Agricultural nutrient balances

Agriculture's environmental effects can be negative or positive. They depend on the scale, type and intensity of farming as well as on agro-ecological and physical factors, and on climate and weather. Farming can lead to deterioration in soil, water and air quality, and to loss of natural habitats and biodiversity. These environmental changes can in turn affect the level of agricultural production and food supply limiting the sustainable development of agriculture. Farming can also provide sinks for greenhouse gases, conserve biodiversity and landscapes and, help prevent floods and landslides.

Among the main environmental concerns are nitrogen (N) and phosphorus (P) runoff from excessive fertiliser use, intensive livestock farming and pesticides. N and P, while major plant nutrients, are responsible for water eutrophication. N further increases soil acidification, contributes to air pollution and alters the balance of greenhouse gases. The main challenge is to progressively decrease the negative and increase the positive environmental effects of agricultural production so that ecosystem functions can be maintained and food security ensured for the world's population.

Definitions

The indicators presented here relate to gross agricultural nutrient balances. They are expressed as N and P surplus intensities per km^2 of agricultural land. They describe the potential loss of nitrogen to the soil, to the air and to surface waters or groundwater in the absence of effective pollution abatement.

Changes in agricultural production and land are given as complements.

These indicators describe potential environmental pressures, and may hide important spatial variations. They reflect nutrient balances from primary agriculture neglecting nutrient flows from other food production systems, such as fisheries or total N cycles in the economy. They should be read with information on water use in agriculture, soil quality, biodiversity and farm management.

Overview

The economic and social significance of the agricultural sector has been declining in most OECD countries for decades. From 2000 to 2010, growth in OECD agricultural production slowed compared to the 1990s. In nearly all OECD countries, the land area used for agricultural purposes has decreased, mainly being converted to use for forestry and urban development. Nevertheless, for almost two-thirds of OECD countries, agriculture remains the major land use (over 40% of total land area).

For many OECD countries, fertiliser consumption and nutrient surpluses relative to changes in agricultural output declined, both in absolute tonnes of nutrients and in terms of nutrient surpluses per hectare of agricultural land:

- The rate of reduction in OECD nutrient surpluses was more rapid over the 2000s than the 1990s. Over the past decade, the overall OECD volume of agricultural production increased by more than 1% per year, whereas the N balance (tonnes) declined by over 1% per year, and the P balance (tonnes) decreased by over 5% per year.
- This signals a process of relative decoupling of agricultural production from N- and P-related environmental pressure. It reflects both improvements in nutrient use efficiency by farmers and slower growth in agricultural output for many countries over the 2000s.

Territorial variations within countries are explained by the spatial distribution of intensive livestock farming and cropping systems that require high nutrient inputs, such as maize and rice.

In a number of countries the absolute pressure on the environment (measured as the intensity of N and P surpluses per area) remains high.

Comparability

OECD and Eurostat data on N and P balances are available for all OECD countries, except Chile, until 2009. Improvements to the underlying methodology, nutrient conversion coefficients and primary data are being undertaken by OECD countries in co-operation with Eurostat and the FAO.

Cross-country comparisons of change in nutrient surplus intensities over time should take into account the absolute intensity levels during the reference period.

Agricultural land: 1990 data for Belgium, the Czech Republic, Estonia, Luxembourg, the Slovak Republic, Slovenia and OECD are estimated by the OECD Secretariat.

For additional notes, see Annex B.

Sources

OECD, "Agri-environmental indicators" (2012), *www.oecd.org/tad/env/indicators*.

FAO, *FAOSTAT* (2012) (database), *http://faostat.fao.org/*.

Further information

Eurostat, "Agri-Environmental Indicators", *http://epp.eurostat.ec.europa.eu/portal/page/portal/agri_environmental_indicators/introduction*.

