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

# ENVIRONMENTAL PERFORMANCE OF AGRICULTURE IN OECD COUNTRIES SINCE 1990:

# Slovak Republic Country Section

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

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

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## BACKGROUND TO THE COUNTRY SECTIONS

### *Structure*

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

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The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).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

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

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

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

### *Coverage, caveats and limitations*

A number of issues concerning the coverage, caveats and limitations need to be borne in mind when reading the country sections, especially in relation to making comparisons with other countries:

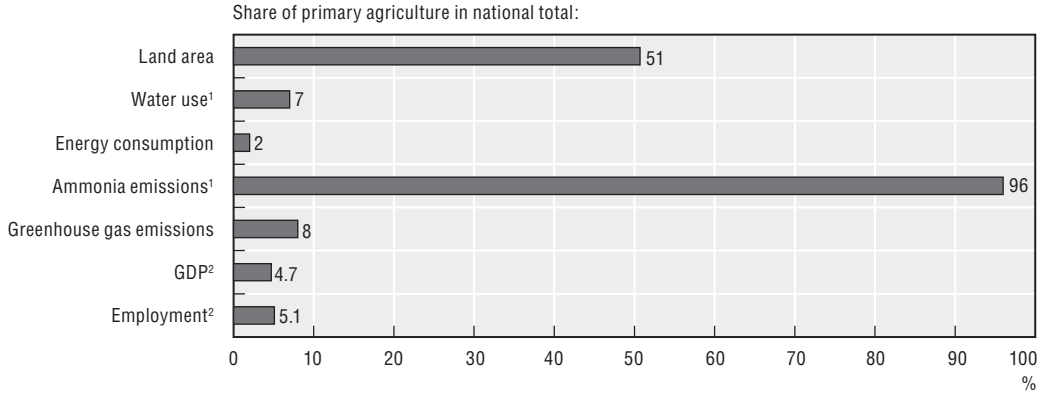
***Coverage:*** The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes in environmental conditions on agriculture (*e.g.* native and non-native wild species, droughts and floods, climate change); the impact of genetically modified organisms on the environment; or human health and welfare consequences of the interaction between agriculture and the environment.

***Definitions and methodologies for calculating indicators*** are standardised in most cases but not all, in particular those for biodiversity and farm management. For some indicators, such as greenhouse gas emissions (GHGs), the OECD and the UNFCCC are working toward further improvement, such as by incorporating agricultural carbon sequestration into a net GHG balance.

- ***Data availability, quality and comparability*** are as far as possible complete, consistent and harmonised across the various indicators and countries. But deficiencies remain such as the absence of data series (*e.g.* biodiversity), variability in coverage (*e.g.* pesticide use), and differences related to data collection methods (*e.g.* the use of surveys, census and models).
- ***Spatial aggregation*** of indicators is given at the national level, but for some indicators (*e.g.* water quality) this can mask significant variations at the regional level, although where available the text provides information on regionally disaggregated data.
- ***Trends and ranges in indicators***, rather than absolute levels, enable comparisons to be made across countries in many cases, especially as local site specific conditions can vary considerably. But absolute levels are of significance where: limits are defined by governments (*e.g.* nitrates in water); targets agreed under national and international agreements (*e.g.* ammonia emissions); or where the contribution to global pollution is important (*e.g.* greenhouse gases).
- ***Agriculture's contribution to specific environmental impacts*** is sometimes difficult to isolate, especially for areas such as soil and water quality, where the impact of other economic activities is important (*e.g.* forestry) or the "natural" state of the environment itself contributes to pollutant loadings (*e.g.* water may contain high levels of naturally occurring salts), or invasive species that may have upset the "natural" state of biodiversity.
- ***Environmental improvement or deterioration*** is in most individual indicator cases clearly revealed by the direction of change in the indicators but is more difficult when considering a set of indicators. For example, the greater uptake of conservation tillage can lower soil erosion rates and energy consumption (from less ploughing), but at the same time may result in an increase in the use of herbicides to combat weeds.
- ***Baselines, threshold levels or targets for indicators*** are generally not appropriate to assess indicator trends as these may vary between countries and regions due to difference in environmental and climatic conditions, as well as national regulations. But for some indicators threshold levels are used to assess indicator change (*e.g.* drinking water standards) or internationally agreed targets compared against indicators trends (*e.g.* ammonia emissions and methyl bromide use).

# 3.24. SLOVAK REPUBLIC

Figure 3.24.1. **National agri-environmental and economic profile, 2002-04: Slovak Republic**




StatLink http://dx.doi.org/10.1787/301013645474

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*.

