Environmental Performance of Agriculture in OECD Countries 2026

Key Trends and Insights

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Key findings

Over the period 1990 – 2023, agricultural production in OECD Member countries significantly increased, while environmental performance showed mixed results.

Overall, the trends presented in this report are consistent with increasing efficiency of production, with decreasing input use and pollution per unit of output produced. However, despite improvements in efficiency, this report shows uneven progress across different agri-environmental indicators.

OECD Member countries saw several positive environmental trends since 1990. Agricultural output grew by 33% while agricultural area decreased by almost 11%, and emissions of agricultural greenhouse gas (GHG) remained relatively stable. These patterns highlight both significant agricultural productivity gains and improvements in GHG emissions per unit of output. There were also reductions in the median nutrient balance (difference between nutrients added versus removed) in OECD Member countries and an increased nutrient use efficiency during that period.

However, progress was uneven across indicators. Some agri-environmental indicators improved between 2013 and 2023, but their rate of improvement slowed while other indicators deteriorated.

More specifically:

- Trends in input use show noticeable decreases in fertiliser consumption, especially between 2021 and 2023, and an increase in on-farm energy consumption.
- Improvements in nutrient balances per hectare were uneven across OECD Member countries and nutrients. The median and maximum phosphorous balances declined over time while remaining in surplus. The maximum nitrogen balance increased to over 200 kilogrammes per hectare.
- Nutrient use efficiency stabilised, with the median nutrient use efficiency ratio remaining around 0.6 for nitrogen and 0.8 for phosphorus since the mid-2010s.
- GHG emission intensity improvements across OECD Member countries slowed over time, with the median annual rate declining more slowly (-0.4%) than in the 1990s (-1.2%).
- National emissions of agricultural ammonia, a gas which contributes to air and water pollution, decreased in 24 OECD Member countries, but increased in 10 countries.
- Farmland bird populations, an indicator for biodiversity, continued to decline in 22 of the 27 OECD Member countries monitoring this indicator over the same period. This highlights the importance of working towards mitigating the pressures exerted by human activities and other disturbances to biodiversity.

1 The OECD agri-environmental indicators

In the 1990s, the OECD began developing indicators of the environmental performance of agriculture amidst increased attention to the sustainability of the agriculture sector. The OECD agri-environmental indicators (AEI) provide internationally comparable data that offer a comprehensive, long-term perspective of the changes in resource use and environmental outcomes related to agriculture. The database covers key dimensions of agri-environmental sustainability, including land, water and other input uses, greenhouse gas (GHG) and ammonia emissions, nutrient balances and farmland bird biodiversity in OECD Member countries and non-Member countries.

The OECD AEIs provide a reliable and robust source of data to assess environmental performance and inform policy action. They help review trends, highlight areas of progress, and identify persistent challenges. They can also help policymakers identify where efforts may be needed to improve the environmental performance of their agriculture. By providing comprehensive and comparable data, the AEIs provide a benchmark for the environmental performance of agriculture across countries.

The data analysed in this report show that, while most OECD Member countries increased their agricultural production over the 1990-2023 period, the environmental performance of the agriculture sector registered mixed results. The overall level of GHG emissions from agriculture in OECD Member countries has not decreased substantially from its 1990 level, though many countries have improved nutrient management and reduced GHG emission intensities. Biodiversity loss, as observed in selected countries through the Farmland Bird Index, is also a continuing concern, particularly in areas with high-intensity farming. By providing a data-driven overview of these trends, this report contributes to discussions on how to align agricultural policies with environmental sustainability objectives.

2 Key trends in the environmental performance of agriculture in OECD Member countries

Between 1990 and 2023, total agricultural production in OECD Member countries increased by 33%. It was accompanied by improvements of certain agri-environmental indicators. Over this period, GHG emission intensity declined and nutrient use efficiency improved, signalling a relative decoupling of environmental effects from agricultural production. However, the data presented in this report suggest that the pace of improvement has slowed.

The trends examined in this section are based on data from the 2026 version of the OECD dashboard Measuring the Environmental Performance of Agriculture. The dashboard presents the evolution of key indicators in the agri-environmental indicators database for the ensemble of the OECD Member countries as well as in each individual country.

