Organisation for Economic Co-operation and Development
Organisation de Coopération et de Développement Économiques

ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN OECD COUNTRIES SINCE 1990:

Belgium 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

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The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).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

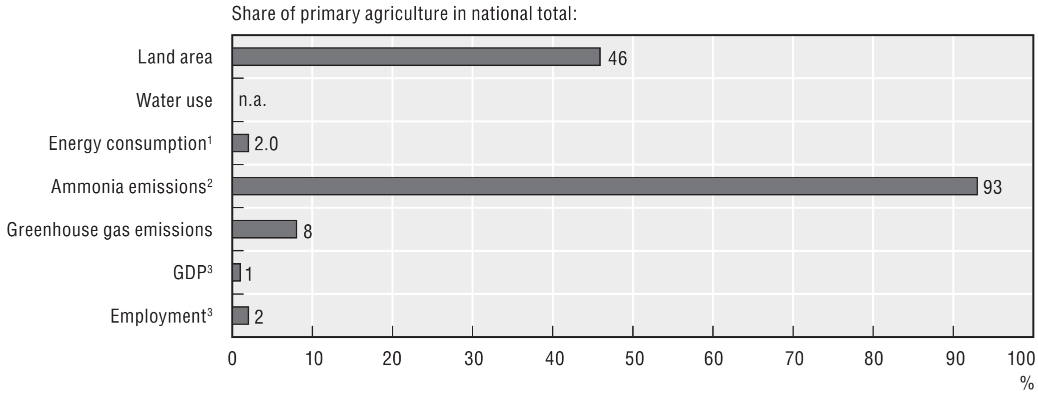
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes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

3.3. BELGIUM

Figure 3.3.1. **National agri-environmental and economic profile, 2002-04: Belgium**



StatLink http://dx.doi.org/10.1787/288840560263

1. Data refer to the period 1999-01.
2. Data for the period 2002-04 refer to the period 2001-03.
3. Data refer to the year 2004.

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

3.3.1. Agricultural sector trends and policy context

Agriculture's contribution to the economy declined over the 1990s, and by 2004 accounted for less than 1% of GDP and represented about 2% of employment [1] (Figure 3.3.1). The overall volume of farm production decreased by around 1% over the period 1990-92 to 2002-04 (Figure 3.3.2), and since 2000 production has decreased most rapidly for livestock but less so for crops. While Walloon accounts for 55% of farmland it generates only half the agricultural value added of Flanders where two-thirds of the intensive farming holdings are situated [1].

The area farmed increased by about 3% from 1990-92 to 2002-04 (Figure 3.3.2), and accounted for 45% of the total land area in 2002-04, although the area of farmland declined by nearly 1% from 2000 to 2005 [1]. The growth in farmland over the 1990s was largely because of improved measurement (*i.e.* registration and reporting by farmers), rather than an actual increase in land farmed, linked to manure policy and the CAP reforms of the early 1990s [2, 3]. Agriculture remains highly intensive by comparison with most OECD countries, although purchased farm input use per unit volume of output diminished over the period 1990-92 to 2002-04. During this period the volume of inorganic fertilisers declining by about –15% for nitrogen and over –30% for phosphorus, pesticides by 19% and direct on-farm energy consumption by –6% (Figure 3.3.2).

Farming is mainly supported under the Common Agricultural Policy, with additional national expenditure within the CAP framework. Support to EU15 agriculture 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% [4]. Nearly 70% of EU15 farm support is output and input linked, falling from over 98% in the mid-1980s. Annual Belgian agricultural budgetary expenditure (less CAP payments) was EUR 222 (USD 277) million in 2004, of which around 30% EUR 65 (USD 80) million) was for agri-environmental measures, which was about 1% of farm gross value added. Since 2001 farm policy is devolved to Flanders, Walloon and Brussels, although only 3% of the Brussels region is farmed [4, 5, 6].

