1. Overview

This chapter provides an overview of the latest set of quantitative medium-term projections for global and national agricultural markets. The projections cover consumption, production, trade, and prices for 25 agricultural products for the period 2020 to 2029. The weakening of demand growth is expected to persist over the coming decade. Population will be the main driver of consumption growth for most commodities, even though the rate of population growth is projected to decline. Per capita consumption of many commodities is expected to be flat at the global level. The slower demand growth for agricultural commodities is projected to be matched by efficiency gains in crop and livestock production, which will keep real agricultural prices relatively flat. International trade will remain essential for food security in food-importing countries, and for rural livelihoods in food-exporting countries. World agricultural markets face a range of new uncertainties that add to the traditionally high risks agriculture faces. The most significant source of uncertainties relates to the COVID-19 pandemic that has impacts on consumption, production, prices and trade. Other uncertainties relate to changes in consumers preferences, plant and animal diseases, and the heightened uncertainty with respect to future trading agreements between several important players on world agricultural markets.

1.1. Introduction

The *OECD-FAO Agricultural Outlook* presents a consistent baseline scenario for the evolution of agricultural and fish commodity markets at national, regional and global levels over the coming decade (2020-2029). The *Outlook* thus focuses on the medium term, complementing both short-term market monitoring, outlook publications, and long-term projections. This current edition of the *Outlook* was being finalised under the unique circumstances generated by the COVID-19 pandemic. As the full impact of the pandemic on agricultural and fish markets remain uncertain, at least in quantitative terms, they were not incorporated into the baseline projections. However, an initial scenario presented in Section 1.6 explores the likely macroeconomic impacts of the pandemic on agricultural markets over the short term. The *Outlook* projections for the early years of the projection period thus need to be qualified and remain more uncertain than projections for the later years. However, since agriculture and the overall economy are expected to recover over the next decade, the projections for the following years of the *Outlook* are consistent with the underlying economic drivers and trends affecting global agricultural markets. Therefore, the short-term impacts of the pandemic on agricultural and fish markets do not alter the medium term baseline scenario.

The OECD and the FAO developed the projections in the *Outlook* in collaboration with experts from member countries and international commodity bodies. These are projections, not forecasts, which present a plausible and consistent scenario of the medium term outlook for agricultural commodities. The OECD-FAO Aglink-Cosimo model defines linkages among the sectors covered in the *Outlook* to ensure consistency and a global equilibrium across all markets. It allows follow-up analysis, including an analysis of market uncertainties. A detailed discussion of the methodology underlying the projections as well as documentation of the Aglink-Cosimo model are available online at www.agri-outlook.org. Regional briefs present projection highlights for the six FAO regions. Projections by commodity are discussed in detail in the commodity chapters.

The *Outlook* projections are influenced both by current market conditions (summarised in Figure 1.1) and by specific assumptions concerning macroeconomic developments, the policy environment, technological change, weather, demographic trends, and consumer preferences. Over the outlook period, world population is expected to reach 8.4 billion people; economic growth will continue to be unevenly spread around the world, with robust per capita income growth in emerging markets (more details in Box 1.4). Both population growth and economic growth are the main drivers of demand for agricultural commodities while the assumptions on continued productivity growth and on resource availability are shaping the production of agricultural commodities.

The *Outlook* projections are inevitably uncertain because they extend ten years into the future and are based on assumptions regarding economic and policy conditions. These uncertainties are discussed in detail at the end of this chapter and in each of the commodity chapters. The most significant source of uncertainties obviously relate to the COVID-19 pandemic. While most primary agricultural production may be only marginally affected by the pandemic, interruptions to downstream food processing, trade in agricultural commodities, forced adjustments of consumer demand, and shortages of seasonal labour will certainly impact agricultural and fish markets, especially in the short term, as discussed in Section 1.6.

Figure 1.1. Market conditions for key commodities

Current market conditions

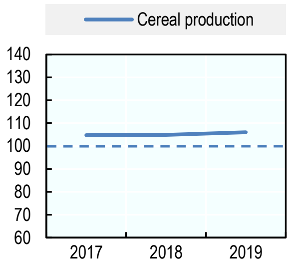
Production Index

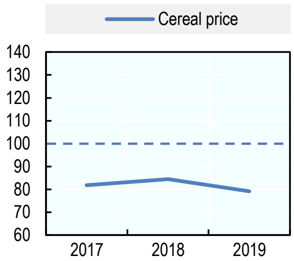
Average 2010-2019 = 100

Real Price Index

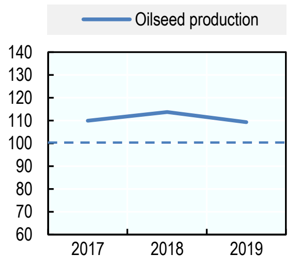
Average 2010-2019 = 100

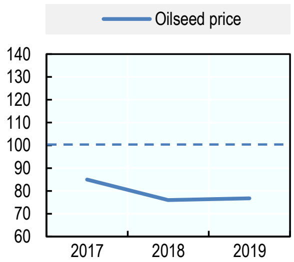
Cereal: After two years with stable world production of cereals, it increased again in 2019, driven by larger wheat and other coarse grains harvests. In contrast, the maize crop was lower and rice output remained at similar levels as in 2018. Production growth outpaced demand growth, weakening prices. Global cereal stocks fell, almost entirely driven by destocking of maize in China.



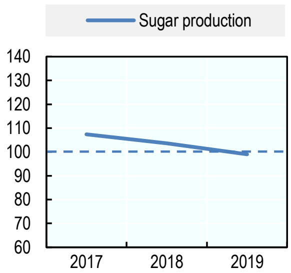


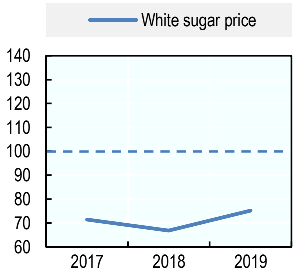
Oilseed: Smaller soybean crop in the United-States and rapeseed crops in Canada and the European Union reduced world oilseed production compared to previous season. Prices of oilseeds and products fared at multi-year lows in 2019, mainly reflecting a slowdown in global demand for oils and meals due to reduced feed demand in China and uncertainties stemming from bilateral trade disputes.



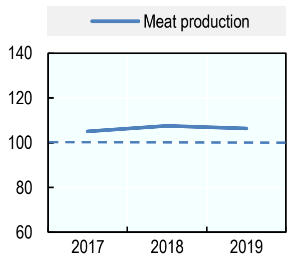


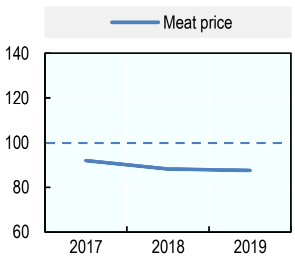
Sugar: After two seasons of production surplus, where India surpassed Brazil as the world top producer, unfavourable weather conditions in Asia and Western Europe (summer 2019) contribute to a large global deficit for 2019-20. Growth in consumption remains strong in many developing countries, while a negative, health-driven trend is observed in countries with high per capita consumption levels. The falling prices of the last two seasons return to an upward trend.



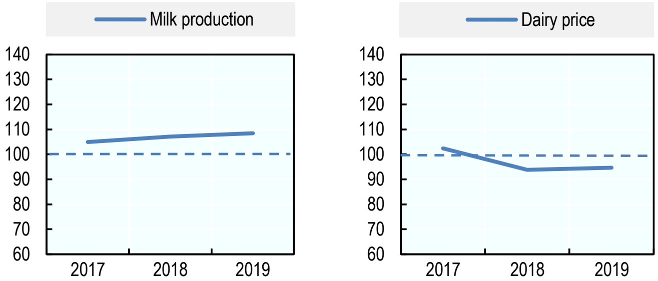


Meat: World meat production decreased by 2% in 2019, this decline is due principally to the impact of ASF in China. China's overall meat output is estimated to have fallen by 10%, which reflects a contraction of at least 21% in pigmeat production. Globally, lower meat production in China was partly offset by increased meat production in Argentina, the European Union, Turkey, and the United-States. As a result, meat price decreased in real terms.

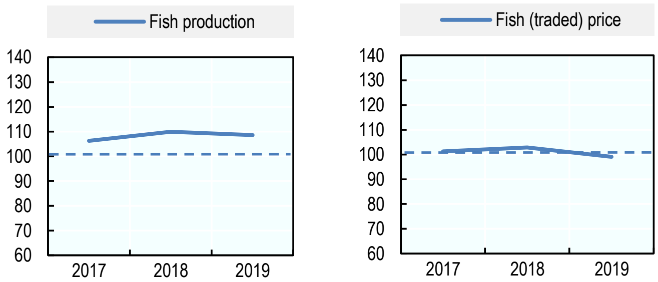




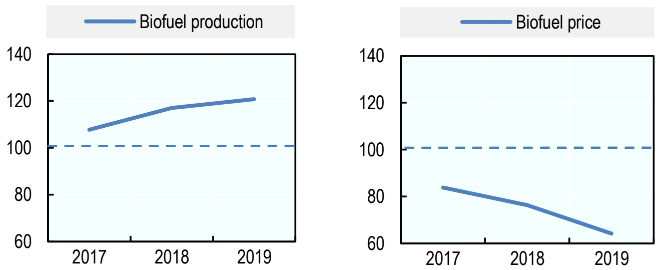
Dairy: World milk production experienced an increase by 1.3% in 2019, fuelled by a strong increase in India, but largely unchanged production in the three major dairy exporters (the European Union, New Zealand and the United-States). While butter prices continued to decline, from their 2017 peak, strong demand for dairy products sustained real prices.



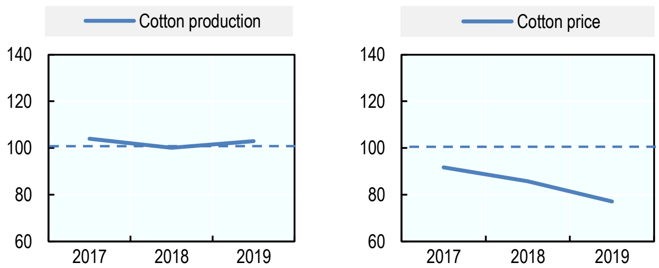
Fish: The global fishery and aquaculture sector slightly declined in 2019, after the rather sustained growth experienced in 2018. However, while aquaculture production continued to expand, capture fisheries declined due to lower catches of selected species. Fish prices were down in 2019, primarily due to price declines for many important farmed species.



Biofuels: Global production increased in all producing regions in 2019. Demand was sustained by obligatory blending and growing total fuel demand. In some countries, increases in mandates and subsidies supported demand for biofuels. Ample supply translated into lower prices for ethanol and biodiesel.



Cotton: Production increased slightly in the 2019 marketing year as harvest were globally better than in the previous year. Consumption grew for all major consumers. Global stocks stagnated in 2019 at about 8 months of world consumption. Prices have been declining but continue to be high compared to polyester, the main substitute for cotton.



Note: All graphs expressed as an index where the average of the past decade (2010-2019) is set to 100. Production refers to global production volumes. Price indices are weighted by the average global production value of the past decade as measured at real international prices. More information on market conditions and evolutions by commodity can be found in the commodity snapshot tables in the Statistical Annex and the online commodity chapters.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database) http://dx.doi.org/10.1787/agr-outl-data-en.

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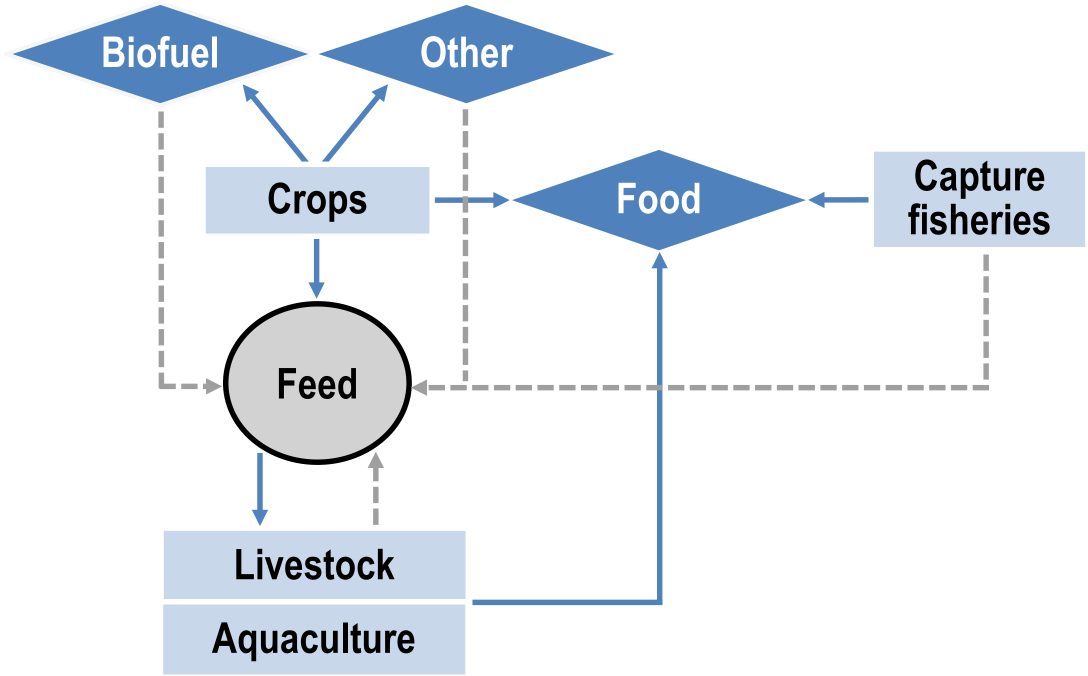
1.2. Consumption

The *OECD-FAO Agricultural Outlook* projects the use of agricultural commodities as food, feed and raw materials for industrial applications, including biofuel. The baseline covers the direct use of crops as minimally processed food, but also includes first level processing, such as the crush of oilseeds and the subsequent use of the derived products as food and feed. Among livestock products, the food consumption of meat, eggs, fish and dairy products is covered by the *Outlook*. Accounting for direct feed use of cereals, as well as the use of processed products such as protein meal, fishmeal, cereal bran and other by-products in the livestock sector allows the *Outlook* to identify the sector's net contribution to human nutrition. Biofuels have become the dominant industrial use of agricultural commodities in recent years. Their production utilises cereals and sugar crops directly, but also processed products such as molasses and various vegetable oils. "Other" uses, mostly industrial applications of agricultural commodities for commercial production, such as grains for industrial starch production, have also become increasingly important in recent years and are expected to gain importance in the future. The decomposition of commodity consumption into the different categories of use primarily considered in the *Outlook* is shown in Figure 1.2.

Figure 1.2. Main commodity uses by agricultural sector



Notes: Boxes indicate agricultural sectors, diamonds refer to final use categories, the circle represents an intermediate use.
Solid lines represent main commodity flows, dashed lines indicate minor or secondary flows. For example, biofuel production (ethanol) is a main use of crops and the residues (DDG) go to feed. Food is the main use of livestock products and a minor part (MBM) flows back to feed.
The final use category "other" refers to seed use, waste and all industrial applications, except biofuel.

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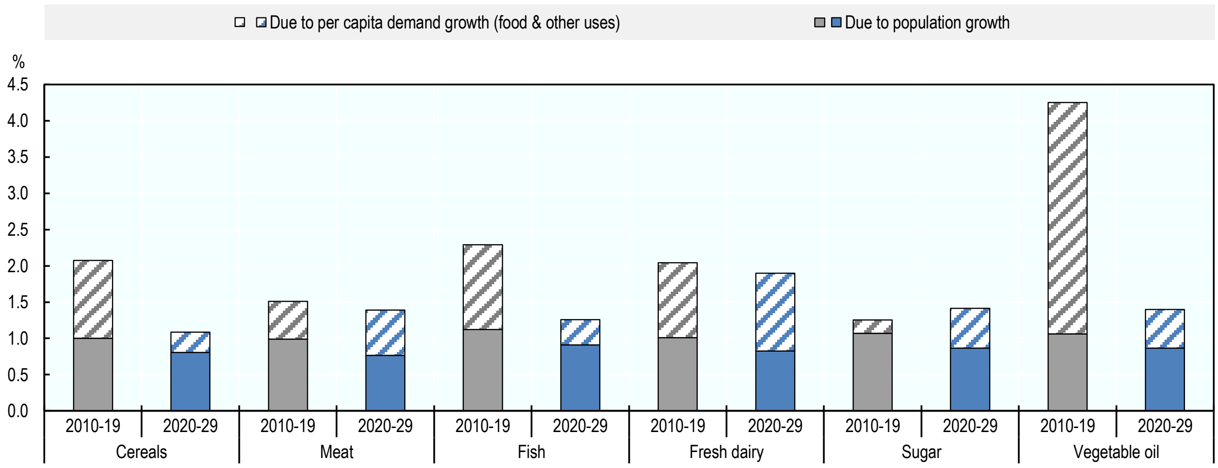
What drives changes in global demand for agricultural products and fish?

The demand for agricultural commodities to fulfil the various uses outlined above is influenced by a set of common elements, such as population dynamics, urbanisation, disposable income, consumer preferences, prices, policies and various social factors. These elements will determine the structure of agricultural commodity demand over the coming decade.

Globally, population growth is expected to remain the dominant driver of total agricultural commodity demand over the outlook period, in particular for commodities that have high levels of per-capita consumption in regions with fast expanding populations. For food grains, the importance of population as a driving factor tends to remain high across regions as per capita food demand is stagnant or even decreasing in several high-income countries. For vegetable oils, sugar, meat and dairy products, the impact of population dynamics is lower as income and individual preferences play a greater role (Figure 1.3).

Figure 1.3. Annual growth in demand for key commodity groups



Note: The population growth component is calculated assuming per capita demand remains constant at the level of the year preceding the decade. Growth rates refer to total demand (for food, feed and other uses).
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.
Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Besides population dynamics, demand growth depends on the individual consumption patterns of the population. These patterns are determined by the respective consumption preferences and the available income to realise them. As a result of global economic development, per capita food expenditures across all income groups are expected to increase in absolute terms with an increasing proportion devoted to higher value items such as vegetable oils, livestock products and fish. However, as incomes rise, people's propensity to spend their extra income on food declines and consequently the food expenditure share in total disposable income falls. Figure 1.4shows this for different groups of countries classified by income.

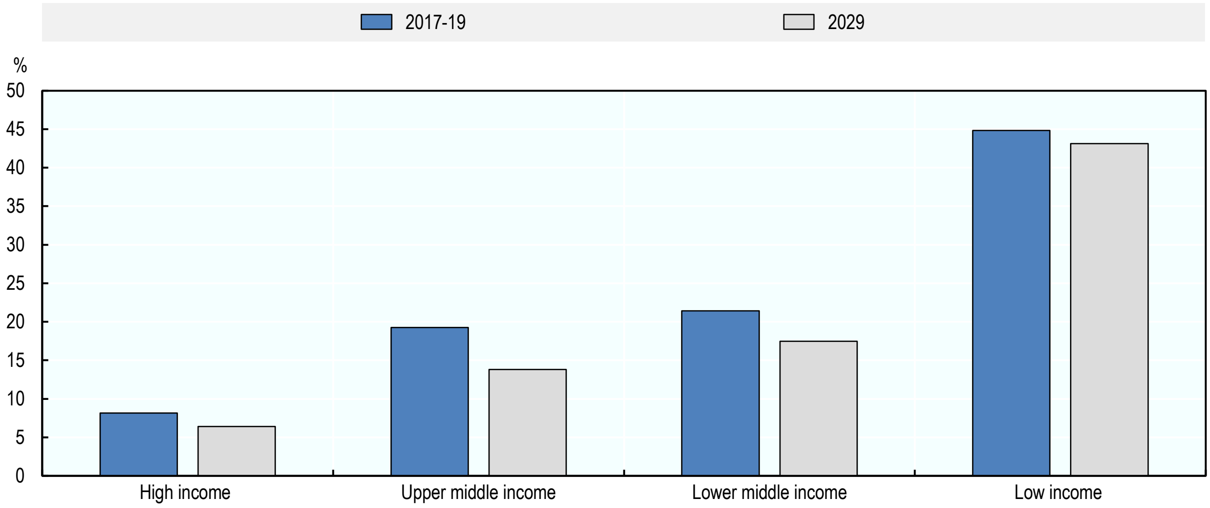
Based on the projected income growth in high-income countries, the share of food in total household expenditure is expected to fall from about 8% in the base period to 6% by 2029.

The absolute decrease is expected to be larger in the emerging economies of upper and lower middle-income countries, where food expenditure shares are expected to fall from 21% to 17% for lower middle-income countries, and from 19% to 14% for upper middle-income countries by 2029 (Figure 1.4).

The projected reduction in the food share of household expenditures will be less pronounced in low-income countries, where per-capita income growth is expected to stagnate during the coming decade. By the end of the projection period, the proportion of household income spent on food is projected to remain on average at 43% in 2029. Food security of people in the lowest income groups in these countries remains very vulnerable to income and food price shocks.

The *Outlook* assumes that developments in the use of agricultural commodities will be additionally shaped by socio-cultural and income-driven changes in consumer preferences over the projection period. The continuing urbanisation and rising female participation in the workforce especially in high-income and emerging economies is expected to contribute to a higher consumption of processed and convenience food, and an increasing tendency to eat outside the home. These trends are underpinning the projected increases in the consumption of sugar and vegetable oils. The effects of ageing populations and more sedentary lifestyles, particularly in high-income countries, are also considered in the projections of daily calorie requirements.

Figure 1.4. Food as a share of household expenditures, by income group



Note: Calculated on per-capita GDP and excludes food consumed away from home.
The 38 individual countries and 11 regional aggregates in the baseline are classified into the four income groups according to their respective per-capita income in 2018. The applied thresholds are: low: < USD 1 550, lower-middle: < USD 3 895, upper-middle: < USD 13 000, high: > USD 13 000.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The baseline projections also account for increasing consumer awareness of the links between diets and health, which is expected to boost the consumption of poultry and fish and reduce the consumption of red meat and sugar. Policies seeking to promote healthy dietary choices and curb the consumption of items that may cause overweight, obesity and diet-related non-communicable diseases such as diabetes have been implemented or are being considered in numerous countries, including Chile, France, Mexico, Norway, South Africa, and the United Kingdom. The introduction of food product labels that provide nutrition information as well as regulations limiting the youth-targeted advertising of ultra-processed products are additional measures that have been incorporated into the assessment of future consumer preferences.

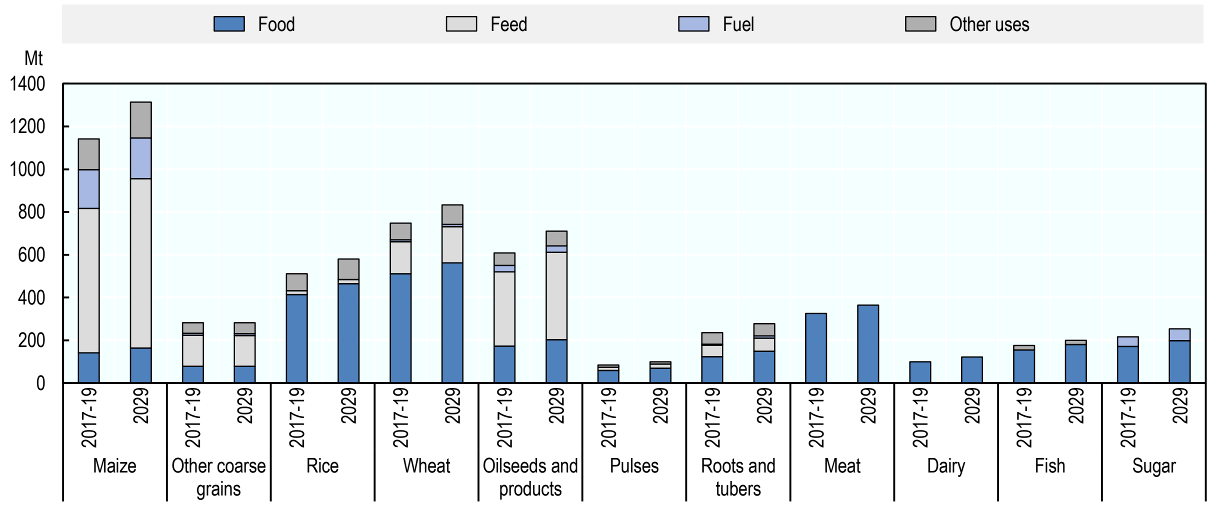
The expectation of a growing awareness of the impact of consumption choices on the environment is moderating the demand growth projections for items such as palm oil, beef, and non-organic cotton. Such concerns are, at the same time, supporting the growing demand for renewable raw products for non-food uses, such as biofuels and industrial applications in packaging, cosmetics or the pharmaceutical industry.

Limited change expected in structure of commodity demand

As shown in Figure 1.2, the *Outlook* accounts for four major use categories of basic agricultural commodities. Food is the primary use of agricultural commodities, currently accounting for 52% of calories produced by global agriculture. Feed is taking up about 31% of calories produced, while the remaining 17% are used as either biofuel, seed, or raw products in industrial applications.