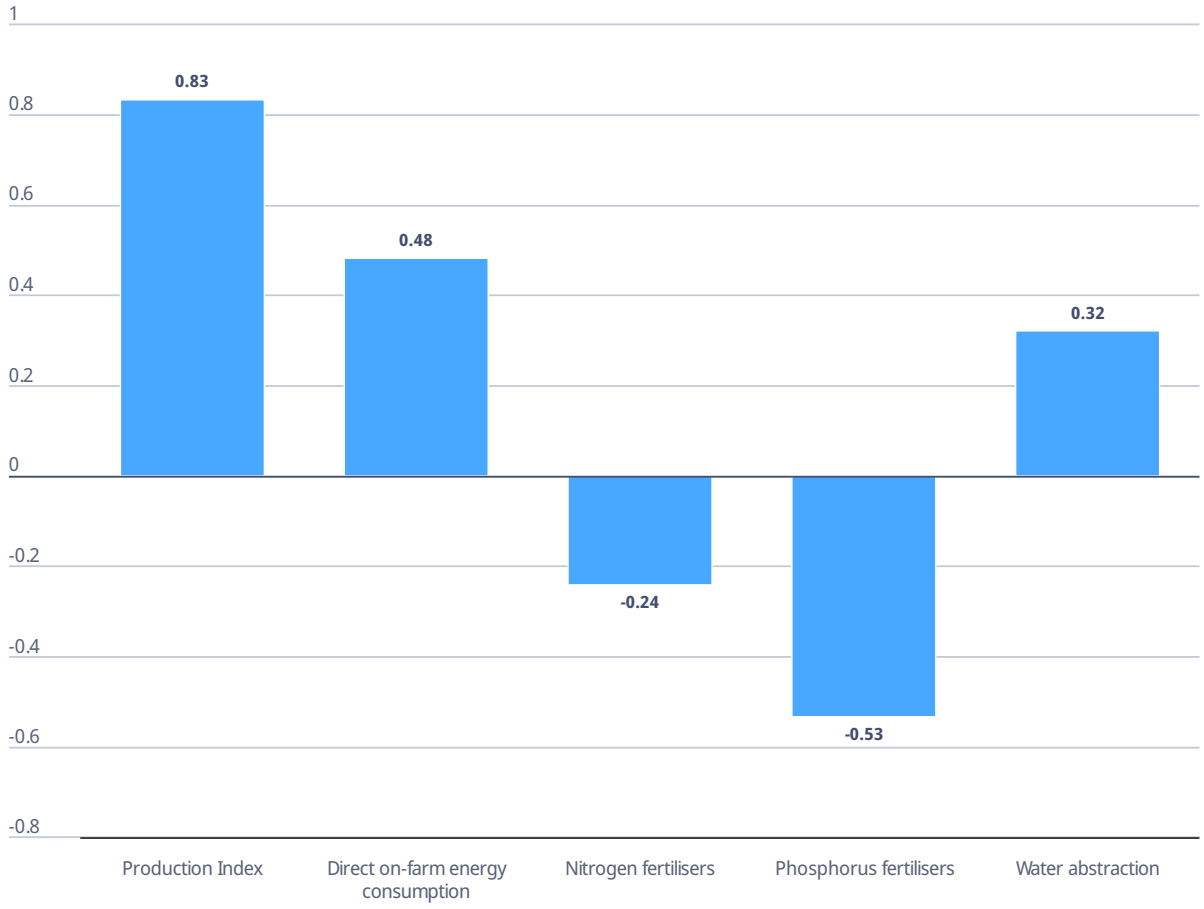
Natural resource and other input uses

Between 2013 and 2023, trends the use of key agricultural inputs (water, fertilisers and energy) in OECD Member countries decreased faster than agricultural production, suggest an overall pattern of decoupling. However, the degree of decoupling observed was not the same across inputs. In the case of nitrogen and phosphorus fertiliser use, the trend is indicative of absolute decoupling, with production increasing while input use decreased at an average rate of 0.24% and 0.53%, respectively, largely driven by decreases in fertiliser input use in 2021 and 2022. For on-farm energy consumption and water, the trends are indicative of relative decoupling between outputs and inputs (i.e. input growth slower than output growth). In the case of on-farm energy consumption, it remained relatively stable, increasing by an average 0.48% per year across OECD Member countries as a whole. Water abstraction also increased (0.32% per year), indicating rising pressures on water resources across OECD Member countries (Figure 2.1).

While trends in agricultural input use reflect shifts in production practices across OECD Member countries, changes in land use patterns provide further insight into how agricultural landscapes are evolving over time. Total agricultural land area in OECD Member countries decreased at an average rate of 0.29% between 2013 and 2023 (Figure 2.2), with annual average decreases observed for both cropland (-0.15%) and pasture land (-0.34%).

