Chapter 3. Cereals

This chapter describes the market situation and highlights the latest set of quantitative medium-term projections for world and national cereals markets for the ten-year period 2018-27. Global cereal production is projected to expand by 13% by 2027, accounted for in large part by higher yields. For maize and wheat, the Russian Federation is emerging as a major player on international markets, having surpassed the European Union in 2016 to become the top wheat exporter. For maize, market shares will increase for Brazil, Argentina and the Russian Federation while declining for the United States. Thailand, India, and Viet Nam are expected to remain the major suppliers on international rice markets, while Cambodia and Myanmar are projected to capture a greater share of the global export market. Over the projection period, prices are expected to increase slightly in nominal terms but decline modestly in real terms.

Market situation

Global supplies of major cereals have exceeded overall demand in recent years, leading to a significant build-up of inventories and much lower prices in international markets as compared to the previous decade. World production of cereals reached a new high in 2017, exceeding the previous peak in 2016. Maize output increased the most, reaching a record in 2017, driven largely by higher production in several major exporting countries. Wheat output was high but slightly below the record set in 2016, and other coarse grain output declined in 2017 due mainly to lower barley production in Australia and lower sorghum and barley production in the United States. Rice output overtook the previous year's record due to continued growth in Asia and a recovery in Latin American production. Given years in which growing cereals production has outpaced demand growth, leading to ample supplies and stocks, international nominal prices in the near term are expected to rise only moderately with support from stable demand and rising oilseed prices. However, in real terms prices will decline over the next ten years.

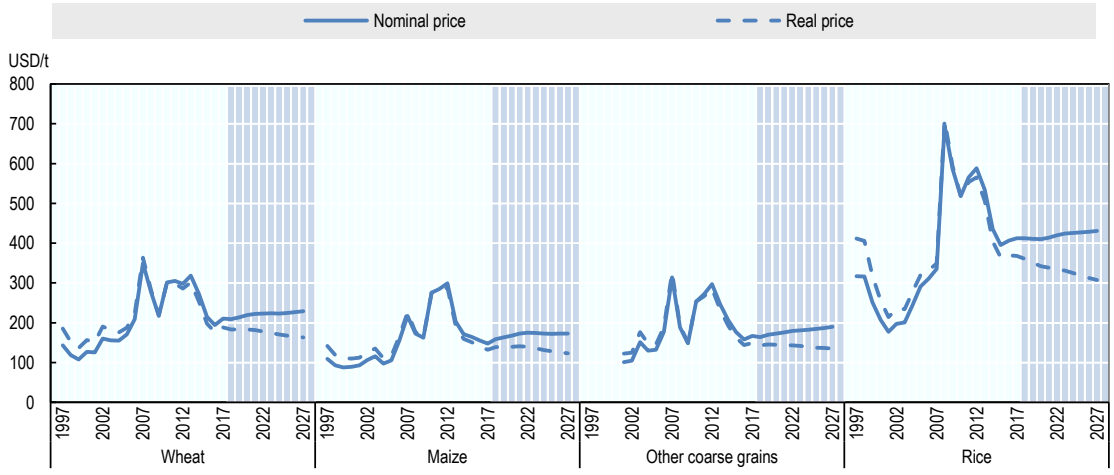
Projection highlights

Prices for cereals, except for maize, reversed the downward trend that started a few years earlier and climbed modestly in 2017. Maize prices, however, fell in 2017 pressured by high stocks. The low prices for all cereals registered during the base period (2015-2017) are likely to give way to higher prices in the near term supported by higher oilseed prices although the gain is expected to be limited because of continued large stocks and slower growth in food and feed demand compared to the previous decade. In the medium term, however, cereal prices are projected to increase in nominal terms, but to decline slightly in real terms.

Global cereal production is projected to expand by 13% between the base period and 2027, mainly owing to higher yields. Production of wheat is projected to increase from 750 Mt in the base period to 833 Mt in 2027, with most of the growth in India (20 Mt), followed by the European Union (12 Mt), the Russian Federation (10 Mt), Pakistan (6 Mt) and Turkey (5 Mt). Maize production is expected to rise by 161 Mt to 1.2 bln t, led by the People's Republic of China (hereafter "China") (31 Mt), Brazil (24 Mt) and the United States (22 Mt). Production of other coarse grains is projected to increase by 29 Mt to 327 Mt by 2027, with the largest increases in Ethiopia (5 Mt) and the European Union (4 Mt). Rice production is projected to increase by 64 Mt to 562 Mt, with 84% of this increase in Asian countries, led by India (20 Mt), Indonesia (8 Mt) Thailand (7 Mt) and Viet Nam (4 Mt). Producers in the Least Developed Countries (LDC) Asian region, which include Bangladesh, Myanmar and Cambodia, will increase rice production by 7 Mt by 2027.

