Organisation for Economic Co-operation and Development

TAD/CA/APM/WP(2023)11/FINAL

Unclassified

English - Or. English

8 November 2023

TRADE AND AGRICULTURE DIRECTORATE
COMMITTEE FOR AGRICULTURE

## Working Party on Agricultural Policies and Markets

# Agricultural Policy Monitoring and Evaluation 2023

## Part I. Agricultural Policy and Support in Light of Climate Change Adaptation

Contact: Martin von Lampe (martin.vonlampe@oecd.org)

JT03531231

**Note by the Secretariat**

As agreed by the Working Party on Agricultural policies and Markets (APM) at its meeting in November 2022, the 2023 edition of the *Agricultural Policy Monitoring and Evaluation* will be published online (via iLibrary in web (HTML), PDF and ePUB formats). The online publication will contain the Executive Summary, Part I ("Agricultural Policy and Support in Light of Climate Change Adaptation") and Part II ("Developments in Agricultural Policy and Support by Country").

Reflecting the OECD's policy not to actively communicate on Russia while taking into account the importance of Russia's indicators of support for our Members, and in line with the 2022 edition, this report excludes most of the material on Russia. More specifically:

- No country chapter on Russia is provided.
- The Statistical Annex excludes tables on Russia. Data on Russia within cross-country tables in the Statistical Annex are replaced by ".." (two dots). For transparency, notes have been added to clarify that data aggregates for emerging economies and for all countries include data on Russia.
- Cross-country figures within Chapter 1 and Chapter 2 continue to show data for Russia in the context of data on other countries.
- The online database associated with this report will continue to include information on Russia
- A footnote is added to the beginning of Chapter 2. The footnote has the following text:
    - This report does not contain a country chapter on the Russian Federation, nor any tables with support indicators in the Statistical Annex. However, aggregate data for the 11 emerging economies and for all 54 countries covered in this report continue to include those for Russia.

This document contains *Part I. Agricultural Policy and Support in Light of Climate Change Adaptation* of the report entitled *Agricultural Policy Monitoring and Evaluation 2023*.

It is part of the following set of documents forming the 2023 report:

Executive Summary
[TAD/CA/APM/WP(2023)10/FINAL]

Part I: Agricultural Policy and Support in Light of Climate Change Adaptation
[TAD/CA/APM/WP(2023)11/FINAL]

Part II: Developments in Agricultural Policy and Support by Country
[TAD/CA/APM/WP(2023)12/FINAL]

Statistical Annex – Summary Tables of Estimation of Support
[TAD/CA/APM/WP(2023)13/FINAL]

The Executive Summary and Part I of the report were declassified by the Working Party on Agricultural Policies and Markets (APM) during its 90th session on 28-29 September 2023. Part II and the Statistical Annex were declassified under the responsibility of the Secretary-General of the OECD.

# Table of contents



## Tables



## Figures

## Boxes

# 1 Policies for agricultural adaptation to a changing climate

## Agriculture is increasingly experiencing the impacts of climate change

1. According to the Intergovernmental Panel on Climate Change (IPCC, 2023[1]), global temperatures averaged 1.1°C higher over the previous decade than preindustrial levels and are rising by 0.2 degrees per decade. Agriculture is among the sectors that is most exposed to the resulting changes in weather patterns and extreme events, such as drought and flooding. Adapting to this changing environment is imperative to tackle the triple challenge of providing food for a growing population, providing livelihoods all along the food value chain and increasing the sustainability of the agricultural sector.

### *Observed impacts of climate change on agriculture*

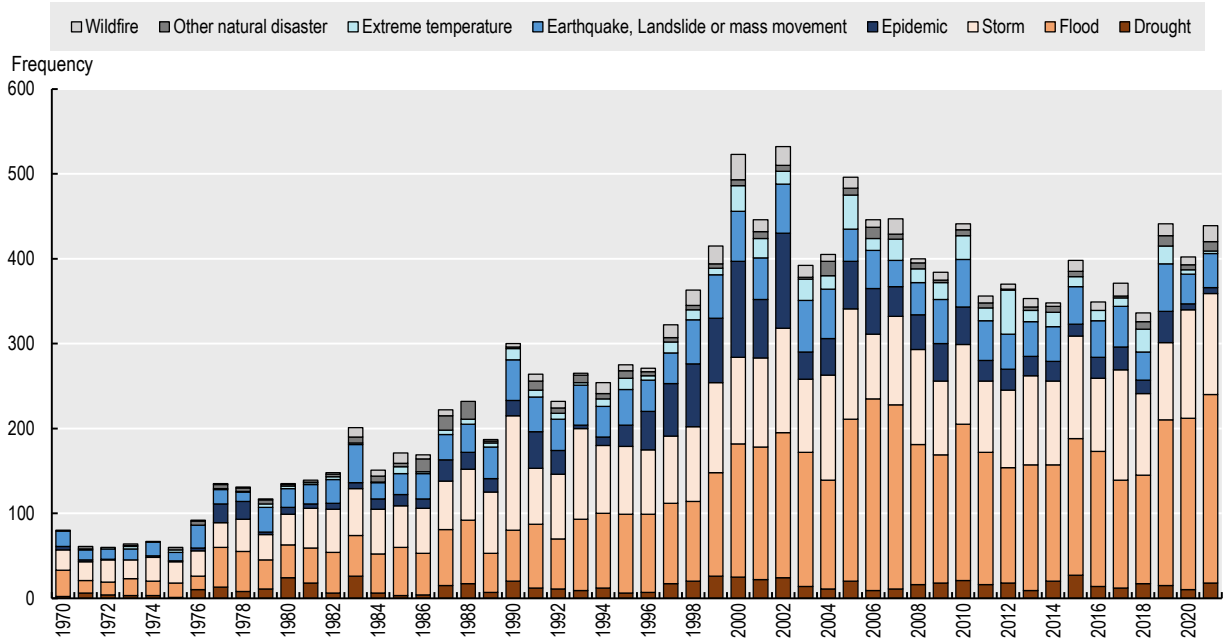
2. The effects of climate change have already had noticeable impacts on yield and the quality of agricultural products. Although yields of staple crops have risen by 2.5 to 3-fold since 1960 due to improved technology and management practices, global yields for crops such as maize and soybean are between 4% and 6% lower than they would have been in the absence of warming trends (IPCC, 2022[2]; Moore, 2020[3]; Iizumi et al., 2018[4]). Growth in the productivity of the sector has also significantly slowed: since 1961, climate change has reduced total factor productivity – a measure of how much output can be produced from a given quantity of inputs – by an estimated 21% (Ortiz-Bobea et al., 2021[5]).

3. Agriculture is also particularly vulnerable to weather extremes given its intrinsic dependence on the natural environment. Among the events most damaging to agricultural production, the frequency of droughts has roughly doubled (from 8 per year in 1971-80 compared to 16 per year in 2011-20), storms have more than tripled (from 29 to 103 per year), and floods have become nearly six times as prevalent (from 27 to 155 per year) (CRED, 2023[6]).[1] In total, the number of natural disasters globally has increased since the 1970s, from an average of 92 events per year between 1971-80 to 372 events per year between 2011-20 (Figure 1.1). The economic cost of disasters has risen from USD 1.63 trillion in 1980-99 to USD 2.97 trillion in 2000-19, driven by a combination of factors including increased frequency of some types of events, increased exposure, and increased vulnerability (CRED and UNDRR, 2020[7]).[2] While the economic losses are greatest in absolute terms in developed countries, the impacts of natural disasters are particularly pronounced in developing countries, where the most vulnerable are less able to cope with and recover from their impacts (OECD/FAO, 2021[8]).

[1] Part of this increase in event frequency may be attributed to better recording and reporting of disaster events since the 1980s. For more information, see CRED database documentation/publications.

[2] Expressed in 2019 US dollar terms.

## Figure 1.1. Frequency of reported natural disasters worldwide, 1970-2021




Note: Data include all reported natural disasters meeting at least one of the following criteria: 10 or more people dead; 100 or more people affected; a declaration of a state of emergency; a call for international assistance.
Source: EM-DAT, CRED / UCLouvain, Brussels, Belgium – www.emdat.be.

4. The risks to agriculture from climate change are considerable, but there are also potential positive effects in some regions, such as the geographic migration of agricultural production and resulting new opportunities.[3] For example, northern regions of Europe and North America are likely to become increasingly suitable for agricultural production as warmer temperatures extend the length of the growing season. Some regions may become more suitable for growing different types of crops. For example, some parts of Spain have reported becoming increasingly favourable for growing tropical fruits. Wine production has already extended northward, into the United Kingdom, for example, and into high-altitude growing regions, such as mountainous areas of Italy. Countries in northern latitudes anticipate improved growing conditions broadly for staple crops, such as sugar beets and maize. Even in countries with warmer climates where increased temperatures are expected to be detrimental, a decrease in frost is expected to benefit certain crops (Cobourn, 2023[9]).

5. Regionally, climate change has had varied effects on agriculture. Europe has faced earlier onset of growing seasons, as well as warming and precipitation changes (IPCC, 2022[10]). Estimates suggest that this positively affects maize and sugar beet yields, but negatively affects those of wheat and barley. Crop losses due to droughts and heat waves in Europe have tripled over the past five decades (Brás et al., 2021[11]). In recent years, cold winters, excessive autumn and spring rain, and summer droughts have combined to reduce yields from expected levels based on historical trends. Warmer temperatures have also led to poleward incursions of pests, diseases and invasive species. For example, the European corn borer has moved over 1 000 km northward, and the Diamondback moth has moved 800 km farther

[3] Increasing levels of carbon dioxide in the atmosphere have been shown to increase biomass growth and drought resistance. This has the potential to benefit crop yields and pasture growth. However, it could also increase the growth of weeds and invasive plant species. Increased carbon dioxide has also been associated with declining nutrient content in many crops which may offset some of the potential benefits of increased vegetation. The IPCC report finds that the positive impacts of climate are likely to be outweighed by the negatives in most regions (IPCC, 2022[10]).

northward in Scandinavia than its former range in Russia. These trends are expected to continue with the spread of the olive fly into northern areas of Italy (Skendžić et al., 2021[12]).

6. In Asia, climate change has been associated with changing monsoonal rains, extreme temperatures and oceanic oscillations (IPCC, 2022[13]; Thirumalai et al., 2017[14]). For agricultural production, climate change has delayed crop harvesting, reduced crop yields and quality, increased the incidence of pests and diseases, stunted livestock growth and increased animal mortality. Climate change influences the magnitude, timing and pattern of El Niño events, with adverse impacts on agricultural productivity and food security in middle- and lower-income countries in Southeast and South Asia (Cai et al., 2014[15]). This is particularly salient for rice production, which depends heavily on monsoon rainfall that declines with a stronger El Niño. According to a recent study, El Niño negatively affects 13.4% of global rice harvesting areas, including those located in India, Viet Nam, the Philippines, northeast People's Republic of China (hereafter "China"), and Japan (Cao et al., 2023[16]). Australasia has been affected by a number of drought, heat and frost events in recent decades that have had strongly negative effects on agriculture (IPCC, 2022[17]). Northern Australia's agricultural output losses are estimated to average 19% each year due to drought. In New Zealand, reduced winter chill has led to earlier harvesting of kiwifruits (Cobourn, 2023[9]).

7. North America has faced shifting growing seasons, as well as extreme heat and precipitation (IPCC, 2022[18]). The share of land area in the United States that experienced extreme precipitation has risen significantly since the 1980s which bring with it increased risk of surface runoff, soil erosion and loss of soil carbon (Gowda et al., 2018[19]). Agricultural total factor productivity growth across North America has generally declined as a direct result of climate change, with growing regions at lower latitudes more affected (Ortiz-Bobea et al., 2021[5]).

8. Most subregions of South America have experienced increases in the intensity and frequency of hot extremes and decreases in those of cold extremes (IPCC, 2022[20]). Drought duration and intensity is also increasing with events such as the "Central Chile Mega Drought", representing the longest drought in the region in one thousand years, and the multi-year drought in the Parana-La Plata Basin, the most severe since 1944. In South America overall, drought conditions reduced cereal harvests in 2020-2021 by 2.6% relative to the prior year (WMO, 2022[21]). Drought in the Mexican state of Zacatecas reduced the bean harvest in 2020 to its lowest level in 20 years. Central America and Northern South America have experienced increases in magnitude and frequency of extreme precipitation events as well as fire. In Argentina, fire destroyed critical pasture in the Gran Chaco region in 2022, decreasing pasture and livestock productivity.

### *Potential future impacts of climate change on agriculture*

9. Against this backdrop, the need for adaptation measures to limit and anticipate the effects of climate change is ever increasing. IPCC scenarios project rising temperatures, elevated levels of $CO_2$ and more frequent and extreme weather events (IPCC, 2023[1]). These effects will continue to challenge agriculture over the coming decades. For example, rising temperatures could reduce soil carbon and nitrogen levels, which in turn will reduce the yield potential of crops (IPCC, 2022[2]; Basso et al., 2018[22]). Further yield losses are expected to be realised from changes in insect pest populations and metabolic processes, which are sensitive to rising temperatures (Deutsch et al., 2018[23]; IPCC, 2022[2]). Higher temperatures will also increase the number of extreme stress days per year for livestock and could cause large production losses, particularly for beef and dairy (Nardone et al., 2006[24]; IPCC, 2022[2]). Increasing $CO_2$ levels are projected to affect the establishment, competition, distribution, and management of weeds, reducing herbicide efficacy (IPCC, 2022[2]). Increasing temperatures will reduce available water resources as a result of changes in river flows, basin storage and decreased rates of groundwater recharge. This will have negative consequences for the roughly 40% of global crops which are irrigated and could have even

more important impact in regions where agriculture faces increased competition from other sectors (OECD, 2017[25]).

10. The frequency and intensity of extreme events are also expected to worsen (IPCC, 2021[26]). More frequent and damaging extreme weather events such as droughts, storms and floods will lead to more crop failures, increase aflatoxin contamination, and affect the economic viability of grassland-based livestock production in some regions. Floods and storms may increase the spread of water-borne diseases, microorganisms and algae which negatively affect livestock health. They may also damage critical infrastructure required for the harvest, transport, and processing of farm produce. Although some tipping points have already been crossed, or are close to being crossed, warming beyond 1.5°C is more likely to induce climate tipping points, irreversibly affecting agriculture in certain regions. For instance, the slowdown of the Atlantic Meridional Overturning Circulation (AMOC), is predicted to lead to abrupt and irreversible impacts, including changes in monsoon systems and widespread drought with detrimental impacts for current agricultural systems (OECD, 2022[27]).

11. Along with risks to individual growers, there are also risks to global food systems. There is growing evidence that rising temperatures increase the probability of simultaneous yield losses in major food producing regions (IPCC, 2022[2]; Gaupp et al., 2019[28]; Cai et al., 2014[15]; Perry et al., 2017[29]). These concurrent yield loss events could lead to significant price spikes on international markets due to reduced global supplies. This will impair the ability of importing countries to secure supplies and could increase the risks to global food security.

12. The magnitude of the impacts of climate change on agriculture rise substantially with every additional degree of warming, stressing the importance of mitigation efforts to limit emissions (IPCC, 2022[2]). Adverse changes in precipitation, temperature and aridity could see as much as one third of current agricultural land become unsuitable for major crop or livestock production by the end of the century under the IPCC's most pessimistic emissions scenario (Kummu et al., 2021[30]; IPCC, 2022[31]). However, even under more optimistic climate change scenarios, large impacts on agricultural production are projected. For instance, under a low-emissions scenario, up to 8% of current agricultural land is expected to become unsuitable for major crop or livestock production by the end of the century.

## How can agriculture adapt to a changing climate?

13. The IPCC defines climate change adaptation in human systems as "the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities" (Ara Begum et al., 2022[32]). Adaptation in the agricultural sector may be autonomous or planned. *Autonomous adaptation* is defined as a process undertaken without explicit planning or guidance and in response to changes in the environment or market (Malik, Qin and Smith, 2010[33]). This form of adaptation often occurs when farmers adjust their practices in response to observed changes in climatic conditions, such as changing livestock or farm management practices, switching varieties or species, or altering the timing of planting, stocking and other key activities. In contrast, *planned adaptation* follows from an intentional and deliberative decision making process. Planned adaptations are often, but not exclusively, undertaken by groups of actors or public entities in anticipation of or in response to a change. Examples include investments in more resilient seeds or technologies to improve irrigation efficiency (Ignaciuk and Mason-D'Croz, 2014[34]).

14. Farmers are often best positioned to determine the adaptation measures needed to mitigate climate risk on their farms, provided that they have sufficient resources, access to knowledge, and financial and technical capacity to adapt (Wreford, Ignaciuk and Gruère, 2017[35]). In many cases, on-farm adaptation occurs without the need for policy interventions, or in spite of policies that hinder adaptation, as farmers react to observed or projected changes in climatic conditions. In these instances, the benefits of

adaptation are derived locally and directly captured by farmers. This means that self-interest is a sufficient incentive for the adaptation action to occur (Ignaciuk, 2015[36]).

15. However, even when there is a private benefit, farmers may choose not to engage in climate adaptation actions due to information gaps, financial constraints or misaligned incentives (Wreford, Ignaciuk and Gruère, 2017[35]). In other instances, climate adaptation cannot be adequately implemented on farm due to market failures, externalities and information asymmetries or if more radical transformation is required (Ignaciuk, 2015[36]). The IPCC (2022[2]) predicts that because of limited adaptive capacities and non-climatic compounding drivers of food insecurity, autonomous adaptation will be insufficient to meet the UN Sustainable Development Goal 2 of ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture. Thus, more pro-active planned adaptation, supported by public policy, will be essential.

### *The role for policy in climate change adaptation: Enhancing resilience*

16. Given that farmers undertake their decisions within the context of social and economic institutions that constrain, or facilitate, their ability to adapt, there is a clear role for public policy to play in creating an enabling environment. The types of adaptation actions that may be justified for public interventions from an economic perspective include, for example, actions that generate or transfer knowledge, correct for externalities, allow for sharing extreme risk, and correct for institutional, regulatory or financial barriers to adaptation (Ignaciuk, 2015[36]).

17. Planning adaptation strategies comes with a great deal of uncertainty and adaptation strategies can fail. In some circumstances strategies may actually increase vulnerability to climate change, a phenomenon known as maladaptation. Maladaptation refers to actions or inactions which lead to increased risk of adverse outcomes, increased vulnerability, or diminished welfare as a result of climate change, now or in the future (IPCC, 2022[2]). For example, subsidies for water efficient irrigation measures may lead to greater extraction of groundwater and planting of more water-intensive crops, increasing the likelihood and magnitude of losses due to future drought (OECD, 2017, p. 166[25]). Government support to specific practices or technologies that do not fully respond to local needs can also generate harmful incentives or simply reinforce existing production profiles and techniques, undermining the incentives for autonomous adaptation. Even well-intentioned adaptation policies implemented today can turn out to be a driver of maladaptation in the future because of significant uncertainty in climate projections. To minimise the risk of maladaptation, “no regret” policies should be prioritised, alongside adaptation policies that are flexible and suitably robust across a range of climate scenario outcomes with a view to improving long-term productivity (Ignaciuk, 2015[36]; Antón et al., 2013[37]).

18. It is difficult for a policymaker to determine the specific adaptation actions suited for local conditions, thus is generally accepted that policy should focus on developing the capacity of a system to adapt, rather than prioritising specific adaptation strategies (OECD, 2014[38]). As a result, adaptation policies often focus on increasing resilience, defined as “the ability to prepare and plan for, absorb, recover from, and more successfully adapt and transform in response to adverse events” (OECD, 2020[39]). This definition incorporates preparation and three core capacities – absorptive, adaptive, and transformative capacity – which correspond to action over the short, medium, and long run, respectively.

19. Following OECD (2020[39]), absorptive capacity refers to the ability of a system to cope with the impacts of a shock in the short run, e.g. by establishing early warning systems that allow farmers to adjust their operations, or crop insurance schemes that compensate farmers for damages. Adaptive capacity is the ability of a system to adjust in the medium-term through incremental changes in behaviour, but without structural change. Examples of such incremental changes in behaviour include changes in farm operations, adjustments to planting dates or crop mix, or changing irrigation systems. Transformative capacity corresponds to the ability of a system to undergo structural change, such as moving crops into

new production regions, developing new infrastructure, creating new market opportunities, or leaving farming altogether which could be supported by compensation for exiting the sector.[4]

20. It is essential that policy for climate change adaptation supports each of these three capacities in order to facilitate effective adaptation and to avoid maladaptive outcomes in the long run. Actions that focus only on countering short-term impacts of climate change can become maladaptive over time if the situation does not improve (Lankoski, Ignaciuk and Jésus, 2018[40]; Schipper, 2020[41]). For example, *ex-post* disaster compensation may support farmers through a season of drought, but increasing instances of drought attributable to climate change may mean that better tools to assist farmers plan for and manage risks or potentially even more transformative change may be necessary in the long-term. Similarly, focusing on medium-run capacity may supplant investments in transformative capacity that are necessary in the long run. For example, investing in the development of new cultivars may delay the need to shift to a new crop or new producing region, even if structural change will be necessary in the long run.

21. While agricultural and climate policies and investments are the main vehicles to progress towards enhanced resilience capacity for agriculture, water policy can also play an important role to foster climate change adaptation particular in regions subject to high water risks (Box 1.1).

### Box 1.1. Water policies and climate change adaptation

Climate change is exacerbating water risks for agriculture, including via prolonged and more intense droughts, extreme flooding, irregular precipitation or sea level rise. Managing these risks, which are often local, complex and dynamic, require a multi-layer approach, encompassing changes at the farm level, water basin level, and national level.

Water policies are essential as a complement to agriculture policies and investments for climate resilient agriculture production systems. They include, in particular, a combination of regulatory economic and collective approaches to manage groundwater sustainably, as aquifers remain the largest water reservoir globally and a central resource for irrigated agriculture in key production regions. Water policies also include water allocation regimes that can balance water demand and supply depending on changes in precipitations.

Earlier OECD work found that future water risks for agriculture are concentrated in particular locations in each country, continent and globally (OECD, 2017[25]). These “water risk hotspots” therefore deserve more policy attention and efforts, as they are particularly likely to affect production, and may generate significant market and food security impacts.

Source: OECD (2015[42]; 2016[43]; 2017[25]; 2020[44]).

### *The importance of linking adaptation and mitigation measures*

22. Both adaptation and mitigation actions are critical in the face of a worsening climate and there are important synergies to be realised from integrated responses that encompass both (Bezner Kerr et al., 2022[45]). Mitigation refers to actions or activities that limit greenhouse gas (GHG) emissions from entering the atmosphere or reduce their levels in the atmosphere (e.g. through carbon sinks) (Grubb et al., 2022[46]). Even with progress on mitigation, some climate impacts are already unavoidable and adaptation efforts will be necessary to address further losses and damages. In this context, an integrated approach to climate policy that includes both mitigation and adaptation components is necessary to develop long-term

[4] The speed of transformation may vary, but the underlying shift in the structure of the industry typically corresponds to the economic notion of the long-run in which fixed costs become variable.

resilience. To transition towards net-zero emissions, leveraging synergies between the two is essential to generating effective and efficient policies (OECD, 2023[47]).

23. Adaptation and mitigation actions often have different drivers, benefits and barriers to adoption (Wreford, Ignaciuk and Gruère, 2017[35]). In particular, adaptation actions can generate direct benefits for farmers and local communities, whereas mitigation actions tend to result in public rather than private benefits. As a result, policy intervention is often required to incentivise mitigation actions. The use of incentives such as well-designed payments for environmental and climate services, land retirement policies, afforestation and R&D incentives are examples of policies that may encourage emissions reductions, although care must be taken in their design and implementation (OECD, 2022[48]). Reform of agricultural support policies, in particular the phase out of market price support and payments with strong potential to harm the environment and to distort markets and trade, is among the priority actions for climate change mitigation (OECD, 2022[48]).

24. Although adaptation actions may sometimes be socially optimal, there are many cases in which adaptation fails due to a lack of financial, knowledge or technical resources. In these cases, the role for policy predominantly lies in the provision of information, access to credit and engagement (Wreford, Ignaciuk and Gruère, 2017[35]). In other cases where structural changes are required, or where there are considerable public benefits, there is a clear economic rationale for policy intervention. Adaptation policies should consider long-term risks, but factor in future uncertainty and build in flexibility so that well-intentioned policies do not lead to maladaptation (Ignaciuk, 2015[36]). Policy coherence is imperative along with monitoring the effectiveness of policy approaches.

25. Although the role of policy in mitigation and adaptation differs, it is often the case that a single policy instrument simultaneously contributes to both objectives, providing mitigation-adaptation co-benefits (Bustamante et al., 2014[49]). For example, measures to increase soil organic carbon may contribute to both mitigation and to improving the yields of crops and pasture.

26. In practice, policies for mitigation and adaptation can be misaligned with each other, and with other objectives (Lankoski, Ignaciuk and Jésus, 2018[40]). For instance, Lankoski, Ignaciuk and Jésus (2018[40]) found that a green set-aside payment may have positive effects on productivity and mitigation but negative effects on adaptation. The impacts of any policy will be highly context-specific. Countries will thus need to make specific assessments of likely policy effects on the three objectives and adopt a holistic approach in order to tackle the triple challenge.

## An evolving focus on agricultural adaptation and resilience: Analysis of UNFCCC reports

27. What importance do governments convey to agriculture in their overall adaptation strategies? Following Cobourn (2023[9]) and the related literature, international reporting documents submitted by each of the countries included in this report (henceforth referred to as the “M&E countries”) to the United Nations Framework Convention on Climate Change (UNFCCC) yield some insight into how the attention paid by governments to climate change adaptation in agriculture has evolved over nearly four decades, from the mid-1990s through early 2023.[5] These include periodic national communications submitted by Parties to

[5] This analysis builds on OECD (2022[88]), Gagnon-Lebrun and Agrawala (2006[70]), Mullan et al. (2013[64]), Pauw et al. (2019[50]), and Crumpler et al. (2021[89]) to analyse the text of documents submitted to the UNFCCC by each of the M&E countries. Details of the analysis are presented in the chapter Annex.

the Convention, as well as reporting documents under the Paris Agreement, namely required nationally determined contributions (NDCs) and optional adaptation communications.[6]

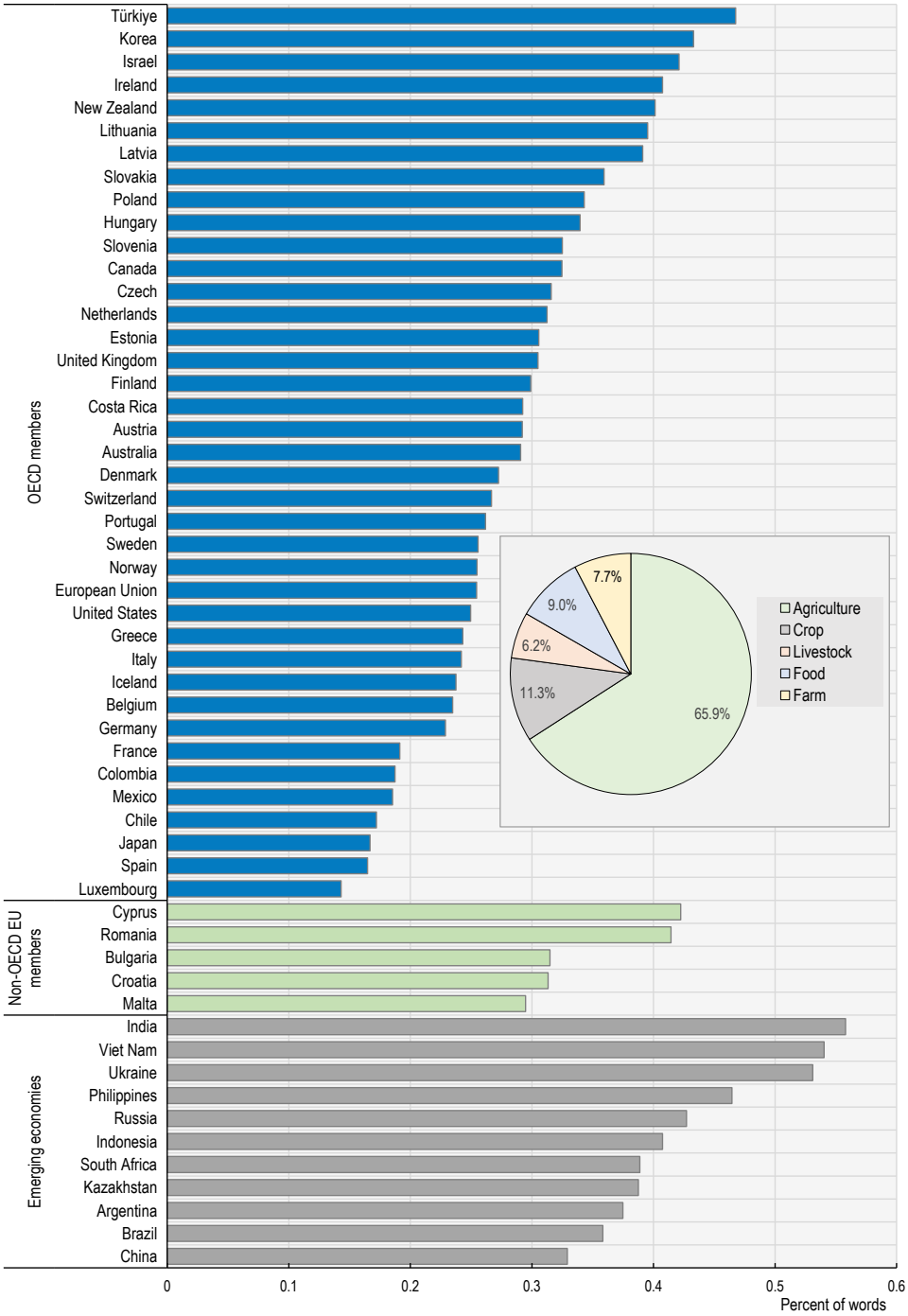
28. All of the documents submitted to the UNFCCC refer to agriculture, though the national communications are the most comprehensive source of information spanning the M&E countries in terms of frequency with which agriculture is discussed (Figures 1.2 and 1.3).[7] Adaptation communications also address issues related to agriculture but have been submitted by only 17 of the 54 M&E countries to date. A keyword frequency analysis was conducted of all reporting documents (see the chapter Annex for more details), which showed that there are large differences between countries in terms of how extensively agriculture is discussed. Among OECD members, for example, words related to agriculture appear 3.3 times more often in the national communications of Türkiye than of Luxembourg. In general, the national communications of emerging economies more heavily emphasise agriculture than those of OECD countries, with a mean frequency of references that is 1.5 times greater. This difference may be driven by the relatively greater importance of agriculture to their overall economies or it may capture differences in predicted climate risks arising from changing growing conditions and extreme events. However, it may also be driven by reporting differences that arise because emerging economies rely on UNFCCC documents to justify their needs for adaptation financing (Pauw, Mbeva and van Asselt, 2019[50]).

29. Since the mid-1990s, the UNFCCC documents have grown in length nearly four-fold as reporting on climate change, including adaptation, has become more developed. The frequency of references to agriculture within these documents has been relatively constant across reporting rounds for OECD members and for the emerging economies, but the total amount of text relevant to agriculture has increased over time, indicating an increased depth of reporting on the sector (Annex Figure 1.A.1).

[6] As discussed in the Annex, the national communications contain a chapter that focuses on vulnerabilities and adaptation. The NDCs for Annex I parties are largely focused on mitigation, whereas those of Non-Annex I parties contain a wealth of information on adaptation. The adaptation communications are solely focused on adaptation.

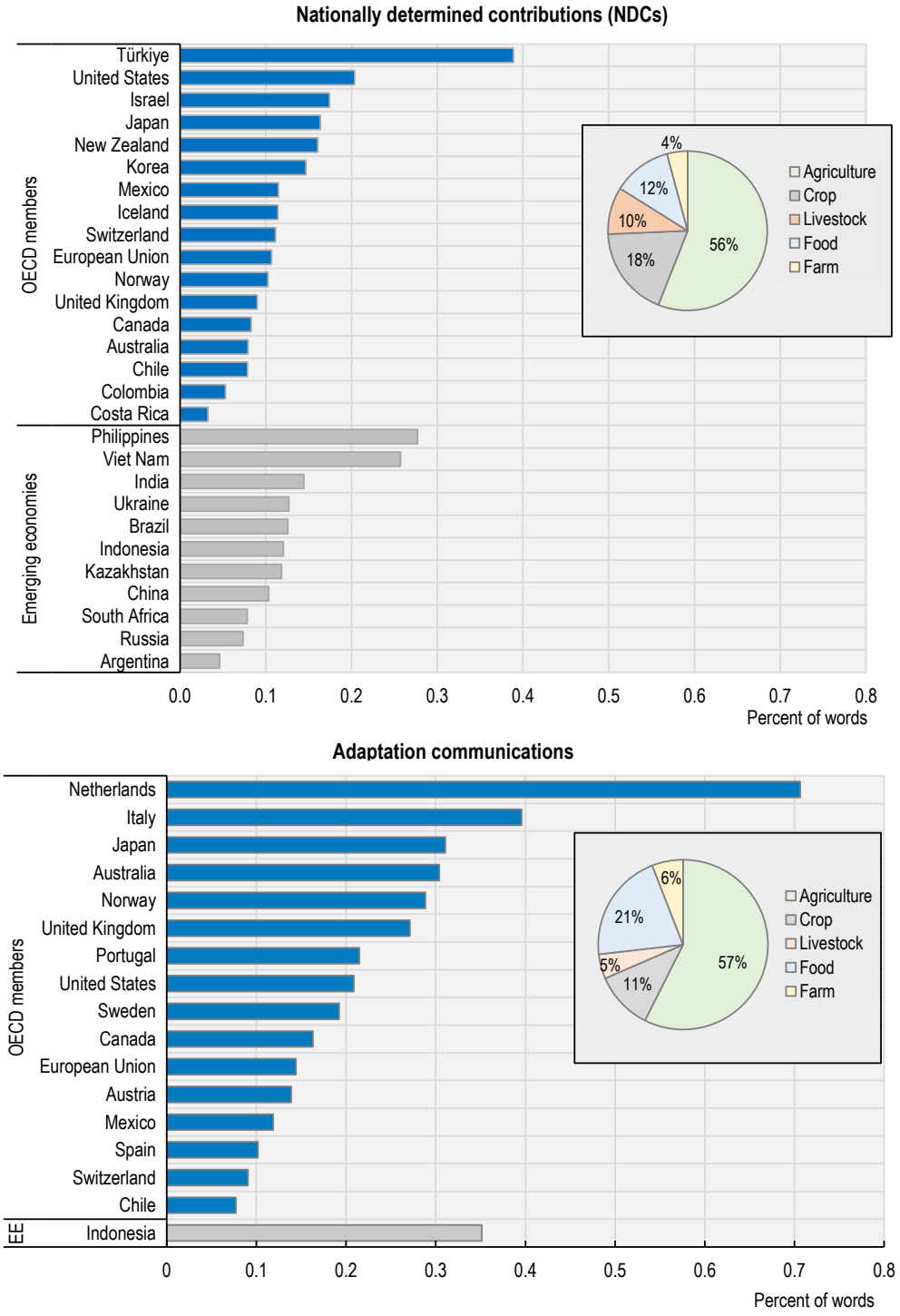
[7] These documents cover many sectors and topics, and as a result do not present a comprehensive catalogue of adaptation activities undertaken by the M&E countries.