Figure 2.1. Agricultural inputs have grown slower than agricultural outputs

Average annual % change, 2013 to 2023*

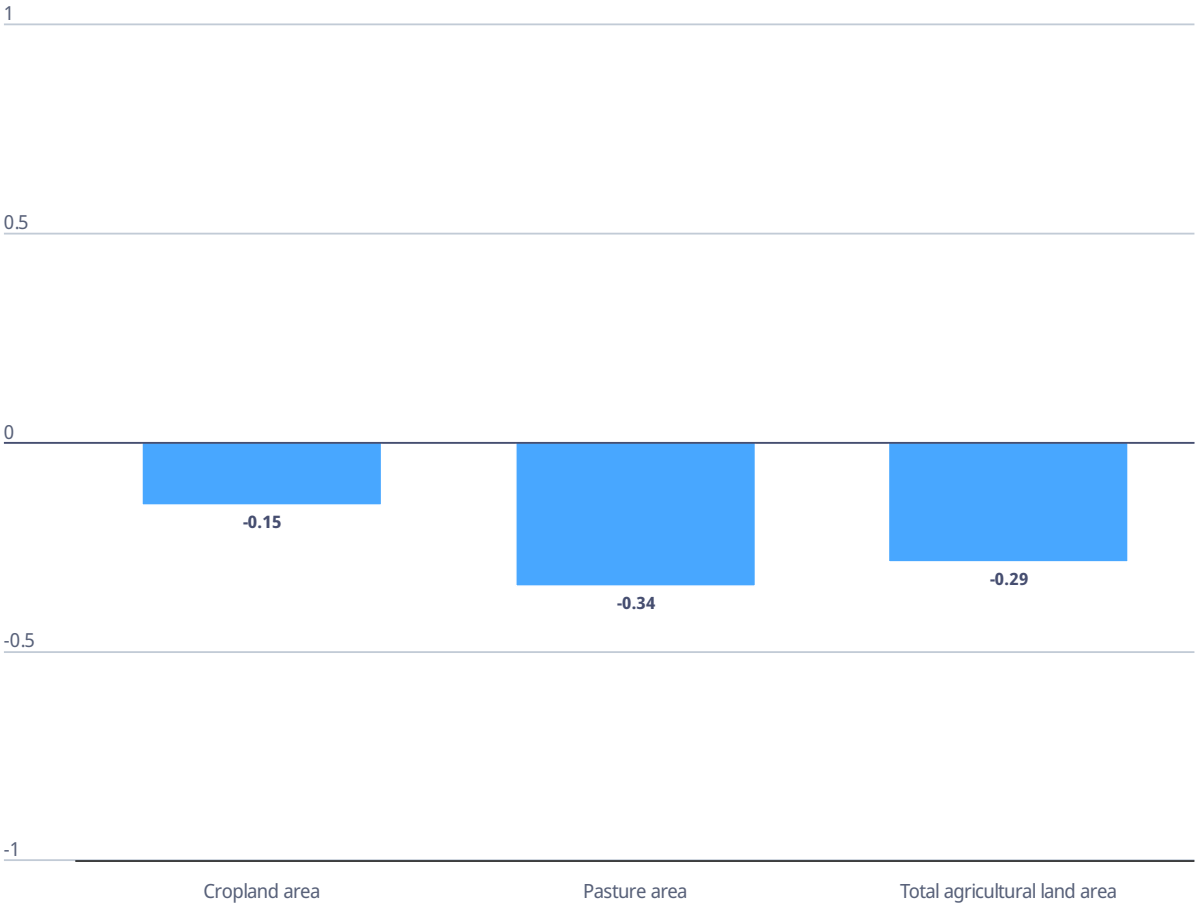


Note: OECD aggregate does not include Chile for Nitrogen and Phosphorus fertilisers. For water abstraction, the OECD aggregate excludes Chile, Colombia, Italy and Norway. The graph suggests different degrees of decoupling of key inputs (energy, fertilisers, water abstraction) from agricultural output, with either negative growth in fertiliser use (absolute decoupling) or input growth below output growth in the cases of water and energy (i.e. relative decoupling).

Source: OECD agri-environmental indicators: Nutrients balances, Water use, and Energy use. For energy use, the growth rates are calculated based on IEA data from the IEA (2025) World Energy Balances, https://www.iea.org/data-and-statistics. FAO; FAOSTAT: Production: Value of Agricultural Production. [Accessed January 2026], https://www.fao.org/faostat/en/#data/QV.

Figure 2.2. Decreases observed in across major agricultural land area types

Average annual % change, 2013 to 2023*



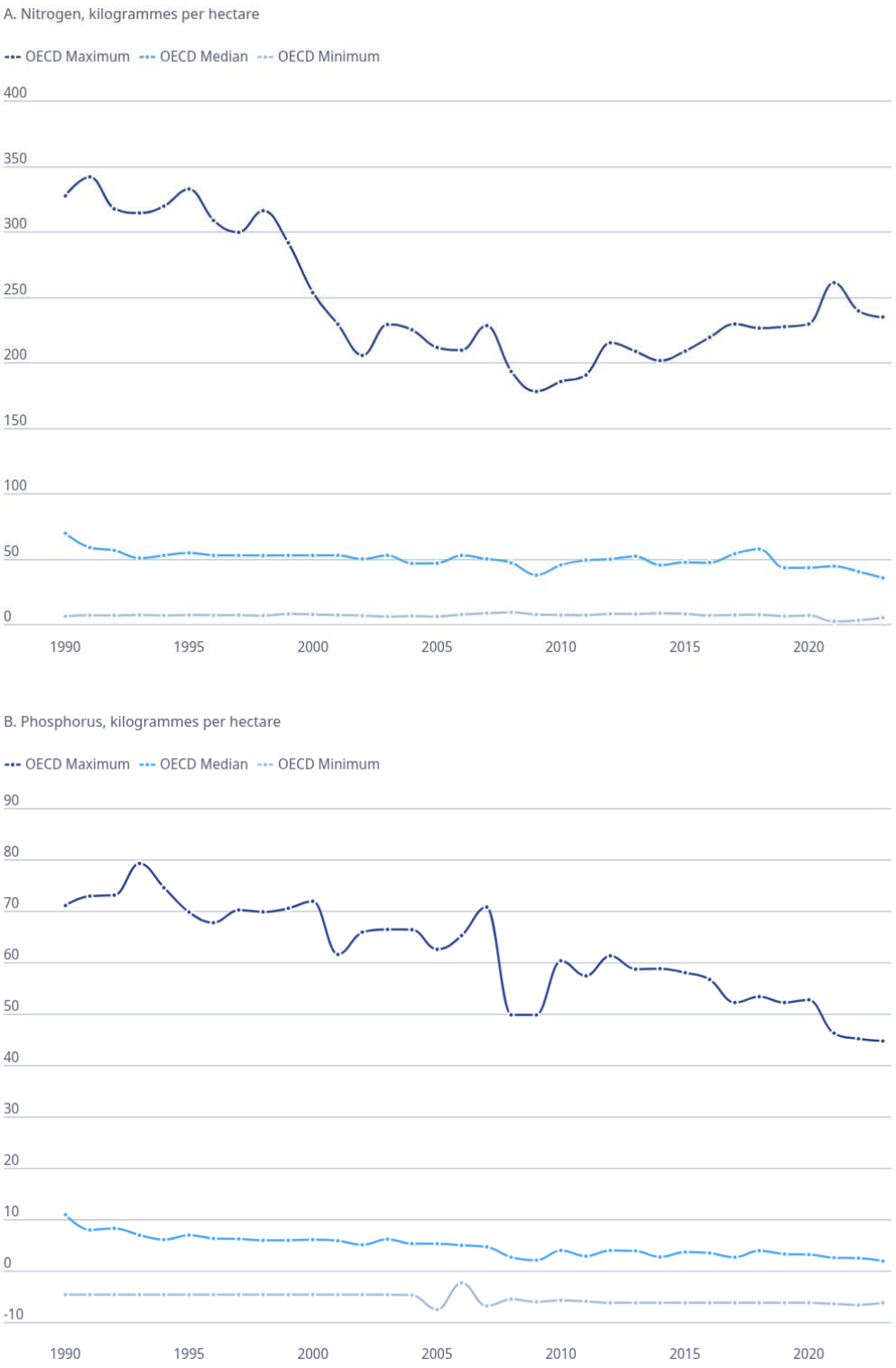
Note: The graph shows a decrease in both cropland and pasture areas in the OECD, resulting in an overall decrease in total agricultural land area.
Source: OECD agri-environmental indicators: Agricultural land area.

Environmental impacts

Nutrient balances

Some environmental effects of agriculture stem from the status of input management and efficiency. While nutrients inputs can contribute to soil fertility when applied in the right quantities, persistent nutrient surpluses could indicate inefficiencies and environmental risks, such as the acidification of soils and eutrophication in water bodies. Figure 2.3 illustrates the evolution of nitrogen and phosphorus balances (kilogramme per hectare) in OECD countries since 1990.

