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

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The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).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

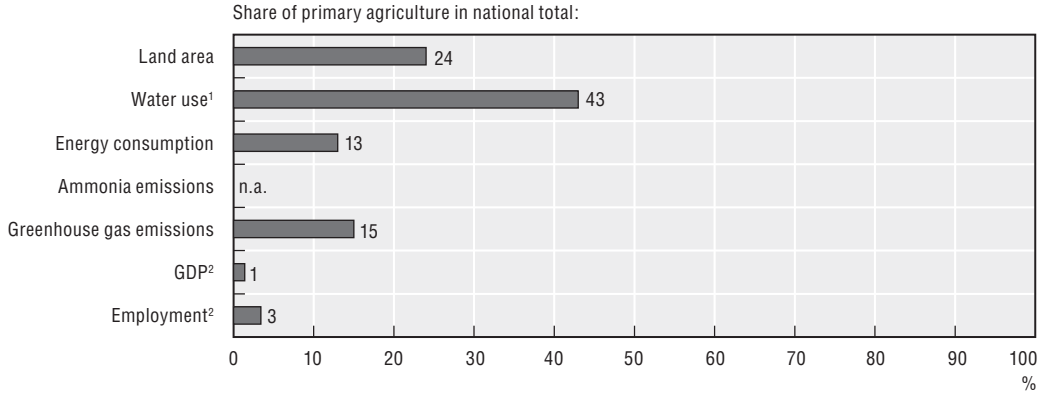
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes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

3.12. ICELAND

Figure 3.12.1. **National agri-environmental and economic profile, 2002-04: Iceland**



StatLink http://dx.doi.org/10.1787/300367505347

1. Data refer to the period 2001-03.
2. Data refer to the year 2005.

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

3.12.1. Agricultural sector trends and policy context

Agriculture is a small and proportionally declining sector in the economy, with its share of GDP and total employment at 1.4% and 3.4% respectively in 2005 [1] (Figure 3.12.1). Farming is limited by a combination of climate, the length of the growing season and topography, and accounts for only around 20% of the total land area, which is low by comparison with many other OECD countries [2].

Farming is dominated by livestock production based on forage grazing and silage production. Livestock products account for approximately 75% of agricultural value added. Overall the volume of agricultural production has increased by almost 6% between 1990-92 and 2002-04, but this has been mainly due to higher yields. Livestock numbers have declined for cattle (including dairy cattle), sheep, and poultry, risen slightly for horses used for recreational purposes, although the pig herd almost doubled in size. The decline in the livestock sector, especially sheep, is in part due to the reduction in market price support and export subsidies in the early 1990s [3, 4, 5]. Crop cultivation involves largely fodder crops (barley, and forage grasses), and a small horticultural sector mainly using greenhouses [6]. Although agriculture's share in total water use was over 40% in 2001-03, there is no use of irrigation as farming is entirely rain-fed. With the overall decline in livestock numbers and decrease in inorganic fertiliser use by over 20%, but little change in the area farmed between 1990-92 and 2002-04, agricultural production is becoming more extensive (Figure 3.12.2).

Agricultural support remains high compared to the OECD average. Support to farmers (as measured by the Producer Support Estimate, PSE) has decreased from 77% to 70% of farm receipts between 1986-88 and 2002-04, while the OECD average decreased from 37% to 30%. The share of output and input linked support, still accounts for 87% of the PSE in 2002-04, although it has fallen from almost 99% in 1986-88. Border measures and budgetary payments to farmers including area, headage, and deficiency payments are the main policy instruments supporting agriculture. A significant proportion of these payments are differentiated by region and farm size [4]. Total agricultural support, including border protection, was nearly ISK 17 (USD 0.21) billion in 2002-04, about 2% of GDP [4].

