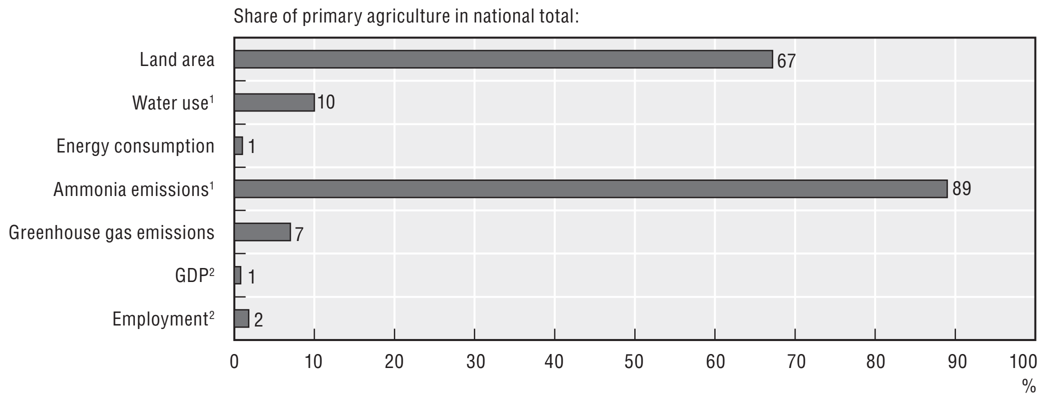
3.29. UNITED KINGDOM

Figure 3.29.1. **National agri-environmental and economic profile, 2002-04: United Kingdom**



StatLink http://dx.doi.org/10.1787/301208146100

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

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

3.29.1. Agricultural sector trends and policy context

Agriculture's contribution to the economy is small but its environmental impact significant. Between 1990 and 2004 farming's contribution to GDP and employment almost halved to 0.8% and 1.8% respectively by 2004 (Figure 3.29.1). Farming generates both environmental costs, calculated at approximately GBP 1 450 (EUR 2 100) million annually (2003 prices), and benefits, estimated at about GBP 1 230 (EUR 1 780) million annually, around 0.13% and 0.11% respectively of GDP in 2003 [1, 2, 3].

The agricultural sector has been contracting. The volume of farm production declined by over 8% during the period 1990-92 to 2002-04, together with a reduction in the volume of purchased farm input use, including –6% for pesticides, –13% for inorganic nitrogen fertilisers, –19% for inorganic phosphate fertilisers, and –24% for direct on-farm energy consumption (Figures 3.29.2 and 3.29.3). Grazing livestock is the dominant sub-sector, with livestock farming accounting for two-thirds of agricultural land use, with much of the rest under arable crops, largely concentrated in Central and Eastern England [4, 5].

Farming is mainly supported under the Common Agricultural Policy (CAP), supplemented with national expenditure within the CAP framework. Support to EU15 agriculture has declined from 39% of farm receipts in the mid-1980s to 34% in 2002-04 (as measured by the OECD Producer Support Estimate) compared to the OECD average of 30% [6]. Nearly 70% of EU15 farm support was output and input linked up to 2004, but this share was over 98% in the mid-1980s. Budgetary support to UK farmers in 2004 was GBP 2.8 (EUR 4.1) billion per annum, of which 80% is funded by the EU. Administration of agricultural policy is devolved to England, Wales, Scotland, and Northern Ireland.

Expenditure on agri-environmental programmes increased five-fold between 1993-2004, rising to GBP 245 (EUR 360) million [4]. Following the government's 2002 Strategy for Sustainable Farming and Food [1, 7], together with the Rural White Paper [8, 9] and CAP reforms, agri-environmental programmes are being further developed to encourage sustainable practices across all farms and to continue with conservation of high priority habitats and landscapes [10]. Support is also provided for conversion to organic farming, while voluntary Codes of Good Agricultural Practice (soil, water, air) encourage farmers to minimise water and air pollution and maintain soil quality [11].