Global cereal use is projected to increase by 14% between the base period and 2027, mainly owing to higher food and feed use in developing countries. Wheat consumption is expected to increase by 13% compared to the base period, and continues to be largely used for human consumption, with food use accounting for about two-thirds of total use throughout the projection period. The use of wheat for animal feed is projected to increase, mostly in China, the Russian Federation and the EU28, while use of wheat for biofuels is projected to account for only 2% of global use in 2027.

Figure 3.1. World cereal prices



Note: Wheat: US wheat No.2 Hard Red Winter (fob), maize: US GULF Maize, No.2 Yellow (fob), other coarse grains: barley (feed Rouen), rice: Thailand, 100% B, 2nd grade
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Maize consumption is expected to increase by 16% by 2027, with maize used for animal feed increasing its overall share of total use from 56% in the base period to 58% in 2027, largely due fast expanding livestock sectors in developing countries. Maize for human consumption will increase mainly in developing countries, especially those in Sub-Saharan Africa where populations are growing rapidly and white maize is an important staple for several countries. The use of other coarse grains is also set to grow, increasing 11% with higher feed demand (+17 Mt) followed by food demand (+15 Mt). The expansion of food use mainly comes from African countries, while China has the highest expansion for feed.

Direct human consumption remains the main end-use of rice, a major staple food in parts of Asia, West Africa, Latin America and the Caribbean. Total rice consumption is projected to rise by 13% by 2027. Asian countries account for over 70% of the projected increase in global consumption, largely due to population growth rather than per capita gains. African countries account for 23% of the increase, with income growth and urbanization driving demand.

World trade of cereals is projected to reach 459 Mt by 2027, up 55 Mt from the base period. The share of global wheat production that is traded is expected to reach 24% by 2027, compared with 13% for maize and 15% for other coarse grains. For maize and wheat, the Russian Federation has started to play a major role on international markets over the past few years. It was the fifth largest exporter of wheat on average over the past decade, surpassed the European Union in 2016 to become the top exporter, and is expected to account for 20% of global exports in 2027. For maize, market shares will increase for Brazil, Argentina, Ukraine, and the Russian Federation while declining for the United States. Developed countries are expected to continue to be the main exporters of coarse grains, while rice is mostly traded among developing countries. The global suppliers on international rice markets are expected to remain the same, principally

Thailand, India and Viet Nam, while Cambodia and Myanmar are projected to expand exports over the next decade and capture a greater share of the global export market.

Compared to the previous decade, the anticipated lower absolute cereal prices through the projection period will impact producers' planting decisions and hence supply responses. Prices relative to other crops, such as oilseeds, are also an important factor, and although higher oilseed prices will support cereal prices, the continued lower cereal prices relative to these crops might lead to stronger reallocation towards non-cereals. On the demand side, developments in the fastest growing economies will have profound implications for trade. Changes in China's demand as well as its overall level of domestic supplies and associated changes in stocks are among the main uncertainties during the projection period.

Prices

The world wheat price, as measured by the benchmark US wheat No. 2 Hard Red Winter (fob), is expected to increase to USD 211/t in the 2017 marketing year, reversing the downward trend that started in 2014. With low but increasing oil prices, average harvest expectations and moderate growth in exports and food use, wheat prices are projected to increase to USD 229/t by 2027. In real terms, however, prices are expected to decline over the ten-year period.

The world maize price, as measured by the benchmark US maize No. 2 Yellow (fob), is projected to average USD 148/t in the 2017 marketing year, continuing the downward trend that started in 2013. Despite sustained high stock levels, the strength of global feed grain demand and oilseed prices will support higher maize prices and moderate growth until 2027. While nominal prices are expected to reach USD 173/t by 2027, prices in real terms will stabilise over the next few years before declining in 2022 and over the rest of the projection period.

The world price for rice (milled, 100% B, fob Bangkok) increased to USD 412/t in the 2017 marketing year, the highest level since 2014. With large global supplies, the rice price is projected to remain flat in the short term, but then recover to reach USD 431/t by 2027 with growing demand from countries in Asia, Africa and the Middle East. Despite this projected increase, prices in real terms are expected to modestly decline over the ten-year horizon.

