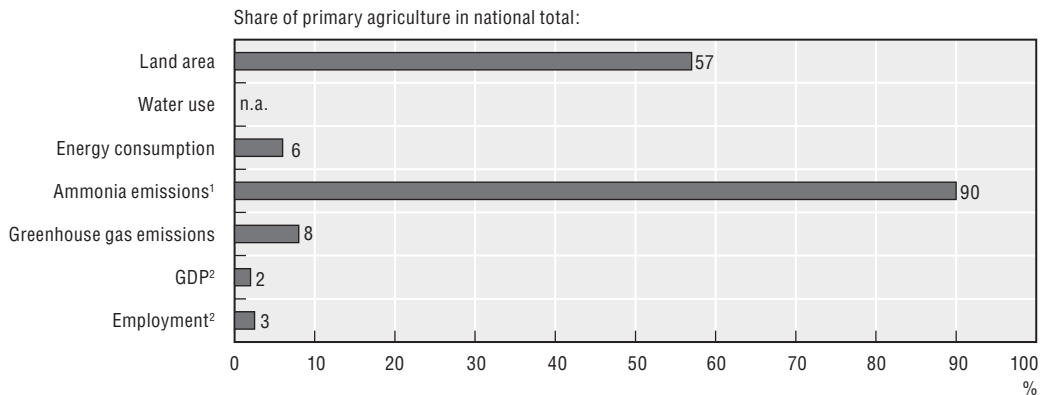



3.19. NETHERLANDS

Figure 3.19.1. **National agri-environmental and economic profile, 2002-04: Netherlands**



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1. Data refer to the period 2001-03.

2. Data refer to the year 2003.

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

3.19.1. Agricultural sector trends and policy context

Overall the agricultural sector has been contracting, with a reduction in the volume of production of nearly –10% and in the area farmed by –3% over the period 1990-92 to 2002-04. As a consequence the share of primary agriculture was around 2% of GDP and 2.5% of employment in 2003 [1] (Figure 3.19.1). However, within this overall decrease there has been an expansion in the horticultural sector, which now contributes around 40% of agricultural gross value added [1].

Agriculture makes intensive use of inputs resulting in high crop and livestock yields in comparison to most other OECD countries [1]. Livestock densities per hectare are among the highest in the OECD [2]. Purchased farm input use has in general declined more rapidly than agricultural production, suggesting that production intensity is diminishing and economic efficiency increasing over the period 1990-92 to 2002-04 (Figure 3.19.2). For example, the volume of inorganic fertiliser use fell by –36% for phosphorus, and –27% for nitrogen, and pesticides fell by over –50%. In contrast, direct on-farm energy consumption rose by 5%, largely reflecting the growth in the horticultural sector.

Farming is mainly supported under the Common Agricultural Policy, together with additional national expenditure within the CAP framework. Support to EU 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). This compares to the OECD average of 30% [3]. Nearly 70% of EU farm support is output and input linked, falling from over 98% in the mid-1980s. The total national agricultural budget (including CAP support) was EUR 1.9 (USD 2.4) billion in 2004, with environmental expenditure around EUR 500 (USD 625) million annually, or

about 5-6% of agricultural gross value added [1, 3]. It is estimated by the Ministry of Agriculture that in 2003 the agricultural sector incurred costs totalling EUR 850 (USD 960) million in order to meet environmental regulations. EUR 650 (USD 730) million of this sum was spent to meet nutrient measures; EUR 90 (USD 100) million for acidification and air quality control; EUR 50 (USD 55) million to reduce pesticide use; and EUR 20 (USD 22) million to meet waste measures.

Agri-environmental policies mainly focus on reducing pollution. There have been three phases in nutrient policy: first, 1984-90, stopping the increase in livestock production; second, 1990-98, a step wise decrease of pressures resulting from surplus quantities of animal manure by using application limits and a manure quota system; and third, 1998-05, balancing farm level nutrient inputs and outputs through a compulsory *Minerals Accounting System (MINAS)*, farmers being subject to levies when nitrogen and phosphorus surpluses exceed certain limits [2, 3, 4, 5, 6]. The annual cost of the nutrient policy rose from near zero in 1984 to EUR 400 (USD 380) million by 2002 [4]. There were also nutrient reduction costs through livestock farm closure schemes during 1998-2003, of EUR 710 (USD 700) million [2]. The *Nature for People, People for Nature* and *Subsidy Scheme for Nature Management* programmes include farmer environmental management agreements covering meadow birds, floral species and cultural landscapes.

Agriculture is affected by national environmental and taxation policies. Farming is assisted through environmentally important tax reductions. The following figures give estimates of annual budget revenue forgone in early 2000 [7] through these tax reductions: energy used for heating greenhouses [EUR 113 (USD 124) million]; on-farm diesel use [EUR 18 (USD 20) million]; and exemption from the groundwater abstraction tax up to a certain limit [EUR 17 (USD 19) million] [5, 8]. Agriculture also contributed 3% of total environmental tax revenues in 2002, mainly from nutrient levies [9]. Support and higher feed-in tariffs are provided for farm biomass used as a bioenergy feedstock [10]. Successive four-year *National Environmental Policy Plans (NEPP)* include environmental targets which affect farmers for pesticides, acid deposition, and eutrophication [5, 11].

To comply with international environmental agreements, agriculture has been set targets, for reducing nitrogen and phosphorus emissions into the North Sea (*OSPAR Convention*) and ammonia emissions into the atmosphere (*Gothenburg Protocol*). Agriculture is also implicated by national commitments under the *Kyoto Protocol* to reduce greenhouse gases and biodiversity conservation under the *Convention of Biological Diversity*.

3.19.2. Environmental performance of agriculture

With among the highest population density in the OECD area, pressure on land resources is high. Farming accounts for almost 60% of land use (2002-04), with most of the reduction in the area farmed since 1990 converted to urban use and, to a lesser extent, nature areas. About 25% of the country lies below sea level, protected from the sea by barriers of dunes and dykes [5, 12]. The main environmental challenge is the control of nutrient use, but also important is the reduction of groundwater use, drainage, and greenhouse gas emissions, as well as the improvement of energy efficiency, and the protection of biodiversity.