Over the coming decade, the shares of the respective uses by commodity are not projected to change significantly, as no major structural shifts in consumption are expected (Figure 1.5). Food will continue to be the dominant use of food grains (rice, wheat), roots and tubers, pulses, sugar, vegetable oils and all animal products. Feed will continue to be the main use of coarse grains and protein meals.

Figure 1.5. Global use of major commodities



Note: Crushing of oilseeds is not reported as the uses of 'vegetable oil' and 'protein meal' are included in the total; Dairy refers to all dairy products in milk solid equivalent units; Sugar biofuel use refers to sugarcane and sugarbeet, converted into sugar equivalent units.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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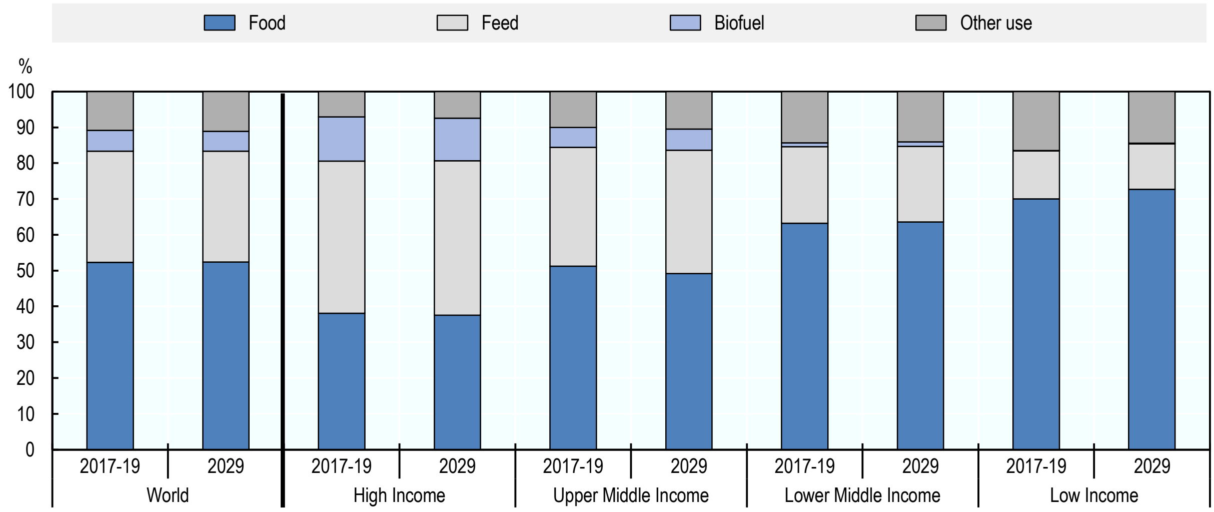
The use of agricultural commodities varies depending on the development status of countries (Figure 1.6). Consumers in low-income countries consume the bulk of their calories from vegetal sources. Their standard of living does not allow them to invest a large share of their domestic crop production into the production of feed for non-ruminant animals, as they cannot afford to consume high-priced calories of animal origin.[1] The food share of the consumed calories is additionally elevated, because livestock products are imported from high-, upper- and lower-middle income countries, where the calories are counted as feed. The food share in low-income countries is projected to rise to 74% by the end of the outlook period, as growth in domestic food demand outpaces the growth in domestic demand for feed and for renewable industrial raw products. By contrast, the structure of demand for agricultural commodities in high-income countries favours further processing, and direct food use accounts for only 43% of total consumption. In North America for example, the sizable biofuel sector as well as the large and feed-intensive livestock sector, take up the bulk of crop production. The feed use of agricultural commodities is also expected to expand particularly in upper-middle income regions over the outlook period, mainly due to export-driven growth in the meat sector. These countries are projected to further capitalise on their resources and competitiveness to capture the additional value of the livestock sector.

Figure 1.6. Uses of agricultural commodities: share of calories, by income group



Note: The 38 individual countries and 11 regional aggregates in the baseline are classified into the four income groups according to their respective per-capita income in 2018. The applied thresholds are: low: < USD 1 550, lower-middle: < USD 3 895, upper-middle: < USD 13 000, high: > USD 13 000.

Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Population growth will be the main driver of food use

Population is the key determinant of total food use. Income, relative prices, other demographic factors, consumer preferences and lifestyles, meanwhile, determine a person's desired food basket. On account of an expected 11% expansion in the global population (an increase of 842 million people between 2017-19 and 2029) as well as notable gains in per capita income in all regions, total consumption of the food commodities covered in this *Outlook* is expected to rise by 15% by 2029, as measured on a calorie basis. Asia Pacific, the world's most populous region, will continue to play the most significant role in shaping global demand for food over the outlook period as it is projected to account for 53% of the global population in 2029 (i.e. 4.5 billion people). Given the significant regional differences in demographic developments, income distribution as well as culture-derived consumer preferences, the relative impact of these factors on food demand differs by country and region.

Differing income levels and varying income growth projections will underlie continuing differences in dietary patterns between countries over the coming decade (Figure 1.7).

Globally, aggregated food consumption (measured in calories) is projected to grow by about 3% over the projections period, reaching just over 3 000 kcal in 2029, fats and staples accounting for about 50% of the additional calories. By far the highest growth rate is projected for fats at 9% over the coming decade. Staples remain the most significant food group across all income groups. With the exception of high-income countries, consumers in all other countries are projected to consume more energy from staples. Nevertheless, on the account of the ongoing transition in global diets towards higher shares of animal products, fats, sugar and other foods, the share of staples in the food basket is projected to decline by 2029 for all income groups though at different rates.

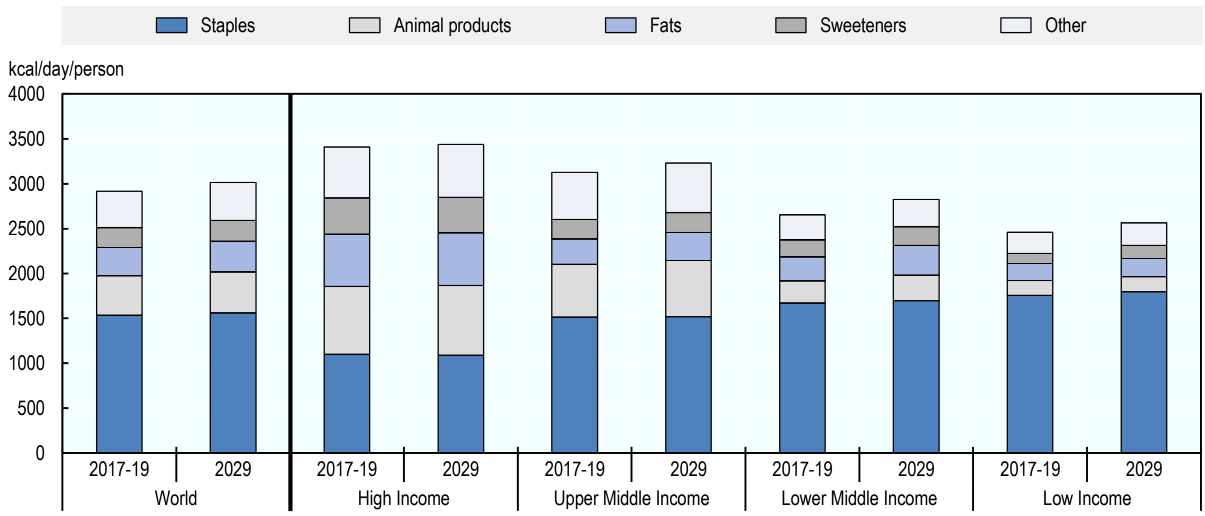
The per capita food energy consumed in high-income countries will remain at current levels. Ongoing income growth and changing consumer preferences will further the substitution of staples, sweeteners and fats for higher-value foods, most importantly foods dense in micronutrient content such as fruits, vegetables, seeds and nuts and, to a lesser extent, animal products.[2] As many of these fruits, nuts and vegetables have to be imported by high-income countries, this shift offers market opportunities for countries with export potential in these commodities. Increased domestic and foreign investments in producing regions (e.g. Sub-Saharan Africa) are expected to develop such market opportunities. Growth in the consumption of animal products will be limited by near saturation levels of consumption of meat and dairy products as well as increasing health and environmental concerns.

In upper-middle income countries, total food consumption is expected to expand by about 4% by 2029. Based on the strong preferences for meat in many of these countries, 38% of the additional calories will be provided by animal products and 26% by fats and other foods.

Consumers in lower-middle income countries are projected to increase their food consumption by 7% (173 kcal) over the coming decade, the largest gain of all four income groups. However, due to limited disposable income, fats and staples will still account for half of the increase, while the growth in the consumption of relatively more expensive options such as fruits, vegetables and animal products will remain limited.

Average diets in low-income countries remain heavily based on staples, which will continue to provide 70% of daily calories. Almost 40% of additional calories over the coming decade are still expected to come from cereals, and roots and tubers. The second most important source of calorie growth will be sweeteners, accounting for 30% of the total increase. Growth in the consumption of animal products and other high value foods (e.g. fruits and vegetables) will, however, remain limited due to income constraints. Given the higher cost of these food items, consumers in lower-middle and low-income countries will only be able to take a small step towards more diversity in their diets.

Figure 1.7. Per capita consumption of main food groups (calorie equivalent), by income group



Note: The 38 individual countries and 11 regional aggregates in the baseline are classified into the four income groups according to their respective per-capita income in 2018. The applied thresholds are: low: < USD 1 550, lower-middle: < USD 3 895, upper-middle: < USD 13 000, high: > USD 13 000. Staples includes cereals roots and pulses. Animal products include meat, dairy products (excluding butter), eggs and fish. Fats include butter and vegetable oil. The category others include fruits, vegetables etc.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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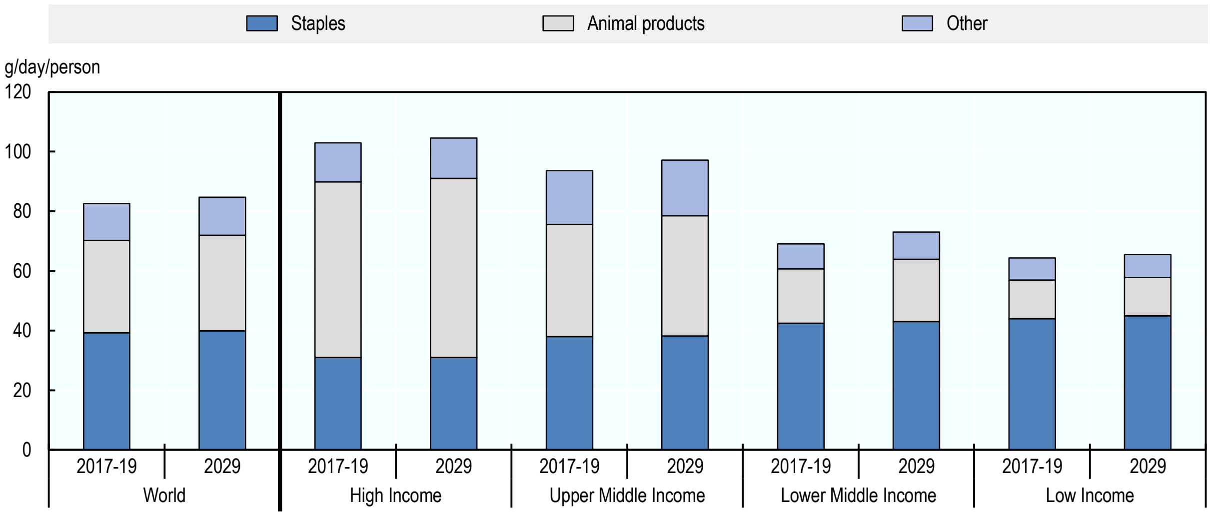
Food proteins play a vital role in food security and nutrition. They are essential in growing, maintaining and providing structure to tissues; they serve to form antibodies and perform essential functions in the human metabolism; and serve as a source of energy. While plant sources such as pulses, and cereals such as wheat, can provide a significant part of the overall protein requirements, essential amino acids are found mostly in proteins from animal sources.

Due to globally rising per capita incomes and declining real food prices, the demand for animal products has risen over the last decade. This increase has also been sustained by urbanisation, which facilitates large-scale meat and dairy processing. Moreover, the retail sector has invested in improving cold chains, allowing perishable food, including animal products, to travel longer distances at lower costs from producers to consumers, preserving its nutrients and organoleptic features. In line with these past developments, total per capita availability of protein is expected to rise at the global level to 85 g per day in 2029, from 83 g per day in the base period. Income-related differences in the composition of protein sources will persist, with lower middle- and low-income countries expected to remain heavily dependent on proteins from crop sources, given lower average household incomes and a lower availability of protein from animal sources due to the lack of adequate supply chains to trade and preserve fresh meat (Figure 1.8). Protein from animal sources, meanwhile, will continue to account for the bulk of protein consumption in the high-income regions of North America, and Europe and Central Asia.

Figure 1.8. Per capita consumption of main food groups (protein equivalent), by income group



Note: The 38 individual countries and 11 regional aggregates in the baseline are classified into the four income groups according to their respective per-capita income in 2018. The applied thresholds are: low: < USD 1 550, lower-middle: < USD 3 895, upper-middle: < USD 13 000, high: > USD 13 000. Staples includes cereals roots and pulses. Animal products include meat, dairy products (excluding butter), eggs and fish. The category others include fruits, vegetables, etc.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Overall, protein from animal sources are expected to account for a greater share of total daily per capita availability. Growth in animal protein consumption will be particularly pronounced in upper middle- and lower middle-income countries, where daily per capita meat and fish availability is expected to rise by 8% and 16%, respectively. Income-driven growth in demand for meat and fish in China, which is expected to see an 11% increase in daily per capita availability, will be the main contributor to the upper middle-income country group. Although consumers in lower middle-income countries increase their consumption of animal protein faster than consumers in any other income group, their per capita intake remains significantly below consumption levels in upper middle- and high-income groups. India's traditionally low consumption of animal protein, especially meat, considerably influences the lower-middle income group trend.

Consumers' growing environmental and health-consciousness, on the other hand, is expected to support a transition from animal-based protein towards alternative sources of protein (e.g. plant-based and insect protein), as well as the more immediate substitution away from red meat, notably beef, mainly towards poultry and fish, which consumers perceive as healthier alternatives. These shifts will be particularly pronounced in high-income countries. Demand for poultry in lower-income countries, meanwhile, will be driven by the affordability of poultry against other meat types, its presumed superior health attributes and its broad cultural acceptability.

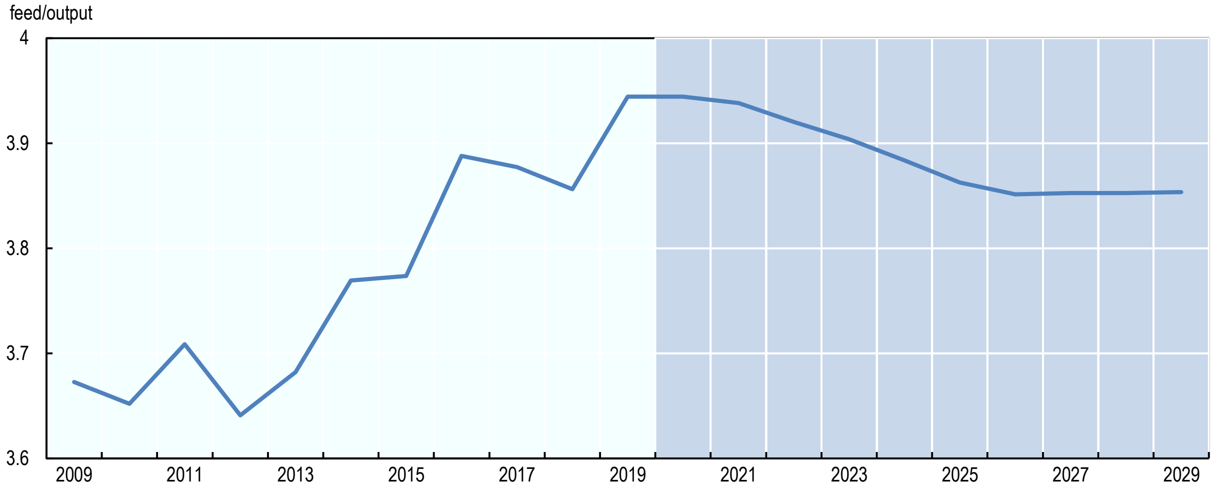
Increasing demand for livestock products and fish will increase feed use

The ongoing evolution of global nutrition patterns towards a higher share of foods from animal origin results in a larger amount of crops and other agricultural and fish products being used as feed. Currently, about 1.7 bln t of cereals, protein meals and various processing by-products (e.g. dried distillers grain, cereal bran) are used as feed. By 2029, this amount is expected to reach almost 2 bln t. This growth is mainly due to the continuing expansion of the livestock herd and aquaculture production in low- and middle-income countries. The *Outlook* also assumes a further intensification of livestock and fish production, whereby more feed per unit of output is used, mostly in order to accelerate the finishing process thus providing a higher return on fixed capital investments. Therefore, advanced economies with capital intensive production technologies typically use feed intensively. They also tend to use the most advanced animal and fish breeds, which provide the most efficient feed conversion rates. Therefore, two offsetting trends in feed demand are expected over the coming decade: intensification and efficiency gains. The *Outlook* assumptions on technology project that after a period of global feed use intensification since 2010, which outweighed the shift of global production to more feed-efficient poultry production, the ongoing commercialisation of the livestock sector in emerging economies will result in further feed use intensification, which, however, will be offset by efficiency gains through investments into genetics, feed technology and herd management that will be achieved in more advanced operations over the coming decade (Figure 1.9)

Commercially raised livestock is mainly fed on compound feed rations to produce high value proteins in the form of meat, fish, eggs and milk. This process uses a wide variety of concentrate feeds that have a high energy and protein concentration. However, only part of this energy and protein is recovered as human food in the form of livestock and fish products (Figure 1.10). The larger part is consumed by the so-called "maintenance ration" which is just sufficient to meet the requirements of the animal to maintain its life. An animal receiving only this ration will neither lose nor gain weight. The rate of conversion of feed into the desired animal products depends on the type of animal, breed and production technology, and on the type of feed. Both the total use of feed energy and protein will grow by about 15% over the coming decade, and despite the ongoing innovation in the livestock sector the share of feed energy that is converted into human food is expected to stay globally at about 23%. The bulk of energy is still spent to maintain the animal and cannot be harvested.

The baseline projections also point to a globally fixed relationship between animal food production and the necessary protein feed over the coming decade. The share of recoverable feed protein is slightly higher (27%) than calculated for the energy component. Non-ruminant animals need plant protein as they do not have ruminant's ability to convert grass and other non-protein feed into meat and milk. However, the protein in meat, fish, eggs and milk is considered of higher value for human nutrition compared to the protein in soybean meal or wheat.

Figure 1.9. Feed to production ratio



Note: This ratio includes only feed prepared from cereals, oilseeds and a number of by-products, it therefore slightly overestimates the feed efficiency of the livestock and aquaculture sector. Pasture-based cattle and sheep convert feed that cannot be accessed directly by humans into meat and milk. Similarly, pigs and poultry are still being raised on organic residues in non-commercial operations. Simple forms of aquaculture rely solely on naturally available feed. Because the nutritional value of these feed sources is difficult to quantify, it is excluded from the above calculation.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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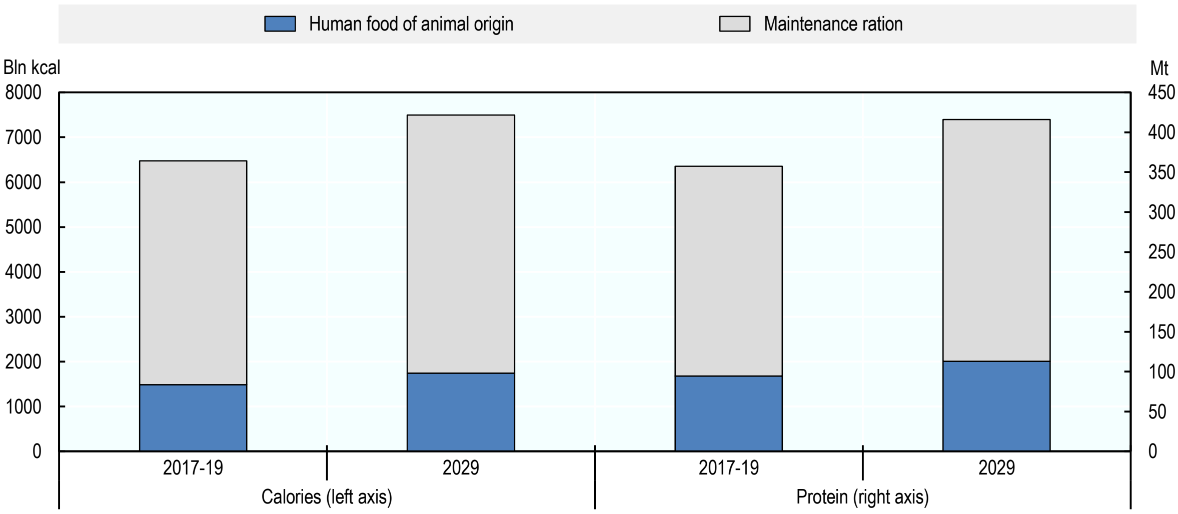
Figure 1.10. Global feed energy and protein use



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Structure of feed demand

There are many different types of animal feed that are customarily classified according to their protein content. High-protein feeds are mainly meals derived from oilseeds, dried distiller grains are a typical medium-protein feed, while cereals are classified as low-protein feeds. Figure 1.11 shows the use of compound feed in non-ruminant production and the composition of feed rations by energy and protein content. Feed intensity and respective shares of high-, medium-, and low-protein feeds vary significantly between high-, middle-, and low-income countries because of their differences in production technology.

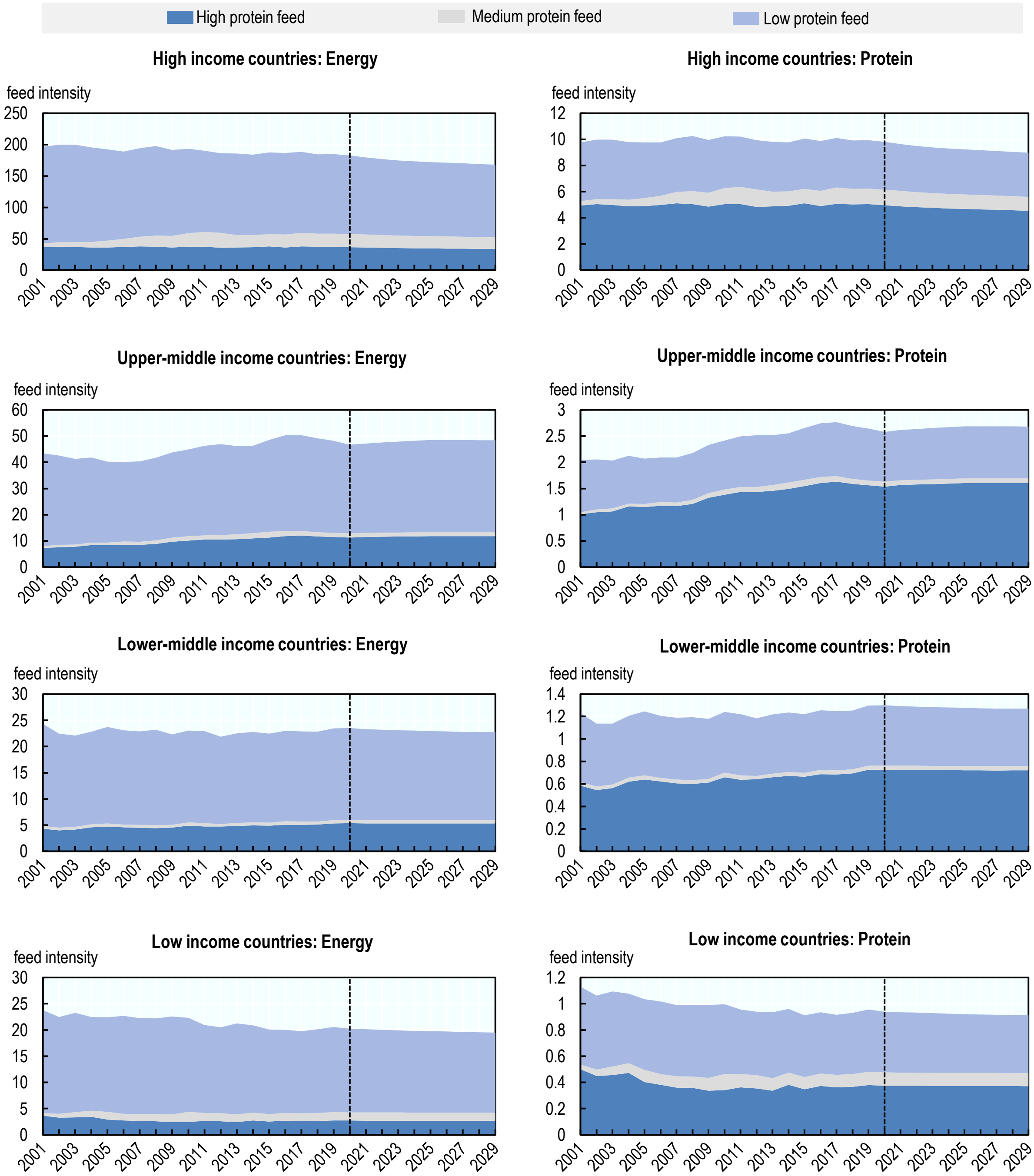
The group of high-income countries is expected to improve the feed conversion for both energy and protein feed further through breeding and herd management advances, without changing the ration composition. These ongoing reductions are possible as a result of breeding progress and other technological advances within a highly feed intensive technology compared to less developed countries.

