of pesticides. Despite the rapid growth in the area under organic farming since the early 1990s, however, the share of organic farming in the total agricultural land area was about 2% by 2002-04, compared to the EU15 average of almost 4%, although by 2006 the share for Luxembourg had risen to nearly 3% [1, 6].

Agricultural ammonia emissions declined by 10% between 1990-92 and 2001-03 (Figure 3.17.2). The reduction in emissions was largely due to the decrease in nitrogen fertiliser use and lower livestock numbers, with the latter accounting for over 90% of

agricultural ammonia emissions. Agriculture accounts for more than 70% of ammonia emissions, which is low by the average of other OECD countries at over 90%. The contribution of agriculture in total emissions of acidifying substances has risen since 1990 as the reduction in other sources of acidifying emissions have fallen more rapidly [7]. Luxembourg has agreed to a ceiling in total ammonia emissions of 7 000 tonnes by 2010 under the *Gothenburg Protocol*. By 2001-03 emissions totalled 3% in excess of this ceiling, so Luxembourg will need to make a further cut in emissions to meet its commitments under the *Protocol*.

Agriculture greenhouse gas emissions (GHGs) declined by 6% between 1990-92 and 2002-04, close to the EU15 reduction of 7% over the same period, but lower than the economy-wide GHG emission reduction in Luxembourg of 9% (Figure 3.17.2). Luxembourg's commitment under the EU burden sharing agreement, part of the *Kyoto Protocol*, is to reduce total GHGs by 28% in 2008-12 compared to 1990 levels. Much of the decrease in agricultural GHGs was due to lower fertiliser and livestock numbers, with farming contributing 4% of total GHG emissions in 2002-04. There is no information on the trends in the **soil organic carbon** content of agricultural soils, but it is possible that with the growth in the area under permanent grassland since 1990 there has been an increase of carbon storage in agricultural soils. The conversion of permanent grassland to arable land is, however, currently excluded through cross-compliance measures and the landscape conservation scheme.

The rise in on-farm energy consumption increased (17%) was just over half the rate of the rest of the economy (31%) over the period 1990-92 to 2002-04 (Figure 3.17.2). While the rise in farm energy consumption contributed to higher GHG emissions, agriculture's share of total energy consumption is very low at less than 0.1% in 2002-04. The use of motor fuels and lubricants per hectare, the main items of on-farm energy consumption, remained stable over the last 10 years. There has been considerable growth in **renewable energy production** from agricultural biomass feedstock since the mid-1990s, mainly in the form of biogas [10]. But the contribution of agriculture to total primary energy supply was less than 1%, and this share is projected to change little up to 2010 [11]. Energy crops accounted for about 9% of the total agricultural land area by 2002-04, but there is no domestic biofuel production in Luxembourg [1].

With the overall pressure of agriculture on the environment easing this could have had a beneficial impact on biodiversity since 1990. Determining the impact of agricultural activities on biodiversity is, however, extremely difficult due to the paucity of data and research. In terms of **agricultural plant genetic diversity**, crop varieties used in production increased in diversity between 1990 and 2002, most notably for cereals [13]. Moreover, there has been a gradual decline between 1985 and 2002 in the number of national crop varieties endangered or not at risk [13]. There is little or no information on the genetic diversity of livestock.

Changes in the use and management of agricultural habitats have been harmful to wild flora and fauna. The conversion of small farmland habitats, such as ditches, hedgerows, stone wall terraces has been a cause of the loss of certain flora and fauna. Also the drainage and fertilisation of nutrient poor wet grasslands has led to the disappearance of some wild plant species from these habitats [4, 14]. Since the introduction of measures concerning the protection of nature and natural resources in 1982 and the implementation of a landscape conservation scheme in 1996, however, the destruction of natural habitats, the reduction of permanent grassland and the drainage of agricultural land has been banned. For bird species whose primary habitat is farmland the trends appear to be mixed. Population numbers of the Northern Lapwing (*Vanellus vanellus*) and Little Owl (*Athene noctua*) have been in long term decline since the 1980s, while numbers of Grey herons (*Ardea cinerea*)

have risen over this period [7]. These trends are of concern as agriculture is estimated to have posed a threat, in the late 1990s, to around 55% of important bird habitats through changes in management practices and land use [15].

3.17.3. Overall agri-environmental performance

Overall the high intensity of farm input use exerts considerable pressure on the environment, although the trend of nutrient surpluses has been declining, but pesticide use has risen. Absolute levels of some agricultural pollutants remain high relative to average OECD standards and as a result the sector continues to be a potential source of pollution. Moreover, agricultural practices continue to pose a threat to biodiversity.

The lack of an adequate agri-environmental indicator monitoring system does not provide the necessary support for policy makers to assess agri-environmental measures [4]. While some areas of environmental monitoring related to agriculture have been developed, such as those related to ammonia and greenhouse gas emissions, for most other areas, notably concerning water pollution from agriculture and agri-biodiversity, monitoring is absent or very weak.

