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

ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN OECD COUNTRIES SINCE 1990:

Portugal Country Section

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

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

TABLE OF CONTENTS OF THE COMPLETE REPORT

BACKGROUND TO THE COUNTRY SECTIONS

Structure

This chapter provides an analysis of the trends of environmental conditions related to agriculture for each of the 30 OECD member countries since 1990, including an overview of the European Union, and the supporting agri-environmental database can be accessed at *www.oecd.org/tad/env/indicators*. Valuable input for each country section was provided by member countries, in addition to other sources noted below. The country sections are introduced by a figure showing the national agri-environmental and economic profile over the period 2002-04, followed by the text, structured as follows:

- ***Agricultural sector trends and policy context:*** The policy description in this section draws on various OECD policy databases, including the *Inventory of Policy Measures Addressing Environmental Issues in Agriculture* (*www.oecd.org/tad/env*) and the Producer and Consumer Support Estimates (*www.oecd.org/tad.support/pse*).
- ***Environmental performance of agriculture:*** The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).
- ***Overall agri-environmental performance:*** This section gives a summary overview and concluding comments.
- ***Bibliography:*** The OECD Secretariat, with the help of member countries, has made an extensive search of the literature for each country section. While this largely draws on literature available in English and French, in many cases member countries provided translation of relevant literature in other languages.

At the end of each country section a standardised page is provided consisting of three figures. The first figure, which is the same for every country, compares respective national performance against the OECD overall average for the period since 1990. The other two figures focus on specific agri-environmental themes important to each respective country.

Additional information is also provided for each country on the OECD agri-environmental indicator website (see address above) concerning:

- Details of national agri-environmental indicator programmes.
- National databases relevant to agri-environmental indicators.
- Websites relevant to the national agri-environmental indicators (*e.g.* Ministries of Agriculture)
- A translation of the country section into the respective national language, while all 30 countries are available in English and French.

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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:

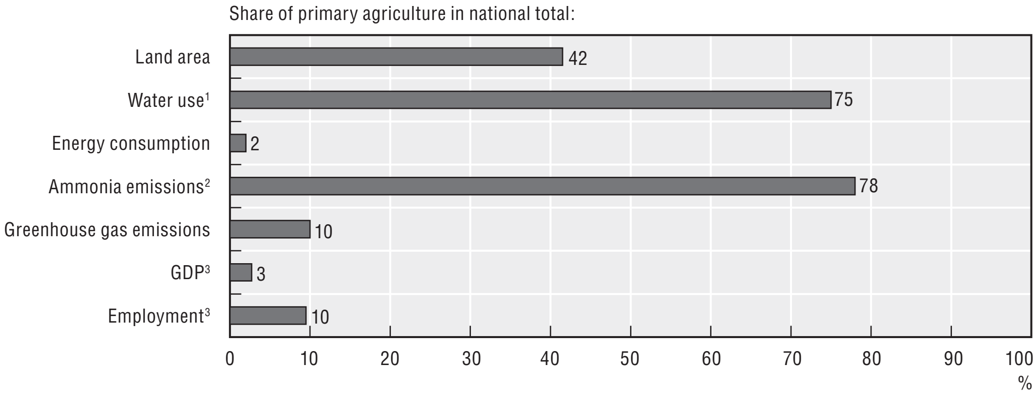
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes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

3.23. PORTUGAL

Figure 3.23.1. **National agri-environmental and economic profile, 2002-04: Portugal**



StatLink http://dx.doi.org/10.1787/300853073268

1. Data refer to the year 2001.
2. Data 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*.

3.23.1. Agricultural sector trends and policy context

Agriculture's contribution to the economy remains important but is declining. Farming's contribution to GDP and employment has halved since 1990, reaching 2.7% of GDP and 9.5% of total employment in 2004, and its share of total export value was around 6% during 2002-04 [1] (Figure 3.23.1). In terms of natural resources farming accounts for over 40% of total land use and 75% of total water use [1, 2].