## Figure 1.2. Frequency of reference to agricultural keywords, UNFCCC national communications




Note: Pie chart represents the proportion of usage of each agricultural keyword within all national communications reviewed (for all M&E countries).
*Note by Türkiye*: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye shall preserve its position concerning the "Cyprus issue".
*Note by all the European Union Member States of the OECD and the European Union*: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.
Source: Author's analysis based on documents submitted to the UNFCCC.

## Figure 1.3. Frequency of reference to agricultural keywords, Paris Agreement documents



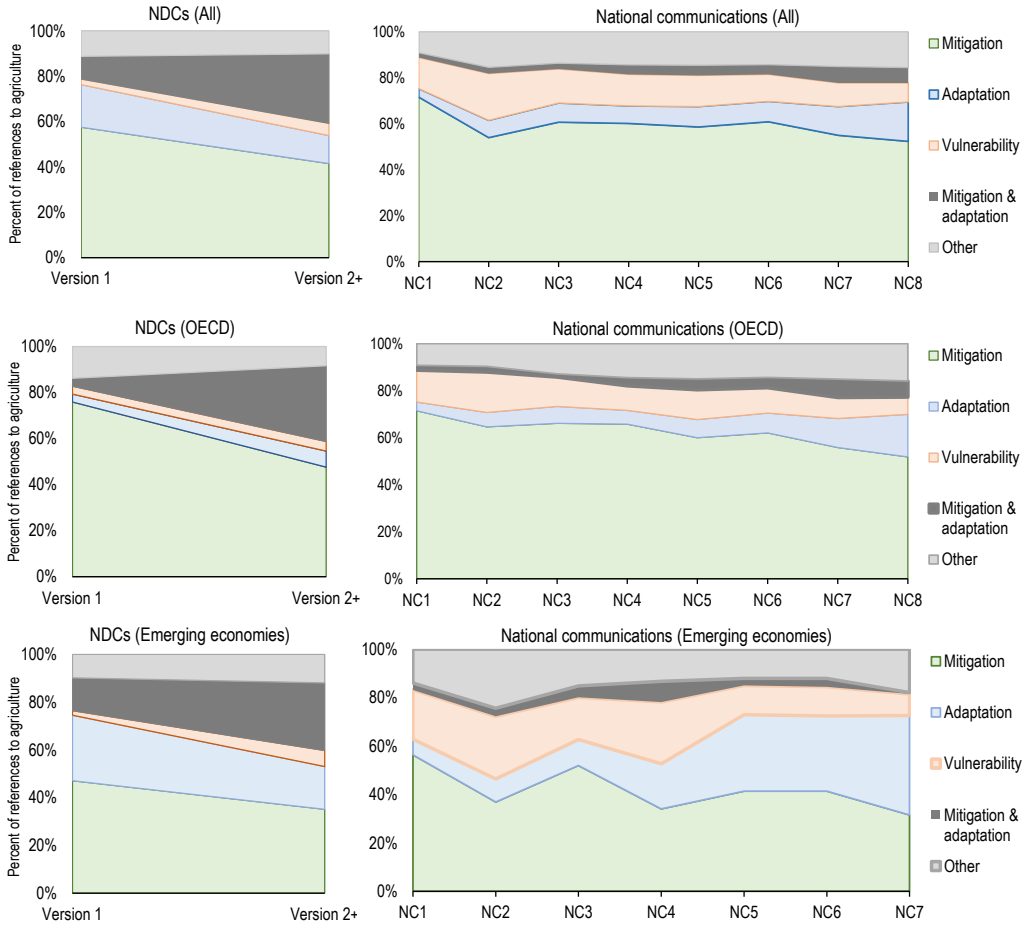

Note: EE = Emerging economies. Pie charts represent the proportion of usage of each agricultural keyword within all NDCs and adaptation communications reviewed (for all M&E countries).
Source: Author's analysis based on documents submitted to the UNFCCC.

30. References to agriculture discuss different topics, including the role of agriculture in mitigation, agricultural vulnerabilities to climate change, and adaptation of agricultural and food systems. The vast majority of the discussion of agriculture in the UNFCCC documents focuses on mitigation, though OECD

countries emphasise mitigation more than the emerging economies, which focus more heavily on identifying agricultural vulnerabilities and on adaptation (Figure 1.4).

31. Over time, agricultural mitigation, in terms of textual references, has declined in relative importance, falling by 27% among OECD countries between the mid-1990s and 2023. Discussion has also focused less on identifying climate change vulnerabilities and more on adaptation, a trend that is particularly evident among emerging economies. Between the first and most recent reporting round for OECD countries, references to agricultural adaptation increased by a factor of 4.9, compared to 6.3 for emerging economies. Notably, discussion of the mitigation-adaptation co-benefits associated with agriculture has increased substantially in the nationally determined contributions of all M&E countries, though the growth in discussion of these co-benefits has been most pronounced among OECD countries.

## Figure 1.4. Contextual topic areas within which agriculture key words appear in UNFCCC reports




Note: NC1 to NC8 refer to reporting rounds for the national communications to the UNFCCC. For original signatories, NC1 was submitted starting in 1994, with successive reporting rounds approximately every 5 years. For Non-Annex I Parties, NC1 was submitted within 5 years of signing the Convention, with dates that vary.
Source: Analysis based on national communications (NC) to the UNFCCC and nationally determined contributions (NDCs) and adaptation communications under the Paris Agreement.

## Agricultural climate change adaptation programmes and activities

32. Governments of M&E countries have undertaken a wide range of climate change adaptation programmes and activities that may not all be described in the UNFCCC reports. This section analyses these efforts, based on reporting from the M&E countries, as described in the country chapters.

33. More specifically, this section assesses and classifies adaptation responses using the following four categories: (1) infrastructure and technological measures (INT); (2) behavioural and cultural measures (BHC); (3) ecosystem or nature-based measures (ECO); and (4) social, economic, and institutional measures (SEI). These categories are based on the classification scheme of the Global Adaptation Mapping Initiative (GAMI), used in the 6th IPCC report to link agricultural adaptation options with the Sustainable Development Goals (SDGs) (Bezner Kerr et al., 2022[45]).[8] The sub-categories presented in Table 1.1 were developed by the Secretariat to reflect the range of programmes and activities implemented and reported by the M&E countries (see the chapter Annex for more details).

34. In total, 599 adaptation programmes and activities across the M&E countries were identified by the Secretariat based on each country's self-reported activities. The majority fall into the SEI category, which account for 60.6% (363) of the total, shown in blue in Figure 1.5. Following that is ECO at 18.7% (112) shown in green; INT at 11.4% (68) shown in grey; and BHC at 9.3% (56) shown in orange. When reported programmes or activities included components or elements spanning multiple categories or sub-categories, they were included in each of them for completeness.[9] The following sub-sections discuss the programmes and activities in each category, with examples from member countries included for illustrative purposes.

### Table 1.1. Categories and sub-categories for adaptation actions and programmes

Categories based on Global Adaptation Mapping Initiative (GAMI), with sub-categories modified to capture the range of activities reported by M&E countries

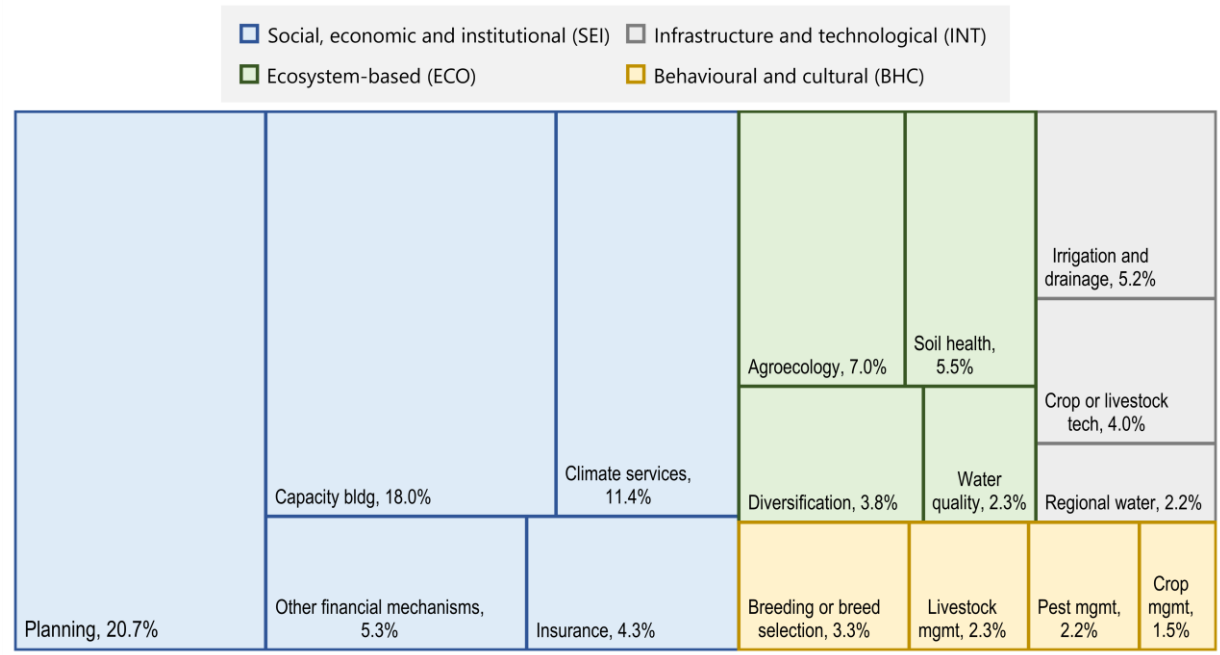
| Category and sub-category | Description |
|---|---|
| Infrastructure and technological approaches (INT) | Enabling, implementing or undertaking technological innovation or infrastructure development |
| Irrigation and drainage | Investing in irrigation and drainage infrastructure on farm; e.g. installation of irrigation or drainage technology, development of individual water storage systems |
| Regional water infrastructure | Investing in water infrastructure at a regional level (off farm); e.g. installation of flood control technology, construction of reservoirs or canals |
| Crop or livestock technology | Investing in technologies for crop or livestock production; e.g. installation of canopies to control the growing climate for tree crops, sprinkler or ventilation systems to prevent livestock heat stress |
| Behavioural and cultural approaches (BHC) | Enabling changes in farmer behaviour |
| Crop management and operations | Altering crop management practices; e.g. adjusting planting dates, changes in growing location |
| Livestock management and operations | Altering livestock management practices; e.g. adjustments in animal husbandry or manure management. |
| Pest, disease and invasive species control | Managing pest, disease and invasive species problems in crop or livestock production; e.g. invasive species inspection programmes, collaborative efforts to slow spread |
| Crop or livestock breeding or breed selection | Supporting the selection of cultivars or breeds or developing new cultivars or breeds; e.g. breeding programmes, adoption of climate-adapted cultivars or breeds |

[8] The GAMI classification encompasses both autonomous and planned adaptation measures. As such, not all of the categories are areas that are appropriate or desirable for government policy intervention, nor are they all applicable to food and agriculture.

[9] Cross-listed activities are counted in each category, meaning that the number of actions and programmes summarised herein exceeds the number reported.

| Category and sub-category | Description |
|---|---|
| Ecosystem-based approaches (ECO) | Enhancing, protecting or promoting ecosystem services |
| Water quality | Efforts to limit soil erosion and nutrient runoff into waterways; e.g. riparian buffers, use of catch crops, fertilisation plans and nutrient balances |
| Soil health | Efforts to improve soil health, reclaim land or limit desertification; e.g. conservation tillage, soil testing, humus management |
| Diversification | Efforts to promote diversity, e.g. crop rotations, preservation of agrobiodiversity, agroforestry |
| Agroecology | Efforts to advance agro-ecological systems, e.g. organic production, land conservation, land retirement |
| Social, economic and institutional approaches (SEI) | Enhancing the capacities of individuals, groups and institutions to respond to climate change |
| Climate services | Providing information to support improved decision making; e.g. early warning systems, decision support tools, the provision of forecasts or climate scenarios, extension and outreach |
| Insurance | Creating or expanding insurance mechanisms to accommodate climate risks |
| Other financial mechanisms | Creating other non-insurance financial instruments; e.g. disaster recovery funding, payments for environmental services; this category also includes funding programmes that support a diversity of activities that potentially span other categories and subcategories (e.g. funding instruments awarded by a national to regional or local governments to support various adaptation activities |
| Capacity building | Investing in the capacity of individuals or institutions to adapt; e.g. research or research funding, the development of partnerships, community based adaptation, changes in legal or governance structures |
| Planning | Developing adaptation strategies or plans; e.g. local, regional, national or sectoral adaptation plans, disaster or contingency planning |

## Figure 1.5. Agricultural adaptation actions and programmes by category and sub-category




Note: Size of rectangle is proportional to the share of the total number of adaptation actions and programmes identified by the Secretariat.

### *Social, economic, and institutional measures*

35. The majority of activities reported by national governments fall within the realm of *social, economic and institutional (SEI)* approaches. This is not surprising as the category covers the key functions of

governments, including developing strategic planning documents; the development of capacity via governance changes, education and outreach; and the provision of information to support decision making. Also included in this category is the provision of insurance programmes targeted to climate risks and the establishment of other financial mechanisms, such as *ex post* disaster relief.

36. Within the SEI category, activities predominantly fall into the categories of *planning* (20.7% of all activities reported), *capacity building* (18.0%) and *climate services* (11.4%). Over three-quarters of the countries covered in this monitoring report reported 124 planning activities relevant to agricultural adaptation. These include general, high-level planning documents that address agriculture, such as **Argentina's** National Plan for Adaptation and Mitigation to Climate Change by 2030, the **European Union's** New Strategy on Adaptation to Climate Change: Forging a Climate-Resilient Europe, and the publication by the **New Zealand** Government in August 2022 of its first National Adaptation Plan, which sets out actions to address the priority and significant risks the country faces from the impacts of climate change.[10] A number of countries report regional-scale planning efforts, such as **Australia's** Regional Drought Resilience Planning Program, which supports the development of community led resilience plans, and **Greece's** efforts to incorporate consideration of climate change adaptation issues into regions' rural development programmes.

37. *Planning* also includes region-, sector-, resource- and event-specific guidance documents. Sector-specific plans include **Brazil's** Agricultural Policy for Climate Adaptation and Low Carbon Emissions (ABC+ Plan), the **Japan** Ministry of Agriculture, Forests and Fisheries (MAFF) Climate Change Adaptation Plan and **Germany's** Agenda for Climate-change Adaptation in Agriculture, Forestry, Fisheries and Aquaculture. Resource-specific guidance covers soil health, e.g. **Mexico's** National Soil Strategy for Sustainable Agriculture (ENASAS), water resources, e.g. **Hungary's** Watershed Management Plan, and the development of organic agriculture, e.g. **Croatia's** National Action Plan for the Development of Organic Agriculture for the period 2023-2030.[11] Event specific guidance includes the **Netherlands'** Action Plan for Heat Stress in Livestock, **Poland's** Drought Counteraction Plan and **France's** Wildfire Programme.

38. Efforts to track adaptation progress or plan implementation are also included in the *planning* category, although there are relatively few examples. One is **Ireland's** Adaptation Scorecard, which assesses adaptation progress across sectors overall and with respect to three criteria: 1) risk, prioritisation and adaptive capacity; 2) resourcing and mainstreaming; and 3) governance, co-ordination and cross-cutting aspects. **France** also conducted an evaluation of the implementation of its National Climate Change Adaptation Plan for the period 2011-2015, finding that the five actions related to agriculture were finished or in process at the time of the assessment.[12]

39. *Capacity building*, cited in 108 activities, includes a broad range of investments and measures that strengthen the capacity of farmers or institutions to adapt to climate change. Investments in agricultural research and development (R&D) and knowledge transfer are critical for driving productivity improvements and supporting the development of new cultivars, livestock breeds, and production technologies. Community-based adaptation strategies involve building adaptive capacity through locally driven and place-based approaches. Examples include community seed, feed or fodder banks, and community forest management. Leveraging indigenous and local knowledge through participatory plant breeding can support adaptation by facilitating interactions between indigenous knowledge systems and scientific

[10] The European Climate Adaptation Platform Climate-ADAPT supports sharing of information on climate change adaptation strategies across Europe (https://climate-adapt.eea.europa.eu/).

[11] The evidence on organic production systems with respect to adaptation and mitigation is mixed. These systems certainly reduce the use of inputs and evidence suggests that they increase soil carbon sequestration, but they also generate lower yields, potentially requiring an increase in production elsewhere. For example, Smith et al. (2019[91]) find that at a national scale, a shift to organic farming increases net emissions.

[12] https://igedd.documentation.developpement-durable.gouv.fr/documents/Affaires-0009000/010178-01_rapport.pdf

research. In livestock systems, pastoralists' local knowledge can complement scientific research and help to inform decision making.

40. The majority of activities in *capacity building* reported target investments in research or research funding programmes, such as **Israel's** Center for Agricultural Adaptation, which supports research on field crops and vegetables, fruit trees, plant protection and animal sciences, and activities related to extension and outreach, such as **India's** National Mission on Agricultural Extension and Technology. **New Zealand's** new Centre for Climate Action on Agricultural Emissions was also established to achieve the objectives of accelerating the development of high-impact technologies and practices to reduce greenhouse gas emissions.[13] This category also includes developing partnerships and promoting knowledge sharing, such as **Belgium's** Flemish Resilience Plan, which allocates EUR 2.8 million (USD 2.9 million) to improve co-operation between the agricultural sector and entrepreneurship, digitalisation and knowledge sharing. Programmes in this category also support extension and outreach, such as the **Chile** Conscious Origin (*Chile Origen Consciente*) programme, established in 2022, to provide a framework for farmers to incorporate sustainability standards in their operations and to verify compliance through self-assessments and independent audits. Several countries also reported participating in international efforts on R&D and knowledge sharing. One such example is the Global Research Alliance on Agricultural Greenhouse Gases, launched in 2009, which brings together leading scientists, researchers and policymakers from over 60 countries to share knowledge and improve agricultural productivity while reducing greenhouse gas emissions. Another example is the OECD's Co-operative Research Programme, a programme joined by **Israel** in 2022, which contributes to climate change adaptation (Box 1.2).

### Box 1.2. The OECD's Co-operative Research Programme: Sustainable Agricultural and Food Systems

The OECD's Co-operative Research Programme: Sustainable Agricultural and Food Systems (CRP) aims to generate knowledge sharing and provide relevant scientific information and advice for policy decisions related to the sustainable use of natural resources in agriculture, food, fisheries and forests. To do so, it focuses on two activities: first, through its fellowships, the CRP funds short-term research projects for individual scientists in other CRP member countries. Second, the CRP sponsors international conferences and workshops. During 2010-2023, a total of 375 fellowships and 112 conference or workshop sponsorships were granted.

Climate change is one of the priority areas of research for the CRP and it has funded many activities related to the issue. These recently included fellowships on, for example, related topics of peatland restoration, land tenure models for carbon-positive land use, adapting crops to changing environments, plant variety protection to drought tolerant varieties, and improved innovation and knowledge systems for forests and natural resource management. Related recent workshops and conferences have explored topics such as nitrogen losses and agricultural GHG emissions, synergies and trade-offs between adaptation, mitigation and ecosystem services, the treatment of peatlands, sustaining soil productivity, and the evaluation of agricultural management practices and infrastructures adapted to climate change.

Further information about CRP fellowships and conferences is available at www.oecd.org/agriculture/crp.

41. *Climate services*, in 68 reported programmes, can contribute to adaptation via the production, translation, communication, and use of climate information in decision-making. The provision of tailored

[13] The Centre has two key components: AgriZeroNZ (the Centre for Climate Action Joint Venture – an innovation 50:50 government/private-funded mechanism), and the New Zealand Greenhouse Gas Research Centre (NZAGRC).

information to decision makers can increase yields and promote changes in farmers' practices. Improvements to weather forecasting, crop monitoring and early warning systems can help farmers to prepare for extreme weather events, manage risks and reduce losses.

42. Activities reported involve the collection and dissemination of data to support decision making. This includes forecasts, such as the **United States'** National Significant Wildland Fire Potential Outlook, which features a monthly and 7-day fire potential outlook, and decision support tools, such as **Australia's** My Climate View online platform, which enables farmers, industry and regional communities to anticipate future climate conditions, draw comparisons with recent weather, consider the implications for production and prepare for future drought. In addition to addressing climate and adaptation possibilities, tools developed by countries support enhanced sustainability in production, such as **Estonia's** Big Data Project, launched in 2022 to provide a free and publicly accessible tool to support precision fertilisation and nutrient balancing, and **Switzerland's** national Soil Mapping Implementation Strategy, which seeks to support sustainable land use in a changing climate.

43. *Insurance* mechanisms developed to target climate-related risks are cited as part of 26 programmes by 24 of the countries covered in this report. **Indonesia**, for example, has implemented insurance products in collaboration with the insurance company PT Jasindo, rice farming insurance (AUTP) and cattle/buffalo insurance (AUTS/K) to protect farmers against flood, drought, pests and disease outbreaks. **Slovenia's** Ministry of Agriculture co-finances insurance premiums at a rate of 55% with the goal of encouraging farmers to insure crops against natural disasters as well as the risk of animal deaths due to disease. **Switzerland** likewise promotes the market penetration of crop insurance through federal contributions to protect against large-scale crop risks.

44. *Other financial mechanisms* include disaster recovery funding or payments for environmental services. Market-based mechanisms that pay farmers for the preservation of biodiversity or other environmental improvements can support transformative capacity by encouraging the development of new and diversified income streams for farmers. Other financial mechanisms, cited as part of 32 programmes, most frequently refer to financial support to recover from climatic events, such as **Canada's** AgriRecovery framework and the **United States'** Livestock Forage Disaster Program (LFP) or Emergency Assistance for Livestock, Honey Bees, and Farm-raised Fish Program (ELAP). Between mid-2021 and early 2023, **New Zealand** endured a record six climate events that required a response under the Primary Sector Recovery Policy: government funding allocated by the Ministry for Primary Industries in the amount of NZD 1.5 million (USD 0.95 million) in the fiscal year ending June 2022 enabled rural support trusts (RSTs) to increase psychosocial support, run information sessions and co-ordinate local recovery efforts. This category also includes instruments such as the **Netherlands'** Transition Fund (Transitiefonds landelijk gebied en natuur), which anticipates spending EUR 24.3 billion (USD 25.6 billion) from 2022-2034 to reduce the negative environmental impacts of farming operations, with a focus on ammonia emissions, but also targeting other environmental concerns.

### *Nature- or ecosystem-based measures*

45. Although *ecosystem-based approaches* (ECO) are cited in far fewer programmes, this is the second-most frequently cited type of action or programme, with 112 references to efforts that seek to broadly advance *agro-ecology* (7.0% of all references) or target specific ecosystem services, by improving *soil health* (5.5%), *diversification* (3.8%) or *water quality* (2.3%).

46. *Agroecology*, a sub-category defined by the GAMI, includes actions or programmes that aim to advance agro-ecological systems, such as organic production, land conservation or land retirement,

among other possibilities.[14] Agroecology can help to improve resilience while providing important co-benefits through climate change mitigation and ecosystem services, by increasing soil organic matter, enhancing soil and water conservation, and diversifying food systems. Consistent with this reasoning, **France** has adopted a holistic approach to reinforcing agricultural resilience by investing in soils, diversification, and agro-ecologic infrastructure. The **United States** Farm Service Agency's Soil Health and Income Protection Program (SHIPP) seeks to enhance soil and water conservation. An area of focus within the category of agro-ecological systems is on advancing organic production methods. Examples include **Costa Rica's** support payments for producers during the transition period toward certified organic and sustainable agriculture, and **India's** Organic Value Chain Development project for the Northeast Region, which supports the purchase of inputs, including seeds, organic fertilisers, and liquid organic pesticides.

47. *Soil health* measures promote practices to limit soil erosion, improve soil fertility and enhance carbon storage. This sub-category also includes programmes targeting soil erosion, land reclamation or desertification. For example, **Kazakhstan's** Republican Scientific and Methodological Center of Agrochemical Activities provides landowners with soil testing to determine nutrient levels and provide targeted recommendations for increasing soil fertility. The **European Union's** Soil Observatory (EUSO) synthesises evidence on soils to identify areas that are vulnerable to soil degradation.[15]

48. *Diversification* of agricultural systems can strengthen resilience to climate change, while providing important synergies with socio-economic and environmental objectives. Examples include expanding the genetic diversity of crops or livestock or altering the mix of crop and livestock production. It also encompasses variations to spatial and temporal arrangements through mixed planting, crop rotations, and integrated crop, livestock and agroforestry systems. Diversification can help to strengthen ecosystem services such as pest control, soil fertility and pollination, and regulate water and temperature extremes, resulting in more stable yields and reduced risk of losses (Tibi et al., 2022[51]). Some practices such as agroforestry can mitigate GHG emissions while improving food security and yield stability.

49. These measures most frequently target the adoption of agroforestry or integrated production systems or greater landscape diversity. **Brazil's** ABC+ programme seeks to move away from conventional cropping and toward integrated crop-livestock-forestry systems (ILPF). The **United Kingdom's** Countryside Stewardship (CS) scheme provides incentives to increase biodiversity, improve habitat and expand woodland areas. A small number of references seek to specifically address water quality degradation, such as the introduction in **Spain** of regulation governing nutrient inputs to reduce greenhouse gas and ammonia emissions and prevent water pollution, while maintaining soil fertility and agricultural productivity. **Switzerland's** programme for the enhanced use of land and water includes a component specifically focused on diversification, including the experimental design and testing of integrated management systems that combine crop rotation, choice of varieties, tillage and other measures.

### *Infrastructure and technological approaches*

50. With 68 references to actions or programmes, the category of *infrastructure and technological approaches* accounts for 11.4% of all programmes referenced. The majority of programmes in this area target either *irrigation and drainage* (5.2% of all references) or *crop and livestock technology* (4.0%). A relatively small number discuss *regional water infrastructure* (2.2%).

[14] Agroecological actions or programmes broadly refer to sustainable agricultural production systems. There are a variety of approaches and practices that may fit into this category, including among others regenerative agriculture, conservation agriculture, circular agriculture.

[15] https://esdac.jrc.ec.europa.eu/esdacviewer/euso-dashboard/

*Irrigation and drainage* infrastructure can improve overall water use efficiency at the basin level and productivity on the farm, alleviating some of the adverse consequences of climate change by helping farmers to cope with higher temperatures and drought. Investments in on-farm rainwater storage can reduce pressures on off-farm water supplies. Programmes for irrigation typically provide support to adopt more efficient technologies, with the goal of supporting adaptation to more variable water availability, although their impact on water consumption will depend on the presence of effective water demand policies (Grafton et al., 2018[52]; OECD, 2016[43]). **China's** Farmland Irrigation Construction programme provides payments to support the construction of small irrigation facilities, rainwater collection, sprinkler and drip irrigation, pumps and small hydropower stations. The **United Kingdom's** Water Management Grant, round 2 provides grants for capital items to promote more efficient use of water for irrigation and support to construct on-farm reservoirs to store water abstractions or harvested rainwater. Countries expected to experience a surplus of water under climate change, such as **Denmark**, **Norway** and **Sweden**, have invested in support to install and renovate drainage systems.

51. *Crop or livestock production technology* investments can facilitate adaptation on the farm, for example through the installation of canopies to control the growing climate for tree crops. Strategies such as providing shading, installing electric fans in sheds, bathing animals several times per day, or installing ventilation and cooling systems can support adaptation in livestock systems by providing relief from heat stress. Programmes also target on-farm investments in adapted crop and livestock technology. For example, **Austria's** Investment Loans in Agriculture provide an approach for investments in technologies, such as biomass heating systems and equipment for manure management. **Lithuania's** Modernization Fund, initiated in 2022 with EUR 1 million already committed, supports the development of non-arable technologies to reduce fuel and mineral fertiliser costs, preserve carbon deposits in the soil and reduce the risk of spring drought. The **Philippines'** Adaptation and Mitigation Initiative in Agriculture (AMIA) is its national flagship programme, which seeks through an approach tailored to villages, to advance the delivery of productivity enhancing technologies, such as the use of coconut husk as mulch in the upland agro-ecological zone. **Colombia's** Climate-smart Initiatives for Climate Change Adaptation and Sustainability in Prioritised Agricultural Production Systems (CSICAP) seeks to develop, validate and scale technologies to increase resilience and low-carbon agriculture.

52. *Regional water infrastructure* such as flood control technology, or the construction of reservoirs or canals, can play an important role in adaptation as complement to water policies (OECD, 2016[43]). The impacts of climate change on infrastructure needed for agriculture is expected to increase, and it is therefore essential to ensure that regional water infrastructure can withstand damage from climate-related natural hazards. At the same time, not all investment will be conducive to adaptation: large-scale or groundwater-based irrigation projects without effective water demand, including water pricing, policies can lead to maladaptation, potentially resulting in increased water consumption and surface or groundwater depletion during periods of drought (OECD, 2015[42]; OECD, 2016[43]).[16]

53. A handful of programmes are targeted toward mitigating flood-related risks, such as **Hungary's** efforts to develop temporary flood water storage in agricultural areas of the Middle Tisza River Basin and the Emergency Watershed Protection Program (EWP) of the **United States**. Others, primarily in emerging economies, seek to expand water supply infrastructure, such as **China's** expenditures to support large-scale irrigation projects and **Viet Nam's** Mekong River Delta water planning and supply projects.

### *Behavioural and cultural approaches*

54. *Behavioural and cultural approaches* are cited in 56 programmes, accounting for 9.3% of the total. Among these, attention is predominantly given to *breeding or breed selection* (3.3%), followed by *livestock*

[16] Public investments should also not prevent self-financing as countries should aim to ensure full supply cost recovery in irrigation (OECD, 2010[90])

*operations or management* (2.3%), *pest, disease and invasive species management* (2.2%) and *crop operations or management* (1.5%).

55. Improvements in cultivars offer an effective means to combat climate change. Adaptation via conventional crop breeding has demonstrated good progress but will require rapid incremental improvements to keep pace with changes in temperatures and the environment. The IPCC states with high confidence that plant breeding biotechnology will contribute to adaptation for large-scale producers, however the uptake of climate-resilient crops may be limited by socio-economic and political factors (Bezner Kerr et al., 2022[45]). Genome sequencing can help to identify agronomic traits that are relevant to climate change and develop crop varieties that are resilient to stress from pests, diseases, temperature and water extremes. In the livestock sector, a range of adaptation options are available including breeding for heat stress tolerance, crossbreeding, and switching to more heat and drought-resilient species.

56. Programmes in *breeding and breed selection* emphasise the development and adoption of varieties adapted to their particular climate challenges. The project Breeding Coffee for Agroforestry System (BREEDCAFS) from 2017-2021, co-ordinated by **France's** CIRAD and funded by the European Union, seeks to develop varieties of Arabica coffee suited to agroforestry production, which reduces temperatures in coffee plantations, preserves soil biodiversity, and enhances yield. **India**, **Indonesia** and **Viet Nam** are experimenting with varieties of rice that are tolerant of increased salinity. **Costa Rica's** Project for Strengthening Capacities in Seed Production for Adaptive and Resilient Agriculture seeks to promote the use of adapted seeds by family farmers to enhance agricultural productivity. In 2023, India promoted the production and use of millets, which are drought resistant nutritious crop, during its Presidency of the G20 coinciding with the United Nations' International Year of Millet. A special scheme was also established in 2023 by the OECD Seed Scheme to facilitate trade in pearl millets and sorghum seeds (Box 1.3). The **United Kingdom** is exploring more environmentally efficient cattle breeds via its Ruminant Genetics Programme in Northern Ireland.

57. Altering *crop management and operations* can involve changes in planting schedules or shifts in production location. While shifting the location of crop production holds significant potential as an adaptation strategy, it may also be impeded by climatic, cultural, institutional and economic barriers, including support payments that lock in production systems and discourage adaptation. Altering livestock management and operations includes measures such as matching stocking rates with feed availability, managing diet quality, rotational grazing, adjustments in animal husbandry and manure management.

58. While governments tend not to specify particular adaptation strategies, favouring instead the development of adaptive capacity, there are some examples of programmes that support the adoption of crop or livestock operations that are known to perform well under changing climate conditions. The Red Meat Development Programme (for sheep) and the Dairy Improvement Programme of Wales (**United Kingdom**) are examples of programmes that specifically target herd management. **Australia's** Extension and Adoption of Drought Resilience Farming Practices Grants Program funds grants ranging from AUD 100 000 to AUD 3 million (USD 69 000 to USD 2.1 million) to support adoption of proven drought resilient farming practices at a large scale (e.g. multiple farms, regions or industries).

59. *Pest, disease, and invasive species management* is essential to mitigate the potential increased impacts of pests and diseases on agricultural production resulting from climate change. Some programmes address pest and disease risk, either in general or in response to specific threats, typically by enhancing monitoring. This category also includes efforts to reduce harmful effects from chemical pesticide use by moving to alternative products or pest control systems. In **Croatia**, for example, the Phytosanitary Information System (FIS) has been upgraded and a new Act passed that requires farmers to connect to the FIS and to be trained in the safe handling and proper applications of pesticides. **Japan's** strategy MIDORI targets a 10% and 50% reduction in risk-weighted use of chemical pesticides through facilitating a shift toward Integrated Pest Management (IPM) systems by 2030 and 2050, respectively.

### Box 1.3. The OECD Seed Schemes for Sorghum and Pearl Millets

The OECD Schemes for the Varietal Certification of Seed (hereafter the "Seed Schemes") aims to facilitate the international trade of quality seeds by applying harmonised seed-certification standards and procedures. The Seed Schemes play a key role in the distribution of plant-breeding innovations from breeders to farmers by facilitating the distribution of seeds of adapted varieties worldwide. By helping farmers improve and stabilise their crop yields, high-quality seeds may help reduce the need to increase the area of agricultural land. New varieties also offer important opportunities for reducing water, fertiliser and pesticide use by improving input efficiency.