Soil quality is generally high [13]. Less than 1% of farmland suffers from high water erosion (above 14 tonnes/hectare/year), and wind erosion affects only about 2% of farmland [14, 15]. There is some evidence that intensive potato production in the northeast has contributed to wind erosion and soil organic carbon losses as a consequence of bulbs/pasture production systems [13] and ploughing grasslands [14, 16].

Water pollution originating from agriculture is an important environmental concern.

While recent trends indicate that the pressure from farming on water quality is diminishing, absolute levels of pollution remain amongst the highest across the OECD. Agriculture is the major source of nutrients, pesticides and the only known source of heavy metals in water. Pollution from endocrine disrupters and veterinary medicines in terms of potential impacts on human and wildlife reproductive systems is also a concern. The total external costs of agricultural water pollution are unknown, but in the late 1990s the annual external costs of eutrophication associated with nitrate emissions was estimated at EUR 600 (USD 540) million [17], and for treating drinking water polluted with nitrates at EUR 23 (USD 21) million [18].

Nutrient surpluses per hectare of agricultural land, among the highest in OECD countries, were greatly reduced between 1990-92 and 2002-04: by about 34% for nitrogen and nearly 50% for phosphorus, with much of the decrease occurring after 1995 (Figure 3.19.2) [4, 17, 19]. The decline in surpluses is attributed to lower fertiliser use and smaller livestock numbers [20]. Despite the decline in fertiliser use, the intensity of use remains high in relation to the OECD average (Figure 3.19.2) [1, 5]. More farmers are improving their nutrient management practices, with the share of farmland under nutrient plans rising from 40% in 1995-99 to over 80% by 2000-03, largely because nutrient management under MINAS became compulsory as from 2001. Storage capacity for manure also grew over the 1990s, with over 80% of dairy and pig farms having storage capacity for at least 5 months of manure production [21]. Infringements of nutrient regulations were found in over a quarter of farms inspected in 2002 [21].

Agriculture is the major source of nutrients in water [21]. Farming contributes more than 50% of the nitrogen and phosphorus loading to surface waters. The share of agriculture is increasing in relation to other sources of nutrient pollution, mainly sewage and the industrial sector, which have declined more rapidly. Farming is also the main source of groundwater and marine water nutrient pollution. Some two thirds of nutrients entering Dutch rivers are from other countries [17, 21]. The share of monitoring sites in farming areas where pollution levels exceed drinking water standards for **surface water**, are 70% for nitrates and 60% for phosphorus. Agricultural nitrate pollution of surface water has declined since the late 1990s, but phosphorus pollution has been decreasing since the early 1990s, although annual mean concentrations of nitrogen and phosphorus in surface water by 2003-05 remained above *Maximum Tolerable Risk Levels* (Figure 3.19.3) [2, 21, 22].

Around 12% of shallow groundwater monitoring sites in farming areas have pollution levels that exceed nitrate drinking water standards, but the share has been declining since the mid-1990s and varies with soil type [2, 4, 21]. For deep groundwater (> 30 m depth) nitrate pollution is still rising because of the long time lags associated with nitrate leaching [21]. **Coastal nutrient pollution** has also declined over the past 10 years, but a 2002 OSPAR Convention assessment concluded that the entire Dutch coastal zone was eutrophic [21]. Levels of cadmium (derived from fertilisers) in fish and shellfish has also risen [5].

The over 50% reduction in the volume of pesticide use (active ingredients) was amongst the highest in the OECD during 1990-92 to 2002-04 (Figure 3.19.2). However, the trend in use stabilised over the period 2000 to 2004 [23], but the intensity of use per hectare remains high [1, 5]. Pesticide use has been decoupled from crop production, although the reduction in pesticide use was offset, to some extent, by higher use in the horticultural sector [5, 24]. The cut in pesticide use met the NEPP1 target which sought a reduction of 50% by 2000

from 1984-88 levels [5]. Pesticide risk indicators for the period 1998-2001 show a lowering of toxic effects on ecosystems and leaching into groundwater. In some regions pesticide concentrations exceeded drinking water standards [5]. The 4% of the agricultural area located in drinking water abstraction areas seems to be more vulnerable to pesticide leaching than the rest of the area farmed [25]. Therefore, special measures have been introduced for pesticide registration to prevent groundwater pollution in drinking water abstraction areas.

There are also pressures on water quality from agricultural heavy metals and pathogens. Loadings of heavy metals (copper and cadmium) on farm soils, mainly derived from manure and fertilisers, fell between 1990 and 1995 but then stabilised up to 2001 [26, 27]. Loadings of zinc rose, linked to corrosion from galvanised steel in greenhouses, although since 2001 agreements have been made with the horticultural industry to reduce this form of pollution [28]. In some regions heavy metal pollution exceeds drinking water standards [5], and there are concerns that their accumulation in soils may lead to leaching over hundreds of years [27]. An estimated 10% of drinking water supplies exceeded the standards for faecal bacteria and some wells where *E. coli* was detected were closed in 2001 [14].

Agriculture accounts for only about 1% of total water use, with 80% of the water used for irrigation. Around 30% of farmland is irrigated [29], and the area of land under irrigation rose by 1% between 1990-92 to 2001-03. About 50% of water used by agriculture is from groundwater, 25% from surface water, and much of the rest piped tap water [29]. Agriculture has contributed to the overexploitation of groundwater [5], which is important as farmers account for about 10% of total groundwater use [29]. Groundwater depletion coupled with agricultural drainage has harmed natural ecosystems on around 15% of the total land area, and possibly up to 5% of land is affected by saltwater intrusion [5, 17]. Since 2002, as part of the plan to address the pressure on groundwater resources, a national and provincial tax has aimed at providing incentives to use surface water [5]. Farmers are exempt from the national groundwater tax if their use is under 40 000m³/year, which has encouraged them to use multiple smaller pumps to avoid the tax [30]. Moreover, around 90% of the irrigated area is under low efficiency high-pressure rain gun application technology.