## *3.24.1. Agricultural sector trends and policy context*

***The long-term contraction of the agricultural sector continued over the period 1990 to 2004.*** The share of agriculture in GDP declined steadily from 8% in 1990 to slightly under 5% by 2004, while over the same period farming's share in total employment fell from 12% to 5% [1, 2, 3, 4] (Figure 3.24.1). These changes reflect the reduction of 10% in the volume of agricultural production (1993-95 to 2002-04), among the largest decrease across OECD countries (Figure 3.24.2). While livestock numbers continue to decline, part of a longer term trend since 1990, more recently from 2000 to 2004 arable crop production has recovered and risen slightly, especially for cereals, oilseeds and sugar beet [1].

***Transition from a centrally planned to a market economy has impacted significantly on agriculture*** since the early 1990s. Together with the division of Czechoslovakia into the Slovak and Czech Republic's in January 1993, this has led to major changes in political and social institutions and economic conditions, had implications for land use, and resulted in extensive changes in farm ownership patterns, productivity and competitiveness [3, 5, 6, 7, 8, 9, 10, 11, 12, 13]. The sharp fall in the volume of farm production during the early 1990s was induced by a major reduction in support (see below), a drop in farm investment, and rising farm debt levels. The use of purchased farm inputs (fertilisers, pesticides, energy and water) decreased sharply in the early 1990s but stabilised and even began to rise slightly from the late 1990s, although by 2005 still remained well below their peak of the late 1980s (Figure 3.24.2) [1, 3, 5].

***Private family farms saw their share of the area farmed rise from zero before 1992 to over 12% by 2003***, but the share of farmland managed (but not all owned) by large corporate farms (privatised successors of former state and co-operative farms) was over 85% in 2003 [1, 6]. The average size of corporate farms at about 1 600 hectares in 2003 is well above the EU average [1]. Agricultural productivity (as measured by total factor productivity) rose by around 2% annually between 1992 to 2002, mainly due to the sharp decline in farm employment [14], with agricultural labour productivity (real GDP per employee) higher in agriculture than in many other sectors of the economy during this time [1, 15].

***Farming is now supported under the Common Agricultural Policy (CAP)***, with support also provided through national expenditure within the CAP framework. Support to agriculture has fluctuated considerably over the past 20 years. Due to the implementation of economic reforms, support declined from almost 60% of farm receipts in the mid-1980s to a low of 10% in 1996 (as measured by the OECD Producer Support Estimate – PSE), but then gradually rose (except in 2001 when it dipped to 16%) to 21% by 2003, as policies were geared toward EU membership in 2004 [6, 16, 17]. The EU15 PSE was 34% in 2002-04 compared to the 31% OECD average [8, 15]. Nearly 70% of EU15 support to farmers was output and input linked in 2002-04, the forms of support that most encourage production [18]. Total annual budgetary support to Slovak agriculture was SKK 5.6 (EUR 149 million) billion in 2005, of which about 60% was nationally financed, the remainder coming from EU funding [18]. Agri-environmental measures in the Slovak Republic accounted for about 10% of total budgetary support in 2002 and 2003 [19].

***Agri-environmental and environmental policy has had to address some key problems.*** Firstly, policy had to respond to the environmental problems that are a part of the legacy of central planning; and secondly, policy changes have been required for EU accession and membership (see below). In the early years of transition, agri-environmental policy was not a priority, and the government lacked resources to invest in environmental protection [20]. Indirectly, however, through the removal of government support for purchased farm inputs (*e.g.* fertilisers by 1999, pesticides, but not fuel or irrigation infrastructure) and other production related support had the effect of lowering agricultural production intensity and pressure on the environment. Agri-environmental policies, however, were first introduced in 1997 to encourage sustainable farming practices and environmental protection, including organic farming in 1998 [2, 6]. Between 1992 to 2004 to protect the most fertile agricultural land from conversion to non-agricultural uses it was evaluated and approved before conversion, with a tax imposed on the land removed from agricultural use, but from 2004 the tax was removed [3].

***EU accession and membership from 2004 has also brought policy change.*** The EU provided pre-accession funds for agriculture up to 2006 (including for environmental purposes) through three programmes: *SAPARD*, the most important for agriculture in terms of funding the establishment of institutions and systems of policy implementation; *PHARE*, covering institutional building; and *ISPA*, to assist infrastructure development, including environmental protection [16, 20, 21]. The EU accession period since 2004 has required the adoption of EU agri-environmental and environmental policies, and harmonisation of technical standards [8, 20]. Policies under the CAP are being phased in up to 2013, when CAP support will reach 100% of the EU15 level.