Pearl millet is a highly nutritious and climate-resilient crop that thrives in arid and semi-arid regions. It can be used as fodder, but its use as a staple cereal crop is gaining importance in Africa and Asia. Having recognised the importance of pearl millet as a significant food crop and its exceptional resilience to drought and high temperatures, the Seed Schemes agreed to establish a specific Sorghum and Pearl Millet Scheme at its 2023 Annual Meeting in Türkiye. By incorporating these two species into this specific scheme and facilitating their certification and trade, the OECD is working towards developing further the potential of drought-tolerant crops to address food security challenges and mitigate the negative effects of climate change.

More information on the OECD Seeds Schemes can be found at https://www.oecd.org/agriculture/seeds/.

## How do agricultural support policies influence climate change adaptation?

60. The above section discussed policies employed by countries that specifically deal with enabling agricultural sectors to adapt to a changing climate. However, other agricultural support policies may unintentionally improve or hinder the ability of individuals to adapt to climate change. As discussed in Chapter 2, in 2020-22, support to agriculture across the 54 countries – totalled USD 851 billion per year, of which USD 630 billion per year was provided as transfers to individual producers. The remainder was made up of support for general services (USD 106 billion) and budgetary transfers to consumers (USD 115 billion). Some emerging economies also implicitly taxed their producers by an average of USD 179 billion per year. This section discusses the mechanisms by which these current support policies may impact climate change adaptation and the potential effects.

### *Adaptation impacts of producer support policies*

*Agricultural support for the production of specific commodities can discourage adjustments*

61. Agricultural policies that provide support coupled to production are among the most common forms of support to the agricultural sector (around 65% of positive producer support). By distorting production signals, these policies can worsen vulnerabilities to climate risk through a variety of mechanisms (Ignaciuk, 2015[36]). Policies that increase the price received by the producer (positive MPS), which represent the largest share of overall producer support, incentivise production, the intensification of input use, the allocation of land to supported crops and the entry of land to the agricultural sector, all of which can reduce the capacity of agriculture to adapt to climate change. Other types of direct production support, including coupled payments, have a similar effect as positive MPS. Some of these effects can be mitigated when support is subjected to environmental conditionality. Conversely, negative MPS for a given commodity shifts resources away from the production of that commodity, potentially altering the mix of commodities produced relative to what would be optimal under given market and climatic conditions. Policies that distort

trade flows may reduce resilience: trade plays an essential role in supporting climate change adaptation and ensuring stability by allowing goods to flow from food surplus to food deficit areas, and by helping to absorb the impacts of local and regional supply shocks (Adenäuer, Frezal and Chatzopoulos, 2023[53]; OECD, 2017[25]; OECD, 2014[38]). Given that production tends to be more volatile in domestic than in global markets, and that domestic shocks are becoming more frequent with climate change, trade will play an increasingly important role in mitigating domestic supply volatility and enhancing global food security.

62. Most support policies also incentivise the production of specific agricultural commodities over others.[17] These policies, here entitled single commodity transfers (SCT), can create barriers to changing production systems away from subsidised commodities and potentially hamper the ability of farmers to adjust production to a changing climate (Wreford, Ignaciuk and Gruère, 2017[35]; OECD, 2017[54]; OECD, 2014[38]). Depending on the commodities that are subsidised and the conditions or regulations associated with these payments, SCTs can reduce incentives to change to more resilient crops; reduce incentives to diversify production; or can induce farming in more risky locations or with risky practices. For instance, support for the production of water-intensive crops such as cotton or rice may increase farmers' risk of loss due to drought in a given season (OECD, 2015[42]; Wreford, Moran and Adger, 2010[55]). Modelling suggests that removal of certain forms of SCTs could enable adaptation by facilitating a shift in production towards regions with comparative advantage and increasing trade flows to areas affected by climate change (Guerrero et al., 2022[56]). These measures are significant; across all 54 countries covered in this report, governments provided USD 380 billion in positive transfers to individual commodities, as well as USD 179 billion in implicit taxation.

63. Other targeted forms of direct payments not included in the SCTs may also favour certain types of products, and ultimately hamper adaptation. For example, support for cereals or ruminants are included as Group Commodity Transfers (GCT), but also create barriers to adaptation by limiting farmers' ability to adjust their production in response to changing climatic conditions. Ultimately the impact on adaptation is highly context-specific and depend on the specific instrument used, the commodity subsidised, and the conditions or regulations associated with these payments.

### *Producer support for managing risk*

64. Policies to help manage risk are a common form of producer support. Interest in these forms of support is rising due to the uncertainties posed by climate change, as reflected in the adaptation actions and programmes focused on insurance (4.4% of programmes from Figure 1.5) and other financial mechanisms (5.5% of programmes). Subsidised agricultural insurance policies are largely used to help manage risks and insurance markets can be useful mechanisms to transfer and pool risks. This can improve resilience in the face of increasing extreme events by allowing farmers to build absorptive capacity to recover from shocks (Cobourn, 2023[9]). Government insurance subsidy programmes can play an important role in ensuring the functioning of insurance markets that allow farmers to manage small to medium business risks. This is because insurance programmes can be economically unviable for insurance companies to offer without subsidies due to high costs of administering, monitoring and adjusting losses which keeps demand low (Glauber et al., 2021[57]).

65. However, insurance-related subsidies can also change producer behaviour and impede adaptation, encouraging farmers to adopt riskier and unsustainable production strategies (Ignaciuk, 2015[36]; OECD, 2016[43]). Insurance which covers a farm for individual loss of yields may cause a moral hazard problem in which the farmer undertakes fewer other risk mitigating activities and instead takes on more risk with less diversification (OECD, 2011[58]; Antón et al., 2012[59]). For instance, insured corn and soybean crops have been shown to be significantly more sensitive to extreme heat compared to uninsured

[17] This is the case with MPS and output payments but can also occur through policies such as payments per head of specific livestock, or payments for area planted to specific crops, among others.

crops, suggesting farmers are less inclined to undertake other adaptation measures to mitigate these risks (Annan and Schlenker, 2015[60]). Subsidies could be made less distortionary by, for example, shifting subsidies to cover only insurance for catastrophic risk rather than normal farm business risks, refraining from restricting crop choice, requiring minimum deductibles on claims and providing transparency over the level of subsidy in each premium (Glauber et al., 2021[57]; OECD/FAO, 2021[8]). Likewise, switching support from schemes based on individual losses to index-based schemes – facilitated by satellite and digital technologies – may reduce the moral hazard problem and the administering costs (Sumner and Zulauf, 2012[61]). However, under this approach indemnities may differ from actual loses, which may not be attractive for farmers.

66. Disaster assistance programmes are another commonly adopted form of risk management support. These programmes are usually introduced in the form of a payment following a natural disaster. In most instances producers are unaware they will be protected until the disaster occurs and the payment is announced. However, there are some cases, such as the United States' Livestock Forage Disaster Program, where the conditions for disaster relief are known in advance. Expectations play a significant role in how producers interact with disaster assistance, as producers may be willing to forego other forms of risk management if there is a credible belief that governments will bail them out in the event of a loss. Disaster assistance should therefore be limited to providing protection for catastrophic or uninsurable risk so as not to discourage participation in other risk mitigating activities such as diversification, irrigation investment or insurance (Glauber et al., 2021[57]). An optimal approach should emphasise capacities farmers need to adapt or transform to climate risks, including exiting the sector altogether. Investment in public goods including weather and climate information resources, research and development and knowledge dissemination will build producers' resilience and strengthen their ability to plan and prepare for, absorb, recover from, and adapt to adverse events.

#### *Payments for provision of environmental public goods can help adaptation*

67. Agricultural policies can also be designed to incentivise adaptation directly, by linking payments to providing environmental goods and services, such as preservation of rural landscapes, resilience to natural disasters, habitat provision, and control of invasive species. Payments for ecosystem services can provide nature-based solutions to some climate risks while also yielding co-benefits for climate mitigation and the environment. For instance, payments for restoration and protection of wetlands reduce flood risk by providing a store for excess water while also providing habitat for animals and sequestering carbon. However, only USD 1.6 billion of the USD 297 billion in budgetary producer support in 2020-22 across the 54 countries was purely for environmental public goods (i.e. payments based on specific non-commodity outputs in the PSE data). The **United Kingdom**'s Countryside Stewardship programme and **Korea'**s direct payments for land conservation are two examples of these types of policies. Some countries also require compliance with certain environmental standards as a condition to other types of payments.

### *Adaptation impacts of general services support policies*

#### *Support for agricultural knowledge generation and transfer*

68. Public funding for agricultural knowledge generation and innovation remains limited, despite the fact that investments in these areas are often cited as one of the most important roles for public policy in aiding the agricultural sector to adapt to a changing climate and build resilience (Ignaciuk, 2015[36]; Wreford, Ignaciuk and Gruère, 2017[35]; OECD, 2020[39]). Spending on agricultural knowledge generation programmes represented 0.4% of the value of agricultural production for the 54 countries covered in this report in 2020-22, while support for knowledge transfer programmes accounted for 0.2% of value of production.

69. There is a clear role for public R&D to provide accurate and detailed information that allows private agents to make well-informed adaptation decisions. Modelling has suggested that directed innovation has offset as much as 20% of the potential losses in agricultural land value from damaging climate trends in the **United States** since the 1960s (Moscona and Sastry, 2022[62]). Equally important is to support research on risk and vulnerability assessment. A number of countries already provide services which help producers to assess their vulnerability to climate risks and adaptation needs, as captured by the 66 actions and programmes dedicated to climate services. Examples include the **Netherlands**' Climate Stress Test tool, the **Philippines'** Climate-Risk Vulnerability Assessment Maps, **Portugal's** Climate Portal and the **United States** Climate Hubs among others.

70. Weather forecasting or early warning systems are also important tools to prepare farmers to undertake early action to minimise the negative effects of extreme events. Some countries already provide funding for or are developing such services, including **Australia's** Drought Early Warning System, **Austria's** contribution to a worldwide Database for Soil and Near Surface Temperatures, **France's** Meteo-France agro-climatic services, **Ireland's** Forest Fire Danger Rating, **New Zealand's** high resolution drought-forecasting tool (NIWA35), and the **United States'** Drought Monitor, among others. Services such as these equip producers with necessary information to understand short and medium-term risks of climate change and facilitate autonomous adaptation actions by producers without distorting production or trade signals. In designing knowledge generation programmes, consideration should be given to "no-regrets" policies, which are those that help farmers under a wide range of scenarios of worsening climate change, such as those discussed above.

71. Knowledge transfer programmes targeting adaptation also play a key role in building capacity of the agricultural sector to deal with future climate change. Knowledge gaps can play a contributing role in creating barriers to uptake of adaptation and other climate-friendly practices on farms (Wreford, Ignaciuk and Gruère, 2017[35]). Improved access to information helps farmers and other private agents to overcome these barriers and make rational decisions in relation to adaptation actions. Capacity-building policies are among the most common employed by countries in this report, for example **Australia**'s Farm Business Resilience Program, **Canada's** Agricultural Climate Solutions Living Labs and the **Netherland's** Regional online connection sessions all work to bring farmers together with the aim of exchanging best practices on climate change.

### *Infrastructure*

72. Provision of infrastructure projects will often be required to reduce barriers to the adoption of climate-friendly practices in agriculture. In the context of this report, infrastructure spending is included under general support services for public good infrastructure, whereas subsidies to producers for the provision of on-farm infrastructure projects are included in payments to producers for fixed capital formation. Spending on these programmes totalled USD 49 billion across the 54 countries covered in this report in 2020-22, equivalent to 1.1% of the value of agricultural production.

73. Farmers rely directly or indirectly on public infrastructure, and its availability will influence how they respond to climate change (Ortiz-Bobea, 2021[63]; Wreford, Ignaciuk and Gruère, 2017[35]). Infrastructure needs are highly location specific and long-term sustainability assessments of each project are important to assess their suitability. For example, irrigation infrastructure will be important to deal with the effects of climate change in some regions, whereas in other regions, in the absence of adequate water management policies, adoption of irrigation infrastructure may actually become a maladaptation mechanism and discourage the move towards less water and emission-intensive production systems, which would increase the overall resilience of the region. Faced with uncertainty in the viability of long-run adaptation projects, the economic literature typically prescribes implementing "no-regret" policies – those which build resilience to risk under a wide range of future scenarios and which will provide benefits to the sector even in the

absence of shocks (OECD/FAO, 2021[8]; OECD, 2020[39]; Mullan et al., 2013[64]; Hallegatte, 2009[65]; Antón et al., 2013[37]).

*Biosecurity, prevention, management and control*

74. Disease and pest outbreaks will be an increasing source of risk for agricultural producers under climate change (Skendžić et al., 2021[12]). Producers typically manage some pest and disease risks on farm through the use of pesticides, cropping practices, antibiotics and other forms of management actions. However, some risks are outside the control of individual producers. For instance, outbreaks on farm can harm producers directly through crop and livestock losses, however, outbreaks elsewhere can still impact them if it results in closures of trade or changing consumer preferences. For this reason, there is also a clear role for governments to continue providing a public good in preventing and managing these risks. Many governments operate nationwide biosecurity systems which employ inspection and control measures to prevent incursions from entering and spreading through agricultural areas. In 2020-22, these measures accounted for USD 8 billion among the 54 covered countries in this report, equivalent to 0.2% of the value of agricultural production.

75. There is also a role for more forward-looking activities, including systems to anticipate new pests and diseases, developing response plans, and early notification systems that help producers and other actors respond to threats. Knowledge transfer and extension programmes are also important to spread information on best practices to manage disease and pests. For instance, as part of its Farm to Fork Strategy, the **European Union** ran a pilot programme, Farmer's Toolbox for Integrated Pest Management, between 2020 and 2022 with the objective to provide background knowledge on the most promising ways farmers could reduce pesticide dependency.

## Reforming agricultural policies for climate change adaptation

76. Climate change is increasingly impacting global agriculture and food systems, through slowing agricultural productivity growth, negative impacts on crop and grassland quality and harvest stability, and disruptions to terrestrial ecosystem services. Higher temperatures and the increased frequency of droughts, floods and natural disasters have negative consequences for food security and livelihoods; this includes a greater frequency of sudden losses in food production, reduced food availability, and higher food prices. Climate change is projected to make some areas unsuitable for food production, increasing the number of people at risk of hunger, malnutrition and diet-related mortality (Bezner Kerr et al., 2022[45]). The agricultural sector faces a formidable challenge: it needs to adapt to a changing climate while reducing GHG emissions, preserving biodiversity and environmental quality, ensuring food security and nutrition, and supporting rural incomes and livelihoods.

### *A broad range of programmes have been developed to help agriculture adapt to climate change, but more attention could be given to implementation, monitoring and evaluation*

77. Governments are already taking significant steps to facilitate climate change adaptation in their agricultural sectors: UNFCCC reports reflect greater attention to agricultural adaptation and adaptation-mitigation co-benefits over time and a stocktake of measures indicates 587 adaptation programmes and activities across the 54 M&E countries. However, a large proportion of reported activities focus on planning, with 120 strategic planning documents recorded across three-quarters of M&E countries. Moving beyond planning to focus on implementation is imperative to support agricultural production systems in adapting to climate change. While there is increasing evidence that many plans are being implemented, evidence on the extent of implementation or documenting the outcomes of programmatic efforts is scant. Countries should continue to implement, monitor and evaluate adaptation policies and programmes in an effort to strengthen resilience by fostering absorptive, adaptive and transformative capacities.

### *Reform is needed so that producer support policies facilitate and do not hinder climate change adaptation*

78. Most agricultural producer support policies were not designed to address climate change adaptation objectives. While some may support adaptation, the majority do little to facilitate, and in many cases hinder, farmers' efforts to adapt to climate change. Support to individual producers amounted to USD 630 billion per year in 2020-22, of which USD 380 billion was provided in the form of support tied to the production of specific commodities that discourage production adjustments. Governments should reduce and reform market price support (MPS) and payments targeted to specific commodities that encourage farmers to maintain pre-existing production systems and reduce incentives to shift production away from subsidised commodities in response to changing climatic conditions. Dismantling policies that distort trade and impede price transmission can also reduce supply volatility by allowing produce to flow from food surplus to food deficit areas, helping to manage domestic food shortages driven by droughts, floods, and other catastrophic events. To facilitate this, short-term non-trade-distorting measures may be required. Market price support and payments linked to outputs or the unconstrained use of variable inputs also have the greatest potential to increase GHG emissions, exacerbating the extent of adaptation required (OECD, 2022[48]). Reforming these policies would help to mitigate climate change and increase the resources available to allocate to climate change adaptation. Developing coherent policy approaches involving all agencies with policy levers is important in this regard so that the synergies and trade-offs are properly understood.

### *Governments should provide support for catastrophic risks only, not impeding adaptation while ensuring well-functioning markets for agricultural insurance*

79. Well-functioning insurance markets can strengthen resilience to climate change by allowing farmers to build absorptive capacity to recover from shocks. While small and medium-scale idiosyncratic risks can be managed at the farm level and through market-based instruments such as insurance, agricultural policy still has a role to play in covering large-scale systemic risks that cannot be covered by farmers themselves or by risk markets, particularly in view of the increasing number of extreme weather events and catastrophic disasters. Disaster assistance payments can generate maladaptation if they are not targeted to catastrophic risks and not well designed. Governments should ensure that insurance subsidies and disaster assistance payments do not cause moral hazard and impede on-farm adaptation, and policies should be well-designed to avoid crowding out private sector activity. Better and more granular data on risks and climate can help to reduce uncertainties surrounding climate change and support the development of optimal local solutions and on-farm strategies. The development of index-based insurance schemes for marketable risks can help to reduce moral hazard and make coverage more affordable for small-scale producers.

### *Targeted interventions to support climate change adaptation in agriculture are needed*

80. Overall, agricultural support policies tend to be poorly targeted, inequitably distributed, and often result in substantial leakages to unintended beneficiaries along the supply chain. This comes at considerable cost not only to consumers and taxpayers, but also to farmers due to the low income transfer efficiency of support policies. Policies should aim to offer multiple adaptation pathways for farm households: supporting sustainable productivity improvements, diversifying income sources among household members, and when necessary, facilitating the transition away from agriculture.

81. Better targeting of agricultural support can facilitate autonomous adaptation and free up scarce budgetary resources that could be used to support planned adaptation initiatives or provide transitional assistance. Investments in research and development, extension services, entrepreneurial skills, human capital, and the uptake of resilience-enhancing technologies can build on-farm resilience capacity and

reduce farmers' risk exposure to climate change over the long-term. Payments can also be made conditional on the provision of ecosystem services such as landscape preservation, biodiversity conservation and control of invasive species – although care must be taken in design and implementation to ensure environmental benefits. However, only USD 1.6 billion of the USD 297 billion per year of budgetary support to producers in 2020-22 was purely dedicated to the provision of environmental public goods (i.e. payments based on a specific non-commodity output).

### *Greater support should be provided for transformative capacity to help farmers build long-run resilience to climate change*

82. Investments in innovation, infrastructure and biosecurity can play an essential role in helping agriculture adapt to climate change. However, support for these and other general services is low. Only USD 106 billion in 2020-22 was spent on these areas, an amount accounting for just 2.5% of the value of agricultural production, or 12.5% of total support directed to the sector. Channelling a greater share of R&D spending towards adaptation can provide the foundation for stronger risk and vulnerability assessments, support informed decision making, facilitate the emergence of new technologies and production practices adapted to the changing climate, and build capacity via knowledge transfer programmes. Investments in infrastructure should be climate-resilient, in that they are planned, designed, built, and operated in a way that adapts to changing climate conditions. Investments in infrastructure may also support nature-based solutions at a landscape scale, which have the potential to contribute simultaneously to objectives related to adaptation, mitigation, and other ecosystem services. Biosecurity measures should be upgraded to ensure farmers can prevent, respond to, and recover from emerging threats from pests and diseases.

83. Public-private partnerships can catalyse investment in innovation and infrastructure, allowing public and private entities to share the risks and costs associated with projects. They can be particularly effective for large-scale infrastructure projects with long time horizons, or in areas where the private sector may be less active. Investments should be carefully designed to avoid maladaptation: for instance, the development of irrigation infrastructure or water-efficient technologies should be complemented by additional measures to discourage the adoption of water-intensive crops or the expansion of production into overly arid areas that may become unsuitable for production in the long run.

84. In the long run, farmers will face increasing pressure for transformative change. This is particularly salient in the context of tipping points, which are likely to irreversibly affect agriculture in certain regions, rendering current agricultural systems untenable. Policies should aim to facilitate structural adjustment and support the emergence of new and diverse income sources as complements to revenue from traditional cropping and livestock production. Examples include renewable energy generation or payments for biodiversity conservation, emissions reductions, and other ecosystem services, or moving towards off-farm employment.

### *Governments should prioritise adaptation measures that have co-benefits with mitigation and other food system objectives*

85. Policies to support climate change adaptation in agriculture can have important synergies with climate change mitigation and other food systems objectives and require a coherent, whole-of-government approach to policy making. Successful adaptation actions should be effective (anticipated or observed to reduce climate risk), feasible (possible and desirable in a particular context), and just. Robust monitoring and evaluation frameworks can help to assess the effectiveness of adaptation measures, prevent maladaptation, and ensure consistency with climate change mitigation goals and wider objectives for food

systems. In 2022, signatories to the OECD Ministerial Declaration[18] committed to "promote the development and implementation of agricultural practices that conserve, sustainably use and restore biodiversity, tackle negative effects of land conversion to agriculture on biodiversity, enhance ecosystem services and improve soil health and water and air quality, including through agro-ecological and other innovative, context specific, approaches."

[18] OECD (2022[92]), *Declaration on Transformative Solutions for Sustainable Agriculture and Food Systems*, OECD/LEGAL/0483, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0483.

# Annex 1.A. Details of the analysis

## Keyword frequency analysis based on UNFCCC reports

86. Each Party to the United Nations Framework Convention on Climate Change (UNFCCC) is required to submit national communications in accordance with guidelines developed and adopted by the Conference of the Parties (COP). The Convention defines three main groups: Annex I countries that were members of the OECD as of 1992 plus economies in transition (EIT); Annex II parties that consist of OECD members as of 1992 but excluding the EIT and Türkiye; and Non-Annex I parties. The distinction is important because reporting requirements differ between groups, as do expectations with respect to climate financing.

87. Annex I Parties are required to submit a national communication (NC) every four years, with the most recent being the 8th national communication, due as of 31 December 2022. Non-Annex I Parties are required to submit their first national communication within three years of entering the Convention and every four years thereafter. For Annex I Parties, the COP adopted guidelines for a standardised national communication format that includes a chapter specifically devoted to assessing climate change vulnerabilities and adaptation measures. For Non-Annex I Parties, the reporting guidelines are more flexible, but the national communications are expected to include sections on programmes that facilitate adaptation to climate change, barriers to implementation of adaptation measures and information on how support programmes through the Convention help to meet their adaptation needs.

88. A core component of the Paris Agreement is the preparation by each Party of a nationally determined contribution (NDC), which embodies "efforts by each country to reduce national emissions and adapt to the impacts of climate change" (UNFCCC, 2022[66]). Each Party is required to communicate an updated NDC every five years starting in 2020, where each NDC represents a progression compared to its predecessor and captures the Party's "highest possible ambition." As of October 2021, all 191 Parties to the Agreement had submitted one or more NDCs to the UNFCCC.

89. In addition to the NDCs, Parties are encouraged to provide information on climate change impacts and adaptation progress as part of an adaptation communication. Although not a formal requirement, article 7 of the Paris Agreement establishes the expectation that each Party submit and update a communication on adaptation in order to: "(a) increase the visibility and profile of adaptation and its balance with mitigation; (b) strengthen adaptation action and support for developing countries; (c) provide input to the global stocktake; (d) enhance learning and understanding of adaptation needs and actions" (UNFCCC, 2022[67]).

90. While NDCs are mandatory under the Paris Agreement, reporting on adaptation within them is not. In contrast, adaptation communications are not mandatory, but their content by design focuses exclusively on adaptation. There is considerable flexibility in the form of the adaptation communication. Slightly more than half of those submitted to date are unique documents. The remainder take the form of the most recent NDC, national adaptation plan (NAP), or national communication to the UNFCC. Adaptation communications are relatively new, with first version submission dates in 2020-2022.

91. The analysis of keyword frequencies in this chapter incorporates all versions of national communications, NDCs and adaptation communications submitted to the UNFCCC prior to 1 February 2023 by 38 OECD members, the European Union as a collective, 5 non-OECD EU members, and the 11 emerging economies included in this report. In total, the quantitative portion of the analysis reviews

413 documents (329 national communications, 67 NDCs, and 17 adaptation communications). The documents reviewed are listed in Table 1.A.1.

## Annex Table 1.A.1. UNFCCC documents reviewed for keyword analysis

| Country | Classification | National communications (NC) | Nationally determined contributions (NDCs) | Adaptation communications |
|---|---|---|---|---|
| Argentina[e] | Non-Annex I | NC1 (1999)-NC3 (2015) | v1 (2016)-v3 (2021) | v1 (2020) |
| Australia | Annex II | NC1 (1994)-NC8 (2022) | v1 (2016)-v4 (2022) | v1 (2021) |
| Austria | Annex II | NC1 (1994)-NC8 (2022) | n/a | v1 (2021) |
| Belgium | Annex II | NC1 (1994)-NC8 (2022) | n/a | |
| Brazil[a,e] | Non-Annex I | NC2 (2010)-NC4 (2020) | v1 (2016)-v3 (2022) | v1 (2022) |
| Bulgaria | Annex I | NC1 (1996)-NC8 (2022) | n/a | |
| Canada | Annex II | NC1 (1994)-NC8 (2022) | v1 (2016)-v3 (2021) | v1 (2021) |
| Chile | Non-Annex I | NC1 (2000)-NC4 (2021) | v1 (2017)-v2 (2020) | v1 (2022) |
| China[e] | Non-Annex I | NC1 (2004)-NC3 (2019) | v1 (2016)-v2 (2021) | v1 (2021) |
| Colombia[e] | Non-Annex I | NC1 (2001)-NC3 (2017) | v1 (2018)-v2 (2020) | v1 (2020) |
| Costa Rica[e] | Non-Annex I | NC1 (2000)-NC4 (2021) | v1 (2016)-v3 (2020) | v1 (2020) |
| Croatia | Annex I | NC1 (2002)-NC7 (2018) | n/a | |
| Cyprus | Annex I | NC6 (2013)-NC8 (2022) | n/a | |
| Czech Republic[b] | Annex I | NC2 (1997)-NC8 (2023) | n/a | |
| Denmark | Annex II | NC1 (1994)-NC7 (2018) | n/a | |
| Estonia | Annex I | NC1 (1995)-NC8 (2022) | n/a | |
| European Union[b] | Annex II | NC2 (1998)-NC8(2022) | v1 (2016)-v2 (2020) | v1 (2021) |
| Finland | Annex II | NC1 (1995)-NC8 (2022) | n/a | |
| France | Annex II | NC1 (1994)-NC8 (2023) | n/a | |
| Germany | Annex II | NC1 (1994)-NC7 (2017) | n/a | |
| Greece | Annex II | NC1 (1995)-NC8 (2022) | n/a | |
| Hungary | Annex I | NC1 (1994)-NC7 (2018) | n/a | |
| Iceland | Annex II | NC1 (1994)-NC7 (2018) | v1 (2016)-v2 (2021) | |
| India | Non-Annex I | NC1 (2004)-NC2 (2012) | v1 (2016)-v2 (2022) | |
| Indonesia | Non-Annex I | NC1 (1999)-NC3 (2018) | v1 (2016)-v3 (2022) | v1 (2022) |
| Ireland | Annex II | NC1 (1995)-NC7 (2018) | n/a | |
| Israel | Non-Annex I | NC1 (2000)-NC3 (2018) | v1 (2016)-v2 (2021) | |
| Italy | Annex II | NC1 (1995)-NC8 (2022) | n/a | v1 (2021) |
| Japan | Annex II | NC1 (1994)-NC8 (2022) | v1 (2016)-v4 (2021) | v1 (2021) |
| Kazakhstan[c] | Non-Annex I | NC1 (1998)-NC7 (2017) | v1 (2016) | |
| Korea | Non-Annex I | NC1 (1998)-NC4 (2019) | v1 (2016)-v3 (2021) | |
| Latvia[b] | Annex I | NC1 (1995)-NC8 (2022) | n/a | |
| Lithuania[a] | Annex I | NC1 (1996)-NC8 (2023) | n/a | |
| Luxembourg | Annex II | NC1 (1995)-NC7 (2018) | n/a | |
| Malta | Annex I | NC3 (2014)-NC8 (2022) | n/a | |
| Mexico | Non-Annex I | NC1 (1997)-NC6 (2019) | v1 (2016)-v3 (2022) | v1 (2022) |
| Netherlands[a] | Annex II | NC2 (1997)-NC8 (2022) | n/a | v1 (2021) |
| New Zealand[f] | Annex II | NC1 (1994)-NC8 (2022) | v1 (2016)-v2 (2021) | v1 (2017)-v2 (2022) |
| Norway | Annex II | NC1 (1994)-NC8 (2022) | v1 (2016)-v3 (2022) | v1 (2021) |
| Philippines | Non-Annex I | NC1 (2000)-NC2 (2014) | v1 (2021) | |
| Poland | Annex I | NC1 (1994)-NC8 (2022) | n/a | |
| Portugal | Annex II | NC1 (1994)-NC8 (2022) | n/a | v1 (2021) |
| Romania | Annex I | NC1 (1995)-NC8 (2022) | n/a | |
| Slovak Republic[a] | Annex I | NC1 (1995)-NC7 (2017) | n/a | |
| Slovenia | Annex I | NC1 (2002)-NC7 (2018) | n/a | |

| Country | Classification | National communications (NC) | Nationally determined contributions (NDCs) | Adaptation communications |
|---|---|---|---|---|
| South Africa[e] | Non-Annex I | NC1 (2003)-NC3 (2018) | v1 (2016)-v2 (2021) | v1 (2021) |
| Spain[b] | Annex II | NC2 (1997)-NC8 (2022) | n/a | v1 (2021) |
| Sweden | Annex II | NC1 (1994)-NC7 (2017) | n/a | v1 (2022) |
| Switzerland | Annex II | NC1 (1994)-NC8 (2022) | v1 (2017)-v3 (2021) | v1 (2020) |
| Türkiye[d] | Annex I | NC1 (2007); NC5 (2013)-NC7 (2019) | v1 (2021) | |
| Ukraine[c] | Annex I | NC1 (1998) | v1 (2016)-v2 (2021) | |
| United Kingdom[b] | Annex II | NC2 (1997)-NC8 (2022) | v1 (2016)-v3 (2022) | v1 (2020) |
| United States[b] | Annex II | NC2 (1997)-NC8 (2022) | v1 (2016)-v2 (2021) | v1 (2021) |
| Viet Nam | Non-Annex I | NC1 (2003)-NC3 (2019) | v1 (2016)-v3 (2022) | |

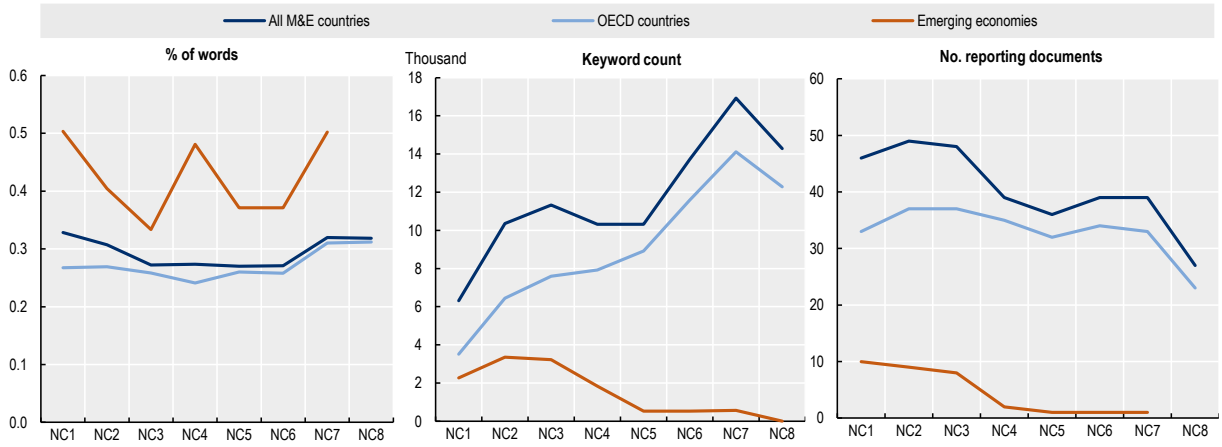
Notes: National communication notes: a) one or more national communications unreadable by keyword analysis software (NVivo), not reviewed; b) one or more national communications available only in hard copy, not reviewed; c) one or more national communications published only in Russian, not reviewed; d) Türkiye did not submit NC2-NC4
Nationally determined contribution notes: the EU submits an NDC as a collective, individual EU members are marked "n/a"
Adaptation communication notes: e) identical to NDC; f) identical to national communication(s); blank cells indicate no adaptation communication submitted to date.
Source: UNFCCC submission registries for national communications, nationally determined contributions (NDCs) and adaptation communications.

92. The approach taken to analyse the use of keywords is grounded in content analysis, established within the social sciences as a method for analysing textual data. At its core, content analysis views words and the context in which they are used as data (Hsieh and Shannon, 2005[68]). The analysis takes a mixed-methods approach, which combines quantitative and qualitative approaches to content analysis. It begins with quantification of the frequency of word use, which serves as an indicator of the extent of interest in, or importance assigned to, particular words, without considering their contextual meaning (Potter and Levine-Donnerstein, 1999[69]). For example, the number of instances in which keywords related to agriculture appear in the UNFCCC documents may indicate the degree of concern over the consequences of climate change for the sector (Gagnon-Lebrun and Agrawala, 2006[70]). The analysis then takes a qualitative approach to examine the context within which keywords of interest are used. This second stage involves examining the text near a keyword to determine, for example, if words related to agriculture are used in a discussion of vulnerabilities, mitigation, or adaptation.

93. The keyword analysis is conducted using NVivo qualitative analysis software (release 1.7). Keyword frequency analysis is executed by developing a set of search words that describe a concept of interest. In this analysis, keywords for agriculture include "agriculture", "food", "farm", "crop", "livestock", related variants for each (e.g. agricultural, farming, crops, cropping). Contextual keywords used for mitigation include "mitigation", "emission", "carbon", "greenhouse", "gas", "enteric", "fermentation" and "food waste"; keywords for adaptation include "adaptation" and "resilience"; keywords for vulnerability include "vulnerability", "impact" and "pressure". For each category, related word variants in English and the Spanish and French equivalents for all keywords are included. To identify the context within which agriculture is discussed, the analysis identified the intersection of agricultural keywords with each of the categories of contextual words (mitigation, adaptation and vulnerability). The coding for each text excerpt was then manually verified.