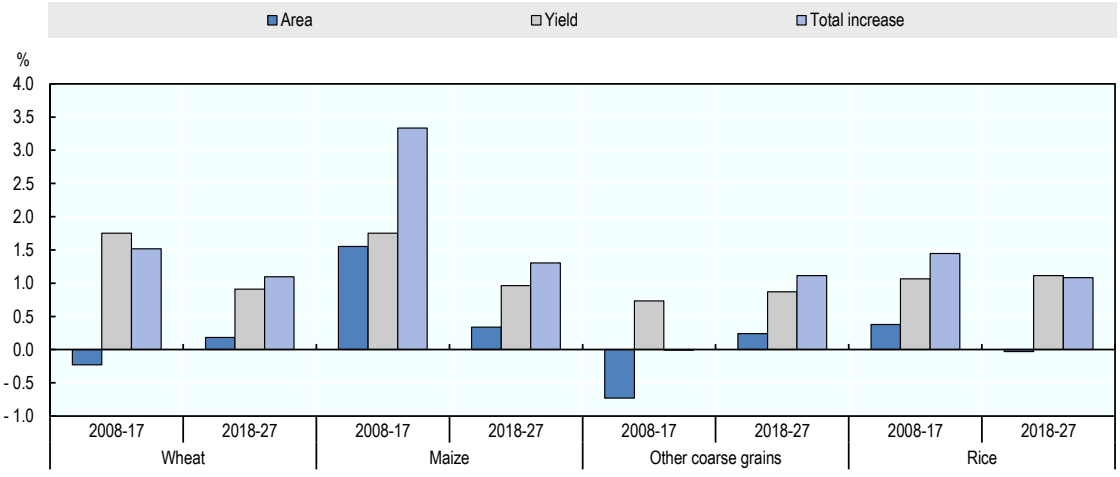
The world market price for other coarse grains, as measured by the price for feed barley (fob. Rouen), is expected to increase to USD 167/t in the 2017 marketing year, reversing a downward trend that started in 2013. By 2027, the world market price for other coarse grains is set to increase to USD 189/t, sustained by growing import demand from China and Saudi Arabia. In real terms, prices are expected to decline slightly by 2027.

Production

Global area harvested to cereals is expected to grow by 17.6 Mha between the base period (2015-17) and 2027, implying weaker growth than the increase in overall harvested crop land. Harvested area in developed countries is expected to slightly decline (-0.4 Mha) as increased wheat area harvested is offset by lower maize and other coarse grain area. Conversely, area harvested in developing countries is projected to expand 18 Mha. Slow global area expansion is largely due to low cereal prices relative to other crops and higher yields that support the growth in production and demand. Area growth is also limited by

more restrictive land availability compared to the previous decade due to constraints on converting forest or pasture into arable land and ongoing urbanisation. Global wheat and maize areas are projected to increase by 1.4% and 3.2%, while other coarse grains are expected to increase by 2.4% by 2027. Rice area will remain stable mainly due to lower area in China being offset by area growth in other parts of Asia. Although the overall area to cereals will grow, the growth in yields is expect to contribute more to higher production (Figure 3.2), especially in developing countries with improving technology and cultivation practices. Global yields for wheat, maize and rice are projected to increase 9%, 10%, and 12%, respectively, between the base period and 2027.