***The joint national-EU funded Rural Development Plan (RDP) provided the main agri-environmental schemes for 2004 to 2006***, including principally area payments per hectare of arable land, permanent cropland (*e.g.* orchards, vineyards) and permanent

grassland (fixed rates defined for each category) conditional on adoption of environmental farm management practices; support for conversion of arable land to permanent pasture; and payments for organic farming [22]. Since 2005 payments are provided for conversion to organic farming (varying from SKK 4 000-10 000 per hectare, EUR 104-259) and post conversion support (varying from SKK 2 000-5 000 per hectare, EUR 52-130) [1, 7, 23]. There are also a number of national agri-environmental programmes that provide support for conservation of agricultural genetic resources (crops and livestock) [16, 19, 22, 24]. To comply with the *EU Nitrates Directive*, the 2002 *Water Act* defines the practices (*e.g.* manure storage, application) required of farmers, and in 2004 about 60% of agricultural land was designated as *Nitrate Vulnerable Zones* [3, 25, 26, 27]. It was estimated in 2001 that the cost to comply with the Directive by 2008 would total SKK 23 billion (EUR 545 million) [26].

***Agriculture is affected by national environmental and taxation policies.*** Support is provided for some farm inputs, important from an environmental perspective, including for fuel and water [3, 19]. Farm fuel use has been supported through a tax exemption since 1996, and after peaking at around SKK 1 600 (EUR 36) million in 2001 declined to SKK 930 (EUR 24) million by 2005 of annual budget revenue forgone [18, 28]. Since 2000 ammonia emissions are taxed at SKK 2 000 (EUR 48) per ton per year [4]. Support is also provided to reduce costs of irrigation water supply by up to 50% from surface water (including energy costs for pumping water), the main source of irrigation water, but farmers pay abstraction charges for groundwater [3, 18]. Support was also provided for irrigation infrastructure operational and maintenance costs, amounting to SKK 30 (EUR 0.8) million in 2006 [18, 29], but since 2007 national support for irrigation water supply has been removed.

***The Slovak Republic is a signatory to a number of international environmental agreements***, some with implications for agriculture including limiting emissions of: ammonia (*Gothenburg Protocol*), methyl bromide (*Montreal Protocol*) and greenhouse gases (GHGs) (*Kyoto Protocol*). As part of the national effort to reduce GHG emissions biofuels are exempt from excise taxes [3, 30]. In terms of its commitments under the *Convention of Biological Diversity*, the *National Biodiversity Strategy*, along with a range of other measures, promotes the conservation and use of agricultural genetic resources through a *National Action Programme* as well as the protection of mountain biodiversity and agricultural landscapes [3]. Slovakia also has a number of bilateral and regional environmental co-operation agreements with neighbouring countries, in particular, of importance to agriculture is the *Carpathian Convention* (2006) covering the conservation of semi-natural farmed grassland in the area of the Carpathian mountains partly included within the country's borders [3, 31], and the *European Landscape Convention* (2005) aiming to promote European landscape protection, management and planning, and to organise European co-operation on landscape issues [32].

### *3.24.2. Environmental performance of agriculture*

***Environmental concerns related to agriculture have changed significantly since 1990.*** With the reduction in farm production and input support, and shift to a market economy, farming moved from an intensive production orientated system to the adoption of more extensive farming methods, linked particularly to the large decrease in use of purchased farm inputs. In the pre-transition period intensification of production led to excessive use of fertilisers, over stocking of livestock on fragile land, and damage to biodiversity [3, 7]. Over the 1990s some of these environmental problems persisted due to the legacy of

decades of damaging farming practices, notably concerning soil erosion [2, 7]. While the pressure on water quality and biodiversity has eased with more extensive farming practices, agricultural water pollution continues and land use change and cessation of farming has led to damage to biodiversity in some areas [2, 3, 7].

***Soil erosion is a major and widespread environmental problem***, partly because of the predominance of mountainous land, but also due to the high share of arable land in total farmland at over 60% [1, 2, 4, 7, 31, 33, 34]. Data (based on a model) for the period 1990 to 2004 indicate that approximately 47% of farmland is potentially (*i.e.* the worst case scenario) affected by a medium to extreme risk of ***water erosion*** (greater than 10t/ha/year). While the share of farmland at moderate to severe risk of water erosion remained stable over the period 1990-92 to 2002-04, the actual area affected declined over this period by around 8 000 hectares. Of the farmland at risk to moderate to severe water erosion, nearly two thirds is subject to extreme water erosion risk (greater than 33t/ha/year), especially in the farmed areas of the Carpathian mountains [4, 34, 35, 36]. The area at moderate to severe risk of ***wind erosion***, is considerably lower at 6% of agricultural land (2003-04), mainly in some parts of the Danube and West Slovakian (Záhorská) Lowlands [4, 34, 36]. Research suggests that highly eroded soils ***on farm*** has reduced fertility considerably compared to unaffected farmed soils, lowering cereal and oilseed crop yields by between 35% to 76% [34]. ***Off-farm damage*** has also been significant with flows of soil sediment impairing reservoir capacity and aquatic ecosystems in rivers [34].

