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

Greece Country Section

This country section is an extract from chapter 3 of the OECD publication (2008) ***Environmental Performance of Agriculture in OECD countries since 1990***, which is available at the OECD website indicated below.

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

A summary version of this report is published as ***Environmental Performance of Agriculture: At a Glance***, see the OECD website which also contains the agri-environmental indicator time series database at: http://www.oecd.org/tad/env/indicators

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The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).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

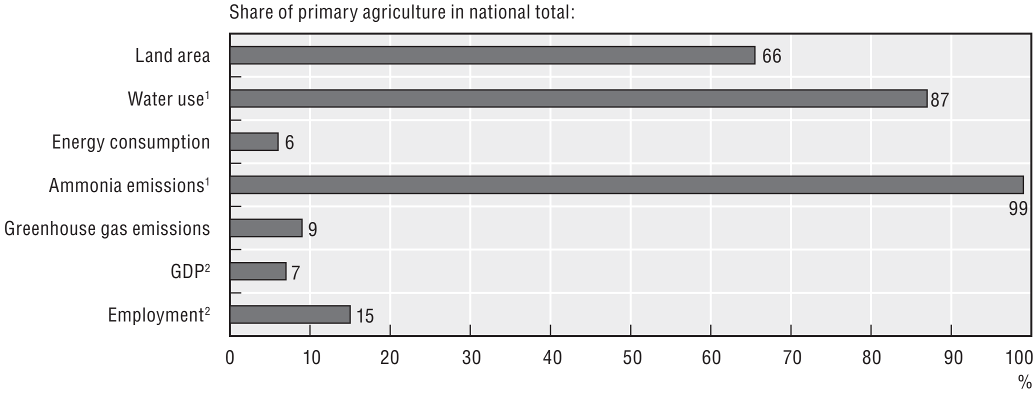
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes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

3.10. GREECE

Figure 3.10.1. **National agri-environmental and economic profile, 2002-04: Greece**



StatLink http://dx.doi.org/10.1787/300287152126

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

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

3.10.1. Agricultural sector trends and policy context

Agriculture continues to occupy an important position in the economy, but its contribution is declining. Between the early 1990s and 2004 the share of agriculture in GDP declined from 14% to 7% and the share of farm employment in total employment from 22% to 15% [1, 2]. Farming accounted for two-thirds of total land use and nearly 90% of water use in 2001-03 (Figure 3.10.1).

While the overall volume of farm production changed little between 1990-92 and 2002-04, the volume of crop production rose by 2.6% but livestock production declined by 2.1% (Figure 3.10.2). Moreover, the intensity of production increased and agricultural productivity improved [3, 4]. The rise in crop production was mainly accounted for by higher output of notably olives, vines for wine, cotton and some horticultural crops, as overall livestock production declined, although poultry, sheep and goat numbers rose [1]. There was a 2% decrease in the area farmed between 1990-2 and 2002-04 but the use of inputs increased during this period including for pesticides (39%), water (33%) and energy (10%), but inorganic fertiliser use (nitrogen and phosphorus) decreased by around –40%. Small family plots of less than 5 hectares, compared to the EU15 average of over 16 hectares, account for three quarters of farmland, and around 60% of farms are situated on hilly or mountainous terrain [5].

Farming is mainly supported under the Common Agricultural Policy (CAP) with support also provided through national expenditure within the CAP framework. Support to EU farmers on average declined from 41% of farm receipts in the mid-1980s to 34% in 2002-04 (as measured by the OECD Producer Support Estimate – PSE) compared to the 31% OECD average. Nearly 70% of EU support to farmers was output and input linked in 2002-04 (compared to over 90% in the mid-1980s), the forms of support that most encourage production [6]. Total budgetary support to Greek agriculture was EUR 3.5 (USD 4.4) billion in 2004, of which 12% (EUR 406-USD 508 million) was financed out of the national budget. Agri-environmental measures accounted for almost 2% of total budgetary support [6].

