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

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The review of environmental performance draws on the country responses to the OECD agri-environmental questionnaires (unpublished) provided by countries and the OECD agri-environmental database supporting Chapter 1 (see website above).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

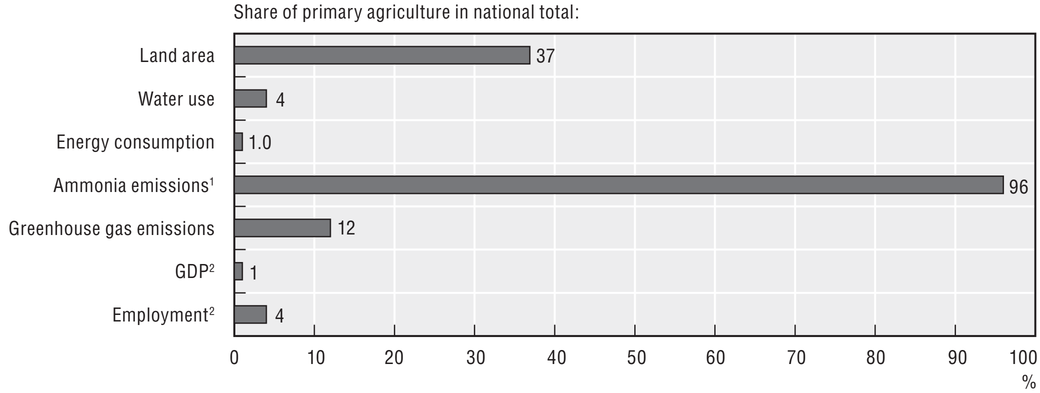
Coverage: The analysis is confined to examination of agri-environmental trends. The influence on these trends of policy and market developments, as well as structural changes in the industry, are outside the scope of these sections. Moreover, the country sections do not examine the impacts of changes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

3.27. SWITZERLAND

Figure 3.27.1. **National agri-environmental and economic profile, 2002-04: Switzerland**



StatLink http://dx.doi.org/10.1787/301143871707

1. Data refer to the period 2000-02.
2. Data refer to the year 2004.

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

3.27.1. Agricultural sector trends and policy context

Agriculture is a small and contracting sector in the economy, with its contribution to GDP and employment at about 1% and 4% respectively [1, 2] (Figure 3.27.1). Both the volume and value of agricultural production decreased over the period 1990-92 to 2002-04, by around 4% and 30% respectively [3]. Farm labour productivity rose by 1.4% per annum between 1990 and 2004 [3].

The intensity of agricultural production is diminishing, with farm input use falling more sharply than the reduction in the volume of agricultural production (over 4%) and the area farmed (–3%) over the period 1990-92 to 2002-04 (Figure 3.27.2). As a result, agricultural production has become more extensive. From 1990-92 to 2002-04 inorganic fertiliser use fell by over 20% for nitrogen fertiliser and 60% for phosphate fertiliser, pesticide use fell by almost 30%, and direct on-farm energy consumption by nearly 30% (Figure 3.27.2). Farmland accounts for about 37% of the total land area, of which around 25% is arable and permanent cropland, and much of the rest permanent pasture (2002-04). About 60% is summer (mountain) pasture on altitudes up to 3 000 m [3]. With climate and topography favouring grazing, animal production (mainly cattle) account for nearly 70% of the value of final farm output [4].

Agricultural support has declined, but is still more than twice the OECD average. Support to farmers (as measured by the OECD's Producer Support Estimate) declined from 78% of farm receipts in 1986-88 to 71% in 2002-04, compared to the OECD average of 31% [5]. The share of output and input linked support, which provides the greatest incentive to expand production, fell from 92% of the PSE in 1986-88 to 66% in 2002-04. Over the same period total support to agriculture, including border protection, fell from about CHF 10 to 8 (USD 7 to 6) billion per annum, declining as a share of GDP from 4% to just under 2% [5].