Greater policy attention is being given to agri-environmental concerns. Over the 1990s agricultural policy was based entirely on economic and social considerations, with environmental issues treated separately [3]. But in 2000 a seven-year voluntary cross compliance scheme was introduced (taking effect in 2003-04) linking sheep headage payments to the adoption of "*quality management*" which includes meeting the criteria of: good animal treatment; controlled use of chemicals and medicines; participation in a national breeding programme; and uptake of sustainable land use practices [5]. Sheep farmers meeting these criteria receive up to 22.5% higher payments in 2007 (up from 12.5% in 2003), than those farmers not adopting the scheme [7]. Two co-operative extension programmes involving farmers mainly in lowland areas have recently been established, "*Farmers heal the land*" and "*Better farms*", which aim to enhance sustainable land use and develop a conservation ethic [5]. Under these programmes the government funds up to 85% of project costs, such as revegetation, fertilisers, and fencing to control grazing on fragile land [3, 8, 9]. Grazing quotas can be imposed if there is evidence of overgrazing [3].

Agriculture is also impacted by a range of national environmental and taxation policies and international environmental agreements. The 2002 *Soil Conservation Strategy* (SCS), covering the period 2003 to 2014, is the main environmental policy affecting agriculture, with emphasis placed on: curbing soil erosion; revegetation; monitoring land conditions; land use management; and research and dissemination of information [8, 10]. Total government expenditure under the SCS (mainly for agriculture) was around ISK 420 (USD 6) million in 2004 [3, 7, 8]. Farmers receive grants for afforestation under the *Regional Afforestation Projects*, to address problems of soil erosion, biodiversity conservation and carbon sequestration [11]. As part of its environmental recycling policy, ***taxes*** are applied to fund municipal recycling and recovery costs for a range of waste products, including farm plastic waste (*i.e.* silage packaging film) and pesticide containers [12]. From 2005 farmers benefited from a diesel fuel tax concession which amounted to ISK 238 (USD 3) million of tax revenue forgone in 2005 [4]. Agriculture is also impacted under ***international environmental agreements*** including commitments to lower emissions of: nutrients into the Atlantic and North Sea (*OSPAR Convention*), methyl bromide (*Montreal Protocol*) and greenhouse gases (*Kyoto Protocol*). In addition, reducing biodiversity loss is part of Iceland's commitments under the Convention of Biological Diversity, and limiting land degradation as part of the UN *Convention to Combat Desertification*. Meeting the commitments under the UN Conventions on climate change, desertification and biodiversity are a key element of the *Soil Conservation Strategy*.

3.12.2. Environmental performance of agriculture

The contraction and extensification of agriculture since 1990 has reduced environmental pressure, especially concerning soil erosion. Given the dominance of pastoral farming, the general fall in livestock numbers has helped to ease environmental damage to soils, biodiversity and led to the reduction in greenhouse gas emissions. Overgrazing in some regions, however, continues to be a problem in meeting soil conservation objectives [4, 7, 10]. Organic farming accounted for under 1% of farmland and all farms in 2002-04, and has grown slowly since 1990 [13].

Soil erosion remains the major agri-environmental challenge to be addressed. The share of the total land area subject to a medium to severe risk of soil erosion remains high (this is measured in terms of landforms and in tonnes of soil loss). Severe and very severe erosion occurs on about 17% of the country, and medium erosion on an additional 22%. When glaciers, water bodies and high mountains are excluded, about 50% of the land is subject to substantial erosion [7, 10 14]. Concerning agricultural land 5% of permanent grasslands (*i.e.* 95% of agricultural land) are affected by moderate to severe water erosion and 50% by wind erosion [3].

Overgrazing is exacerbating soil erosion problems in some areas although this pressure is declining and the problem is being addressed [15]. Many of the ecosystems that are being used for grazing by sheep have vulnerable vegetation and soils, and a harsh climate [7]. Soil erosion is particularly acute in the communal highland grazing areas, which provide pasture for about 10% of the national sheep flock [3, 5]. The increase in horse numbers, mainly for riding, is beginning to exert some pressure on soil quality, although most horses are grazed on the less fragile lowland areas [3, 15]. Under farm forestry schemes over 1 000 hectares annually were being afforested over the period 1990 to 2005 (Figure 3.12.3), which was about a fourfold increase over the levels achieved during the 1970s and 1980s [3, 15]. The rapid increase in the area being afforested, from around 1 000 hectares in 1990 to an accumulated total of over 22 000 hectares by 2005 (Figure 3.12.3) (and over the same period the number of farmers participating in afforestation projects rising from around 300 to over 500), is also contributing to soil conservation goals, as well as bringing benefits for biodiversity and carbon sequestration [15].