***The quality of agricultural soils is also affected by other degradation processes*** [1, 4]. Farm soil quality is impacted by ***soil compaction***, with about 8% of farmland affected in the early 2000s, and a further 19% share where the process of compaction is progressing due to the greater use of heavy machinery and inappropriate farming practices [1, 4, 7]. ***Soil acidification***, mainly near industrial areas, although agriculture also produces acidifying emissions, affects around 17% of farmland in the early 2000s [1, 7, 12]. The problem of soil acidification has diminished over the 1990s with the decrease in acidifying emissions from industry, lower acidic fertiliser use, and due to the liming of acidic soils [4]. Levels of soil liming, however, are considered to fall well short of requirements [7] and the share of acid soils are likely to gradually increase [37]. ***Waterlogged soils*** is another concern, with over 20% of agricultural land permanently affected by waterlogging mainly because of high groundwater levels and soil structure [4].

***There has been some progress in increasing farmer adoption of soil conservation practices since 1990***, but adoption rates remain very low. The share of arable land under soil conservation practices (*e.g.* conservation tillage, contour cultivation, crop rotations, winter cover crops) rose from 8% to 12% between 1995-99 and 2000-03 [36]. Moreover, the overall share of arable and permanent crop under vegetative cover over the year is very low (around 9% in 2002), and declining (13% in 1992) compared to many other OECD countries (over 60%) [36]. Investment in soil conservation declined considerably over the 1990s compared to the levels during the centrally planned era [34].

***Overall there has been a long term decline in water pollution from agricultural activities***, between 1990 and 2004 [19]. This has been closely associated with the sharp decrease in nutrient surpluses, especially as a result of lower fertiliser use and livestock numbers, and the decline in pesticide use over the period [1]. But since the late 1990s there has been a small rise in nitrogen surpluses (but not phosphorus) and pesticide use, with the pollution of surface water and groundwater in some intensively farmed areas remaining stable and in certain cases slightly rising [2].

***There have been substantial reductions in agricultural nutrient surpluses*** (Figure 3.24.2). The reduction in support to fertilisers and crop and livestock products since the early 1990s, largely explains the decrease in nutrient surpluses. The trends in nutrient surpluses, both of nitrogen (N) and phosphorus (P), fluctuated considerably between the late 1980s and 2004. In the late 1980s nitrogen surpluses (expressed as kg N per ha) were at a level comparable to the EU15 average (but the P surplus was much above EU levels), although by the early 1990s nitrogen surpluses were more than halved, and P surpluses decreased from around 30 kgP/ha of farmland in the late 1980s to under 1 kgP/ha by the late 1990s. But from the late 1990s, while there has been a slow increase in N surpluses (but not for P surpluses), they were still well below the levels of the late 1980s. These developments are highlighted by fluctuations in the use of inorganic N fertilisers which fell from (figures in brackets are for P fertilisers) around 220 000 (170 000) tonnes in the late 1980s down to 70 000 (17 000) tonnes in the early/mid 1990s, rising to over 80 000 (18 000) tonnes by 2002-04 [36].

***Agricultural pollution of water bodies from nutrients has declined since 1990***, but in some regions pollution is a concern, especially Western Slovakia [2, 3, 7]. Overall water pollution levels from agricultural nutrients is well below that for many EU15 countries, and concentrations in water bodies has been stable or declined in some areas [3]. Despite reductions in ***nitrogen*** surpluses, 14% of groundwater monitoring points in agricultural areas exceeded EU standards on nitrate in drinking water (1985-2002), although this applied to only 1% of monitoring points for surface water [36]. A study in 1999 estimated that 47% of agricultural land had only a low to moderate threat of polluting water, 43% posed a medium threat to water quality with nitrates, while the remaining 10% of farmland was a high threat [2]. Eutrophication of some water bodies has been harmful to aquatic ecosystems [3]. ***Phosphorus pollution*** of surface water has been was much higher than for nitrates, with 30% of monitoring points in agricultural areas exceeding EU standards on phosphorus in drinking water (2002) [36].