Agriculture has undergone significant structural change with environmental implications. Overall farm production volume remained near stable between 1990-92 and 2002-04 while the area farmed decreased by 5%, employment in agriculture declined by 53% and the number of farms decreased by 40%. This has led to the substitution of labour by capital and purchased inputs over the period since 1990, with mixed pressures on the environment in view of the diversity of production systems and farm size across the country. Some purchased farm input use increased, including inorganic nitrogen fertilisers (20%), pesticides (26%), and water use (21%), although there was less use of inorganic phosphorus fertilisers (–23%) and on-farm direct energy consumption (–23%) (Figure 3.23.2). Underlying these changes has been a major shift from crop to livestock production, with the volume of livestock production rising by 15% compared to a reduction of almost 5% in crop production between 1990-92 and 2002-04, although for some crops output rose, notably for maize, sugar beet, olives, and horticultural crops. During the same period the area of pasture rose by over 60% while the arable and permanent crop area declined by almost 25%, such that pasture now accounts for nearly 40% of total farmland. Nevertheless, crop products still account for more than 60% of the total value of agricultural output in 2004, of which horticultural products, olive oil and wine contributed over 40% [1].

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 has 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 still output and input linked in 2002-04 (compared to over 90% in the mid-1980s), the forms of support that most encourage production [3]. In 2003, national budgetary expenditures to support agriculture were estimated at EUR 380 (USD 430) million, and the EU funded around 75% of the total support to the sector [3, 4].

Agri-environmental measures have been strengthened since their introduction in 1994. Expenditure on agri-environmental measures rose by 97% from 1996 to 2003, accounting for around 7% of total agricultural budgetary expenditure in 2003. Emphasis is on: reducing soil erosion and agricultural pollution; maintaining extensive farming systems to support biodiversity objectives; managing natural resources (especially soil and water) and cultural landscapes; as well as preserving animal genetic resources for agriculture [4]. Schemes addressing pollution reduction and soil protection are applied nationally, while other schemes are regional and apply mainly to specific farming systems [5]. About 40% of total agri-environmental budgetary expenditure is used for: the maintenance of mixed farming (in the Northern and Central regions); low-intensity olive production; extensive grazing systems (semi-natural grasslands) with payments provided per hectare of EUR 30-260 (USD 38-325) depending on the farming system and area; and the protection of threatened local breeds including payments of EUR 84-139 (USD 105-174) per livestock unit depending on the number of animals [4].

Measures addressing the reduction of farm pollution comprise restrictions on the use of farm chemicals and encouraging greater uptake of integrated environmental farm management practices, including, integrated pest management, and farmer training and demonstration projects. This includes, for example, improving livestock manure storage facilities with 35-55% of investment costs covered and payments differentiated by commodity and farm size of EUR 39-500 (USD 49-625) per hectare, and EUR 70-688 (USD 87-860) per hectare for the adoption of organic farming. There are compulsory pollution discharge limits under the EU *Nitrates Directive* for farms in designated vulnerable areas. Payments to farmers are now conditional on respecting the EU *Nitrates Directive* with improved fertiliser management practices. The use of agricultural conservation practices for the protection of soil against erosion is encouraged, such as direct seeding and minimum tillage, with payments of EUR 8-182 (USD 10-227) depending on the practice and area [4].

National and regional environmental policies have implications for agriculture. As part of the national strategy to prevent desertification, reduce soil erosion and improve water retention, payments totalling nearly EUR 50 (USD 63) million annually are currently provided to farmers (75%) and regional authorities (25%) for afforestation of marginal farmland. These payments cover 50-100% of afforestation costs, compensation costs for loss of income, and forest maintenance costs [6]. National policies seek to manage cultural landscape features [7], with specific farm payments made available for cultural landscape conservation [4]. For example payments for farmed landscapes such as the "Douro" terraced vineyards, EUR 75-374 (USD 94-468) per hectare, and the grazed "Montado" (Holm oak forests) system, EUR 19-94

(USD 24-118) per hectare. In total 17% of farmland was included under the *National Network of Protected Areas* and EU *Natura 2000* sites in 1995-2000 [1, 4], as national conservation of wildlife, especially birds, relies on the maintenance of specific farming production systems that provide the main habitat for those species, such as extensive cereals, "montados", traditional farming and permanent pasture land, such as "lameiros". The conversion of these farming systems to other uses requires special authorisation [8]. Farmers are paid to maintain these farming systems in protected areas, designated mainly under the EU *Habitat* and *Birds Directives*, with payments ranging from EUR 25-900 (USD 31-1 125) per hectare.