Agri-environmental policies focus on promoting organic farming and reducing water pollution [7]. Under the *Rural Development Plan* 2000-06 (RDP): more than 50% of agri-environmental expenditure is allocated to promote organic farming; nearly 40% to the reduction of nitrate pollution of agricultural origin, especially groundwater; and much of the remaining 10% is used for biodiversity conservation, including programmes for the conservation of native crop varieties and livestock breeds [1, 7]. The *Organic Farming Scheme*, implemented in 1995, provides area payments to cover conversion costs and any possible income loss [8]. Under the EU *Nitrate Directive* (91/676/EEC) seven nitrate vulnerable zones have been designated by the government and farmers are required to undertake obligatory actions to reduce farm nitrogen run-off in these areas [9]. Agri-environmental measures include 20 year set-aside and afforestation of farmland. The government has encouraged the adoption of codes of good practice (*e.g.* Integrated Pest Management), with farmers receiving compensation for income losses associated with the implementation of agri-environmental programmes. Small farms in mountainous regions are eligible to a scheme that provides payments for innovative and environmentally sound investments aimed at environmental protection, lowering production costs and improving product quality [7, 9]. There is also a policy strategy to develop agriculture on the Greek islands, with emphasis on promoting organic production and the conservation of biodiversity and cultural landscapes [10].

National and regional environmental and taxation policies have implications for agriculture. The National Strategy for the Abatement of Desertification has as a target the abatement of ***desertification*** of 35% of land directly affected by desertification, and the prevention of desertification risks on 60% of the total land area by 2015 [11]. The construction, operation and maintenance costs of large and medium sized ***irrigation*** infrastructures are financed by the government with smaller farm level irrigation projects funded privately [12, 13]. Overall the price of water delivered to farmers is subsidised, with no charge for irrigation water supplied from large government irrigation facilities, while farmers pay only a minimal fee for water supplied by smaller municipal irrigation systems [9, 12, 13]. The water charges to farmers, however, vary greatly between different catchment areas and even within the catchment, depending on the water management agency [12, 13]. Access for farmers to artesian wells is commonly unlicensed [14]. Farmers are exempt from the value added tax on ***diesel fuel*** for tractors and farm machinery, equivalent to EUR 52 (USD 58) million annually of tax revenue forgone over the period 2001-05 [6], and also benefit from reduced rates on electricity prices [12]. A number of policies introduced in 2005-06 seek to encourage production and domestic consumption of ***bioenergy***, some of which will use agricultural biomass and by-products as a feedstock [15]. Measures include support of 40% of the capital costs for biodiesel plants, tax reductions for biodiesel and favourable feed-in-tariffs for generation of renewable electricity production [1, 15].

International and regional environmental agreements are important to agriculture and include those seeking to: lower ammonia emissions (*Gothenburg Protocol*), methyl bromide use (*Montreal Protocol*), and greenhouse gas emissions (*Kyoto Protocol*); address desertification and soil erosion concerns (*UN Convention to Combat Desertification*) and also biodiversity conservation (*Convention on Biological Diversity*) [10]. Greece has engaged in environmental

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co-operation, at varying levels of collaboration, with neighbouring countries (Albania, Bulgaria, the former Yugoslav Republic of Macedonia and Turkey), especially concerning transboundary rivers which are of great importance to irrigation in Northern Greece [12].

3.10.2. Environmental performance of agriculture

The key environmental issues related to agriculture concern soil erosion, water quality and water resource use. Also of importance are agricultural emissions of ammonia and greenhouse gases and conservation of biodiversity and cultural landscapes. More than 80% of the country is rocky and mountainous terrain with low marginal productivity for agriculture, covered mainly by pasture suitable only for sheep and goats [5]. Many of the environmental problems facing agriculture stem from, on the one hand, the abandonment and change in use of agriculturally marginal mountainous areas (but which are often rich in biodiversity and cultural features) and, on the other hand, the intensification of farms at low altitudes exacerbating water pollution problems and competition for scarce water resources with other users [5].

Soil erosion is a major concern, especially in mountainous areas and across the islands. While there is no regular monitoring of soil erosion on agricultural soils, estimates for all land show that about 20% is subject to high risk of soil erosion, although the majority of land falls within the low to moderate category for actual erosion [16]. Most soil erosion is caused by water, but the Aegean islands are subject to both wind and water erosion [17]. Soil degradation is aggravated by a combination of unfavourable natural conditions including: the high proportion of steeply sloping farmland, heavy rainfall interspersed by long droughts, a thin topsoil layer in mountain areas; and the semi-arid climate in some parts of the country [10, 13, 18]. Soil erosion on farmland, especially in mountainous areas and the Aegean islands, has also has been attributed to poor farm management practices, including overgrazing (especially of sheep and goats), deforestation, and structural changes in agriculture, notably the abandonment of farmland [10, 18].