94. The results of the keyword search are reported as a percentage of the total number of words published, which adjusts for differences in the lengths of documents by type (NDCs are generally shorter than adaptation communications or national communications) and across UNFCCC classifications (the NDCs of Non-Annex I Parties tend to be longer than those of Annex I parties).

## Annex Figure 1.A.1. Agricultural keywords in UNFCCC reports over time




Note: NC1 to NC8 refer to reporting rounds for the national communications (NC) to the UNFCCC, the timing of which is presented in Annex Table 1.A.1. Left panel reports frequency of agricultural word references among total words published. Right panel reports the number of reporting documents analysed. Graphic omits data on non-OECD member states of the European Union.
Source: Analysis based on national communications to the UNFCCC.

## Stocktake of agricultural climate change adaptation programmes and activities

95. This chapter's stocktake of current agricultural climate change adaptation programmes and activities uses information collected by the Secretariat from each of the M&E countries, as reported in the individual country chapters, as well as supplemental research to identify efforts implemented to support climate change adaptation. The catalogue of activities reported herein is not exhaustive, but rather represents an overview of areas of programmatic emphasis and investment across the M&E countries.

96. Each of the programmes and activities that were self-reported to the Secretariat by member countries was manually reviewed and classified, first to ensure that activity is specifically focused on adaptation (rather than a general programme that may touch incidentally on adaptation), then reviewed and classified based on GAMI category and sub-category, as defined in Table 1.1. Where actions spanned more than one category or sub-category, they were cross-listed. Each action was coded by at least two staff to ensure consistency in the classification of programmes. Many actions undertaken by governments do not involve direct intervention to facilitate adaptation, but rather the creation of institutions to support adaptation decisions by individuals or groups. In most cases, these sorts of supporting actions fall into the realm of social, economic and institutional (SEI) measures. For example, a decision support tool that provides information on potential changes in crop operations in response to climate change would fall into the category of "climate services", not "crop operations and management." Programmes that are planned for implementation but have not yet been implemented were coded to the SEI category and the sub-category that best fit the information available on the programme.

# 2 Developments in agricultural policy and support

97. For the past several years, agricultural have been shaped by multiple crises. Policy makers were forced to respond first to the pandemic caused by the coronavirus SARS-CoV-2 (henceforth referred to as the COVID-19 pandemic), which initially disrupted production and later snarled supply chains. As the effects of the pandemic faded, Russia's[19] illegal and unjustified invasion of Ukraine in February 2022 roiled markets for specific agricultural inputs and outputs.

98. Alongside these acute consequences of war and pandemic, the effects of climate change were felt in the increased prevalence of natural disasters such as floods, drought and storms in many of the countries in this report. African Swine Fever and Avian Flu are two reoccurring biosecurity threats that also strongly affected global markets in 2022.

99. All of this taken together has put the stability and resilience of the sector, the predictability of trade, food security, and the stability of markets on the top of the policy agenda. These issues added to (and competed with) existing priorities to improve the sustainability of food systems and mitigate their effects on climate change. As this chapter will describe, policymakers took action to try to help the sector absorb and recover from these events in the short run and undertook steps to address the impacts of future shocks. Temporary export bans, tariff reductions (or increases) and other measures were used with the intention of securing domestic food supplies and managing market disruptions. Overall, these and other actions taken by policy makers increased total support to producers.

100. Agriculture policy in 2022 was also made in the context of a global economy weighed by value chain disruptions and high energy prices. GDP growth both globally and in the OECD area dropped by close to half in 2022, as did real global trade. These rates remained above those observed prior to the pandemic, but fell short of earlier expectations after the contractions in 2020. Moreover, average inflation in the OECD area climbed to more than 9%.

101. This chapter first presents the general economic and market context in which agricultural policies evolved over 2022. The second section provides an overview of policies responding to the Russian war of aggression in Ukraine and its consequences for agricultural input and output markets. This is complemented by a discussion of other agricultural policy developments in 2022 and early 2023, while a fourth section presents and analyses developments in agricultural support. The chapter concludes by providing an overall assessment of the use of support against the main policy objectives for the agricultural sector.

[19] This report does not contain a country chapter on the Russian Federation, nor any tables with support indicators in the Statistical Annex. However, aggregate data for the 11 emerging economies and for all 54 countries covered in this report continue to include those for Russia.

## Key economic and market developments

102. Conditions in agricultural markets are strongly influenced by macro-economic factors such as economic growth (measured by gross domestic product, GDP), which drives demand for agricultural and food products, as well as by prices for crude oil, natural gas and other energy sources that underpin many production inputs in agriculture, notably fuel, chemicals and fertiliser. Energy prices also affect the demand for cereals, sugar crops and oilseeds through the market for biofuels produced from these feedstocks.

103. Global GDP, which had begun to recover from its 3% contraction following the COVID-19 pandemic and grew by almost 6% in 2021, saw its growth reduced to just over 3% in 2022 (Table 2.1). Across the OECD, deceleration was most significant in fast-growing economies, including Chile (2.5%, down from 11.9% in 2021), Estonia (-1.7% compared to +8%) and Türkiye (5.6% after 11.4%). Across the euro area, growth remained comparatively robust at 3.5%, down from 5.2% in 2021. While output exceeded pre-pandemic levels in most countries, GDP remained below 2019 levels in Spain, Japan, Mexico and the United Kingdom.

104. Labour markets were a bright spot in the overall economic picture. Unemployment rates that had peaked in 2020 fell over the course of 2021 and 2022 to average 5% across the OECD area, the lowest in more than 40 years. At the same time, shortages of qualified workers have sometimes dampened economic growth.

105. Prices rose strongly over the same period and inflation reached an average 9.3% in 2022, a level not seen for more than 30 years. Energy and food prices strongly contributed to such high inflation rates (see below).

106. Emerging economies were also affected. Growth in the countries covered by this report fell significantly relative to their rebounds in 2021, but in most cases remained close to or above average growth rates seen prior to the pandemic. The stark and obvious exception is Ukraine, where the war has wiped out close to 30% of its economic output.

107. Global trade grew by 5% year on year, a deceleration relative to the 10% growth in 2021 but still slightly higher than average pre-pandemic growth rates.

## Table 2.1. Key economic indicators

| | Average 2010-19 | 2020 | 2021 | 2022 |
|---|---|---|---|---|
| Real GDP growth[1] | | | | |
| World[2] | 3.1 | -3.1 | 6.1 | 3.3 |
| OECD[2] | 1.8 | -4.4 | 5.7 | 3.0 |
| United States | 2.0 | -2.8 | 5.9 | 2.1 |
| Euro area | 1.2 | -6.2 | 5.2 | 3.5 |
| Japan | 0.8 | -4.3 | 2.2 | 1.0 |
| Non-OECD[2] | 4.3 | -2.0 | 6.5 | 3.7 |
| Argentina | 0.3 | -9.9 | 10.4 | 5.2 |
| Brazil | 0.7 | -3.6 | 5.3 | 3.0 |
| China | 6.6 | 2.2 | 8.4 | 3.0 |
| India[3] | 5.8 | -5.8 | 9.1 | 7.2 |
| Indonesia | 4.8 | -2.1 | 3.7 | 5.3 |
| South Africa | 1.4 | -6.3 | 4.9 | 2.0 |
| Ukraine | .. | -3.8 | 3.4 | -29.1 |
| OECD area | | | | |
| Unemployment rate[4] | 7.0 | 7.2 | 6.2 | 5.0 |
| Inflation[1,5] | 1.6 | 1.5 | 3.8 | 9.3 |
| World real trade growth[1] | 3.5 | -8.0 | 10.4 | 5.0 |

1. Per cent; last three columns show the change over a year earlier.
2. Moving nominal GDP weights, using purchasing power parities.
3. Fiscal year.
4. Per cent of labour force.
5. Personal consumption expenditures deflator.

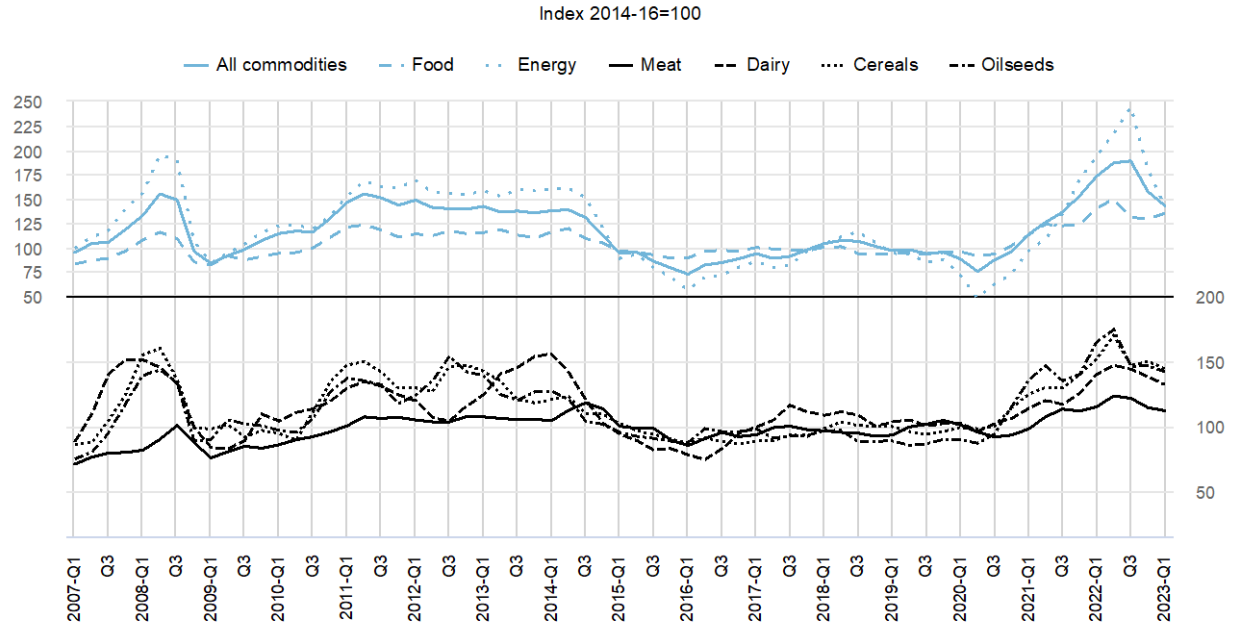
Source: OECD (2023), Economic Outlook N°113 - June 2023, *OECD Statistics Database*, https://stats.oecd.org/Index.aspx?lang=en&SubSessionId=943670ea-b9e0-4eb4-9447-2347c99584f5&themetreeid=4.

108. Inflation was driven notably by prices for energy and food. Energy prices, which had doubled already in 2021 relative to the comparatively low levels in 2020, rose by a further 64% year on year in 2022 and began to fall only in the last third of the year (Figure 2.1). Sanctions against Russia following its war against Ukraine, Russia's decision to suspend gas deliveries to EU Member States and the continued relatively robust economic growth have contributed to lower supplies and growing demand for primary energy sources. Average prices for natural gas doubled again in 2022, after a 253% increase in 2021. Crude oil also increased by almost 50% year on year. Prices for both declined in early 2023, approaching their pre-pandemic levels.

109. Fertiliser prices, which had almost doubled in 2021, rose further after Russia's invasion of Ukraine and averaged 74% higher in 2022 than in 2021, peaking only in November 2022, before slowly retreating. The run-up in fertiliser prices was driven not only by higher energy prices but also by the high pre-war market share of exports from Russia, Belarus and Ukraine. Potash prices rose by 166% year on year, as Russia and Belarus alone had accounted for more than a third of global potash exports in 2018-20.

110. Food prices had been on the rise before the war, driven by stronger demand due to the rebounding economic activities post-COVID-19, harvest shortfalls in some major producing countries and higher input costs. On average, food prices further increased by 14% in 2022, as lower exports from Ukraine and Russia reduced supply and increased uncertainties on markets already affected by rising energy and fertiliser costs. This increase, while significant, remains lower than the increase observed in 2021 and significantly less pronounced than those for energy or fertilisers, although the extent of price increases differed by commodity (FAO, 2022[71]).

## Figure 2.1. Commodity world price indices, 2007 to 2023




Note: The top part of the graph relates to the left scale, while the bottom part of the graph to the right scale.
Source: IMF (2023), Commodity Market Review, for all commodities, food and energy indices (base year: 2016), www.imf.org/external/np/res/commod/index.aspx; FAO (2023), FAO Food Price Index dataset, for meat, dairy and cereal indices (base period: 2014-16), www.fao.org/worldfoodsituation/foodpricesindex/en.

111. The growth rate of *meat production* slowed from over 4% in 2021 to 1% in 2022. Higher pig meat production in the People's Republic of China (hereafter "China") was a factor for continued growth, as the sector continues to recover from the African Swine Fever (ASF) disease. Production levels in North and South America remained relatively stable, while Europe and Oceania observed a decline in meat output. Rising input costs, the prevalence of animal diseases, and unfavourable weather conditions adversely affected producer margins and disrupted meat production in various parts of the world. This, together with growing import demand, has led to average meat prices rising by more than 10% in 2022, although prices started to decline in the second half of the year as import demand slowed, and in December were only slightly higher than a year earlier.

112. World *milk* production grew by just 0.6% in 2022. Output increased notably in India, Pakistan and China, offset by contractions in Ukraine due to the ongoing war, and in several other countries due to extreme weather events, shortages in labour supply and higher input costs. World dairy prices further increased and peaked in June before declining due to lower import demand. On average, dairy prices in 2022 were almost 20% higher than in 2021.

113. Recovering demand for vegetable oils and rising feed demand for oilseed meals notably in China were met by a 7% increase in oilseed production in 2022/23 compared to the previous season.[20] Record world soybean production was driven mainly by strong output growth in Brazil, while rapeseed production growth factors included its recovery from the very low preceding harvest in Canada and increased output also in Australia and the European Union, among others. In contrast, lower global sunflower seed production is caused mainly by disrupted production in Ukraine. World oilseed prices, already high in 2021, increased sharply in early 2022, peaking at record levels in March before declining by more than 40%

[20] Crop production developments are expressed on a crop year basis.

towards the end of the year. On average, oilseed prices in 2022 were 13% higher than in 2021 as stock-to-use ratios remained low compared to historical levels. Prices for vegetable oils and for meals and cakes rose slightly more strongly, by 14% and 15% respectively.

114. Global cereal production was down by almost 2% in 2022/23, as lower production of coarse grains and rice more than offset a slight increase in global wheat output. Reductions in coarse grains were mainly driven by declining maize harvests in the European Union, Ukraine and the United States, and lower sorghum production in the United States, more than offsetting higher global barley production. Production in the European Union and the United States was down also for rice, but the global decline was mainly due to weather conditions in southern Asia, while other parts of Asia and Africa saw some increased output. A 40% drop in Ukraine's wheat output and declining production also in several other countries were more than offset by significant recovery from the previous harvest in Canada and a second record harvest in a row in Australia, among others. Overall, cereal prices increased by 18% year on year, with barley, maize and wheat prices rising particularly strongly, while rice prices on average remained largely unchanged. Prices have declined somewhat following the implementation of the Black Sea Grain Initiative,[21] allowing significant amounts of grains to be exported through three key Ukrainian ports.

115. Sugar production increased as a result of a significant recovery in Brazil's output, the world's largest sugar producer and exporter, and increased production notably in Australia, China and Thailand, which more than offset declines in the European Union, India and Pakistan. Overall, global sugar production increased by more than 4% in 2022/23 and exceeded slightly increasing sugar demand, driven among others by population growth and urbanisation in Africa and growing demand from the processing industry in Asia but limited by lower economic growth. International sugar prices, which peaked in April, declined thereafter, but rebounded strongly since October 2022. On average, prices in 2022 were 5% higher than in 2021, a much less pronounced increase compared to other food commodities and dampened by the global supply surplus.

116. Overall, average farm receipts (including budgetary transfers from agricultural policies) across the 54 countries covered in this report, which have been rising continuously since 2016, are estimated about 5% higher[22] than in 2021, mostly driven by higher international commodity prices. This increase is slightly above the average growth during the decade preceding the COVID-19 pandemic, but lower than growth in the two years of the pandemic. This suggests that on average, farm revenues have not only proved relatively resilient vis-à-vis the COVID-19 pandemic but also against the implications of the war in Ukraine. However, farmers also faced significant increases in the prices for key production inputs such as fertilisers and fuels, meaning that production margins and incomes have likely developed less favourably than revenues.

## Policy responses to the war in Ukraine and to inflationary pressures more generally

117. As supply chains were recovering from the COVID-19 pandemic, inflationary pressures and the outbreak of war had profound impacts on global agro-food systems in 2022. World prices for grains and oilseeds rose as tensions escalated and spiked following the outbreak of war (OECD/FAO, 2023[72]). These effects were particularly important for commodities such as wheat, barley, maize and sunflower oil for

[21] The Initiative on the Safe Transportation of Grain and Foodstuffs from Ukrainian ports, also known as Black Sea Grain Initiative, is an agreement between Russia and Ukraine facilitated by Türkiye and the United Nations and creating procedures to safely export grains from certain Ukrainian ports, after Russia had blocked such exports following its invasion of Ukraine. The agreement was originally signed in July 2022 for a period of 120 days and renewed several times thereafter. The initiative was not renewed after its third term, which expired on 17 July 2023.

[22] This refers to total gross farm receipts expressed in current US dollar.

which Ukraine is among the largest global exporters (more context on Ukraine's importance to global agricultural markets is provided in Box 2.1). Input costs such as for fertiliser and energy also rose due to reduced global supply. Russian exports of natural gas declined following the outbreak of war, and supply concerns prompted some producing countries to restrict exports of fertiliser to ensure domestic availability.

118. Policy responses to these global challenges were introduced by most countries covered in this report in 2022. These included direct support measures to farmers, consumers, and food processors; measures dealing with fertiliser supplies and prices; measures to facilitate imports and restrict exports of critical materials. Countries also introduced measures to improve the prospects for Ukrainian agriculture.

### Box 2.1. Impacts of the war on Ukraine's agricultural sector

On 24 February 2022, Russia started its large-scale invasion of Ukraine which marked the beginning of the largest military conflict in Europe since World War II. The war has caused significant damage to Ukraine's economy which shrank by close to 30% in 2022.

Agriculture accounted for more than 10% of total GDP and almost 15% of employment in Ukraine prior to the war, but production and trade have fallen considerably since. The impacts on the sector include damage to infrastructure and material, labour shortages, loss of productive land, direct loss of production, shortage and high costs of agricultural inputs, and reduced export capacity, among others.

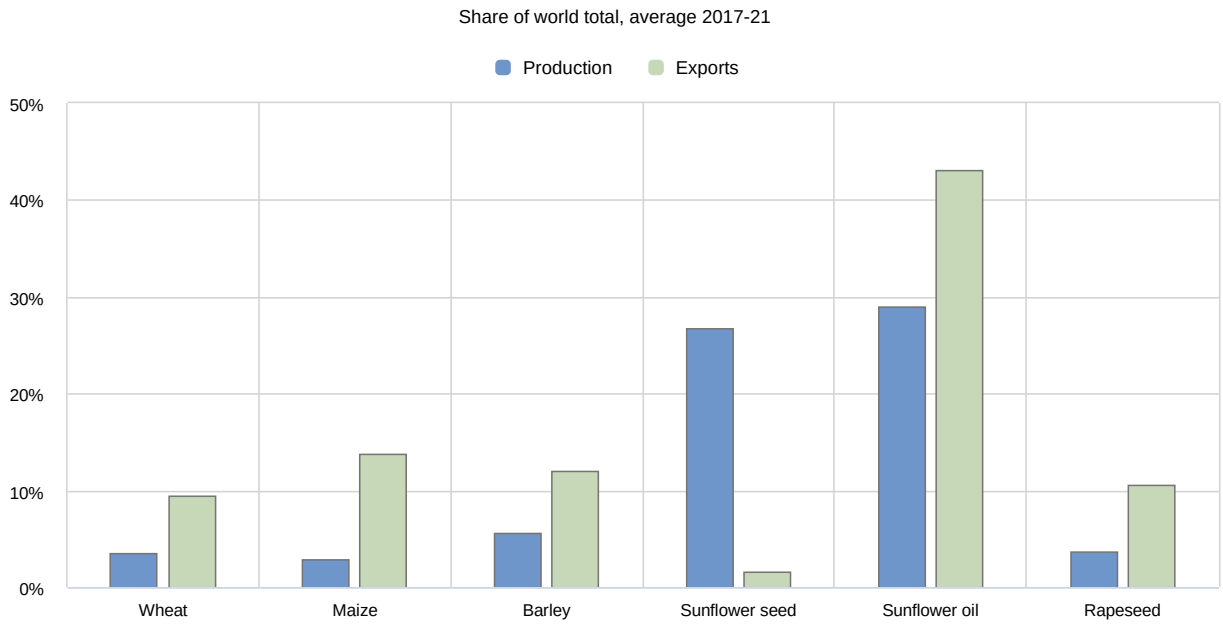
More than USD 6.6 billion in agriculture and land resources have been damaged or lost (Kyiv School of Economics, 2023[73]). This includes agricultural machinery and equipment on farms along with infrastructure such as elevators and grain storage. More detailed estimates as of September 2022 suggest that 6.5 million tonnes of storage capacity had been destroyed, with another 2.9 million tonnes of capacity having been partially damaged (Kyiv School of Economics, 2022[74]).

Agriculture may have lost up to 15% of its labour force[1] as many former farm workers now serve in the Ukrainian military. Land use is imperilled too as agricultural land has become part of the battleground, impacted by artillery strikes and land mines that make sowing and harvesting potentially life-threatening tasks. This touches farms not only in areas close to the combat zones but in large parts of the country.[2] Estimates of the area affected differ widely, ranging from just over 1% of Ukraine's farmland[3] to as much as 30% of the country's territory, including in several highly agriculture dependent regions[4], with other estimates falling in-between.[5] High concentrations of toxins from munitions and fuel pose an additional threat to agricultural land. At least 10.5 million hectares of agricultural land in Ukraine could be degraded, equivalent to a quarter of its total farm land.[6]

Economic losses to agriculture go well beyond destroyed or damaged property and were estimated to exceed USD 34 billion as of October 2022 (Kyiv School of Economics, 2022[75]), which would correspond to one-sixth of the country's GDP in 2021. These losses include the effects of reduced crop production in 2022 (more than USD 11 billion), expected production shortfalls in the winter crop 2023 (USD 3 billion), livestock losses, higher input costs (notably for diesel and fertilisers, close to USD 1 billion) and depressed output prices due to disruptions in logistics and export facilities (more than USD 18 billion).

Before the war, Ukraine was an important producer and exporter of agricultural products, notably grains and vegetable oil. Over the five years preceding the war, Ukraine produced 4% of the world's wheat, 3% of its maize and 6% of its barley. However, Ukraine's shares in global exports were multiples of those at 9%, 14% and 12%, respectively (Figure 2.2), placing the country among the top five exporters for these commodities. The country's importance was even higher in some oilseeds, with production of sunflower seed exceeding 25% of the world total. Ukraine was the world's largest exporter of sunflower oil, originating 43% of global sunflower oil exports. Due to the very good harvest in 2021, shares in the year just preceding the war were even higher.

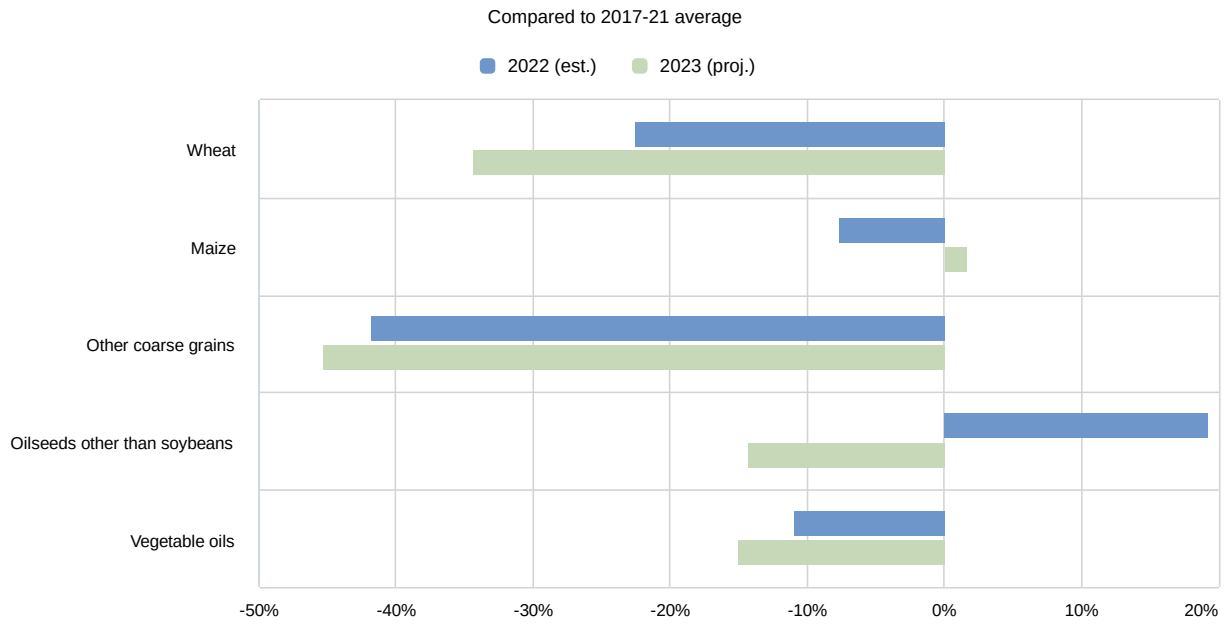
## Figure 2.2. Ukraine's share in global production and exports of selected agricultural commodities




Source: FAO (2023[76]; 2023[77]).

The combined production of wheat, maize, barley and sunflower seed could fall by between one-fifth and one-third relative to this five-year average due to the war, and by between one-third and a half relative to the year preceding the war.[7] Total agricultural production in 2022 is estimated to have been about 28% below its 2021 level.[8] This, combined with the damage to infrastructure and blockage of ports, significantly hinders Ukraine's exports of these products. While data for the full marketing year following the invasion remain incomplete, exports of agricultural commodities are estimated to have fallen significantly in the 2022 marketing year and to be lower still in 2023 (OECD/FAO, 2023[72]), with future developments strongly depending on the continuation of the Black Sea Grain Initiative (Figure 2.3). Wheat and barley (the most important cereal in "other coarse grains") exports are most strongly affected. Due to damage to infrastructure, more sunflower seed was exported rather than processed domestically in 2022, leading to some increased oilseed exports compared to historical averages.

## Figure 2.3. Ukraine's exports 2022 and 2023 of selected agricultural commodities




Source: OECD/FAO, (2023[72]).

1. https://www.reuters.com/world/europe/ukraine-farms-lose-workers-war-complicating-tough-harvest-2023-05-08/
2. https://edition.cnn.com/2023/03/27/europe/farmers-land-mines-clearance-ukraine-russia-invasion-intl-hnk/index.html
3. Forbes Ukraine as reported by (USDA, 2023[78]).
4. Ukrainian authorities as reported by (UNOCHA, 2023[79]).
5. The Yale School of Environment estimates that "some 15 percent of farmland in Ukraine has been littered with land mines" (https://e360.yale.edu/digest/russia-ukraine-war-environmental-cost-one-year), an assessment that is backed up by (GLOBSEC, 2023[80]) and by the Agrarian Committee of the Parliament, as cited by d'Istria (2023[81]), which in March 2023 spoke of about 5 million hectares of farmland that would be unusable due to landmines, explosive remnants and continued combat.
6. Ukraine's Institute for Soil Science and Agrochemistry Research. https://www.reuters.com/world/europe/soils-war-toxic-legacy-ukraines-breadbasket-2023-03-01/.
7. Estimates by USDA and the Ukrainian Grain Association (Martyshev, Nivievskyi and Bogonos, 2023[82]).
8. State Statistics Service and the Ministry of Agrarian Policy and Food of Ukraine.

### *Many countries introduced or increased support for rising input costs….*

119. The rising costs of farm inputs were a global concern for farmers and policymakers responded with a number of different types of support to assist. Some countries introduced policy support targeting specific inputs, such as the **Philippines** which provided fuel discount vouchers to farmers. Others provided support to specific industries. For instance, **China** provided three rounds of direct subsidies to grain farmers between March and August 2022. Certain provinces also provided additional area and/or production payments to encourage higher production of soybean and intercropping of maize and soybean. **Japan** provided payments to livestock farmers to compensate for higher feed costs.

120. Countries also introduced more general support to compensate for rising input costs. For instance, **Canada** increased the interest-free limit on loans under its *Advance Payment Program* for 2022 and 2023, providing interest rate relief to participating agricultural producers. **Colombia** provided input cost support

to small-holder farms through a 20% refund on the value of purchases of agricultural inputs. **Iceland** increased existing payments and introduced new payments to accommodate increased production costs. **Norway** similarly increased the size of its annual support package to farmers by a substantial amount, including one-off exceptional payments to compensate for rising input costs. **Korea** provided tax relief to farmers and direct compensation for higher feed and fertiliser prices. In the **United Kingdom**, the government of Northern Ireland expedited the delivery of direct payments to assist farmers with cash flow.

121. The **European Union** implemented an aid framework allowing individual Member States to implement direct support to farmers and rural areas; exceptional market measures; actions to foster the overall resilience of the sector; and exceptional flexibilities in the use of CAP funding. EU Member States implemented their own suite of support measures, such as tax concessions, investment assistance, and allowances to consumers and farm households to help farmers and agro-food enterprises cope with the financial impacts.

### *…including support to farmers for fertiliser*

122. Fertiliser supply was of particular concern for many countries and led to many measures to attempt to either reduce costs to farmers or dependence on fertiliser. For instance, **Chile** both provided fertiliser and gave per hectare payments to compensate for rising variable input costs as part of the country's *Sow for Chile (Siembra por Chile)* programme. **India** increased its fertiliser subsidies twice during 2022 and **Mexico** increased its subsidy by 16-fold across 2022 and 2023. The **Philippines** implemented subsidies for fertiliser in the form of fertiliser discount vouchers as part of its *Plant, Plant, Plant Part 2* programme. **Switzerland** released 20% of its strategic reserves of fertiliser in 2021 in response to early supply difficulties in international and kept the measure in place throughout 2022 to mitigate the market effects of Russia's war of aggression, equal to roughly one third of the country's annual needs for crop production. **Japan** subsidised transportation and storage costs for fertiliser manufacturers to compensate for costs associated with changing suppliers. The **United States** announced the new *Fertiliser Production Expansion Program* to increase domestic fertiliser availability.

123. **Internationally**, a group of countries announced the Global Fertiliser Challenge in 2022. The challenge seeks to both strengthen food security and reduce agricultural emissions by advancing fertiliser efficiency and alternatives in low-and middle-income countries. It hopes to achieve this challenge through innovation and knowledge sharing on fertiliser-efficient farming practices. US and European officials announced at the 2022 United Nations Climate Change Conference (COP27) that USD 135 million in funding had been raised for the effort.

### *Some countries suspended environmental requirements to encourage domestic production*

124. Several countries made decisions to postpone the implementation of sustainability measures as a response to food security concerns stemming from the war in Ukraine. The **European Union** adopted an exceptional flexibility to allow agricultural production on fallow land while still maintaining the full level of the associated income support payments. This option was taken up by several EU Member countries, including **Austria**, **Belgium** (Wallonia), the **Czech Republic**, **France**, **Germany** (partly), **Italy**, Latvia, **Luxembourg** and **Poland**. **Switzerland** similarly postponed measures to fallow cropland for the promotion of biodiversity by one year.

### *Additional support was provided for agricultural consumers*

125. Rising inflation and cost of living was an issue for many countries in 2022. Some countries introduced measures to specifically aid agricultural consumers. For instance, **China** began releasing strategic supplies of pig meat with the objective of stabilising prices. The government in the **Philippines**

imposed price ceilings for staple foods such as milk, beef, poultry and pork in an effort to counter food price inflation. In the **United States**, additional food assistance was provided for children in eligible families as part of the *Consolidated Appropriations Act*. Many more countries introduced other measures that were not agriculture-specific and increased consumer incomes. These included actions such as reducing various taxes; raising minimum wages and welfare payments for the poorest in society; energy price caps; and one-off cash payments.

126. Other countries implemented policies to assist processing firms who use agricultural products as inputs. For instance, **Japan** subsidised the costs of food producers to develop, manufacture, and source materials for new food products. **Belgium** introduced emergency changes to labelling regulations allowing food producers to more easily change the composition of food products and still abide by labelling requirements.

### *Trade restrictions were eased on some imports….*

127. Several countries sought to make importing inputs and food easier to avoid domestic shortfalls. **Brazil** temporarily suspended some agricultural tariffs from non-Mercosur countries, including on maize, soybeans, soymeal and soy oil. **China** signed a protocol to allow imports of maize from Brazil as part of its strategy to diversify its import sources of key commodities. **Colombia** removed tariffs on all agricultural inputs and 163 basic household consumer products. **Mexico** similarly exempted tariffs on imports of 5 strategic agricultural inputs and 21 basic consumer goods. **Switzerland** reduced tariffs on animal feed imports from 15 March 2022. Some **EU** Member States made use of existing flexibility in EU legislation to make imports of animal feed easier, for example **Spain** relaxed maximum residue limits for pesticides in maize. **Korea** reduced the tariff rate to 0% for wheat and flour imports within quota to alleviate upward pressure on prices, and increased the quota for unhulled barley, wheat hull and root vegetables to secure supplies of feed.

128. Countries also facilitated trade as a way of providing economic support for Ukraine. **Australia, Canada, Iceland, the European Union,** the **United Kingdom** and the **United States** all implemented temporary exemptions from tariffs on agricultural products imported from Ukraine.

### *….but trade restrictions were increased on some exports*

129. **India** introduced export bans, duties or permits on commodities such as rice, wheat, sugar and related products. **China** imposed a ban on state-owned phosphate producers from exporting phosphate starting from October 2021 until June 2022 and introduced a new requirement for inspection certificates to ship fertilisers. In addition, a quota limiting total phosphate exports to 3.16 million tonnes was introduced for the second half of 2022. **Mexico** introduced a 50% export tariff on white maize for human consumption.