Agri-environmental policies are mainly focused on reducing the intensity of farming and protecting biodiversity and cultural landscapes. Flanders and Walloon have established their own agri-environmental plans [6, 7, 8]. While there are many common elements in these plans, they accounted for 23% of the agricultural budget in Flanders and 45% in Walloon in 2004 [4]. Nutrient policy under the EU *Nitrates Directive* was implemented in Flanders in 1991, with obligatory requirements for manure application and storage and voluntary codes of good environmental farm practice. Since 2004 there have been obligatory requirements for nutrient application and storage, and soil cover during winter [2, 7] in Walloon. Payments have been provided for biodiversity and landscape conservation since 2000, such as maintaining hedges, ponds and meadow birds, and also to reduce nutrient application rates [2, 6, 9].

Agriculture is impacted by national environmental and taxation policies and international environmental agreements, with national environmental policies devolved to the regions in the early 1990s [6]. Revenue from environmental taxes was about 2% of GDP in 2003, including taxes on manure surpluses, groundwater use [10] and, since 1997, on five of the most common pesticides found in water at EUR 2.5 (USD 3.1)/kg [2]. Under measures to manage and recycle packaging waste, farmers are required to recover at least 80% of their pesticide packaging or they are subject to a tax of EUR 0.124 (USD 0.155)/litre of pesticide [2]. Farmers are exempt from fuel tax [11], while tax reductions were granted on biofuels from 2005 [12], and tax benefits are available to farmers if they invest in energy saving (13.5% tax deduction on the energy saving investment) [1]. Some international environmental agreements require Belgian agriculture to reduce nutrient pollution into the North Sea (*OSPAR Convention*), ammonia emissions (*Gothenburg Protocol*), methyl bromide (*Montreal Protocol*) and greenhouse gases (*KyotoProtocol*) [13].

3.3.2. Environmental performance of agriculture

The high population density and intensive farming system exert great pressure on the environment. The key environmental challenges are to reduce water pollution from farm nutrients, pesticides and heavy metals, as well as to maintain soil quality, reduce ammonia and greenhouse gas emissions, and enhance biodiversity and cultural landscapes [8, 14].

Soil erosion is a concern in some regions, although less than 1% of farmland area is experiencing water erosion greater than 11 tonnes per hectare per year. Problems related to wind erosion are minor. Some improvement in soil management practices (*e.g.* low tillage, green cover during winter) is helping to raise soil quality, especially in those regions (central areas) at greatest risk of erosion both on and off-farm [2, 15, 16]. Improvements in soil management practices together with land use changes may also have increased soil organic carbon levels over the 1990s, thus, improving soil fertility and carbon sequestration in soils, although current evidence suggests such improvements are likely to have been small [2, 8, 17, 18].

The pressure from farming activities on water quality is easing, but absolute levels of agricultural nutrient and pesticide pollution of water remain amongst the highest in the OECD. Agriculture is the major source of nutrient pollution of water, with water pollution from pesticides and heavy metals also important [8, 14].

Agricultural nutrient surpluses decreased between 1990-92 and 2002-04, but surpluses per hectare of farmland remain amongst the highest in the OECD (Figure 3.3.2). Over this period surpluses (tonnes) of nitrogen fell by –26% and phosphorus by –43%, mainly because of a reduction in fertiliser use and higher uptake of nutrients due to an expansion in crop production, although this was partly offset by an increase in livestock numbers (largely pigs and poultry) [14, 19]. As a result livestock now accounts for the major share of nutrient surpluses (notably dairy cattle). The drop in fertiliser use has become decoupled from the growth in crop production over the past decade, although the intensity of fertiliser use remains high in relation to the OECD average [13]. The efficiency of nutrient use (volume ratio of inputs to outputs) is below the OECD average, but overall has improved over the period 1990-92 to 2002-04 [20, 21]. The improvement in nutrient use efficiency is partly because of the obligation of all farms to implement a nutrient management plan since the early 1990s, with an increasing number of farms now undertaking soil nutrient testing.