Ammonia emissions from agriculture have declined continuously by 48% between 1990 and 2003, the largest reduction across the OECD (Figure 3.19.2) [5]. Farming accounts for over 90% of total ammonia emissions, mainly from livestock, and contributes about 30% to problems of acidification [31]. About two thirds of ammonia emissions are of domestic origin, while the Netherlands contributes to deposition in Germany and the North Sea [5]. Much of the reduction in emissions is due to: obligatory regulations to cover livestock manure facilities and use low emission spreading practices; lower livestock numbers (manure accounts for over 90% of emissions); and to some extent use of low emission livestock housing. A 2001 survey showed that only 15% of pigs were housed under low emission conditions [5, 32]. Ammonia emissions are expected to meet the EU and Gothenburg Protocol emission targets by 2010, but not the stricter NEPP4 target [11, 31]. Nitrogen deposition levels across the country are too high for the recovery of natural habitats, such as heathland and peat bogs, although there are regional differences [11]. Currently about 10% of natural habitats are protected from acidification, compared to the NEPP4 target of protecting 20-30% by 2010 [5].

Agricultural greenhouse gas (GHG) emissions declined by 18% between 1990-92 and 2002-04, and accounted for 8% of total national emissions in 2002-04 (Figure 3.19.2).

This compares to no change in total national GHG emissions over the same period and a Kyoto Protocol reduction target of -6% by 2008-12 under the EU *Burden Sharing Agreement*. The fall in GHGs was largely due to lower emissions of methane and, to a lesser extent, nitrous oxide, due to reduced livestock numbers and nitrogen fertiliser use, and improved manure management [33]. There was also a decrease in carbon dioxide (CO₂) emissions from agriculture. The potential loss of soil organic carbon in farmed soils and possible underestimation of GHG emissions from grassland ploughing [16], might be offset, to some extent, by the conversion of farmland to forestry over the 1990s and the growth in agricultural biomass for bioenergy production. The share of bioenergy in national heat, power and transport fuel production is under 1% [10].

Direct on-farm energy consumption rose by 5% over the period 1990 to 2004 (Figure 3.19.2). Most of this occurred in the first half of the 1990s, since when consumption has decreased [34]. Nearly 85% of on-farm direct energy consumption in 2001 was used for heating greenhouses [34], with farming accounting for 6% of total national energy consumption in 2002-04. A target has been set to reduce energy use per unit of production by 65% by 2010 compared to 1980 levels [31]. But while agriculture achieved a nearly 2% per annum improvement in energy efficiency over the 1990s [10], it has been estimated this rate needs to rise to 4.5% per annum between 2000 and 2010 to realise the government energy efficiency target [35]. The agricultural energy use per unit of production, however, almost halved between 1980 and 2003 [36].

The high intensity of agriculture has exerted substantial pressure on biodiversity. The main causes of this pressure derive from: acidification of natural habitats; drainage of farmland (lowering groundwater tables); pollution of aquatic ecosystems from eutrophication, pesticides and pathogens; and land use changes, including loss of semi-natural biotopes, ploughing of grasslands and conversion of farmland to urban use [5, 37]. Trends in **agricultural genetic resources** show that for crops extensive *ex situ* collections exist and are being increased, while *in situ* conservation is limited to fruit trees and some grasslands, as most traditional varieties were replaced many decades ago [14, 38]. For livestock all endangered breeds are included under conservation programmes with growing interest for *in situ* conservation of rare breeds and an expansion of genetic material in gene banks [39].

Over 50% of terrestrial flora and fauna species depend on farmland as habitat. Farmland bird populations declined by over 1% annually during 1990 to 2003, but the rate of decline accelerated over 2000 to 2004 to more than 4% annually, although the reasons for this are not yet known (Figure 3.19.4) [40]. Some bird species are in a critical situation, such as the Black Tailed Godwit (*Limosa limosa*) and the Skylark (*Alauda arvensis*) (Figure 3.19.4) [40, 41, 42]. The Netherlands has an international responsibility for some of these species, including, for example, the Black Tailed Godwit, with about 50% of the European population found in the country [43]. Numbers of reptiles (*e.g.* adders and lizards) on heath land have also declined by about a third between 1994 to 2003, mainly because of agricultural habitat fragmentation, and groundwater withdrawal and drainage leading to desiccation [44].

Acidification from ammonia emissions has caused the displacement of local flora by species that flourish in acid and nitrogen rich conditions. In addition, groundwater depletion and farmland drainage have led to the displacement of flora that thrive in moist habitats. About 40% of native plant species require wet environments [5]. The reduction in pesticides, however, appears to be easing threats to birds, worms and aquatic species, but pollution from heavy metals and pathogens remains a concern for aquatic ecosystems [5].

Changes to agricultural habitats have also adversely impacted on wild species, especially the conversion of farmland to urban use, and of pasture to arable and permanent crops. Around 7% of farmland is semi-natural habitat, mainly extensive grasslands, heaths and marshes [14], while there has been an increase in fallow land rising to over 1% of total farmland. Uncultivated habitats account for a 3% share of agricultural land, mainly woodland (> 5 ha) and small water bodies. Uncultivated habitats also provide a linear network of wet and dry ditches and hedgerows [14, 45].

As the major land user farming determines, to a great extent, the appearance of cultural landscapes. The government retains responsibility for 20 “national landscapes” covering about a quarter of the total national land area [1]. In most cases pasture is the main form of land use in these areas. The commitment to protect landscapes has been reconfirmed in several government plans. While some landscapes are still intact, many are in danger of losing their unique character, particularly open cultivated grassland on peat soils [5, 14].

3.19.3. Overall agri-environmental performance

Overall agriculture is slowly moving toward a more environmentally sustainable path, but at a considerable environmental and financial cost [5]. Environmental pressure has largely become decoupled from the rise in farm production, but the intensity of farming across the country, however, remains high by OECD standards. Agriculture is the major contributor to eutrophication, acidification, and groundwater depletion. It is a source of continuing pressure on the pollution of surface and groundwater from nutrients, pathogens and heavy metals; and on biodiversity.