### *Countries also provided support for Ukraine and Ukrainian agriculture*

130. Along with domestic measures to assist with the fallout from the war, many countries also took steps to support Ukraine. As mentioned in Box 2.1, Ukraine was a significant exporter of grain and oilseeds before the war and exports were significantly hampered following its outbreak. To assist with the challenges, the Black Sea Grain Initiative was brokered with the assistance of **Türkiye** and the United Nations to allow Ukraine to resume exports of grain through the Black Sea. A Joint Coordination Center with officials from Türkiye, Russia and Ukraine and the United Nations was set up in Istanbul to oversee shipments of grain from three Ukrainian Black Sea ports. The **European Union** also assisted in establishing “Solidarity Lanes” to ensure Ukraine can export grain and import essential goods, such as animal feed, fertiliser, and humanitarian aid. The “Solidarity Lanes” and the Black Sea Grain Initiative allowed the export of about 25 million tonnes of Ukrainian grain, oilseeds and related products between May 2022 and the end of October 2022 (EC, 2022[83]). Despite these initiatives, logistics costs and

bottlenecks have caused a larger-than-usual amount of Ukrainian grain to be marketed in neighbouring countries. In April 2023, **Poland, Bulgaria, Hungary,** and the **Slovak Republic** all introduced measures to ban imports of a range of agricultural products from Ukraine as a result. An agreement was soon made following intervention from the European Commission which keeps the import bans in place but allows Ukrainian grain to transit through these countries for export elsewhere. **Romania** joined this agreement later in April.

131. Countries worked together with private companies and international organisations to aid Ukraine with seed and infrastructure investments. In February 2023, the **United States** (through the US Agency for International Development, USAID) and biotechnology company Bayer provided a joint donation of 13.5 tonnes of high-quality vegetable seeds to Ukrainian farmers in advance of planting season. USAID also partnered with agribusinesses Grain Alliance, Kernel and Nibulon to invest USD 44 million in storage and infrastructure expansion to help enable Ukraine to increase its grain shipping capacity. **Japan** partnered with the Food and Agriculture Organisation of the United Nations (FAO) to provide maize and sunflower seeds to agricultural producers and small farms during the 2023 spring-summer season. The **Netherlands** included EUR 40 million (USD 42 million) for the purchase of seed and equipment as part of its 2023 support package for defence and recovery.

132. To help address the challenges related to the large-scale contamination of Ukrainian agricultural land with mines and other explosives (Box 2.1), the **Netherlands** provided EUR 10 million (USD 11 million) for demining as part of its 2023 support package to Ukraine. **Switzerland** also included CHF 7.5 million (USD 8 million) in targeted support for mine clearance in Ukraine over the next few years as part of its "Action Plan on Mine Action 2023-2026

133. The **United States** and Ukrainian agricultural ministries issued a memorandum of understanding to co-operate on areas of productivity data, shared expertise and guidance on new technologies, and enhanced co-operation on bilateral trade and post-conflict capacity building. To date, technical assistance and other initiatives have been launched in the areas of animal health, biosecurity, sanitary and phytosanitary capacity building, agricultural and trade policy, wildfire control, water management, and preventing illegal deforestation.

134. The **European Union** activated the *Temporary Protection Directive*, granting access to labour market, housing, education and healthcare across the European Union to over 4 million people fleeing the war. **Poland** extended the admissible period of employment for Ukrainian citizens involved in harvest assistance. The **Czech Republic** supported inclusion of Ukrainian scientists, and students in research teams, including providing CZK 6 million (USD 269 224) to subsidise salaries of Ukrainians joining certain projects in agriculture, forestry, fisheries and aquaculture.

135. In addition to these activities, the OECD launched its Ukraine Country Programme to support Ukraine's agenda for reform, recovery and reconstruction, including related to agriculture (Box 2.2).

### Box 2.2. OECD Ukraine Country Programme

The OECD and the government of Ukraine launched a four-year Country Programme that will support Ukraine's agenda for reform, recovery and reconstruction and will help Ukraine advance its ambitions to join the OECD and the European Union. The programme will enable Ukraine to leverage OECD expertise and best practices, strengthen institutions, and build capacity for successful policy reforms aligned with OECD standards and best practices. It will consist of reviews and other projects resulting in policy recommendations and capacity building activities; legal instruments for Ukraine to advance alignment with the Organisation's standards; and targets to enhance Ukraine's participation in OECD bodies.

Together with energy, agriculture will be one of the two focus areas of sectoral policy work within the programme. The OECD has monitored developments in Ukraine's agricultural policy and provided recommendations and analysis as part of this publication since 2004 and will continue to do so into the future. The programme intends to build upon this work as the situation in Ukraine stabilises to conduct an OECD Agricultural Policy Review. Ukraine could also consider being a potential new member of the Co-operative Research Programme: Sustainable Agricultural and Food Systems.

Note: Further information about the Ukraine Country Programme is available at https://www.oecd.org/mcm/documents/Ukraine-Country-Programme.pdf.

## Other recent developments in agricultural policies

136. While policies for agriculture and food have been strongly influenced by the war in Ukraine, not all policy changes introduced in 2022 were related to the war situation. This section provides a summary of some other major trends in agricultural policies implemented by countries. More details on specific policies are available within the relevant country chapters.

### *Several countries implemented changes to their policy frameworks*

137. A number of countries updated their policy frameworks for agriculture during the year. The **EU** *Common Agricultural Policy* (CAP) for 2023-27 entered into force in January 2023. This new CAP is built around ten specific objectives: ensuring fair incomes for farmers; increasing competitiveness; improving the position of farmers in the food chain; climate change action; environmental care; preserving landscapes and biodiversity; supporting generational renewal; vibrant rural areas; protection of food and health quality; and fostering knowledge and innovation. Under the new CAP, Member States play a key role in designing and implementing their *CAP 2023-27 Strategic Plans* to achieve EU-level objectives. **Canada** agreed on its new five-year agricultural policy framework for 2023-28, called the *Sustainable Canadian Agriculture Partnership*. The framework focuses on five priorities: climate change and environment; market development and trade; building sector capacity, growth, and competitiveness; resiliency and public trust; and science, research and innovation.

138. In **Colombia**, the new administration introduced the *Towards Agriculture for Life (Hacia Una Agricultura Para La Vida)* development plan for 2022-26. The plan focuses on five key strategies of comprehensive land reform; addressing inequalities facing indigenous, black, women, and young people in the sector; environmental protection and sustainability; market inclusion on agricultural value chains; and a territorial approach. In the **United Kingdom**, both Wales and Northern Ireland introduced new policy framework documents. The *Agriculture (Wales) Bill* was introduced by the Welsh parliament setting the overarching framework for future support for agriculture with a major focus on sustainable land management. The Northern Ireland ministry published the *Future Agricultural Policy Decisions* report along with 54 policy decisions on the future of agricultural support. The **Philippines** published the *National Agriculture and Fisheries Modernisation Plan* that serves as the directional plan for the agricultural sector for the next decade.

139. **Argentina** launched the *Plan GanAr* with the aim of contributing to the sustainable development of Argentine livestock. **Australia** drafted the *National Agricultural Traceability Strategy 2023-28* and its five-year implementation plan. The strategy aims to develop connected, aligned and interoperable world-class traceability systems along supply chains to accelerate premium Australian exports and enhance biosecurity and food security. The **United States** introduced a new rule, *Requirements for Additional Traceability Records for Certain Foods,* which establishes traceability recordkeeping requirements for

participants in supply chains of certain foods in an effort to facilitate rapid identification and removal of potentially contaminated food from the market.

140. **Costa Rica** reduced market price support and liberalised trade in paddy and milled rice in 2022 as part of its *Rice Path* strategy. In 2023, the government unveiled a new public policy governing the agricultural sector for 2023-32 aiming for greater prominence of Costa Rican products in international markets; creating decent jobs; and improving living conditions. **Israel** similarly underwent important sector reforms for egg, dairy and beef production, and limited tariffs on selected produce. Production quotas for eggs and dairy target price mechanisms will be progressively phased out over time, while tariffs for chilled beef were eliminated and replaced with direct payment compensation and branding investments. Tariffs were also cut on selected fruits and vegetables and agricultural inputs.

### *Some countries increased their climate mitigation ambitions*

141. Countries unveiled new measures relating to climate change. Chapter 1 of this publication provides a detailed discussion of the many adaptation policies implemented by countries. However, several countries also took further steps to mitigate the contribution to climate change of their agricultural sectors. **Australia** invested new funds into discovering technological solutions to reduce agricultural emissions and announced knowledge transfer initiatives to encourage farmers to participate in carbon markets and integrate low-emission technologies into their operations. **Canada** tabled its *2030 Emissions Reduction Plan* in March 2022 which outlines efforts it is undertaking across all sectors to meet its 2030 emissions target and lay the foundation for achieving net-zero emissions by 2050. **New Zealand** published its first *Emissions Reduction Plan* in May 2022. The plan contains several key actions including the introduction of an agricultural emissions pricing mechanism by 2025, among others. The **United States** launched its initiative *Partnerships for Climate-Smart Commodities* in 2022, providing USD 3.1 billion in funding for 141 pilot projects to expand markets for climate-smart commodities.

142. Several countries also pledged to increase the ambition of their climate mitigation targets. **Australia, India, Norway** and **Viet Nam** all updated their emissions reductions targets, and **Australia, Austria,** the **Czech Republic,** the **Slovak Republic**, and the **United Kingdom** all joined the Global Methane Pledge in 2022. Of the 54 countries covered in this report, 19 have mitigations targets specifically for the agricultural sector. A summary of emissions reductions targets of all 54 countries is provided below (Table 2.2).

## Table 2.2. Emissions reductions targets

| | Economy-wide emissions reduction targets | | Long-term strategy submitted to UNFCCC | Agriculture-specific target (base year/level) | Global methane pledge (reduce global anthropogenic CH4 30% from 2020 levels by 2030) |
|---|---|---|---|---|---|
| | 2030 target (base year/level) | 2050 target | | | |
| Argentina | Max 349 $MtCO_2eq$ | Net zero | Yes | None | Yes |
| Australia | -43% (2005) | Net zero | Yes | None | Yes |
| Brazil | -50% (2005) | Net zero | No | None | Yes |
| Canada | -40-45% (2005) | Net zero | Yes | -30% fertiliser emissions by 2030 (2020) | Yes |
| Chile | Max 95 $MtCO_2eq$ | Net zero | Yes | None | Yes |
| China | Peak $CO_2$; -65% GDP emission intensity (2005) | Net zero by 2060 | Yes | None | No |
| Colombia | Max 169.4 $MtCO_2eq$ | Net zero | Yes | None | Yes |
| Costa Rica | Max 9.11 $MtCO_2eq$ | Net zero | Yes | None | Yes |
| European Union | -55% (1990) | Net zero | Yes | None at EU level | Yes |
| EU Member States | | | 19 out of 27 countries (except Bulgaria, Estonia, Greece, Croatia, Ireland, Italy, Poland, Romania) | 2030 Targets: Belgium -25% (1990); Denmark -55-65% (1990); Germany -31-34% (1990); Spain -18% (2005); France -18% (2015); Ireland -25% (2018); Portugal -11% (2005); Netherlands -3.5 $MtCO_2eq$ | 22 out of 27 countries (except Hungary, Lithuania, Latvia, Poland, Romania) |
| Iceland | -55% (1990) | "Largely neutral" by 2040 | Yes | Carbon neutral by 2040 | Yes |
| India | -45% GDP emission intensity (2005) | Net zero by 2070 | Yes | None | No |
| Indonesia | -32% (BAU); up to -43% conditional on int. support | Net zero by 2060 | Yes | None | Yes |
| Israel | -27% (2015) | -85% from 2015 levels | No | None | Yes |
| Japan | -46% (2013) | Net zero | Yes | 49.5 $MtCO_2eq$ by 2030 | Yes |
| Kazakhstan | -15% (1990) | None | No | None | No |
| Korea | -40% (2018) | Net zero | Yes | -27.1% by 2030; -37.7% by 2050 (2018) | Yes |
| Mexico | -25% (BAU); up to -40% conditional on int. support | None | Yes | -8% by 2030 (BAU) | Yes |
| New Zealand | -50% (2005) | Net zero | Yes | -24-47% reduction in biogenic methane by 2050 | Yes |
| Norway | -55% (1990) | -90-95% (1990) | Yes | Voluntary agreement with agriculture sector: -5 $MtCO_2eq$ by 2030 | Yes |
| Philippines | -2.7% (2020); up to -72% conditional on int. support | None | No | -29.4% by 2030 (BAU) conditional on int. support | Yes |
| Russia | -30% (1990) | Net zero by 2060 | Yes | None | No |
| South Africa | 350-420 $MtCO_2eq$ (BAU 398-614 $MtCO_2e$) | Net zero | Yes | None | No |
| Switzerland | -50% (1990) | Net zero | Yes | -40% by 2050 (1990) | Yes |

| | Economy-wide emissions reduction targets | | Long-term strategy submitted to UNFCCC | Agriculture-specific target (base year/level) | Global methane pledge (reduce global anthropogenic CH4 30% from 2020 levels by 2030) |
|---|---|---|---|---|---|
| | 2030 target (base year/level) | 2050 target | | | |
| Türkiye | -21% (BAU) | Net zero by 2053 | No | None | No |
| Ukraine | -65% (1990) | Net zero by 2060 | Yes | None | Yes |
| United Kingdom | -68% (1990) | Net zero | Yes | -17-30% by 2030; -24-40% by 2035 (2019) | Yes |
| United States | -50-52% (2005) | Net zero | Yes | None | Yes |
| Viet Nam | Reduction of 15.8% (BAU) or 146.3 $MtCO_2eq$ (unconditional distribution); 43.5% or 403.7 $MtCO_2eq$ (conditional distribution with international financing) | Net zero | No | -43% (BAU) by 2030, Decision No. 888/QD-TTg | Yes |

### *Several countries responded to natural disasters with assistance to their agricultural sectors*

143. Several countries that experienced natural disasters implemented direct support to those affected within the agricultural sector. **Argentina** adopted exceptional measures in 2022 and 2023 to compensate territories affected by droughts, fires and frost. In October 2022, provincial governments in **Canada** implemented programmes to provide additional support to agricultural producers significantly affected by Hurricane Fiona. **China** provided disaster relief funds to 13 provinces affected by floods and droughts. Several **EU** Member States, such as **Croatia**, the **Czech Republic**, **France**, **Poland**, **Romania** and the **Slovak Republic** provided disaster relief funding for various adverse weather events in 2022, ranging from droughts, floods, frost, hail, torrential rain, hurricanes, landslides and avalanches. **New Zealand** responded to a record number of weather-related adverse events, including flooding, drought and cyclones, by providing funding for psychosocial support, recovery and clean-up. The **United States** launched two temporary programmes in 2022 to compensate for losses incurred in prior years – the Emergency Livestock Relief Program and Emergency Relief Program.

### *Many worked on policies which will improve environmental sustainability*

144. **Australia** launched several new measures that trial market-based approaches to incentivise landholders to improve biodiversity as part of the *Agriculture Biodiversity Stewardship Package.* These include the *Carbon + Biodiversity Pilot*, and the *Enhancing Remnant Vegetation Pilot.* A *National Stewardship Trading Platform* was also established allowing landholders to plan and evaluate carbon and biodiversity projects, and options are being explored to implement the *Australian Farm Biodiversity Certification Scheme* to certify farm businesses for their biodiversity management. As of 30 April 2023, the **European Union** completed 47 of the more than 100 actions committed to in the EU Biodiversity Strategy intended to halt and reverse biodiversity loss by 2030. Several EU Member States also adopted new regulatory measures to reduce the environmental impacts of agricultural inputs, including **Austria**, **Croatia**, the **Czech Republic**, **France, Poland**, **Romania**, and **Spain**. The **EU** *CAP 2023-27* introduced a new "green architecture" with higher environmental ambitions, including stricter basic requirements (conditionality) in cross-compliance. Twenty-five per cent of the direct payments budget is dedicated to eco-schemes, a new policy tool that has been introduced to incentivise the adoption of farming practices

with additional environmental benefits. These schemes are part of the CAP's long-standing commitment to helping farms make necessary ecological transitions.

145. **Japan** added nine key performance indicators to its 2030 *MIDORI* plan, including zero $CO_2$ emissions from fossil fuels combustion in agriculture, forestry and fisheries sectors; reductions in risk-weighted use of chemical pesticides and chemical fertiliser; and increases in organic farming. In the **United Kingdom**, England launched a programme on sustainable farming standards for arable and horticultural soils, improved grassland soils and the moorlands. Numerous conservation projects were introduced to restore over 40 000 hectares of land to protect and provide habitats for wildlife as part of the *Landscape Recovery* scheme. The **United States** gave a substantial funding increase of approximately USD 20 billion over ten years to various conservation programmes as part of the *Inflation Reduction Act*. New initiatives were also launched in 2022 to assist businesses to transition to organic farming. In 2022, **Viet Nam** approved the *National Green Growth Action Plan for 2021-2030* which includes goals to develop a sustainable and low-emissions agricultural sector that is adaptable in the face of climate change.

### *Countries took steps to foster inclusion in the sector*

146. To improve equity and inclusion, the **United States** undertook several actions focused on improving equity for farmers from minority groups. These include new investments in *Equity Conservation Cooperative Agreements*, funding various outreach and assistance programmes and releasing the USDA Equity Action Plan. **Canada** renewed the *AgriDiversity Program* which aims to reduce barriers to participation for indigenous peoples and increase economic development through capacity building activities. Most **EU** Member States proposed to maintain higher rates of investment support for young farmers and the vast majority include plans for additional income support and installation aid for young farmers in their Strategic Plans. Some **EU** Member States, such as Austria, Germany, Ireland, Italy and Spain, included specific measures supporting rural women in their *CAP 2023-27* Strategic Plans. In particular, **Spain** included direct payments for young female farmers who own or co-own their farm.

### *Countries implemented new programmes for innovation and the modernisation of agriculture*

147. Countries introduced a number of new initiatives aimed at knowledge generation in agriculture. In the **European Union**, the European Commission presented four new partnership programmes as part of its *Horizon Europe Research and Innovation Framework*. These are designed to bring together the European Commission and a consortium of partners, structured around research funders and other public authorities, to tackle some of the European Union's most pressing challenges in agriculture by stimulating public and private investment in research activities.

148. **Korea** announced new innovation measures to enhance smart agriculture, with goals to convert 30% of horticultural and livestock facilities into smart facilities. The **Philippines** approved the *Coconut Farmer and Industry Development Plan*, aimed at modernising the coconut industry and increasing incomes and competitiveness of farmers. **India** introduced new support for the use of drones in agricultural activities to modernise land records, check the state of crops and for pesticide and fertiliser application.

149. Other countries made changes to modernise programme delivery. **Türkiye** made additional efforts to advance digital transformation, including the *Tarim Cebimde* mobile application deployment and the new *Farmer Registration System* which both make it easier to register applications and receive product notifications. The application also provides some functionality for livestock farmers to monitory herd demographics. **Kazakhstan** introduced the *Unified State Information System for Subsidies* to streamline subsidy registration and remove the need for farmers to pay subscription fees to apply for subsidies.

### *New laws and programmes on biosecurity and animal health were introduced*

150. A number of new and ongoing disease outbreaks prompted countries to tighten biosecurity regulations. **Australia** passed the *Biosecurity Amendment (Strengthening Biosecurity) Act 2022* to strengthen the ability to manage and respond to emerging biosecurity risks. **Canada** provided new funding to enhance efforts to prevent African Swine Fever (ASF) from entering the country and to prepare for a potential outbreak. Outbreaks of avian influenza led several **EU** Member States to adopt policies such as bans on outdoor poultry farming (the **Czech Republic**), vaccination programmes (**France**) and compensation payments for affected producers (**France**, **Poland**). In 2022, **Indonesia** declared an outbreak of Foot-and-Mouth disease for the first time in more than 30 years and introduced control measures including decontamination, massive vaccination, and strengthened surveillance on areas with known infections.

151. Measures were also introduced targeting animal welfare. **New Zealand** passed legislation in 2022 ending the export of livestock by sea from April 2023, although with an adjustment period for affected businesses. **New Zealand** also had a ban on battery cages for layer hens come into effect on 1 January 2023 following a period of adjustment since the ban was passed in 2012. In the **United Kingdom**, the *Animals (Penalty Notices) Act 2022* gives ministers powers to impose financial penalties for a wide range of animal health and welfare offences in England and Wales. In the **European Union**, **Austria** and **France** ended the culling of male chicks in egg-laying hen production as of 1 January 2023, one year after **Germany** became the first to do so. **Austria**, **Germany** and **Spain** introduced new rules on the transportation of livestock.

### *Some COVID-19 measures were phased out while new and post-pandemic measures were implemented*

152. Countries generally scaled back some of the support provided in previous years for the COVID-19 pandemic. In June 2022, **Australia** concluded its temporary emergency freight assistance support that had been introduced in response to the collapse of international airfreight capacity during the pandemic. The **EU** rules allowing Member States to introduce COVID-19 aid to affected sectors ended on 30 June 2022.

153. **New Zealand** lifted the annual cap on *Recognised Seasonal Employee Scheme* workers from 16 000 to 19 000 places to address seasonal worker shortages experienced during the pandemic. **China** introduced new disinfection requirements on imports of non-cold chain goods in September 2022. These and other PCR testing requirements were then later removed in December 2022.

### *Progress was made on several trade deals and negotiations*

154. Countries advanced several multilateral agreements in 2022 and early 2023. The Regional Comprehensive Economic Partnership (RCEP) entered into force on 1 January 2022. The agreement covers 15 countries in the Asia-Pacific region including **Australia, China, Indonesia, Japan, New Zealand, the Philippines, Korea** and **Viet Nam**. The agreement foresees reductions to 8.4% of agricultural tariff lines, with an average tariff reduction of 12.8 percentage points. With the introduction of RCEP, around 83% of agricultural tariff lines are either subject to tariff reduction under the agreement or were already at zero (UNCTAD, 2021[84]). The agreement also provides a framework for streamlining rules of origin and border processes for perishable goods, as well as strengthening co-operation in the areas of standards, technical regulations, and conformity assessment procedures.

155. In other multilateral agreements, in 2022 and 2023, **Chile**, Malaysia and Brunei became the final three signatories to ratify the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). The CPTPP eliminates 98% of tariffs in the free trade area and contains a number of provisions on agriculture. These include reduced Japanese beef tariffs; new access for dairy products into Japan,

Canada and Mexico; the elimination of all tariffs on sheep meat, cotton, wool and manufactured products; and some elimination of tariffs on seafood, horticulture and wine. The **United Kingdom** concluded negotiations to join the CPTPP in 2023 pending ratification of their entry from all 11 signatories. **South Africa** also ratified the African Continental Free Trade Agreement.

156. Several bilateral free trade agreements (FTAs) were finalised or came into effect in 2022, helping to facilitate trade in agricultural products. These include: the **Australia-United Kingdom** FTA, the **Australia-India** Economic Cooperation and Trade Agreement, the **Israel-Korea** FTA, the **Cambodia-Korea** FTA, the **Indonesia-Korea** FTA and the **New Zealand-United Kingdom** FTA. Many other FTAs are awaiting ratification, including the **EU-Chile** FTA, the **EU-Mercosur** agreement, the **EU-New Zealand** FTA, and the **Korea-Philippines** FTA. Market access and tariff reductions or phase-outs on agricultural products formed part of most trade agreements. However, products deemed domestically important continue to remain excluded from agreements, such as rice in Korea or wheat, rice and maize in India. The European Union agreements were notable for the novel inclusion of chapters on sustainable food systems, covering co-operation on topics such as animal welfare, food waste, pesticides and fertilisers among others.

## Developments in support to agriculture

157. This section provides an overview on developments in policy support in agriculture, building on the OECD indicators of agricultural policy support that are comparable across countries and time. These indicators show the diversity of support measures implemented across different countries and focus on different dimensions of these policies. Definitions of the indicators used in this report are shown in Annex 2.A, while Figure 2.4 illustrates the links between, and components of, the different indicators.

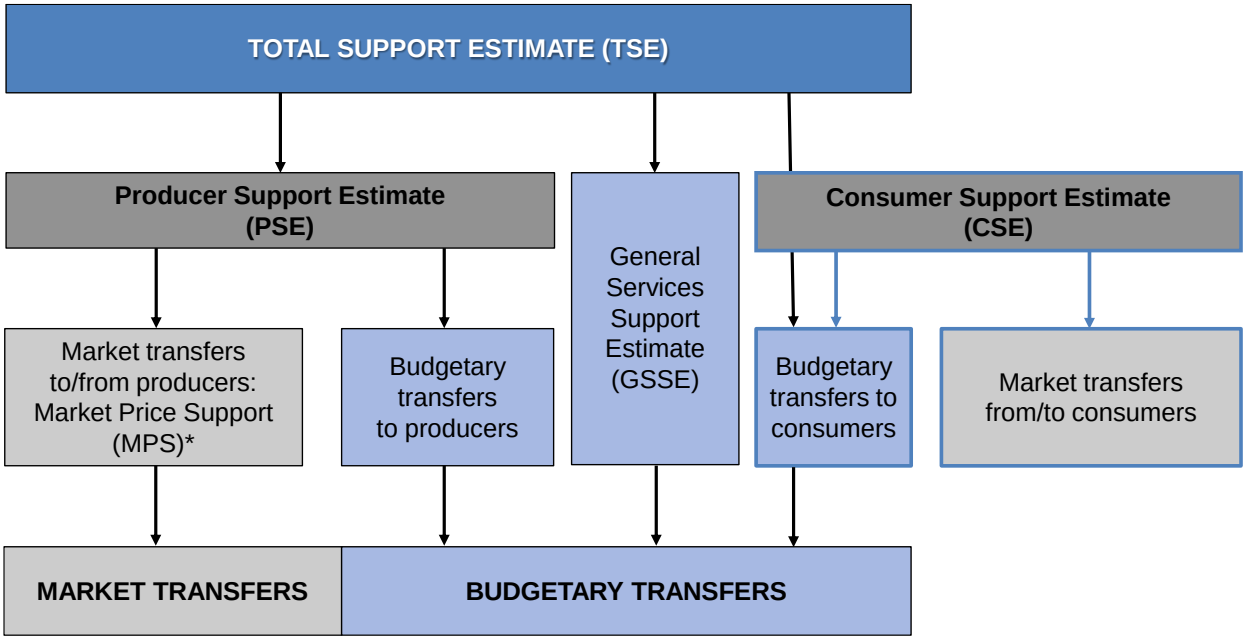
158. The **Total Support Estimate (TSE)** is the broadest of the OECD support indicators. It combines three distinct elements: a) transfers to agricultural producers individually; b) policy expenditures for the primary agricultural sector collectively; and c) budgetary support to consumers of agricultural commodities. The TSE is expressed as a net transfer indicator, including both positive and negative elements.

159. The **Producer Support Estimate (PSE)** measures all transfers to agricultural producers individually. Two major types of transfers can be distinguished: **Market Price Support (MPS)** represents transfers from taxpayers and consumers to agricultural producers through domestic prices that are higher than their international reference prices due to domestic and trade policies. MPS can also be negative, representing transfers from producers to consumers through domestic prices that are lower than references prices. **Budgetary support** is financed by taxpayers only and is further broken down into various categories distinguished by the different implementation of the underlying policies. The PSE indicator is expressed as a net transfer, including both positive and negative elements.

160. The **General Services Support Estimate (GSSE)** measures policy expenditures that benefit the primary agricultural sector as a whole, rather than going directly to individual producers. Different types of expenditures are represented in specific categories of the GSSE.

161. Similarly to the PSE, the **Consumer Support Estimate (CES)** reports support to consumers of agricultural commodities, distinguishes between market transfers that mirror the MPS, and budgetary support. To avoid double-counting, only the budgetary part of the CSE is included in the TSE.

### Figure 2.4. Structure of agricultural support indicators




Note: *Market Price Support (MPS) is net of producer levies and excess feed cost.
Source: Annex 2.A.

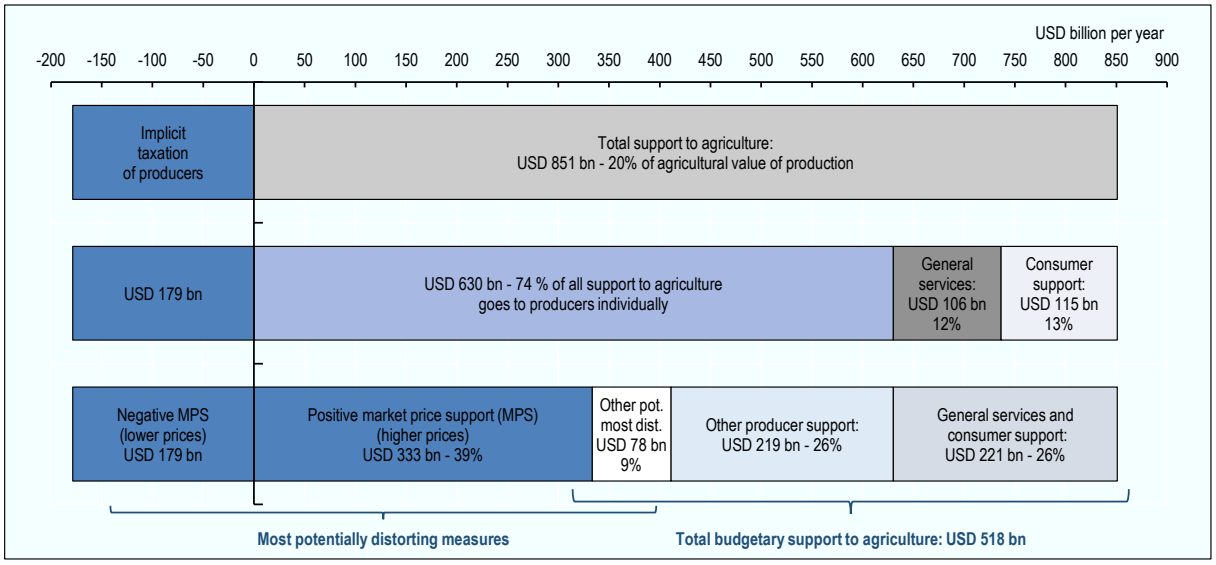
## *Total Support*

*Total support to agriculture remains around record highs despite recommendations for reform*

162. Across the 54 countries covered in this report, total support directed to the sector totalled **USD 851 billion** per year on average over 2020-22 (Figure 2.5). This is considerably higher than the USD 696 billion averaged in the three years preceding it from 2017 to 2019, largely reflecting policy responses to the COVID-19 pandemic, inflationary pressure and fallout from the war in Ukraine. Transfers to producers rose by 20% and budgetary consumer support for agriculture was nearly double in 2020-22 compared to 2017-19. Producer support is estimated to have declined in 2022 due to falling market price support, but still remains higher than pre-pandemic levels.

163. Of the 2020-22 total, USD 630 billion (74% of total support) goes to producers individually either directly from government budgets or implicitly through market price support (MPS). The remainder of support was split nearly equally between support for general services (USD 106 billion, 12.5%) and budgetary transfers to consumers of agricultural products (USD 115 billion, 13.5%). At the same time, some emerging economies implicitly taxed their producers through measures such as export taxes and other actions which suppress domestic market prices. This implicit taxation was valued at USD 179 billion per year on average between 2020-22.

## Figure 2.5. Breakdown of agricultural support, total of all countries, 2020-22

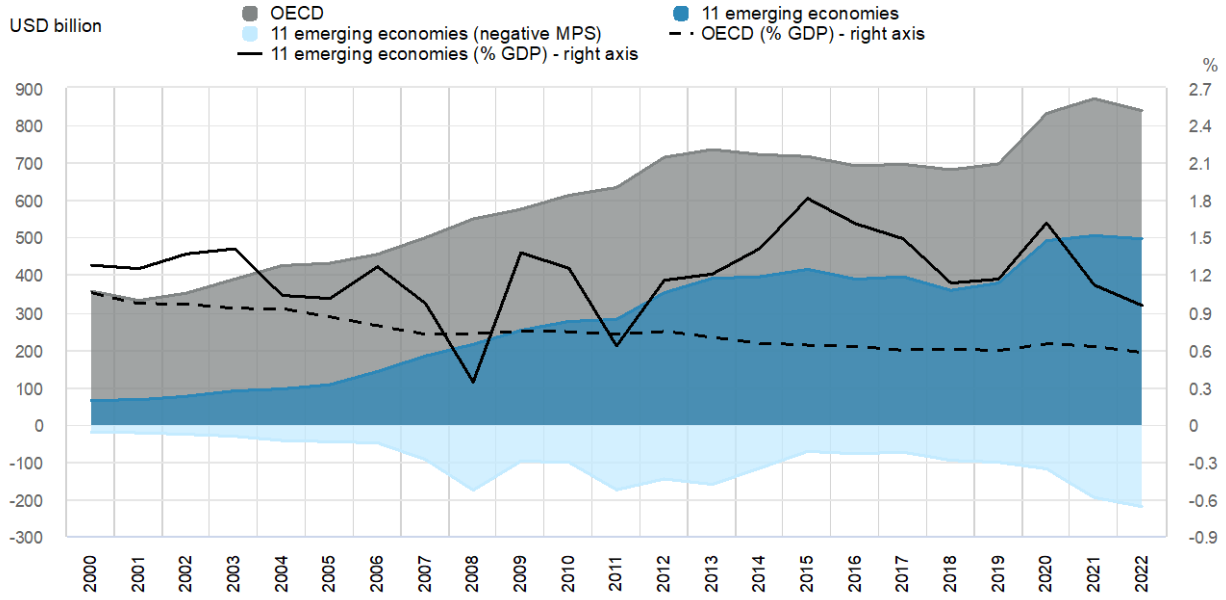



Notes: Data refer to the All countries total, including all OECD countries, non-OECD EU Member States, and the 11 emerging economies. "Implicit taxation" of producers refers to negative market price support, "General services" refers to the General services support estimate, "Consumer support" is transfers to consumers from taxpayers, "Other pot. most dist." refers to the potentially most distorting producer support measures other than market price support (i.e. support based on output payments and on the unconstrained use of variable inputs).
Source: Based on OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

164. Support in countries covered in this report has risen consistently over the past 20 years in nominal terms (Figure 2.6). Much of this rise has been driven by emerging economies where support has increased markedly from averaging USD 68 billion per year in 2000-02 to USD 497 billion per year in 2020-22. China and India account for the vast majority of emerging economy support, valued at USD 310 billion and USD 124 billion, respectively. Agricultural support among OECD countries has grown at a modest rate from a higher base, rising from an average of USD 278 billion per year in 2000-02 to USD 349 billion per year in 2020-22. The United States and the European Union combine for the largest share of OECD support at USD 122 billion and USD 107 billion, respectively, in 2020-22.

165. Despite the rise in nominal support among OECD countries, total support has been declining consistently relative to GDP. Support in the emerging economies covered in this report generally places a higher burden on their respective economies. This reflects the larger relative importance of agriculture to these economies and policy choices.