Agriculture accounts for the major and growing source of nutrients and heavy metals in water, as pollution from other sources (industry, urban) is declining [14, 22]. The shares of ***nitrogen and phosphorus*** from agriculture in surface waters in the Flanders region were about 60% and 35% respectively, compared to respective shares of 50% and 25% in 1992 [14, 22]. Similar levels are apparent for coastal waters, which rose from 39% and 14% for nitrogen and phosphorus respectively in 1985, to respective shares of 56% and 39% by 2000 [2]. The share of surface water monitoring sites in agricultural areas of Flanders exceeding drinking water standards in 2001-02 for surface water was about 40% for nitrates and phosphorus and 30% for nitrates in groundwater. Nitrate concentrations are also rising in certain aquifers in Walloon [8]. Despite the decrease in agricultural nitrogen surpluses, pollution of groundwater is not expected to improve for many years because of the time lags involved in the transfer of nitrates through water tables [2, 7], with even longer time lags for phosphorus.

Agricultural pollution of surface water from heavy metals, especially fertilisers, is making a growing contribution to total emissions, as heavy metal pollution from non-agricultural sources is rapidly declining [8, 14]. In Flanders, however, targets for heavy metal emissions in surface water are being met in most cases [14]. This is mainly because of lower inorganic fertiliser use and the ban on applying sewage sludge as a fertiliser (although sewage sludge use is restricted in Walloon) [18].

Environmental risks have diminished with the 19% reduction in the volume of pesticide use (active ingredients) over the period 1990-92 to 2001-03 (Figures 3.3.2 and 3.3.3). Agriculture accounts for around 70% of pesticide use, with horticultural producers being the major users [23]. Pesticide use has become decoupled from the growth in crop production, mainly because of the increasing use of new generation pesticides, which in general are applied at a much lower dose per hectare, and improvements in pest management practices [23]. But despite the increase in the area under integrated pest management (IPM) over the past decade this only accounted for under 2% of the total arable and permanent crop area, with organic farming accounting for 3% of the total agricultural land area in 2003. For some crops the share under IPM is higher, such as for apples (23%) and pears (33%) [24]. In Flanders 11% of surface water monitoring sites in agricultural areas recorded that atrazine (a pesticide) was found in excess of drinking water standards in 2002, with a share of 25% for groundwater monitoring sites, but this varies regionally from 13% to 32% [2]. An environmental pesticide risk indicator for aquatic species declined by in excess of 100% during the period 1990 to 2004, well in excess of the target set by the Flemish government to achieve a 50% reduction between 1990 and 2005 [14].

Farming accounts for a minor share of water use despite significant growth in the area irrigated. The area irrigated grew by 67% between 1990-92 and 2001-03, but accounts for less than 2% of total farmland (3% of arable and permanent cropland), and 22% of total agricultural water use. Most of the irrigated area is in the Flanders region, and is mainly used for irrigating horticultural crops [2]. Over 80% of the water used on irrigated areas is applied using efficient water application technologies, such as drip emitters and low pressure sprinklers [2].

Agricultural ammonia and methyl bromide emissions have declined over the past decade. Having increased slightly over the period 1990 to 1997, agricultural ***ammonia*** decreased sharply from 1998 to 2002, largely because of the obligatory requirement for low emission spreading of manure (Figure 3.3.2). Agriculture accounted for over 93% (2001-03) of ammonia emissions, and the lowering of emissions has contributed to the overall reduction in emissions of acidifying substances by nearly 30% between 1990 and 2002, although the level of acidification continues to damage ecosystems [8, 14]. While there has been a substantial reduction in the use of ***methyl bromide*** (an ozone depleting substance) it continues to be used by the horticultural sector [14, 25]. Belgium, as a signatory to the *Montreal Protocol* agreed to phase out methyl bromide use by 2005, but also agreed under the Protocol to "*Critical Use Exemption*" of 36 tonnes (ozone depleting potential) or about 10% of its consumption level in 1991, which under the Protocol allows farmers additional time to find substitutes [25].