***The agricultural land area under nutrient management plans has declined sharply.*** The share fell from 75% in 1985-89 down to 5% by 2000-03 [35]. This is now at a level considerably lower than most EU15 countries where the share of farmland under nutrient plans is commonly above 50%. Similarly the numbers of farms conducting a regular soil nutrient test (every 4-5 years) declined over the same respective periods from 90% down to 70% [35]. Moreover, while there has been a slight improvement in nutrient use efficiency (ratio of nutrient N/P inputs to outputs), mainly due to fertiliser consumption, efficiency ratios are below EU15 and OECD averages, substantially so for phosphorus. The declining adoption of nutrient management practices are largely attributed to farmers' lack of capital to invest in manure storage and other manure treatment technologies [25]. Even so, during the 1980s the maintenance of manure storage facilities was poor, and enforcement of nutrient practices weak [26].

***Trends in pesticide use have fluctuated greatly during the period 1990 to 2004*** (Figure 3.24.2). From a peak of nearly 5 000 tonnes (of active ingredients) in the late 1980s, pesticide use fell sharply to 2 500 in 1992, but has subsequently risen (leaving aside annual fluctuations) to about 3 500 by 2002-04 [1]. The reduction in support to pesticides and crops during the transition period explains much of the decrease in pesticides use, but also to a limited extent the expansion in organic farming. Organic farming grew rapidly over the 1990s, although accounted for less than 3% of farmland in 2002-04, below the EU15 average of nearly 4%, but above the OECD average [23, 39]. Permanent grassland accounted for about 70% of land under organic management, with much of the remainder arable land,

and a small share under horticultural crops [1]. While initially the reduction of pesticide use in the early 1990s lowered pressure on water quality, with growing use since then this has increased pressure in some regions. Overall, less than 1% of groundwater (wells) monitoring points in agricultural areas exceeded EU standards for pesticides between 1985-2002 [36]. Despite the ban on many highly toxic and persistent organochlorine pesticides (*e.g.* DDT), however, research in 2002-03 has shown that in some districts (*e.g.* Michalovce) they were found at levels in children that should be a cause for concern [40].

***As agriculture is largely rain-fed use of irrigation is limited***, accounting for 6% of the total farmland area in 2001-03, and used mainly for horticultural crops. Farming's share in national water use was 7% in 2001-03, while over the period 1990-92 to 2001-03 agricultural water use declined by over 60%, largely because the area irrigated halved over this period following the privatisation of some irrigation schemes and a lack of investment in irrigation infrastructure (Figure 3.24.2) [3, 4]. With the greater incidence and severity of droughts (in 2000 the severe drought was estimated to have cost agriculture SKK 11 billion-EUR 245 million), agri-environmental schemes are being used to upgrade and improve the current irrigation infrastructure, with the area under irrigation increasing (2004-05) [4, 7, 39]. Most water used for irrigation is drawn from surface water, with farming accounting for 5% of total groundwater use in 2002. High-pressure rain guns are the main water application technology used by farmers [36]. In the past the construction of irrigation systems has led to damage of wetlands and other habitats [7].

***The decrease in air-polluting emissions from agriculture has been among the largest reduction across OECD countries since 1990.*** Total ***ammonia emissions*** fell by 44% between 1990-92 and 2001-03, with agriculture accounting for 96% of these emissions in 2001-03 (Figure 3.24.2) [42]. The drop in emissions has been mainly due to the reduction in livestock numbers and, to a lesser extent, nitrogen fertiliser use, with livestock accounting for over 90% of agricultural ammonia emissions [2, 4, 42]. With total ammonia emissions falling to 31 000 tonnes by 2001-03, the Slovak Republic has already achieved its 2010 emission ceiling target of 39 000 tonnes required under the *Gothenburg Protocol* [40]. Both soil and water acidification have decreased over the past 15 years along with the reduction in agricultural ammonia and other sources of acidifying emissions [42]. For ***methyl bromide*** use (an ozone depleting substance) the Slovak Republic is one of only a few OECD countries to have eliminated its use well ahead of the complete phase-out agreed under the *Montreal Protocol* for 2005.

***The decrease in agricultural greenhouse gas (GHG) emissions decreased by 42% from 1990-92 to 2002-04, was the largest reduction across the OECD*** (Figure 3.24.2). This compares to an overall reduction across the economy of 22%, and a commitment under the *Kyoto Protocol* to reduce total emissions by 8% over 2008-12 compared to 1990 levels [1, 42]. Agriculture's share of total GHGs was 8% by 2002-04. Much of the decrease in agricultural GHGs was due to lower livestock numbers (reducing methane emissions) and reduced fertiliser use (lowering nitrous oxide emissions) (Figure 3.24.3) [40]. Projections suggest that agricultural GHG emissions will stabilise in the period from 2005 to 2010, rising slightly after this period, although by 2020 are expected to be only at about a third of the 1990 level of emissions [43].