An extensive environmental monitoring system has been established, which also covers agricultural pressures on the environment. Monitoring and evaluation efforts are important in tracking national progress toward the targets established under the NEPPs; and also the numerous international environmental agreements ratified by the Netherlands. The *Dutch Soil Quality Monitoring Network* started in 1993 to collect data on soil biodiversity. Initial results show some declines for nematodes in intensive pastures [13, 46]. However, information on biodiversity in relation to farming, especially on trends and the quality of semi-natural and uncultivated habitats [45] and landscapes is poor. Also there are few estimates of the costs and environmental benefits of nutrient policies [47].

Strengthening of agri-environmental policy measures should further ease environmental pressures. The European Court of Justice ruled in 2003 that the methodology of the MINAS system did not comply with the EU Nitrates Directive, and in response the government implemented a new nutrient policy from January 2006. Under the new policy nutrient application standards, determined by crop and soil types, comply with the EU Nitrates Directive [3, 4]. Decreasing application standards should lower nutrient losses to the environment, with the standards set for 2009 seeking to achieve a maximum of 50 mg nitrate per litre in upper groundwater and the standards for 2015 aiming to have an equilibrium level of phosphate fertilisation [48]. A target to reduce pesticides by 95% by 2010 compared with 1998 (pesticide use stabilised between 2000 and 2004 [23]) will be addressed by greater adoption of integrated pest management; stricter regulations on pesticide sales and use; improved farmer education; and farm certification [3, 5].

In 2005 the government introduced a habitat approach into biodiversity policy with a specific focus on an integrated area, rather than the earlier approach of conservation plans for each species [49]. The *Policy Document on Organic Agriculture 2005-07* aims for 10% of

farmland to be under organic production by 2010. The growth in conversion of land to organic farming slowed between 1999 to 2004, and accounted for around 2.5% of farmland in 2002-04 [50]. Payments provided for 5 years for organic conversion and maintenance were phased out from 2005, with instead a system whereby certification costs for the period 2006-10 are to be paid under the EU Rural Development Programme [1, 50, 51].

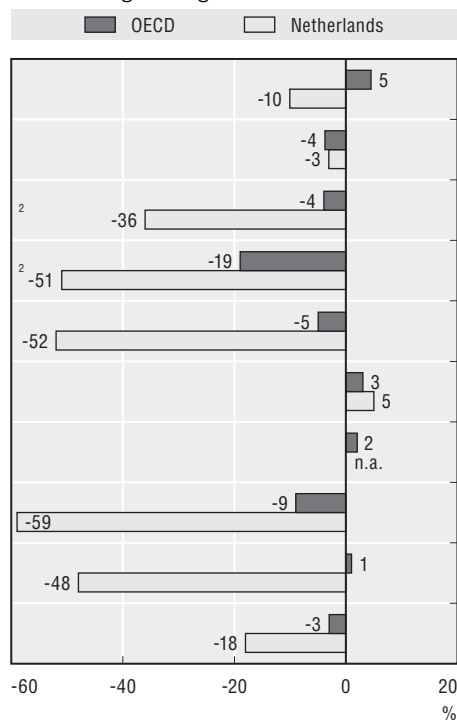
Moving agriculture onto a sustainable path will remain a major challenge. Currently more than half of Dutch dairy farms apply more than 250 kg nitrogen per hectare (kg N/ha) through the application of livestock manure to grassland [47]. The EU Nitrate Directive, however, stipulates a maximum of 170 kg N/ha from livestock manure, but the EU agreed to grant the Netherlands a derogation of 250 kg N/ha, which the new nutrient policy aims to meet over the next 5-10 years [52]. In addition, a further reduction of nutrient loadings into the North Sea will be necessary to achieve the OSPAR Convention target of 2010. While EU and international targets have been met for ammonia emission reduction, and are likely to be met up to 2010, these emissions need to be further reduced in order to prevent harm to natural habitats [1]. The accumulation of phosphorus in farmed soils and the build up of agricultural pathogens and heavy metals may affect water quality for many decades to come [5]. For groundwater the farm tax exemption reduces the incentive for farmers to use surface water, with only around 2% of them paying the national tax and many avoiding payment of the provincial tax [8, 18, 30].

Meeting government targets by 2010 for pesticide use and the area organically farmed will require a substantial effort over the second half of this decade in view of the limited progress to date. Improving energy efficiency in the horticultural sector may require containing the increase in area of greenhouse cultivation under artificial lighting [32]. But subsidising energy use by greenhouse operators, and on-farm diesel use, acts as a disincentive to improving energy use efficiency and reducing GHG emissions. To date, efforts to slow or reverse agriculture's pressure on biodiversity have had little success, possibly due to the fact that the intensity of farming has counteracted the effects of agri-environmental measures, as revealed by, for example, the poor state of meadow birds and the decline in the area of land under on-farm conservation schemes by private landowners [41, 42]. The government is committed to halting biodiversity loss by 2010 [49], with payments to farmers being increased to meet the 2010 target of around 5% (110 000 ha) of agricultural land being managed as semi-natural habitat [5].

Figure 3.19.2. **National agri-environmental performance compared to the OECD average**

Percentage change 1990-92 to 2002-04¹

Absolute and economy-wide change/level



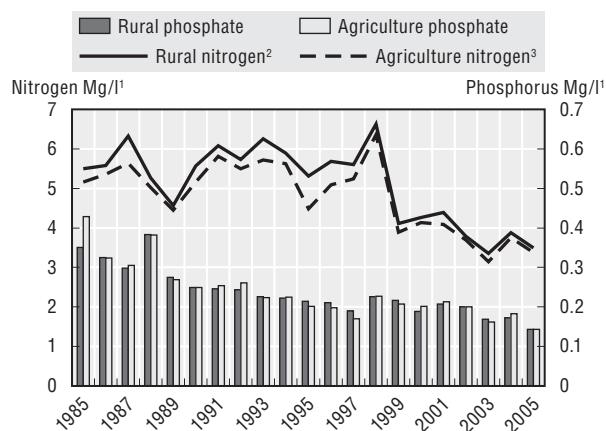
Variable	Unit	1990-92 to 2002-04	Netherlands	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	90	105
Agricultural land area	000 hectares	1990-92 to 2002-04	-61	-48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	229	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	19	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	-9 283	-46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	+175	+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	0.1	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	-113	+115
Agricultural greenhouse gas emissions	000 tonnes CO ₂ equivalent	1990-92 to 2002-04	-4 100	-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.