Agricultural greenhouse gas emissions (GHGs) declined by 10% between 1990-92 and 2002-04, but rose by 1% for other sectors of the economy (Figures 3.3.2 and 3.3.4). This compares to a commitment as part of the *Kyoto Protocol* to reduce total GHGs by 7.5% in 2008-12 under the EU GHG *Burden Sharing Agreement*, relative to the 1990 base period [1]. Much of the decrease in agricultural GHGs was due to lower fertiliser and livestock numbers, with farming contributing 8% of total GHG emissions in 2002-04 and 2% of total energy consumption. ***Carbon sequestration*** related to agriculture showed a small increase over the period 1990 to 2004, mainly due to improvements in soil management practices (low tillage practices) and reafforestation of farmland, to some extent offset by land use changes, especially the increase in arable and permanent cropland [17, 18]. The potential of agricultural to provide biomass feedstock for renewable energy production is limited at present as there is no biofuel production capacity [26].

Agriculture has adversely impacted on biodiversity since 1990, but there are recent signs since around 2000 that this pressure could be easing. The key pressures derive from eutrophication and acidification of ecosystems due to surplus nutrients, desiccation from farmland drainage and groundwater extraction, and the fragmentation and conversion of farmland to non-agricultural uses [27]. For ***agricultural genetic resource diversity*** an increasing number of crop varieties and livestock breeds (except cattle) have been used in production in Flanders since 1990. Some endangered cattle breeds, however, are maintained under *ex situ* conservation programmes, and a regional network of *ex situ* fruit orchards to conserve local fruit varieties was established in 2005. There are also some improvements for *in situ* collections of crops and livestock genetic material [28].

Trends in species diversity showed that farming accounts for over 70% of the harmful impacts affecting the quality of important bird areas. Compared to other EU countries there has been a high rate of decline in farmland birds. Within Flanders ten species showed a negative trend, especially the Skylark (*Alauda arvensis*) and Meadow Pipit (*Anthus pratensis*), and two a positive trend from 1985 to 2002 [2, 29]. The acidification and eutrophication of terrestrial and aquatic ecosystems from excess agricultural nitrogen emissions in Flanders currently threaten 40% of the floral species that are not tolerant to acid conditions. Over 70% of species rich grasslands exceeded the critical load for nitrogen in 2003, although pressure on habitats from nitrogen pollution declined over the 1990s [14, 29]. Butterfly populations have been negatively affected by excess nitrogen in the environment as well as the conversion of extensive pasture to other uses [27, 30]. Concerning ***agricultural habitat diversity***, conversion of small farmland habitats, such as ditches and hedgerows, has also been a major cause of the loss of certain flora, for example the Primrose (*Primula vulgaris*) [27, 31]. Moreover, wild species have been adversely impacted since 1990 by the conversion of pasture to cropland, and to a lesser extent permanent crops (horticultural crops), and the conversion and fragmentation of farmland to other uses, especially urban use and forestry [29].

Agriculture plays a key role in changing cultural landscapes [5]. There are landscape inventories, but no regular monitoring of changes in agricultural cultural landscapes. But concerns remain, however, that cultural landscapes are being adversely impacted by fragmentation, as a result of the enlargement of field size and the expansion of urban areas and transport networks [5].

3.3.3. Overall agri-environmental performance

Overall the high intensity of farm input use exerts considerable pressure on the environment, although since the late 1990s there have been signs the pressure could be easing. Pressure on the environment has largely become decoupled from farm production with the reduction in output over the period 1990-92 to 2002-04 less than the much larger decline in purchased input use. But absolute levels of many agricultural pollutants in Belgium remain high relative to average OECD standards, and as a result the sector is a major source of water and air pollution, while farming practices continue to cause pressure on soil erosion, biodiversity and cultural landscapes.