Upper middle-income countries currently use much less feed per unit of non-ruminant output. The pork, poultry and egg sectors in these countries are expected to intensify their technology as their operations are becoming more commercialised. Feed rations are expected to incorporate slightly more high protein feed over time.

Farmers in lower-middle income countries are expected to maintain their level of feed use per unit of output of non-ruminant livestock production. The composition of rations is not expected to change significantly, only a very slight increase in the share of high-protein feed is projected. The predominantly smallholder and small family farmers in these countries are not expected to significantly intensify the technology of their operations.

Animal husbandry in low income countries is expected to remain largely dependent on small-scale producers, who are using mostly locally sourced feed. Poultry operations tend to be the most commercialised and are projected to expand the fastest. The projected reduction in feed use per unit output is due to the growing share of poultry in total non-ruminant production. The intensification of production technology is constrained by a lack of investment capital stemming mostly from the small-scale structure of the sector, underdeveloped financial markets and value chains in the agriculture of these countries.

Figure 1.11. Structure of feed use, by income group



Note: Feed intensity indicates the amount of feed energy per unit of non-ruminant animal product production. Feed intensity indicates the amount of feed protein per unit of non-ruminant animal product production.

The 38 individual countries and 11 regional aggregates in the baseline are classified into the four income groups according to their respective per-capita income in 2018. The applied thresholds are: low: < USD 1 550, lower-middle: < USD 3 895, upper-middle: < USD 13 000, high: > USD 13 000.

Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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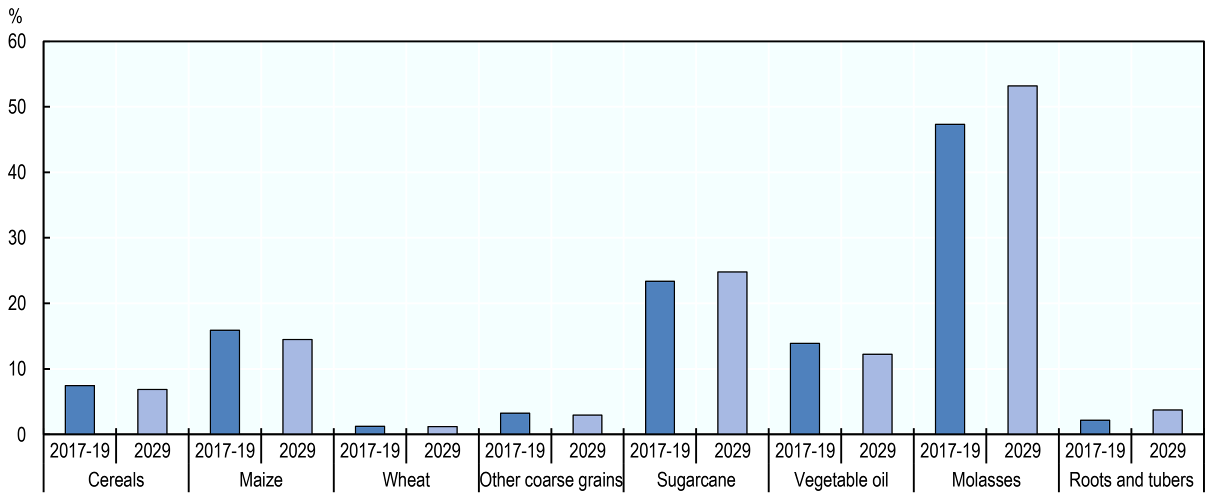
Limited growth in biofuels demand

Over the past decades, demand for biofuels has increased significantly following the implementation of policies with three main objectives: (i) support countries' commitments to reduce their carbon dioxide (CO_2) emissions, (ii) reduce the dependency on imported fossil fuels and (iii) create additional demand for feedstock crops to support domestic producers.

While these drivers are assumed to persist over the coming decade, biofuels are not expected to generate a lot of additional demand for feedstock crops. Biofuels are not expected to receive the same kind of political support as in the past, due to the growing proliferation of electric and hybrid vehicles, which offer better efficiency in the reduction of greenhouse gas (GHG) emissions. Additionally, the use of gasoline-type transportation fuel in two of the main ethanol markets, the United-States and the European Union, is projected to decline over the next decade. This decline is only partly compensated by an increase in the blend rate in the United-States, resulting in a slower growth in demand for maize as the main feedstock. Globally, biofuel use of maize is expected to expand only slightly over the coming decade, thus reducing its share of total use from 16% in the base period to about 14% in 2029 (Figure 1.12).

Figure 1.12. Share of biofuel in total use



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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By contrast, biofuel is expected to increase its share in global sugarcane use to about 25% in 2029 from 23% in the base period. This gain can be largely attributed to the projected expansion of the Brazilian RenovaBio program, which aims to reduce GHG emissions from transportation fuel by 2028. In Brazil, fuel ethanol is consumed either blended with gasoline or as pure anhydrous ethanol fuel, which significantly increases the ethanol share of total transportation fuel compared to countries that mainly use low blends. The higher blends of ethanol are supported by lower taxes, making ethanol more competitive than fossil fuel. These policies will continue to help Brazil to meet its GHG emissions reduction commitments, to decrease its dependency on imported gasoline, and to support the country's sugar cane sector, which provides 1.15 million direct jobs. In other Latin American countries, such as Colombia, Paraguay and Peru, the sugar cane sector is similarly labour intensive and provides a significant share of farmers' income in rural areas. In order to protect these jobs, governments will support the biofuel demand for sugar cane by restricting ethanol imports in combination with mandatory fuel blending.

Asian countries barely use sugar cane for ethanol production, in part because increasing its use would require additional land, which could negatively affect the production of cereals for food consumption and thereby threaten food security. Given those constraints, sugarcane molasses, a by-product of refining sugar, is one of the main feedstock in ethanol production. Over the outlook period, the share of molasses used for biofuel is expected to increase from 49% in the base period to 54% in 2029. Biofuel demand is projected to increase its share of global roots and tubers demand from 2% in the base period to about 4% in 2029, with China accounting for most of the increase.

While the use of vegetable oil as biofuel is expected to remain constant at about 30 Mt, its share in global vegetable oil use is expected to decline from about 14% in the base period to about 12% in 2029. In addition to the expected decline in biofuel-blended diesel fuel use in the European Union, a new regulatory framework limits the use of feedstock (mostly palm oil) grown in carbon-capturing ecosystems such as forests, wetlands and peatlands. However, increasing demand for palm oil-based biodiesel, mainly in South East Asian countries will compensate the reduction in the European Union. Indonesia and Thailand are expected to continue to support the use of domestically produced palm oil in the production of biodiesel. Indonesia, for instance, employs a variable levy system to ensure the domestic supply of feedstock to the local biofuel industry by taxing palm oil exports.

Other uses

Apart from food, feed and biofuel use, the agricultural commodities covered in the *Outlook* are used for a broad range of additional purposes. The *Outlook* combines seed use, postharvest losses, waste and all industrial applications, except biofuel, into the summary category “other uses”. The industrial applications include the use of cereals for the production of industrial starch, spirituous liquors, and for the paper, textile and pharmaceutical industries. Maize in particular has an increasing importance in the production of bioplastic for food packaging, bottles, kitchen utensils, straws, etc. Rice is projected to have a growing importance in the cosmetics industry. Face washes, liquid shower soaps and hair products, especially in Asian countries, are going to contain more rice ingredients. Molasses, a by-product of beet or cane sugar production, is used in the production of products like yeast, vinegar, citric acid, vitamins, amino and lactic acid. Vegetable oils are used as ingredients in cosmetics and personal care products, lipid-based excipients in pharmaceutical products, pet feed additive, etc. The role of plant-based ingredients is increasingly important in cosmetics which will likely result in a growing demand for vegetable oil, mainly olive oil, for cosmetic products. Cotton is mainly grown for its fibrous content (cotton lint), which is spun into yarn that is subsequently used for the production of garments and other textile products.

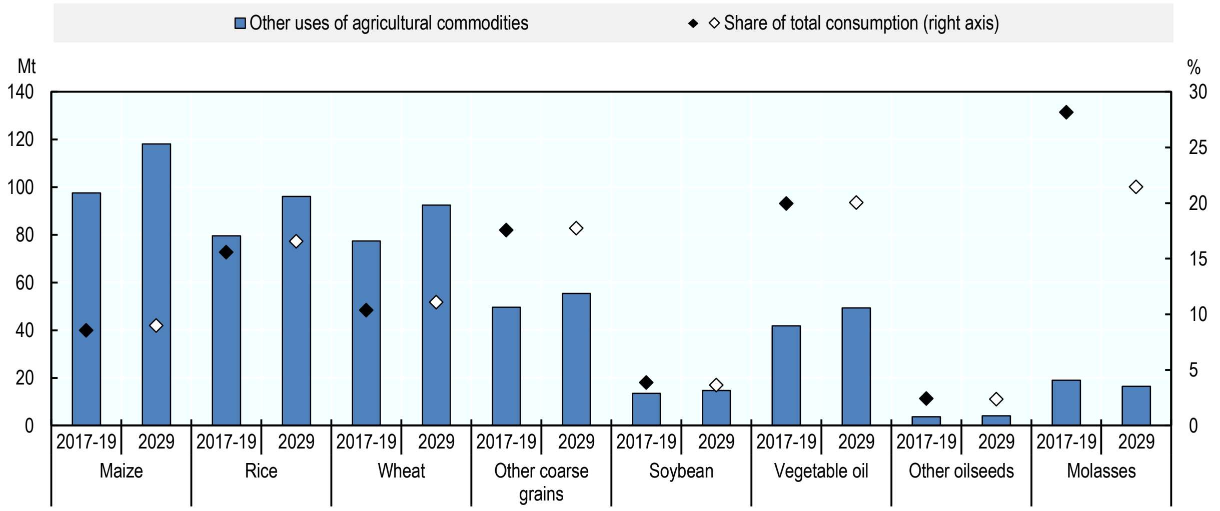
Other use of maize will increase by about 20% over the projections period, which is slightly faster than the projected overall consumption growth, thereby increasing the other use share from currently 8.5% to 9% in 2029. The share of other use of wheat and rice is also expected to slightly expand over the coming decade, indicating a heightened demand for renewable raw products (Figure 1.13).

The use of molasses as an industrial raw product is expected to decrease significantly as its biofuel feedstock use is expanding further during the projection period. The share will drop from nearly 30% in the base period to about 20% in 2029.

The other use shares of the remaining commodities, oilseeds, including vegetable oil and other coarse grains, are expected to remain at current levels during the outlook period. No structural changes in their consumption profile are foreseen, the industrial applications, the seed use and waste will follow the overall consumption patterns.

Global consumption of lint cotton will grow at a slightly higher rate than global population in the coming decade. Ongoing income growth should lead to a higher demand for cotton products. The geographical distribution of demand depends on the future location of spinning mills. China has been the world’s largest consumer of raw cotton since the 1960s. However, major shifts are taking place, with yarn production gradually moving from China to other Asian countries, mainly Bangladesh and Viet Nam. Growth in raw cotton processing is also expected in India, Turkey and Central Asia.

Figure 1.13. Other use in absolute value and as share of total consumption



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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1.3. Production

The *OECD-FAO Agricultural Outlook* projects future trends in production of the main livestock (meat, dairy, eggs and fish) and crop commodities (cereals, oilseeds, roots and tuber, pulses, sugar cane and sugar beet, palm oil and cotton) to be used for human consumption, as animal feed or as biofuel feedstock. The *Outlook* projections break down agricultural output growth into its main determinants; namely growth in crop yields, area harvested intensification, cropland expansion, growth in output per animal and herd expansion. This reveals how the production responses to meet growing demand for agricultural commodities, varies across different sectors and regions.

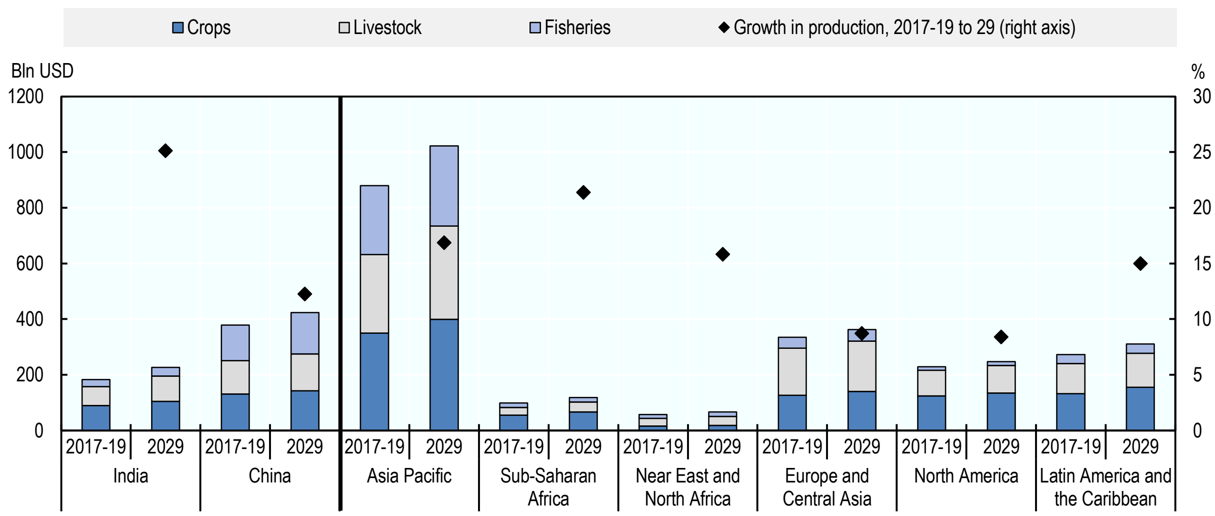
Global agricultural production is projected to increase over the coming decade, in response to growing demand, albeit at a slower rate than observed over the previous decades (Figure 1.13). Most of the growth in production is projected to occur through productivity improvements, due to intensification and ongoing technological change leading to a further decline in real commodity prices, despite increasing constraints on expanding agricultural land in some regions.

For crops in particular, yield improvements are projected to account for almost all of the additional output, with only a small expansion of cropland area being required at the global level. However, the relative importance of increased productivity (i.e. higher yields and cropping intensity) and cropland expansion will vary between world regions and commodities, reflecting differences in availability and cost of land and other resources. Productivity gains will come from more intensive use of agronomic inputs (fertiliser, pesticides, and irrigation), which can lower land use requirements, as well as through technical changes (e.g. improved crop varieties) and technical efficiency improvements (e.g. better cultivation practices) that reduce the inputs required per unit of output.

Global growth in livestock output will rely on a combination of yield improvements (i.e. higher output per animal) and an expansion of the production base (i.e. more animals). As with the crop sector, a combination of intensification (e.g. increasing use of high energy and high protein feed), technical changes (e.g. ongoing progress in breeding), and technical efficiency improvements (e.g. disease control and improved management practices), will support productivity growth at the global level. Increase in animal numbers will also play a significant role, especially in low income and emerging countries, which are expected to account for the majority of output growth over the next decade.

The agriculture sector is not only under pressure to increase production in line with growing demand but also to do so sustainably. While the intensification of agricultural production has enabled the sector to feed a growing population and limit increases in agricultural land use, some intensification practices, however, have also exacerbated environmental problems and threatened sustainability. The Agriculture Forestry and Land Use (AFOLU) sector is one of the main contributors to climate change; accounting for a fifth of global GHG emissions. It thus has a key role to play in mitigating global GHG emissions, and meeting the Paris Agreement's target of limiting global temperature increases to well below 2°C. Agriculture is also one of the most exposed sectors to climate change, which will harm crop and animal productivity in most regions, particularly if no adaptation measures are implemented, and will also lead to a relocation of agricultural production. This could give rise to more volatile food supplies and prices over the coming decades.

Figure 1.14. Regional trends in agriculture and fish production



Note: Figure shows the estimated net value of production of agricultural and fish commodities covered in the *Outlook*, in billions of USD, measured at constant 2004-6 prices.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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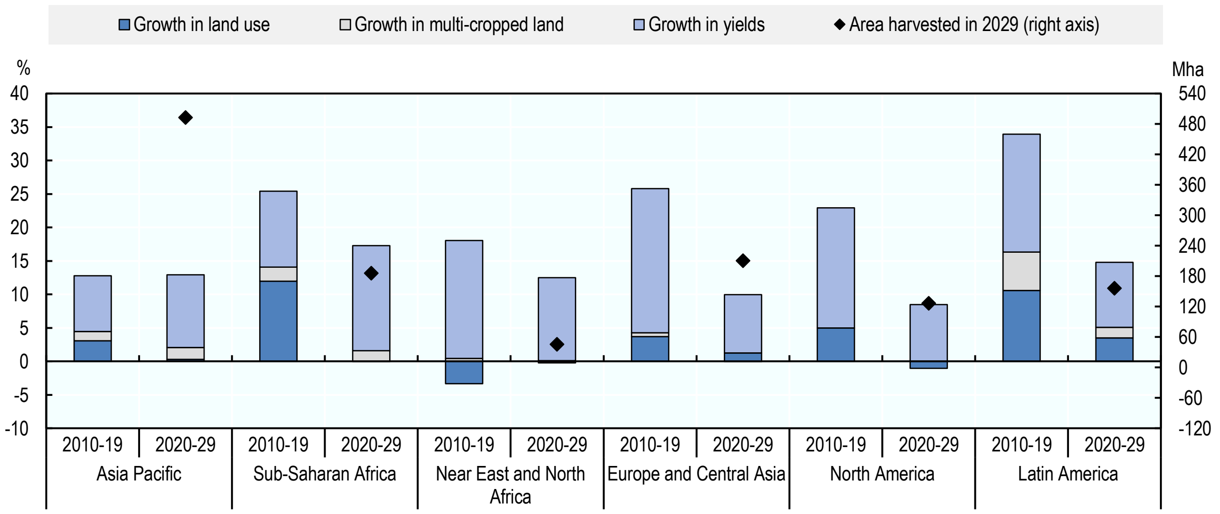
Currently, the Asia Pacific region contributes most to global agricultural production, accounting for almost half of global output. Europe and Central Asia and the Americas are responsible for another 45% (Figure 1.14). Over the coming decade, crop, livestock and fish production are expected to grow most strongly in Asia Pacific (17%) – mainly driven by strong output growth in India (25%) – and in Latin America (15%). Production growth will be more muted in Europe and Central Asia, and in North America as agricultural productivity is already at high levels, and policies constraints (e.g. environmental and animal welfare policies) will limit further output growth. Sub-Saharan Africa and Near East and North Africa, on the other hand, currently account for a small share of global output of basic agricultural commodities. However, from their small production base and low productivity levels, strong production growth is projected in these two regions over the next ten years (21% and 16%, respectively). The significant output growth in emerging and low-income regions reflects greater investment and technological catch-up, as well as resource availability. Producers in these regions also respond to higher expected returns due to export opportunities (e.g. in Latin America) or comparative advantages in satisfying a growing domestic demand induced by population and income growth (e.g. in Sub-Saharan Africa and India). Such opportunities might be particularly important for fruits and vegetables (see Chapter 11 “Other Products”).

Productivity improvements drive crop production growth

Main drivers of global crop production growth

Over the coming decade, most production growth is expected to come from increased productivity (i.e. higher yields and cropping intensities) with only limited expansion of agricultural land at the global level. The *Outlook* projects global crop production to increase by almost 15% by 2029 (582 Mt), with cereals output projected to expand by 375 Mt, 80 Mt for oilseeds, 42 Mt for roots and tubers, 16 Mt or pulses and 3.5 Mt for cotton. Cropland expansion, on the other hand, is expected to be limited at the global level (1.3%). Globally, crop output is expected to increase more slowly than over the last decade, as yield growth starts from a higher base and less land will be brought into production (Figure 1.15).

Figure 1.15. Global growth in crop production



Note: Figure shows the decomposition of total production growth (2010-19 and 2020-29) into growth in land use, land intensification through growth in multi-cropped land, and growth in yields. It covers the following crops: cotton, maize, other coarse grains, other oilseeds, pulses, rice, roots and tubers, soybean, sugarbeet, sugarcane, wheat and palm oil.
Source: OECD/FAO (2020), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Low income and emerging regions with greater availability of land and labour resources are expected to experience the strongest growth in crop production over the next ten years, accounting for about 50% of global output growth. National food self-sufficiency policies will also support this expansion, and in particular for cereals. In Asia Pacific only, crop output is projected to grow at the same rate than over the last ten years (13% or 248 Mt), mainly on the account of strong production growth in India. High crop output growth is also projected in Latin America (15% or 115 Mt), and in Sub-Saharan Africa (17%), albeit from a lower production base, adding 62 Mt. Europe and Central Asia and North America will continue to significantly contribute to global crop production, maintaining their share of global output by 2029, at 19% and 17%, respectively. However, production growth in these regions will be more limited; despite strong output growth in Eastern Europe.

Yield growth is expected to be responsible for 88% of global crop output growth over the next ten years. In the high yielding regions of North America and Europe and Central Asia, yields will grow at a slower rate than over the last decade as they are already at high level for most crops. In these regions, further yield growth will be mainly achieved through the adoption of advanced technologies (e.g. plant breeding) and the implementation of better cultivation pratices. Yields will grow strongly in Sub-Saharan Africa (16%) and in Near East and North Africa (12%), reflecting the important production potential of these regions, increasing use of agronomic inputs and the implementation of better farm management practices, but also the relatively low yields experienced so far. These higher growth rates will thus translate into a lower absolute increase in yields for several crops.

Harvested area intensification will also contribute to global crop production growth, especially in Latin America, Sub-Saharan Africa, and Asia Pacific where it is projected to account for 10% to 15% of total output growth. Overall, area harvested of the main crops reflected in the *Outlook* is projected to expand by 19.6 Mha between 2020 and 2029, with 30% of this occurring in Brazil and Argentina. In these two countries, the expanding practice of double cropping of maize/wheat and soybean is expected to raise output through more intensive use of already cultivated land. Double cropping also plays an increasing role in other regions and for other crops, in particular for rice.

Cropland area expansion, on the other hand, is projected to account for only 5% of global crop production growth and will play a much smaller role than over the last decade, in all regions. In Sub-Saharan Africa, for instance, growth in land use accounted for about half of total crop production growth over the last decade. Over the outlook period, output growth is expected to be achieved without expansion of the cropland area due to productivity improvements (i.e. higher yields and cropping intensities), and investors focus on acquiring and consolidating existing farm land into larger units rather than investing into the expensive clearing of additional land, as it was the case in the past. Growth in land use will only be a substantial contributor to crop production growth in Latin America, where it is expected to account for 25% of total output growth, reflecting greater land availability and lower costs associated with land expansion in the region (Section 1.3).

Crop yield variations

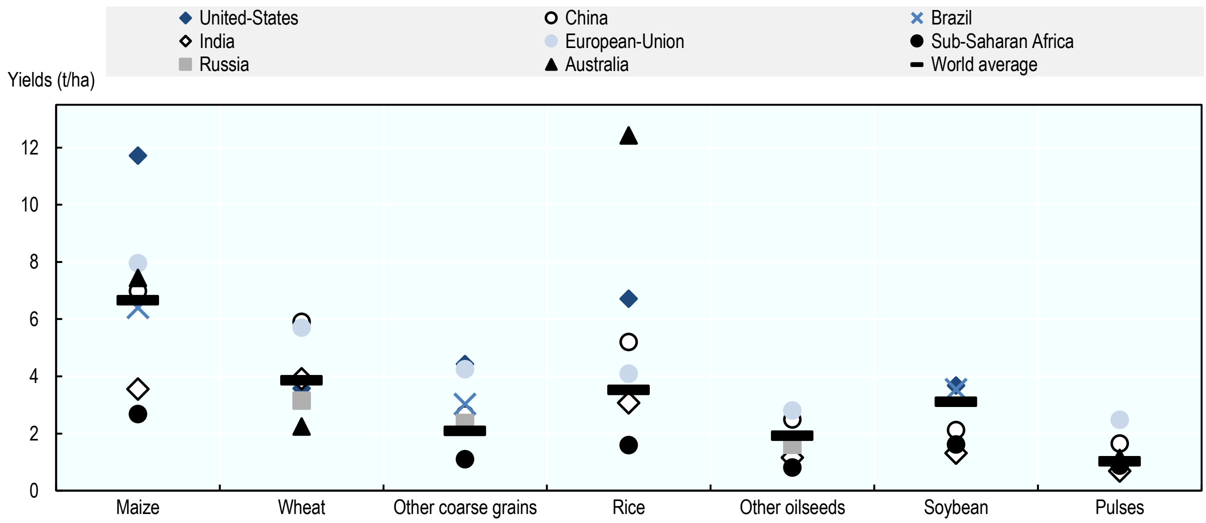
Despite the significant growth in yields projected in emerging and low-income regions over the coming decade, large disparities in yield levels between countries and regions are expected to remain. This is partly due to differences in agro-ecological conditions but it also reflects differences in access to agronomic inputs including fertiliser and improved crop varieties as well as differences in access to technologies and human capital. Inter-regional variation in yields also tend to differ widely between crop types (Figure 1.16).