There has been growing emphasis on agri-environmental policies [6]. From 1993 *Ecological Direct Payments* were granted on condition that farmers adopt a set of environmental management practices. By 2004 these payments were 6% of the PSE [5], and 15% of budgetary expenditure on agriculture [3]. About 40% of these payments were provided to improve animal welfare; and over 30% were used to finance *ecological compensation areas* (ECAs) to develop more extensive farming and semi-natural habitats (*e.g.* extensive meadows, hedges, floral and rotation fallow, extensive cereal and rapeseed production) (Figure 3.27.3). A further 20% was assigned for summer pasturing to help prevent scrub growth; and much of the remaining 10% went to organic farming [5]. Revision of the *Agricultural Policy Reform* programme, which provided the basic framework governing agricultural policy for the 1999-03 period, required that any general direct payment to farmers meet five environmental criteria going beyond legal environmental requirements: a balanced use of nutrients; at least 7% of the farm area to be under extensive practices or semi-natural habitats (ECAs); crop rotation; soil protection; and improved pesticide management [6]. Animal welfare is an additional sixth criterion.

Farming is subject to economy wide environmental measures and international environmental agreements. The *Water Protection Act* requires farmers to limit manure and fertiliser application per hectare; install facilities to store manure for at least three months; and adopt practices to prevent pollution of water from fertilisers and pesticides [4]. Under the *Order on Hazardous Substances* soil nutrient assessment is compulsory for each crop during the growing season [7]. Farming is affected by various international environmental agreements, including lowering ammonia emissions (*Gothenburg Protocol*) and greenhouse gas emissions (*Kyoto Protocol*).

3.27.2. Environmental performance of agriculture

Agriculture plays a key role in the national sustainable development strategy. The main environmental challenges facing agriculture were identified in 2002 by the Federal government which established a number of intermediate agri-environmental targets for 2005 (from a 1990-92 base), including: reducing surplus nitrogen (23%) and phosphorus (50%); lowering pesticide use (30%) and ammonia emissions (9%); achieving 10% of farmland as *ecological compensation areas*; cultivating 98% of farmland according to ecological compliance or organic farming standards; and requiring 90% of drinking water in agricultural areas to have a nitrate level below 40 mg/l [6, 8, 9, 10].

Soil quality is not a national concern but is important in some regions. Data on ***soil erosion*** are poor as there is no national monitoring network nor database on soil erosion [11]. On arable land, average soil losses are less than 1 tonne per hectare annually [11], although in some regions, such as the Central Lowlands, 10%-40% of arable land is at risk of erosion [4]. Soil erosion risks are being minimised with the high and increasing area of farmland under soil conservation management practices (*e.g.* conservation tillage, crop rotations) and permanent cover throughout the year. Over 95% of farmland conformed with these practices in 2002-04. Heavy rain is the primary cause of erosion in most areas at high risk [4]. ***Soil compaction*** due to farm machinery is a concern but no data exist on the extent of the problem [4].

Soil organic carbon (SOC) stocks have been lost from peatland cultivation and conversion of farmland to urbanisation and forestation. But farmed soils may be near their limit with respect to SOC storage, because of the extensification of farming and over 70% of farmland being under permanent pasture [12, 13]. Research suggests that soil biodiversity activity (*e.g.* beetles, spiders, earthworms) is higher in the areas under organic rather than "conventional" management practices [4]. Heavy metals in farm soils, mainly from air emissions but also from fertilisers, sewage sludge and manure, have an impact on soil fertility. Exceedence of federal heavy metals standards is widespread across all agricultural land, with between 5% and 10% of monitoring sites for lead, copper, cadmium and zinc exceeding the standards [14]. While sewage sludge spread on agricultural land has been a major source of heavy metals, its use has been prohibited since 2006, with a transition period until 2008 [7].

Some progress has been achieved in reducing the pressure from agriculture on water quality. Water quality has improved both in certain surface waters affected by urban pollution and in agricultural regions. However, the situation in some regions is still a matter of concern [7, 10]. The main water pollutants derived from agriculture include nutrients and pesticides.