Each Federal region is developing its own agri-environmental monitoring and evaluation system. As a consequence of the shift to a regional decision making system, obtaining a uniform assessment and data for Belgium as a whole is difficult and, hence, there is little co-ordinated information available at a national level [5, 27]. Both Flanders and Walloon publish annually environmental indicators, including many of relevance to agriculture [8, 14, 29], and in 2004 Flanders made a detailed study of agri-environmental performance [32].

Agri-environmental measures have been considerably strengthened and expanded since 2000, compared to those measures first introduced in the early 1990s [6, 9]. In 2003 around 10% of the agricultural land area was under agri-environmental schemes [6, 9], with the major part of expenditure under these schemes being aimed at reducing nutrient pollution (water and air) [6, 9]. Recent policy initiatives, including budgetary payments, have led to a substantial expansion in agricultural areas under biodiversity conservation (*i.e.* field margins, ponds, hedges, extensive grassland), even so they only covered just

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over 1% of farmland in Flanders in 2004 [29]. Payments to convert and maintain organic farming were increased in 2003, for a minimum period of 5 years [4]. The target area organically farmed is set to rise from 3 % of farmland in 2003 to 10% by 2010 [2, 9, 28].

Despite recent improvements in agri-environmental performance major challenges remain. Flanders has identified a 2010 target for ***nutrient surpluses*** (70 kg N/ha and 4 kg P/ha) to protect drinking water quality, but this will require a major effort to achieve, as the surpluses in 2002-04 were 184 kg N/ha and 23 kg P/ha [14]. Similar concerns also arise in overcoming farm nitrogen pollution in Walloon [7]. Improving nitrogen use efficiency levels, which are relatively low by average OECD standards, has been recognised as one way of reducing nitrogen surpluses [20, 21, 33]. From 2003 some 40 active ***pesticide*** ingredients were prohibited out of a total 375 authorised ingredients in Flanders. This has help the region meet the 50% reduction target for its environmental pesticide risk indicator between 1990-2005 (for farm and non-farm pesticides) [14, 23].

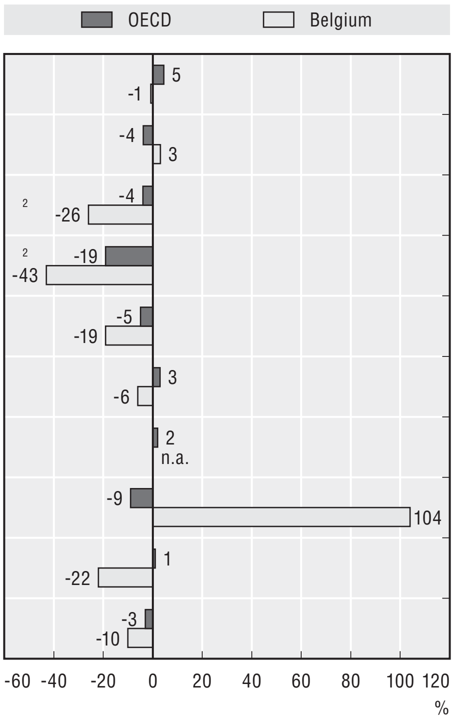
To meet the national ammonia emission ceiling target by 2010 agreed under the Gothenburg Protocol, emissions will need to decline by a further 8% from their 2001-03 average level. This compares to a reduction of 22% from 1990-92 to 2001-03. Some researchers consider it unlikely, however, that acidification will decrease sufficiently by 2010 to avoid damage to vulnerable ecosystems [27].