Agriculture pollution of surface water is at very low concentrations compared to many other OECD countries [3, 10]. This reflects the extremely low levels of agricultural nutrient surpluses (surpluses are the quantity of nutrient inputs minus outputs of nutrients, nitrogen – N – and phosphorus – P) and use of pesticides compared to the OECD average (Figure 3.12.2). Agriculture, however, is the major source of nutrients in rivers and lakes. An outbreak of Campylobacter bacteria in drinking water in 1999, connected to the poultry industry, prompted the government to take measures to address the problem and the number of cases has been lowered [10].

Agricultural nitrogen and phosphorus balance surpluses declined over the period 1990-92 to 2002-04, mainly due to the decrease in overall livestock numbers (*i.e.* less manure) and use of inorganic fertilisers. The use of inorganic phosphate fertilisers, however, declined by 25% over this period compared to a reduction of 12% for nitrogen fertilisers. Moreover, the intensity of nutrient surpluses (expressed as kg of nutrients per hectare of agricultural land) was among the lowest across the OECD in 2002-04 (Figure 3.12.2). The trends in nutrient surplus balances are consistent with the low concentrations of nitrates and phosphorus in rivers and lakes, which overall were below national drinking and

environmental limits during the period 1996 to 2004 [10, 15]. This is in part because of the high flow rates in rivers, while most groundwater abstractions are upstream from the main cultivated areas were the intensity of fertiliser use is highest [3]. It is not clear due to a lack of monitoring data, however, the impact of nutrient flows into rivers and coastal waters on aquatic ecosystems [3]. The growth of the pig industry is a concern for water pollution, as pig slurry must be spread on land, since the prohibition in 1999 of the disposal of pig slurry into the sea [3].

Pesticide use is extremely low mainly attributed to the dominance of livestock in the agricultural sector. Pesticides in domestic foodstuffs are reported to be well below permissible limits believed to be hazardous to human health, although there are no monitoring data on concentrations of pesticides in water bodies [10, 15]. All the most toxic and persistent pesticides have been prohibited since the 1980s, including DDT and methyl bromide [16].

Agricultural greenhouse gas (GHG) emissions decreased by 10% over the period 1990-92 to 2002-04, compared to a reduction of 3% for the OECD on average (Figure 3.12.2) [6]. Total national GHG emissions rose by 6% and farming contributed 15% of total GHG emissions (2002-04), while its commitment under the *Kyoto Protocol* is an increase of total GHGs of 10% from the 1990 base year by 2008-12. The decline in agricultural GHGs is largely due to falling livestock numbers and lower fertiliser use, offset to a limited extent by higher direct on-farm energy consumption. ***Agricultural energy consumption*** grew by 7% between 1990-92 and 2002-04 compared to a 40% rise in national total energy consumption over this period, consequently farming only accounted for 13% of total energy consumption by 2002-04 (Figure 3.12.2).

Carbon sequestration is increasing as a result of the revegetation and afforestation of farmland (Figure 3.12.3) [6]. Agriculture has also contributed to carbon sequestration through the rise in soil carbon in restored wetlands on farms and from reduced soil erosion rates [6]. Projections suggest that the continuation of programmes that promote revegetation and afforestation are likely to lead to a further rise in carbon sequestration in the period up to 2008-12 [6]. But the continued high levels of soil erosion in some farming regions is leading to ongoing losses of soil organic carbon, to the detriment of carbon sequestration and the quality of farmed soils [17].

Overall agricultural pressure on biodiversity has diminished since 1990. This is a marked change from the trend in earlier decades when agricultural practices led to the drainage of wetlands and high rates of soil erosion to the detriment of biodiversity. In terms of ***agricultural genetic resources*** Icelandic farming, and livestock in particular, enjoy a special position relative to other countries. For each type of livestock there is usually only a native breed whose origins can be traced back to the settlement of the country [18]. These breeds are believed to have been subject to extremely limited cross-breeding with foreign breeds, and have undergone selective breeding such that the frequency of disease in the stock is low. Imported breeds, however, are important for beef and intensive pig and poultry production. All cattle and sheep in Iceland are registered in breeding databanks, and although some breeds have in the past been close to extinction *in situ* and *ex situ* conservation programmes have improved the situation, such as for the goat [19].