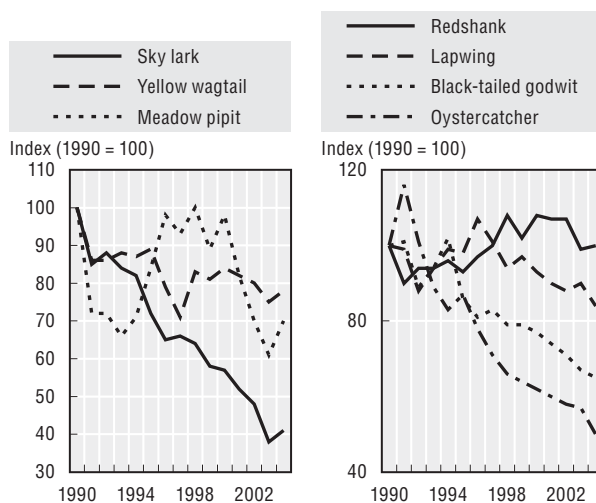
Figure 3.19.3. **Annual mean concentrations of nitrogen and phosphorus in surface water of rural and agricultural water catchments**



1. Maximum tolerable risk for nitrogen 2.2 mg N/l and 0.15 mg P/l for phosphorus in surface water.
2. 75% of rural upstream catchments including agricultural and other effluents.
3. 75% of agricultural upstream catchments.

Source: RIZA Institute for Inland Water Management and Waste Water Treatment, 2007.

Figure 3.19.4. **Farmland bird populations**



Source: NEM (SOVON, CBS, provinces).

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Table of Contents

I. Highlights	15
Overall agri-environmental performance.	15
Agri-environmental performance in specific areas	16
Caveats and limitations	19
Matching indicator criteria.	20
II. Background and Scope of the Report.	23
1. Objectives and scope.	23
2. Data and information sources.	24
3. Progress made since the OECD 2001 Agri-environmental Indicator Report	25
4. Structure of the Report	26
Bibliography	28
Annex II.A1. List of indicators in Chapter 1	29
Annex II.A2. Indicators in Chapter 1 assessed according to the OECD indicator criteria	31
Chapter 1. OECD Trends of Environmental Conditions related to Agriculture since 1990	37
1.1. Agricultural production and land	38
1.1.1. Introduction	39
1.1.2. Agricultural production	39
1.1.3. Agricultural land use.	40
1.1.4. Linkages between agricultural production and land use.	46
Bibliography	47
1.2. Nutrients	48
1.2.1. Nitrogen balance	52
1.2.2. Phosphorus balance	56
1.2.3. Regional (sub-national) nutrient balances.	60
Bibliography	62
1.3. Pesticides	63
1.3.1. Pesticide use	63
1.3.2. Pesticide risk indicators	67
Bibliography	74
1.4. Energy	76
Bibliography	83
1.5. Soil	84
Bibliography	90

1.6. Water.....	92
1.6.1. Water use	93
1.6.2. Water quality	100
Bibliography	108
1.7. Air	109
Background	110
1.7.1. Ammonia emissions, acidification and eutrophication.....	110
1.7.2. Methyl bromide use and ozone depletion	117
1.7.3. Greenhouse gas emissions and climate change	122
Bibliography	130
1.8. Biodiversity	133
Background	134
1.8.1. Genetic diversity	136
1.8.2. Wild species diversity	146
1.8.3. Ecosystem diversity.....	148
Bibliography	159
1.9. Farm management	160
1.9.1. Overview of environmental farm management	163
1.9.2. Nutrient management	163
1.9.3. Pest management	168
1.9.4. Soil management.....	169
1.9.5. Water management.....	172
1.9.6. Biodiversity management	173
1.9.7. Organic management	174
Bibliography	176
Chapter 2. OECD Progress in Developing Agri-environmental Indicators	179
2.1. Introduction.....	180
2.2. Progress in developing OECD Agri-environmental Indicators	180
2.2.1. Soil: Erosion, biodiversity and soil organic carbon	180
2.2.2. Water: Use and water quality	184
2.2.3. Biodiversity: Genetic, wild species and ecosystem diversity	188
2.2.4. Land: Landscapes and ecosystem functions	192
2.2.5. Farm management	195
2.3. Overall assessment.....	196
Annex 2.A1. Agri-environmental Indicators of Regional Importance and/or under Development.....	200
Annex 2.A2. A Qualitative Assessment of the Agri-environmental Indicators included in Annex 2.A1 according to the OECD Indicator Criteria	202
Bibliography	207
Chapter 3. OECD Country Trends of Environmental Conditions related to Agriculture since 1990	209
Background to the country sections	210
3.1. Australia	212
3.2. Austria	224
3.3. Belgium.....	234
3.4. Canada	243