Agriculture plays an important role in the degradation of water bodies in some regions [5, 9]. Overall while agricultural production has intensified in some locations resulting in greater pressure on water quality the increase in production intensity was lower than many other EU15 countries over the past 15 years [4, 5, 12]. Some nutrients and pesticides in rivers are attributed to discharges from neighbouring countries [17]. Monitoring farm pollutants in water bodies is neither regular nor widespread. Pressure on water quality has increased as a result of the greater use of pesticides since 1990 [19], but the decline in farm nutrient surpluses (nitrogen and phosphorus) has eased potential pollution pressure, although not in some of the more intensively farmed areas [12, 20]. There has also been a rise in salinity of wells in mainly coastal regions, due to the over extraction of groundwater for agricultural use leading to intrusion of sea water into coastal aquifers [5, 9, 12, 17]. Heavy metals from farm run-off and other sources are at levels in certain lakes in excess of water quality standards [9, 12].

There was a large decrease in agricultural nutrient surpluses from 1990-92 to 2002-04, among the largest reductions (especially for nitrogen) across OECD countries (surpluses are the quantity of nutrient inputs minus outputs of nutrients, nitrogen – N – and phosphorus – P). Nutrient surpluses expressed in terms of kilos per hectare of farmland were less than half of the OECD and EU15 averages in 2002-04 (Figure 3.10.2). There has also been a substantial improvement in nutrient use efficiency (the ratio of N/P output to N/P input), to levels above the OECD average in 2002-04. The decrease in nutrient surpluses is mainly due to the decline in inorganic fertiliser use of 38% for nitrogen and 41% for phosphorus. In addition, less manure resulted from the fall in total livestock numbers, especially cattle and goats, although there was a small rise in sheep numbers. Overall nutrient uptake from crops and pasture declined slightly, but not as sharply as for nutrient inputs.

Agricultural nitrate pollution of water bodies declined but remained stable for phosphorus, from the late 1990s to 2002 [17]. Despite the decline in ***nitrates***, 10% to 20% of samples from groundwater in agricultural areas exceeded the EU drinking water standard of 50 mg/l in 2001-02 [17]. There is also evidence of continuing farm nutrient pollution in surface and coastal waters at levels harmful to aquatic ecosystems, especially of some internationally important wetlands [9, 12, 20, 21, 22]. Overall the concentrations of nitrates in groundwater were higher than for surface water [17]. While ***phosphorus*** surpluses have been on a downward trend since 1990, the average concentrations in surface water have been stable because of the long time lags for the transport of phosphorus through soils into water bodies. The average concentrations of phosphorus in surface waters in agricultural areas did not exceed drinking water standards in the late 1990s [17], but have exceeded environmental water quality standards in some areas to the detriment of aquatic ecosystems [9, 23].

Pesticides are frequently detected in many rivers and lakes [16, 19]. The rise in the volume of pesticides (active ingredients) was among the highest across OECD countries from 1991-93 to 2001-03. Rivers are generally found to be more polluted than lakes and some prohibited pesticide products (*e.g.* DDT and other organochlorine insecticides) are still being detected in water bodies due to their persistence in aquatic environments [19]. Nationally in most cases pesticides were reported in low concentrations, but in areas of high use and intensive agriculture, concentrations were more elevated [19]. Greater pesticide use is also reported to have had an adverse impact on bird populations and damage to other biodiversity, such as wetlands, although this is poorly monitored [5, 12]. Adoption of ***organic farming*** and integrated pest management practices (*e.g.* biological controls, pheromones) is slowing the rate of growth of pesticide use. However, by 2003 organic farming accounted for only 1% of total farmland (30 000 hectares), of which around 50% is organic olive groves, but the total area is projected to rise to 200 000 hectares by 2010 [1, 8].

Agricultural water use grew by over 30% between 1985 and 2001, among the highest rate of growth across OECD countries, and compares to the growth in water use for the economy as a whole of 24% (Figure 3.10.2). As a result agriculture accounted for nearly 90% of water use by 2001. Much of the growth in water use is because of a 3% increase in the area irrigated from 1990-92 to 2001-03, with 17% of farmland under irrigation and over a third of arable and permanent crop land by 2001-03. Irrigation water application rates (litres per hectare of irrigated land) also increased by 7% between 1990-92 and 2001-03, and compared to a decrease of 9% for the OECD on average (Figures 3.10.2 and 3.10.3).