Farmers benefit from the reduction in input costs with implications for the environment. Water policies since 1994 require that all ***water use*** (surface and groundwater) is licensed and subjected to a charge based on the quantity used given the region's relative scarcity of water and to cover its opportunity cost, but providing an exemption until 2009 for irrigation [9]. The collection of water charges, however, has never come into force because of difficulties in registering water users. Nearly 80% of the irrigated infrastructure is under private ownership and the remainder provided nationally or by projects collectively built and managed by municipalities and farmers' associations. Under private irrigation projects, farmers can receive a 55% refund of their investment costs. For public irrigation projects beneficiary farmers are not charged for any part of the capital expenditure on the main and secondary distribution network, although infrastructure investment costs at the farm level are under the farmers' responsibility, but with a general refund of 55%. For these public schemes, charges are intended to cover a share of the maintenance and distribution costs. The level of cost recovery is evaluated at 23% for total costs and 114% for maintenance and distribution costs [10]. A tax concession on ***diesel fuel*** is provided to farmers for tractors and farm machinery, equivalent to EUR 77 (USD 96) million annually for 2004 and 2005 of tax revenue forgone [4, 9]. Following the 2003 EU Directive on increasing the use of ***biofuels*** in the transport sector, the use of biofuels (ethanol and) has been exempt from excise taxes of EUR 280 (USD 350) per 1 000 litres since the end of 2006 [9].

International and regional environmental agreements are also important for agriculture. They include those seeking to: curb nutrient emissions into the North Sea and Atlantic (*OSPAR Convention*), although Portugal is not subject to the 50% reduction target for agricultural nutrient under the Convention [4]; lowering ammonia emissions (*Gothenburg Protocol*), methyl bromide use (*Montreal Protocol*) and greenhouse gas emissions (UN Convention on Climate Change); and addressing desertification and soil erosion concerns (*UN Convention to Combat Desertification*) [11]. The improvement of carbon sequestration by agricultural soils, together with forest, as well as emission reduction from intensive livestock production, are important agricultural measures to fulfil the national commitments under the *Kyoto Protocol*. Portugal has a number of environmental co-operation agreements with Spain, notably concerning water resources, as nearly half of Portugal's renewable freshwater resources originate in Spain [4]. The *Convention on the Co-operation for the Protection and Sustainable Use of Waters of Portugal and Spain River Basins*, which entered into force in 2000, covers water quality and resource use, and defines minimum flows for transboundary river basins [4].

3.23.2. Environmental performance of agriculture

The main agri-environmental issues are soil erosion, water quality and use, and biodiversity conservation. Other important agri-environmental issues include agricultural ammonia and greenhouse gas emissions and conservation of cultural agricultural

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landscapes. There are a wide variety of agri-ecosystems and landscapes. These range from Mediterranean in the south with hot and dry summers and irregular rainfall during and across years [13], to oceanic climate in the north with a cooler climate tempered by the Gulf Stream but also with a Mediterranean rainfall regime characterised by a dry five months season in the summer [4].

Soil erosion remains a major concern. Around 70% of the total land area is estimated at high risk of erosion, a further 24% at medium risk and 5% at low risk [4, 11]. There is no national soil quality monitoring network, but a number of studies reveal that soil erosion from water is widespread on farmland, especially in the south, where soil erosion research has been undertaken over many decades. However, soil erosion from wind is not a concern [4, 11, 12]. Soil degradation has been aggravated by a combination of unfavourable natural conditions, including a high proportion of steeply sloping farmland, heavy rainfall in autumn and winter when land cover is reduced, thin topsoil, and the semi-arid climate in the south. Soil erosion has also been attributed to: poor farm management depending on the region; cereal growing on unsuitable soils; and overgrazing and forest fires, especially in mountainous areas [11]. In the steeper regions of the north-west the abandonment and collapse of many small irrigated terraces has also increased soil erosion rates [11]. Loss of soil productivity has occurred in the eroded areas as well as sedimentary deposition downstream, with erosion triggering potentially irreversible degradation and desertification [4, 11, 12].