Figure 3.2. Global growth rates of harvested areas and yields for cereals



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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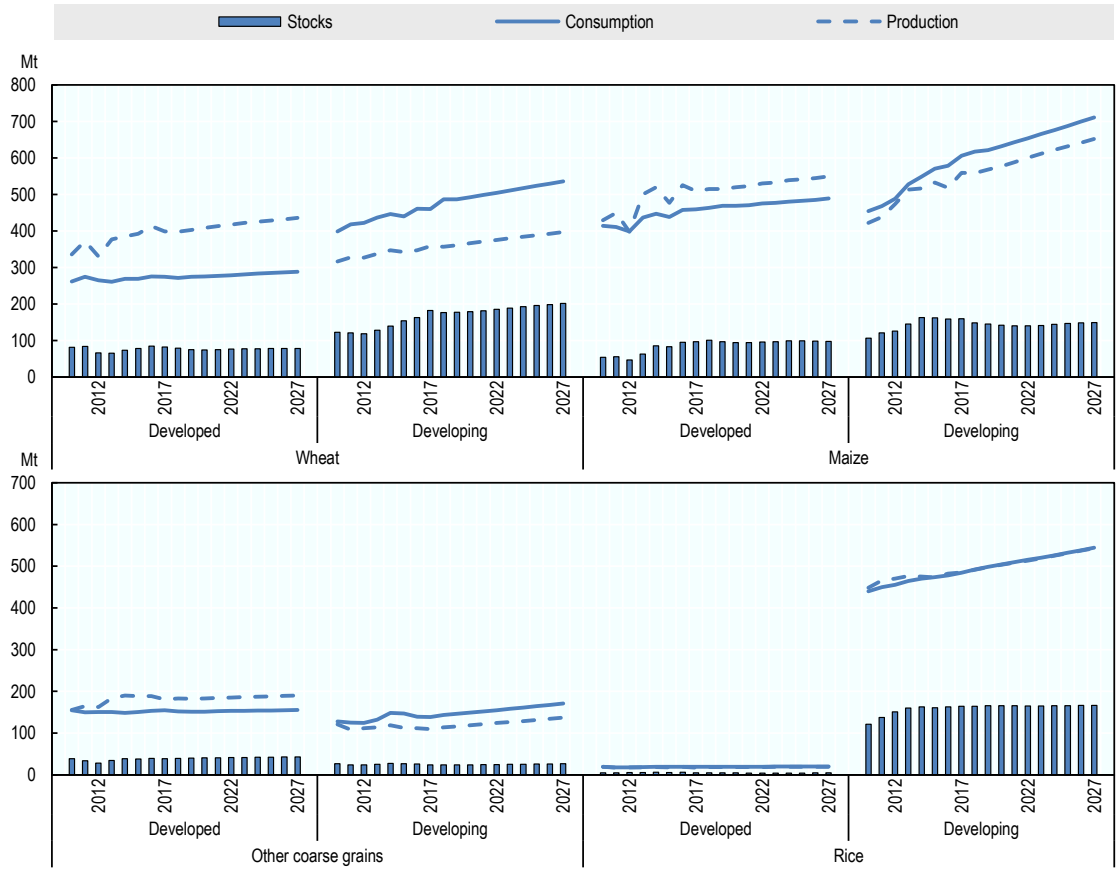
Global wheat production is expected to increase by 82 Mt to 833 Mt by 2027, a more moderate pace compared to the last decade. While developed countries are set to increase production by 34 Mt by 2027, developing countries are expected to add 48 Mt to global output thus increasing their share of global production (Figure 3.3). India, the world's third largest wheat producer, is expected to provide the largest share of additional wheat supply, increasing wheat production by 20 Mt by 2027, driven largely by area expansion and the response to national policies to enhance self-sufficiency in wheat. Following India, there will be significant production increases for the European Union (12 Mt), the Russian Federation (10 Mt), Pakistan (6 Mt), Turkey (5 Mt). Ukraine (4 Mt), China (4 Mt) and Argentina (3 Mt). In Argentina, wheat area harvested over the next ten years will average over 1 Mha more compared to the previous decade due to national export policies favouring wheat production.

In some developing countries, notably India and Pakistan, wheat production growth will be driven by area gains in. In other developing countries, like Egypt and Ukraine, yields will be the main driver to production growth due to increased access to higher yielding and drought tolerant varieties, and increased investment in new technologies. While good post-harvest practices are common in developed countries, assumed improvements in post-harvest practices in developing countries will likely improve wheat quality and may

play a larger role in determining the prices farmers receive. This is particularly important for China as the government moves away from fixed prices.

Figure 3.3. Supply, demand and stocks of cereals in developed and developing countries



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Global maize production is expected to grow by 161 Mt to 1.2 bln t over the next decade, with the largest increases in China (31 Mt), followed by Brazil (24 Mt), the United States (22 Mt), the European Union (11 Mt) and Argentina (10 Mt). Increased production in Brazil will be largely driven by higher second-crop maize following soybeans. Production growth in the United States is expected to slow to less than 1% p.a. over the next ten years, compared to 2.4% p.a. the decade before, due to slower growth in domestic demand, particularly for ethanol, and increased export competition. Slow production growth in the United States will be supported by higher yields as planted area is expected to decline with pressure from higher soybean area and slightly higher wheat area. Production in Argentina will increase motivated by the removal of export taxes in 2016.