Figure 2.3. Nutrient surpluses declined in most OECD Members, but at a slowing rate.



Note: The graph excludes Chile. The graph shows an overall decrease in the median nitrogen and phosphorus surplus per hectare in the OECD. The minimum values have remained relatively constant over time for both nitrogen and phosphorus, while maximum values have decreased for phosphorus.
Source: OECD agri-environmental indicators: Nutrient balances.

From 1990 to 2009, the nitrogen balance (Panel A) shows a marked decline in the maximum value observed across OECD Member countries. This decline is consistent with improvements in nutrient management or reduced fertiliser use across OECD Member countries with the highest nutrient balances. However, since 2010, the OECD maximum value for nitrogen balance showed an increasing trend and increasing above 200 kg/ha, reflecting a resurgence of nutrient surpluses in some OECD Member countries. Meanwhile, the median value remained relatively stable within the 45-60 kg/ha range from 1990 to 2018 (with a dip in 2009). The value began decreasing slightly in 2019, and then showed marked decreases in 2022 and 2023, which likely reflect the response to shocks induced by high fertiliser prices in 2022. The minimum nitrogen balance per hectare, however, remained relatively stable and close to zero.

The phosphorus balance (Panel B) also displays a downward trend across several statistics. Between 1990 and 2023, the maximum value gradually decreased from 71.2 kg/ha to 44.8 kg/ha, with a large dip in 2008 and 2009. The median values gradually decreased over time and remained within a range of 2-4 kg/ha since 2009. Meanwhile, the minimum values show that one or more countries faced a deficit in phosphorus throughout the period.

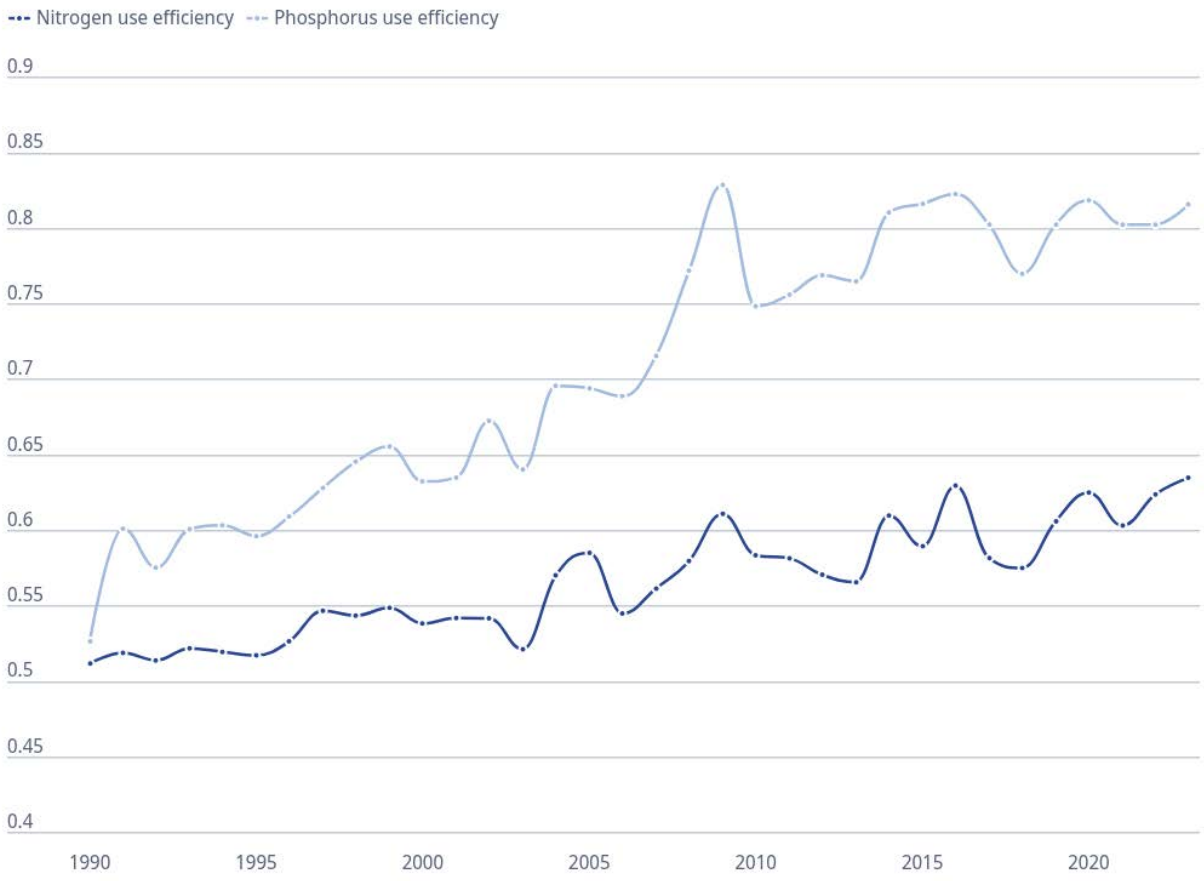
These trends in nitrogen and phosphorus surpluses across OECD Member countries reflect shifts in fertiliser use and environmental pressures, as well as ongoing efforts to improve nutrient use efficiency in agriculture. Optimising nutrient use is an important lever to improving agricultural sustainability. Higher efficiency levels indicate better nutrient management and reduced environmental impacts, while lower values highlight persistent challenges in minimising nutrient losses. The data show a steady increase in both nitrogen and phosphorous use efficiency but also reveal a certain margin for improvement (Figure 2.4).

Nitrogen use efficiency, measured as the ratio of outputs to inputs, has shown improvements over time, though fluctuations persist. The median efficiency has exceeded 0.6 in recent years, which is higher than the observed values in the 1990s. While this represents an improvement, it also implies that only about 60% of applied nitrogen is effectively converted into outputs. This suggests continuing challenges in reducing nutrient losses and optimising fertiliser use, with around 40% of nutrients lost to the environment through soil, water or air. In contrast, phosphorus use efficiency has exhibited a clearer upward trend since the early 2000s, reflecting overall improved nutrient management.