Maize yields in 2029 are projected to range between 2.7 t/ha in Sub-Saharan Africa and almost 12 t/ha in the United-States, the largest maize producer and exporter in the world. In the later, intensive input use together with ongoing progress in plant breeding will enable further yields growth over the coming decade. Similarly, average rice yield in Australia is expected to reach 12.4 t/ha in 2029, due to intensive use of agronomic inputs (fertiliser, pesticide, irrigation) and the implementation of good cultivation practices on the most suitable lands. This is almost eight times higher than the projected average rice yield in Sub-Saharan Africa (1.6 t/ha), where fertilizer availability and quality are limited and application rates are the lowest among all regions. Average yields are also influenced by harvest failures caused by drought or locust plagues, which are frequent in Sub-Saharan Africa. Overall, these trends in cereal yields highlight the need for increased technology transfer across world regions in order to further reduce yield gaps. Nevertheless, sustained growth in cereal yields in all regions will enable most of global output growth to be achieved without an expansion in the cropland area.

For oilseeds and traditional crops such as pulses, yield gaps are more limited. In 2029, pulses yields in the European Union, one of the highest yielding regions, are expected to be only three times higher than pulses yields in India, the world largest producer. For oilseeds and pulses, growth in global production is expected to come in part from greater land use as yield growth will be more limited over the coming decade. Area expansion will also remain important for other crops such as cotton (not represented in Figure 1.16) as yield improvement in key producing countries (e.g. India) are expected to be insufficient to meet global demand growth.

Overall, the strongest yield growth in low income and emerging regions will translate into relatively small absolute increases in yields, given their low base levels. By 2029, average crop yields in both India and Sub-Saharan Africa, for instance, are projected to remain well below yield levels in all high yielding countries, including countries/regions with comparable natural conditions (e.g. South East Asia, Latin America). This indicates that many countries will still be far from their yields potential and therefore from their potential output by the end of the outlook period.

Figure 1.16. Projected crop yields for selected countries and regions in 2029



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Potential for sustainable intensification

Given appropriate incentives, further intensification in crop production will occur to meet growing demand for crop commodities, especially in regions that have not reached their potential yields and output. Output growth through the intensification of crop production (i.e. higher output per unit of land) is assumed to be more economically efficient than through large expansion of agricultural land given the prevailing policy and economic conditions. More intensive use of agronomic inputs, in particular, has made it possible to feed a growing population with relatively small increase in agricultural land use. However, the intensification of agricultural practices (e.g. drainage, tillage), and in particular the more intensive use of fertilisers and pesticides, can exacerbate some environmental problems and threaten sustainability (Section 1.3). In most world regions, there is scope for efficiency gains through the adoption of more advanced technologies (e.g. precision farming) or the implementation of better management practices, which would allow to produce a greater output without an increase, or with less than proportional increase, in inputs use, including natural resources and chemical inputs.

In addition to conventional, high input systems, alternative crop production systems have emerged. By reducing or eliminating the use of chemical inputs or shorting supply chains, some of these approaches aim to reduce the environmental footprint of commercial agriculture. Organic agriculture, for instance, achieves better environmental impact per unit of land used, although it produces less food per unit of agricultural land. Studies have showed that organic yields are at least 20% lower than yields in conventional agriculture, which implies that it requires much more land to produce the same output (De Ponti, Rijk and Van Ittersum, 2012[1]). This raises a number of concerns given the limited availability of land suitable for agriculture, and the negative environmental impacts associated with agricultural land expansion (Section 1.3).

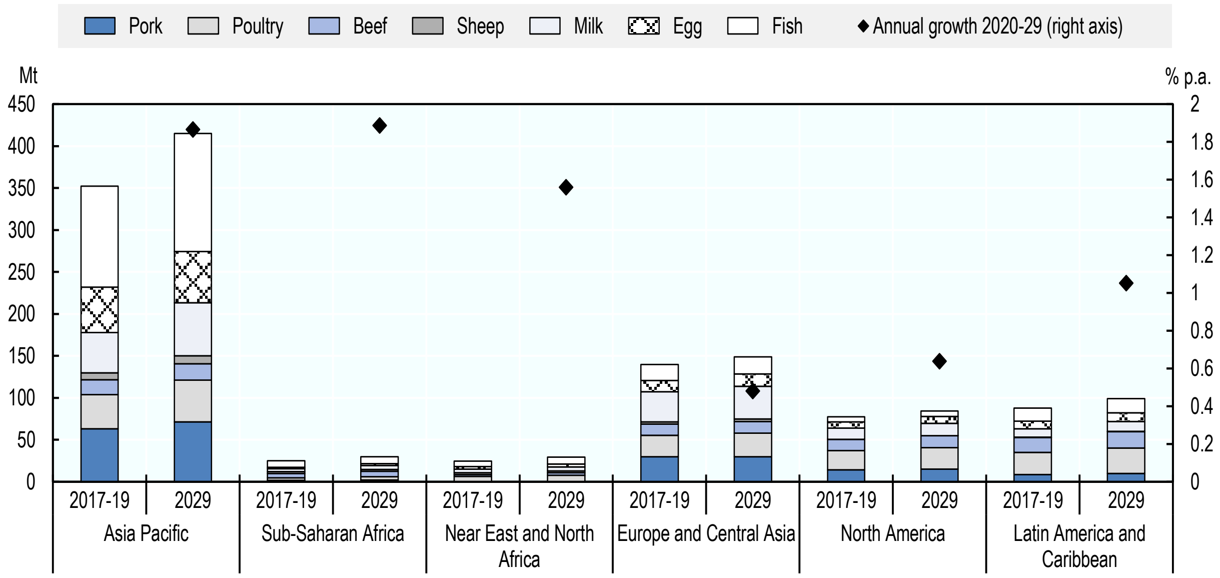
Organic agriculture is rising globally. It already accounts for 7.5% of total agricultural area in the European Union for instance, with this share being higher than 20% in some Members States (e.g. Austria, Estonia, Sweden) (Eurostat, 2020[2]). Over the coming decade, the share of organic area in the European Union could be sufficiently high to influence average fertiliser use by hectare, and potentially average crop yields. Crop production in other main producing regions, however, should continue to mostly rely on conventional high-input systems.

Intensity of livestock production varies by type of product and by world region

Location of global production growth

The Asia Pacific region currently accounts for half of global livestock production. Europe and Central Asia, and the Americas are responsible for another 20% and 23%, and these shares are expected to remain stable by the end of the outlook period. A few countries, in particular (i.e. China, India, Brazil and the United-States), and the European Union, will continue to dominate livestock production globally. Over the outlook period, global livestock production (i.e. meat, milk, egg and fish) is expected to expand by 14% (99 Mt), supported by lower feed prices and stable product prices ensuring remunerative profit margins to producers (Figure 1.17).

Figure 1.17. Global livestock production



Note: Milk production is expressed in Mt of milk solids.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Globally, meat production is projected to expand by 12%, supported by favourable meat-to-feed price ratios. Most of the growth in meat output will originate from emerging and low-income countries (Brazil, China, India, Mexico, Pakistan, and Turkey in particular).

Poultry is expected to be the fastest growing meat, with a projected increase in production of 16% (20 Mt). This accounts for about half of the projected increase in total meat output. Rising poultry production in Asia Pacific and Latin America, in particular, is expected to account for 60% of the global increase in poultry meat. This growth in output will be encouraged by low production costs, a short production cycle, high feed conversion ratios and growing consumer demand in most world regions, which will keep prices stable.

Sheep meat production is significantly lower than the production of other meat types at the global level, but it is also expected to grow strongly over the next ten years. The projected increase of 14% or 2 Mt in sheep meat output will mainly be supported by strong demand growth in China and Africa, most of which will be sourced locally. More limited output growth is projected in Oceania (6%), due to the ongoing competition for pastureland from beef and dairy in New Zealand, and the prolonged drought condition in Australia, which has resulted in a decrease in sheep flocks.

Globally, beef production is projected to expand by about 9% over the outlook period. Most of this increase will originate from Asia Pacific (2 Mt), China and Pakistan, in particular, and from Latin America (1.5 Mt), together accounting for more than half of global output growth. Beef production will also expand in North America (0.8 Mt) supported by low feed costs and positive price expectation due to sustained domestic demand. In the European Union, however, the low profitability of the beef sector, which can partly be explained by declining domestic demand, together with large efficiency gains in the dairy sector have led to a reduction in the cowherd in recent years. This is expected to result in a decrease of 6% (-0.4 Mt) in the beef output over the next ten years.

Pigmeat production is projected to grow by 11 Mt by 2029 (9%). This expansion will be largely concentrated in China, which is expected account for nearly 60% of global output growth over the coming decade (6.5 Mt). While the African Swine Fever outbreak is projected to continue to negatively impact pork production in China and in other countries in East and South-East Asia in the first years of the projection period, pigmeat output is expected to gradually recover by 2025. In the European Union environmental restrictions are expected to cause pigmeat production to fall by 2% (-0.5Mt) over the outlook period.

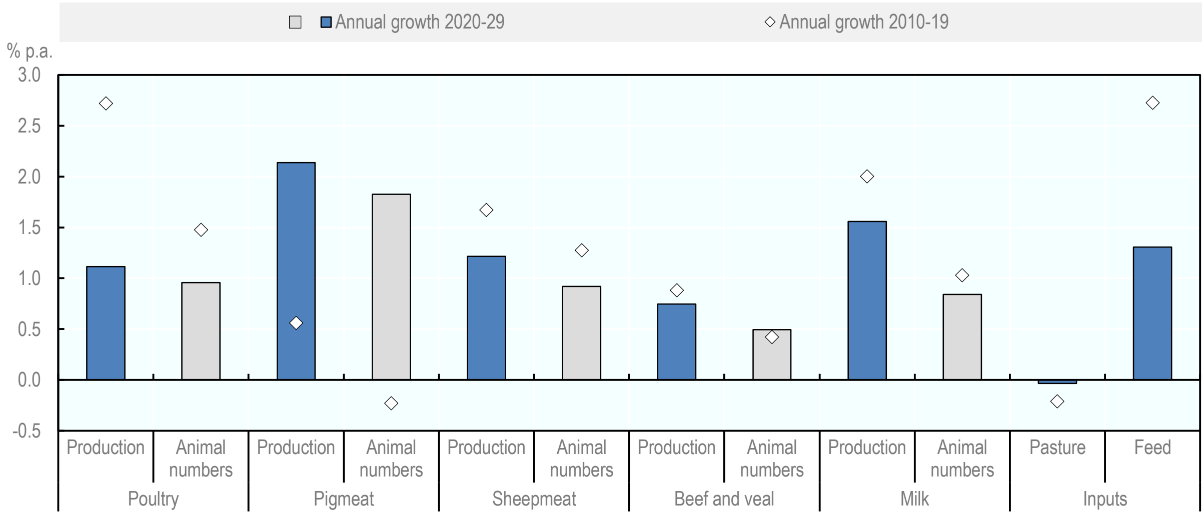
Among all livestock commodities, dairy is expected to experience the strongest growth over the next decade in response to strong demand. Milk production is projected to increase by 20%, with India and Pakistan accounting for 60% of global output growth. The sector is responding to low production costs and high prices expectations. Milk prices are supported by strong demand, especially for fresh dairy products in Asian countries (India, Pakistan). In Africa, strong population growth and the introduction of cooling systems are also expected to result in growing demand for dairy products. Globally, egg production is projected to increase by 13%; China and India accounting for 45% of the global increase.

Main drivers of global production growth

The global expansion in livestock production will rely on a combination of two main growth factors (Figure 1.18). First, improvements in genetics and animal health together with better management and feeding practices will enable higher livestock production intensity (i.e. higher output per animal per year) in all regions. More intensive meat production will occur through higher slaughter weight per animal and shortening the time to finish an animal for slaughter. In addition to further intensification, output growth will also be supported by an increase in animal numbers. The relative importance of these two growth factors will vary by type of livestock commodity, and by world region.

Globally, poultry output and animal numbers are projected to grow in step over the coming decade (1% p.a.) (Figure 1.18). In some important producing regions such as North America and the European Union, where productivity per animal is already high, further intensification options will be limited. However, greater feed efficiency is expected to be achieved, thus reducing production costs and pressure from feed availability. In emerging and low-income countries, however, there is still significant scope for intensification in the poultry sector. For instance, the modernisation of the poultry supply chain which has occurred in a several countries in Sub-Saharan Africa (e.g. South Africa, Tanzania) is expected to continue and lead to strong output growth over the coming decade (2.4% p.a.).

Figure 1.18. Growth in global livestock production



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Sheep meat production and animal numbers are also projected to grow in line over the next ten years, as sheep in most part of the world are farmed extensively in pastoral production systems. Strong output growth in Sub-Saharan Africa (2.3% p.a.), in particular, will be supported by a large increase in animal stocks, as breeding progress has so far been limited in the region. Overall, intensification in Africa is still constrained by structural issues such as lack of investment capital, the limited availability of feed and environmental factors such as desertification or locust plagues. These factors are particularly pronounced for ruminants production (cattle, sheep and goats).

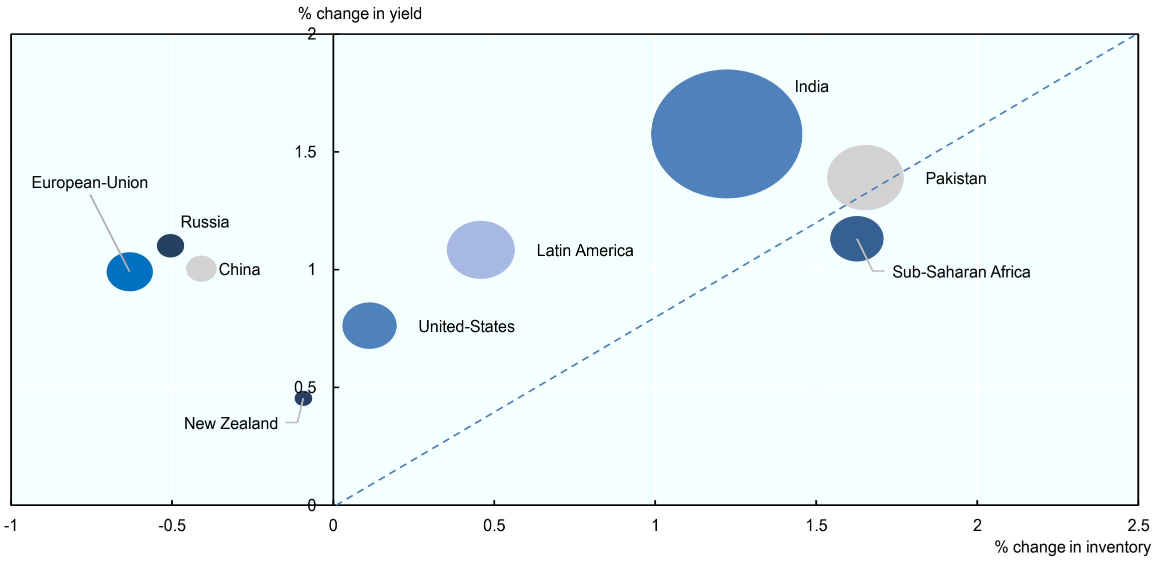
Milk, beef and pork outputs, on the other hand, are projected to grow faster than animal numbers in all regions due to further intensification of these livestock sectors. Global milk production, in particular, is projected to intensify; however, this trend hides important structural differences between main world producers as discussed in the next section. Beef production will also intensify further, including in key producing countries of Latin America, where it will enable strong production growth (0.7% p.a.) with a limited increase in animal numbers (0.2% p.a.). In Argentina, the intensification of production processes through feedlots is continuously improving yields while in pasture-based systems like in Brazil, intensification will be mainly achieved through improved grazing management.

At the global level, livestock production growth will be achieved alongside declining pasture land due to further intensification of pasture and ruminant production, and the growth in non-ruminant meat sectors (poultry and pork) that do not require pasture. This process will be supported by a robust growth in the use of concentrate feed (1.3% p.a), with pasture land mainly declining in regions where the use of this feed is projected to expand most strongly (Section 1.3).

Dairy: Large structural differences persist between major producing countries

Over the coming decade, most dairy production growth will originate from low-income and emerging countries (India and Pakistan in particular) where milk is mostly produced by smallholders in extensive pastoral production systems (Figure 1.19). In these regions, output growth will rely strongly on an increase in dairy inventories, by 21 million and 29 million in India and Sub-Saharan Africa, for instance. This represents two-third of the projected increased in global dairy inventories. Yields will also increase over time, however, given their low base level, the absolute increase in yield will remain small. India's dairy yields, for instance, are expected to reach 1.57 t/head in 2029, seven times lower than projected average yield in the United-States. Dairy productivity in these regions is still constrained by poor quality feed, diseases and dairy animal low genetic potential for milk production. An important share of milking animals in Sub-Saharan Africa for instance is goats, which are characterised by a low productivity per head.

Figure 1.19. Changes in inventories of dairy herds and yields, 2020 to 2029



Note: The size of the bubble reflects absolute growth in dairy production between 2017-19 and 2029.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Lower production growth is projected in leading producers in developed countries (e.g. the United-States) as well as in key milk exporters, the European Union and New Zealand, where increasing environmental requirements (e.g. phosphate, nitrate, GHG emissions), together with land constraints for the latter will also limit further output growth. Production growth, however, will be achieved with stagnant or declining animal inventories, and sustained growth in yields, coming from a combination of improvements to animal genetics, greater feeding efficiency and adjustment to management practices. Absolute yield growth in tonnes per milking animal might still increase faster in developed countries and lead to larger absolute differences in yields.

Livestock intensification and animal welfare

Productivity improvements in animal agriculture can alleviate food security, land use and GHG emissions concerns, as higher production intensity is associated with lower GHG emissions per unit of output. However, the impact of intensification on animal welfare is more complex. At low levels of productivity (e.g. in pastoral production systems), further intensification might lead to improvements in animal nutrition and health care, thereby increasing animal welfare but at higher productivity levels, some production practices (e.g. small pens and cages limiting mobility in confined production systems) might put animal welfare at risk (Leenstra, 2013[3]). Animal welfare policies, which already play an important role in some developed countries, set welfare requirements for farming activities including, for instance, minimum access to outdoor activities for farm animals, housing design standards or caps on farm size. These policies could limit further intensification of some livestock sectors over the next ten years (e.g. poultry and pig).

Global outlook for fish production

Over the outlook period, world fish production is projected to grow at 1.3% p.a., to 200 Mt in 2029 (+24.6 Mt). Asia Pacific, the main producing region, will account for 80% of the global increase. Lower production growth is projected in Latin America, and Europe and Central Asia, two other important fish producers. Strong output growth, however, is expected in Near East and North Africa (1.7% p.a.) and in Sub-Saharan Africa (1.1% p.a.), albeit from lower base levels, together adding less than 2 Mt (Figure 1.16).

Until the 1990s, almost all fish and seafood was obtained through capture fisheries, but since the last 20 years, capture fisheries production has been relatively flat. Aquaculture production, on the other hand, has been growing steadily – notably in China – increasing its role in total fish supply. Over the outlook period, aquaculture production will continue to grow while fish capture production is expected to be remain broadly flat. As a result, by 2024, aquaculture is projected to overtake capture fisheries as the most important source of fish worldwide (Chapter 8).

Despite the projected growth in fish production, global output is expected to grow at a significantly slower pace than over the past decade (1.3% p.a. compared to 2.3% p.a.). This mainly reflects the expectation that China, the main fish producer in the world, will implement more sustainable fisheries and aquaculture policies, in line with its 13th Five-Year Plan. This is expected to lead to an initial reduction in capacity but will result in productivity improvements in the aquaculture sector over the second half of the projection period.

Environmental impact of agricultural production

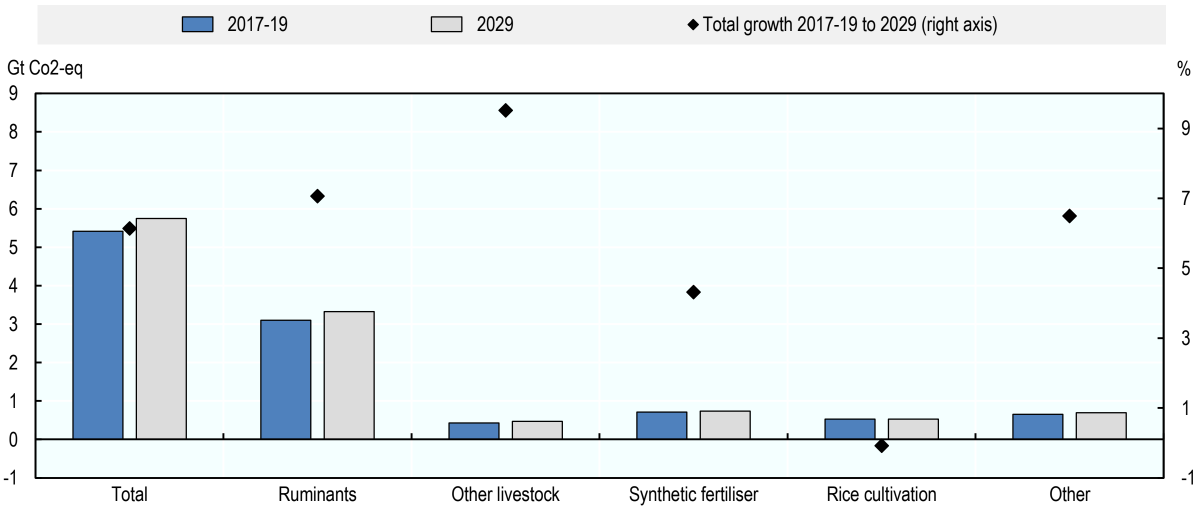
Direct GHG emissions

Direct emissions from agriculture account for about 11% of global GHG emissions. Livestock (in particular ruminants) are currently responsible for two-thirds of agriculture's direct emissions, mainly through enteric fermentation. Other important sources of direct GHG emissions include the application of synthetic fertilisers to agricultural soils (13%) and anaerobic decomposition of organic matters on paddy rice fields (10%) (Figure 1.20).

Over the outlook period, and assuming no changes in current policies and technologies, projections suggest a growth in direct GHG emissions of 6%, an increase of 332 MtCO2-e from the base period. Livestock will account for 80% of this global increase. Geographically, most of the increase in direct emissions is projected to occur in emerging and low-income regions due to higher output growth in production systems that are more emission intensive. Sub-Saharan Africa alone is expected to account for 48% of the global increase in direct GHG emissions, and Asia Pacific for another 46% (50% of which will originate from India and China).

Global agricultural emissions are set to increase but the carbon intensity of production is declining over time. Over the next ten years, most world regions are expected to further reduce the emission intensity of their agricultural production (Figure 1.21). In Europe and Central Asia, output growth is projected to be matched with a decrease in direct GHG emissions (-0.15% p.a.), partly due to further yield improvements, but mostly as a result of a declining share of ruminant production in total production. This is mainly driven by the projected decline in beef output in the European Union over the next ten years. In the Americas, Asia Pacific and Near East and North Africa, strong growth in crop and livestock production are expected to be achieved with a much slower growth in direct GHG emissions. In Sub-Saharan Africa, however, agricultural production and direct GHG emissions are projected to grow more in step, mainly because output growth will be strongly reliant on increasing animal numbers in extensive ruminant production systems. A further reduction of the carbon intensity of agricultural production could be achieved by large-scale adoption of emission reducing technologies. The effect of technology adoption on direct GHG emissions from agriculture requires a more detailed reporting to be visible in GHG emission statistics.