The increasing use and intensity of irrigation water use is of concern since about half of the water used by irrigators is extracted from aquifers [9]. For some areas this is leading to the over extraction of groundwater for irrigation beyond rates of recharge and, in certain coastal regions (*e.g.* the Argolid plain of the Peloponnesus), the intrusion of sea water into aquifers [3, 5, 12]. In some regions (*e.g.* Crete) major water losses from irrigation systems of between 45-50% of the water delivered to crops have been reported, caused by, for example, seepage, leakage and evaporation [13]. A further concern with the rise in irrigation is that its peak demand period in the summer is similarly a period of high demand for other uses notably tourism, but also a period of seasonal water scarcity [3, 9, 10, 12, 13].

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There has been an improvement in irrigation management practices, with the more efficient drip emitter systems (compared to irrigation through flooding) accounting for nearly 9% of total irrigation water use in 1991 rising to 22% by 1999 [16]. Efforts are also being made to recycle wastewater effluent for use on irrigated areas [13]. Despite the greater uptake by irrigators of more efficient water application technologies, irrigation water application rates per hectare rose (*i.e.* a declining trend of irrigation water efficiency). This might be explained not only by the high water losses from the irrigation infrastructure, but also by technical inefficiency in managing drip irrigation systems due to, for example, poor education and weak extension advisory services. Research in Crete has revealed that the technical efficiency of farmers using a drip irrigation system is low and they are not fully exploiting the water resource savings this technology can provide [24]. Moreover, farmers using their own wells had a lower level of irrigation water efficiency compared to those using a common groundwater source, probably due to differences in water charges [24].

Agricultural air pollution has been declining since 1990. Agricultural ***ammonia emissions*** decreased by 5% between 1990-92 and 2001, mainly due to the drop in livestock numbers and nitrogen fertiliser use (Figure 3.10.2). Farming accounted for almost all ammonia emissions in 2001, with livestock making up over 95% of emissions. Greece's target of a reduction of total ammonia emissions to 73 000 tonnes by 2010 under the *Gothenburg Protocol* was achieved by 2001-03. For ***methyl bromide*** (an ozone depleting substance), mainly used for soil fumigation in the horticultural sector [25], 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 136 tonnes (ozone depleting potential), or about 5% of the EU15's CUEs, which under the Protocol allows farmers more time to find substitutes.

There was a 10% decline in agricultural greenhouse gas (GHG) emissions, close to the EU15 average reduction of 7% over the period 1990-92 to 2002-04 (Figure 3.10.2). The fall in agricultural GHG emissions compares to an increase of 26% for total national GHG emissions over the same period, while Greece's target for total emissions under the EU *Burden Sharing Agreement* toward the 2008-12 *Kyoto Protocol* commitments is a 25% increase. Farming accounted for 9% of total GHG emissions in 2002-04, mostly of methane and nitrous oxide [1]. The main reasons for the steady decline in agricultural GHGs are linked to the reduced use of fertilisers and to a lesser extent lower livestock numbers [1]. Projections point to a further decrease in agricultural GHGs from 2005 to 2010, but this is expected to be a smaller reduction in GHGs relative to that achieved over the period 1990-2004. The continued downward trend in GHGs to 2010 is likely to originate from reduced fertiliser use and improved manure management, as overall livestock numbers may rise for poultry, sheep and goats, but decline for dairy cattle and pigs [1]. Changes in agriculture are also leading to greater ***carbon sequestration***. Between 1994 and 2003 about 40 000 hectares of farmland were forested, and the projected continuation of afforestation of farmland should lead to an increase of GHG removals equivalent to about 5% of current agricultural GHG emissions [1].

Direct on-farm energy consumption rose by 10% compared to an increase of 36% across the economy, over the period 1990-92 to 2002-04, leading to a rise in GHGs (Figure 3.10.2). Agriculture accounted for 6% of total energy consumption in 2002-04, and projections suggest that farm energy consumption will continue to grow up to 2010 [1]. Much of the increase in energy consumption is explained by the expansion in use and size of machinery as a substitute for labour over the past 15 years [4]. The production of ***bioenergy*** from agricultural biomass and waste product feedstocks is small but expanding [1, 14, 15], with the possibility of developing energy crops [26]. Limited quantities of biogas are also produced from livestock manure [27]. Biodiesel production, supplied from domestically produced cottonseed oil and imported oils was under 1% of total diesel consumption in 2004, but production is being encouraged by the government as part of a drive to expand renewable energy supplies [15].