These trends underscore the progress achieved in nutrient use efficiency, while emphasising the need for further improvements to reduce nutrient losses and their environmental impact.

Figure 2.4. Nutrient use efficiency has increased but has plateaued in recent years

Ratio of nutrient outputs to nutrient inputs, OECD median



Note: The graph excludes Chile. The graph shows improvements in nutrient use efficiency (the share of nutrient inputs divided by nutrient outputs), with nutrient use efficiency being higher for phosphorus than for nitrogen. Early increases in nutrient use efficiency have slowed in recent years with recent levels of nutrient efficiency remaining similar to 2010 levels.
Source: calculation based on OECD agri-environmental indicators: Nutrient balances.

GHG and ammonia emissions

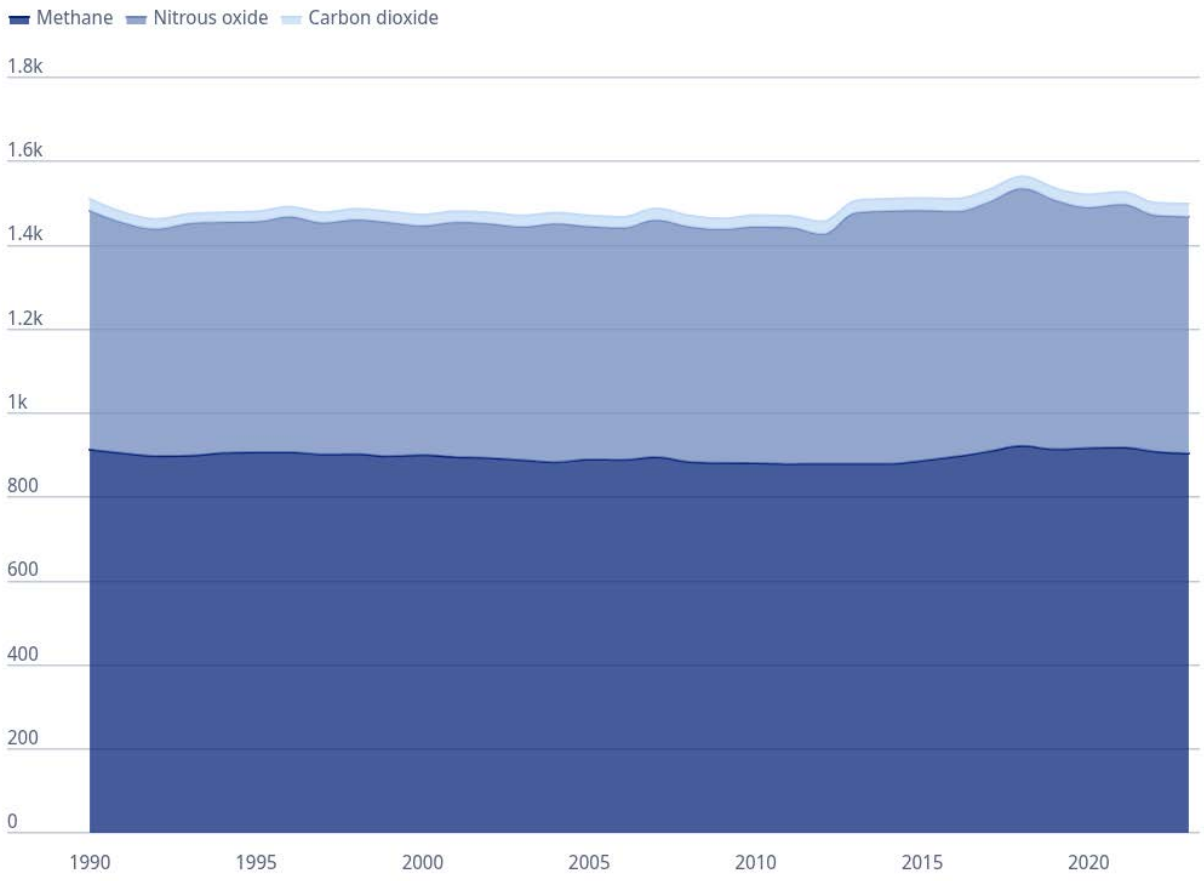
Agriculture remains a significant GHG-emitting sector due to its methane and nitrous oxide emissions. Figure 2.5 illustrates the trends in GHG emissions from agriculture in OECD Member countries. Since 1990, the overall level of GHG emissions remained relatively stable in absolute terms. An increase was observed between 2013 and 2018 (the observed peak), before gradually declining between 2019-2023.

Between 2013 and 2023, aggregate GHG emissions declined by approximately 0.45%, but this figure hides two very different sub-periods. Between 2013 and 2018, emissions grew at an annual rate of 0.76%, before decreasing at an annual rate of 0.84% since. The recent decreases appear to be largely driven by reductions in nitrous oxide emissions, which fell by approximately 8% between 2019 and 2023, while methane emissions also decreased over the same period, but to a much lesser extent.

These trends reflect the ongoing influence of livestock production and fertiliser use on agricultural GHG emissions, with methane primarily linked to enteric fermentation and manure management, while nitrous oxide emissions are largely driven by nitrogen-based fertilisers and associated soil processes.