Figure 1.20. Direct GHG emission from crop and livestock production, by activity



Note: The category "other" includes direct GHG emissions from burning crop residues, burning savanna, crop residues, and cultivation of organic soils.
Source: FAO (2019). FAOSTAT Emissions-Agriculture Database, http://www.fao.org/faostat/en/#data/GT; OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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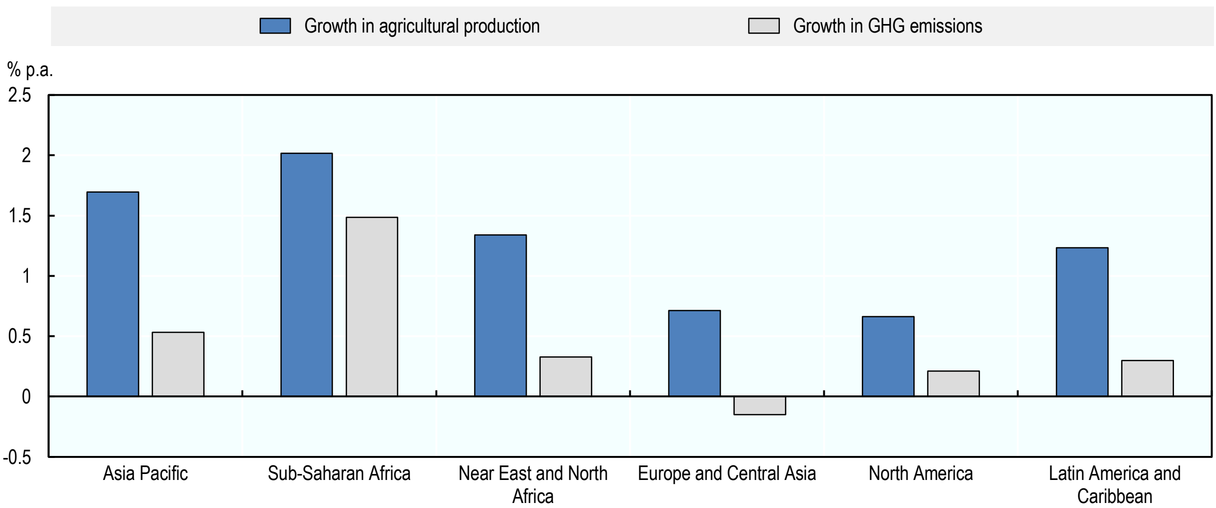
Figure 1.21. Annual change in agricultural production and direct GHG emissions, 2020 to 2029



Note: Figure shows projected annual growth in direct GHG emissions from agriculture together with annual growth in the estimated net value of production of crop and livestock commodities covered in the Outlook (in billions of USD, measured at constant 2004-6 prices).
Source: FAO (2019). FAOSTAT Emissions-Agriculture Database, http://www.fao.org/faostat/en/#data/GT; OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The agricultural sector has a key role to play in climate change mitigation as it is a major emitter of GHG emissions worldwide. A number of supply-side and demand-side policy options exist to reduce GHG emissions from agriculture, although so far their uptake has been limited. Effective mitigation strategies in the agricultural sector also require collaboration at the national and international level (Box 1.1).

In parallel to public policies, an increasing number of private industry initiatives are emerging, particularly in livestock sectors, which seek to measure and benchmark GHG emissions and in some cases set ambitious mitigation goals (OECD, 2020[4]). In the European Union (e.g. Ireland, Netherlands, France), New Zealand, Australia, and the United States, for example, the dairy industry has recently committed to reduce GHG emissions from the sector through a number of actions, including the promotion of good agricultural practices among farmers (e.g. soil conservation measures, grazing preservation, improved feed efficiency) and the development of tools to monitor on-farm GHG emissions (Origin Green IRELAND, n.d.[5]; Zuivelketen, n.d.[6]; CNIEL, 2020[7]; DairyNZ, n.d.[8]; Dairy Australia, 2019[9]; U.S. Dairy, n.d.[10]). In addition to their branding and marketing benefits, these initiatives can support the achievement of national mitigation goals for the agriculture, forestry and land use (AFOLU) sector.

Box 1.1. The role of agriculture for climate change mitigation

The agriculture, land use and forestry sector is the second largest contributor to global greenhouse gases (GHG) emissions, after the energy sector. Overall, there is a growing recognition of the large mitigation potential of the sector and an increasing awareness of the need to reduce GHG emissions from agriculture. In recent years, a number of countries have set GHG emission reduction targets for agriculture, either as part of their Nationally Determined Contributions to the Paris Agreement or, more typically, as part of their national mitigation strategies. However, the implementation of policies to incentivize these emission reductions is still ongoing. Moreover, governments face social and political challenges for implementing mitigation policies in the sector, not least in balancing emission reductions with the need to feed billions of people every day. If no further collective progress is made over the coming decade, direct and indirect emissions from agriculture could become the largest source of global emissions by mid-century, as more rapid decarbonisation in is anticipated in other sectors (e.g. energy). Recent OECD work on the topic offers a number of recommendations for effective mitigation strategies in the agricultural sector

- Governments should, first, roll back market-distorting agriculture subsidies. It has been shown that the most distortive forms of support also tend to be the most environmentally harmful. Many countries have taken significant steps in reforming support policies in the early 2010s, but further progress has been limited since then.
- Market-based instruments that aim to reduce GHG emissions, such as carbon taxes, emissions trading schemes, and abatement payment schemes, are the most cost-effective ways to cut emissions from agriculture, even though they introduce different trade-offs for farmers, consumers and taxpayers and are challenging to implement. A significant implementation challenge for all of these policies include difficulties in measuring agriculture emissions, which are mainly from diffuse heterogeneous sources.
- Co-operation at the national and international level is key for climate change mitigation in the agricultural sector, because unilateral approaches, using carbon pricing, can cause emissions leakage by increasing emissions in unregulated countries. Countervailing measures like carbon border taxes can reduce, but not eliminate this effect.
- Reducing food losses and waste along the supply chain through to consumers could significantly lower GHG emissions, but might be costly to achieve. Information about the emission contents of products could encourage people to switch to lower emission diets.

- Increased agriculture productivity growth can help to reduce GHG emissions while alleviating food security concerns. One example is precision agriculture, where global positioning systems and sensors, for instance, are helping to lower fertilizer use in crop production. For cattle, improving feed rations and breeding technologies can help reduce associated GHG emissions.
- Forestry and agro-forestry play important roles as a carbon sink. Even though the amount of carbon that can be captured is limited, natural and sustainably managed forests can considerably help to mitigate GHG emissions from the AFOLU sector

The importance of sending clear and consistent policy signals to the agricultural sector cannot be overstated as the high levels of support to agriculture in many countries are likely to counteract the effectiveness of mitigation policies in many instances, raising concerns with regard to policy coherence. Clear signals are also necessary to allow farmers to make investment decisions that can facilitate the transition to low carbon agriculture, particularly in farming systems with high fixed investment costs.

Source: (OECD, 2019[11]; Henderson and Lankoski, 2019[12]; OECD, 2020[4])

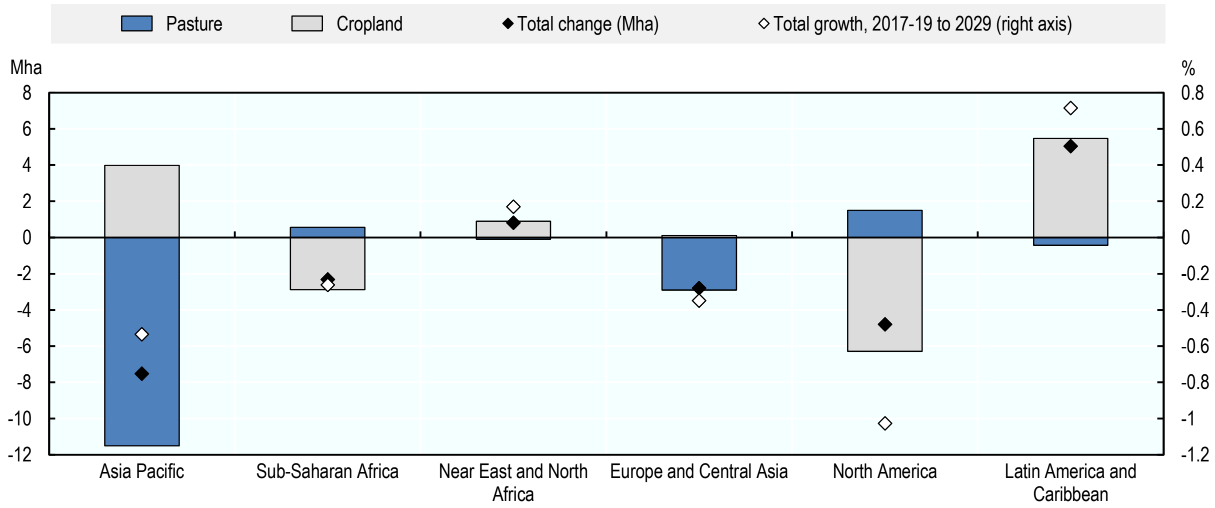
Environmental effects of agricultural land use

Agriculture currently uses 40% of the world's land, 70% of which is pasture land. Globally, agricultural land use is expected to remain at current levels during the coming decade as an increase in cropland offsets a decrease in pasture, in line with historic trends. However, trends in land use, and their underlying determinants, differ around the world.

In Latin America, cropland use is expected to expand by about 5.5 Mha over the next ten years while pastureland will decline by only 0.4 Mha, resulting in a total increase in agricultural land of 5 Mha (0.7%). Large-scale commercial farms in the region are expected to remain profitable and invest in the clearing and cultivation of new land, including previous pasture land, for soybean and maize production. A significant increase in cropland is also expected in the Asia Pacific region (4 Mha), but this is projected to be more than counterbalanced by a decline in pasture land (more than 11 Mha), which will be enabled by further intensification of pasture and ruminant production. More limited land use changes are expected in other world regions (Figure 1.22). Despite substantial land availability in Sub-Saharan Africa, for instance, total agricultural land use is projected to slightly decline (-0.3%) over the next ten years. Farmland expansion will be mainly constrained by the prevailing smallholder structure, the presence of conflict in land- abundant countries, and the loss of agricultural land to other uses such as mining and urban sprawl.

Agricultural expansion through clearing or conversion of forest, shrub land, savannah and grassland has been responsible for substantial CO_2 emissions from the loss of above and below-ground carbon sinks, and is associated with negative effects on biodiversity. When taking into account those indirect effects of agriculture on land use change, agriculture's contribution to global GHG emissions increases from 11% to 24%. In 2018, global land use and forest emissions amounted to 3.4 Gt CO_2-e, most of which was coming from burning biomass and deforestation. However, indirect emissions have been declining over time (-1.6% p.a. between 2000 and 2018), mainly due to efforts to reduce deforestation rates, in particular in countries such as Brazil and Indonesia. The future evolution of these emissions is not projected in this *Outlook*.

Figure 1.22. Change in agricultural land use, 2017-19 to 2029



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Other environmental impacts

In many countries, irrigated agriculture is the main user of water resources, accounting for about 70% of global freshwater withdrawal. Irrigated farming has played a key role in agricultural production growth by enabling strong growth in yields. However, despite significant improvements in water productivity by agriculture over the last decades, continuing efforts are needed to increase water use efficiency, improve water management, and reduce water pollution from nutrient run-off, pesticides, soil sediments, and livestock effluents. Moreover, in coming decades, agricultural production in many regions will be subject to increasing water risks, coming from climate variability, extreme events, depletion of groundwater resources, and growing resource competition from other sectors (Gruère, Ashley and Cadilhon, 2018[13]).

As a major user of land in many countries, agriculture has a large impact on biodiversity. Agricultural production depends on biodiversity for the provision of essential ecosystem services such as pollination, pest control, and nutrient cycling. However, agricultural land use and production practices have both beneficial and harmful impacts on biodiversity. Traditional agricultural practices can create diverse semi-natural habitats (e.g. extensive pastures and meadows) whose species depend on their existence and on the continuation of certain beneficial practices, such as low intensity grazing. At the same time, these agricultural production systems may have lower yields that require more land to be put into production. Agricultural intensification (e.g. increased use of fertilizers and pesticides), specialisation and rationalisation, on the other hand, can also require the clearing of natural ecosystems for agricultural expansion and can contribute to a loss of both semi-natural habitats and species abundance (Lankoski, 2016[14]). Over the coming decade, greater efforts are needed to reduce the pressure exerted by some agriculture practices on biodiversity while enhancing agriculture's positive contributions to the environment; agriculture being dependant on ecosystems services for its continuing development (OECD, 2018[15]).

1.4. Trade

Trade plays a critical key role in enabling a more efficient and sustainable global food system, as product moves from countries/regions where resources are comparatively well endowed to those that are less well endowed. This is particularly true for agriculture, where land and water resources, climatic conditions, and population densities vary considerably among countries and regions. As trade barriers, both technical/economic and policy in nature, have been lowered or removed, trade has increased considerably over the last decades, particularly with the signing of numerous trade agreements. As reductions in these barriers have occurred, growth in trade has contributed to a more efficient allocation of agricultural production across countries and regions. In the next decade, trade will increasingly reflect diverging demand and supply developments among trading partners. Some regions are projected to experience the largest population or income-driven increases in food demand but do not necessarily have the resources for a corresponding increase in agricultural output. Moreover, changing nutritional preferences and requirements are changing the profile of demand in most regions. Divergent productivity growth, impacts on production from climate change, and developments in animal or crop diseases will affect supply potential. In this context, appropriate enabling trade policies will mitigate emerging regional imbalances and support sustainable global development, particularly with regard to meeting the sustainable development goals (SDGs). This is even more important considering that low- and middle-income countries account for approximately one third of global trade in food and agricultural products.

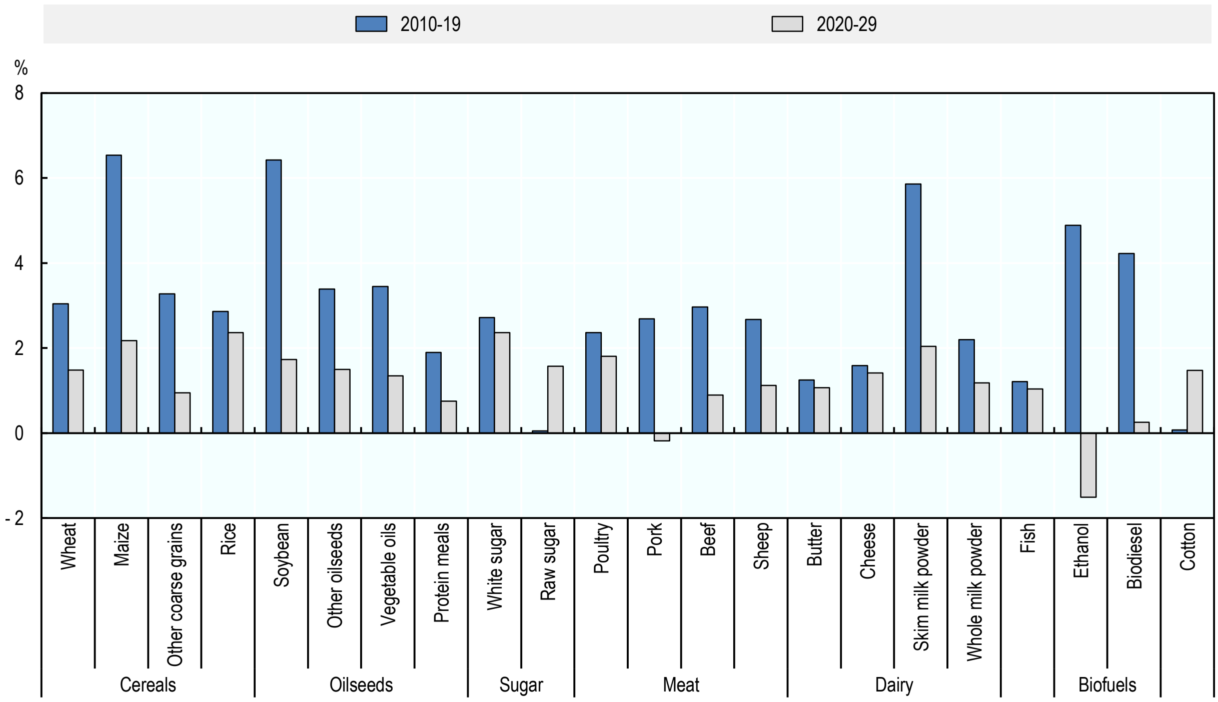
Growth in agricultural and fish trade is slowing

Agricultural trade is anticipated to continue to grow over the outlook period, albeit at significantly slower pace than over the previous decade. Trade had grown rapidly since the early 2000s, supported by a lowering of agro-food tariffs and trade-distorting producer support in the wake of the Uruguay Round. Agricultural trade has also been supported by strong economic growth in emerging and developing countries, particularly in China, but also in other countries in South East Asia and Africa, and by the rapid growth of the biofuel sector, particularly the growth of biodiesel production in the European Union. Excess demand spurred higher real prices and was met by higher additional supplies largely from Latin America, North America and Eastern Europe. Over the outlook period, slower global demand growth triggered by a slowdown in demand growth in China and other emerging economies, and lower global demand growth for biofuels given developments in the energy sector and in biofuels policies is expected to result in a slower growth in trade.

Aggregate trade for the commodities covered in this *Outlook* is projected to grow at 1.2% p.a. over the projection period, compared to 2.8% p.a. over the previous decade. Figure 1.23 displays the projected average annual growth rates for the global trade in agricultural commodities, in volume terms. In general, the projections indicate a broad decline in commodity trade across all commodities, except for sugar and cotton, with considerable slowing in trade anticipated for maize, soybeans and biofuel products.

New digital technologies have the potential to enhance agro-food trade, and improve food security and safety over the coming decade by enabling more efficient and transparent agricultural value chains, as discussed in Box 1.2.

Figure 1.23. Growth in trade volumes, by commodity



Note: Annual growth rate of trade volumes as calculated from 2004-06 reference prices.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Box 1.2. Digital innovations shaping the future of agri-food trade

In our increasingly digital world, there are new opportunities that are going to improve efficiency, transparency and traceability in agricultural trade over the coming decade (Tripoli and Schmidhuber, 2019[16]; Jouanjean, 2019[17]).

Challenges for trade and supply chains are often related to how data are collected, analysed and shared. Whether it is the sheer quantity of often duplicated paper documents or the reliance on human labour to check and clear goods, an international trade transaction is well known for lacking efficiency. Legacy trade processes are complex, expensive, and time-consuming, often resulting in long payment terms. In addition, too often food chains have insufficient levels of transparency and traceability to prevent and mitigate food safety risks and food fraud or enforce compliance with sustainability standards.

New digital technologies are changing the way we use data collection and analysis to produce, trade and consume food and other primary products. Digital technologies, such as the Internet of Things (IoTs), artificial intelligence and machine learning, big data analytics, and distributed ledger technologies (DLTs) have the potential to support increasingly smarter agricultural value chains by: enabling actors to collect data on how agricultural products are produced, processed, transported and stored; analysing data for predictive and data-driven decision making; and sharing data securely along complex agricultural value chains (Tripoli and Schmidhuber, 2018[18]).

Efficiency gains from the adoption of digital technologies by actors in agricultural value chains are projected to lead to increases in production and trade over the next decade. One estimate predicts technological change will increase trade growth by 31 to 34 percentage points until 2030 (WTO, 2018[19]). Technology can generate greater efficiency and increase agri-food trade in several ways. For example, e-commerce and digital trade finance platforms can increase market opportunities for micro, small and medium-sized enterprises by connecting producers to consumers, reducing payment risk and increasing access to trade finance (Tripoli and Schmidhuber, 2018[18]). In addition, the adaptation of digital trade certificates can facilitate trade in the projections by eliminating paper documentation, reducing fraud and enabling faster border procedures, all of which reduce costs (Tripoli and Schmidhuber, 2019[16]). The ePhyto Solution developed by the International Plant Protection Convention (IPPC) is one example that helps governments and companies facilitate trade in plants and plant products by providing a standardised approach for the exchange of electronic phytosanitary certificates. Numerous countries are already using e-phyto certificates with many more planning to adopt the technology in the future. Lastly, by collecting and tracking product data as products move through value chains, digital technologies can help improve compliance with food safety standards and rules of origin (Tripoli and Schmidhuber, 2018[18]). This enhanced traceability can increase market participation from the greater compliance with trade rules and by serving consumers that increasingly expect more detailed information on the food they purchase.

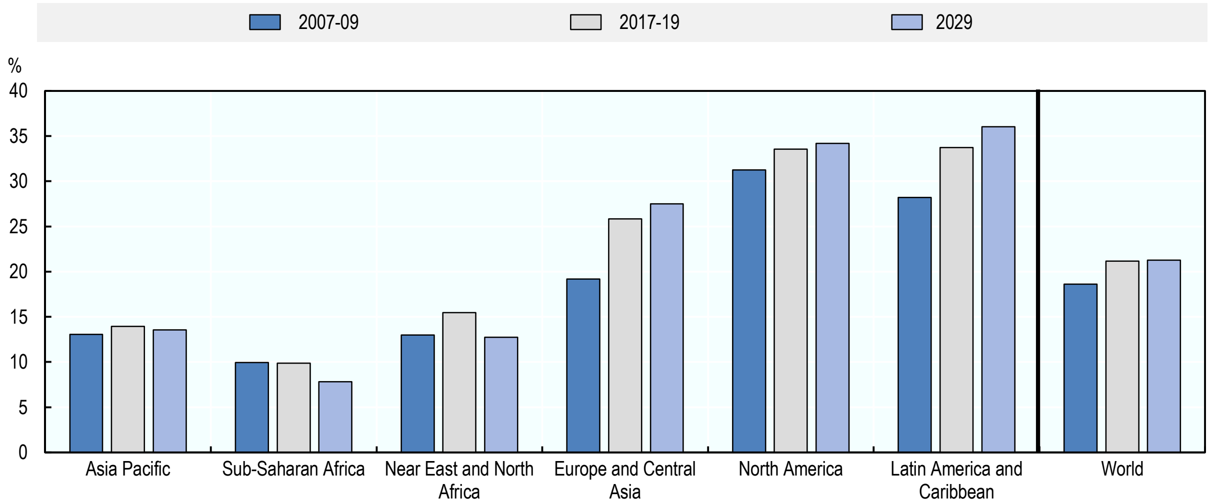
Blockchain is an example of one technology that can facilitate trade over the coming decade. Recently, Cargill and Agrocorp executed a USD 12 million intercontinental wheat trade transaction using blockchain, which was completed in a matter of hours compared to the several weeks the process traditionally takes. Blockchain and smart contracts helped to reduce the time spent in exchanging and processing documents by more than 50% (Ellis, 2020[20]).

The baseline projections of the 2020 *OECD-FAO Agricultural Outlook* incorporate the positive effects digital technologies can have on farmers to manage their risks and engage more effectively in global trade and value chains. Nevertheless, for the agriculture sector to reap the benefits of digital technology, there are a number of challenges that must be addressed by both the public and private sectors. A few of these challenges that are needed to facilitate digital trade include: updating regulatory frameworks, improving digital and physical infrastructure, incentivizing stakeholder buy-in to uptake new technologies, capacity development to improve digital skills at the government and farm levels and promoting interoperability between legacy systems and new technologies (Tripoli and Schmidhuber, 2018[18]; Tripoli, 2020[21]). Both the public and private sectors will need to commit both financial resources and human capital to enable the transition to digital trade and for it to reach its fullest potential.

Trade relative to output is stabilizing

Global trade relative to production for the commodities covered in the *Outlook* has been gradually increasing over time, rising from 15% in 2000, to 21% in 2019, and reflects a trade sector that has been growing at a faster pace than overall agricultural production. Assuming a diminishing impact of previous trade liberalisations that boosted global agricultural trade, the commodity projections in the *Outlook* indicate that trade relative to production will increase only marginally over the next decade as growth in trade will be more closely aligned with growth in output. For imports, rising trade relative to output is being driven largely by the Asia and Pacific region, where it will rise to 20% of production value, by countries in the Middle East and North Africa region where it will rise to 94%, and by Sub-Saharan Africa where it will rise to 33% by 2029. From an export perspective, Latin America and the Caribbean, North America, and Eastern Europe and Central Asia have been the key supplying regions, and exports relative to net domestic agriculture and fish production is projected to rise to 36%, 34% and 32% respectively in 2029 (Figure 1.24).

Figure 1.24. Value of agriculture and fish exports relative to production by region



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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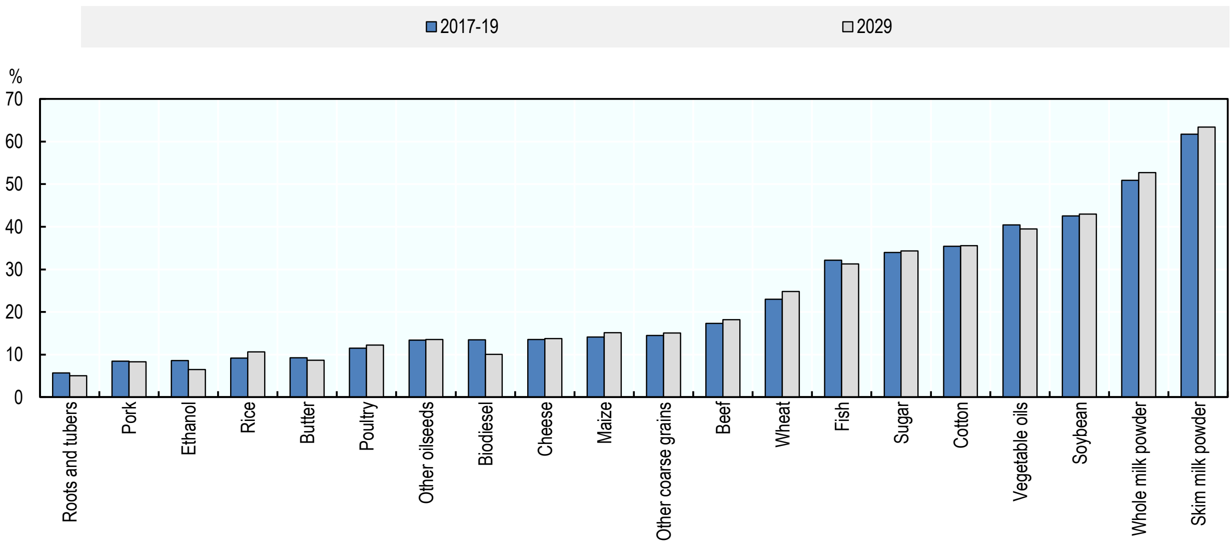
The shares of production traded by commodity are shown in Figure 1.25. Highly traded commodities such as wheat, soybeans and milk powders are those demanded for further local processing by importing countries. A number of commodities may have their export ratios decline marginally over the outlook period, reflecting either weakness in import demand, or in the case of vegetable oil, increasing domestic use for biodiesel production, especially in Indonesia.