***Agriculture has contributed to lowering GHG emissions by reducing direct on-farm energy consumption***, but also by expanding renewable energy production and carbon sequestration in agricultural soils. On-farm energy consumption fell by over 70% between 1990-92 and 2002-04 (compared to a reduction of 21% for total national energy consumption), among

the largest reduction across OECD countries [42]. This is mainly because of the decrease in producer support leading to lower production, and also higher energy prices. Farming accounted for only 2% of total energy consumption in 2002-04.

***Renewable energy production from agricultural biomass feedstocks is expanding***, but remains under 3% of total primary energy supply [30, 43]. The main agricultural sources for renewable energy production are: straw used for heating; liquid cow manure to produce biogas, with 24 biogas units in operation in 2004; oilseeds, mainly rapeseed used to produce 15 000 tons of biodiesel in 2004, with installed capacity for biofuel production at 125 000 tons in 2004 [1, 30]. Projections indicate a large increase in biomass (not only from agriculture) and biogas production up to 2010, possibly raising their share in renewable energy production (in energy equivalent) from 3% in 2002 to nearly 7% by 2010 [43]. There is considerable physical capacity to expand the use of agricultural biomass for renewable energy production, especially for heat generation and biogas [1, 30].

***Carbon sequestration associated with agriculture has increased since 1990***, contributing to a reduction in GHG emissions [43]. The rise in carbon sequestration has been largely due to the conversion of cropland to pasture, and to a lesser extent farmland converted mainly to forestry [43]. Over the period 1990-92 to 2002-04 the area of agricultural land declined by less than 0.5%, reflecting a 5% in the area under crops and permanent crops, but an 8% rise in the area of pasture. Projections suggest that the carbon sink role of agricultural land would continue from 2005 to 2010 and beyond, but remain stable [43].

***Evaluating the effects of agriculture on biodiversity over the past 20 years is complex.*** This is because of the inheritance from the previous centrally planned economy which led to widespread damage to biodiversity, such as species rich meadows, land drainage (*e.g.* loss of wet meadows), and intensive grazing on marginal soils [7, 44]. Over the 1990s, the pressure on biodiversity from farming activities diminished, especially with the reduction in fertiliser and pesticide use and conversion of cropland to pasture [7]. But while the overall farming system has become more extensive, in certain areas the abandonment of semi-natural farmed grassland habitats has emerged as a threat to biodiversity, especially some endangered birds [3, 7, 44].

***There are active* in situ *and* ex situ *programmes for agricultural genetic resource conservation*** [24]. ***Crop varieties*** used in production have in general increased in diversity over the period 1990 to 2002, although for some varieties of oilcrops, pulses, vegetables and forage they have declined [36]. Crop genetic resources are mainly conserved *ex situ* in national gene banks and research centres, but gene banks of native wild plant species have not yet been established [24]. ***Livestock breeds*** used in marketed production have increased in number over the period 1990 to 2002, with a national programme since 1998 covering *in situ* conservation of livestock breeds and an *ex situ* gene bank established in 2000 [24, 36]. Most endangered livestock breeds are now under *in situ* conservation programmes [36].

***Overall pressure on wild species using agricultural land as habitat has eased***, mainly reflecting the increasing area of pasture and shift towards a more extensive farming system. With only a small decline in total agricultural land between 1990-92 to 2002-04 (a reduction of 11 000 hectares), the key change to agricultural habitats has been the conversion of about 6 000 hectares of cropland to pasture per annum [36, 39]. About a third of specially protected habitats across Slovakia are farmed (Figure 3.24.4), while semi-natural grassland accounted for about 12% of agricultural land in 1998, equal to about a third of all permanent grassland [4, 7, 12, 44, 45].

***The two key threats to semi-natural grasslands*** (which are usually associated with a rich and abundant wildlife that coexists with livestock at low stocking densities), are their switch to more intensive forms of management (*i.e.* higher stocking rates), and second, in some marginal mountain areas their abandonment to overgrowth as they were often sites converted to cropland in the pre-transition period but unsuited to farming [7, 9, 44]. In this context, the ***White Carpathians***, a mountainous region in the north and north-western part of Slovakia, is of significance as it has been recognised as a UNESCO Biosphere Reserve since 1996 with much of the region under pastoral semi-natural grassland. These grasslands are considered to be among the most species rich in Europe with many protected plant species, such as those belonging to the orchid family [31, 45, 46]. But their continued existence is coming under a variety of threats, especially the increase in the area under fallow and the reduction in livestock over the 1990s leading to the abandonment of some areas or in others under grazing below a level necessary to maintain the plant species richness of the grasslands [45, 46].