Figure 2.5. The overall level of agricultural GHG emissions remained stable over time

Million tonnes of CO_2 equivalent



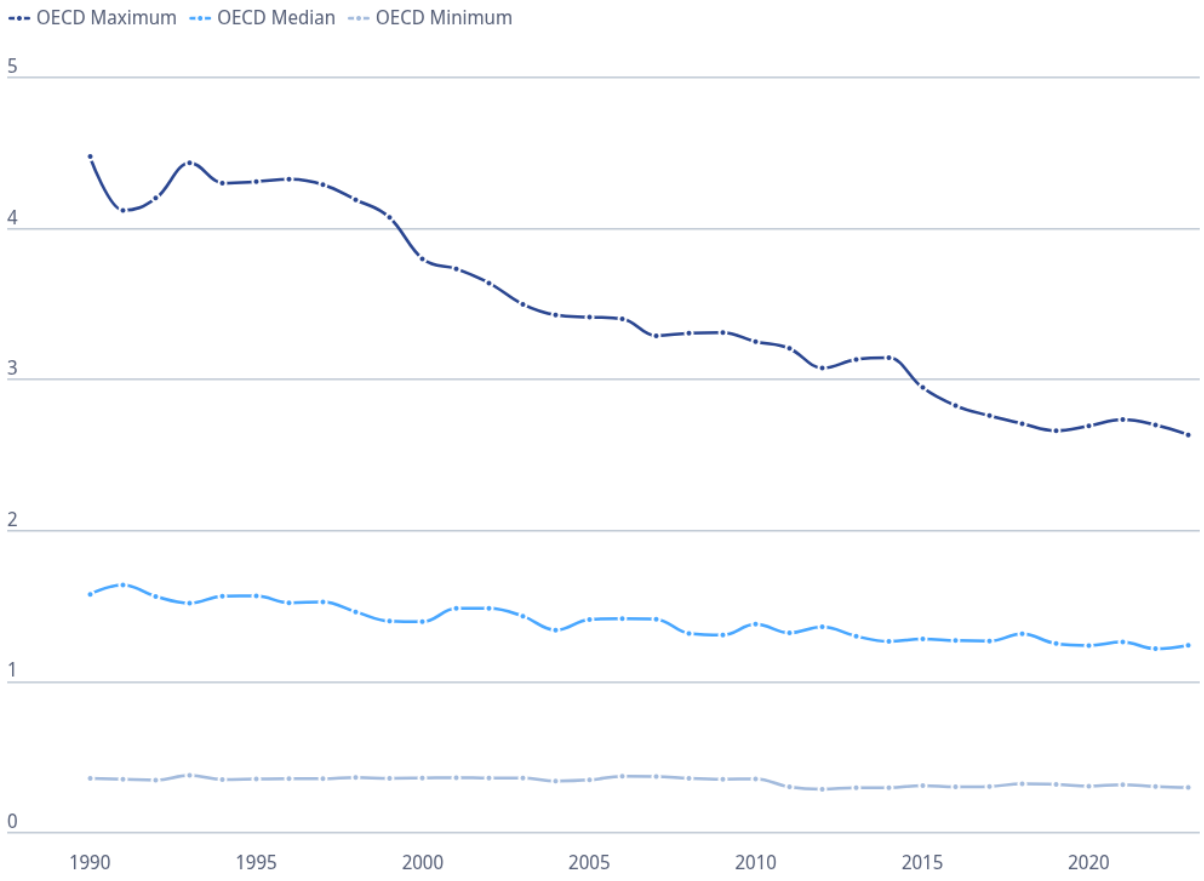
Note: The graph suggests that the overall level of agricultural GHG emissions and their composition remaining relatively constant over time.
Source: OECD agri-environmental indicators: Agricultural greenhouse gases emissions.

While the overall level of GHG emissions has remained stable over time, emission intensity of agriculture in the OECD has decreased. Figure 2.6 illustrates the evolution of GHG emissions intensity across OECD Member countries from 1990 to 2023, measured in kilograms of CO_2 equivalent (CO_2e) per unit of agricultural output (USD). Over this period, the OECD maximum emissions intensity steadily declined, decreasing from above 4 kg CO_2e/USD in 1990 to less than 2.6 kg CO_2e/USD, reflecting improvements in productivity and adoption of less GHG-emission intensive practices. The OECD median also declined by approximately 20%, from around 1.6 kg CO_2e/USD in the early 1990s to 1.25 kg CO_2e/USD in 2023. However, the rate of decline slowed over the recent period, from 1.2% per year in the 1990s to approximately 0.4% per year since the 2000s.

Despite these improvements, total emissions from the sector remained stable or increased slightly for most of the period. This suggests a situation of relative decoupling, where emissions grow at a slower rate than agricultural output. However, since 2018, emissions decreased alongside improvements in emission intensity. This suggests some degree of absolute decoupling — a reduction in total emissions — in recent years. Ensuring a continuing downward trend in the absolute level of GHG emissions, however, is likely to require more transformative changes, as efficiency gains alone have not been sufficient to compensate for the growth of agricultural production.

Figure 2.6. GHG emission intensities have declined over time in OECD Member countries