The farming sector has reduced its GHG emission levels, and this trend is projected to continue up to 2010 [34, 35], but the contribution from soil carbon sequestration could be modest [18]. While agricultural GHG emissions and on-farm energy consumption have decreased over the past 15 years, further reductions might be achieved if the fuel tax exemption for farmers were removed, which acts as a disincentive to lower energy use, improve energy efficiency and further reduce GHG emissions.

Concerning biodiversity risks of future adverse impacts from farming remain [27]. Implementation of meadow bird and floral protection schemes are progressing only slowly in Flanders [27], and were behind the targets set for 2006 [29].

Figure 3.3.2. **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		Belgium	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	99	105
Agricultural land area	000 hectares	1990-92 to 2002-04	42	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	184	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	23	10
Agricultural pesticide use	tonnes	1990-92 to 2001-03	–1 283	–46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	–55	+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	0.2	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	–21	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	–1 233	–30 462

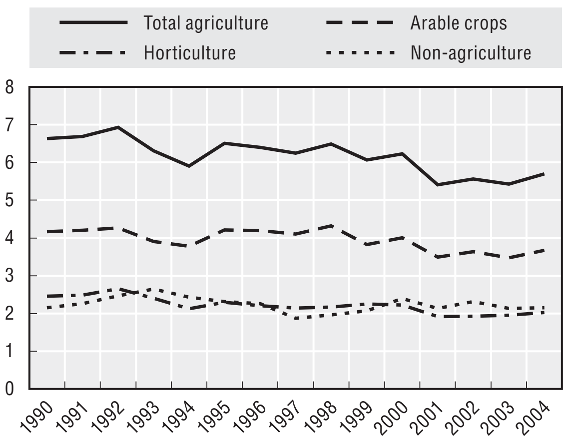
n.a.: Data not available. Zero equals value between –0.5% to < +0.5%.

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*.

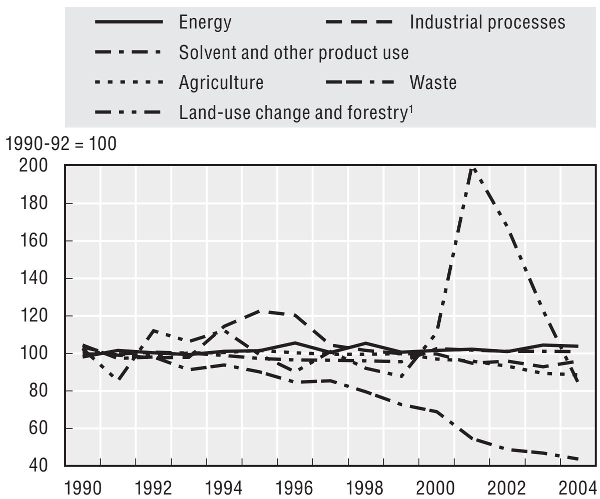
Figure 3.3.3. **Total pesticide use**

Thousand tonnes, active ingredients



Source: Crop Protection Department, Ghent University, Belgium.

Figure 3.3.4. **Greenhouse gas emissions and sinks**



1. Index shows the increase and decrease in GHG sinks.

Source: National inventory report under the UNFCCC, 2007.

StatLink http://dx.doi.org/10.1787/288850702786

Bibliography

[1] National Climate Commission (2006), *Belgium's Fourth National Communication under the UNFCCC*, Brussels, Belgium, *http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/3625.php*.

[2] The Belgian response to the OECD Agri-environmental Indicator Questionnaire, unpublished.

[3] Duvivier, R., F. Gaspart and B.H. de Frahan (2005), *A panel data analysis of the determinants of Farmland price: An application to the effects of the 1992 CAP Reform in Belgium*, paper presented to the XIth International Congress of the European Association of Agricultural Economists, Copenhagen, Denmark, August.

[4] OECD (2005), *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2005*, Paris, France, *www.oecd.org/agr/policy*.