## Figure 2.6. Evolution of total support to agriculture in OECD and 11 emerging economies, 2000 to 2022




Note: Negative MPS for OECD countries, mostly reflecting adjustments for higher feed costs due to positive MPS for feed commodities, averaged USD 423 million per year between 2000 and 2022, and is therefore too small to be visible on the graph.
The OECD total does not include the non-OECD EU Member States. Latvia and Lithuania are included only from 2004.
The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

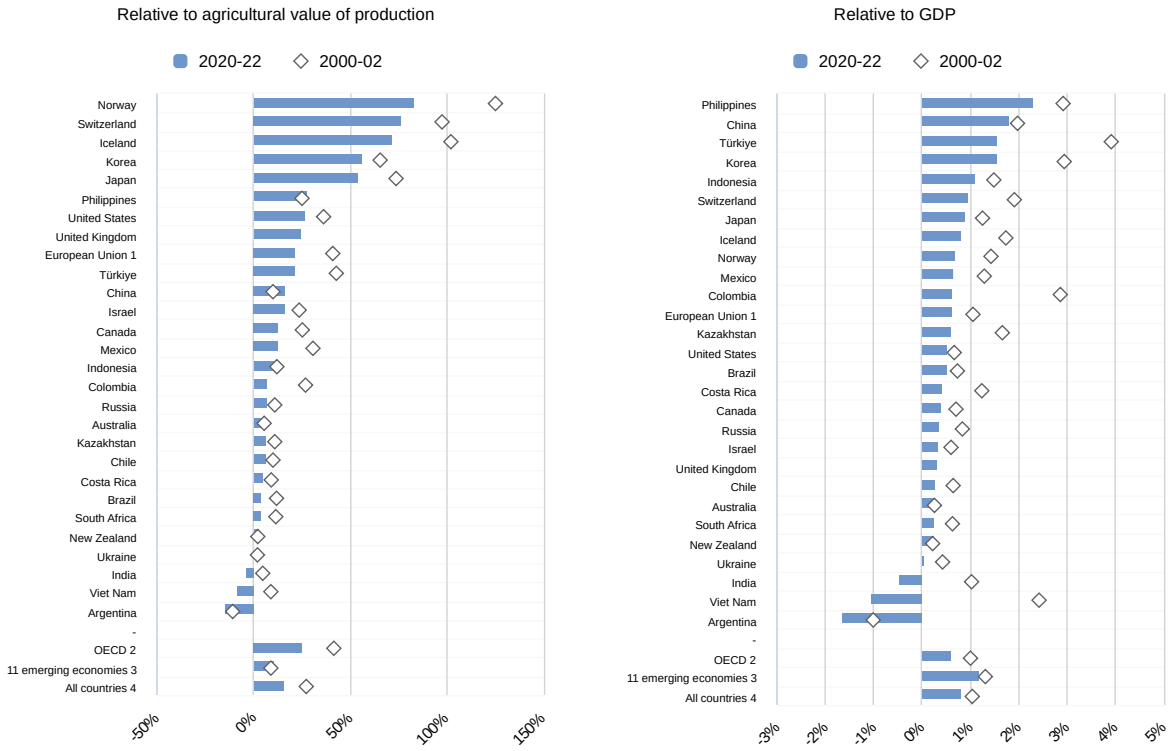
166. Expressing support as a share of the value of production adds important context to the data. For the 54 countries covered by this report, the total positive support provided in 2020-22 was equivalent to 20% of the production value generated by the sector. This represents a decline from 29% of the production value of the sector in 2000-02. Across the OECD area, support as a percentage of the value of production fell from 41% in 2000-02 to 25% in 2020-22. In contrast, this percentage rose across the 11 emerging economies from 13% to 17% over the same time frame. However, including the effects of negative MPS (that is, the extent that countries implicitly tax the sector), this percentage rose from 9% to 11%.

167. The situation varies considerably for individual countries.[23] For example, in 2020-22 support as a percentage of production value was between 72% and 83% in Norway, Switzerland and Iceland; less than 5% in Brazil, South Africa, New Zealand and Ukraine; and negative in India, Viet Nam and Argentina (Figure 2.7). The countries that provide the highest level of support relative to the sector's size are not always those with the highest economic burden of support. This reflects differences in levels of support, levels of economic development and agricultural sector size between countries. For example, countries such as Norway, Switzerland and Iceland have the highest levels of support based on value of production, but because agriculture is a relatively small share of GDP, the economic burden is lower than countries such as the Philippines, China and Türkiye. These latter three countries have the highest support relative to GDP at 2.3%, 1.8% and 1.6%, respectively. In Australia, South Africa, New Zealand and Ukraine,

[23] Any variation in support levels across EU Member States is not presented in the support database OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

support is 0.25% or less of GDP. China and India, the world's two most populous countries, are the largest providers of positive support to agriculture (USD 310 billion and USD 124 billion per year in 2020-22, respectively). However, the countries differ in how the support is provided. China provides almost all of its support to the sector in the form of positive market price support, while India provides high levels of producer payments for the use of variable inputs as well as budgetary support to consumers. Although gross support in India is high, its policies suppressing domestic prices result in negative net support to the agricultural sector.

## Figure 2.7. Total Support Estimate by country, 2000-02 and 2020-22




Notes: Countries are ranked according to TSE relative to the value of agricultural production (left panel) and relative to GDP (right panel) in 2020-22, respectively.
1. EU15 for 2000-02, EU27 and the United Kingdom for 2020, and EU27 from 2021.
2. The OECD total does not include the non-OECD EU Member States. Latvia and Lithuania are included only for 2020-22.
3. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
4. The All countries total includes all OECD countries, non-OECD EU Member States, and the Emerging Economies.
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

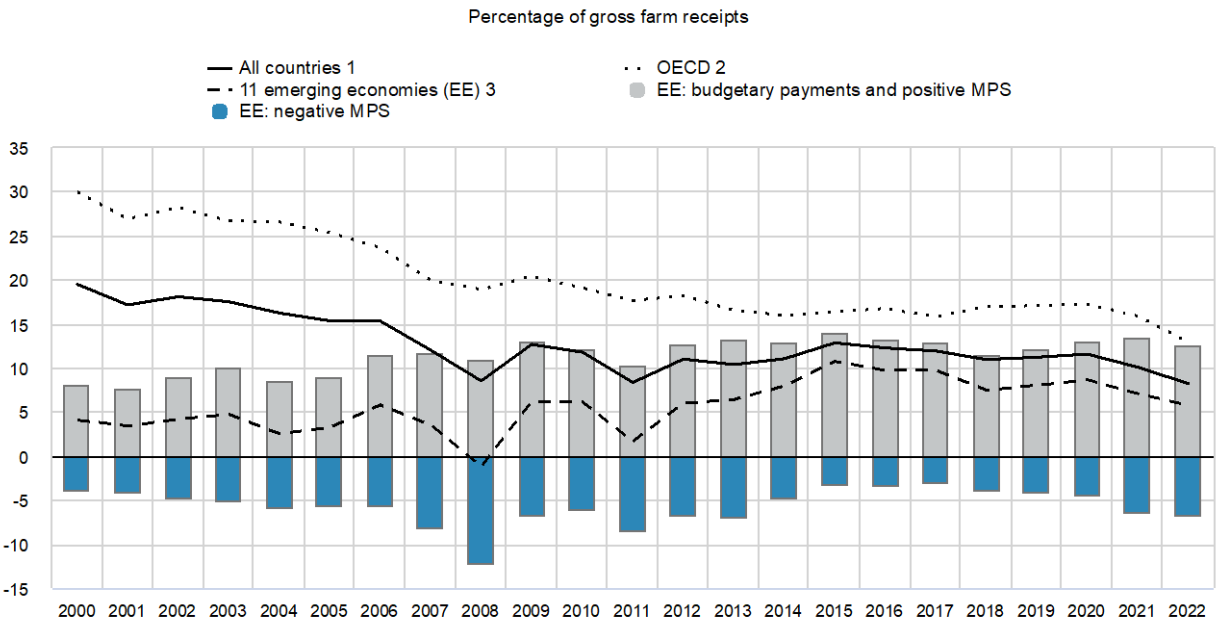
### *Producer Support*

*Reform to producer support has stalled in recent years*

168. Preliminary estimates for 2022 across the 54 covered economies indicate that the level of support to individual producers declined for a second year when measured relative to gross farm receipts (an indicator referred to as **%PSE**). This decline largely reflects an estimated decline in market price support (and increase in negative market price support) due to rising world prices rather than substantial policy reforms. On a three-year average, the %PSE across the 54 countries equalled 10% of gross farm receipts in 2020-22, relatively unchanged from 2010-12 and down from 18% in 2000-02.

169. Producer support among OECD countries has been in long-term decline. However, the rate of decline has slowed since the early 2010s (Figure 2.8). OECD producer support averaged 15% of gross farm receipts in 2020-22, compared to 18% in 2010-12 and 28% in 2000-02. Levels of producer support among the 11 emerging economies rose markedly starting in the 2010s before stabilising at about half the OECD average. The average %PSE in these economies averaged 7.1% in 2020-22, compared to 4.5% in 2010-12 and 3.9% in 2000-02. However, these figures for average support to producers include the effects of negative market price support. Countries such as Argentina, India and Viet Nam employ measures such as export taxes or other programmes which implicitly tax producers by suppressing domestic prices. Excluding negative market price support, the %PSE among emerging economies was 13.0% in 2020-22, close to but still below the OECD average, while across all 54 countries, the positive producer support corresponded to 13.7% of gross farm receipts.

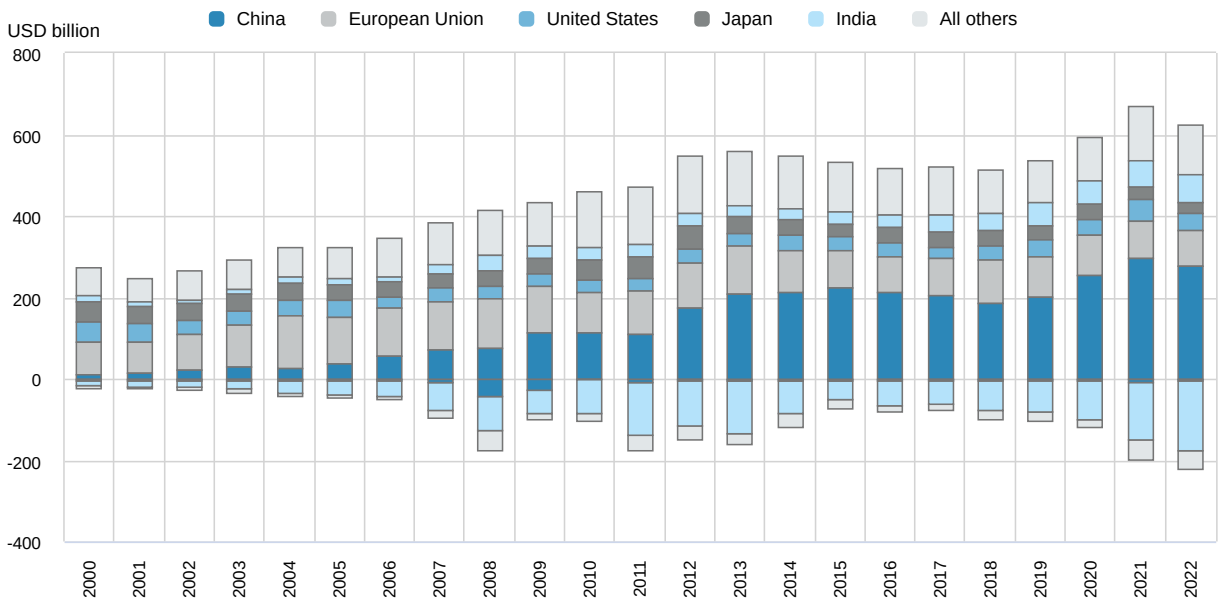
## Figure 2.8. Evolution of the % Producer Support Estimate, 2000 to 2022




Notes: The two bars relate to the 11 Emerging Economies and represent a decomposition of PSE into its positive and negative parts.
1. The All countries total includes all OECD countries, non-OECD EU Member States, and the 11 emerging economies.
2. The OECD total does not include the non-OECD EU Member States. Latvia and Lithuania are included only from 2004.
3. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

170. Only four economies – China, Japan, the European Union, and the United States – account for roughly 70% of all positive producer support over the past 20 years. However, the relative shares among these economies have changed dramatically over this time (Figure 2.9). In 2000-02, the European Union[24] accounted for the largest share with 30% of all positive producer support, followed by Japan (17%), the United States (17%) and China (7%). In 2020-22, China now represents just under 44% of producer support, followed by the European Union[25] (15%), United States (7%) and Japan (5%). India has accounted for a majority and growing share of all implicit taxation among countries, from 61% of all negative support in 2000-02 to 76% in 2020-22.

## Figure 2.9. Producer support by country, 2000 to 2022



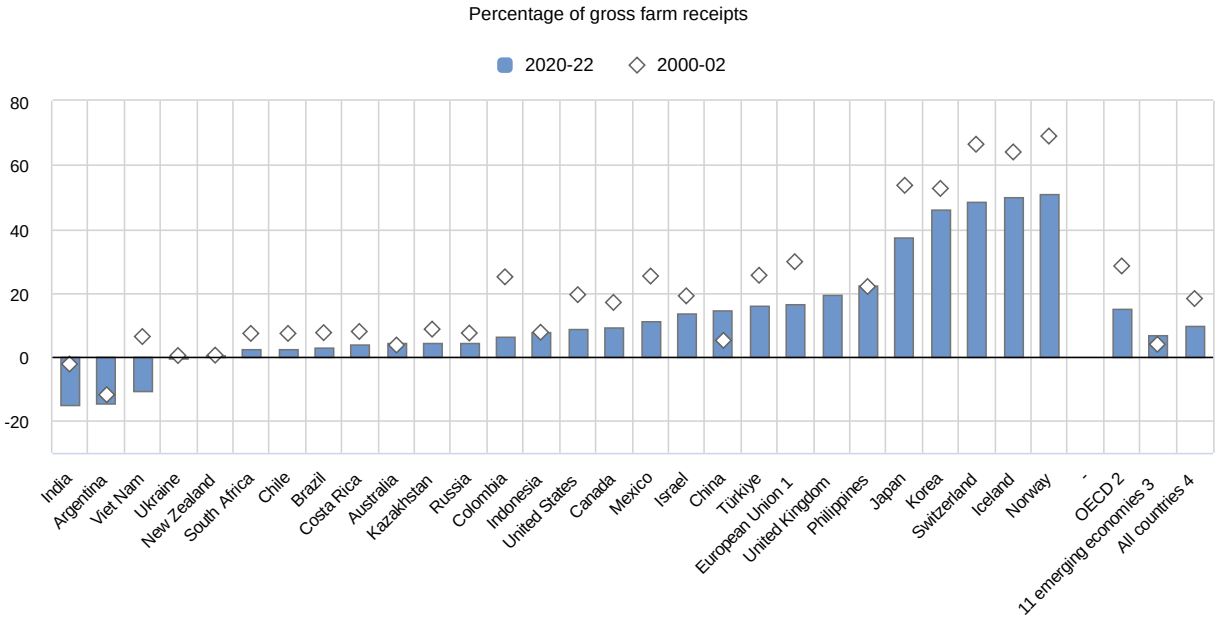

Note: European Union refers to EU15 for 2000-03, EU25 for 2004-06, EU27 for 2007-13, EU28 for 2014-19, EU27 and the United Kingdom for 2020, and EU27 from 2021.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

171. While China provides the most support in terms of value transferred, the countries with the highest levels of producer support as a share of gross farm receipts are all found in the OECD area (Figure 2.10). In Norway, Iceland, Switzerland, Korea, and Japan, the benefits arising from direct budgetary support as well as implicit support from measures such as protective tariffs on imports represent between 35% and 55% of the revenue received by farmers. Conversely, support accounts for about 15% of farm receipts in China and less than 5% in New Zealand, South Africa, Chile, Brazil, Costa Rica, Australia, and Kazakhstan (including the negative effects of implicit taxation from policies in Kazakhstan).

[24] Includes 15 countries.

[25] Includes all current EU27 countries for all three years. United Kingdom is included for 2020 only.

## Figure 2.10. Producer Support Estimate by country, 2000-02 and 2020-22




Notes: Countries are ranked according to the 2020-22 levels.
1. EU15 for 2000-02, EU27 and the United Kingdom for 2020, and EU27 from 2021.
2. The OECD total does not include the non-OECD EU Member States. Latvia and Lithuania are included only for 2020-22.
3. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
4. The All countries total includes all OECD countries, non-OECD EU Member States, and the Emerging Economies.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

172. Governments use a mix of different types of policies in order to achieve their objectives and support farmers, and each may emphasise different types of policies. For instance:

- Market price support (MPS) arises as a result of domestic or trade policies that raise or lower domestic market prices, such as border tariffs, export taxes and price ceilings or floors. Excluding policies that depress prices, MPS accounts for the majority of positive support provided to farmers across all covered economies both in aggregate as well as within a majority of the covered economies (counting the European Union collectively as one economy).
- Payments based on output are payments made to farmers per unit of production, often through measures such as strategic stabilisation funds or deficiency payments. These types of payments were between 10% and 25% of support in Iceland and Norway between 2020 and 2022.
- Payments based on use of variable inputs, such as subsidies on the use of fertiliser, electricity, animal feed or credit. These types of payments were between 20% and 40% of positive support in South Africa, Viet Nam and Australia, and 70% of positive support in India in 2020-2022.
- Payments made on the basis of production area or animal numbers, or to top up farmers' receipts or incomes. This approach was the largest share of support provided to producers in the OECD in 2020-22, reflecting its prominence in the support packages provided in economies such as the European Union, the United Kingdom, Canada, and the United States.

- Payments made to subsidise the acquisition of fixed capital like farm equipment, land, or breeding stock. This approach accounted for over 30% of the positive support provided to producers in Australia, Chile, and Kazakhstan.
- Payments are provided to individual farmers to reduce the cost of on-farm services such as technical, accounting, commercial, training and sanitary or phytosanitary assistance. This type of support made up between 10-25% of total producer transfers in New Zealand, Chile, and the United States.
- Payments can be based on variable input use, but with constraints, limits or restrictions. Brazil was the only country which used this form of support for more than 10% of their transfers to producers.
- Payments for non-commodity criteria, which include payments for long-term resource retirement or for non-commodity based output such as reducing pesticide or fertiliser use, or linked directly to supply of environmental public goods. This type of support was 10-20% of producer transfers in Mexico and Switzerland.

### *The majority of producer support still takes the form of the potentially most distorting measures*

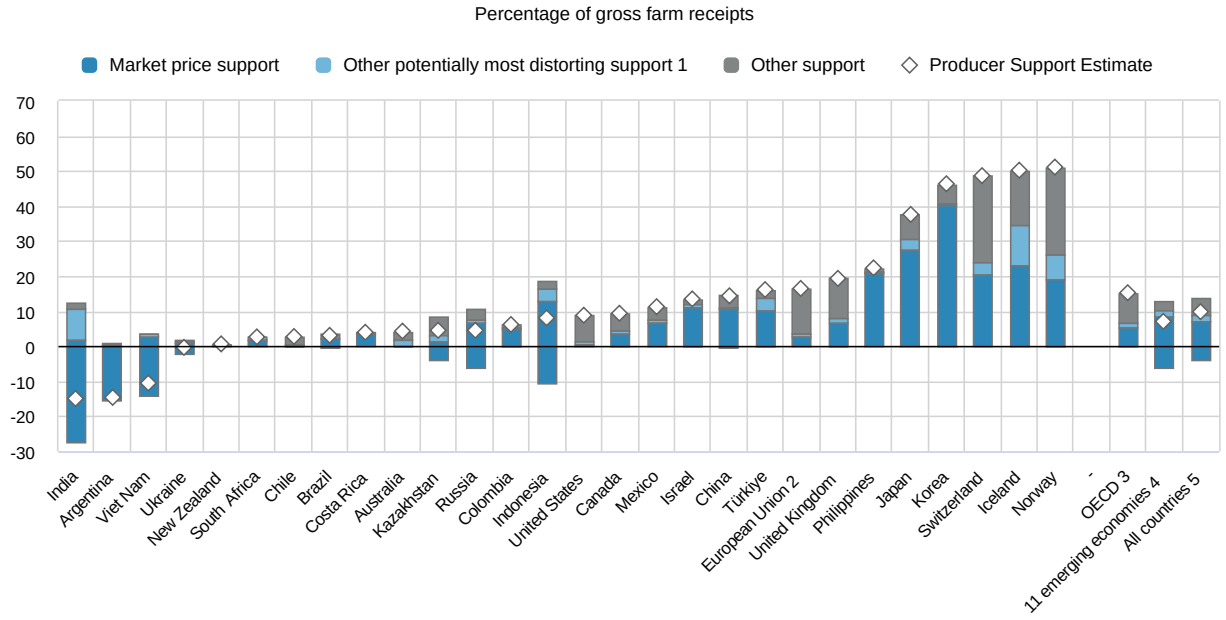
173. Different types of support have different impacts on producer behaviour. Producers respond to the incentives provided by support policies and adjust their production decisions accordingly. This changes the overall level of agricultural production, the mix of agricultural products produced, farm incomes and social and environmental outcomes.

174. In 2020-22, USD 411 billion, or two-thirds of the USD 630 billion in positive support to producers across the 54 countries covered in this report, was in forms considered to be the potentially most distorting to production and trade (9% of gross farm receipts). Across the OECD, such support amounted to USD 103 billion, while for the 11 emerging economies such transfers to producers totalled to USD 308 billion per year. Negative MPS policies additionally gave rise to USD 179 billion in implicit taxation in 2020-22 and these also have a distorting effect. The OECD has consistently recommended the phase out of potentially most distorting policies. More recent OECD work has shown that these measures also have a particularly high potential to harm the environment (Henderson and Lankoski, 2019[85]).[26]

175. Based on past and ongoing OECD work, the types of support considered to have the potential to be the most distorting are market price support, payments based on output, and payments based on the unconstrained use of variable inputs. These forms of support are also known for being both inefficient and untargeted to providing support to those households in need as a large share of the transfers are leaked in the form of higher prices for and larger use of inputs, or capitalised into land values. On average, these forms of support are much more prevalent in emerging economies than in OECD nations. In the 11 emerging economies, potentially most distorting policies generated positive support to producers equalling 10% of gross farm receipts and implicit taxation equal to 6% of gross farm receipts in 2020-22. In OECD countries, potentially most distorting policies generated positive support equalling 7% of gross farm receipts in 2020-22, but did not implicitly tax producers (Figure 2.11).

[26] Further analysis is needed on the environmental impacts of market price support when limits on production are in place.

## Figure 2.11. Potentially most distorting transfers and other support by country, 2020-22




Notes: Countries are ranked according to the %PSE levels.
1. Support based on output payments and on the unconstrained use of variable inputs.
2. EU27 and the United Kingdom for 2020, and EU27 from 2021.
3. The OECD total does not include the non-OECD EU Member States.
4. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
5. The All countries total includes all OECD countries, non-OECD EU Member States, and the emerging economies.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

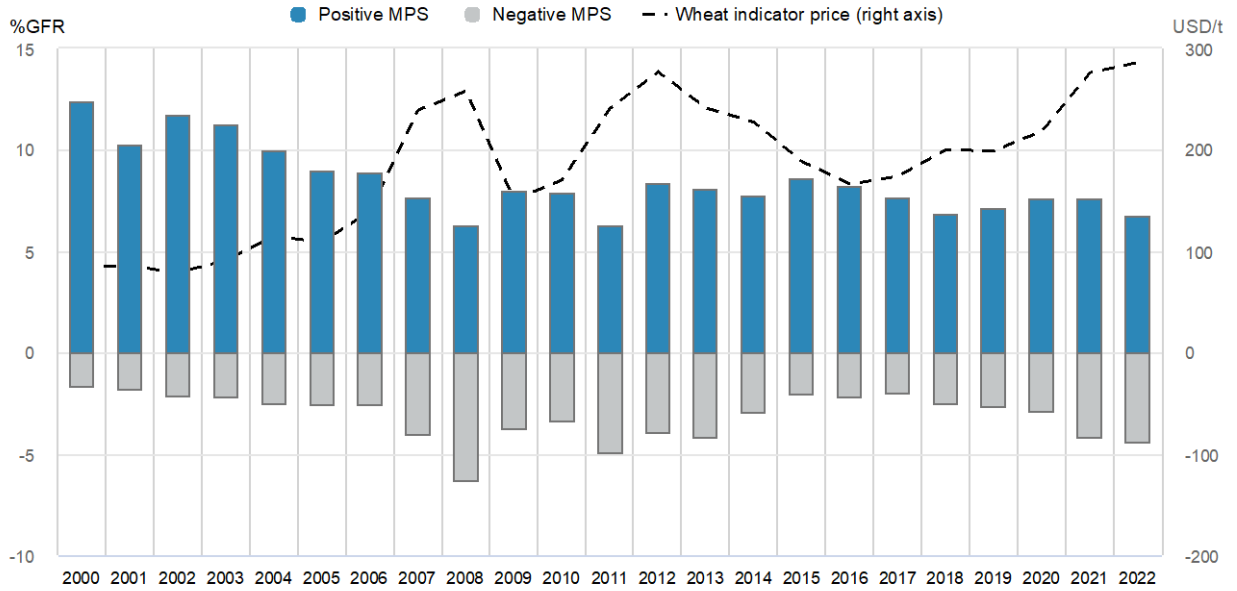
### *Recent macroeconomic factors drove a decline in market price support*

176. Preliminary estimates indicate that net market price support declined for a second year in 2022. Positive MPS fell by an estimated USD 22 billion and negative MPS became USD 24 billion further negative. This means that both farmers benefitting from supported domestic prices and those already implicitly taxed experienced an estimated reduction in support equivalent to 0.5% of their 2021 receipts. This decline has been largely driven by the recent period of exceptional spikes in agricultural prices (Figure 2.1). Market price support can fall or become increasingly negative when there are sudden increases in world prices if supported domestic prices do not change to match. This is because supported domestic prices lose some of their premium and suppressed domestic prices become increasingly unfavourable compared to border prices. This phenomenon of falling net MPS was also observed in 2008 and 2011 during instances of sudden and rapid rises in the prices of agricultural products (Figure 2.12). MPS subsequently rebounded as price spikes abated and emergency measures were eased, and this may be the case as well in 2023 depending on the path of global prices and the corresponding responses by countries.

177. Measures providing positive MPS to producers provided USD 333 billion per year on average between 2020-22 across all covered economies. This was equivalent to 7% of annual gross farm receipts over the same period. Negative MPS caused by policies which reduce domestic prices was worth USD 179 billion or 4% of gross farm receipts over that time. Import tariffs and tariff rate quotas are the

most frequently applied policies which give rise to positive MPS, whereas export restrictions, quotas, bans or taxes are most frequent for negative MPS.

## Figure 2.12. Market price support for all 54 covered countries and global wheat indicator price, 2000 to 2022




Note: Wheat indicator price refers to export price of wheat from Ukraine with less than 11% protein content. The price is free on board denominated in USD per tonne. Both positive and negative market price support include MPS for all 54 countries and all commodities.
Source: International Grains Council (2023), OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

178. MPS declines estimated in 2022 were largest in China, where most commodities tracked in the MPS data are subject to domestic market price support and most of which saw declines, in particular cotton, maize, groundnuts, and milk. These declines more than offset a significant increase in MPS for pig meat that reflects policies implemented to encourage pig herd rebuilding following recent outbreaks of African Swine Fever. Japanese farmers also experienced a significant reduction in market price support. The value of MPS in Japan declined by over 50% for rice and over 25% for pork. This reflected a narrowing of the gap between domestic and border prices and a depreciation of the Japanese Yen.

179. Changes in India drove movements in negative MPS estimated in 2022. India introduced export bans, duties or permits on several commodities to stabilise prices following the outbreak of war in Ukraine. While this kept domestic prices from rising by the same rate as border prices, it also meant that producers' receipts were lower than they would have been had these policies not been in place. The effect of these new and other existing policies was particularly pronounced for the MPS of Indian wheat, causing implicit taxation to increase by close to USD 10 billion. Indian wheat single commodity transfers were estimated to have risen from -48% to -74% of 2022 wheat receipts.[27]

[27] Single Commodity Transfers (SCTs) are the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers arising from policies linked to the production of a single commodity, such that the

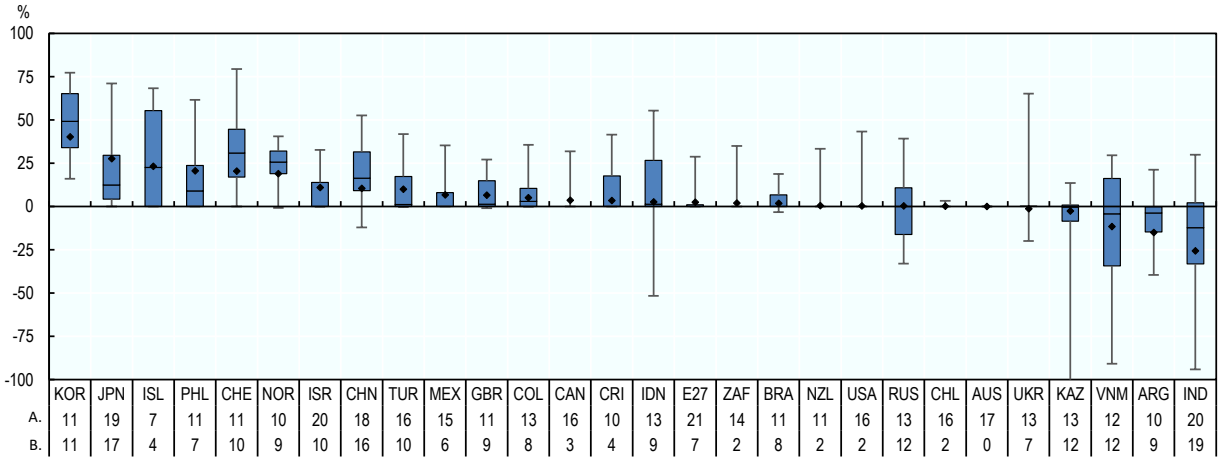
180. The significance of MPS varies strongly across countries. In Norway, Switzerland, the Philippines, Iceland, Japan, and Korea, MPS accounts for around 20% to 40% of gross farm receipts. In 16 other countries, MPS represents less than 5% of gross farm receipts. While in Argentina, India, Kazakhstan, Ukraine, and Viet Nam, producers are implicitly taxed, with negative MPS values of anywhere from -1% to -26%.

181. Levels of support also differ between commodities in a given country. Countries can have a low rate of average MPS that masks the fact that particular commodities are highly supported while others are relatively unsupported or implicitly taxed. For example, in Indonesia, MPS represented 2.6% of gross farm receipts in 2020-22. However, MPS represented 55% of the gross farm receipts specifically related to the production of beef and veal, and -52% of those related to the production of palm oil. Gross farm receipts for a specific commodity are referred to as "commodity gross receipts", which includes the value of production of that specific commodity plus any transfers arising from policies specifically targeting that commodity.

182. In Korea, Japan, Iceland and Switzerland, MPS on the most supported product is between 68% to 80% of commodity gross receipts. Whereas, in countries such as India, Kazakhstan and Viet Nam, MPS on the most implicitly taxed product is between -91% and -138% of commodity gross receipts (Figure 2.13) (see Box 2.3 for interpretation).

## Figure 2.13. Variation of product-specific market price support by country, 2020-22

Percentage of commodity gross receipts




Notes: A. Number of MPS commodities. B. Number of MPS commodities with non-zero MPS values.
The ends of the whiskers represent the minimum and maximum values across commodities, while the boxes indicate ranges between the first and the third quartiles with the horizontal line inside indicating the median. Diamonds represent the MPS share in GFR for total agriculture.
The minimum value for Kazakhstan is -138%
EU27 and the United Kingdom for 2020, and EU27 from 2021.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

producer must produce the designate commodity in order to receive the transfer. In this instance it is the monetary value of the gross transfers from Indian producers of wheat to consumers and taxpayers as a result of policies affecting wheat production. SCTs are measured at the farm gate level.

### Box 2.3. Market price support – concept and interpretation

Simply put, market price support (MPS) is the benefit or loss farmers receive by having domestic prices that do not reflect those of world prices. Specifically, MPS is defined as the "annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, arising from policy measures that create a gap between domestic market prices and border prices of a specific agricultural commodity, measured at the farm gate level" (OECD, 2016[86]). It is calculated for individual commodities as the gap between the domestic price paid to producers and the equivalent price at the border. This is multiplied by the quantity produced and aggregated to the national level.

This definition contains three key elements. First, it measures the transfers that arise from policy measures that create a price gap (e.g. import tariffs, minimum prices, export taxes, etc.). Second, it measures gross transfers (positive or negative) to agricultural producers from consumers and taxpayers. Third, it is measured at the farm gate level to ensure that MPS values are consistent with the production and price data for the farming sector overall.

The price gap for a specific commodity measures the difference between two prices: the average domestic price and a reference price calculated at the same level in the value chain (generally at the farm gate). This reference price corresponds to the country's border price, i.e. the import price (for net-imported commodities) or the export price (for net-exported commodities). In the absence of a border price, another price indicative of them is used which could be a world price or another country's border price, adjusted for transportation costs and any differences in quality, weight or processing level, to make them comparable to the average domestic price (see below).

If the price gap is such that the domestic price is twice the border price, the MPS as a share of commodity gross receipts should be 50% and producers receive double the revenue they would have otherwise. If domestic prices are five times border prices, the MPS as a share of commodity gross receipts would be 80%--an amount observed for some commodities. For negative MPS, if the MPS as a share of commodity gross receipts is -138%, the implicit tax on revenue would be 58%.

The price gap is calculated only if policies exist that can could cause such a gap, such as border measures that restrict or promote imports or exports, and government purchases, sales and intervention prices in the domestic market. If countries do not implement such policies, the price gap is assumed to be zero. A non-zero price gap, whether positive or negative, originates from price-distorting policies. It is important to note that MPS measures the "policy effort" (or level of support to prices), not the policy effect (e.g. the impact on farm income). In addition to policy instruments that restrict price transmission (say, a target price), market developments (such as exchange rate movements affecting world prices expressed in local currencies) may influence the implied policy effort and, hence, the resulting transfers.

The calculation of the price gap for individual commodities requires information not only on product prices, but also on differences in product qualities, processing and transportation margins, to compare like with like. In some cases, difficulties in identifying and obtaining relevant prices or other required information prevent the price gap calculation used to calculate MPS from being based on observed price gaps. An alternative option for calculating the price gap is the use of import tariffs or export taxes, which is likely to provide accurate MPS estimates only if a uniform tariff or tax rate is the sole border measure in place.