Figure 1.25. Share of production traded, by commodity



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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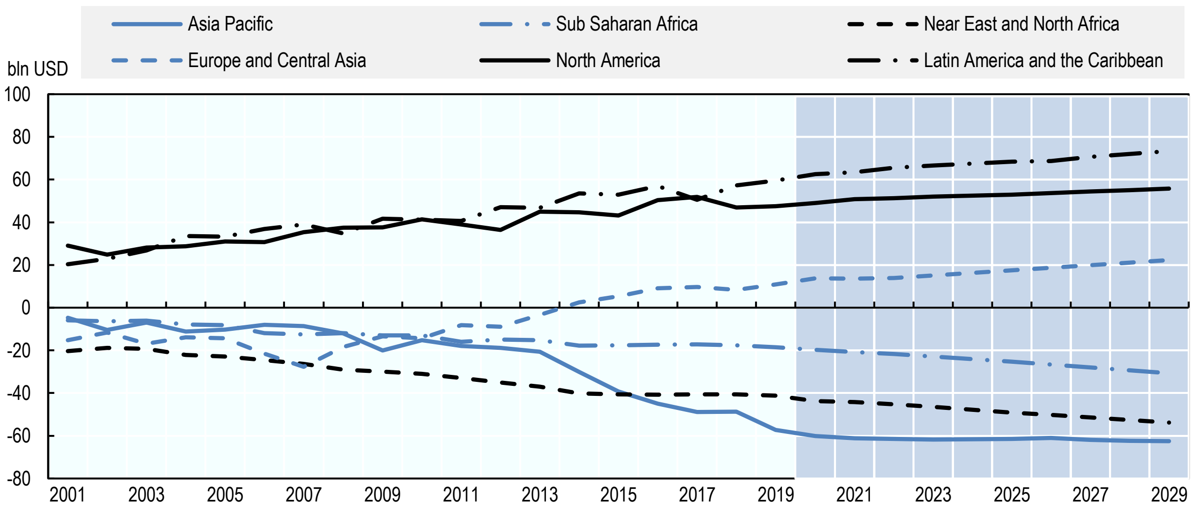
Specialisation among the regions is increasing

Over the coming decade, world trade in agricultural commodities is expected to continue to develop according to comparative advantage, given the relative availability of natural resources. Widening trade balances reflect per capita availability of agricultural land. For example, the Americas have the most land available (1 ha/capita) and the Asia and Pacific region has the lowest availability of land on a per capita basis (0.3 ha/capita). Net exports continue to increase from the Americas while net imports increase by the Asia and Pacific region (Figure 1.26). Other regions range between these two extremes, with the exception of Near East and North Africa, where extreme water resource constraints exist which limit local production response. Accordingly, established net exporters of agricultural commodities are expected to increase their trade surpluses while regions with important population growth or land or other natural resources constraints, are expected to see their trade deficit widening. Amidst this continuing differentiation between net importing and net exporting regions, the number of exporters is expected to remain relatively small, while the number of importers is expected to grow. While this paradigm of comparative advantage given resource availability applies, relative productivity given available resources is also a critical determinant of trade patterns and will also affect developments in the longer term. For example, reducing the yield gap in Sub-Saharan Africa would improve the region's self-sufficiency and reduce its trade deficit.

Figure 1.26. Agricultural trade balances by region, in constant value



Note: Net trade (exports minus imports) of commodities covered in the *OECD-FAO Agricultural Outlook*, measured at constant 2004-06 USD.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink https://doi.org/10.1787/888934141513

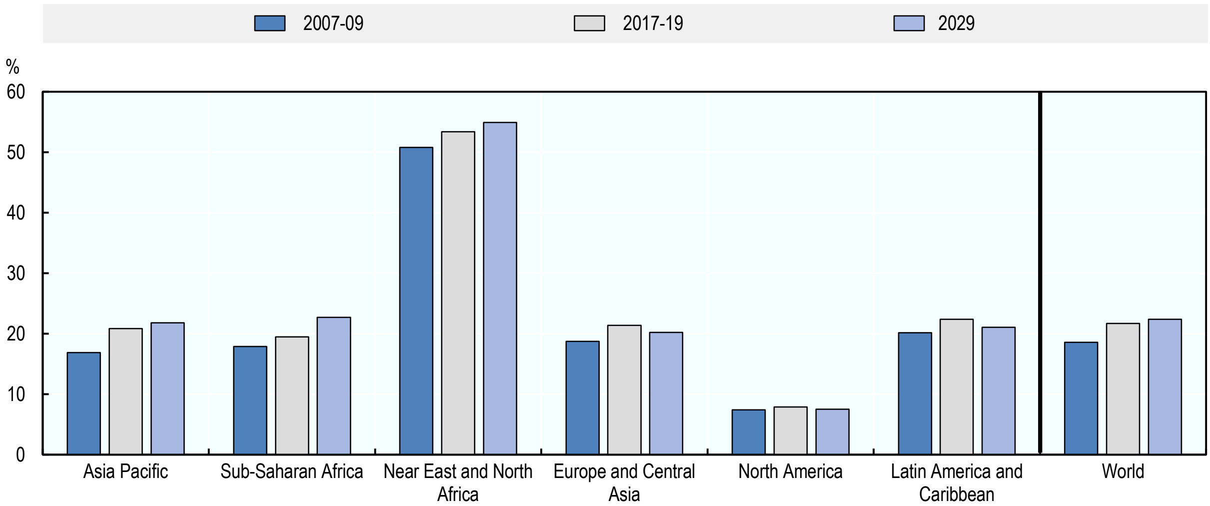
Latin America and the Caribbean is expected to reinforce its position as the world's prime supplier of agricultural commodities, with an average growth in net exports of 1.7% p.a. over the outlook period. Increased production of maize, soybeans, beef, poultry and sugar will facilitate this expansion. Net exports from North America, the second leading supplier of agricultural commodities to world markets, are expected to expand at slower pace (1.3% p.a.) over the outlook period, due to a more limited expansion in agricultural output. Exports of maize and soybeans, in particular, will significantly slowdown from a rate of 5% p.a. in the last decade to about 2% p.a. Over the coming decade, net exports from Eastern Europe and Central Asia are projected to increase by 47% from base period levels, largely due to higher exports from the Russian Federation and Ukraine. As a result of this significant expansion in agricultural export, the region will emerge as the third main net-exporting region in the world. Rising productivity in combination with slow domestic demand due to low population growth will be the primary reason behind this trend.

In contrast, net imports by the largest net importing region, Asia and the Pacific, are projected to increase by a further 21% from the base period, largely due to increasing imports by China. Net imports by Sub-Saharan Africa will rise by over 70% by 2029 compared to the base period due to higher imports of wheat, maize and soybeans. Net imports by Near East and North Africa, the second largest importing region, are expected to rise to over 32% by 2029, further deepening the region's dependence on international markets. Near East and North Africa will remain the largest importer of basic foods on a per capita basis.

The role of trade in food security and livelihoods

Food imports play an increasingly important role in ensuring global food security providing improved access to food and nutrition. This is particularly true for resource-constrained countries, which are highly dependent on the import of basic and high value food commodities; imports may account for a large share of their total calorie and protein availability (Figure 1.27). An enabling trade environment thus increases availability in these countries and may moderate pressures on consumer prices. In a country experiencing declines in production due to a weather-induced shortfall, trade can contribute towards food security in terms of both availability and access (FAO, 2018[22]). Furthermore, trade can have a positive effect on utilization, as it allows for greater diversity in the food available, particularly in regions where the climatic factors may not be suitable for the production of a large variety of crops, nor allow for the production of sufficient quantities to ensure domestic food-security such as in the Near East and North Africa region.

Figure 1.27. Imports as a share of total calorie availability for selected regions



Note: Calculations using average calorie content of commodities included in the *Outlook*. Note that imports include feed, and availability includes processing of commodities which may be re-exported.
Source: FAOSTAT (2020). OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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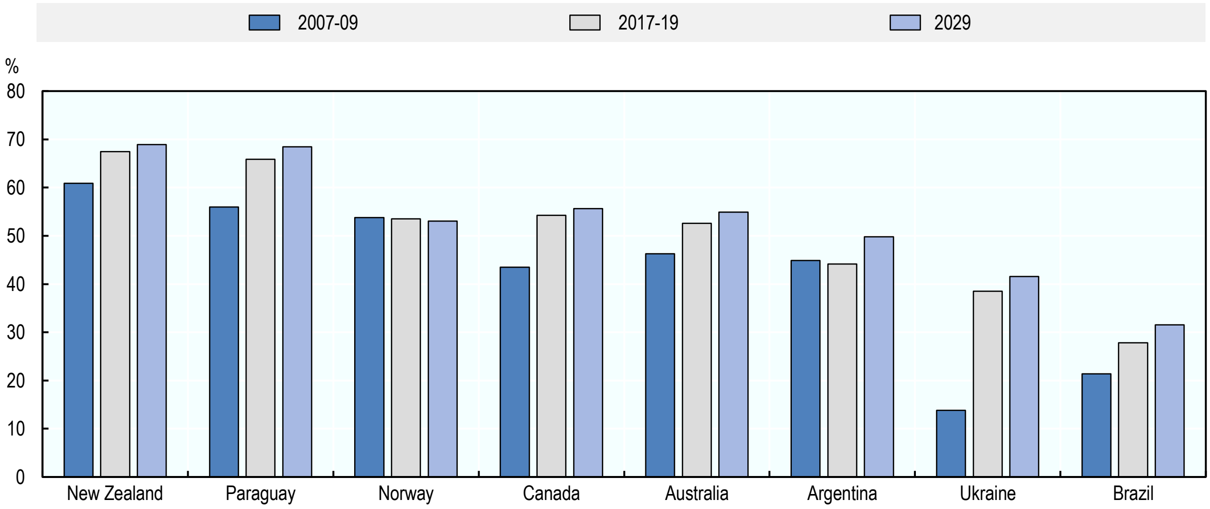
Exports are critical to livelihoods in many countries

For many countries, trade plays a central role in sectoral performance. Exports of some agricultural commodities account for a large share of domestic production and are therefore an important source of income and an opportunity to access growing markets without depressing local markets. For many developing countries, exports of commodities not included in this *Outlook*, such as fruits and vegetables, tea, cocoa and fibres, provide a substantial source of income. However, international market fluctuations and shocks as well as changes in trade policies may inordinately affect their rural or coastal sectors. As measured by the ratio of the net value of exports to net value of domestic production for the commodities included in the *Outlook*, eight countries will continue to have high dependency on international markets (Figure 1.28). While some of these countries, such as Canada and Brazil, export a wide set of commodities, some others such as New Zealand, Paraguay and Norway, depend on just a few commodities (dairy products, oilseed products and fish, respectively).

Figure 1.28. Exporting countries with greater than 25% dependency on foreign markets



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The role of trade in nutrition

Beyond the importance of trade in facilitating global food security, trade will also increasingly be central to ensuring nutrition security in exporting and importing countries alike. The projections in this *Outlook* indicate that, as consumption growth outpaces production growth in the developing world, many countries will see an increasing share of their food demand met by imports. For example, in Southeast Asia, where rising incomes are altering consumer preferences, an increasing share of demand for meat (especially poultry and bovine meat) will be met through imports. Similarly, increasing demand for milk powders in Near East and North Africa, Southeast Asia, and Sub-Saharan Africa will be met by suppliers in the developed world.

While a greater openness to trade can positively impact the affordability and availability of different foods, add to a wider choice for consumers and thus help to diversify diets, the rise in the international food trade, especially through imports, can be associated with a greater availability of less healthy foods, including ultra-processed foods, to the detriment of dietary quality. Particularly in view of the increasing incidence of various forms of food-related non-communicable diseases globally, targeted domestic policies designed to improve the nutritional status of the population are additionally needed to maximize the positive net effects of trade on nutritional outcomes (FAO, 2018[23]).

Trade policies

Trade has been an engine of transformation of the global agriculture and food sector. Changes in trade policies have been critical in facilitating this transformation by reducing both tariff and non-tariff barriers which have limited the movement of goods and services. The results of reducing barriers has been to increase the welfare of consumer and producers in capturing the welfare benefits of increased market efficiency. Major developments in trade policy that will be negotiated/implemented over the next decade will potentially increase intra-regional trade and inter-regional trade. A detailed discussion on trade negotiations with a potential strong impact on global agricultural trade is provided in the uncertainty section. A broad global trade agreement (WTO) is not anticipated.

The presented baseline incorporates only implemented or ratified bilateral trade agreements such as the African Continental Free Trade Agreement (AfCFTA) which came into force in May 2019 and will achieve duty free trade on 90% of products in internal African trade by July 2020, and a further 7% of such products by 2029. This should improve market efficiency within the region, although non-tariff barriers such as weak transportation links may limit the extent of market integration.

1.5. Prices

The *Outlook* uses international trade prices at key markets as reference prices for each agricultural commodity. Historical observations are used to describe previous developments while projected values reflect future market trends. Near-term price projections are still influenced by the effects of recent market events (e.g. droughts, plant and animal diseases, policy changes), whereas in the later years of the projection period, price projections are driven by fundamental supply and demand conditions only. Potential price variability is explored in a partial stochastic analysis (see below).

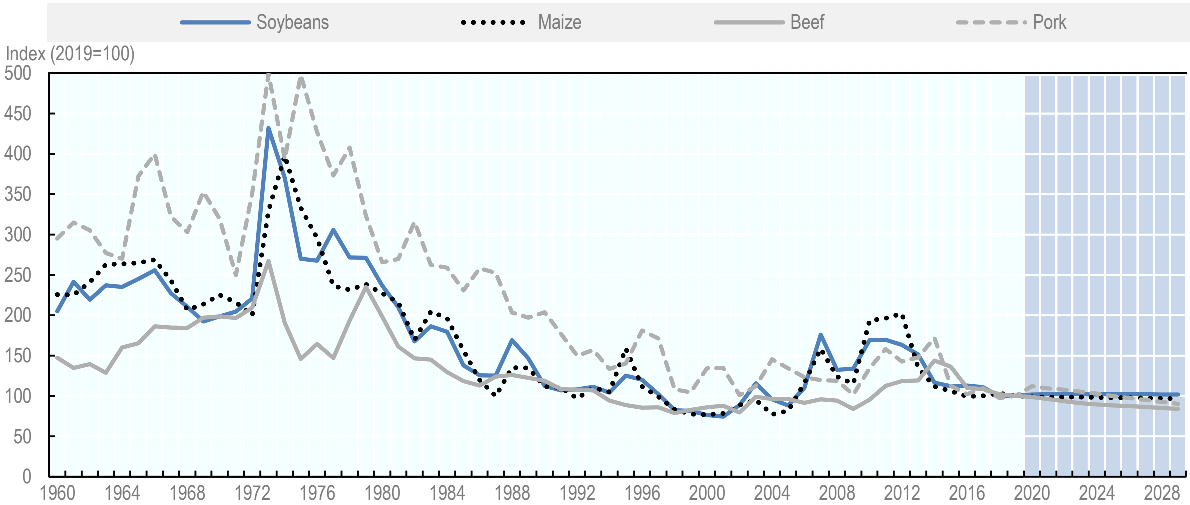
Over the coming decade, most of the commodities covered in the *Outlook* are expected to see real price declines, suggesting that, under the assumptions made by this *Outlook*, price reducing-factors (mainly productivity improvements) are expected to dominate factors leading to higher prices, such as resource constraints and higher demand induced by population and income growth.

On the supply side, the *Outlook* projects strong yield growth in emerging and low-income countries due to technological catch-up and the adoption of better management practices. In developed regions, technological innovation (e.g. plant and animal breeding) and efficiency gains will also enable further yield improvements. The resulting price projections assume that this continuing productivity growth lowers marginal production costs and that all additional resources can be mobilised at these lower prices. On the demand side, global population growth is slowing down, so too is income growth in emerging economies, where consumers also have a declining propensity to spend their additional income on food.

This expected decline in real prices is consistent with a long-term downward trend in agricultural commodity prices (Figure 1.29). Historical data show that the prices of agricultural commodities tend to be highly correlated and to follow a declining trend over the long run. The prices of different crops (here soybean and maize) and livestock commodities (here beef and pork), in particular, tend to follow similar developments. Over the coming decade, meat prices are projected to decrease more strongly (-1.8% p.a.), partly as a reflection of their current high levels, while crops prices will experience a more modest decline (-0.3% p.a.).

Another way of assessing the evolution of prices is through the expected future path of the FAO Food Price Index (FPI). This index, introduced in 1996, captures the development of nominal prices for a range of agricultural commodities in five commodity groups (cereal, vegetable oil, sugar, dairy and meat), weighted with the average export shares of these groups in 2002-2004. As this commodity price index is similar in commodity coverage to the *Agricultural Outlook*, it is possible to project the future evolution of the FPI as a summary measure of the evolution of nominal agricultural commodity prices (Figure 1.30).

Figure 1.29. Long-term evolution of commodity prices, in real terms



Note: Historical data for soybeans, maize and beef from World Bank, "World Commodity Price Data" (1960-1989). Historical data for pork from USDA QuickStats (1960-1989).
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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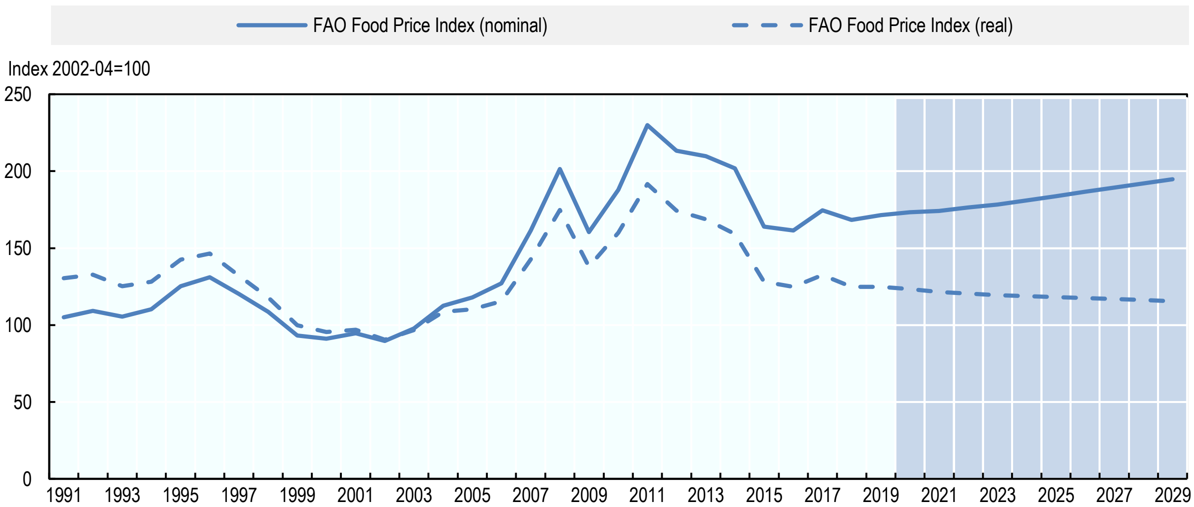
Figure 1.30. Projected evolution of FAO FOOD Price Index



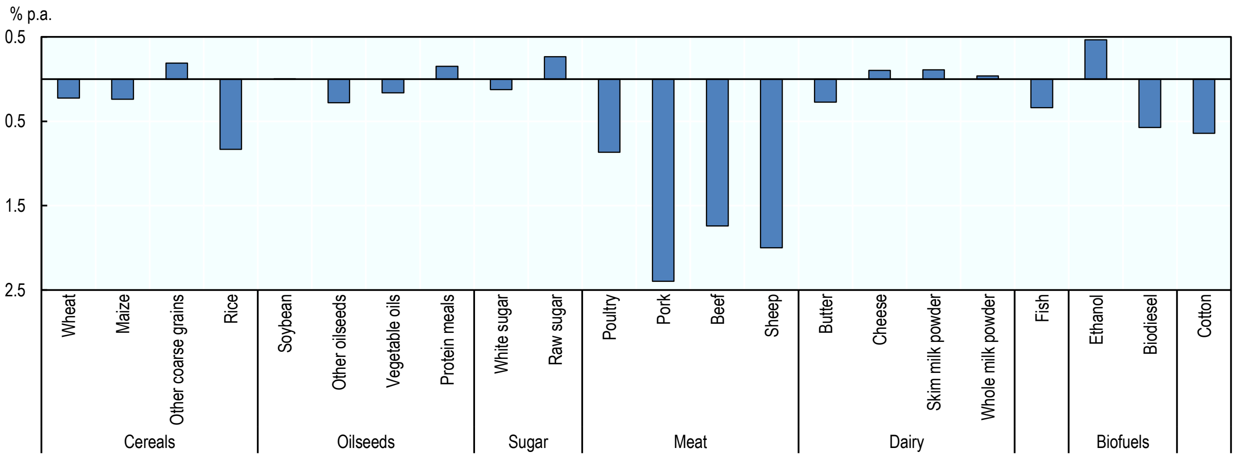
Note: Historical data is based on the FAO Food Price Index, which collects information on nominal agricultural commodity prices; these are projected forward using the *OECD-FAO Agricultural Outlook* baseline. Real values are obtained by dividing the FAO Food Price Index by the US GDP deflator (2002-04 = 1).
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink https://doi.org/10.1787/888934141589

Based on the supply and demand conditions projected in the *Outlook*, nominal agricultural commodity prices as summarised by the FAO FPI are expected to grow by only 1% p.a. over the coming decade. In real terms, the FAO FPI is projected to decline by 0.7% p.a. over the next ten years. While agricultural commodities prices are expected to be below the peaks seen in 2006-08 and in 2013-14, they will remain above early 2000s price levels, both in nominal and real terms.

A more detailed view by commodity is provided in Figure 1.31, which shows the projected average annual real price change over the outlook period. Overall, most of the commodities covered in the *Outlook* are expected to see real price changes of less than 1% p.a. over the coming decade, with the exception of meat.

Figure 1.31. Average annual real price change for agricultural commodities, 2020-29



Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The pronounced price decline for all meats is against their current high levels resulting from supply constraints in a number of Asian countries and the resulting strong import demand on international markets. This is particularly true in the pigmeat sector where the African Swine Fever outbreak has resulted in a drop in output in the two main producing countries (China and Viet Nam), leading to strong import demand growth in 2019. Declining pork output in Asia also led to a growing import demand for other meat types (substitution effect), keeping their prices at high levels. Sheep prices, in particular, have been supported by both the strong import demand from China and supply constraints in Oceania. As production gradually recover over the second half of the projection period, meat prices are projected to decline in real terms. However, this trend of declining prices also reflects longer-term supply and demand conditions. Meat production is projected to expand over the coming decade through a combination of higher carcass weight per animal and growing herd and flock sizes, in particular in low-income and emerging countries. Demand growth for meat, on the other hand, is expected to slow down, given slower income growth in several regions, ageing populations and the decrease in per capita meat consumption in a number of high-income countries.

For cereals, the increase in global production together with the ongoing destocking of maize and rice in China will continue to exert downwards pressure on prices over the outlook period. Rice prices, in particular, are projected to decline by 0.8% p.a. in real terms, as productivity gains in major Asian importing countries like Indonesia are expected to reduce global import growth.

Prices for soybean and other oilseeds are projected to remain essentially at their current levels as productivity growth is expected to keep pace with growing demand over the coming decade. Compared to the last decade, demand growth for vegetable oil is slowing down considerably, as consumption in many emerging economies (including China, Brazil, and South Africa) is reaching saturation level; as a result, a small decrease in real prices is projected. For protein meals, a modest increase in real prices (0.15% p.a.) is expected due to low starting prices in 2019, as Chinese feed demand was considerably reduced due to the ASF outbreak.

With a return to a more balanced market (after a large production deficit in 2019), nominal sugar prices are expected to increase but should remain broadly flat in real terms with a slowdown in demand growth in regions where per capita consumption is already high.

There is no real international milk price, as unprocessed milk is practically not traded. The two main reference prices for dairy products are international prices for butter and skimmed milk powder (SMP), which can been seen as proxies for the price of milk fat and milk solid, respectively. SMP prices recovered following the complete disposal of the European Union's intervention stocks in 2019, and are expected to remain constant in real terms throughout the outlook period. Annual butter prices peaked in 2017, and have declined since then. Over the coming decade, butter prices are projected to continue to decrease slightly in real terms, which will contribute to further narrow the price gap between SMP and butter. World prices for whole milk powder (WMP) and cheese reflect butter and SMP price developments, in line with the respective content of fat and non-fat solids.