***Overall the impact of agriculture on wildlife has been mixed***, despite the trend towards a more extensive farming system. In lowland areas of meadows and grasslands, partridge, pheasants and hares are common but populations have been in decline (except pheasants) [3]. With the declining area under arable crops, some bird species that rely on this type of habitat are near extinction, such as the great bustard (*Otis tarda*), and corncrake (*Crex crex*), while the imperial eagle (*Aquila heliaca*) which also relies on agricultural land has been threatened with extinction [3]. This trend is of concern as farming was estimated to have posed a threat to around 45% of important bird habitats through changes in management practices and land use in the late 1990s [47].

### *3.24.3. Overall agri-environmental performance*

***Overall the environmental pressure from agricultural activities has declined since 1990.*** The transition to a market economy has resulted in a more extensive farming system, leading to: a decrease in the use of purchased farm inputs (fertilisers, pesticides, energy and water); lower water and air pollution; and the conversion of cropland to pasture [4]. With the small rise in farm input use since the late 1990s, water pollution in some intensively farmed areas has risen slightly. Even so, by 2005 farm input use remained below its peak of the late 1980s. Soil erosion is a major and widespread problem, partly because the share of arable land in total farmland is over 60%. With respect to biodiversity there are concerns over damage to semi-natural grasslands and the decline in farmland bird species.

***Progress is being made toward establishing a agri-environmental monitoring system***, to provide the information required to effectively monitor and evaluate agri-environmental performance and policies [3, 7, 48]. In some areas monitoring is well developed and established over a long period, notably the soil monitoring system managed by the Soil Science and Conservation Research Institute since 1993 [36], as well as ammonia and greenhouse gas emission monitoring [43]. An important area requiring improvement, however, is agri-biodiversity monitoring, but starting from 2001 the government is now beginning to establish indicators to better assess biodiversity trends [24]. With the recent introduction of agri-environmental schemes that address biodiversity conservation in agriculture, this information will be important to help evaluate the effectiveness of these schemes.

***With the entry into the EU Slovak agri-environmental policies are being strengthened***, but it is too early to assess the environmental outcomes from their implementation. The 2004 *Principles of National Soil Policy* establishes a framework for sustainable use and protection of

farmed soil against erosion, compaction and pollution [1, 4]. Agri-environmental programmes implemented since the early 2000s are planned to reintroduce some endangered bird species and address other concerns related to biodiversity, notably the conservation of semi-natural grasslands [3]. Recent policy priority has been given to promote organic farming through the 2005 *Action Plan for the Development of Organic Farming*, and meeting the obligations under the EU *Water Framework Directive* especially the *Nitrates Directive*.

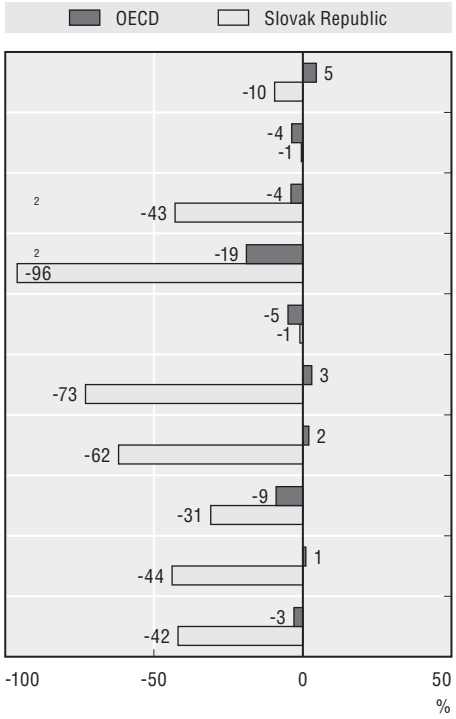
***While the environmental performance of agriculture has improved since 1990 problems persist.*** With 47% (2002-04) of farmland affected by medium to extreme risk of ***soil erosion*** from water, soil conservation measures are inadequate to address the problem, with very low uptake of soil conservation practices. While the conversion of some arable land to grassland in areas at high risk of erosion is likely helping to lower soil erosion rates, greater investment in soil and other environmental farm management conservation practices is needed [4]. ***Tax exemptions*** on fossil fuel used by farmers provide a disincentive to improve energy efficiency and help further reduce greenhouse gas emissions, but this support has been reduced as have agricultural GHG emissions and energy consumption.