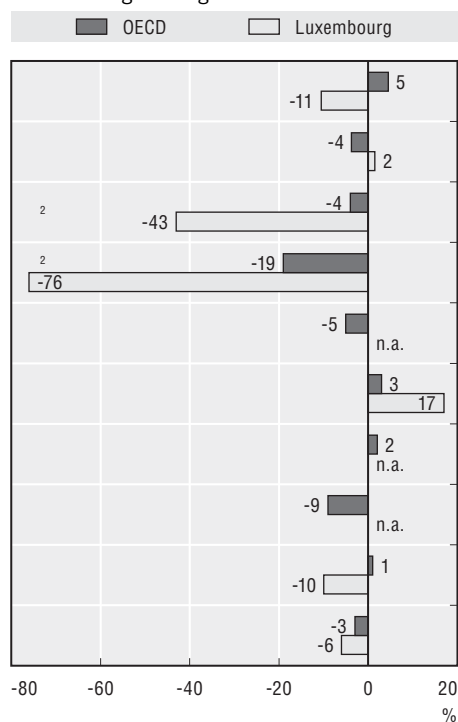
Agri-environmental measures have been considerably strengthened and expanded since 2000, compared to those measures first introduced in the early 1990s [1, 4]. In terms of meeting the government's 2010 agri-environment goals of increasing the area under organic management to 4 000 hectares and the area under agri-environmental schemes to 16 000 hectares, by 2005 (estimate) the areas achieved were respectively about 2 900 and 24 000 hectares, with an additional 3 250 hectares under agri-biodiversity schemes (Figure 3.17.4) [6]. Hence, in 2005 around 2% of the total agricultural land area was under organic management, 18% under agri-environmental schemes, and nearly 3% under biodiversity schemes.

Despite the strengthening of agri-environmental policies some problems persist. The EU Commission has been critical of the weakness of Luxembourg's efforts to adequately address its commitments under the EU Nitrates Directive [16]. Despite the reduction in the total tonnes of **nutrient surpluses** since 1990 the intensity (kg of nutrient per hectare of agricultural land) remains high in relation to the EU15 and OECD averages (Figure 3.17.2). In addition considerable improvements could be made to raise the efficiency of nutrient use, which is very low by OECD standards, especially for nitrogen. Moreover, risks of water pollution from **pesticides** run-off have increased with their growing use since 1990, although data on pesticide use and environmental risks are poor. While **agricultural GHG emissions** have decreased since 1990, further reductions might be achieved if the fuel tax exemption for farmers was removed, which acts as a disincentive to lower energy use, improve energy efficiency and further reduce GHG emissions. But the growing use of agricultural biomass to produce **renewable energy** (notably biogas) is helping to reduce GHG emissions.

Concerning biodiversity risks of future adverse impacts from farming remain, especially given the intensity of farming in Luxembourg. Meeting the 2010 agri-environmental goals under the *National Plan for Sustainable Development*, however, holds the potential to ease agricultural pressure on wild flora and fauna. Moreover, the recent introduction of agri-environmental measures should ease pressure on the environment, such as those addressing soil erosion and nutrient management.

Figure 3.17.2. **National agri-environmental performance compared to the OECD average**

Percentage change 1990-92 to 2002-04¹



Absolute and economy-wide change/level

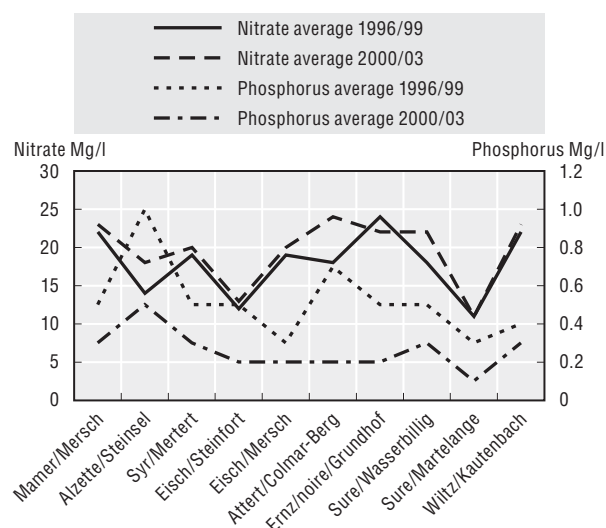
Variable	Unit	Period	Luxembourg	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	89	105
Agricultural land area	000 hectares	1990-92 to 2002-04	2	-48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	129	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	11	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	n.a.	-46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	+2	+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	-1	+115
Agricultural greenhouse gas emissions	000 tonnes CO ₂ equivalent	1990-92 to 2002-04	-28	-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.

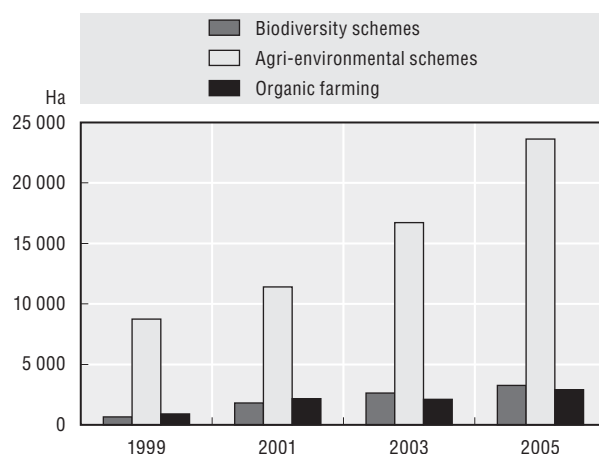
Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the Main Report.

Figure 3.17.3. **Nitrate and phosphorus concentration in river sampling stations**



Source: Water Management Authority, Luxembourg.

Figure 3.17.4. **Agricultural land under agri-environmental schemes**



Source: Agricultural Technical Services Authority.

StatLink <http://dx.doi.org/10.1787/300626813520>

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