3.5. Czech Republic	256
3.6. Denmark.....	269
3.7. Finland	284
3.8. France	296
3.9. Germany	305
3.10. Greece.....	313
3.11. Hungary	324
3.12. Iceland	336
3.13. Ireland.....	344
3.14. Italy	357
3.15. Japan.....	366
3.16. Korea.....	377
3.17. Luxembourg.....	386
3.18. Mexico.....	393
3.19. Netherlands	402
3.20. New Zealand	413
3.21. Norway	423
3.22. Poland.....	433
3.23. Portugal.....	448
3.24. Slovak Republic	459
3.25. Spain.....	472
3.26. Sweden.....	486
3.27. Switzerland	498
3.28. Turkey.....	507
3.29. United Kingdom	522
3.30. United States	532
3.31. European Union.....	545
Chapter 4. Using Agri-environmental Indicators for Policy Analysis	551
4.1. Policy context to OECD agri-environmental performance	552
4.2. Tracking agri-environmental performance.....	554
4.2.1. Evolution of Agri-environmental Indicators to track sustainable development.....	554
4.2.2. Tracking national agri-environmental performance	556
4.2.3. International reporting on environmental conditions in agriculture	559
4.2.4. Non-governmental organisations (NGOs)	561
4.3. Using Agri-environmental Indicators for policy analysis	562
4.3.1. OECD member countries	563
4.3.2. International governmental organisations	565
4.3.3. Research community	567
4.4. Knowledge gaps in using Agri-environmental Indicators.....	568
Bibliography	571
 List of boxes	
II.1. OECD Expert Meetings on Agri-environmental Indicators: 2001-04	25
1.7.1. Towards a net agricultural greenhouse gas balance indicator?.....	123

1.8.1. Defining agricultural biodiversity	134
2.1. Soil biodiversity in agricultural land	182
2.2. Agricultural livestock pathogens and water pollution	187
2.3. The impact of agriculture on aquatic ecosystems.	188
4.1. Main agri-environmental measures in OECD countries	553
4.2. Selected international and regional environmental agreements relevant to agriculture.	555

List of tables

1.1.1. OECD and world agricultural production	39
1.1.2. OECD and world agricultural exports	40
1.3.1. Germany: Percentage risk indices	70
1.7.1. Total OECD emissions of acidifying pollutants	114
1.7.2. Ammonia emission targets to 2010 under the Convention on Long-range Transboundary Air Pollution.	116
1.7.3. Methyl bromide use and progress in meeting the phase-out schedule under the <i>Montreal Protocol</i>	120
1.7.4. Critical Use Exemptions (CUEs) for methyl bromide agreed under the <i>Montreal Protocol</i> for 2005.	121
1.7.5. Total OECD gross greenhouse gas emissions	124
1.7.6. Main sources and types of gross greenhouse gas emissions	127
1.8.1. Area of transgenic crops for major producing countries	139
1.8.2. Plant genetic resource conservation activities for OECD countries	139
1.8.3. Livestock genetic resource conservation activities for OECD countries.	144
1.8.4. Share of farm woodland in agricultural land area.	157
1.8.5. Share of farm fallow in agricultural land area	157
1.9.1. Countries recording adoption of environmental farm management practices	164
1.9.2. Overview of farmer incentives to adopt environmental farm management practices	166
2.1. Net water balance in a Japanese rice field irrigation system: 2003.	185

List of figures

II.1. The Driving Force-State-Response framework: Coverage of indicators	24
1.1.1. Production, yields and area harvested and future projections for selected commodities and OECD countries	41
1.1.2. Volume of total agricultural production	43
1.1.3. Share of agricultural land use in the national land area	44
1.1.4. Agricultural land area	45
1.1.5. Agricultural production volume index and agricultural land area	46
1.2.1. Main elements in the OECD gross nutrient (nitrogen and phosphorus) balance calculation	50
1.2.2. Gross nitrogen balance estimates	51
1.2.3. Gross nitrogen balances for selected OECD countries	53
1.2.4. Inorganic nitrogen fertilisers and livestock manure nitrogen input in nitrogen balances.	54

1.2.5. Agricultural use of inorganic nitrogen and phosphate fertilisers	54
1.2.6. Contribution of the main sources of nitrogen inputs and outputs in nitrogen balances	56
1.2.7. Nitrogen efficiency based on gross nitrogen balances	57
1.2.8. Gross phosphorus balance estimates	58
1.2.9. Gross phosphorus balance for selected OECD countries	59
1.2.10. Contribution of the main sources of phosphorus inputs and outputs in phosphorus balances	60
1.2.11. Phosphorus efficiency based on phosphorus balances	61
1.2.12. Spatial distribution of nitrogen balances in Canada and Poland	62
1.3.1. Pesticide use in agriculture	65
1.3.2. Pesticide use for selected OECD countries	66
1.3.3. Belgium: Risk for aquatic species due to use of pesticides in arable land, horticulture and outside of agriculture	69
1.3.4. Denmark: The annual trend in frequency of pesticide application	70
1.3.5. The Netherlands: Potential chronic effects scores for aquatic and terrestrial organisms and leaching into groundwater	71
1.3.6. Norway: Trends of health risk, environmental risk and sales of pesticides	72
1.3.7. Sweden: National level pesticide risk indicators and the number of hectare doses	73
1.3.8. United Kingdom (England and Wales): Total area of pesticide applications	74
1.4.1. Simplified energy “model” of an agricultural system	78
1.4.2. Direct on-farm energy consumption	79
1.4.3. Direct on-farm energy consumption for selected OECD countries	80
1.4.4. Agricultural employment and farm machinery use	81
1.4.5. Composition of on-farm energy consumption in the EU15 and the United States	82
1.5.1. Agricultural land area classified as having moderate to severe water erosion risk	87
1.5.2. Trends in agricultural land area classified as having moderate to severe water erosion risk	88
1.5.3. Agricultural land area classified as having moderate to severe wind erosion risk	89
1.6.1. Agricultural water use	95
1.6.2. Share of national water use in annual freshwater resources and share of agricultural water use in national use	96
1.6.3. Irrigated area, irrigation water use and irrigation water application rates	97
1.6.4. Share of agricultural groundwater use in total groundwater use, and total groundwater use in total water use	99
1.6.5. Share of agriculture in total emissions of nitrates and phosphorus in surface water	102
1.6.6. Share of agriculture in total emissions of nitrates and phosphorus in coastal water	103
1.6.7. Share of monitoring sites in agricultural areas exceeding national drinking water limits for nitrates and phosphorus in surface water	104
1.6.8. Share of monitoring sites in agricultural areas exceeding national drinking water limits for nitrates in groundwater	105