Agriculture needs to respect national environmental and taxation policies and international environmental agreements. The *Bioenergy Infrastructure Scheme* provides grants to farmers to expand biomass and bioenergy production, linked to consumer tax reductions for biodiesel and bioethanol. Diesel fuel tax is reduced by nearly 90% for farmers, involving around GBP 220 (EUR 321) million annually (2005) of budget revenue forgone. National targets for farmland priority species and habitats are included under the *Biodiversity Action Plan*, as part of the broader commitment under the *Convention on Biological Diversity* (CBD). Farming is affected by commitments under international environmental agreements, which in addition to the CBD, include lowering: nutrient loadings into the North Sea (*OSPAR Convention*); ammonia emissions (*Gothenburg Protocol*); methyl bromide use (*Montreal Protocol*); and greenhouse gases (GHGs) emissions under the *Kyoto Protocol*. A climate change levy was introduced in 2001 to encourage businesses, including farming, to improve their energy efficiency and further reduce GHGs. Depending on the type of energy used (*e.g.* coal, gas) the levy in 2005 varied from GBP 0.07-0.43 pence/kilo Watt hour (kWh) (EUR 0.1-0.63 cents/kWh), although the horticultural sector was provided a 50% rebate on the levy until 2006 [12].

3.29.2. Environmental performance of agriculture

With a high population density, pressure on land resources in the UK is intense. Agriculture accounting for 67% (2002-04) of the land area, provides about two-thirds of UK food and areas for recreational activities [4, 13]. The area farmed has declined by 10% from 1990-92 to 2002-04 (Figure 3.29.2), with land mainly converted to forestry, urban use or fallow [14]. While the UK has a temperate maritime climate, the frequency and severity of flooding has increased, with about 12% of farmland in England (around the year 2000) located in areas prone to flooding [15]. Farmers face environmental challenges with respect to water pollution, biodiversity and landscape conservation, and air pollution from ammonia.

Soil losses from cultivated land are generally low, at less than 5 tonnes/hectare [16, 17], with farming contributing about 95% of erosion [5]. In some localities erosion can exceed 100 tonnes/hectare, with about 25% of England and Wales at moderate to very high risk, predominantly arable and rough grazing land [3]. Concern has shifted from on-farm to off-farm impacts of soil erosion [18]. The off-site costs of soil erosion from farmland, are estimated at GBP 9 (EUR 15) million annually, mainly the costs of dredging rivers of soil derived from farms [19], while soil compaction is also beginning to be recognised as increasing the risk of flooding [20]. The main causes of soil erosion are related to land left uncovered over winter, the use of heavy machinery and areas subject to high livestock densities [17]. While there has been a loss of soil organic matter (SOM) in arable and rotational grassland topsoils between 1980 and 1996 [4, 21], this is not considered to have damaged soil fertility [14], although impacts on soil biodiversity and soil health are unclear [22]. Loss of soil organic carbon, a principal component of SOM, reduces soil carbon stocks which has implications for climate change [23, 24].

Agriculture is a major source of water pollution entailing high costs. As urban and industrial water pollution is largely controlled, diffuse pollution, is becoming comparatively more important especially farm run-off of nitrates, phosphorus, pesticides and pathogens, mainly of agricultural origin and concentrated in England. The overall cost of water pollution from agriculture was estimated in 2003/04 at around GBP 500 (EUR 725) million annually, contributing over 40% of total water pollution costs [25]. Nearly half of the prosecutions for pollution by the agricultural sector in 2002-03 were related to water pollution incidents [13], mainly from the dairy sector [3, 26]. Almost 5% of *Sites of Special Scientific Interest* (*e.g.* bogs, upland heath) in England in 2005 were in an unfavourable condition because of agricultural water pollution [4].

Nutrient surpluses from agriculture have declined, but are a major source of water pollution. While tonnes of nitrogen and phosphorus surpluses decreased over the period 1990-92 to 2002-04, mainly due to lower livestock numbers, and reduced fertiliser use, especially since 1996 (Figure 3.29.3). The intensity of nutrient surpluses (expressed as kg of nutrient per hectare of agricultural land) was higher than the EU15 and OECD averages for phosphorus, but around half these averages for nitrogen (Figure 3.29.2). About 60% of sewage sludge is recycled and applied to farmland, saving GBP 21 (EUR 31) million annually in fertiliser costs [15]. Following a ruling by the European Court of Justice that the UK had failed to comply with the EU *Nitrate Directive*, the area designated as *Nitrate Vulnerable Zones* was increased in 2004 to over 50% of the land area in England (2% in Wales and 14% in Scotland) compared to 8% in 1996 [5].