The use of tariffs rather than price gap data comes with a number of complex measurement issues, covering issues such as the composition of product groups across tariff lines and the seasonality of production and trade. Moreover, in order to capture the marginal rather than the average import protection rate, the statutory applied most-favoured nation (MFN) tariffs are used. In light of the growing number of preferential trade agreements (PTAs) engaged in by countries covered in this report, an

important caveat therefore relates to the fact that the statutory applied MFN tariffs remain unchanged even when increased quantities of products are imported under preferential tariffs or duty-free within such PTAs. As a consequence, potential liberalising effects of new PTAs are not reflected in the MPS estimates when tariffs are used to calculate them. With the increased relevance of PTAs for international trade, it therefore becomes even more important to base the MPD calculations on price gap calculations whenever data allow.

When interpreting MPS values, it is important to bear in mind that MPS is not a measure of public expenditures but an estimation of implicit or explicit transfers. MPS estimates published by the OECD therefore often differ from, and should not be confused with, those published by other organisations, including by the World Trade Organization, which may use very different concepts to calculate their indicators, despite similar names.

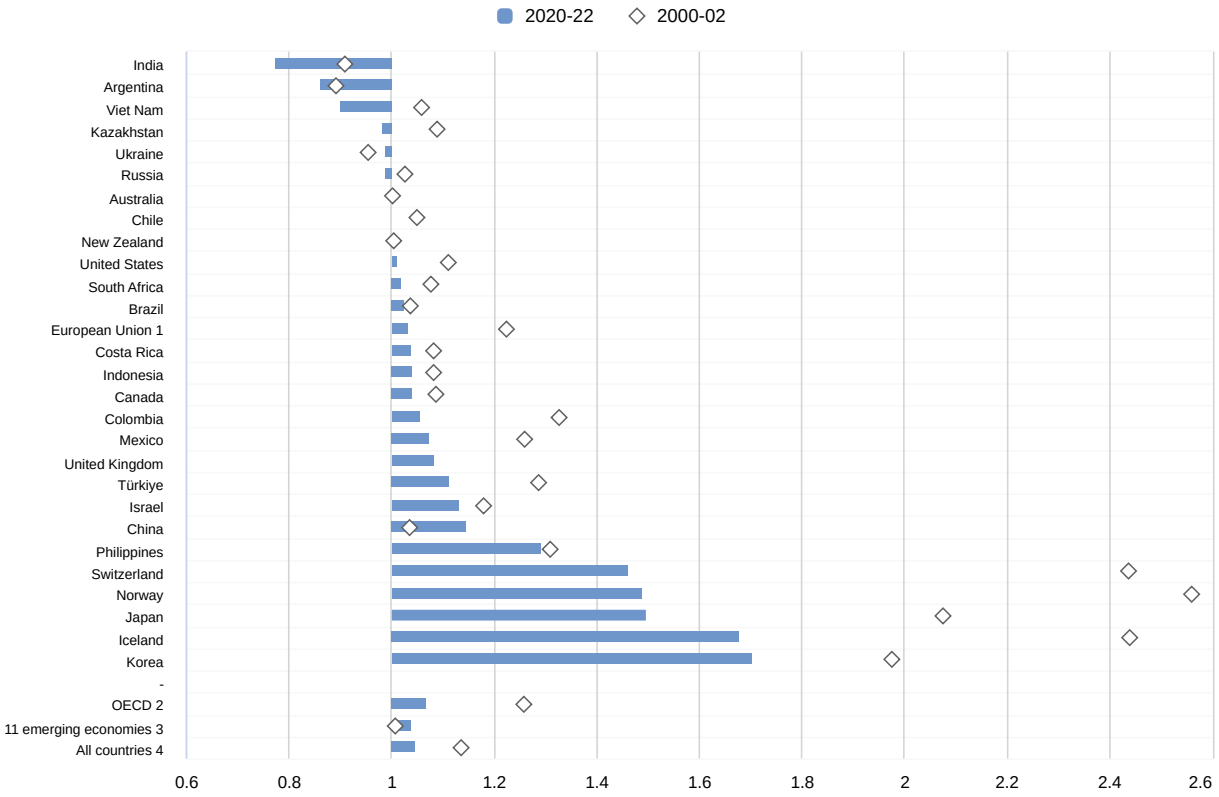
Source: OECD (2020[87]).

183. The gap between domestic prices and world prices has narrowed over the past 20 years on average across the OECD (Figure 2.14). To measure this, the OECD uses the indicator Nominal Protection Coefficient (NPC), which is the ratio between average effective producer prices and the border price. The effective producer price is the price received plus any payments provided per unit of output. Declining price gaps, measured by NPC, imply that producers are receiving price signals that more closely reflect world prices.

184. On average over all OECD countries, the NPC averaged 1.07 in 2020-22. This means that effective prices received by farmers were on average 7% higher than world prices. This represents a decline of 19 percentage points from the 26% higher prices averaged in 2000-02. Price gaps have declined in almost all countries between 2000-02 and 2020-22. Change has been particularly substantial in countries such as Switzerland, Norway, Japan, and Iceland where price gaps have reduced by between 55 and 110 percentage points.

185. China is the only country to have seen a rising positive NPC over the past 20 years, with the gap widening from 1.03 to 1.15 over that time. This reflects the introduction of several measures that have increased domestic prices, such as minimum purchase prices for rice and wheat. Price gaps in India and Argentina are increasingly negative. The NPC in India has fallen from 0.91 to 0.78, meaning prices are now 22% below international levels. Likewise, the NPC of Argentina has fallen from 0.89 to 0.86, putting prices 14% below world prices.

## Figure 2.14. Producer Nominal Protection Coefficient by country, 2000-02 and 2020-22




Notes: Countries are ranked according to 2020-22 levels.
1. EU15 for 2000-02, EU27 and the United Kingdom for 2020, and EU27 from 2021.
2. The OECD total does not include the non-OECD EU Member States. Latvia and Lithuania are included only for 2020-22.
3. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
4. The All countries total includes all OECD countries, non-OECD EU Member States, and the emerging economies.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

### *The use of partly or fully decoupled producer support has increased*

186. Payments based on production factors (area, animal numbers, revenue or income) or other non-commodity criteria have declined as a share of gross farm receipts across the 54 countries from 4.6% in 2000-02 to 3.8% in 2020-22. This has been driven by countries opting to remove or reorient policies which use *current* area, animal numbers, farm receipts or income as the criteria for determining the eligibility or amount of payments. Payments from policies of this type have declined from 3.2% to 1.9% of gross farm receipts in the last 20 years. This is a welcome development as payments that use current production factors as a criterion for payment provide a direct production incentive to farmers that can have a distorting effect, even if generally less so than MPS and other measures previously discussed.

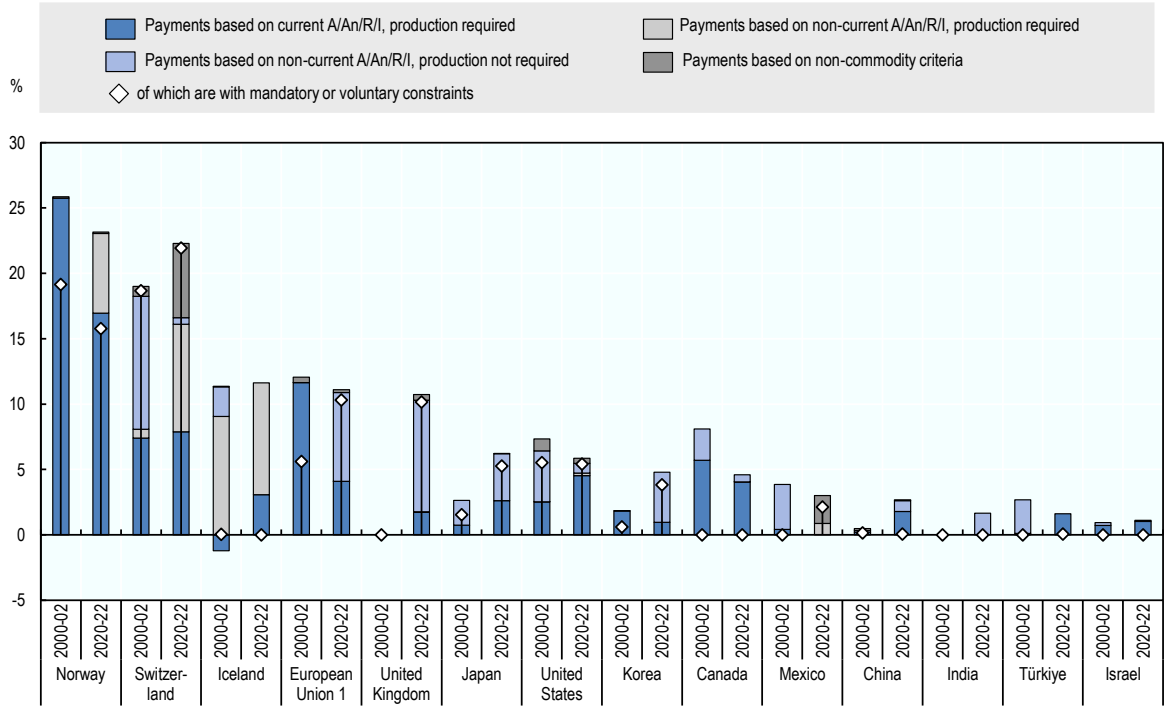
187. Payments based on current production factors have in many cases been replaced by payments based on historical production factors (both those requiring and not requiring production), which rose from 1.1% to 1.7%. Payments based on historical production factors like this are generally said to be "decoupled" from production because they have no direct link to current production decisions, even though

they tend to slow structural change and hinder the conversion of agricultural land to other uses. About 96% of payments based on historical production factors do not require current production.

188. The move from current to historical production factor payments has been particularly visible in the European Union. Payments based on current production factors accounted for 11.6% of gross farm receipts in 2000-02 and there were none based on non-current production factors. Following the Fischler Reform from 2003 much of the support in the European Union was decoupled from production and in 2020-22, payments on current production factors had fallen to 4.1% of the total and those on non-current production factors represented 6.8%. A similar pattern of decoupling has occurred to lesser degree in Korea and Norway (Figure 2.15).

## Figure 2.15. Use and composition of support that is less coupled to production, selected countries, 2000-02 and 2020-22

Percentage of gross farm receipts




Notes: Figure presents countries having share of payments based on area, animal numbers, farm receipts or farm income and on non-commodity criteria above 1% for 2020-22 period. Countries are ranked according to the total share of payments for 2020-22.
1. EU15 for 2000-02, EU27 and the United Kingdom for 2020, and EU27 from 2021.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

### *Producer support tied to specific commodities also declined*

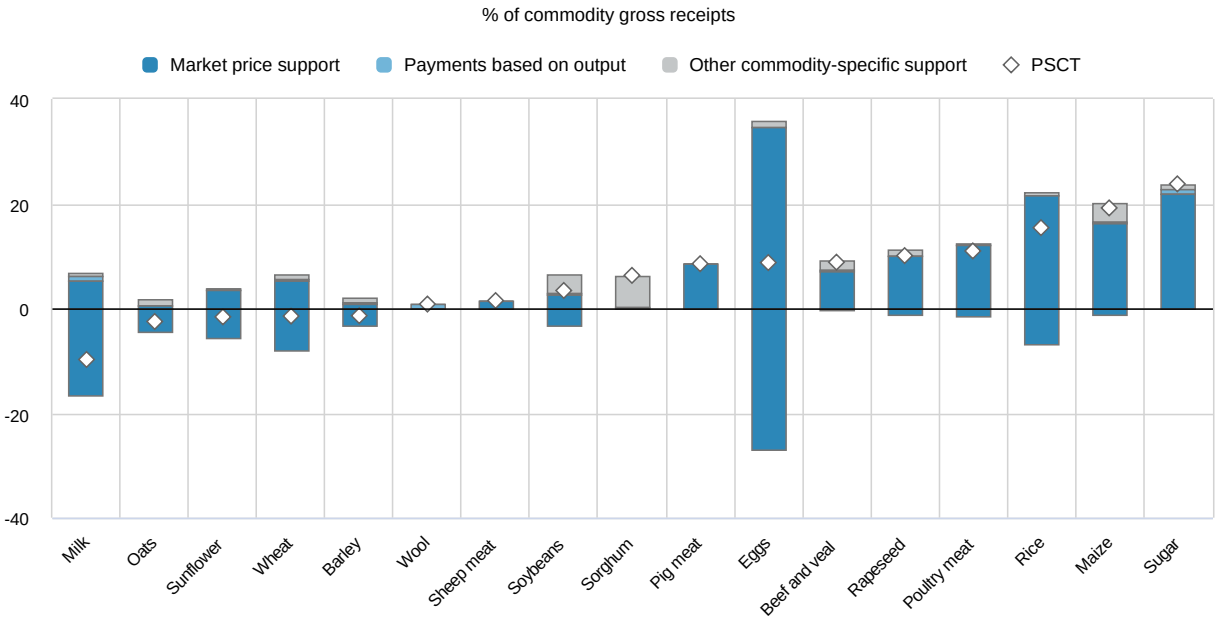
189. As well as the structure of support, another important lens to investigate producer support is to examine which commodities (or groups of commodities) are being supported. Policies are often designed to result in benefits or losses that are commodity specific. For example, a tariff put on imports of wheat results in market price support which advantages domestic producers of wheat to the exclusion of producers of other commodities. By their construction, policies providing MPS and payments for outputs are commodity specific, while other budgetary payments may or may not be targeted to a specific

commodity. For example, payments based on inputs or other production factors often stipulate terms that make them commodity specific such as when a fertiliser subsidy is granted only for production of maize, or a payment that is made per head of livestock. The total value of such payments taken together with MPS are reported for each commodity as single-commodity transfers (SCT).

190. On average across all countries in this report, SCTs averaged 4.4% of gross farm receipts in 2020-22, roughly half of the 9.8% averaged in 2000-02. Preliminary estimates for 2022 indicate that SCTs declined in 2022 for the second year in a row. MPS policies account for most commodity-specific support, so SCTs followed a similar pattern to those described in the section on MPS above.

191. SCTs are particularly high for sugar, maize and rice where they each represented over 15% of the gross receipts for the respective commodity in 2020-22 (Figure 2.16). However, there is significant variation in the level of commodity support among the covered countries. Support averaged 8.7% of egg receipts, but this average is the net effect of significant price support in some countries and significant implicit taxation in others. In countries that subsidised egg production through supported domestic prices and other measures, support averaged 36% of egg receipts. Conversely in countries that penalised egg production through depressed market prices, implicit taxation averaged 27% of egg receipts. Egg production has been negatively affected by avian flu which has decimated flocks in recent years. As a result, the gap between domestic and border prices has been volatile, a fact that is reflected in the changed values of MPS.

## Figure 2.16. Transfers to specific commodities (SCT), all countries, 2020-22




Note: Data refer to the All countries total, including all OECD countries, non-OECD EU Member States, and the 11 emerging economies. Commodities are ranked according to their net percentage Specific Commodity Transfers (PSCT).
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

192. Commodity-specific support can influence production choices by changing the relative returns of commodities or groups of commodities. For example, a payment per bale of cotton produced can lead to more area being planted to cotton instead of other alternatives. In this way, support that is targeted to a

few specific commodities can be more distorting of production than the same level of support that is distributed evenly across commodities or that is not commodity specific. To the extent the commodities targeted by SCTs are more intensive users of natural resources or generate higher pollution than those not benefitting from this support, commodity-specific support can also increase environmental pressures.

*Farm revenues continued to increase, despite lower levels of producer support in 2022*

193. Despite falling levels of producer support in 2022, gross farm receipts are estimated to have increased for a sixth consecutive year. Higher world market prices for agricultural products in 2022 drove a significant increase in the value of agricultural production which more than offset declines in market price support and budgetary payments to producers. Overall, gross farm receipts were 20% higher in 2020-22 compared to 2017-19 before the COVID-19 pandemic.

### *Consumers support*

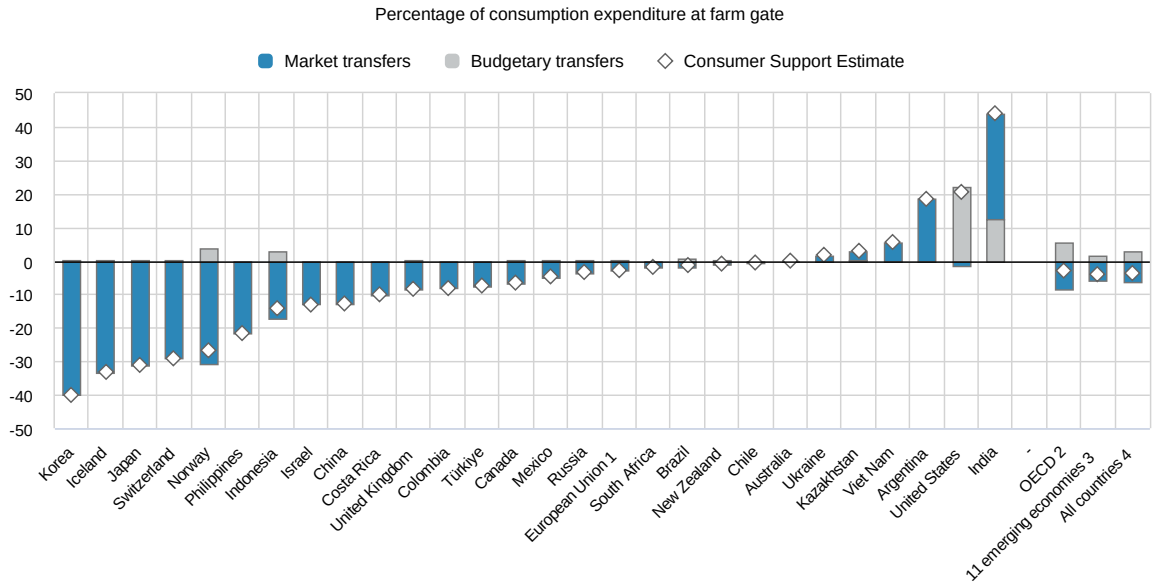
*Consumers are implicitly taxed on average due to market price support*

194. Agricultural policies can increase the price of food bought by consumers, as when positive MPS is in place, or they can reduce food costs through food assistance programmes (which usually target poor consumers). The Targeted Public Distribution System (TPDS) in India and the Supplemental Nutrition Assistance Program (SNAP) in the United States are two examples. Consumer support includes both support to final consumers of agricultural products as well as industry consumers who transform agricultural commodities into processed products. India, Argentina, Viet Nam and Kazakhstan also support consumers via depressed commodity prices.

195. Budgetary consumer support rose dramatically following the outbreak of the COVID-19 pandemic. In 2020, governments provided USD 131 billion in budgetary support to agricultural consumers, roughly double the USD 65 billion provided one year earlier. Consumer budgetary support declined to an estimated USD 112 billion in 2022, still higher than pre-pandemic levels. Food subsidies in India accounted for a large share of this increase, with temporary measures in 2020 increasing budgetary consumer support 5-fold to USD 74 billion.

196. While the pandemic brought about temporary increases in consumer support, the normal situation is that consumers pay higher than world prices for food. In 2020-22, policy support to consumers represented -3.7% of gross expenditures as measured at farm gate prices (an indicator referred to as **%CSE**) (Figure 2.17). This implies that consumers were implicitly taxed on purchases of agricultural products. In most countries, the %CSE mirrors the level of market price support provided to producers. Korea, Iceland, Japan, Switzerland, Norway, and the Philippines all have %CSE of -20% or above of gross expenditures reflecting high levels of market price support to producers. Norway and Indonesia provide some level of budgetary support to consumers to partially offset these negative effects.

## Figure 2.17. Composition of the Consumer Support Estimate by country, 2020-22




Notes: Countries are ranked according to percentage CSE levels. A negative percentage CSE is an implicit tax on consumption.
1. EU27 and the United Kingdom for 2020, and EU27 from 2021.
2. The OECD total does not include the non-OECD EU Member States.
3. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
4. The All countries total includes all OECD countries, non-OECD EU Member States, and the emerging economies.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

197. Declining rates of MPS have reduced the effect of agricultural policies on consumers over time. Across all 54 countries, the %CSE has risen from an average of -10.3% in 2000-02 to -3.7% in 2020-22. This is most notable in OECD countries, where the %CSE rose from -18.3% in the early 2000s to -3% in the recent data. Conversely, consumers in emerging economies have become worse off over time, with %CSE falling from near zero 20 years ago to average -4.1% in 2020-22. This largely reflects increasing market price support in China which drove %CSE to average -12.7% in 2020-22.

### *General Services Support*

*Support to general services is declining in real terms*

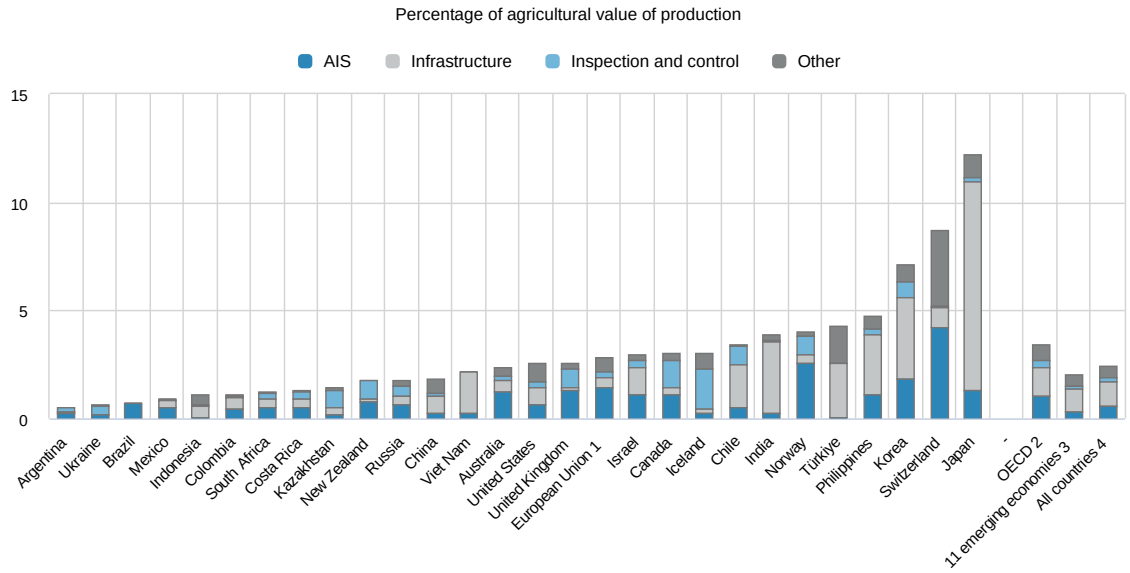
198. Countries provided USD 106 billion in support for general services to the agricultural sector on average over 2020-22. While this spending has increased in nominal terms over the past 20 years, it has declined as a share of total support to the sector. This share had fluctuated between 15% and 17% of support since 2000 but fell significantly after 2018 and averaged 12.5% in 2020-22. General services support has also declined relative to the size of the sector, from an average of 4.6% of the value of agricultural production in 2000-02 to 2.5% in 2020-22. This trend is observed both in the OECD and among emerging economies. In 2020-22, spending on general services was the equivalent of 3.4% of the value of production in OECD countries and 2% in the 11 emerging economies.

199. General services support arises from policies that are aimed to benefit the broader agricultural sector, rather than producers or consumers individually. Investments in general services can help the

agricultural sector to become more productive, sustainable and resilient. For example, infrastructure development and maintenance can include building hydrological assets which make irrigation more accessible, or other physical infrastructure such as rail or port storage which makes transport and marketing of products easier and reduces wastage. It can also include institutional infrastructure such as support for farm organisations or payments relating to structural transformation of the industry, such as financing new entrants, exits or diversification strategies outside of agriculture. Infrastructure spending was almost half of general services support in the most recent data, worth 46% in 2020-22, most of which was for irrigation-related projects. Agricultural innovation systems, covering both the generation and transfer of knowledge; and inspection and control measures are also important for enabling productivity growth and accounted for 23% and 8%, respectively. These three types of investment will be crucial for preparing agriculture to adapt to a changing climate. However spending across all three has declined relative to the size of the agricultural sector, accounting for under 10% of total support.

200. Other forms of general service spending have the potential to distort markets, but also generally account for a low, and decreasing, percentage of general service spending. Marketing and promotion was 8% of general service spending and the cost of public stockholding[28] was 13%.

## Figure 2.18. Composition of General Services Support Estimate, 2020-22




Notes: "AIS" refers to the Agricultural knowledge and innovation system. "Other" includes the marketing and promotion, cost of public stockholding, and miscellaneous categories of the GSSE. Countries are ranked according to the share of total GSSE in agricultural value of production.
1. EU27 and the United Kingdom for 2020, and EU27 from 2021.
2. The OECD total does not include the non-OECD EU Member States.
3. The 11 emerging economies include Argentina, Brazil, China, India, Indonesia, Kazakhstan, the Philippines, Russian Federation, South Africa, Ukraine and Viet Nam.
4. The All countries total includes all OECD countries, non-OECD EU Member States, and the emerging economies.
Source: OECD (2023), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en.

[28] Cost of public stockholding are expenditures to cover the cost of storage or disposal of agricultural commodities, as well as their depreciation.

## Summary and conclusions

201. Agricultural support policies generated USD 851 billion per year in transfers towards agriculture in 2020-22 across the 54 countries covered in this report. This is the highest level since records began and 2.5 times larger than aggregate transfers observed in 2000-02, although it represents a decline as a share of the agricultural value of production. Almost three-quarters of transfers, USD 626 billion, was transferred to individual producers through higher prices and budget payments. Some countries continue to implicitly tax their producers through policies that depress domestic market prices, generating transfers away from producers worth USD 179 billion per year.

202. Overall, total net support to the sector (TSE) is equivalent to 0.6% of GDP across the 54 countries, down from 1.0% in the early 2000s. As a share of the agricultural sector, total net support was 16% of agricultural value of production in 2020-22, compared to 27% in 2000-02.

203. Net producer support across all 54 countries has declined as a share of gross farm receipts (%PSE) over the past 20 years, from 18% in 2000-02 to 10% in 2020-22. This reflects declining producer support amongst OECD countries, which fell from 28% of gross farm receipts in the early 2000s to 15% in 2020-22. Conversely, producer support rose in emerging economies between 2000-02 and 2020-22 from 4% to 7%.

204. Most of the decline in OECD support occurred in the 2000s, driven by declining market price support. Progress in reducing support has been slower in recent years and there has been some increase in payments based on current production factors in recent years, despite consistent recommendations to reduce notably the potentially most distorting forms of support. The rise in emerging economy support largely reflects a significant increase in the prominence of China as an agricultural producer and the vast market price support it provides to producers. China now accounts for around 44% (USD 276 billion) of all the producer support among the 54 countries covered in this report after accounting for only 7% in 2000-02.

205. Market price support is still the dominant form of support to producers. MPS generated USD 333 billion or roughly half of the positive support to agriculture in 2020-22. It has declined as a share of gross farm receipts from 11.5% at the start of the century to 7.3% today. At the same time, several countries utilise policies which caused negative market price support worth USD 179 billion. This implicit tax was equivalent to 3.9% of gross farm receipts in 2020-22, up from 1.8% of GFR two decades earlier. This implies that across all 54 countries, positive producer support accounted for 13.7% of gross farm receipts in 2020-22.

206. Other support to farmers included USD 11 billion in payments based on production output and USD 67 billion in input subsidies without use constraints. These payments have a similar tendency as market price support to create production distortions. This means that USD 411 billion was transferred to producers in forms that are potentially the most distorting, or around two-thirds of positive producer support. The remaining USD 219 billion was provided for in payments that were less coupled to production decisions. This includes USD 77 billion in decoupled payments based on historical production factors such as area, animal numbers, receipts or income. Although they tend to be less harmful than coupled payments, decoupled payments may slow structural change and hinder the conversion of agricultural land to other uses.

207. Aside from support to individual producers, governments provided USD 106 billion to assist the sector more broadly through general services in 2020-22. This equates to around 12.5% of positive transfers to agriculture, down from 16.0% two decades earlier. Expenditures for general services also declined relative to the sector's size, from 4.6% of the value of production in 2000-02 to 2.5% in 2020-22. Investments in agricultural knowledge and innovation, inspection and control, and infrastructure development and maintenance, which represent general services with a particularly strong potential to facilitate sustainable productivity growth and resilience, totalled USD 82 billion or about three-quarters of

all support to general services. Relative to the total value of production, spending on these services fell from 3.1% in 2000-02 to 1.9% in 2020-22.

208. Consumers were also supported with direct budgetary assistance of USD 115 billion per year on average in 2020-22. This was mostly in the form of food assistance programmes. On average, however, consumers were still implicitly taxed on agricultural products through price policies that support farmers. These implicit taxes more than offset the direct budgetary assistance from government.

209. The level of support varied greatly among countries. On average during 2020-22, producer support ranged from 5% or less of the value of agricultural production in Brazil, South Africa, New Zealand, and Ukraine, to more than 70% in Norway, Switzerland, and Iceland. Net support was negative in Argentina, Viet Nam, and India.

### *Countries introduced a range of emergency measures in response to recent global shocks including inflationary pressures as well as the war in Ukraine and its effects. Countries should now act to build resilience to future shocks*

210. Prices for agricultural products and inputs rose significantly following the outbreak of war due to the prominence of Ukraine and Russia in global trade markets for these goods. This happened in the context of global value chains that had already been tested by COVID-19 in the two years prior. Governments responded to these new global challenges by implementing a wide range of different policies aimed at supporting farmers and consumers, securing critical supplies, and providing assistance to Ukraine.

211. The shocks experienced have led some governments to rethink their approach to securing strategic supplies. Many countries reduced tariffs on imports of animal feed and agricultural goods as a means of taming rising input costs and consumer prices. Others put restrictions on exports of food and fertiliser to protect domestic supplies. Countries also took steps to help Ukraine and its agricultural sector. These included efforts to resume Ukrainian exports through the Black Sea and via road or rail through Europe, easing restrictions on trade with Ukraine, and providing employment opportunities to Ukrainian refugees in the agricultural sector. Countries are also taking steps now to prepare the Ukrainian agricultural sector to be able to rebound swiftly once hostilities end. Such efforts include bi- or plurilateral government-to-government collaboration, public-private partnerships, and international efforts such as the recently launched OECD Ukraine Country Programme.

212. Looking ahead, countries should draw on the experiences of the past few years and seek to build resilience to risks in the future. Governments should look to implement policies and investments that enhance the ability of the sector to absorb, adapt and transform in response to future shocks. For example, they should seek out “no-regrets” policies that provide these benefits under a wide range of future scenarios, while also contributing to agricultural productivity and sustainability. Temporary measures are often hard to dismantle once in place and long-term objectives need to be balanced with short-term responses. Risk management policies should be developed with stakeholders to ensure a common understanding of the risk landscape and responsibilities for managing risks.

### *Market price support has fallen in response to macroeconomic factors, but more reform is needed*

213. Preliminary estimates indicate that market price support declined in 2022. This decline has been largely driven by the recent period of exceptional spikes in agricultural prices which caused prices of supported products to become relatively less valuable compared to if it were valued at world prices. This is a similar experience to what occurred during price spikes in 2008 and 2011. Market price support will likely rebound in 2023 depending on actions taken by governments implementing MPS policies and the path of global prices.

214. Two countries, Costa Rica and Israel, took steps in 2022 to reduce market price support as part of an effort to liberalise some of their agricultural industries in line with OECD recommendations. These are positive steps to reduce production and trade distortions within their agricultural sectors. However, policies which create market price support remains particularly prevalent in the portfolio of agricultural support for many economies and more should be done to reform.

215. Reforms in OECD countries have largely stalled in the past ten years, with little change in the level or composition of support over this period. In 2022, signatories to the OECD Ministerial Declaration[29] committed to "intensify efforts as appropriate to reform or reorient agricultural policy, and in particular to address those support measures that are harmful to the environment, to move towards more sustainable agriculture and food systems". Meanwhile, support, which had increased significantly in the past, has remained high over the past decade in large emerging economies. Across the 54 countries, two-thirds of support is still provided through price interventions and other distorting support. These are known for their negative implications for food security and the environment, and for being both inefficient and untargeted to providing support to those households in need. Countries should look to reinvigorate domestic policy reform efforts to reduce the use of these measures. At the same time, more stringent multilateral disciplines may be required to facilitate such reforms.

### *Countries should not lose sight of the need to do more to mitigate and adapt their agricultural sectors to climate change*

216. The recent few years has seen significant challenges for agriculture between the COVID-19 pandemic and now the fallout from the war in Ukraine. Countries have largely managed to respond effectively to these crises and absorb the shocks rapidly. However, countries should not lose sight of the existing and coming challenges posed by climate change.

217. Some countries pledged more ambitious climate targets in 2022. Others, such as New Zealand have taken positive new steps to price carbon. These are welcome developments that will help countries to respect their Paris Agreement commitments. More could be done to increase ambitions, however. Only 19 out of the 54 countries in this report have a mitigation target specific to the agricultural sector, and three do not have targets to reach or get close to net zero emissions for their overall economies.

218. The structure of much agricultural policy support is at odds with the actions needed to mitigate and adapt to climate change. USD 411 billion of support is in forms that are potentially most distorting, comprising market price support and payments linked to output or the unconstrained use of inputs. These policies may encourage over-production and can contribute to GHG emissions if they lead to the overuse of polluting inputs, degradation of soils and increased land clearing. They can also contribute to increasing pressure on resources, biodiversity and the environment that are already adversely affected by climate change. Many of these policies also have the potential to hinder climate change adaptation by reducing incentives for farmers to change production systems away from subsidised commodities in response to changing climatic conditions. Countries may need to collaborate to avoid possible environmental leakages and other issues that may arise from asymmetries in policies across countries.

219. The role of support for livestock production is particularly sensitive in this regard. Livestock is responsible for the largest share of agricultural GHG emissions and a strong contributor to the global methane footprint. Livestock is highly supported, typically in the form of MPS. Support to poultry, beef and veal and pig meat are all around 10% of their gross commodity receipts. Combined, market price support to these three commodities were worth USD 71 billion or 11% of all positive producer support. Rice also contributes significantly to emissions relative to other crops due to methane from flooded areas. Support

[29] OECD (2022[92]), *Declaration on Transformative Solutions for Sustainable Agriculture and Food Systems*, OECD/LEGAL/0483, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0483.

to rice production totalled USD 54 billion in 2020-22. These forms of support to highly emitting commodities should be reduced and reformed as much as possible while taking into consideration national conditions and policy design.