[5] Antrop, M. (2003), "Results from the Recent Landscape Inventories for Building Landscape Indicators in Belgium", in OECD, *Agricultural Impacts on Landscapes: Developing Indicators for Policy Analysis*, Paris, France, *www.oecd.org/tad/env/indicators*.

[6] Carels, K. and D. van Gijseghem (2005), "Evaluation of Agri-environmental Measures in Flanders, Belgium", in OECD, *Evaluating Agri-environmental Policies: Design, Practice and Results*, Paris, France, *www.oecd.org/tad/env*.

[7] Hendrickx, C., R. Lambert, X. Sauvenier and A. Peeters (2006), "Sustainable Nitrogen Management in Agriculture: An Action Programme towards Protecting Water Resources in Walloon Region (Belgium)", in OECD, *Water and Agriculture: Sustainability, Markets and Policies*, Paris, France, *www.oecd.org/tad/env*.

[8] Ministry of the Walloon Region (2005), *Scoreboard of the Walloon Environment 2005*, Directorate-General for Natural Resources and the Environment, Ministry of Agriculture, Rural Affairs, and Environment and Tourism, Namur, Belgium, *www.environnement.wallonie.be*.

[9] Maljean, J.F., V. Brouckaert, N. van Cauwenbergh and A. Peeters (2005), "Assessment, Monitoring and Implementation and Improvement of Farm Management for Environmental and Sustainable Agriculture Purposes: A Belgian Perspective (Walloon Region)", in OECD, *Farm Management and the Environment: Developing Indicators for Policy Analysi*, Paris, France, *www.oecd.org/tad/env/indicators*.

[10] OECD (2006), *The Political Economy of Environmentally Related Taxes*, Paris, France, *www.oecd,.org/env*.

[11] OECD (2005), *Taxation and Social Security in Agriculture*, Paris, France, *www.oecd.org/tad*.

[12] United States Department of Agriculture (USDA) (2006), *Belgium-Luxembourg Oilseeds and Products Biofuels Situation in the Benelux*, Gain Report No. BE6003, 8 February, Foreign Agricultural Service, Washington DC, United States.

[13] OECD (1998), *Environmental Performance Reviews: Belgium*, Paris, France, *www.oecd.org/env*.

[14] Flemish Environment Agency (2003), *MIRA – T 2003 themes: Report on the Environment and Nature in Flanders, Mechelen*, Belgium, *www.milieurapport.be*.

[15] Vandekerckhove, L., M. Swerts, G. Verstraeten, H. Neven and M. De Vrieze (2004), "Four Indicators of Soil Erosion as used by Policy Makers in Flanders", in OECD, *Agricultural Impacts on Soil Erosion and Soil Biodiversity: Developing Indicators for Policy Analysis*, Paris, France, *www.oecd.org/tad/env/indicators*.

[16] Dupraz, D.P., D. Vermersch, B.H. de Frahan and L. Delvaux (2003), "The environmental supply of farm households", *Environmental and Resource Economics*, Vol. 25, pp. 171-189.

[17] Smith, P., O. Andren, T. Karlsson, P. Perala, K. Regina, M. Rounsevell and B. van Wesemael (2005), "Carbon sequestration potential in European croplands has been overestimated", *Global Change Biology*, Vol. 11, pp. 2153-2163.

[18] Dendoncker, N., B. van Wesemael, M. Rounsevell, C. Rielandt and S. Lettens (2004), "Belgium's CO_2 mitigation potential under improved cropland management", *Agriculture, Ecosystems and Environment*, Vol. 103, pp. 101-116.

[19] Ministry of Small Enterprises, Trades and Agriculture (2002), *TAPAS 2001(3) Agri-environmental indicators related to nutrient flows in agriculture*, Centre for Agricultural Economics, Ministry of the Walloon Region.

[20] Nevens, F., I. Verbruggen, D. Reheul and G. Hofman (2006), "Farm gate nitrogen surpluses and nitrogen use efficiency of specialized dairy farms in Flanders: Evolution and future goals", *Agricultural Systems*, Vol. 88, pp. 142-155.