Biodiversity is under growing pressure from agriculture, although the impacts of farming on biodiversity are diverse, complex and poorly monitored [3, 5]. The increasing pressure on biodiversity is mainly due to intensification in fertile areas (*e.g.* the plain of Thessaly), such as the greater use of pesticides and diversion of water for irrigation to the detriment of wetlands. At the same time there is the loss of farmed habitats from the conversion to urban use and, in marginal farming areas, from the afforestation and abandonment of semi-natural farmed habitats. The lowering of nutrient surpluses and ammonia emissions leading to a reduction in the eutrophication and acidification of ecosystems are likely, however, to help ease the pressure on ecosystems [3].

Conservation of agricultural genetic resources is a key aim of agri-environmental programmes. The diversity of ***cereal and horticultural varieties*** used in production has increased in diversity over the period 1990 to 2002. The Greek Gene Bank is due to become larger and develop further under a special project that will involve programmes of *in situ* crop, including cultivation of 77 species and local varieties and *ex situ* collections of crop germplasm, especially conservation of endangered accessions (Figure 3.10.4) [17, 28]. For ***livestock breeds*** there was little change in the numbers of breeds used in marketed production between 1990 and 2002 except for an increase in the number of pig breeds. Conservation of local breeds is considered important, especially for sheep and goats, as they are raised under mountainous and low input production systems [29]. The number of rare breeds under *in situ* conservation programmes rose from 27 000 to 33 000 animals between 1998 and 2002, supported by *ex situ* collections of animal genetic material [29]. Despite these changes there was a small rise in the number of critical and endangered livestock breeds (mainly sheep and horses) from 17 to 18 breeds between 1990 and 2002.

Agriculture is adversely impacting on natural and semi-natural habitats [3, 12]. Greece has designated 11 wetlands of international importance under the *Ramsar Convention*, two UNESCO *World Heritage* areas and numerous reserves and protected areas rich in flora and fauna [12]. Agriculture has been one of the major causes of ***wetland degradation***, including the: adverse impacts from construction of irrigation projects and diversion of water causing changes in water flows to wetlands; excessive extraction of aquifers harming water flows to wetlands; agricultural pollutant run-off, especially the eutrophication of inland and coastal wetlands; and the expansion of the area cultivated in some areas leading to a loss of wetlands [3, 12, 30]. The impact of farming on bird populations, measured by the BirdLife International ***Important Bird Areas*** (IBAs) indicator defined as prime bird habitat, shows that around 50% of the most significant threats to Greek IBAs originates from farming [31]. This threat involves not only the intensification of production but also the loss of semi-natural farmed habitat to other uses, while the construction of irrigation projects also threatens IBAs [32].

Some semi-natural farming systems provide important cultural landscapes and ecosystem services. These semi-natural habitats, however, have been in decline due to changes in land management systems [33]. On one hand, the quality of semi-natural habitats has been degraded to the detriment of biodiversity due to the adoption of more intensive farming practices, such as greater homogeneity in cropping patterns [33] and, in

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some areas, uncontrolled and highly intensive sheep and goat grazing [12]. On the other hand, the area of semi-natural extensively farmed habitats has diminished due to their abandonment to shrub or conversion to forestry [5, 29, 34]. In contrast, around 75% of the area of olive groves is considered as semi-natural habitat because of the low input of chemicals and extensive system of their cultivation.

Some cultural features in farmed landscapes have been left to deteriorate, such as stone walls and terraces in the mountain olive groves of Lesvos [33]. The extensive network of ponds, terraces and small lakes across agricultural landscapes has provided certain ecosystem services, such as: reducing soil erosion rates; and providing water holding capacity, which can help recharge aquifers and reduce the severity of flooding and landslides as well as contributing to the conservation of farm habitats and wildlife using farmland. But the deterioration and disappearance of a part of this network has lowered the water retaining capacity of agricultural land [12, 17]. This is of some concern in view of the predominance of mountainous terrain; increasing occurrence and severity of droughts, floods and associated landslides; and also the depletion of aquifers in rural areas. But the introduction of agri-environmental schemes in the Greek islands, is targeting the re-building and maintenance of structures such as stone walls and terraces.