Farming is exerting significant pressure on the quality of water bodies [2, 4, 9, 12]. There are increasing concerns with agricultural pollution from nitrates and pesticides, both run-off into rivers and lakes, and leaching into groundwater, especially shallow aquifers [14, 15, 16]. In the absence of systematic monitoring of pollution in predominantly agricultural water catchments data on agricultural pollution of water bodies is patchy, except for nitrates. There is also some evidence of growing salinity levels in groundwater resulting from irrigation return flows [15, 17].

The agricultural nitrogen surplus rose by 7% between 1990-92 and 2002-04, while the phosphate surplus was stable. But the nitrogen (N) surplus quantity per hectare of agricultural land was almost half (47 kg N/ha) the EU15 averages, while phosphorus (P) surplus per hectare of agricultural land (15 kg P/ha) was above the OECD and EU15 averages in 2002-04 (Figure 3.23.2). There was some improvement in nutrient use efficiency (the ratio of N/P output to N/P input), but P use efficiency was well below the OECD average in 2002-04. The rise in nitrogen surplus is mainly due to higher inorganic fertiliser use and livestock numbers (*i.e.* more manure), especially poultry and pigs, despite the rise in nitrogen uptake with the expansion in pasture area. The stability in phosphorus surpluses resulted from the fall in phosphorus inorganic fertiliser use balanced by the rise in livestock numbers and greater nutrient uptake from higher pasture production.

Agricultural nitrate pollution of groundwater bodies is high in some areas, but the situation is improving. Almost 20% of the monitoring sites in farming areas reported nitrates in groundwater above the drinking water standard (1995-2005) [18], but were even higher in some regions, such as Alentejo [15]. Intensive crop farming on irrigated land and intensive poultry and pig farming are the main causes of nutrient pollution in certain areas [4, 12]. In agricultural nitrate vulnerable areas, over 50% of groundwater monitoring stations were above drinking water standards (50 mg/l) during 1997-99, declining to 37% by 2000-03. Almost 70% of monitoring stations measured a decrease of over 50% of nitrates from agricultural sources in vulnerable areas into groundwater between 1997 and 2003 [1].

The use of pesticides rose by 26% over the period 1996-98 to 2001-03, although around three-quarters of pesticide use is in the form of low-toxicity fungicides, mainly sulphur to control mildew in vineyards (Figure 3.23.2) [4]. Portugal has experienced a high rate of growth in pesticides (active ingredients) over the past decade, mainly for use on irrigated crops (*e.g.* rice, maize, horticultural crops) and vineyards [19]. Monitored pesticides have been detected in surface and ground water in the few agricultural areas where monitoring took place and in some cases are substantially above the EU maximum concentration value for pesticides in drinking water of 0.1 μg/l [14, 19]. Over the period 1983 to 1999 certain insecticide and herbicide products were detected in surface water at between 0.18 μg/l and 56 μg/l [19]. This is of particular concern in groundwater as the country draws over 50% of its drinking water supplies from this source [19]. Nevertheless, monitoring of water for human consumption indicates no problems in terms of harmful pesticide concentrations [20]. Farmers are adopting integrated pesticide management (IPM) practices to lessen the potential pressure of pesticides on the environment, with an increase in the area of IPM as a share of total arable and permanent crop land from less than 1% in 1995 to over 5% by 2002 [18]. In addition, the area under organic farming also rose over the past 15 years to nearly 6% of total farmland by 2005 compared to an EU15 average of nearly 4% (2002-04) [1, 21].