1.6.9. Share of monitoring sites in agricultural areas where one or more pesticides are present in surface and groundwater	106
1.6.10. Share of monitoring sites in agricultural areas exceeding national drinking water limits for pesticides in surface water and groundwater	107
1.7.1. Impacts of agriculture on air quality: Multi-pollutants, multi-effects	110
1.7.2. Ammonia emissions from agriculture	112
1.7.3. Emissions of acidifying airborne pollutants for the EU15, US and OECD.	113
1.7.4. Agricultural ammonia emission trends for selected OECD countries	114
1.7.5. Share of the main sources of agricultural ammonia emissions in OECD countries	117
1.7.6. Methyl bromide use	119
1.7.7. Global methyl bromide use by major sectors.	121
1.7.8. Agricultural gross greenhouse gas emissions	125
1.7.9. Gross agricultural greenhouse gas emissions in carbon dioxide equivalent for selected OECD countries	126
1.7.10. Agricultural production and agricultural greenhouse gas emissions.	128
1.7.11. Main sources of methane and nitrous oxide emissions in OECD agriculture	129
1.7.12. Contribution of main sources in agricultural greenhouse gas emissions	130
1.8.1. OECD agri-biodiversity indicators framework	135
1.8.2. Change in the number of plant varieties registered and certified for marketing	137
1.8.3. Change in the share of the one-to-five dominant crop varieties in total marketed crop production	138
1.8.4. Change in the number of livestock breeds registered and certified for marketing	141
1.8.5. Change in the share of the three major livestock breeds in total livestock numbers.	142
1.8.6. Total number of cattle, pigs, poultry and sheep in endangered and critical risk status and under conservation programmes	143
1.8.7. Share of selected wild species that use agricultural land as primary habitat.	148
1.8.8. Population trends of farmland birds	149
1.8.9. Change in agricultural land use and other uses of land.	152
1.8.10. Permanent pasture and arable and permanent cropland	155
1.8.11. Share of arable and permanent cropland, permanent pasture and other agricultural land in total agricultural land area.	156
1.8.12. Share of national Important Bird Areas where intensive agricultural practices pose a serious threat or a high impact on the areas' ecological functions	158
1.9.1. OECD farm management indicator framework	162
1.9.2. Share of agricultural land area under nutrient management plans.	168
1.9.3. Share of total number of farms under nutrient management plans	169
1.9.4. Share of total number of farms using soil nutrient testing	170
1.9.5. Share of total arable and permanent crop area under integrated pest management.	171
1.9.6. Share of arable crop area under soil conservation practices	172
1.9.7. Share of total arable and permanent crop area under all-year vegetative cover	173
1.9.8. Share of irrigated land area using different irrigation technology systems	174

1.9.9. Share of agricultural land area under biodiversity management plans	175
1.9.10. Share of agricultural land area under certified organic farm management	176
2.1. Canadian soil organic carbon stocks in agricultural soils by different classes	183
2.2. United States soil organic carbon stocks in agricultural soils by different classes	184
2.3. Agricultural, industrial, and household water charges	186
2.4. National crop varieties that are endangered	189
2.5. National crop varieties that are not at risk.	190
2.6. Edge density of agricultural fields in Finland.	190
2.7. Share of Canadian farmland in various classes of the habitat capacity index.	191
2.8. Cultural landscape features on agricultural land	193
2.9. Water retaining capacity of agriculture	194
2.10. Water retaining capacity for agricultural facilities	195
2.11. Share of farmers participating in agri-environmental education programmes	197
3.1.1. National agri-environmental and economic profile, 2002-04: Australia	212
3.1.2. National agri-environmental performance compared to the OECD average.	220
3.1.3. National Landcare membership.	220
3.1.4. Annual quantities of insecticide and acaricide applied to the cotton crop	220
3.2.1. National agri-environmental and economic profile, 2002-04: Austria	224
3.2.2. National agri-environmental performance compared to the OECD average.	231
3.2.3. Area under non-use of inputs, organic farming and erosion control measures of the ÖPUL agri-environmental programme.	231
3.2.4. Greenhouse gas emissions from agriculture	231
3.3.1. National agri-environmental and economic profile, 2002-04: Belgium	234
3.3.2. National agri-environmental performance compared to the OECD average.	240
3.3.3. Total pesticide use	240
3.3.4. Greenhouse gas emissions and sinks	240
3.4.1. National agri-environmental and economic profile, 2002-04: Canada	243
3.4.2. National agri-environmental performance compared to the OECD average.	252
3.4.3. Share of cropland in different soil organic carbon change classes.	252
3.4.4. Share of farmland in different wildlife habitat capacity change classes.	252
3.5.1. National agri-environmental and economic profile, 2002-04: Czech Republic	256
3.5.2. National agri-environmental performance compared to the OECD average.	265
3.5.3. Share of samples above Czech drinking water standards for nitrates in surface water	265
3.5.4. Monitored numbers of partridge population	265
3.6.1. National agri-environmental and economic profile, 2002-04: Denmark	269
3.6.2. National agri-environmental performance compared to the OECD average.	280
3.6.3. Share of monitoring sites with occurrences of pesticides in groundwater used for drinking	280
3.6.4. Share of meadows and dry grasslands, heath, and bogs and marshes in the total land area	280
3.7.1. National agri-environmental and economic profile, 2002-04: Finland	284
3.7.2. National agri-environmental performance compared to the OECD average.	292
3.7.3. Nitrogen fluxes in the Paimionjoki river and agricultural nitrogen balances	292