Agriculture accounts for 60% of nitrates and 29% of phosphates into surface water in England and Wales, and 50-70% of nitrates and almost 40% of phosphorus into coastal waters [5, 27, 28, 29]. Nutrients are in excess of drinking water standards in 30% of monitoring sites for nitrates in surface water (15% in groundwater) and over 50% for phosphorus. Almost 80% of water catchments are affected by eutrophication, with around half identified as a serious environmental issue [15]. Over 80% of fresh water aquatic ecosystems designated as *Sites of Special Scientific Interest* show symptoms of being eutrophic with a loss of aquatic species [27].

Pesticide use declined by 6% during the period 1990-92 to 2001-03 (sales volume in active ingredients), but the trend has been variable, linked to changes in cropping patterns and weather conditions (Figure 3.29.2) [30]. Farming uses almost 90% of pesticides [3], and accounts for most pesticide water pollution incidents [30]. Removing pesticides from drinking water supplies is estimated to cost around GBP 110 (EUR 160) million annually [27]. Over half of the farmed area in England and Wales on which pesticides were applied in 2002 qualified as "acceptable risk", based on EU criteria, with a further 30% of the area with buffer zones to reduce pesticide pollution, and the remaining 20% on which pesticides were applied was either unquantified or had an unacceptable risk [30]. Pesticide incidents involving terrestrial wildlife remain a concern, although the area of cereal field margins, which can help to reduce these incidents increased from under 5 000 to over 40 000 hectares from 1997 to 2004, while the area under crop protection management plans is also expanding [30].

Growth in water use by agriculture (+10%) was below that by other users (+16%) over the period 1990-92 to 2001-03, but the share of agriculture in total water use was only 10% (for England and Wales only) (Figure 3.29.2). Increasing water use is linked to the expansion in irrigated area, about 2-3%/annum (although the share of total arable and permanent cropland irrigated is only 3%), and the shift to crops requiring higher quantities of water, such as maize. By 2020 climate change impacts may lead to a 20% increase in water for irrigation from current levels [31]. Farm storage of water has increased over recent years [19], but only 30% of the area irrigated is under efficient water supply systems, while water charges for agricultural use are lower than those for industry or households, although water charges paid by farmers are rising.

There has been a reduction in air polluting emissions from agriculture since 1990. ***Ammonia emissions*** declined, largely due to declining livestock numbers and fertiliser use (Figures 3.29.2 and 3.29.3) [4]. Agriculture accounted for nearly 90% of total ammonia emissions (2001-03), with livestock accounting for around 90% of agricultural ammonia emissions. Deposition of ammonia above critical loads occurred for a number of semi-natural habitats over large areas of the UK [4, 32]. To reach the total ammonia emission target under the *Gothenburg Protocol* a further reduction of total emissions by 5% from 2001-03 to 2010 will be required, which compares to a reduction of 16% achieved over the period 1990-92 to 2001-03. For ***methyl bromide*** (an ozone depleting substance), mainly used for soil fumigation in the horticultural sector (*e.g.* strawberry and lettuce growing), use was cut over the 1990s as agreed under the *Montreal Protocol*, which seeks to eliminate all use by 2005. But in 2005 a "*Critical Use Exemption*" (CUE) was agreed up to 81 tonnes (ozone depleting potential), or about 3% of the EU15's CUEs, which under the *Protocol* allows farmers more time to find substitutes.

Agricultural greenhouses gas (GHG) emissions declined by 13% from 1990-92 to 2002-04, and in 2002-04 accounted for 7% of total GHG emissions (Figures 3.29.2 and 3.29.4). This reduction was close to the 11% decrease for total national GHG emissions, and the 12.5% cut agreed as the commitment under the *Kyoto Protocol* by 2008-12 as part of the EU *Burden Sharing Agreement*. But farming is the major source of nitrous oxide (nearly 70%) and methane GHGs (nearly 50%) (Figure 3.29.4) [4, 33]. Projections suggest that the declining trend of agricultural GHGs will continue over the next 20 years [14], down to 32% below 1990 levels by 2010 (Figure 3.29.4) [12]. The loss of ***soil organic carbon*** in agricultural soils is a concern in terms of reducing agriculture's GHG soil sequestration capacity [34], however, changes in land use from farming to woodlands, and the expansion of agricultural biomass feedstocks for renewable energy is helping reduce GHG emissions [12].