Agricultural nutrient surpluses have decreased by 5% for nitrogen and 56% for phosphorus over the period 1990-92 to 2002-04 (Figure 3.27.2) [9]. However, the intensity of nutrient surpluses (expressed per hectare of farmland) is close to the OECD and EU15 averages for nitrogen, but considerably lower than these averages for phosphorus (Figure 3.27.2). Much of the reduction in nutrient surpluses is explained by lower fertiliser use, especially inorganic fertiliser, significantly so in the case of phosphate fertiliser and, to some extent, greater use of livestock feeds containing less phosphorus [15], especially as overall livestock numbers (hence manure output) and crop uptake of nutrients showed only a small reduction over this period [3]. However, most of the reduction in nitrogen surpluses occurred during the period 1990-97, and since then surpluses have increased, largely explained by a rise in fertiliser use, lower crop output (resulting in reduced nitrogen uptake) and the prohibition of the use of animal meal in livestock feeding. The efficiency of nutrient use improved over the period 1990 to 2002, markedly so far phosphorus reflecting the fall in inorganic phosphorus fertiliser use while the volume of crop production decreased by 13% (Figure 3.27.4). Moreover, most farms and farmland were under a nutrient management plan, with around 90% of farms (2000-03) conducting soil nutrient tests [3]. In addition, manure storage capacity rose by over 50% from 1990 to 2003 [16].

Despite reductions in nutrient surpluses, agricultural nutrient pollution of water persists, mainly in arable farming regions [4, 6, 9]. Farming contributes around 40% of nitrates and over 20% of phosphorus in surface water. With respect to nitrates in groundwater, agriculture's share is 75% [4]. The concentrations of nitrates in groundwater in monitoring points in agricultural areas have declined from around 20 mg/l in the mid-1990s to 18 mg/l by 2003. Over 10% of monitoring points (risk areas) in arable cropping areas have nitrate concentrations greater than 40 mg/l [14, 17]. About 3% of monitoring points in agricultural areas exceed drinking water standards, although this share is low compared to many other OECD countries [17]. Pollution from phosphorus is also evident in some lakes. For certain lakes (*e.g.* Lakes Hallwil and Baldegg) [3], agriculture is a key source of phosphorus pollution of surface water. This follows the ban on phosphate use in detergents enforced in 1986 [4].

Pressure on water quality from agricultural pesticides has eased. Pesticide sale quantities (active ingredients) decreased by 28% between 1990-92 and 2001-03, but the change in sales stabilised from 1998 to 2004 (Figure 3.27.2) [3]. In part, the reduction in pesticide use is explained by the expansion in the area of arable and permanent crops under integrated pesticide management practices rising to over 95% by 2000-03, and the increase in organic farming. Switzerland now has the highest share of agricultural land under ***organic farming*** in the OECD at over 10% (2002-04) compared to 2% in 1993-95. The reduction in pesticide use can also be partly explained by the technical progress of the pesticide industry in replacing high with more low dosage products that are more targeted. About 65% of groundwater monitoring sites in agricultural areas showed the presence of one or more pesticides in 2002, with atrazine especially prominent [4, 17]. In arable farming regions, under 15% of groundwater monitoring sites (2002) had pesticide concentrations in excess of drinking water standards. ***Methyl bromide*** (an ozone depleting pesticide) use by primary agriculture was eliminated in the late 1980s, but small quantities are still used by the agro-food industry [18].

Farming's use of water resources is small in a largely rain-fed agriculture. Farming accounts for around 4% of total annual water abstractions, given that only 2% of the total agricultural land is irrigated. Farmers are required to pay for wastewater treatment as well as for water supply, a situation which does not apply in most other OECD countries [19].

Ammonia emissions from agriculture fell by 12% over the period 1990-92 to 2000-02, according to recent modelled results (Figure 3.27.2). Farming's share of total ammonia emissions is 96%. Much of the decrease in ammonia emissions, which vary regionally, has resulted from improvements in livestock manure and fertiliser management [20]. Ammonia emissions contribute 60-80% of the nitrogen input to sensitive ecosystems (*e.g.* forests, raised bogs, species rich grasslands). Critical loads of nitrogen (the risk indicator for eutrophication) were exceeded at 95% of forest sites and 55% of other semi-natural ecosystem sites around 2000 [20]. With the substantial reduction of sulphur and nitrous oxide emissions, nitrogen compounds from ammonia now contribute about 50% of the acidifying air pollution of ecosystems [20, 21]. An integrated assessment of acidifying emissions has shown that agricultural ammonia emissions should be further reduced by around 50% in order not to exceed critical loads that can damage ecosystems [20, 22]. Under the *Gothenburg Protocol* Switzerland agreed to reduce total ammonia emissions to 63 000 tonnes by 2010, but by 2000-02 Switzerland had already met this target, with emissions down to 59 333 tonnes.