The use of water by agriculture for irrigation grew by over 20% from 1991 to 2001, although data availability is limited. Increasing agricultural water use is in part due to the 3% expansion in the area irrigated between 1990-92 and 2001-03, with 17% of the total agricultural area under irrigation by 2001-03. Irrigation water application rates (litres per hectare of irrigated land) also rose 18% between 1991 and 2001, compared to a decrease of 9% for the OECD on average (Figure 3.23.2). The increasing intensity of irrigation water use is of concern since irrigation is shifting from the North, which is best endowed with water, to the South, which is least so [4, 12]. Research suggests farming is over exploiting aquifers and extracting water beyond rates of replenishment in the Algarve, although since the 1980s abstraction from aquifers has to be licensed [4, 16, 17]. About 10% of public and private irrigation infrastructure was rehabilitated between 1996 and 2000 at a cost of EUR 35 (USD 44) million [4]. The Alqueva water development project in the Guadiana basin (to be completed in 2024) has a major irrigation component, which is expected to cover 110 000 ha, leading to the expansion in irrigated land area of around 15% above the level of 2001-03, although some of it is already irrigated with less efficient systems [4, 22]. EU structural funds will cover a large part of the EUR 1.88 (USD 2.35) billion investment for this project [4].

Air pollution trends linked to farming have been mixed. Agricultural ***ammonia emissions*** rose by 13% between 1990-92 and 2001-03, mainly as a result of the increase in livestock numbers and nitrogen fertiliser use (Figure 3.23.2). Farming accounted for nearly 80% of total ammonia emissions in 2001-03. Despite the rise in total ammonia emissions to around 65 000 tonnes by 2001-03, this remains well below the 2010 target of 108 000 required under the *Gothenburg Protocol*. For ***methyl bromide*** use (an ozone depleting substance) Portugal, along with other EU15 countries, reduced its use over the 1990s as agreed by the phase-out schedule under the *Montreal Protocol*, which sought to eliminate all use by 2005. But in 2005 a "*Critical Use Exemption*" (CUE) was agreed up to 30 tonnes for Portugal (ozone depleting potential), or about 1% of the EU15's CUEs, which under the Protocol allows farmers additional time to find substitutes.

Agricultural greenhouse gas (GHG) emissions increased by 6% between 1990-92 and 2002-04, while there was a 36% rise in total GHG emissions for the Portuguese economy as a whole (Figure 3.23.2). Under the EU *Burden Sharing Agreement* for the *Kyoto*

Protocol Portugal can increase total GHG emissions up to 27% by 2008-12 from the 1990 base year [23]. The share of farming in national GHG emissions was 10% in 2002-04 and the main sources and growth of agricultural GHGs are methane from livestock and nitrous oxide from fertilisers and manure applied on soils [23]. Agricultural GHGs emissions are projected to further increase up to 2008-12, mainly because of higher livestock numbers and fertiliser use, although the rate of emission increase is expected to be reduced due to improved manure management practices [23]. In addition, agricultural emissions might be further reduced with an expansion in ***carbon sequestration by agricultural soils and forests*** being promoted through the incentives for afforestation of marginal agricultural land, minimum tillage practices and improved pasture systems [24].

The drop in direct on-farm energy consumption of 23% compared to a rise of 50% across the economy, over the period 1990-92 to 2002-04, has helped lower GHG emissions, with farming accounting for about 2% of total energy consumption (Figure 3.23.2). But the projected growth in the farm sector could see energy consumption rise, unless energy efficiency gains are realised [25]. Up to 2006 farming produced no feedstock for ***renewable energy production***, although tax incentives were introduced at the end of 2006 to encourage its development [25].

The intensification and structural changes in agriculture has led to greater pressure on biodiversity, but there are signs of the pressure easing and the area of low intensity production systems remains important [4]. However, disentangling the impacts of farming activities on biodiversity is difficult because of the complex relationship between agricultural production systems and biodiversity conservation. This is mainly due to a lack of data, but also because of a combination of: the continued process of intensification in fertile areas; flooding habitat for irrigation; conversion of land for urban use; in marginal farming areas the afforestation or abandonment of semi-natural farmed habitats; and an overall increase of pollutants into the environment, especially nitrates, pesticides and ammonia emissions, raising pressure on terrestrial and aquatic ecosystems [4].