Overall direct on-farm energy consumption by agriculture declined by 24% between 1990-92 and 2002-04 (Figure 3.29.2), compared to an 8% increase across the economy, and accounted for less than 1% of total energy consumption in 2002-04 [12]. There was a five-fold increase in electricity generated from farm wastes between 1995-2003 [4], although at present ***agricultural biomass feedstocks*** account for under 2% of electricity and heat generation and less than 0.1% of total transport fuel sales [35, 36].

Pressures from farming on biodiversity continue [15]. While agriculture, as the major land user remains a key threat to habitats and wild species, the growth in the area under agri-environmental schemes is beginning to ease the pressure [15, 37]. Over (and under) grazing practices, loss of mixed farming systems and semi-natural farmed habitats (*e.g.* grasslands), drainage, moor burning, and pollution are the main pressures from agriculture on biodiversity [4, 15, 37, 38]. The trends for ***agricultural genetic resources*** are unclear, although an inventory of *in situ* plant genetic resources is underway [39] and *ex situ* plant accessions are extensive, while for livestock all endangered breeds are under a conservation programme [40].

For agricultural habitats, there has been an overall net loss of farmland to forestry and urban use (6% over the 1990s), a reduction in semi-natural farmed habitats, a 3% increase in cultivated land to improved grassland, and expansion of woodlands on farms. Despite the slower rate of semi-natural habitat loss (*e.g.* grasslands) and the increase in farm woodland cover, the quality of remaining habitats may have deteriorated [13, 41]. But 60% of agricultural designated *Sites of Special Scientific Interest* (SSSI) were in a favourable or recovering condition in 2005 in England, although this compares to nearly 70% for all SSSI [4]. The main agricultural causes for unfavourable conditions on SSSI include a combination of overgrazing, moor burning, and drainage [4].

Wild species are under continued pressure from agriculture. For wild species on agricultural land a survey of ***wild flowering plants***, from 1987 to 1999, showed a decrease in the frequency of wild plants on arable and grassland (except on improved grassland) [see 42, supported by other research 43, 44]. The Government's indicator of ***wild bird populations*** shows that overall populations were 10% higher in 2004 compared to 1970, but for farmland birds they are under 60% of their 1970 level. The decline in farmland bird populations have been associated with changes in agricultural practices, including the loss of mixed farms, the switch to autumn sowing of cereals, and the loss of field margins and hedges. Since the late 1990s the farmland bird indicator, however, has remained fairly stable (Figure 3.29.3) [45], although there are regional differences, with northern parts of England showing a recovery in farmland birds since 1994 [46]. For other fauna (*e.g.* mammals, butterflies), incomplete evidence suggests that farming continues to pose a major threat to wild species diversity and abundance [15, 47].

Agriculture generally maintains cultural landscape features, but deterioration in quality is a concern [19]. Linear landscape features on agricultural land (*e.g.* hedges, stone walls) increased by about 3% between 1990 and 1998, while the number of ponds rose by 6% [5, 21]. However, the quality of some of these features is deteriorating, with over 50% of stone walls in poor or derelict condition and a decline in remnant (historic) hedges [41]. The reduction in mixed farming systems and semi-natural habitats is also adversely impacting on the quality of agricultural landscapes [13, 41]. About one-third of all archaeological sites are in ploughed sites, with 2% at high risk, while farming has contributed to 10% of the destruction and 30% of the damage to ancient monuments since 1945 [17, 48]. There are concerns for biodiversity and landscapes in some extensive upland farmed areas, which agri-environmental schemes are seeking to address. In Wales and Scotland, especially, afforestation on farms poses a threat to bird species of conservation value and has led to a loss of farmed landscapes [49, 50].

3.29.3. Overall agri-environmental performance

With the contraction of agriculture pressure on the environment has eased. This has been supplemented by less environmental pressure per unit of production, as the rate of reduction in some inputs (fertilisers and energy) has been greater than the decline in production, plus there has been a rapid growth in the area under agri-environmental schemes. But given the intensity of farming systems (notably in South, Central and Eastern parts of England) and the extent of diffuse agricultural pollution, the management and conservation of soils, water, biodiversity and landscapes, remain priority environmental issues [15]. It should be noted, however, that there are a range of potential external factors (*e.g.* CAP health check, commodity prices, demand for energy crops) that could see an increase in the intensity of agricultural production, and consequently lead to an associated rise in environmental pressures.