Agricultural emissions of greenhouse gases (GHGs) have decreased, and at a more rapid rate than other sectors of the economy. Agricultural GHGs, which contributed 12% of national GHGs (2002-04), declined by 7% between 1990-92 and 2002-04 (Figure 3.27.2). This compares to a 3% reduction in total emissions over the same period and the country's total reduction commitment of –8% under the *Kyoto Protocol* by 2008-12 [23]. There are no direct policies that target GHG reductions in agriculture, but the decrease is partly the indirect consequence of policies that have reduced livestock numbers and fertiliser use [24, 25]. Agricultural methane and nitrous oxide GHG emissions declined. Agricultural ***direct on-farm energy consumption*** accounted for around 1% of total national energy consumption (2002-04), with the reduction in energy consumption between 1990 and 2004 (Figure 3.27.2), largely explained by the contraction of agricultural production and use of farm machinery. Agricultural energy efficiency (*i.e.* the ratio of direct and indirect farm energy consumption to food calories produced) remained virtually unchanged from 1990 to 2002 (Figure 3.27.4) [3]. The production of ***renewable energy*** from agricultural biomass and waste feedstocks to reduce GHG emissions is currently very low [26].

Reduced pressure from agriculture is helping to maintain biodiversity. With the reduction in farm chemical use and growth in *ecological compensation areas* (ECAs), pressure on biodiversity impacted by farming is easing. A high share of the nation's flora and fauna uses farmland as primary habitat, including mammals (75%) and invertebrates (55% butterflies, 40% of grasshoppers), although the share is lower for birds (22%). However, the share of endangered birds using farm habitat is 50%. In terms of ***agricultural genetic resources*** the diversity of crop varieties [27] and livestock breeds used in production has risen over the period 1990 to 2002 [3]. There are also programmes for conservation of crops and livestock *in situ* and extensive gene bank collections *ex situ*, while all endangered native livestock breeds are included under conservation programmes.

The area of agricultural semi-natural habitats under ECAs expanded from 2% to 11% of farmland (excluding summer pasture) from 1993 to 2004. Over 85% of the ECAs are extensive and low intensity managed meadows, and about 50% of ECAs are in lowland areas (60 000 ha) [3, 6]. There is no national monitoring of wild species on farmland, but some studies show mixed results for the impact of ECAs on flora and fauna [28, 29]. ECAs seem to have enhanced biodiversity (flora and fauna) in contrast to intensively managed farmland, although there are important variations between different ECA types [28, 29]. Species abundance and richness of meadow litter and hedgerow ECAs, however, seem to be higher than for hay meadow and traditional orchard ECAs, which still reflect the impact of intensive management practices [4, 29]. The ecological quality of mountainous ECAs was significantly higher than for lowland ECAs (Figure 3.27.3) [9, 10, 29].

Conversion of farmland to other uses has had adverse impacts on ecosystems and cultural landscapes. The fragmentation of agricultural land (by urban and transport development), the conversion of farmland to mainly urban use, and the abandonment of farmland in marginal areas have had an adverse impact on farmed ecosystems and ***cultural landscapes*** [4, 14]. For example, in some regions alpine pastures have been converted to forestry [4]. But there has been an increase in some linear landscape features on farmland, such as hedges and dry stone walls [4, 17]. ECAs are also reported to have reduced the effects of farm habitat fragmentation by serving to interconnect habitat sites [6]. A full national inventory of agricultural landscapes is not complete but work is underway to improve monitoring [4, 30]. The volume of agricultural ***water retaining capacity*** (*e.g.* small dams and ponds) grew by about 10% (1990-2002), which may have had beneficial consequences for biodiversity and flood control [17].