***Wildlife has benefited from the conversion of cropland to grassland***, as well as reduced pressure from agricultural water and air pollution on ecosystems, although there are few studies that have examined these changes. But there are concerns with the decline in numbers of certain endangered farmland bird populations and the abandonment to overgrowth of high nature value semi-natural grasslands. The key threats to high nature value semi-natural grasslands, include in some regions the switch to more intensive forms of management (*i.e.* higher stocking rates), but in other areas the reduction in livestock numbers leading to abandonment or under-grazing below a level sufficient to maintain the species richness of semi-natural grasslands [3, 4].

***Projections of agricultural production up to 2010 indicate that overall the farming system is likely to remain at a significantly lower level of intensity compared to the 1980s***, especially in terms of the use of purchased farm inputs, such as fertilisers, pesticides, energy and water [43]. Moreover, research into the likely impacts of EU membership on agricultural production up to 2010 reveals that overall production is expected to stabilise or slowly increase for both arable crops and livestock [49].

Figure 3.24.2. **National agri-environmental performance compared to the OECD average**

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




Absolute and economy-wide change/level

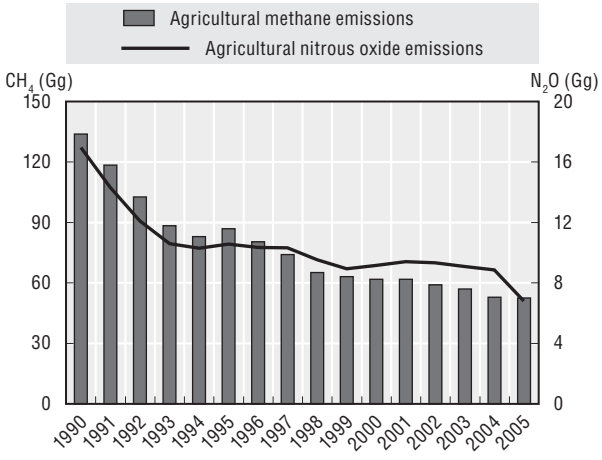
| Variable | Unit | | Slovak Republic | **OECD** |
|---|---|---|---|---|
| Agricultural production volume | Index (1999-01 = 100) | 1990-92 to 2002-04 | 90 | 105 |
| Agricultural land area | 000 hectares | 1990-92 to 2002-04 | –11 | –48 901 |
| Agricultural nitrogen (N) balance | Kg N/hectare | 2002-04 | 46 | 74 |
| Agricultural phosphorus (P) balance | Kg P/hectare | 2002-04 | 1 | 10 |
| Agricultural pesticide use | Tonnes | 1990-92 to 2001-03 | –22 | –46 762 |
| Direct on-farm energy consumption | 000 tonnes of oil equivalent | 1990-92 to 2002-04 | –484 | +1 997 |
| Agricultural water use | Million $m^3$ | 1990-92 to 2001-03 | –116 | +8 102 |
| Irrigation water application rates | Megalitres/ha of irrigated land | 2001-03 | 0.4 | 8.4 |
| Agricultural ammonia emissions | 000 tonnes | 1990-92 to 2001-03 | –23 | +115 |
| Agricultural greenhouse gas emissions | 000 tonnes $CO_2$ equivalent | 1990-92 to 2002-04 | –2 939 | –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.

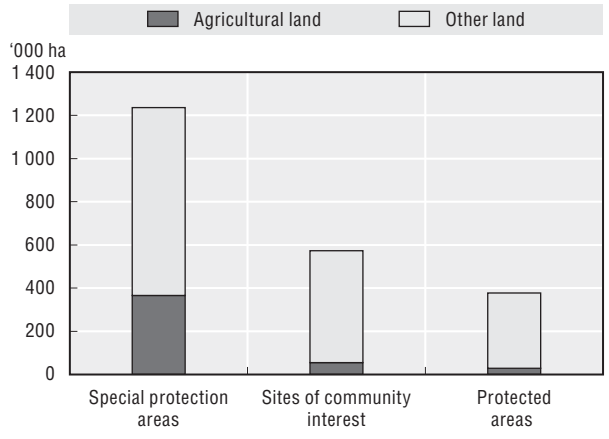
*Source:* OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

Figure 3.24.3. **Agricultural methane ($CH_4$) and nitrous oxide ($N_2O$) emissions**




*Source:* Slovak Environmental Agency (SEA).

Figure 3.24.4. **Share of agricultural land under different types of protected areas: 2003**




*Source:* Slovak Environmental Agency (SEA).

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