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The UK has a good record in monitoring agri-environmental performance. About GBP 1.6 (EUR 2.4) million is available annually for monitoring the effectiveness of agri-environmental schemes in England. The *Sustainable Development Indicators* [21], the *Countryside Survey* [41], and various bird [45] and pesticide monitoring programmes [22], all track environmental performance [15, 51]. But monitoring trends in flora and fauna (except birds) and soil quality [18, 20, 52, 53] are weak, as is co-ordination of information across agencies and the devolved administrations [15]. The use of environmental impact assessment is limited, but being extended to cases involving the conversion of uncultivated and semi-natural land to intensive farming [15]. Moreover, the *Agriculture Change and Environment Observatory Programme* (2005) will monitor and assess the environmental impacts of farming [54].

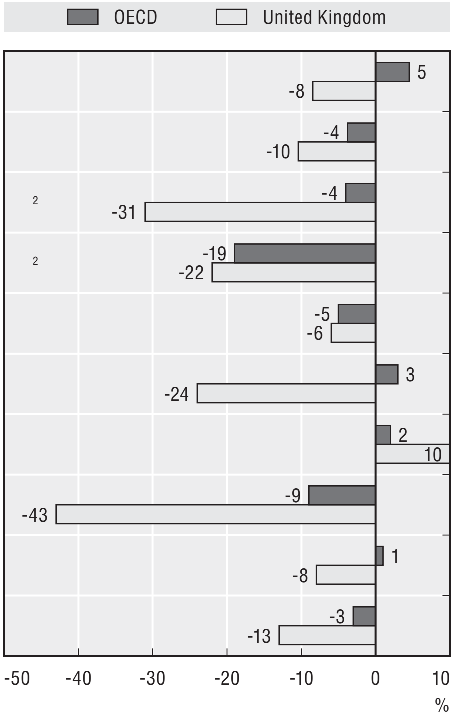
Wider coverage and changes to agri-environmental schemes could enhance their performance. Over 25% of the UK agricultural land area was under some form of environmental programme by 2006, compared to less than 1% in the early 1990s. In addition to the continuation of existing schemes, the government introduced from 2005 *Environmental Stewardship*, consisting of three elements: *Entry Level Stewardship* providing farmers up to GBP 30 (EUR 44) per hectare, such as for maintaining hedgerows, leaving conservation strips for biodiversity conservation and to cut diffuse pollution; the *Higher Level Stewardship*, targets high priority and endangered habitats and landscapes; and the *Organic Entry Level Stewardship*, is designed to encourage organic farming systems, with payments of GBP 60 (EUR 88) per hectare [55]. About 4% of UK farmland was under ***organic production*** in 2005, with around 2% of the livestock numbers under organic systems [4]. The three schemes together have funding of GBP 150 million (EUR 221 million), half of which comes from EU co-financing. Similar schemes are being introduced in Scotland, Wales and Northern Ireland. The UK has also launched an action plan toward sustainable soil management [56], and is planning to further increase energy crop production under the *Energy Crops* scheme [12].

Despite the growth in agri-environmental schemes a number of environmental problems persist. Diffuse water pollution from farming is a key concern with the share of farms under nutrient management plans less than 5%. The voluntary approach used to address agricultural water pollution is currently under review [15]. Under the EU *Nitrates Directive* a four-yearly review is required to assess the effectiveness of *Action Programme* measures, and according to the UK's Department for Environment, Food and Rural Affairs there is a strong likelihood that revised *Action Programme* measures could impose stricter measures on some farmers. Tax exemption on diesel fuel used by farmers provides a disincentive to improve ***energy efficiency*** and help further reduce GHGs, although both direct on-farm energy consumption and agricultural GHG emissions have been reduced (Figure 3.29.2).