[21] Buysse, J., G. van Huylenbroech, I. Vanslem, F. Nevens, I. Verbruggen and P. Vanrolleghem (2005), "Simulating the influence of management decisions on the nutrient balance of dairy farms", *Agricultural Systems*, Vol. 86, pp. 333-348.

[22] Flemish Environment Agency (2003), *Milieu-en Natuurrapport Vlaanderen* (available in Dutch only), MIRA Achtergronddocument 2003, 2.19, Mechelen, Belgium, *www.milieurapport.be*.

[23] Smet, B. de, S. Claeys, B. Vagenende, S. Overloop, W. Steurbaut and M. Van Steertegem (2005), "The sum of spread equivalents: a pesticide risk index used in environmental policy in Flanders, Belgium", *Crop Protection*, Vol. 24, pp. 363-374.

[24] Lierde, van D. and A. van den Bossche (2002), *Economical and environmental aspects of integrated fruit production in Belgium*, paper presented to the International Horticultural Congress, 11-17 August, Toronto, Canada, *www2.vlaanderen.be/ned/sites/landbouw/downloads/cle/pap3.pdf*.

[25] Pesticide Action Network UK (2004), *Methyl bromide exemptions flout rules of Montreal Protocol*, London, *www.pan-uk.org/pestnews/pn64/pn64p18.htm*.

[26] IEA (2005), *Energy Policies of IEA Countries – Belgium 2005 Review*, Paris, France, *www.iea.org*.

[27] García Cidad, V., G. De Blust, J.F. Maljean and A. Peeters (2003), "Overview of Biodiversity Indicators Related to Agriculture in Belgium", in OECD, *Agriculture and Biodiversity: Developing Indicators for Policy Analysis*, Paris, France, *www.oecd.org/tad/env*.

[28] Royal Belgian Institute of Natural Sciences (2005), *Third National Report of Belgium to the Convention on Biological Diversity*, Secretariat to the Convention on Biological Diversity, Montreal, Canada, *www.biodiv.org/reports/list.aspx?type=all*.

[29] Institute of Nature Conservation (2005), *Nature Report 2005: State of Nature in Flanders Summary*, Brussels, Belgium, *www.nara.be*.

[30] Maes, D. and H. Van Dyck (2001), "Butterfly diversity loss in Flanders (north Belgium): Europe's worst case scenario?", *Biological Conservation*, Vol. 99, pp. 263-276.

[31] Endels, P., H. Jacquemyn, R. Brys, M. Hermy and G. De Blust (2002), "Temporal changes (1986-99) in populations of primrose (*Primula vulgaris* Huds.) in an agricultural landscape and implications for conservation", *Biological Conservation*, Vol. 105, pp. 11-25.

[32] Wustenberghs, H., L. Lauwers and S. Overloop (2005), *Landbouw and visserij en het milieu 2004* (available only in Dutch), Publication No. 1.14, Centre for Agricultural Economic (CLE), Merelbeke, Belgium, *www2.vlaanderen.be/ned/sites/landbouw/publicaties/cle/114.html*.

[33] Vervaet, M., L. Lauwers, S. Lenders and S. Overloop (2005), *Effectiveness of Nitrate Policy in Flanders (1990-2003): Modular Modelling and Response Analysis*, paper presented at the XIth European Association of Agricultural Economists, Copenhagen, Denmark, 24-27 August, *http://agecon.lib.umn.edu/cgi-bin/pdf_view.pl?paperid=18095*.

[34] UNFCCC (2003), *Belgium: Report on the in-depth review of the third national communication of Belgium*, UN Framework Convention on Climate Change, *http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/3625.php*.

[35] National Climate Commission (2006), *Report on Demonstrable Progress under the Kyoto Protocol Belgium*, Brussels, Belgium, *http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/3625.php*.