Kilogrammes of CO_2 equivalent/USD

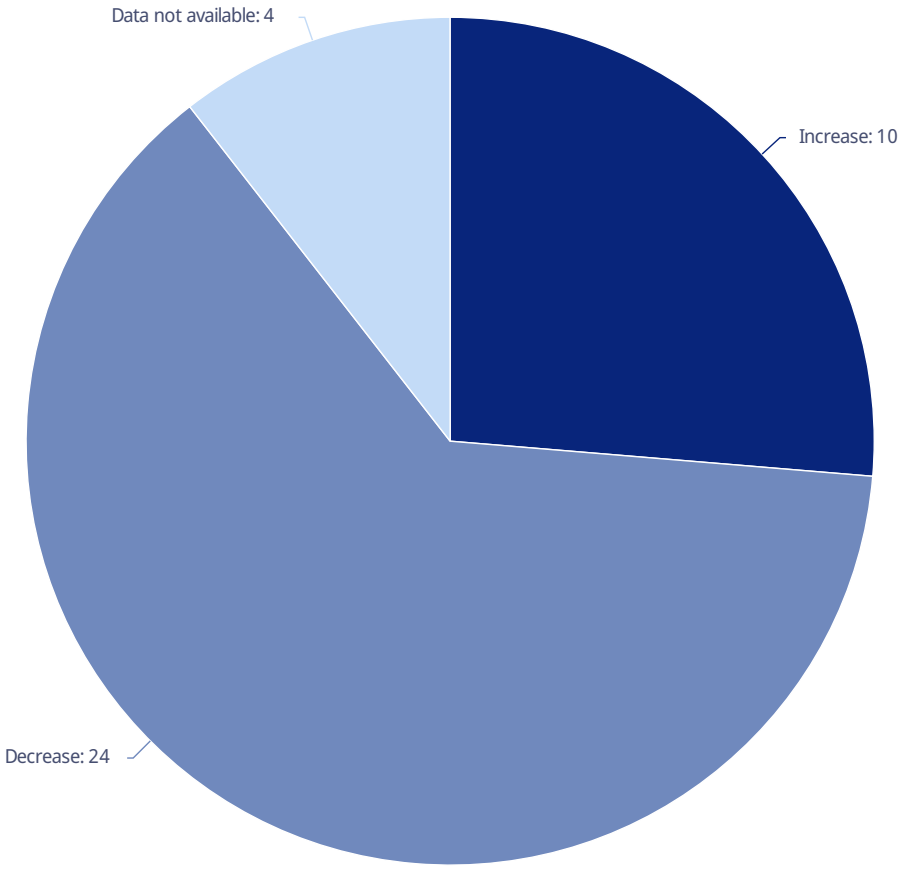


Note: The graph shows a decrease in both the maximum and median level GHG emission intensity, with the maximum GHG emission intensity decreasing faster than the median GHG emission intensity.
Source: based on OECD agri-environmental indicators: Agricultural greenhouse gases emissions and production value estimates from *FAOSTAT: Production: Crops and livestock products. [Accessed January 2026]*, https://www.fao.org/faostat/en/#data/QV.

Most OECD Member countries have also reduced their agricultural ammonia emissions. Across the 34 countries that have reported data for the 2013-2023 period, 24 recorded negative average growth rate in agricultural ammonia emissions for the reported years (Figure 2.7). This is important as manure from livestock production and the use of fertiliser can generate ammonia emissions that contribute to both air and water pollution.

Figure 2.7. Agricultural ammonia emissions decreased in most OECD countries

Number of OECD Member countries by change in emission trends, 2013-23



Note: Average annual % change, based on the period 2013-2023. Countries for which the data is not available include Colombia, Costa Rica, Japan, and New Zealand. The graph shows that 24 of the 34 countries that reported on agricultural ammonia emissions experienced a decreasing trend in agricultural ammonia emissions.
Source: OECD agri-environmental indicators: Agricultural ammonia emissions.

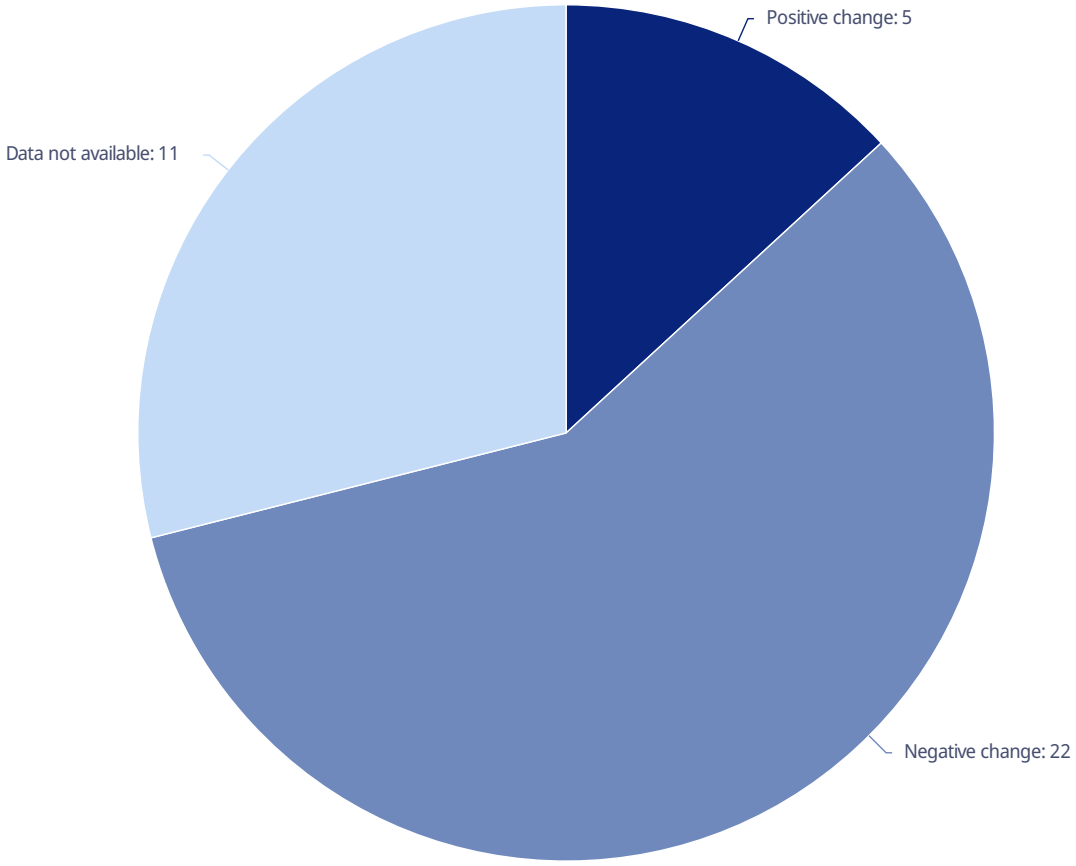
Farmland biodiversity

The impact of agriculture on biodiversity remains an important challenge. This is reflected by farmland bird populations, which serve as a key indicator of ecosystem health in a subset of OECD Member countries.