Halting the long term decline in the quantity and quality of biodiversity and landscapes associated with farming is also a policy priority. Agri-environmental schemes are the main mechanism to help alter this trend, and success may depend on the balance of the uptake under the new *Environmental Stewardship* scheme between low cost options, applied widely across the country, and higher cost options targeting specific habitats and wild species [57]. The restoration of some semi-natural habitats (*e.g.* grassland) may take more than a decade [36, 58, 59]. Also the conservation of wild species by creating semi-natural habitats on farms (*e.g.* field margins), will depend on improvements in their management, habitat structure and the cultivars used in these areas [58, 59].

Figure 3.29.2. **National agri-environmental performance compared to the OECD average**

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



Absolute and economy-wide change/level

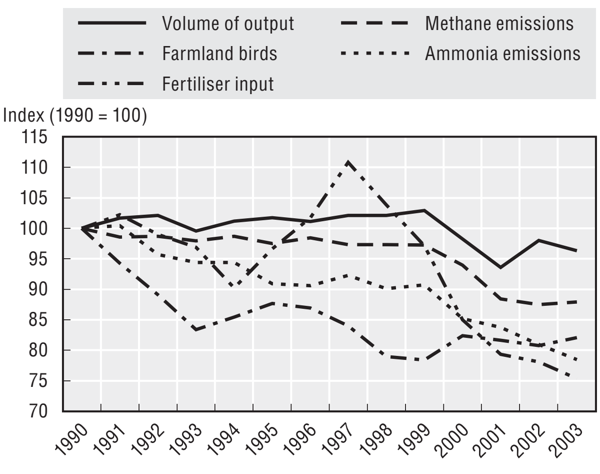
Variable	Unit		United Kingdom	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	92	105
Agricultural land area	000 hectares	1990-92 to 2002-04	–1 883	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	43	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	13	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	–1 996	–46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	–309	+1 997
Agricultural water use	Million m^3	1990-92 to 2001-03	+129	+8 102
Irrigation water application rates	Megalitres/ha of irrigated land	2001-03	0.6	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	–25	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	–6 912	–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.

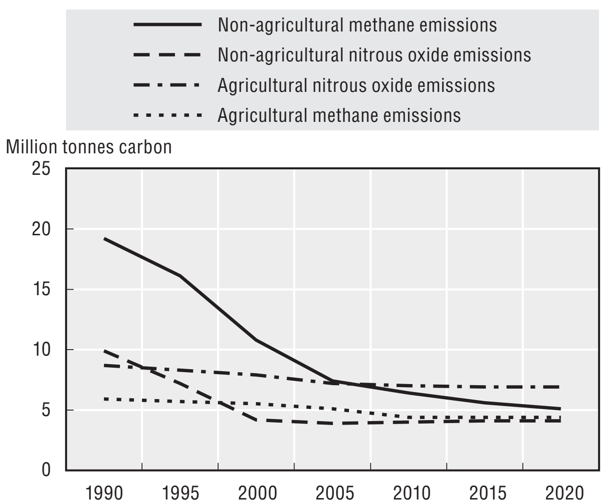
Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

Figure 3.29.3. **Agri-environmental trends**



Source: Fertiliser Input (Defra-British Survey of Fertiliser Practice), *Farmland Bird Index* (Defra, Royal Society for the Protection of Birds and British Trust for Ornithology), *Volume of Output* (Defra-Agriculture in the UK), *Methane and Ammonia Emissions* (Defra-Digest of environmental Statistics and Netcen). Netcen is now part of AEA Energy and Environment.

Figure 3.29.4. **Greenhouse gas emission trends and projections**



Source: UK, Department of Environment, Food and Rural Affairs.

StatLink http://dx.doi.org/10.1787/301248617826

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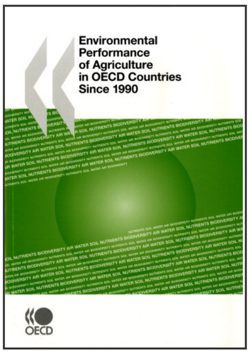

From:

Environmental Performance of Agriculture in OECD Countries Since 1990

Access the complete publication at:

https://doi.org/10.1787/9789264040854-en

Please cite this chapter as:

OECD (2008), "OECD Country Trends of Environmental Conditions related to Agriculture since 1990: United Kingdom", in *Environmental Performance of Agriculture in OECD Countries Since 1990*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/9789264040854-34-en