3.27.3. Overall agri-environmental performance

Overall the environmental pressures related to farming have decreased. The intensity of production has been reduced considerably, with environmental pressure largely decoupled from changes in farm production, and in some regions, because of a growing trend towards the extensification of agriculture. But despite these improvements in agri-environmental performance, progress has stagnated more recently. Farming remains the main single source of nutrient pollution of water and ammonia emissions; pesticide run-off from agricultural soil is a major water pollutant; and intensive farming practices continue to put pressure on biodiversity.

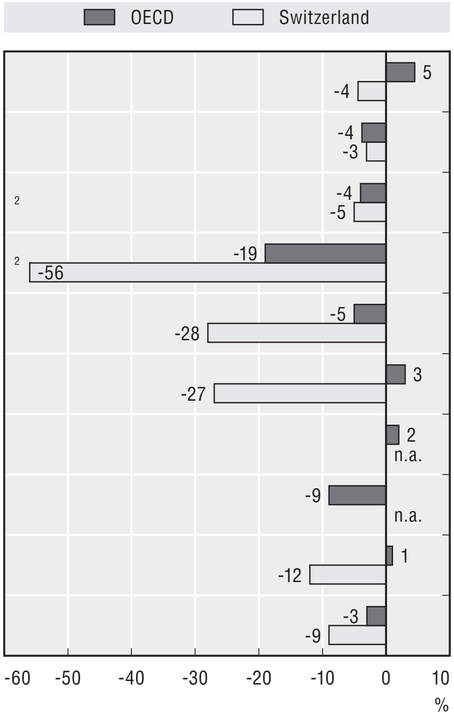
A considerable effort is underway to establish an agri-environmental monitoring system. In 2002 the Federal Office for Agriculture implemented the first stage of designing and implementing a set of agri-environmental indicators, with the indicators already established and being regularly reported by the government [3], and the full set planned to be operational in a first step by 2008 [31]. The Swiss Agency for the Environment has a longer track record in overall environmental monitoring. It is constructing an *Eco-Fauna Database*, which is a matrix of the habitat and other requirements for nearly 3 000 species of fauna (*e.g.* mammals, butterflies, birds) [32], as well as monitoring networks for water, air and soil quality. These environmental monitoring programmes are also being integrated into agri-environmental policy evaluation [6]. However, there is an absence of national monitoring networks and databases for: agricultural soils; acidification; agricultural ecosystems and species diversity; farmed landscapes; while data on the pollution of water from phosphorus and pesticides are poor.

Areas under agri-environmental schemes have expanded and most of the government's intermediate environmental targets for agriculture have been met. Since the increase in expenditure on agri-environmental measures from the early 1990s, farmer participation in these schemes has grown to nearly 90% of all farms and 98% of farmland in 2003 [3]. Progress has been made in meeting some of the government's agri-environmental targets for 2005 (numbers in brackets) in relation to the early 1990s base, including ammonia emissions reduced by 18% (9%); groundwater nitrate levels in agricultural catchments lower than 40 mg/litre in 97% of the observation stations (90%); phosphorus surpluses reduced by 69% (50%); pesticide use falling by 31% (30%); the area under ECAs expanded to 11% of farmland (10%), with 97% of farmland under environmental compliance (98%); but the target will not be met for nitrogen surpluses which decreased by only 13% up to 2002-04 (23%) [3, 6]. (It should be noted that the changes indicated here do not precisely match those in the text above because of the use of different time periods, and indicator calculation methodologies in the case of nutrient balances.)