The restoration of wetlands on agricultural land has been important as they provide habitat for a wide variety of flora and fauna. In 1999 a programme was launched to restore wetlands, after a period from the 1950s to the 1990s when the government had provided

support to farmers to drain wetlands, although few intertidal mudflats were drained [3, 10]. With the abolition of support in the mid-1990s for wetland drainage, the total area of restored wetlands rose on a small scale from 35 hectares in 1996 to an accumulated total of almost 500 hectares of wetlands restored by 2005 (Figure 3.12.4) [15]. These changes are significant as Iceland supports internationally important bird populations that require wetland habitats, such as the Golden Plover (*Pluvialis apricaria*), Purple Sandpiper (*Calidris maritime*), Whimbrel (*Numenius phaeopus*) and Black-tailed Godwit (*Limosa limosa*) [20].

Lowering grazing intensity and increasing afforestation is helping to limit degradation of soil and vegetation to the potential benefit of wild species. But while these changes in land use and management can be beneficial to some species they are harmful to others that depend on extensive grazing or open spaces rather than forested areas. These diverse impacts on species are revealed by recent research studies of bird species that prefer wetlands and beetles (*Coleoptera*) preference for hayfields and pastures [20, 21]. There has also been a ***growing public appreciation for rural landscapes*** with some farmers beginning to respond to this demand. There is an increasing shift on farms in combining low intensity farming practices with providing agri-tourism services such as cottage rental, horse rentals, angling and other services linked to agricultural landscapes [22].

3.12.3. Overall agri-environmental performance

Overall the pressure from agriculture on the environment has decreased. With the dominance of pastoral farming in the agricultural sector, the decline in livestock numbers since 1990, especially the national sheep flock, but little change in the area farmed, the intensity of agriculture has diminished. Despite these improvements agriculture remains a major contributor to soil erosion, and as a consequence, a continued threat to biodiversity.

A substantial effort is underway to improve the monitoring of agri-environmental performance. A joint project – *The Icelandic Farmland Database* – between several government agencies and the Farmers Association was initiated in 2000 to collect primary data to help assess whether there is sufficient vegetation for grazing [5, 10]. This database has been established to both help guide soil conservation programmes and also as information for the "*quality management*" scheme linking sheep headage payments to environmental criteria. As the database is developed it will be capable of being used for other agri-environmental monitoring purposes, such as tracking biodiversity and carbon sequestration on farmland [5]. In a number of areas, however, agri-environmental monitoring needs to be strengthened to better assist policy makers and farmers. There are no monitoring data on concentrations of pesticides in water bodies, while the lack of wild species monitoring affected by agricultural activities (*e.g.* farmland bird populations) is a limitation in assessing agri-environmental performance. Also there is no monitoring of the extent and trends in the eutrophication and acidification of land and freshwater resources from agricultural nitrogen run-off, agricultural ammonia emissions, although other sources of acidifying emissions are measured. Ammonia emissions from livestock, as an acidifying substance of both land and water, could be important given the size of livestock numbers (Iceland is not a signatory to the *Gothenburg Protocol on Long-range Transboundary Air Pollution*).

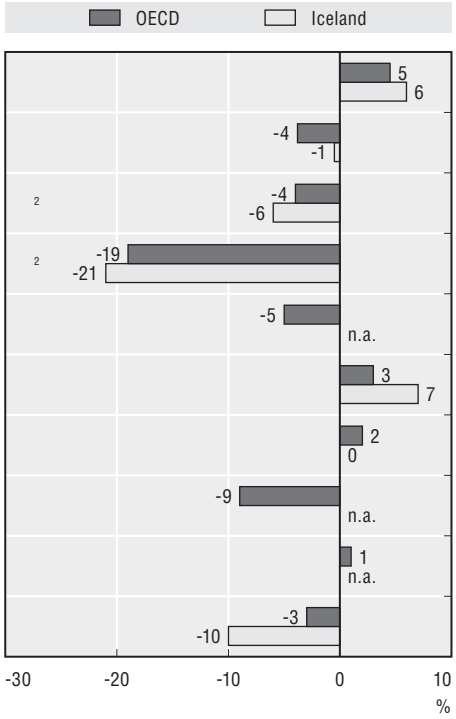
There has been a shift toward greater use of agri-environmental measures, brought about in part by the national soil erosion assessment programme, which has highlighted the extent and severity of soil erosion on agricultural land. The new awareness of the problem led to an agreement whereby a part of the headage payments sheep farmers receive is