3.10.3. Overall agri-environmental performance

Overall agriculture has exerted greater pressure on the environment since the 1990s. This is in part because of the increased use of inputs including pesticides, water and energy, although there has been a reduction in fertiliser use and agricultural air pollution emissions, while the area farmed has declined. Soil erosion remains a major problem and irrigation water application rates (litres per hectare) increased compared to a declining trend for most other OECD countries where irrigation is important. There are also concerns over the conversion to other uses (mainly forestry) and abandonment of semi-natural agricultural habitats to the detriment of the biodiversity and cultural landscape benefits associated with these farmed habitats.

The agri-environmental monitoring system needs strengthening, to help improve the quality of information for policy makers to evaluate the environmental effectiveness of agri-environmental measures [35]. More effective and regular monitoring of water quality and water quantity needs to be reinforced across the main water catchments dominated by farming [9, 19], although the Ministries of Agriculture and Environment are beginning to co-operate to improve their water monitoring networks [12]. Efforts are also being made to establish indicators that track changes in cultural features in agricultural landscapes [36, 37], and improve agri-environmental indicators more widely [38].

Greater attention by policy-makers is being paid to address agri-environmental problems [1, 3, 9]. With regard to agricultural ***nitrate pollution*** of water bodies the government increased the area of designated nitrate vulnerable zones under the EU *Nitrates Directive* in 2004 to about 1% of the total agricultural area [6]. Under the 2002 *National Strategy for Water Resources* the objective is to achieve sustainable use of ***water resources***, protection of aquatic ecosystems and attainment of high water quality standards for all water bodies by 2015 [9]. There has been some improvement in the uptake of more efficient irrigation application technologies, notably the higher adoption of drip emitter irrigation systems [17]. Success has also been achieved in meeting international environmental agreement targets to reduce agricultural ***ammonia emissions*** (*Gothenburg Protocol*) and ***methyl bromide use*** (*Montreal Protocol*), although a few farmers continue to use methyl bromide despite the commitment to phase out use by 2005.

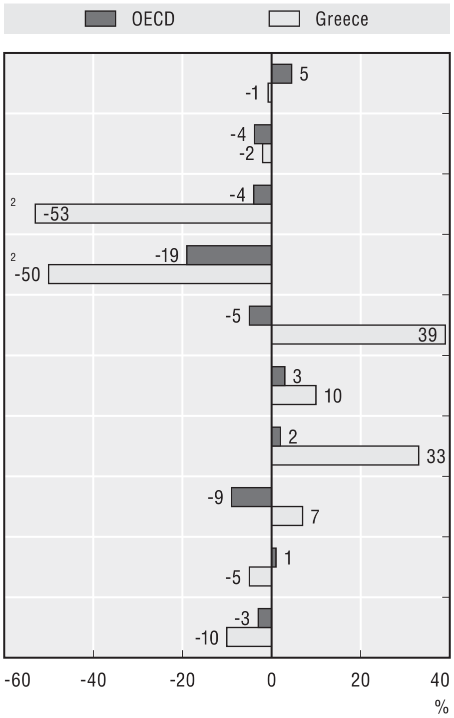
Despite policy efforts to improve environmental performance in agriculture not all problems have yet been resolved. Even though agricultural nitrate pollution of water bodies has been declining, absolute levels of pollution remain high with 10-20% of groundwater samples in agricultural areas exceeding the EU drinking water standard in 2001-02. Also pesticide use has been rising with pesticides frequently monitored in many rivers and lakes. While measures are successfully being taken to reduce water pollution from industry and sewage treatment plants, this does not appear to be the case for agricultural water pollution, experiencing poor farm management and weak enforcement of current measures to limit pollution [21]. Research suggests that there is considerable potential to raise farm output through improved efficiency in the use of inputs, which would bring environmental gains by, for example, lowering pesticide use [2]. Several of these issues are addressed by the adoption of a comprehensive set of Good Agricultural and Environmental Conditions under Cross Compliance, which is intended to further improve the environmental performance of agriculture. Fuel tax concessions and reduced electricity prices for farmers hinder the more efficient use of energy and may lead to higher GHG emissions. Increasing taxes on fuels across the rest of the economy has been shown to lead to reductions in GHG emissions [1].