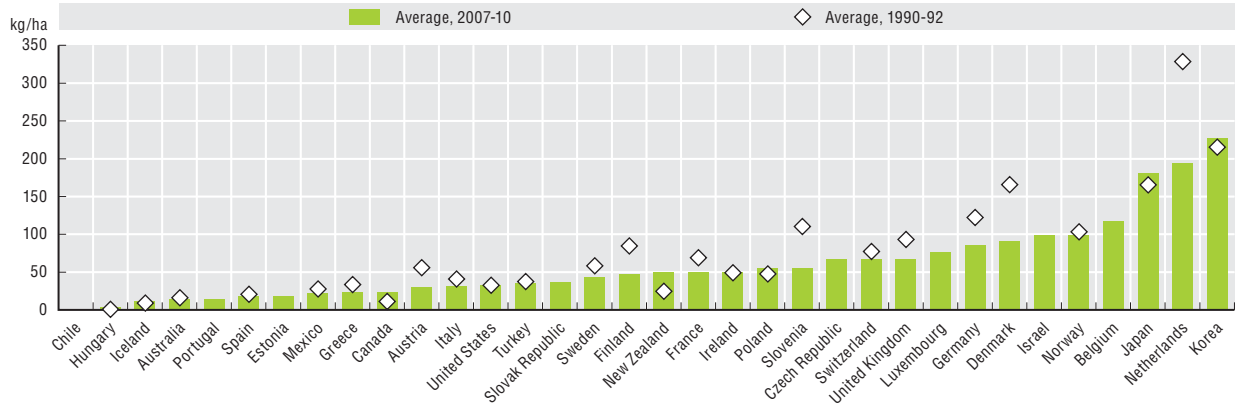
OECD (2013), *OECD Compendium of Agri-environmental Indicators*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264186217-en*.

OECD/FAO (2012), *OECD-FAO Agricultural Outlook 2012*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/agr_outlook-2012-en*.

Information on data for Israel: *http://dx.doi.org/10.1787/888932315602*.

Figure 2.14. **Nitrogen surplus intensity, kg per hectare**

Agricultural area



Source: OECD, "Agri-environmental indicators" (2012); FAO, *FAOSTAT* (2012) (database).

StatLink http://dx.doi.org/10.1787/888932977486

Table 2.6. **Nutrient surplus intensities and agricultural production**

	Nutrient surplus intensity per agricultural area				Agriculture production		Agricultural land	
	Nitrogen		Phosphorous		Crops	Total agriculture	% total area	% total area
	kg/ha	% change	kg/ha	% change	% change	% change		
	Average 2007-10	Since 1990-92	Average 2007-10	Since 1990-92	1990-2010	1990-2010	1990	2010
Australia	13.7	-15	0.04	-93	78	38	60	51
Austria	29.7	-47	2.09	-77	30	14	42	38
Belgium	117.0	..	5.06	..	..	..	..	44
Canada	23.0	107	0.10	-183	30	37	7	6
Chile	..	..	..	..	91	95	21	21
Czech Republic	66.5	..	0.20	..	-5	-21	..	54
Denmark	90.6	-45	6.39	-60	-11	10	65	61
Estonia	18.4	..	-7.59	..	-10	-23	..	21
Finland	47.5	-44	4.02	-81	-9	-9	7	7
France	50.3	-27	2.19	-85	4	1	56	53
Germany	85.8	-30	0.25	-98	1	-2	51	47
Greece	23.0	-32	-1.98	-156	2	0	70	62
Hungary	3.7	313	-9.60	26	-17	-30	70	57
Iceland	10.9	19	1.88	-8	89	26	18	15
Ireland	50.4	3	3.39	-65	7	8	80	65
Israel	98.6	..	31.86	..	3	40	26	23
Italy	30.6	-25	-2.97	-156	9	6	56	48
Japan	180.2	9	49.05	-18	-31	-19	15	12
Korea	226.4	5	45.27	-5	5	26	22	18
Luxembourg	75.8	..	0.35	..	..		..	51
Mexico	21.8	-21	1.22	-41	36	57	53	52
Netherlands	193.3	-41	11.02	-70	26	14	48	46
New Zealand	49.0	98	9.91	109	40	53	60	43
Norway	98.6	-5	14.47	-10	-42	-12	3	3
Poland	55.0	15	5.10	-31	-27	-19	60	47
Portugal	14.5	..	4.22	..	-16	0	43	40
Slovak Republic	36.7	..	-1.74	..	-12	-26	..	40
Slovenia	55.5	-50	8.15	..	24	19	..	24
Spain	18.2	-12	1.05	-70	19	26	60	54
Sweden	43.1	-26	-0.25	-106	-23	-14	8	7
Switzerland	66.7	-14	3.16	-71	-4	1	38	37
Turkey	34.9	-7	5.07	-43	39	45	51	50
United Kingdom	67.4	-28	5.17	-42	-1	-2	75	71
United States	32.8	0	2.34	-15	24	28	44	42
OECD[1]	**61.5**	**-20**	**6.03**	**-50**	..	..	..	**34**

1. The OECD total is a simple average of available country values.

Source: OECD, "Agri-environmental indicators" (2012); FAO, *FAOSTAT* (2012) (database).

StatLink http://dx.doi.org/10.1787/888932978455