Real fish prices are expected to remain largely unchanged over the next ten years, with small increases in the first part of the outlook period followed by a decline in the second half as production grows faster, particularly in China.

For biofuels, ethanol prices are projected to increase slightly in real terms, as they are currently at very low levels, while biodiesel prices are expected to decrease by about 0.6% p.a. over the next ten years. The evolution of biofuels markets is heavily dependent on the evolution of crude oil prices (which are mostly constant in real terms) and policy decisions, but also on the prices of feedstock, e.g. vegetable oils for biodiesel and maize and sugar crops for ethanol. The modest evolutions in prices for these feedstock over the coming decade will contribute to the relatively flat price evolutions for biofuels.

International cotton prices are expected to continue to decrease in real terms throughout the projection period, as world cotton demand remains under pressure from synthetic fibres, notably polyester. However, the price ratio between cotton and polyester is expected to stabilise.

Lower agricultural commodity price benefit millions of consumers worldwide, as it improves affordability and hence access to food. However low prices can also put pressure on the income of producers who are not lowering their costs sufficiently through improved productivity. A low-price environment could thus lead to increasing demand for support to farmers, which could in turn affect the projections. Moreover, low agricultural prices reduce incentives for farmers to invest in technologies that may allow further yield gains in the future, which could limit supply expansion over the coming decades.

Overall, the continued demand for agricultural commodities is projected to be met by efficiency gains in production, which will keep real agricultural prices relatively flat. However, periodic shocks will affect commodity prices over the outlook period creating temporary periods of rising prices and higher volatility. The magnitude of such shocks has been declining over time due to improvement in the resilience of production systems, and access to global trade. However, climate change, could increase the likelihood of extreme weather events (e.g. drought, flooding), which could lead to stronger variations around the trend.

1.6. Risks and uncertainties

The baseline projection is a plausible scenario based on specific assumptions regarding population and other demographic trends, macroeconomic conditions, productivity trends, consumer preferences, agricultural and trade policies and weather conditions. While it is based on the best information available at the time, it is inevitable that there should be a degree of uncertainty attached to projections of demand, and supply that extend ten years into the future and also to the underlying assumptions on which the projections are based. The occurrence of some changes to exogenous conditions may be predicted – conclusion of some trade negotiations, for example – although the magnitude and dynamics of their effects may not. Others may be entirely unpredicted or inherently unpredictable events such as some pests or diseases or weather shocks. These uncertainties surrounding the projections of demand and supply are discussed below in this final section.

Impact of the COVID-19 pandemic

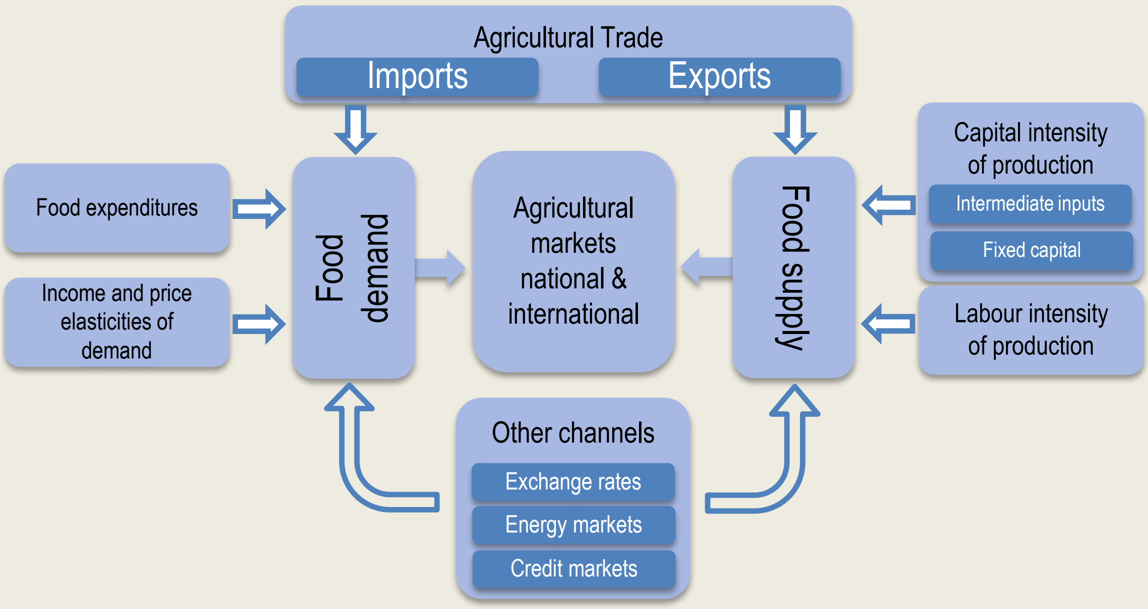
The most significant immediate uncertainties obviously relate to the COVID-19 pandemic which impacts on all of consumption, production and trade. The channels of transmission are summarised in Box 1.3. This current edition of the *Outlook* was already being finalised when the COVID-19 pandemic began. Its full impacts on agricultural and fish markets remain uncertain, at least in quantitative terms, and were therefore not incorporated into the baseline projections. However, they are the subject of an initial analysis in a special scenario exploring the implications of the macroeconomic impacts of the pandemic, which is presented below. Disruption of primary agricultural production could be limited for most of the commodities covered in the *Outlook*, especially crops, and at least in the major producing and trading countries. However, interruptions to downstream food processing, trade, forced adjustments of consumer demand, and shortages of seasonal labour will all have some impact on agricultural and fish markets, especially in the short term.

Box 1.3. COVID-19: Channels of transmission to food and agriculture

The general consensus in April 2020 regarding the impacts of COVID-19 anticipated a contraction in both supply and demand of agricultural products and pointed to possible disruptions in trade and logistics. They will affect all elements of the food system, from primary supply, to processing, to trade and national and international logistics systems, to intermediate and final demand. It also affects factor markets, namely labour and capital, and intermediate inputs of production (e.g. pesticides, seeds). The magnitude of these effects will depend upon the persistence and spread of the pandemic itself and the dynamics of economic adjustments and recovery. On the supply side, widely different views remained on the duration of the shocks, the price dynamics, differential impacts between domestic and international markets, differences across countries and commodities, the timing and likely paths of recovery and the policy actions to remedy the various shock waves. On the demand side, there was a near ubiquitous agreement that agricultural demand and trade would slow-down, with contractions stemming from a deceleration in overall economic activity (GDP growth) and rising rates of unemployment. Social distancing measures will restrict access to foods, notably those typically consumed out of the home. Food and agricultural systems are exposed to both demand and supply side shocks (symmetric), but these shocks are not expected to take place in parallel (asynchronous) as consumers can draw on savings, food stocks and safety nets to supplement their income devoted to food purchases.

The channels of transmission into food and agricultural demand include numerous macroeconomic factors, notably swings in exchange rates, in energy and credit markets, and, most importantly, the expected surge in unemployment and the contractions in overall economic activity. The impacts of the pandemic will be felt differently depending on the type of industry and the stage of development of a country. In general, agriculture in high-income countries is a capital-intensive industry, exposed to possible disruptions of supplies of intermediate inputs in the short term and fixed capital items in the longer term. The same holds for some agricultural systems in low-income countries, but their exposure to a pandemic shock can differ markedly. For instance, while export-oriented farmers in North America may benefit from lower interest rates but suffer from an appreciation of their currency, similar producers in South America may experience the opposite impacts.

Figure 1.32. COVID-19: Channels of transmission to food and agriculture



Source: J. Schmidhuber, J. Pound & B. Qiao (2020), *COVID-19: Channels of transmission to food and agriculture*, FAO Publications, Rome, https://doi.org/10.4060/ca8430en.

Lack of inputs affects a growing number of farmers around the world. Low supplies of pesticides for instance is already affecting crop protection efforts in countries affected at an early stage and will likely reduce yields later in the year. A lack of pesticides is also hampering efforts to contain pest outbreaks, including the current locust outbreak in East Africa.

Labour availability for agricultural supply chains has become a near global problem. In general, low-income countries employ higher shares of labour for primary production, which makes them more exposed to direct disruptions in labour supply. Such deficits can be caused by domestic labour supply disruptions, as well as by shortages of seasonal and migrant workers.

In addition, macroeconomic channels of transmission affect agricultural supply, trade and final demand. The precipitous fall in oil and metal prices, for instance, exerted downward pressure on the exchange rates of many commodity-exporting countries ("commodity currencies"). The downward pressure on exchange rates, triggered by price declines in non-food commodities, affects all tradeable commodities, including food. It makes food supplies internationally more competitive, at least in the short term, raising concerns in some countries about potential shortages in domestic supplies. Globally, carry-over stocks are high, the prospects for the next crop are good and food demand is likely to stagnate or even decline given the expected global recession, while biofuel demand is likely to be capped in view of the sharply lower crude oil prices. Still, the extent of a possible demand contraction is unclear. In the case of a substantial global GDP contraction, low-income countries may experience food security challenges due to lower incomes, rather than increased prices.

Finally, and arguably most importantly, COVID-19 will exert a shock on final food demand by lowering overall purchasing power, especially for an increasing number of unemployed people. The actual impact on food demand will depend on numerous factors, including the depth and length of the macroeconomic shock, the availability of savings and access to credit and safety-net mechanisms. While neither the final income nor the final price impacts are clear at this early stage, the availability of food staples and the greater exposure of labour intensive foods such as vegetables and dairy products to adverse effects emanating from this pandemic, suggests a deterioration in the quality of the diets rather than increases in calorie deficits.

Source: (Schmidhuber, Pound and Qiao, 2020[24])

The baseline projections in the *Outlook* represent a consensus among the secretariats of OECD and FAO as well as collaborating institutions about the future trends in global agriculture. The projections cycle began at the end of 2019 and the baseline was subsequently prepared on the basis of a set of demographic and macro-economic assumptions that reflect the global economic outlook at the time. Shortly after, the COVID-19 outbreak was declared a pandemic, significantly disrupting all sectors of the economy. However, the precise effects of this pandemic on agricultural and fish markets remained uncertain, at least in quantitative terms, and were therefore not incorporated in the baseline projections.

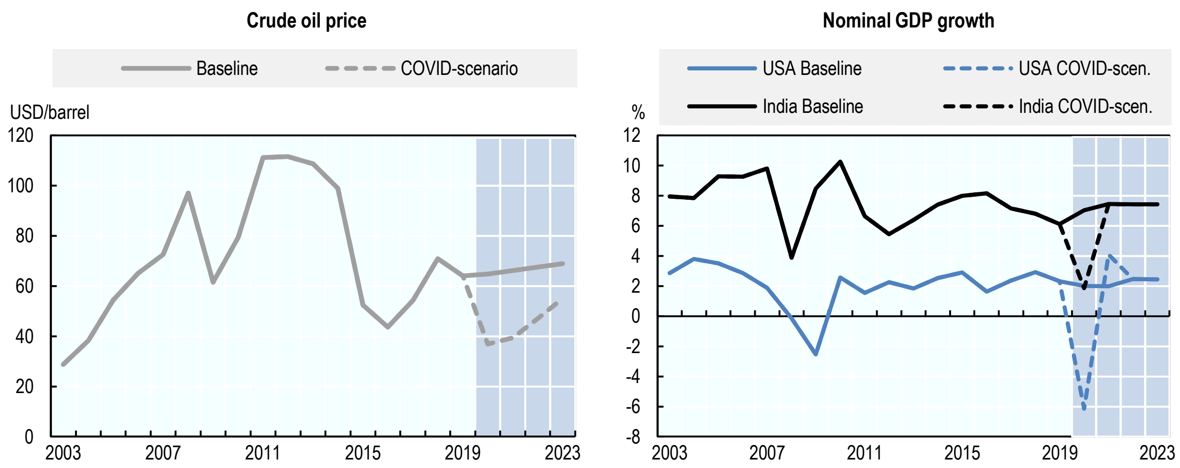
The Aglink-Cosimo simulation model underlying the baseline projections of the *Outlook* offers the possibility to conduct scenario analyses to explore the impact of alternative sets of assumptions on future developments of global agricultural markets. These capabilities are used to simulate possible impacts of the COVID-19 pandemic on agricultural markets over the short term.

This scenario focuses on the potential macroeconomic impacts of the pandemic rather than focusing on the short-term disruptions related to the restrictions of movement of people and disruption to transport and logistics. The scenario uses projections from the *World Economic Outlook* of the International Monetary Fund (IMF) for GDP growth, inflation and the world crude oil price for the next two years. According to the IMF projections, the global economy will contract by 3% in 2020, which is a larger GDP decline than experienced during the 2008–09 financial crisis. It is then assumed that the pandemic will fade in the second half of 2020, and that containment measures will be gradually relaxed allowing the global economy to grow by 5.8% in 2021, as economic activities normalize. For the remaining years of the outlook period, the baseline growth rates for macroeconomic variables (i.e. GDP growth, inflation) are applied to the revised 2021 values.

Additionally, the average crude oil price is projected to be USD 37/barrel in 2020 and USD 40/barrel in 2021, down from USD 64/barrel in 2019. Thereafter, the crude oil price recovers to the baseline values in 2025 and remains as in the baseline for the final years of the projection period. Figure 1.33 illustrates some of the scenario assumptions relative to the macroeconomic assumptions underlying the baseline.

The macroeconomic shocks induced by the COVID-19 pandemic are expected to put downward pressure on agricultural commodity prices. The contraction in economic activity is projected to weaken global demand for agricultural commodities. Supply-side reaction to this reduction in demand will be delayed as production decisions (e.g. sowing of crops) were made prior to the onset of the COVID-19 pandemic, leading to an oversupply of many agricultural commodities in the short run. In response, stocks of agricultural commodities are expected to increase, causing commodity prices to fall further until normal levels of consumer demand resume. In addition, the drop in oil prices will reduce agricultural production costs in the first years of the projection period (e.g. lower fuel and fertilizer costs). All these factors will contribute to lower agricultural commodity prices in this scenario compared to those projected in the *Outlook* for the first years of the projection period.

Figure 1.33. COVID-19 scenario macro assumption



OECD/FAO (2020), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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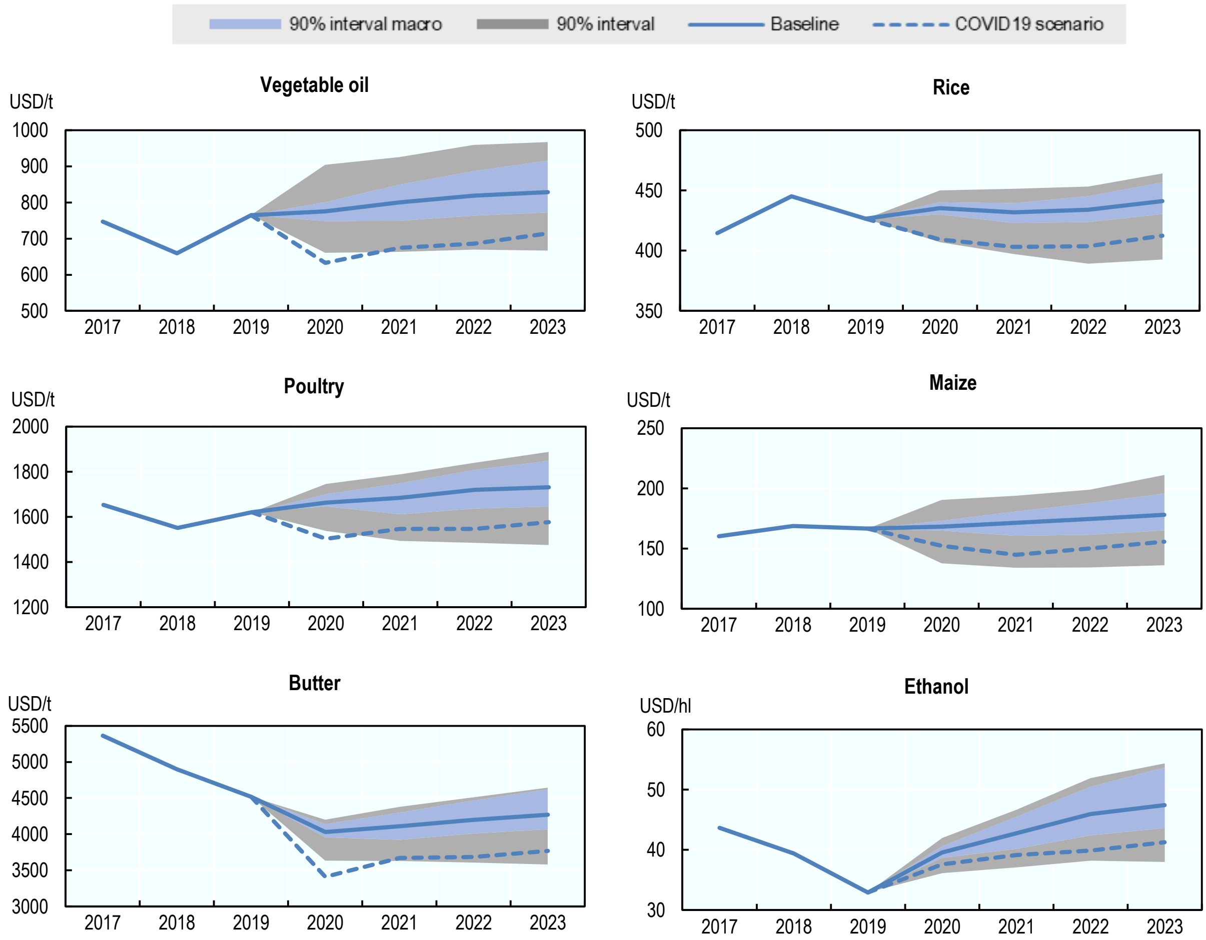
Figure 1.34 shows the expected evolution of nominal prices for selected commodities under the baseline scenario of the *Outlook* (solid line) and under the COVID-19 scenario (dashed line) in relation to the stochastic outcomes. To assess the uncertainty around the projected prices, two sets of partial stochastic analysis were performed on the projections of the *Outlook*. The first stochastic analysis simulates the potential variability of agricultural markets using 1 000 different scenarios based on historic variations from their long-run trend for macroeconomic (GDP growth, inflation) and other variables, such as oil prices, exchange rates and yield shocks (grey fan). The second one only varies macroeconomic variables (GDP growth and inflation) and the crude oil price (blue fan for 90% confidence interval). Consequently, more extreme shocks than those observed in the past are not incorporated in the stochastic analysis. Moreover, the analysis is partial as not all sources of variability affecting agricultural markets can be captured. For example, animal diseases such as African Swine Fever can have important effects on markets but are not included here. Nevertheless, the results of the partial stochastic analysis give an indication of the sensitivity of the projections to some of the most important sources of variability in agricultural markets.

The lower economic growth path in the COVID scenario leads to a reduced growth in demand for agricultural commodities. In 2020, prices in the COVID scenario fall below the 90% macro confidence interval (blue fan) and prices for higher value commodities (e.g. vegetable oil, poultry and butter) even fall lower than during 90% of all previously conceivable disasters (grey interval); indicating that the COVID-19 pandemic is expected to create a historically significant market shock. Based on the assumed economic recovery beginning in 2021, prices gradually return to the baseline scenario over the following years.

The projected food demand is determined by two main drivers: lower economic growth reduces food demand whereas lower commodity prices support demand. The outcome differs among agricultural products and countries. The consumption of staple food like roots and tubers, rice and wheat is less affected under the COVID scenario. The impact on the food consumption for vegetable oil and animal products is considerably higher. As can be seen on Figure 1.35, the impact on least developed countries (LDCs) is considerably higher than the impact on the world average. For certain combinations of products and countries, the food consumption even increases as lower prices outweigh lower economic growth. Overall, the medium-term impact on average food consumption is not projected to be particularly strong, but LDCs appear to be more at risk and the impact will be even larger for the poorest segments of the population.

Figure 1.34. First years' evolution of nominal prices for selected commodities

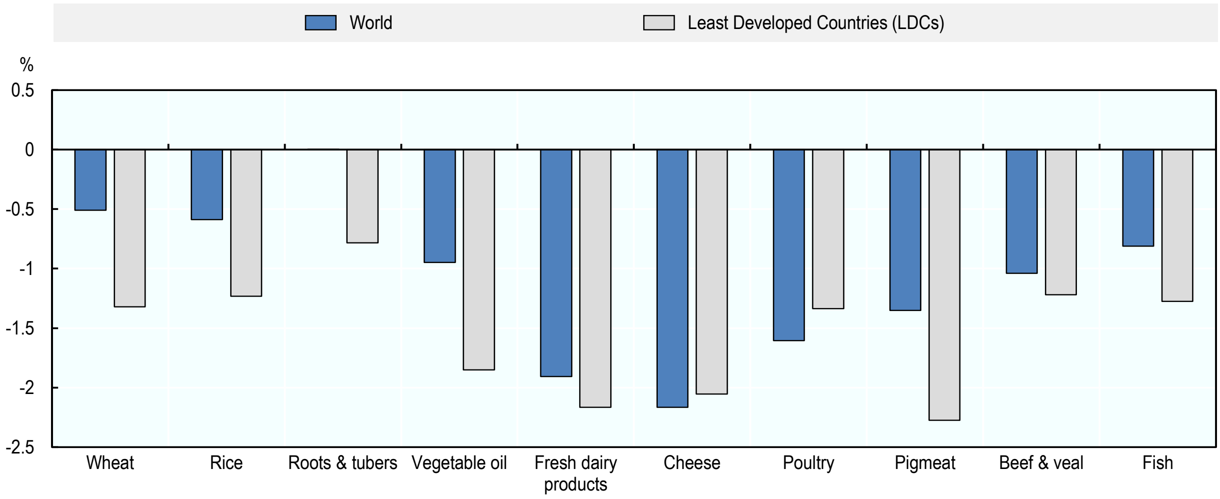


Note: Expected evolution of nominal prices under the baseline scenario of the *Outlook* (solid line) and under the COVID-scenario (dashed line) in relation to the stochastic outcomes shown in the grey (macro and yields) and blue (macro) 90% confidence intervals.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink https://doi.org/10.1787/888934141646

This initial COVID-19 scenario provides some preliminary insights into the short-term impacts of the current pandemic on agricultural markets and, in particular, on agricultural prices and food demand. However, the economic, social and political fallout of the pandemic is evolving in extremely complex patterns. Additional aspects would need to be assessed in order to provide a more complete picture of the effect of the pandemic. These include structural changes to food demand, policy measures affecting national and global food chains, and the depth and length of the macroeconomic shock and the recovery path. Another limitation of this scenario analysis is the absence of feedback loops, including those on other sectors of the economy, on households and government (e.g. lower commodity prices could reduce income, lower prices reduce investment, new policy measures could affect outcome).

Figure 1.35. Food consumption in 2020/21 (COVID-19 scenario vs. baseline)



OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.
StatLink https://doi.org/10.1787/888934141665

Other uncertainties to the projections

Demand

On the demand side, one main source of uncertainty relates to the likely evolution of consumer preferences. Overall, consumers' purchasing decisions are increasingly driven by factors beyond prices and taste, such as health and environmental concerns. One key expression of this trend is the surge in vegetarian, vegan or "flexitarian" lifestyles in high-income countries, and in particular among the young. Currently, vegetarians, vegans and related categories are estimated to account for less than 10% of the global population, but if adopted by an increasing share of the population, these diets could affect global markets, in particular for meat and dairy products, by fostering a shift away from animal proteins towards plant (or insect) proteins. Overall, these trends tend to be relatively slow moving and are hard to assess. Any alternative assumption about the evolution of consumer preferences than the one made in this *Outlook*, such as wider spread of vegetarians, vegan or "flexitarian" lifestyles, would alter the medium term projection trend. Food health scares, by contrast, have the potential of reducing consumer demand in the short run, sometimes with lasting consequences. These are not considered in the *Outlook* but would lead to fluctuations around the food consumption projections.

Moreover, growing consumers' expectations for sustainable farming practices along with environmental, ethical and animal welfare concerns could influence the level but also the composition of feed demand over the coming decades. This could stimulate demand for locally produced and/or feed that is not genetically modified, including pulses and other legumes, and reduce demand for soybean, especially in the high-income countries of Europe.

The *Outlook* holds policies fixed in the medium term and makes assumptions about their future effectiveness, which also constitutes a source of uncertainty. For instance, policy measures introduced to reduce overall calorie consumption or to foster a shift towards healthier diets (e.g. sugar tax, labelling schemes, product reformulation) could affect both the overall demand for food as well as the relative demand for different food products in ways that are unforeseen today. Similarly, policies that aim to encourage consumers to adopt more sustainable/lower emissions diets (e.g. consumer taxes on emission intensive products) or to reduce food waste, could also affect consumption patterns.