Subsidised water prices and irrigation infrastructure costs deter farmers from conserving water [12]. While households and industries pay a share of the costs of the public treatment and distribution of water, this is not the case for farmers. In certain regions (*e.g.* Crete) there are reportedly major water losses from irrigation systems and increasing competition for scarce water resources between farming and tourism [3, 9, 10, 12, 13]. Moreover, despite the greater uptake by irrigators of more efficient water application technologies, irrigation water application rates per hectare rose. Research has shown that this might be explained not only by water losses from the irrigation infrastructure, but also by the technical inefficiency of farmers using drip emitter systems such that they are not fully exploiting the water resource savings this technology can provide [24]. Also farmers using their own wells had a lower level of irrigation water efficiency compared to those using a common groundwater source, probably due to differences in water charges [24].

Greece's protection of some wetlands is not very extensive or effective, including pressure from agricultural activities notably irrigation projects, with the risk that some wetlands might be removed from the international list of *Ramsar* sites [12]. In 2005 Greece was referred by the EU Commission to the European Court of Justice, as it considered Greece had not effectively counteracted the pollution and degradation of Lake Koronia an internationally important wetland [22]. The Lake has mainly been damaged through high levels of water abstraction for irrigation purposes, as well as being harmed from agricultural pollutant run-off, in addition to pollution from industry and surrounding urban areas [22]. In addition, within the framework of the EU Cohesion Fund, however, the Greek Government submitted in 2005 a new "Master Plan" that focuses on the recovery of Lake Koronia. The Plan has been approved by the EU, and a series of projects and actions (such as agri-environmental schemes and water recovery projects) will be implemented. Starting from 2006 the *Water Protection and the Sustainable Management of Water Resources* legislation enforced in December 2003, translates the 2000 EU *Water Framework Directive* into national policies. These policies hold the potential to limit water pollution, excessive water abstraction by agriculture, and protect wetlands [9, 13].

Figure 3.10.2. **National agri-environmental performance compared to the OECD average**

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



Absolute and economy-wide change/level

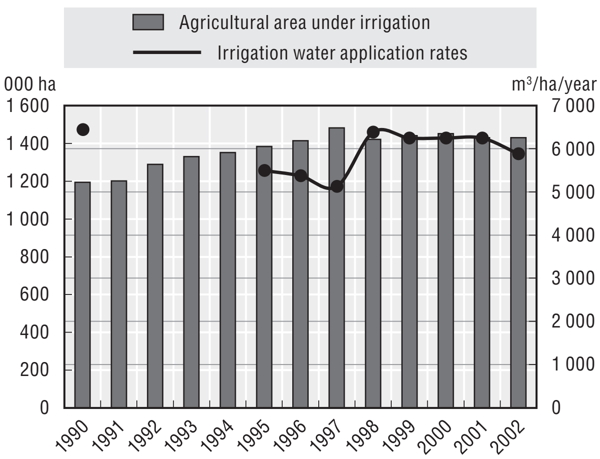
Variable	Unit		Greece	**OECD**
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	99	105
Agricultural land area	000 hectares	1990-92 to 2002-04	–175	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	15	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	4	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	+3 268	–46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	+110	+1 997
Agricultural water use	Million m^3	1990-92 to 2001-03	+1 906	+8 102
Irrigation water application rates	Megalitres/ha of irrigated land	2001-03	5.9	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	–4	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	–1 304	–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.

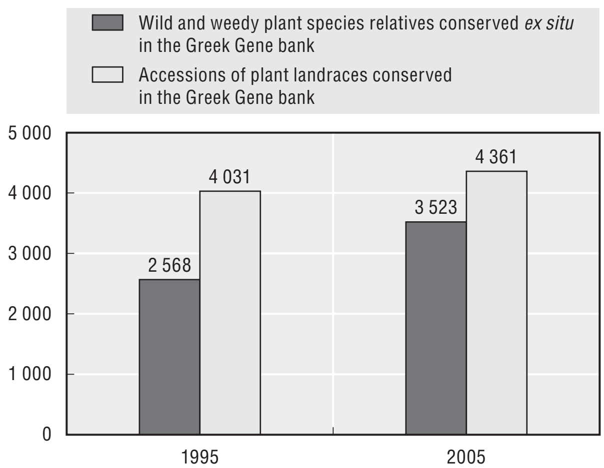
Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

Figure 3.10.3. **Irrigated area and irrigation water application rates**



Source: Greek Ministry of Rural Development and Food.

Figure 3.10.4. ***Ex situ* accessions of plant landraces, wild and weedy relatives**



Source: Greek Ministry of Rural Development and Food.

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