Agricultural genetic resources for crop varieties used in production have increased in diversity, over the period 1990 to 2002, except for cereal and forage varieties. There are also *in situ* conservation programmes mainly for maize and beans, and an extensive *ex situ* collection of crop germplasm [18]. For livestock there was no change in numbers of livestock breeds used in marketed production between 1990 and 2002. Payments are provided to farmers to help with *in situ* conservation of local threatened breeds, and a programme is underway aimed at establishing *ex situ* collections of their genetic material (Figure 3.23.3) [18].

Adverse changes in the quantity and quality of farmed habitats are a risk for biodiversity conservation. Despite the absence of regular monitoring of trends in flora and fauna linked to agriculture, changes in the quantity (area) and quality of farmed habitats provide indirect evidence of likely impacts of farming on wild species (Figure 3.23.4). The overall 5% reduction in farmland between 1990-92 and 2002-04 mainly involved the conversion of farmland to roads, urban development and forestry, although the net impact on biodiversity through conversion to forests is unclear. The area under fallow nearly halved and there was a decrease in ***semi-natural farmed habitats***, including "traditional" orchards (4%), and uncultivated farmland (17%) between 1990 and 2000. But over the same period the area of some semi-natural habitats almost doubled, including extensive pasture and wooded pasture, improving the conditions to support wild species [18]. Assessing the overall trends of agriculture's impact on habitats and wild species is hampered, however, by insufficient data.

The change and loss of semi-natural farmed habitats has been detrimental to bird populations [26]. This is of particular importance as the Iberian peninsula supports a major share of some globally threatened bird species, notably the Little Bustard (*Tetrax tetrax*) and Great Bustard (*Otis parda*) [27, 28]. The intensification of extensive cereal farming systems has been especially damaging to populations of Bustards, while increases in pasture and irrigated crops are unsuitable habitats for these bird species [27, 28]. Moreover, the importance of farming practices on bird populations is also revealed by the BirdLife International Important Bird Areas (IBAs) indicator, defined as prime bird habitat. The indicator shows that around 50% of the most significant threat to Portuguese IBAs originates from farming, including not only intensification of production but also the loss of semi-natural farmed habitat to other uses, while the construction of irrigation projects threatens nearly 40% of IBAs [29]. But there is evidence that agri-environmental measures have helped increase bird diversity and abundance, such as the restoration of low intensity farming practices in the *Special Protection Area* of the Castro Verde [4]. Other threatened species, such as the Cabrera Vole (*Microtus cabrerae*), require the maintenance of uncultivated agricultural habitats (*e.g.* field margins, ditches, fence lines, etc.) for their survival [30]. While some of these habitat features have been changed to other uses, overall the area of uncultivated farm habitats has increased.

Certain semi-natural farming systems are also important as cultural landscapes, as well as providing biodiversity. The *Montado* is an agro-forestry pastoral system in southern Portugal, characterised by a combination of an open tree cover of Cork Oak (*Quercus suber*) and Holm Oak (*Quercus rotundifolia*), which support extensive livestock grazing [4, 31, 32]. The *Montado* closely resembles the Spanish *Dehesa* farming system [31, 32]. Similarly the *Lameiros* provides hillside permanent pasture farming, in the north, irrigated by a system of centuries old terraces [4]. Both the intensification of these farming systems and also in some regions their abandonment to shrub or forest has been to their detriment [31]. Since the mid-1990s the conservation of these farming systems has been encouraged through both training farmers to improve management practices and providing payments to farmers adopting conservation practices that go beyond good agricultural practice (Figure 3.23.4) [4].