## References


Adenäuer, M., C. Frezal and T. Chatzopoulos (2023), "Mitigating the impact of extreme weather events on agricultural markets through trade", *OECD Food, Agriculture and Fisheries Papers* No. 198, OECD Publishing, Paris, https://doi.org/10.1787/aa584482-en. [53]

Annan, F. and W. Schlenker (2015), "Federal Crop Insurance and the Disincentive to Adapt to Extreme Heat", *American Economic Review*, Vol. 105/5, pp. 262-266, https://doi.org/10.1257/aer.p20151031. [60]

Antón, J. et al. (2013), "Agricultural risk management policies under climate uncertainty", *Global Environmental Change*, Vol. 23/6, pp. 1726-1736, https://doi.org/10.1016/j.gloenvcha.2013.08.007. [37]

Antón, J. et al. (2012), "A Comparative Study of Risk Management in Agriculture under Climate Change"*, OECD Food, Agriculture and Fisheries Papers*, No. 58, OECD Publishing, Paris, https://doi.org/10.1787/5k94d6fx5bd8-en. [59]

Ara Begum, R. et al. (2022), *Point of Departure and Key Concepts*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter01.pdf. [32]

Basso, B. et al. (2018), "Soil Organic Carbon and Nitrogen Feedbacks on Crop Yields under Climate Change", *Agricultural & Environmental Letters*, Vol. 3/1, p. 180026, https://doi.org/10.2134/ael2018.05.0026. [22]

Bezner Kerr, R. et al. (2022), *Food, Fibre, and Other Ecosystem Products*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter05.pdf. [45]

Brás, T. et al. (2021), "Severity of drought and heatwave crop losses tripled over the last five decades in Europe", *Environmental Research Letters*, Vol. 16/6, p. 065012, https://doi.org/10.1088/1748-9326/abf004. [11]

Bustamante, M. et al. (2014), "Co-benefits, trade-offs, barriers and policies for greenhouse gas mitigation in the agriculture, forestry and other land use (AFOLU) sector", *Global Change Biology*, Vol. 20/10, pp. 3270-3290, https://doi.org/10.1111/gcb.12591. [49]

Cai, W. et al. (2014), "Increasing frequency of extreme El Niño events due to greenhouse warming", *Nature Climate Change*, Vol. 4/2, pp. 111-116, https://doi.org/10.1038/nclimate2100. [15]

Cao, J. et al. (2023), "Forecasting global crop yields based on El Nino Southern Oscillation early signals", *Agricultural Systems*, Vol. 205, p. 103564, https://doi.org/10.1016/j.agsy.2022.103564. [16]

Cobourn, K. (2023), "Climate change adaptation policies to foster resilience in agriculture: Analysis and stocktake based on UNFCCC reporting documents", *OECD Food, Agriculture and Fisheries Papers* No. 202, OECD Publishing, Paris, https://doi.org/10.1787/5fa2c770-en. [9]

CRED (2023), *EM-DAT: The international disaster database*, https://www.emdat.be/ (accessed on 13 June 2023). [6]

CRED and UNDRR (2020), *The Human Costs of Disasters: An Overview of the Last 20 Years (2000-2019)*, https://www.preventionweb.net/publications/view/74124. [7]

Crumpler, K. et al. (2021), *2021 (Interim) Global update report: Agriculture, Forestry and Fisheries in the Nationally Determined Contributions*, https://doi.org/10.4060/cb7442en. [89]

Deutsch, C. et al. (2018), "Increase in crop losses to insect pests in a warming climate", *Science*, Vol. 361/6405, pp. 916-919, https://doi.org/10.1126/science.aat3466. [23]

d'Istria, T. (2023), *In Ukraine, once the fighting stops, the demining begins*, https://www.lemonde.fr/en/international/article/2023/03/10/in-ukraine-once-the-fighting-stops-the-demining-begins_6018785_4.html. [81]

EC (2022), *Joint Declaration - 1 billion euro mobilised for Solidarity Lanes*, https://ec.europa.eu/commission/presscorner/detail/en/statement_22_6825 (accessed on 19 April 2023). [83]

FAO (2023), *FAOSTAT Production dataset Crops and Livestock Products*, https://www.fao.org/faostat/en/#data/QCL. [76]

FAO (2023), *FAOSTAT Trade dataset Crops and Livestock Products*, https://www.fao.org/faostat/en/#data/TCL. [77]

FAO (2022), *Food Outlook – Biannual Report on Global Food Markets*, https://doi.org/10.4060/cc2864en. [71]

Gagnon-Lebrun, F. and S. Agrawala (2006), *Progress on adaptation to climate change in developed countries: An analysis of broad trends*, OECD Publishing, Paris, https://www.oecd.org/env/cc/37178873.pdf. [70]

Gaupp, F. et al. (2019), "Increasing risks of multiple breadbasket failure under 1.5 and 2 °C global warming", *Agricultural Systems*, Vol. 175, pp. 34-45, https://doi.org/10.1016/j.agsy.2019.05.010. [28]

Glauber, J. et al. (2021), "Design principles for agricultural risk management policies"*, OECD Food, Agriculture and Fisheries Papers*, No. 157, OECD Publishing, Paris, https://doi.org/10.1787/1048819f-en. [57]

GLOBSEC (2023), *Walking on Fire: Demining in Ukraine*, https://www.globsec.org/sites/default/files/2023-04/Demining in Ukraine report ver5 web.pdf. [80]

Gowda, P. et al. (2018), *Chapter 10 : Agriculture and Rural Communities. Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II*, U.S. Global Change Research Program, https://doi.org/10.7930/nca4.2018.ch10. [19]

Grafton, R. et al. (2018), "The paradox of irrigation efficiency", *Science*, Vol. 361/6404, pp. 748-750, https://doi.org/10.1126/science.aat9314. [52]

Guerrero, S. et al. (2022), "The impacts of agricultural trade and support policy reform on climate change adaptation and environmental performance: A model-based analysis"*, OECD Food, Agriculture and Fisheries Papers*, No. 180, OECD Publishing, Paris, https://doi.org/10.1787/520dd70d-en. [56]

Hallegatte, S. (2009), "Strategies to adapt to an uncertain climate change", *Global Environmental Change*, Vol. 19/2, pp. 240-247, https://doi.org/10.1016/j.gloenvcha.2008.12.003. [65]

Henderson, B. and J. Lankoski (2019), "Evaluating the environmental impact of agricultural policies", *OECD Food, Agriculture and Fisheries Papers*, No. 130, OECD Publishing, Paris, https://doi.org/10.1787/add0f27c-en. [85]

Hsieh, H. and S. Shannon (2005), "Three Approaches to Qualitative Content Analysis", *Qualitative Health Research*, Vol. 15/9, pp. 1277-1288, https://doi.org/10.1177/1049732305276687. [68]

Ignaciuk, A. (2015), "Adapting Agriculture to Climate Change: A Role for Public Policies", *OECD Food, Agriculture and Fisheries Papers*, No. 85, OECD Publishing, Paris, https://doi.org/10.1787/5js08hwvfnr4-en. [36]

Ignaciuk, A. and D. Mason-D'Croz (2014), "Modelling Adaptation to Climate Change in Agriculture", *OECD Food, Agriculture and Fisheries Papers* 70, https://doi.org/10.1787/5jxrcljnbxq-en. [34]

Iizumi, T. et al. (2018), "Crop production losses associated with anthropogenic climate change for 1981-2010 compared with preindustrial levels", *International Journal of Climatology*, Vol. 38/14, pp. 5405-5417, https://doi.org/10.1002/joc.5818. [4]

IPCC (2023), "Summary for Policymakers. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.", in *Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change*, IPCC, Geneva, Switzerland, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf. [1]

IPCC (2022), "2022: Technical Summary. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_TechnicalSummary.pdf. [31]

IPCC (2022), "Chapter 10: Asia. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2022: IMpacts, Adaptation and Vulnerability.*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter10.pdf. [13]

IPCC (2022), "Chapter 11: Australasia. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2022: Imapcts, Adaptation and Vulnerability.*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter11.pdf. [17]

IPCC (2022), "Chapter 12: Central and South America. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.", in *Climate Change 2022: Impacts, Adaptation and VUlnerability*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter12.pdf. [20]

IPCC (2022), "Chapter 13: Europe. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter13.pdf. [10]

IPCC (2022), "Chapter 14: North America. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2022: Impacts, Adaptation and Vulnerability.*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter14.pdf. [18]

IPCC (2022), "Chapter 5: Food, Fibre and Other Ecosystem Products. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2022: Impacts, Adaptation, and Vulnerability.*, Cambridge University Press, Cambridge, United Kingodm and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter05.pdf. [2]

IPCC (2021), "Chapter 11: Weather and Climate Extreme Events in a Changing Climate. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change", in *Climate Change 2021: The Physical Science Basis*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter11.pdf. [26]

Kummu, M. et al. (2021), "Climate change risks pushing one-third of global food production outside the safe climatic space", *One Earth*, Vol. 4/5, pp. 720-729, https://doi.org/10.1016/j.oneear.2021.04.017. [30]

Kyiv School of Economics (2023), *The total amount of damage caused to Ukraine's infrastructure due to the war has increased to almost $138 billion*, https://kse.ua/about-the-school/news/the-total-amount-of-damage-caused-to-ukraine-s-infrastructure-due-to-the-war-has-increased-to-almost-138-billion/. [73]

Kyiv School of Economics (2022), *Agricultural War Losses Review Ukraine - Rapid Losses Assessment Issue 2*, https://kse.ua/wp-content/uploads/2022/11/Losses_report_issue2-1.pdf. [75]

Kyiv School of Economics (2022), *Assessment of damages in Ukraine due to Russia's military aggression as of September 1, 2022*, https://kse.ua/wp-content/uploads/2022/10/ENG-Sep22_Working_Sep1_Damages-Report.docx.pdf. [74]

Lankoski, J., A. Ignaciuk and F. Jésus (2018), "Synergies and trade-offs between adaptation, mitigation and agricultural productivity: A synthesis report"*, OECD Food, Agriculture and Fisheries Papers*, No. 110, OECD Publishing, Paris, https://doi.org/10.1787/07dcb05c-en. [40]

Malik, A., X. Qin and S. Smith (2010), "Autonomous adaptation to climate change: a literature review"*, IIEP Working Paper*, No. 2010-24, Elliott School of International Affairs, Washington, D.C., https://www2.gwu.edu/~iiep/assets/docs/papers/Smith_Malik_IIEPWP2010-27.pdf. [33]

Martyshev, P., O. Nivievskyi and M. Bogonos (2023), *Regional war, global consequences: Mounting damages to Ukraine's agriculture and growing challenges for global food security*, https://www.ifpri.org/blog/regional-war-global-consequences-mounting-damages-ukraines-agriculture-and-growing-challenges#:~:text=The%20total%20agricultural%20losses%20associated,output%20the%20previous%20agricultural%20year. [82]

Moore, F. (2020), *The Fingerprint of Anthropogenic Warming on Global Agriculture*, California Digital Library (CDL), https://doi.org/10.31223/x5q30z. [3]

Moscona, J. and K. Sastry (2022), "Does Directed Innovation Mitigate Climate Damage? Evidence from U.S. Agriculture", *The Quarterly Journal of Economics*, Vol. 138/2, pp. 637-701, https://doi.org/10.1093/qje/qjac039. [62]

Mullan, M. et al. (2013), "National Adaptation Planning: Lessons from OECD Countries", *OECD Environment Working Papers*, No. 54, OECD Publishing, Paris, https://doi.org/10.1787/5k483jpfpsq1-en. [64]

Nardone, A. et al. (2006), "Climatic Effects on Productive Traits in Livestock", *Veterinary Research Communications*, Vol. 30/S1, pp. 75-81, https://doi.org/10.1007/s11259-006-0016-x. [24]

OECD (2023), *Net Zero+: Climate and Economic Resilience in a Changing World*, OECD Publishing, Paris, https://doi.org/10.1787/da477dda-en. [47]

OECD (2022), *Agricultural Policy Monitoring and Evaluation 2022: Reforming Agricultural Policies for Climate Change Mitigation*, OECD Publishing, Paris, https://doi.org/10.1787/7f4542bf-en. [48]

OECD (2022), "Climate change adaptation policies to foster resilience in agriculture", [TAD/CA/APM/WP(2022)25/FINAL], https://one.oecd.org/official-document/TAD/CA/APM/WP(2022)25/FINAL/en. [88]

OECD (2022), *Climate Tipping Points: Insights for Effective Policy Action*, OECD Publishing, Paris, https://doi.org/10.1787/abc5a69e-en. [27]

OECD (2022), *Declaration on Transformative Solutions for Sustainable Agriculture and Food Systems*, OECD/LEGAL/0483, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0483. [92]

OECD (2020), *Agricultural Policy Monitoring and Evaluation 2020*, OECD Publishing, Paris, https://doi.org/10.1787/928181a8-en. [87]

OECD (2020), *Strengthening Agricultural Resilience in the Face of Multiple Risks*, OECD Publishing, Paris, https://doi.org/10.1787/2250453e-en. [39]

OECD (2020), *Water and agriculture*, Agriculture Policy Brief, OECD, Paris, https://issuu.com/oecd.publishing/docs/water_and_agriculture. [44]

OECD (2017), *Adaptation to climate change in Philippine agriculture*, OECD Publishing, Paris, https://doi.org/10.1787/9789264269088-7-en. [54]

OECD (2017), *Water Risk Hotspots for Agriculture*, OECD Studies on Water, OECD Publishing, Paris, https://doi.org/10.1787/9789264279551-en. [25]

OECD (2016), *Mitigating Droughts and Floods in Agriculture: Policy Lessons and Approaches*, OECD Studies on Water, OECD Publishing, Paris, https://doi.org/10.1787/9789264246744-en. [43]

OECD (2016), *OECD'S Producer Support Estimate and Related Indicators of Agricultural Support - Concepts, Calculations, Interpretation and Use (The PSE Manual)*, https://www.oecd.org/agriculture/topics/agricultural-policy-monitoring-and-evaluation/documents/producer-support-estimates-manual.pdf. [86]

OECD (2015), *Drying Wells, Rising Stakes: Towards Sustainable Agricultural Groundwater Use*, OECD Studies on Water, OECD Publishing, Paris, https://doi.org/10.1787/9789264238701-en. [42]

OECD (2014), *Climate Change, Water and Agriculture: Towards Resilient Systems*, OECD Studies on Water, OECD Publishing, Paris, https://doi.org/10.1787/9789264209138-en. [38]

OECD (2011), *Managing Risk in Agriculture: Policy Assessment and Design*, OECD Publishing, Paris, https://doi.org/10.1787/9789264116146-en. [58]

OECD (2010), *Sustainable Management of Water Resources in Agriculture*, OECD Studies on Water, OECD Publishing, Paris, https://doi.org/10.1787/9789264083578-en. [90]

OECD/FAO (2023), *OECD-FAO Agricultural Outlook 2023-2032*, OECD Publishing, Paris, https://doi.org/10.1787/08801ab7-en. [72]

OECD/FAO (2021), *Building Agricultural Resilience to Natural Hazard-induced Disasters: Insights from Country Case Studies*, OECD Publishing, Paris, https://doi.org/10.1787/49eefdd7-en. [8]

Ortiz-Bobea, A. (2021), "The empirical analysis of climate change impacts and adaptation in agriculture", in *Handbook of Agricultural Economics*, Elsevier, https://doi.org/10.1016/bs.hesagr.2021.10.002. [63]

Ortiz-Bobea, A. et al. (2021), "Anthropogenic climate change has slowed global agricultural productivity growth", *Nature Climate Change*, Vol. 11/4, pp. 306-312, https://doi.org/10.1038/s41558-021-01000-1. [5]

Pauw, P., K. Mbeva and H. van Asselt (2019), "Subtle differentiation of countries' responsibilities under the Paris Agreement", *Palgrave Communications*, Vol. 5/1, https://doi.org/10.1057/s41599-019-0298-6. [50]

Perry, S. et al. (2017), "Future Changes to El Niño-Southern Oscillation Temperature and Precipitation Teleconnections", *Geophysical Research Letters*, Vol. 44/20, pp. 10,608-10,616, https://doi.org/10.1002/2017gl074509. [29]

Potter, W. and D. Levine-Donnerstein (1999), "Rethinking validity and reliability in content analysis", *Journal of Applied Communication Research*, Vol. 27/3, pp. 258-284, https://doi.org/10.1080/00909889909365539. [69]

Schipper, E. (2020), "Maladaptation: When Adaptation to Climate Change Goes Very Wrong", *One Earth*, Vol. 3/4, pp. 409-414, https://doi.org/10.1016/j.oneear.2020.09.014. [41]

Shukla, P. et al. (eds.) (2022), *Introduction and Framing*, Cambridge University Press, Cambridge, UK and New York, NY, USA, https://doi.org/10.1017/9781009157926.003. [46]

Skendžić, S. et al. (2021), "The Impact of Climate Change on Agricultural Insect Pests", *Insects*, Vol. 12/5, p. 440, https://doi.org/10.3390/insects12050440. [12]

Smith, L. et al. (2019), "The greenhouse gas impacts of converting food production in England and Wales to organic methods", *Nature Communications*, Vol. 10/1, https://doi.org/10.1038/s41467-019-12622-7. [91]

Sumner, D. and C. Zulauf (2012), *Economic and Environmental Effects of Agricultural Insurance Programs*, C-FARE Reports, https://doi.org/10.22004/ag.econ.156622. [61]

Thirumalai, K. et al. (2017), "Extreme temperatures in Southeast Asia caused by El Niño and worsened by global warming", *Nature Communications*, Vol. 8/1, https://doi.org/10.1038/ncomms15531. [14]

Tibi, A. et al. (2022), *Protéger les cultures en augmentant la diversité végétale des espaces agricoles. Synthèse du rapport d'ESCo*, INRAE (France), 86 p. [51]

UNCTAD (2021), *An Assessment of the Regional Comprehensive Economic Partnership (RCEP) Tariff Concessions*, United Nations Conference on Trade and Development (UNCTAD), https://unctad.org/system/files/official-document/ser-rp-2021d16_en.pdf. [84]

UNFCCC (2022), *Adaptation communications*, https://unfccc.int/topics/adaptation-and-resilience/workstreams/adaptation-communications (accessed on 10 October 2022). [67]

UNFCCC (2022), *Nationally Determined Contributions (NDCs): The Paris Agreement and NDCs*, https://unfccc.int/ndc-information/nationally-determined-contributions-ndcs (accessed on 10 October 2022). [66]

UNOCHA (2023), *Ukraine Humanitarian Response 2023 Situation Report 29 May 2023*, https://reports.unocha.org/en/country/ukraine/card/vxxNhuJBA5/ (accessed on 19/06/2023). [79]

USDA (2023), *Grain and Feed Annual Ukraine*, https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Grain%20and%20Feed%20Annual_Kyiv_Ukraine_UP2023-0012.pdf. [78]

WMO (2022), *State of the Climate in Latin America and the Caribbean 2021*, World Meteorological Organization, No. 1295. [21]

Wreford, A., A. Ignaciuk and G. Gruère (2017), "Overcoming barriers to the adoption of climate-friendly practices in agriculture", *OECD Food, Agriculture and Fisheries Papers*, No. 101, OECD Publishing, Paris, https://doi.org/10.1787/97767de8-en. [35]

Wreford, A., D. Moran and N. Adger (2010), *Climate Change and Agriculture: Impacts, Adaptation and Mitigation*, OECD Publishing, Paris, https://doi.org/10.1787/9789264086876-en. [55]

# Annex 2.A. Definition of OECD indicators of agricultural support

## Nominal indicators used in this report

***Producer Support Estimate (PSE):*** The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income. It includes market price support, budgetary payments and budget revenue foregone, i.e. gross transfers from consumers and taxpayers to agricultural producers arising from policy measures based on: current output, input use, area planted/animal numbers/receipts/incomes (current, non-current), and non-commodity criteria. PSE categories are defined in Box 2 A.1.

***Market Price Support (MPS):*** The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers arising from policy measures that create a gap between domestic market prices and border prices of a specific agricultural commodity, measured at the farm gate level. MPS is available by commodity, and sums of negative and positive components are reported separately where relevant along with the total MPS.

***Producer Single Commodity Transfers (producer SCT):*** The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policies linked to the production of a single commodity such that the producer must produce the designated commodity in order to receive the payment. This includes broader policies where transfers are specified on a per-commodity basis. Producer SCT is also available by commodity.

***Group Commodity Transfers (GCT):*** The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policies whose payments are made on the basis that one or more of a designated list of commodities is produced, i.e. a producer may produce from a set of allowable commodities and receive a transfer that does not vary with respect to this decision.

***All Commodity Transfers (ACT):*** The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policies that place no restrictions on the commodity produced but require the recipient to produce some commodity of their choice.

***Other Transfers to Producers (OTP):*** The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level, arising from policies that do not require any commodity production at all.

***Consumer Single Commodity Transfers (consumer SCT):*** The annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at the farm gate level, arising from policies linked to the production of a single commodity. Consumer SCT is also available by commodity.

***Consumer Support Estimate (CSE):*** The annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at the farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on consumption of farm products. If negative, the CSE measures the burden (implicit tax) on consumers through market price support (higher prices), that more than offsets consumer subsidies that lower prices to consumers.

***General Services Support Estimate (GSSE):*** The annual monetary value of gross transfers arising from policy measures that create enabling conditions for the primary agricultural sector through development of private or public services, institutions and infrastructure, regardless of their objectives and impacts on farm production and income, or consumption of farm products. The GSSE includes policies where primary agriculture is the main beneficiary, but does not include any payments to individual producers. GSSE transfers do not directly alter producer receipts or costs or consumption expenditures. GSSE categories are defined below.

***Total Support Estimate (TSE):*** The annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support agriculture, net of the associated budgetary receipts, regardless of their objectives and impacts on farm production and income, or consumption of farm products.

***Total Budgetary Support Estimate (TBSE):*** The annual monetary value of all gross budgetary transfers from taxpayers arising from policy measures that support agriculture, regardless of their objectives and impacts on farm production and income, or consumption of farm products.

***Gross Farm Receipts (GFR):*** The annual monetary value of production, to which budgetary transfers to individual producers are added (i.e. VP + PSE – MPS).

***Commodity Gross Receipts***: The annual monetary value of production for an individual commodity, to which budgetary transfers to producers of that commodity are added (i.e. VP + producer SCT – MPS).

## Ratio indicators and percentage indicators

***Percentage PSE (%PSE):*** PSE transfers as a share of gross farm receipts (including support in the denominator).

***Percentage SCT (%SCT):*** Single Commodity Transfers as a share of gross receipts for the specific commodity (including support in the denominator).

***Share of SCT in total PSE (%):*** Share of Single Commodity Transfers in the total PSE. This indicator is also calculated by commodity.

***Producer Nominal Protection Coefficient (producer NPC):*** The ratio between the average price received by producers (at farm gate), including payments per tonne of current output, and the border price (measured at farm gate). The Producer NPC is also available by commodity.

***Producer Nominal Assistance Coefficient (producer NAC):*** The ratio between the value of gross farm receipts including support and gross farm receipts (at farm gate) valued at border prices (measured at farm gate).

***Percentage CSE (%CSE):*** CSE transfers as a share of consumption expenditure on agricultural commodities (at farm gate prices), net of taxpayer transfers to consumers. The %CSE measures the implicit tax (or subsidy, if CSE is positive) placed on consumers by agricultural price policies.

***Consumer Nominal Protection Coefficient (consumer NPC):*** The ratio between the average price paid by consumers (at farm gate) and the border price (measured at farm gate). The Consumer NPC is also available by commodity.

***Consumer Nominal Assistance Coefficient (consumer NAC):*** The ratio between the value of consumption expenditure on agricultural commodities (at farm gate) and that valued at border prices.

***Percentage TSE (%TSE):*** TSE transfers as a percentage of GDP.

***Percentage TBSE (%TBSE):*** TBSE transfers as a percentage of GDP.

***Percentage GSSE (%GSSE):*** Share of expenditures on general services in the Total Support Estimate (TSE).

***Share of potentially most distorting transfers in aggregated gross producer transfers (%):*** represents the sum of positive MPS, the absolute value of negative MPS, payments based on output and payments based on unconstrained use of variable inputs, relative to the sum of positive MPS, the absolute value of negative MPS, and all budgetary payments to producers.

## Annex Box 2.A.1. Definitions of categories in the PSE classification

**Definitions of categories**

***Category A1, Market price support (MPS):*** Transfers from consumers and taxpayers to agricultural producers from policy measures that create a gap between domestic market prices and border prices of a specific agricultural commodity, measured at the farm gate level.

***Category A2, Payments based on output***: Transfers from taxpayers to agricultural producers from policy measures based on current output of a specific agricultural commodity.

***Category B, Payments based on input use:*** Transfers from taxpayers to agricultural producers arising from policy measures based on on-farm use of inputs:

- ***Variable input use*** that reduces the on-farm cost of a specific variable input or a mix of variable inputs.
- ***Fixed capital formation*** that reduces the on-farm investment cost of farm buildings, equipment, plantations, irrigation, drainage, and soil improvements.
- ***On-farm services*** that reduce the cost of technical, accounting, commercial, sanitary and phytosanitary assistance and training provided to individual farmers.

***Category C, Payments based on current A/An/R/I, production required:*** Transfers from taxpayers to agricultural producers arising from policy measures based on current area, animal numbers, revenue, or income, and requiring production.

***Category D, Payments based on non-current A/An/R/I, production required***: Transfers from taxpayers to agricultural producers arising from policy measures based on non-current (i.e. historical or fixed) area, animal numbers, revenue, or income, with current production of any commodity required.

***Category E, Payments based on non-current A/An/R/I, production not required:*** Transfers from taxpayers to agricultural producers arising from policy measures based on non-current (i.e. historical or fixed) area, animal numbers, revenue, or income, with current production of any commodity not required but optional.

***Category F, Payments based on non-commodity criteria***: Transfers from taxpayers to agricultural producers arising from policy measures based on:

- ***Long-term resource retirement:*** Transfers for the long-term retirement of factors of production from commodity production. The payments in this subcategory are distinguished from those requiring short-term resource retirement, which are based on commodity production criteria.
- ***A specific non-commodity output:*** Transfers for the use of farm resources to produce specific non-commodity outputs of goods and services, which are not required by regulations.
- ***Other non-commodity criteria:*** Transfers provided equally to all farmers, such as a flat rate or lump sum payment.

***Category G, Miscellaneous payments***: Transfers from taxpayers to farmers for which there is a lack of information to allocate them among the appropriate categories.

*Note*: A (area), An (animal numbers), R (receipts) or I (income).

**Definitions of labels**

***With or without current commodity production limits and/or limit to payments***: Defines whether or not there is a specific limitation on current commodity production (output) associated with a policy providing transfers to agriculture and whether or not there are limits to payments in the form of limits to area or animal numbers eligible for those payments. Applied in categories A–F.

***With variable or fixed payment rates***: Any payments is defined as subject to a variable rate where the formula determining the level of payment is triggered by a change in price, yield, net revenue or income or a change in production cost. Applied in categories A–E.

***With or without input constraints***: defines whether or not there are specific requirements concerning farming practices related to the programme in terms of the reduction, replacement, or withdrawal in the use of inputs or a restriction of farming practices allowed. Applied in categories A–F. The payments with input constrains are further broken down to:

- Payments conditional on compliance with basic requirements that are mandatory (with mandatory);
- Payments requiring specific practices going beyond basic requirements and voluntary (with voluntary).
  - Specific practices related to environmental issues.
  - Specific practices related to animal welfare.
  - Other specific practices.

***With or without commodity exceptions***: defines whether or not there are prohibitions upon the production of certain commodities as a condition of eligibility for payments based on non-current A/An/R/I of commodity(ies). Applied in Category E.

***Based on area, animal numbers, receipts or income***: defines the specific attribute (i.e. area, animal numbers, receipts or income) on which the payment is based. Applied in categories C–E.

***Based on a single commodity, a group of commodities or all commodities***: defines whether the payment is granted for production of a single commodity, a group of commodities or all commodities. Applied in categories A–D.

## Drivers of the change in PSE

### *Decomposition of PSE*

***Per cent change in PSE*:** Per cent change in the nominal value of the PSE expressed in national currency. The per cent change is calculated using the two most recent years in the series.

***Contribution of MPS to per cent change in PSE*:** Per cent change in nominal PSE if all variables other than MPS are held constant.

***Contribution of price gap to per cent change in the PSE*:** Per cent change in nominal PSE if all variables other than gap between domestic market prices and border prices are held constant.

***Contribution of quantity produced to per cent change in the PSE*:** Per cent change in nominal PSE if all variables other than quantity produced are held constant.

***Contribution of budgetary payments (BP) to per cent change in PSE*:** Per cent change in nominal PSE if all variables other than BP are held constant.

***Contribution of BP elements to per cent change in PSE*:** Per cent change in nominal PSE if all variables other than a given BP element are held constant. BP elements include Payments based on output, Payments based on input use, Payments based on current A/An/R/I, production required, Payments based on non-current A/An/R/I, production required, Payments based on non-current A/An/R/I, production not required, Payments based on non-commodity criteria and Miscellaneous payments.

### *Change in Producer Price*

***Per cent change in Producer Price*:** Per cent change in Producer Price (at farm gate) expressed in national currency. The per cent change is calculated using the two most recent years in the series.

### *Decomposition of the change in the Border Price*

***Per cent change in Border Price*:** Per cent change in Border Price (at farm gate) expressed in national currency. The per cent change is calculated using the two most recent years in the series.

***Contribution of Exchange Rate to per cent change in Border Price*:** Per cent change in the Border Price (at farm gate) expressed in national currency if all variables other than Exchange Rate between national currency and USD are held constant.

***Contribution of Border Price expressed in USD to per cent change in Border Price*:** Per cent change in the Border Price (at farm gate) expressed in national currency if all variables other than Border Price (at farm gate) expressed in USD are held constant.

Note: The change in Producer Support Estimate (PSE) is not decomposed when PSE is negative for the current and/or previous year. The producer price change and the border price change are not calculated when both negative and positive market price support (MPS) occur at the commodity level for the previous year. Note that negative MPS estimates for livestock products may arise in cases of aligned product prices if there is positive MPS for feed commodities.

## Definition of GSSE categories

### *Agricultural knowledge and innovation system*

- ***Agricultural knowledge generation***: Budgetary expenditure financing research and development (R&D) activities related to agriculture, and associated data dissemination, irrespective of the institution (private or public, ministry, university, research centre or producer groups) where they take place, the nature of research (scientific, institutional, etc.), or its purpose.
- ***Agricultural knowledge transfer***: Budgetary expenditure financing agricultural vocational schools and agricultural programmes in high-level education, training and advice to farmers that is generic (e.g. accounting rules, pesticide application), not specific to individual situations, and data collection and information dissemination networks related to agricultural production and marketing.

### *Inspection and control*

- ***Agricultural product safety and inspection***: Budgetary expenditure financing activities related to agricultural product safety and inspection. This includes only expenditures on inspection of

domestically produced commodities at first level of processing and border inspection for exported commodities.

- ***Pest and disease inspection and control:*** Budgetary expenditure financing pest and disease control of agricultural inputs and outputs (control at primary agriculture level) and public funding of veterinary services (for the farming sector) and phytosanitary services.
- ***Input control:*** Budgetary expenditure financing the institutions providing control activities and certification of industrial inputs used in agriculture (e.g. machinery, industrial fertilisers, pesticides, etc.) and biological inputs (e.g. seed certification and control).

### *Development and maintenance of infrastructure*

- ***Hydrological infrastructure:*** Budgetary expenditure financing public investments into hydrological infrastructure (irrigation and drainage networks).
- ***Storage, marketing and other physical infrastructure***: Budgetary expenditure financing investments to off-farm storage and other market infrastructure facilities related to handling and marketing primary agricultural products (silos, harbour facilities – docks, elevators; wholesale markets, futures markets), as well as other physical infrastructure related to agriculture, when agriculture is the main beneficiary.
- ***Institutional infrastructure***: Budgetary expenditure financing investments to build and maintain institutional infrastructure related to the farming sector (e.g. land cadastres; machinery user groups, seed and species registries; development of rural finance networks; support to farm organisations, etc.).
- ***Farm restructuring***: Budgetary payments related to reform of farm structures financing entry, exit or diversification (outside agriculture) strategies.

### *Marketing and promotion*

- ***Collective schemes for processing and marketing***: Budgetary expenditure financing investment in collective, mainly primary, processing, marketing schemes and marketing facilities, designed to improve marketing environment for agriculture.
- ***Promotion of agricultural products***: Budgetary expenditure financing assistance to collective promotion of agro-food products (e.g. promotion campaigns, participation on international fairs).
- ***Cost of public stockholding***: Budgetary expenditure covering the costs of storage, depreciation and disposal of public storage of agricultural products.
- ***Miscellaneous***: Budgetary expenditure financing other general services that cannot be disaggregated and allocated to the above categories, often due to a lack of information.

More detailed information on the indicators, their use and limitations is available in *OECD's Producer Support Estimate and Related Indicators of Agricultural Support: Concepts, Calculation, Interpretation and Use* (the PSE Manual) available on the OECD public website (http://www.oecd.org/agriculture/topics/agricultural-policy-monitoring-and-evaluation/documents/producer-support-estimates-manual.pdf).

## OECD indicators of support

| | |
|---|---|
| ACT | All Commodity Transfers |
| CSE | Consumer Support Estimate |
| GCT | Group Commodity Transfers |
| GSSE | General Services Support Estimate |
| MPS | Market Price Support |
| NAC | Nominal Assistance Coefficient |
| NPC | Nominal Protection Coefficient |
| OTP | Other Transfers to Producers |
| PEM | Policy Evaluation Model |
| PSE | Producer Support Estimate |
| SCT | Single Commodity Transfers |
| TSE | Total Support Estimate |

## Currencies

| | |
|---|---|
| ARS | Argentinian peso |
| AUD | Australian dollar |
| BRL | Brazilian real |
| CAD | Canadian dollar |
| CLP | Chilean peso |
| COP | Colombian peso |
| CHF | Swiss frank |
| CNY | Chinese yuan renminbi |
| CRC | Costa Rican colon |
| EUR | Euro |
| GBP | British pound |
| IDR | Indonesian roupiah |
| INR | Indian rupee |
| ILS | Israeli shekel |
| ISK | Icelandic krona |
| JPY | Japanese yen |
| KRW | Korean won |
| KZT | Kazakh tenge |
| MXN | Mexican peso |
| NOK | Norwegian krone |
| NZD | New Zealand dollar |
| PHP | Philippines peso |
| RUR | Russian rouble |
| TRY | New Turkish lira |
| UAH | Ukrainian hryvnia |
| USD | United States dollar |
| VND | Vietnamese dong |
| ZAR | South African rand |