Figure 2.8 illustrates the evolution of the farmland birds index across OECD Member countries. Of the 27 countries within OECD Member countries reporting that indicator, 22 experienced a decline in farmland bird populations between 2013 and 2023. This drop signals ongoing pressures from agricultural intensification, habitat loss, or land use changes. In contrast, five countries reported a positive trend, suggesting localised improvements in conservation efforts or habitat management. The overall pattern underscores the continued challenges in maintaining farmland biodiversity and the need for targeted agri-environmental policies to support bird populations. Further efforts are underway to complement this indicator with the monitoring of farmland habitat biodiversity, which could be used in countries that do not report this indicator.

Figure 2.8. Declining farmland bird indices in most OECD Member countries

Number of OECD Member countries by change in trend, 2013 to 2023



Note: Average annual % change, based on the period 2013 to 2023. Countries for which the data is not available include Australia, Chile, Colombia, Costa Rica, Iceland, Israel, Japan, Korea, Mexico, New Zealand, and Türkiye. The graph shows that 22 of the 27 countries that reported data on the farmland bird index saw a negative change in the indicator.
Source: OECD agri-environmental indicators: Biodiversity.

The overall environmental performance of agriculture in OECD Member countries is a mix of progress and persistent challenges. While improvements in nutrient use efficiency and emissions intensity indicate advances in sustainable practices, stable overall GHG emissions and worsening biodiversity indicators in some countries remain pressing concerns. Trends in land use, input consumption, and air emissions highlight the complex interplay between agricultural production and environmental sustainability. The continued decline of farmland bird populations in some countries further underscores the need for targeted policies to mitigate biodiversity loss. Strengthening data-driven policy approaches will be essential to improve sustainable productivity growth, ensuring that future food systems are both resilient and sustainable.

3 About the OECD agri-environmental indicators database

The OECD agri-environmental indicators (AEI) database provides comprehensive data on the environmental performance of agriculture across OECD Member countries and selected partner countries. The database serves as a critical tool for policymakers, researchers, and stakeholders in assessing trends, identifying policy impacts, and supporting evidence-based decision making to enhance agricultural sustainability.

Scope and coverage

The AEI database covers a wide range of indicators that measure the environmental footprint of agricultural activities. These indicators are organised into thematic areas such as:

- Agricultural land area: Covers total agricultural land, cropland, pasture as well as organic farming and transgenic crop area.
- Nutrient balances: Tracks nitrogen and phosphorus balances, including detailed nutrient inputs such as fertilisers and manure as well as outputs such as crop harvest and forage.
- Water use and quality: Includes irrigation areas, agricultural water withdrawals, agricultural sources of nitrate and phosphate in surface water, and monitoring sites exceeding thresholds for nitrates and/or pesticides in surface and groundwater.
- Pesticide sales: Monitors sales of insecticides, herbicides, fungicides and other pesticides.
- Biodiversity: Reports trends in farmland and forest bird populations.
- Air quality: Reports agricultural ammonia emissions and greenhouse gas emissions, by gas and by source, from agriculture and Land Use, Land Use Change and Forestry.
- Soil erosion: Evaluates land degradation due to water and wind erosion.
- Energy use: Assesses direct on-farm energy consumption.

The database includes historical data spanning from 1985 to the most recent updates, covering all 38 OECD Member countries, 5 OECD non-Members that are EU member states, and 13 emerging economies including Argentina, Brazil, People's Republic of China, Egypt, India, Indonesia, Kazakhstan, Peru, the Philippines, the Russian Federation, South Africa, Ukraine and Viet Nam.

Data collection and methodology

Data for the AEI database is compiled through a combination of national statistical sources, international organisations, and OECD-specific surveys. The collection process is co-ordinated with Eurostat, FAOSTAT, the UNFCCC, and other relevant bodies to ensure consistency and comparability across countries.

- For EU countries, Norway, and Switzerland: Eurostat leads data collection efforts, with the OECD integrating the updates into the AEI database.
- For non-EU OECD Member countries: The OECD Secretariat distributes tailored questionnaires to collect missing or country-specific data.
- For non-OECD partner countries: Data is obtained from international databases, complemented by national reporting where available.

The methodologies used align with international standards, including the Eurostat/OECD Handbook on Nutrient Budgets and Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories.

Data accessibility and visualisation

The AEI database is hosted on the OECD Data Explorer platform, providing users with interactive access to individual datasets by thematic area. The platform allows users to explore trends, compare countries, and generate customised visualisations for policy analysis.

The AEI database can be accessed here:

- Agri-environmental indicators: all data
- Agricultural land area
- Ammonia emissions
- Agricultural greenhouse gases emissions
- Biodiversity
- Energy use
- Nutrients balances
- Pesticides use
- Soil erosion
- Water quality
- Water use

Additionally, the OECD AEI dashboard, published as a web-based tool, presents key agri-environmental indicators in an intuitive and accessible format. The dashboard is regularly updated, with the latest version including expanded country coverage and refined data integration.

The AEI dashboard is accessible at https://www.oecd.org/en/data/dashboards/measuring-the-environmental-performance-of-agriculture.html.

Future developments

The AEI database will continue to evolve, with enhancements in data granularity, methodological improvements, and expanded geographic coverage. By continuously refining the AEI database, the OECD aims to support informed policymaking and promote sustainable agricultural practices worldwide.

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Environmental Performance of Agriculture in OECD Countries 2026

Key Trends and Insights

The 2026 *OECD Agri-Environmental Indicators* (AEIs) present key trends in the environmental performance of agriculture across OECD Member countries over the period 1990–2023.

Overall, observed trends continue to be consistent with increasing efficiency of production, with decreasing input use and pollution per unit of agricultural output produced. However, progress continues to be uneven across indicators. Trends in input use show noticeable decreases in fertilizer consumption and an increase in on-farm energy consumption. The observed decreases in fertilizer consumption, in particular, contributed to the decreases observed in both the median and maximum nitrogen surplus per hectare since 2021.

Progress has also been uneven across countries. For instance, whilst agricultural ammonia emissions decreased in 24 OECD countries over the 2013-2023 period, it increased in 10 countries covered by the database.

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