3.23.3. Overall agri-environmental performance

Overall the pressure on the environment from farming has risen since 1990 [33]. The growing intensity of farming is evident with the increase in use of nitrogen fertilisers, pesticides, and water, while the area farmed declined. In addition, there was greater pressure on ecosystems, terrestrial and aquatic, with an increase in nitrogen surpluses and higher emissions of ammonia and greenhouse gases. Soil erosion remains a major concern and irrigation water application rates rose in comparison to a downward trend for most other OECD countries where irrigation is important. There are also concerns over the loss to other uses and abandonment of semi-natural agricultural habitats, to the detriment of the biodiversity and cultural landscape benefits associated with these habitats.

There is a need to strengthen agri-environmental monitoring and evaluation systems. This would provide information for policy makers to help monitor agri-environmental policy measures and evaluate their environmental effectiveness [4, 12]. The extent of pesticide monitoring is limited to concentrations in water for human consumption, but researchers consider the coverage of monitoring should be extended [19]. The pollution and extraction of groundwater by agriculture also requires more comprehensive monitoring [15]. Despite the importance of soil erosion there is no national monitoring network, while the impacts of agriculture on biodiversity and cultural landscape features are not regularly measured.

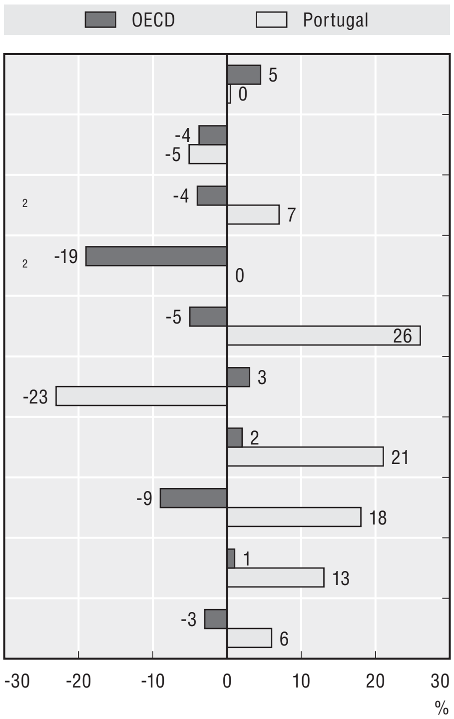
Greater policy attention is being paid to help improve environmental performance in agriculture, with some signs that environmental improvement is emerging. The area covered by agri-environmental measures rose to nearly 25% of farmland by 2000, mostly concentrated in Northern (52%) and Central (37%) regions. This is above the 15% target set for 2000 under the EU's *Fifth Environmental Action Programme*. Since 2000 greater policy attention has been paid to addressing soil erosion problems on farmland, including promoting soil conservation practices (*e.g.* extensive forage systems and low tillage) and agro-forestry [4, 11]. These measures will also address rising GHG emissions by promoting sequestration of carbon in farmed soils [23]. Agri-environmental measures have encouraged the adoption of integrated pest management and organic farming, while some improvement to biodiversity and cultural landscape conservation has been stimulated through payments to maintain semi-natural extensive farmed habitats and landscapes. The 2005 *Water Law*, which translates the EU *Water Framework Directive* of 2000 into national legislation, provides the potential to limit water pollution and excessive water abstraction by agriculture, providing the framework for the implementation of the polluter-pays-principle and cost recovery for water in projects, such as the Alqueva project [4, 9]. With regard to water quantity, the *National Programme for the Efficient Use of Water* provides guidance and sets targets to improve the management of this natural resource [34]. The implementation of the measures dealing with GHGs will help to improve water quality and soil protection [24].

Subsidised input costs do not provide incentives to conserve resources [4]. Farmers have little incentive to conserve water resources given the support provided to water charges and irrigation infrastructure costs, highlighted by the rise in irrigation water application rates (megalitres/hectares irrigated) compared to a reduction for the OECD on average. While households and industries pay a share of the cost of public treatment and distribution of water, farmers pay a smaller share of those costs [12]. The Alqueva water development project in the Guadiana basin has raised a debate in Portugal about how the capital, maintenance and operation costs of the project should be shared among different water users [4]. ***Fuel tax concessions*** for farmers undermine more efficient use of energy and may lead to higher GHG emissions, of particular significance as agricultural GHGs have been increasing, although direct on-farm consumption has been reduced.