3.7.4. Population trends of Finnish farmland butterflies in three ecological species groups.	292
3.8.1. National agri-environmental and economic profile, 2002-04: France.	296
3.8.2. National agri-environmental performance compared to the OECD average.	302
3.8.3. Trends in key agri-environmental indicators.	302
3.8.4. Trends in key agri-environmental indicators.	302
3.9.1. National agri-environmental and economic profile, 2002-04: Germany	305
3.9.2. National agri-environmental performance compared to the OECD average.	310
3.9.3. Share of the number of farms and Utilised Agricultural Area (UAA) under organic farming.	310
3.9.4. Share of renewable biomass and energy crop area in the total agricultural land area	310
3.10.1. National agri-environmental and economic profile, 2002-04: Greece	313
3.10.2. National agri-environmental performance compared to the OECD average.	321
3.10.3. Irrigated area and irrigation water application rates	321
3.10.4. <i>Ex situ</i> accessions of plant landraces, wild and weedy relatives.	321
3.11.1. National agri-environmental and economic profile, 2002-04: Hungary	324
3.11.2. National agri-environmental performance compared to the OECD average.	333
3.11.3. Agricultural land affected by various classes of water erosion	333
3.11.4. Support payments for agri-environmental schemes and the number of paid applications.	333
3.12.1. National agri-environmental and economic profile, 2002-04: Iceland	336
3.12.2. National agri-environmental performance compared to the OECD average.	342
3.12.3. Annual afforestation	342
3.12.4. Annual area of wetland restoration.	342
3.13.1. National agri-environmental and economic profile, 2002-04: Ireland	344
3.13.2. National agri-environmental performance compared to the OECD average.	353
3.13.3. River water quality	353
3.13.4. Population changes for key farmland bird populations	353
3.14.1. National agri-environmental and economic profile, 2002-04: Italy.	357
3.14.2. National agri-environmental performance compared to the OECD average.	363
3.14.3. Actual soil water erosion risk.	363
3.14.4. Regional change in agricultural land area: 1990 to 2000.	363
3.15.1. National agri-environmental and economic profile, 2002-04: Japan	366
3.15.2. National agri-environmental performance compared to the OECD average.	373
3.15.3. National water retaining capacity of agriculture.	373
3.15.4. Share of eco-farmers in the total number of farmers.	373
3.16.1. National agri-environmental and economic profile, 2002-04: Korea	377
3.16.2. National agri-environmental performance compared to the OECD average.	383
3.16.3. Composition of soils	383
3.16.4. National water retaining capacity of agriculture.	383
3.17.1. National agri-environmental and economic profile, 2002-04: Luxembourg	386
3.17.2. National agri-environmental performance compared to the OECD average.	391
3.17.3. Nitrate and phosphorus concentration in river sampling stations.	391
3.17.4. Agricultural land under agri-environmental schemes	391
3.18.1. National agri-environmental and economic profile, 2002-04: Mexico	393
3.18.2. National agri-environmental performance compared to the OECD average.	399

3.18.3. Trends in key agri-environmental indicators	399
3.18.4. Trends in key agri-environmental indicators	399
3.19.1. National agri-environmental and economic profile, 2002-04: Netherlands	402
3.19.2. National agri-environmental performance compared to the OECD average	409
3.19.3. Annual mean concentrations of nitrogen and phosphorus in surface water of rural and agricultural water catchments	409
3.19.4. Farmland bird populations	409
3.20.1. National agri-environmental and economic profile, 2002-04: New Zealand	413
3.20.2. National agri-environmental performance compared to the OECD average	420
3.20.3. Sectoral use of pesticides: 2004	420
3.20.4. Dairy cattle enteric methane emissions per litre of milk	420
3.21.1. National agri-environmental and economic profile, 2002-04: Norway	423
3.21.2. National agri-environmental performance compared to the OECD average	430
3.21.3. National sales of pesticides	430
3.21.4. Net change in agricultural land for five counties	430
3.22.1. National agri-environmental and economic profile, 2002-04: Poland	433
3.22.2. National agri-environmental performance compared to the OECD average	444
3.22.3. Agriculture and forest land at risk to erosion	444
3.22.4. Index of population trends of farmland birds	444
3.23.1. National agri-environmental and economic profile, 2002-04: Portugal	448
3.23.2. National agri-environmental performance compared to the OECD average	456
3.23.3. Numbers of local breeds under <i>in situ</i> conservation programmes: 2006	456
3.23.4. Relation between land use and Designated Nature Conservation Areas (DNCA): 2004	456
3.24.1. National agri-environmental and economic profile, 2002-04: Slovak Republic . .	459
3.24.2. National agri-environmental performance compared to the OECD average	468
3.24.3. Agricultural methane (CH ₄) and nitrous oxide (N ₂ O) emissions	468
3.24.4. Share of agricultural land under different types of protected areas: 2003	468
3.25.1. National agri-environmental and economic profile, 2002-04: Spain	472
3.25.2. National agri-environmental performance compared to the OECD average	482
3.25.3. Area of organic farming	482
3.25.4. Share of Dehesa area in total land area for five regions	482
3.26.1. National agri-environmental and economic profile, 2002-04: Sweden	486
3.26.2. National agri-environmental performance compared to the OECD average	494
3.26.3. Losses of nutrients from arable areas and the root zone	494
3.26.4. Cultural features on arable land	494
3.27.1. National agri-environmental and economic profile, 2002-04: Switzerland	498
3.27.2. National agri-environmental performance compared to the OECD average	504
3.27.3. Support for agricultural semi-natural habitats	504
3.27.4. Input/output efficiency of nitrogen, phosphorous and energy in agriculture . . .	504
3.28.1. National agri-environmental and economic profile, 2002-04: Turkey	507
3.28.2. National agri-environmental performance compared to the OECD average	518
3.28.3. Trends in key agri-environmental indicators	518
3.28.4. Trends in key agri-environmental indicators	518
3.29.1. National agri-environmental and economic profile, 2002-04: United Kingdom	522
3.29.2. National agri-environmental performance compared to the OECD average	528

3.29.3. Agri-environmental trends	528
3.29.4. Greenhouse gas emission trends and projections.	528
3.30.1. National agri-environmental and economic profile, 2002-04: United States.	532
3.30.2. National agri-environmental performance compared to the OECD average.	540
3.30.3. Soil erosion on cropland	540
3.30.4. Change in palustrine and estuarine wetlands on non-federal land and water area	540
3.31.1. National agri-environmental and economic profile, 2002-04: European Union (15)	545
3.31.2. EU15 agri-environmental performance compared to the OECD average.	548
3.31.3. Agri-environmental trends, EU15	548
3.31.4. Agri-environmental trends, EU15	548

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