Despite better agri-environmental performance a number of key issues remain. As point source nutrient ***water pollution*** is now largely contained, the main issue is to control diffuse agricultural sources of pollution in some regions. But the canton's (local government) participation in government programmes targeting nitrates has been low [7], while the share of *Ecological Direct Payments* used to address water pollution is also low, less than 1% of total payments in 2003-04 [5]. The pollution of water from agricultural ***pesticide*** run-off and leaching persists. But the ban on sewage sludge will help to lower heavy metal contamination of soils. There has also been little improvement in agricultural ***energy efficiency*** although direct on-farm energy consumption decreased. ***Agricultural GHG*** emissions have been reduced over the past decade, but recent research suggests that further reductions in agriculture over the coming 10 years are likely to be limited [23]. While a considerable effort has been made to expand the areas under less intensive farming, the rate of progress in improving ***biodiversity*** quality has not been as significant [28, 29]. However, since 2001 payments have been provided to improve the quality of ECA habitats on condition that certain criteria are met, such as having at least 10 native tree or bush species per 10 metre length of hedgerows (Figure 3.27.3) [4, 33].

Figure 3.27.2. **National agri-environmental performance compared to the OECD average**

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



Absolute and economy-wide change/level

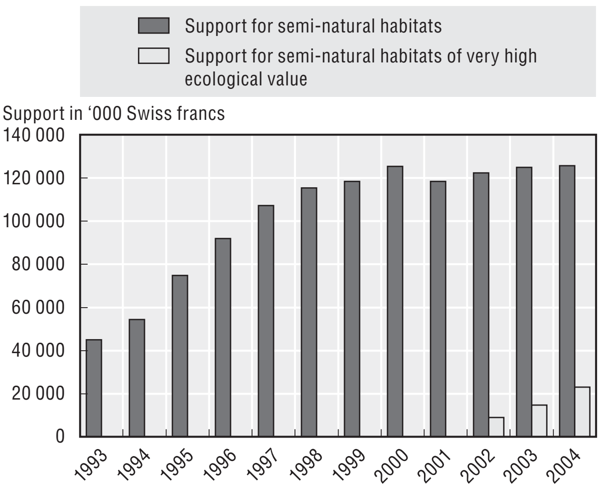
Variable	Unit		Switzerland	OECD
Agricultural production volume	Index (1999-01 = 100)	1990-92 to 2002-04	96	105
Agricultural land area	000 hectares	1990-92 to 2002-04	–48	–48 901
Agricultural nitrogen (N) balance	Kg N/hectare	2002-04	76	74
Agricultural phosphorus (P) balance	Kg P/hectare	2002-04	5	10
Agricultural pesticide use	Tonnes	1990-92 to 2001-03	–600	–46 762
Direct on-farm energy consumption	000 tonnes of oil equivalent	1990-92 to 2002-04	–55	+1 997
Agricultural water use	Million m^3	1990-92 to 2001-03	n.a.	+8 102
Irrigation water application rates	Megalitres/ha of irrigated land	2001-03	n.a.	8.4
Agricultural ammonia emissions	000 tonnes	1990-92 to 2001-03	–8	+115
Agricultural greenhouse gas emissions	000 tonnes CO_2 equivalent	1990-92 to 2002-04	–603	–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.

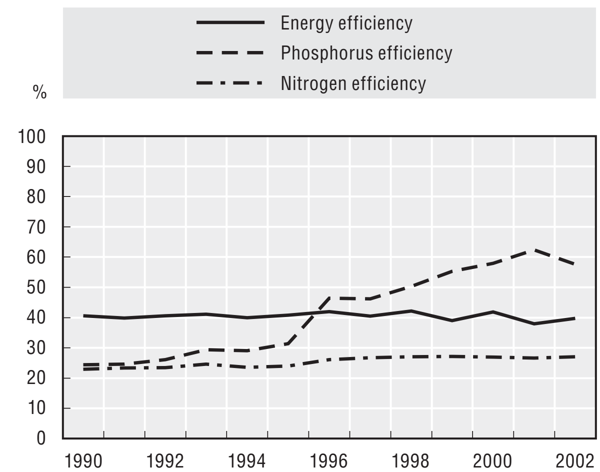
Source: OECD Secretariat. For full details of these indicators, see Chapter 1 of the *Main Report*.

Figure 3.27.3. **Support for agricultural semi-natural habitats**



Source: Federal Office for Agriculture.

Figure 3.27.4. **Input/output efficiency of nitrogen, phosphorus and energy in agriculture**



Source: Swiss Confederation.

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