A number of important agri-environmental issues still need attention [33]. The major problem of ***soil erosion*** needs to be addressed by greater uptake of soil conservation practices, although the recent EU *Soil Strategy and Framework Directive* could help to improve soil conservation [12]. Despite the progress made since 2000 regarding ***nitrate pollution***, with 6% of farmland designated as nitrate vulnerable zones (NVZs) under the EU's *Nitrates Directive* in eight different areas, the adoption of the farm practices necessary to improve the pollution situation is still under way. There are concerns with ***pesticide pollution*** of water bodies, especially groundwater as this is a major source of drinking water supplies [14, 19]. The costs of removing farm nutrient and pesticide pollutants from drinking water are passed onto water treatment plants and other water users. Farmers have little incentive to control pollution, although a code of good farming practice has been in place since 1997 to help reduce pollution and failure to observe it makes them liable to financial penalties [12]. ***Biodiversity conservation*** requires greater adoption of environmentally beneficial farm practices and maintenance of specific production systems in protected areas, which may depend on the government's capacity to promote rural development strategies in the future [33].

Figure 3.23.2. **National agri-environmental performance compared to the OECD average**

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



Absolute and economy-wide change/level

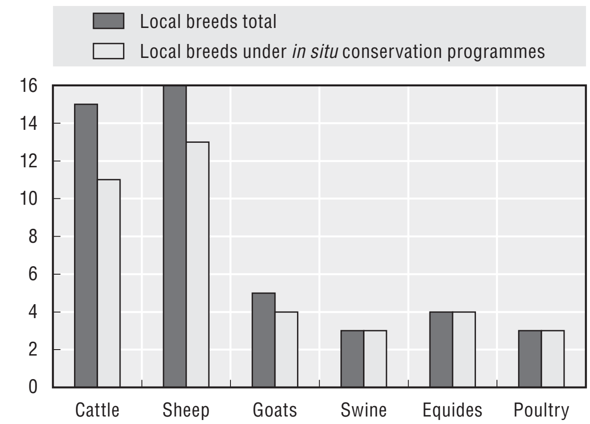
Variable	Unit		Portugal	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	100	105
Agricultural land area	000 hectares	1990-92 to 2002-04	–200	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	47	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	15	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	+3 461	–46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	–135	+1 997
Agricultural water use	Million m^3	1990-92 to 2001-03	+1 078	+8 102
Irrigation water application rates	Megalitres/ha of irrigated land	2001-03	9.5	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	+6	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	+490	–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.

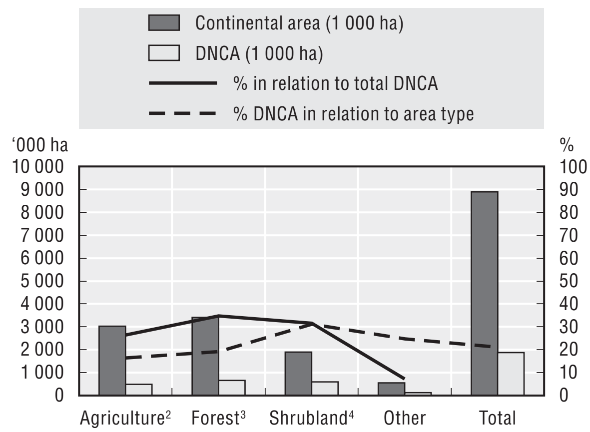
Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

Figure 3.23.3. **Numbers of local breeds under *in situ* conservation programmes: 2006**



Source: Gabinete de Planeamento e Políticas, MADRP, 2007.

Figure 3.23.4. **Relation between land use and Designated Nature Conservation Areas (DNCA):[1] 2004**



1. Includes Nature 2000 sites and national network of protected areas.
2. Does not include under cover agricultural areas.
3. Includes under cover agricultural areas.
4. Includes pastures, fallow land and uncultivated areas.

Source: National Forestry Inventory, DGRF 2005/06.

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