linked to sustainable land use. About 40% of sheep farmers, as well as a number of farms rearing horses and other land users, are participating in this and other related agri-environmental programmes [5].

Despite progress in reducing pressures from grazing, concerns over soil erosion remain high. While the government's recent attempt to address soil erosion by making a thorough physical assessment and tying some farm payments to meeting environmental conditions, the most production distorting policies still account for over 80% of agricultural support [3, 4]. Moreover, sheep farming persists on land that is already eroded or highly susceptible to erosion, especially the common areas in the highlands [3]. Grazing quotas can be imposed to limit overgrazing but this measure is rarely enforced, while livestock density regulations adapted to the carrying capacity of the soil and prohibiting grazing on the most fragile soils are not part of the *Soil Conservation Strategy* (SCS) [3]. Property rights further complicate the implementation of the SCS as the government has legal responsibility to control erosion, while farmers own or have grazing rights over much of the country [3]. But progress has been made in establishing the *Farmland Database* which is a key element for an effective land use policy.

Figure 3.12.2. **National agri-environmental performance compared to the OECD average**

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



Absolute and economy-wide change/level

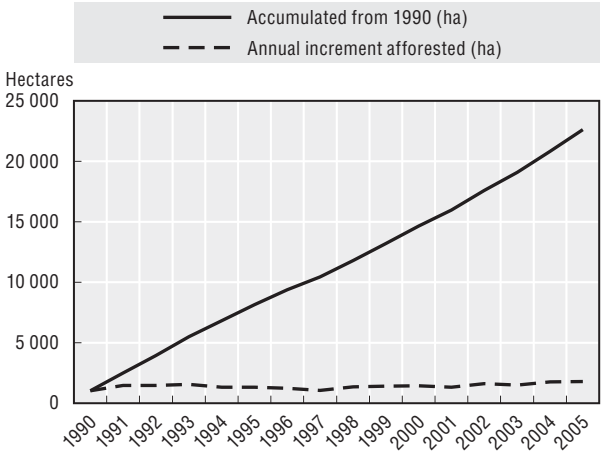
Variable	Unit		Iceland	**OECD**
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	106	105
Agricultural land area	000 hectares	1990-92 to 2002-04	–13	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	7	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	1	10
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	+21	+1 997
Agricultural water use	Million m^3	1990-92 to 2001-03	+0	+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	n.a.	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	–57	–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.

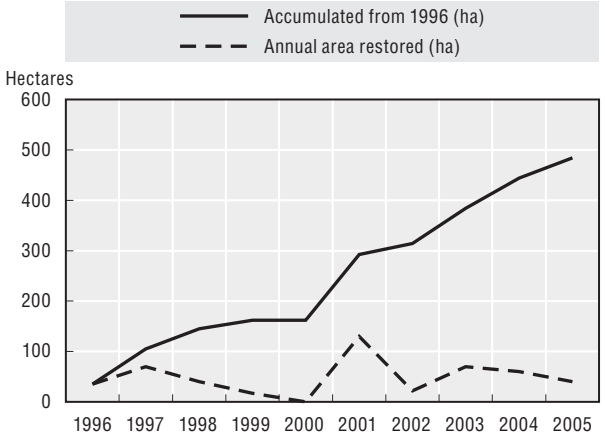
Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

Figure 3.12.3. **Annual afforestation**



Source: Annual data of number of planted seedlings in Iceland (Annual report of the Icelandic Forest Association 1991-2006). Data from the Icelandic National Forest Inventory (unpublished data).

Figure 3.12.4. **Annual area of wetland restoration**



Source: Report by the Ministry of Agriculture, Iceland (in Icelandic).

StatLink http://dx.doi.org/10.1787/300450330843

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