The assessment of the effectiveness of biofuel polices also remains uncertain. In January 2020, for example, the Indonesian government introduced the B30 programme nationwide to reduce its dependence on imported fossil fuels. The *Outlook* assumes that Indonesia will successfully implement the programme and that the biodiesel blending rate will remain at around 30% over the projection period. However, reaching the intended target will largely depend on the government support policy for biodiesel producers, which relies on the relationship between domestic and international palm oil prices. Higher production costs driven by higher palm oil prices and engine durability could jeopardise these targets. The evolution of biofuel markets is also heavily dependent on the evolution of crude oil prices. Current low international oil prices – a result of weak global demand resulting mainly from the COVID-19 pandemic – are reducing demand for crops for biofuels. An economic recession due to COVID-19 could further decrease global transportation fuels and biofuel demand.

Supply

The production of agricultural commodities is uniquely vulnerable to natural conditions, including weather and different plant and animal diseases. The African Swine Fever (ASF) outbreak is one example. In August 2018, China reported its first case. The disease subsequently spread to other countries in East Asia (e.g. Viet Nam), and has re-emerged in Europe. In 2019, pork production in China and Viet Nam – the two largest pork producers in the world – declined by 21% and 17%, respectively. Measures put in place to contain the outbreak (e.g. subsidies for culling herd) are expected to continue to depress global pork production in the next three years. Starting from 2021, however, the *Outlook* assumes that global pigmeat production will increase again and reach pre-ASF production levels by 2025. However, as the success of these policies is uncertain, the medium term impact of the epidemic may be more severe than currently anticipated. Moreover, the drop in pork production in Asia also creates uncertainty around projections for import demand of different meats and for global demand for animal feed.

One major pest outbreak affecting crops is desert locust swarms that consume crops, pasture, forage and any other green vegetation. According to the FAO, a swarm of one square kilometre can eat in one day the same amount of food as 35 000 people. In February 2020, eight East African countries suffered the worst locust outbreak in decades, with tens of thousands of hectares of croplands and pasture being damaged in Ethiopia, Kenya and Somalia. Moreover, heavy rains in late March established favourable breeding conditions that will allow for a second, and potentially larger, wave of desert locus infestation in the Horn of Africa, but also in eastern Yemen and southern Iran. In May, the eggs will hatch into hopper bands that will form new swarms in late June and July, coinciding with the start of the harvest and posing an unprecedented threat to food security and farmers' livelihoods in the region (FAO, 2020[25]). Moreover, lockdown measures as a result of COVID-19 have slowed ground and aerial control operations to fight the infestation, as crossing borders has become difficult and pesticide deliveries are delayed (Okiror, 2020[26]).

Extreme climate events such as heat waves, droughts, and heavy rainfall have a strong impact on agricultural production, particularly on crop output. Supply and demand projections in the *Outlook* are based on the assumption that weather conditions continue to follow their established patterns throughout the projection period. However, climate change may slowly shift climatic conditions and increase the likelihood of adverse weather events in the coming decades. If no appropriate adaptation measures are implemented, this could negatively impact crop and animal yields in most regions, and give rise to more volatile food supplies and prices. Any alternative assumption about agro-climatic and weather conditions than the one made in the *Outlook* would alter the medium term projection trend.

Policies and regulations allowing the development and adoption of new technologies such as new plant breeding techniques or digital technologies, on the other hand, could result in higher productivity gains than the one projected by the *Outlook*. The projected trends in crop and animal productivity in the *Outlook* assume continued improvements to the genetic potential of crops and farm animals and ongoing innovations in the production technology, which in turn depend on continued public and private investment in research and development (R&D). Since the 2008-09 financial crisis, public R&D spending has fallen in high-income countries although it has been growing in a number of emerging economies, including India and China. Moreover, global private-sector R&D investments have been growing faster than public R&D spending in recent years. These trends support the assumptions of continuing productivity growth in this Outlook, but any alternative scenario with respect to the assumed rate of progress would alter the projections of yield and production growth.

Over the coming decade, agricultural production will also be shaped by a wide range of policy measures that aim to reorient, adjust or restrict production practices. These measures pursue various objectives, such as limiting contributions to or adapting to climate change, ensuring animal welfare and human health, increasing domestic self-sufficiency or meeting export targets. While the *Outlook* has incorporated expectations on the impact of all known measures, their actual outcomes are uncertain, and policy change could intervene before the end of the projection period.

International trade

The nature and volume of international trade flows in agricultural and fish products are influenced by bilateral trade relations and a variety of regional trade arrangements. The ongoing trade tension between the United States and China continues to create uncertainty around the projections in the *Outlook*. Since April 2018, China has been imposing retaliatory tariffs of 25% or more on nearly all US agricultural commodities, leading to a fall in US agricultural exports to China from USD 19 billion in 2017 to USD 9 billion in 2018, and exports have remained depressed in 2019 (Congressional Research Service, 2019[27]). On 15 January 2020, however, the United States and China signed the Phase One Agreement, which includes commitments by China to increase purchases of US agricultural commodities. In particular, it targets increasing China's agricultural imports from the United-States by USD 12.5 billion in 2020 and by USD 19.5 billion in 2021, compared to 2017 values (Lighthizer and Mnuchin, 2020[28]). However, the agreement does not discuss tariff levels or specify an end date for the Chinese tariffs. The *Outlook* therefore assumes that tariffs between the United-States and China will remain at current levels over the projection period but that other measures, beyond tariffs, will be taken to enhance trade between the two countries. In particular, the *Outlook* assumes that China's tariff rate quotas (TRQs) for maize, rice and wheat will be filled at a higher rate after a short transition period. The implementation of the Phase One Deal, and any further negotiated resolution to this dispute, are likely to have a significant impact on world markets of agricultural commodities, redirecting agricultural trade flows and impacting global prices as well as the market share of other countries. This is particularly likely for soybean given the importance of China and the United States in the global soybean market.

On 1 February 2020, the United Kingdom officially left the European Union, a process commonly refer to as Brexit. During the preparation of the *Agricultural Outlook*, the European Union and the United Kingdom had just started negotiations to determine future trade rules (e.g. custom duties, standards, quotas) that will apply after the transition period.[3] Hence, the *Outlook* reports the United Kingdom separately from the rest of the European Union but assumes no disruption to trading relations. However, the impact of Brexit could be substantial, since the United Kingdom has a strong trading relationship with the European Union: in 2018, more than 70% of the country's agricultural imports came from the European Union and 62% of the country's agricultural exports went to the European Union. Overall, the United Kingdom is a net importer of agricultural products, and in 2018 it had an annual agri-food trade deficit of USD 27 billion with the rest of the European Union. While trade between EU Member States is tariff free, Brexit could result in higher trade barriers, which would affect agricultural prices and production in the United Kingdom and the European Union. Furthermore, the UK farming sector receives on average 60% of farm incomes from the EU Common Agricultural Policy (CAP) subsidies. Even though the UK government is committed to maintaining these subsidies in 2020, the proposed refocus of support could affect domestic production and prices. Brexit may have a global impact on markets for cheese, butter, pork and sheep meat, commodities for which the United Kingdom is a large net importer. For other markets, the main effect may be a reallocation of trade flows to other trade partners with less impact on overall numbers.

The African Continental Free Trade Agreement (AfCFTA) officially came into force in May 2019 and has already been ratified by 29 countries. The agreement will effectively consolidate 55 African countries into a single market, which will have a combined population of more than 1.3 billion people and a combined GDP of USD 2.26 trillion. By July 2020, when trade under the agreement is scheduled to commence, 90% of the products traded within the region will be duty free, while duties for an additional 7% of products will be phased out over the next decade. The elimination of tariffs on agricultural commodities offers significant opportunities for an expansion in intra-Africa trade and improvements in market efficiency. However, non-tariffs barriers to trade, including the poor quality of transport infrastructure, may challenge the implementation of this free trade area and limit market integration. Africa's logistics challenges also include long and bureaucratic customs procedures, corruption at borders, and security issues that can further hamper the transportations of goods between countries (Berahab and Dadush, 2018[29]).

On 28 June 2019, the European Union and Mercosur states (i.e. Argentina, Brazil Paraguay and Uruguay) announced the conclusion of the negotiations of the EU-Mercosur trade agreement although a full implementation of the agreement may take up to three years. The European Union has already signed a wide range of agreements governing its trade relations with most of the sub-regional groups and individual countries of the Americas but the EU-Mercosur agreement has the potential to become the European Union's most important trade agreement, several times larger than the one between the European Union and Canada (CETA). Market access for agricultural goods will be liberalized significantly. Mercosur duties will be gradually eliminated over the next ten years on 93% of tariff lines, with a longer liberalization of up to 15 years for some sensitive products. In parallel, the European Union will liberalise 82% of its agricultural imports. Tariff-rate quotas (TRQs) will be applied for some EU sensitive products such as beef, poultry, pigmeat, sugar, ethanol, rice, honey and sweetcorn. Further reciprocal TRQs will be opened by both sides and cover imports of cheese, milk powders and infant formula. Mercosur countries stand to benefit from lower EU tariffs and hence higher exports of meat products, fruit, orange juice, sugar and ethanol. The European Union, in turn, could benefit from higher exports of dairy products, pigmeat, wine and spirits. By contrast, some sensitive EU products such as beef, rice, poultry and sugar might see greater competition from Mercosur suppliers and increased downward pressure on prices. France, Ireland and Belgium are likely to be the most exposed to higher competition, notably in the beef market.

Box 1.4. Macroeconomic and policy assumptions

The main assumptions underlying the baseline projection

This *Outlook* presents a scenario that is considered plausible given the assumptions made on the macro-economic, policy and demographic environment. These assumptions underpin the projections for the evolution of demand and supply for agricultural and fish products. The main assumptions are highlighted in this box while detailed data are available in the Statistical Annex.

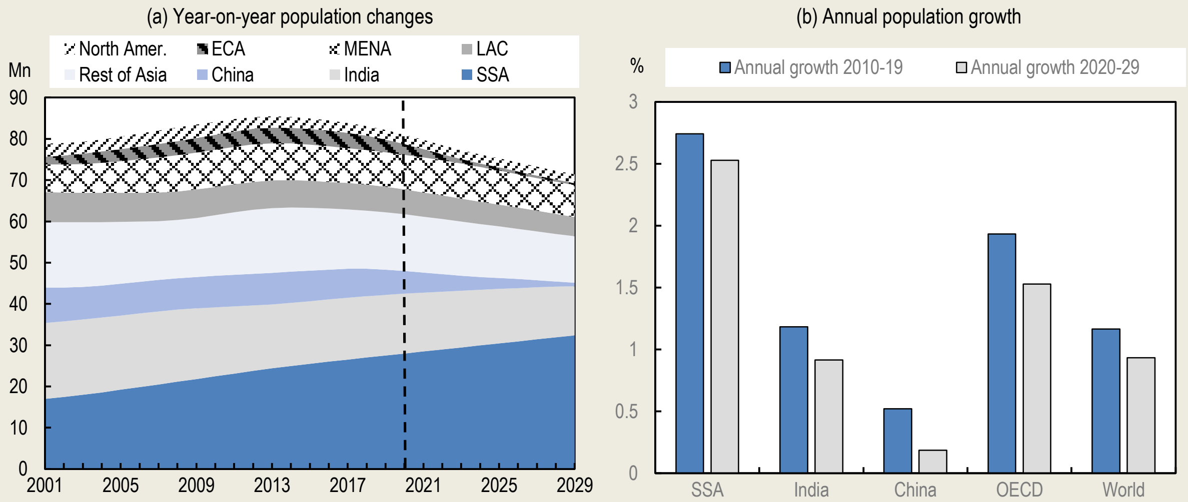
Population growth

The *Outlook* uses the UN Medium Variant set of estimates from the 2019 Revision of the United Nations Population Prospects database.

Over the projection period, world population will grow from an average of 7.6 billion people in 2017-19 to 8.4 billion people in 2029. This corresponds to an annual growth rate of 0.9%, a slowdown compared to the 1.2% p.a. growth rate experienced over the last decade. Population growth is concentrated in developing regions, particularly Sub-Saharan Africa, which is expected to have the fastest growth rate at

2.5% p.a., and India, where the population will grow by 0.9% p.a. With an additional 147 million people by 2029, India is expected to overtake China as the most populous country.

Figure 1.36. World population growth



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; ECA is Europe and Central Asia; MENA is Middle East and North Africa; Rest of Asia is Asia Pacific excluding China and India.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database).
StatLink https://doi.org/10.1787/888934141684

Per capita income growth

Estimates of per capita income growth are taken from the *OECD Economic Outlook* No. 106 (November 2019) and the *IMF World Economic Outlook* (October 2019). They are expressed in purchasing-power parity terms, in constant 2011 US dollars.

One of the main determinants of food demand is household disposable income, which is approximated in this *Outlook* using growth in per capita GDP. As showed in the World Bank's Poverty and Shared Prosperity 2018 report, however, the impact of economic growth, including on average food consumption, can be unevenly spread. In particular, in several Sub-Saharan African countries the incomes of the poorest 40% of the population have lagged average income growth. For this reason, demand projections in Sub-Saharan Africa in this *Outlook* can deviate from what might be expected based on average growth.

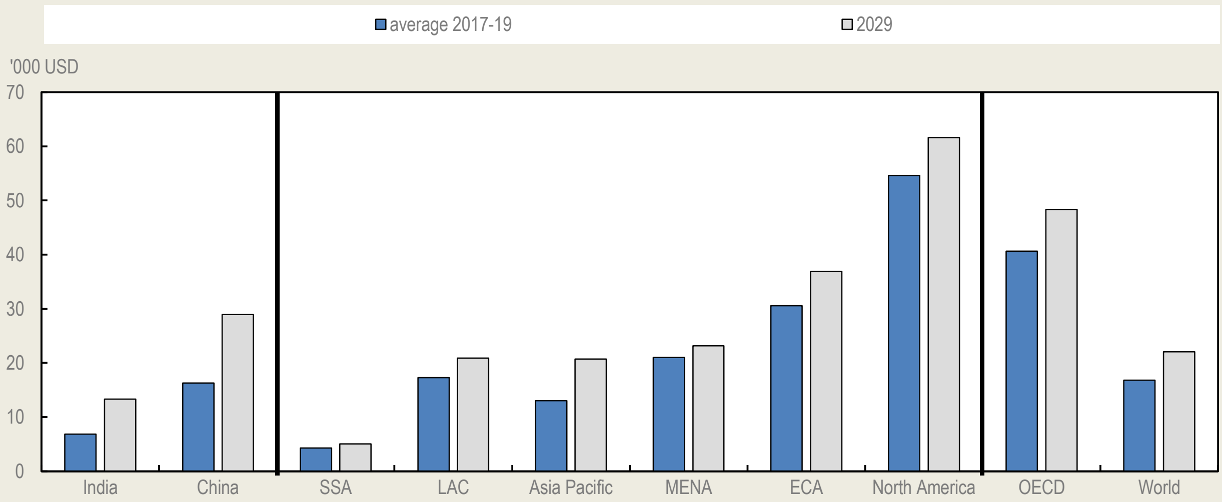
Over the projection period, global income per capita is expected to grow by 2.8% p.a. in real terms. In India, strong economic growth (6.3% p.a.) is expected to almost double per capita incomes over the projection period. Economic growth in China is expected to slow down over the coming decade, although per capita incomes will still grow by 78% (or 5.3% p.a.) over the next ten years. Other developing countries in Asia are projected to continue experiencing robust growth over the medium term. The growth of per capita incomes in Viet Nam, Indonesia, and the Philippines is projected to be in the 4-6% p.a. range, while in Thailand and Malaysia it is projected to be around 3.6% p.a.

Per capita income in least developed countries in Asia is expected to grow at an average of 5.8% over the next ten years, the second highest growth rate after India. In Pakistan, growth will be slightly slower at 3.2% p.a. Similarly, per capita income in countries in Central Asia is anticipated to grow at about 4.6% p.a. on average. In Sub-Saharan Africa, per capita incomes are projected to grow by 17.5% over the projection period, mainly due to high economic growth expected in Ethiopia at 6.6% p.a. In the Latin America and Caribbean region, per capita income growth varies considerably by country. While incomes in Brazil and

Mexico will grow relatively slowly in the next decade (i.e. below 2% p.a.), countries such as Peru and Paraguay will see per capita incomes grow by 2.8% p.a., and Colombia by 3.1% p.a. In the Middle East and North Africa, overall growth is negatively affected by the projected decline in per capita incomes in Syria and Libya over the next ten years. Egypt will experience the fastest growth in per capita incomes in the region, at 4.4% p.a.

In OECD countries, per capita income is projected to grow at around 1.7% p.a. over the coming decade. Higher growth is expected for Turkey and Korea at 2.9% p.a., while per capita incomes are expected to grow the slowest in Canada at 0.9% p.a.

Figure 1.37. Per capita income



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; ECA is Europe and Central Asia; MENA is Middle East and North Africa. The graph shows per capita GDP in purchasing-power parity (PPP) terms (constant 2011 US dollars).
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database).

StatLink https://doi.org/ 10.1787/888934141703

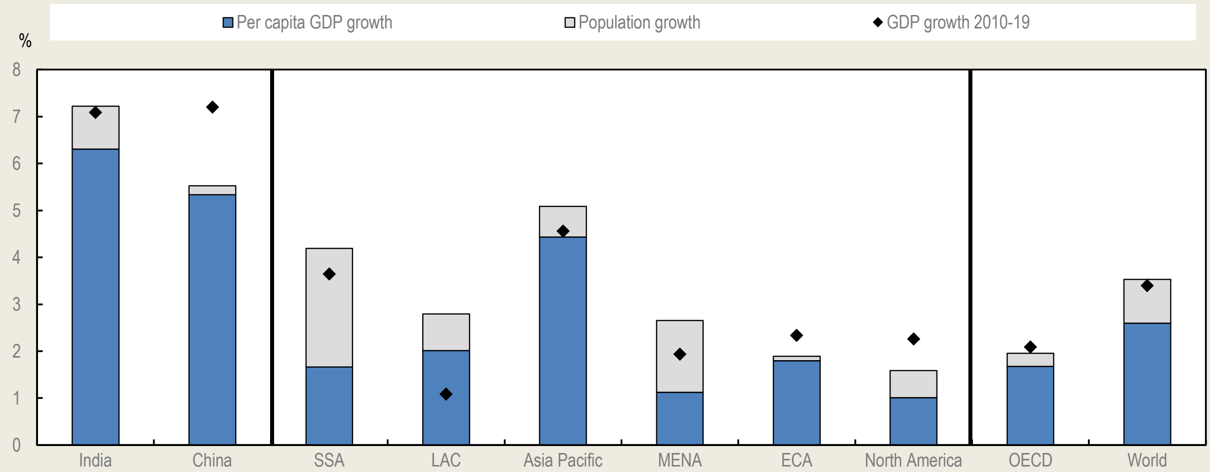
Global growth

GDP growth assumptions are based on the *OECD Economic Outlook* No. 106 (November 2019) and on the *IMF World Economic Outlook* (October 2019).

The global economy will grow at an average rate of 3.4% over the next ten years. Figure 1.38 shows growth rates of GDP for key regions, including those of the regional briefings of this year's *Outlook,* and for selected countries. Globally, the highest growth will be recorded in India, at 7.4% p.a. In Latin America, the fastest GDP growth will be seen in Paraguay at 4.0% p.a. Among South East Asia countries, Viet Nam and the Philippines will experience the highest growth at 6.5% p.a. In Sub-Saharan Africa, Ethiopia will dominate at 6.6% growth p.a. In the Middle East and North Africa, the strongest growth is expected in Egypt at 6% p.a., followed by Yemen, Morocco and Tunisia at around 4.2-4.9% p.a., while other countries of the region will experience more modest growth at around 2-3% p.a.

Figure 1.38 also decomposes the GDP growth assumptions into per capita GDP growth and population growth. Globally, economic growth will be mainly driven by per capita income growth; this is especially the case in OECD countries, in Europe and Central Asia and in China. By contrast, high population growth in Sub-Saharan Africa means that the relatively high rate of economic growth in the region (4.5% p.a.) corresponds to only a modest growth in per capita incomes (at around 1.7% p.a.).

Figure 1.38. Annual GDP growth rates 2020-2029



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; ECA is Europe and Central Asia; MENA is Middle East and North Africa.
Source: OECD/FAO (2020), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database).

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Exchange rates and inflation

Exchange rate assumptions are based on the *OECD Economic Outlook* No. 106 (November 2019) and on the *IMF World Economic Outlook* (October 2019). Real exchange rates for the period 2020-29 are assumed to be broadly stable, so that nominal exchange rates relative to the US dollar are mostly driven by differences in inflation compared to the United States. Some currencies are expected to appreciate in real terms compared to the US dollar; this is the case in particular for Argentina, but also to a lesser extent for Turkey, Japan, Mexico, New Zealand, Russian Federation, Paraguay and Uruguay. By contrast, a real depreciation is expected for Norway, Australia, Korea, the European Union, Brazil and China. In non-OECD countries, the highest real depreciation is expected in Ethiopia, Ukraine and South Africa.

Inflation projections are based on the private consumption expenditure (PCE) deflator from the *OECD Economic Outlook* No. 106 (November 2019) and on the *IMF World Economic Outlook* (October 2019). In the United States, an inflation rate of 2% p.a. is expected over the next ten years, and in the Euro zone the inflation rate is expected to be 1.7% p.a. over the same period. In other OECD countries, inflation rate is expected to average 3% p.a. Among the main emerging economies, consumer price inflation is projected to remain stable in China at around 3% p.a., and to decrease in Brazil to 3.5% p.a., compared to 6.8% p.a. in the previous decade. Similarly, consumer price inflation in India should decrease from an annual growth rate of 5.9% to 4% p.a. over the next ten years. Argentina's inflation growth rate will remain very high but is expected to decrease annually compared to the last decade, from 28.1% p.a. to 18.8% p.a.

The Euro is expected to appreciate relative to the US dollar in nominal terms. The currencies of Japan, Canada, Korea, and New Zealand are also expected to appreciate nominally. In contrast, strong depreciations are projected for Argentina, Turkey and Nigeria and to a lesser extent for Ethiopia, Egypt, South Africa, Brazil, India, and the Russian Federation.

Input costs

The projections in the *Outlook* are based on assumptions about agricultural production costs, which include costs of seed, energy, fertilisers, and various tradable and non-tradable inputs. The projections are guided by the evolution of a composite cost index based on these input costs and constructed using historical cost shares for each country and commodity (held constant for the duration of the outlook period). Energy costs are represented by the international crude oil price expressed in domestic currency. The evolution of costs of tradable inputs such as machinery and chemicals is approximated by the development of the real exchange rate, while the evolution of costs of non-tradable inputs (mainly labour costs) are approximated by the evolution of the GDP deflator. The evolution of seed and fertiliser prices is approximated in an iterative way, as these input costs depend in part on crop prices and, in the case of fertiliser, on crude oil prices.

Historical data for world oil prices for 2018 are based on Brent crude oil prices obtained from the short-term update of the *OECD Economic Outlook* N°106 (November 2019). For 2019, the annual average monthly spot price in 2019 was used, while the estimate for 2020 is based on the average of daily spot prices in December 2019. For the remainder of the projection period, oil prices are assumed to remain flat in real terms, which implies an increase in nominal terms from USD 65/barrel at the end of 2019 to USD 78/barrel in 2029.

Policy considerations

Policies play an important role in agricultural, biofuel and fisheries markets, with policy reforms often changing the structure of markets. This *Outlook* assumes that policies currently in effect will remain as they are throughout the projection period.

The United Kingdom officially left the European Union on 1 February 2020. The United Kingdom is reported separately from the rest on the European Union in this report; however, the projections assume no disruption to trading relationships between the United Kingdom and the European Union.

The *Outlook* assumes that tariffs between the United States and China will remain at current levels but that other measures, beyond tariffs, will be taken to enhance trade between the two countries. In particular, the *Outlook* assumes that China's tariff rate quotas (TRQs) for maize, rice and wheat will be filled at a higher rate after a short transition period.

The African Continental Free Trade Agreement (AfCFTA) officially came into force in May 2019. The agreement will effectively consolidate 55 territories into a single market, which will have a combined population of more than 1.3 billion people and a combined GDP of USD 2.26 trillion. By July 2020, when trade under the agreement is scheduled to commence, 90% of products traded within the region will be duty free, while duties for an additional 7% of products will be phased out over the next decade.

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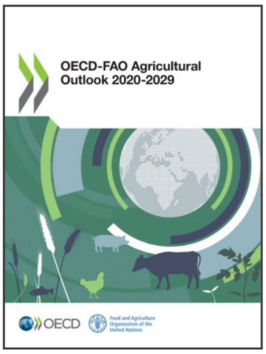
Notes

[1] Feed in Figure 1.5 is calculated as "maintenance ration", which is the amount of feed an animal needs to maintain its metabolism without gaining or losing weight, producing milk, or laying eggs. About 25% of the total feed energy is recovered as livestock products and counted as food. Similarly, biofuel shares reflect the energy in ethanol and biodiesel, while Dried Distillers Grain (DDG) is included in feed.

[2] Analysis of the current market situation and outlook for global production, consumption and trade of bananas and tropical fruits is presented in Chapter 11 on other products.

[3] The Withdrawal Agreement provides for a transition period from the 1 February 2020 until the 31 December 2020 during which the United Kingdom will maintain access to the internal market and the Customs Union. This transition period may be extended by one or two years. If negotiations are not concluded at the end of the transition period, it may end without agreement on future trade relations, and WTO rules would then apply.



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