With feed demand driving maize production, the bulk of the increase is expected to with come from yellow maize, with the exception of Sub-Saharan Africa where the total maize output is projected to increase by 24 Mt, of which white maize – a major staple crop in

the region – accounts for the largest share. While increases in maize production are expected to stem primarily from yield improvements, area expansion will be an important driver of white maize production in Sub-Saharan African countries, despite projected area contractions in South Africa in favour of yellow maize and soybeans. White maize yields in most of Sub-Saharan Africa are projected to rise by more than 1% p.a. Output is also expected to increase by about 3 Mt in the Russian Federation, as a result of efforts to maintain domestic feed as the main source for their growing meat and dairy industries.

Although China will contribute the most to increases in global maize output, production in China is projected to grow much slower (1.3% p.a.) than over the previous decade (3.7% p.a.), as a consequence of China's policy change in 2016 under which price supports were reduced with a view to ending stock piling and replace with market-oriented purchasing combined with direct subsidies for farmers. Despite lower farmer support, area will slightly increase (0.3% p.a.) as feed demand strengthens at 1.9% p.a. over the next ten years, incentivising farmers to keep area in maize production. As a result, consumption growth will outpace production growth as the feed sector strengthens leading to the release of accumulated stocks over the projection period. China's stocks are expected to decline from near 100 Mt in the base period to 71 Mt by 2027. Since China held about 70% of global stocks during 2015-2017, as production slows and China's maize stocks are released, the global stocks-to-use ratio will decline from 24% in the base period to 21% in 2027 (Figure 3.5)

Global production of other coarse grains, such as sorghum and barley, is projected to reach 327 Mt by 2027, up 29 Mt from the base period. Developing countries will contribute the most, increasing their share of global output from 37% to 42% in 2027. Several countries in Africa, with fast-growing populations and strengthening feed sectors, rely on other coarse grains, such as millet for food and feed uses. Nearly half of the global production increase of other coarse grains is expected to happen in these countries. Ethiopia will contribute the most, adding 5 Mt to reach 18 Mt by 2027. Unlike developing countries, output in most developed countries will stagnate due to slower growth in feed demand. For instance, production in the United States will increase slightly but not reach the production level of 2016. On the other hand, production in the European Union will reverse the downward trend that started in 2014, and production will grow 4 Mt over the projection period to reach 97 Mt by 2027. Latin America and the Caribbean will contribute a fifth to the increase in production, with higher production mainly in Argentina and Mexico (+3 Mt each).

Global rice production is expected to grow by 64 Mt to reach 562 Mt in 2027. While production in developed countries is projected to increase marginally, from 18 Mt in the base period to 19 Mt in 2027, production in developing countries is expected to be relatively robust, increasing by 62 Mt to 543 Mt in 2027. Asia contributes the majority of the additional global production, accounting for 54 Mt of the increase during the outlook period. The highest growth is expected in the world's second largest rice producer India (+20 Mt), followed by Indonesia (+8 Mt), Thailand (+7 Mt), LDC Asian region (+7 Mt) and Viet Nam (+4 Mt). India will remain a major producer of indica rice, but also of aromatic varieties. Viet Nam is expected to increase production mainly through yield improvement, while harvested area is expected to decline, assuming government efforts promoting a shift towards alternative crops continue and are effective. China, the world's largest rice producer, is expected to increase production by 2 Mt by 2027, implying a slower pace than during the last ten years. Area planted to rice in China is expected to decline despite government policies to maintain production through its minimum purchase price. Production in developed markets, like Korea, Japan and the European

Union, is expected to stagnate or fall slightly below the base period's production level. Production in the United States and Australia will expand at about 1% and 3% p.a. respectively, but not exceed peaks in 2010 for the United States and 2001 for Australia.

Consumption

Global consumption of cereals is projected to increase from 2.6 bln t in the base period to 2.9 bln t in 2027, driven mainly by higher feed use (+167 Mt) followed by food use (+151 Mt). Developing countries will account for 84% of the projected increase in overall consumption, but contrary to the global outlook, the absolute growth in food use (+148 Mt) for developing countries will exceed the growth in feed use (+132 Mt). Conversely, for developed countries, feed use (+36 Mt) will grow more than food use (+3 Mt).

Global feed consumption of cereals is expected to expand the most for maize (1.6% p.a.) and more modestly for wheat (1.5% p.a.) and other coarse grains (1.0% p.a.) during the next ten years (Figure 3.4). Food consumption per capita of cereals is expected to increase at a faster pace compared to the previous decade as higher per capita use of maize, rice and other coarse grains is only partly offset by slower growth for wheat.

Wheat consumption is expected to increase 13% by 2027. Four countries account for nearly half of this increase in consumption: China (+23 Mt), India (+12 Mt), Pakistan (+6 Mt) and Egypt (4 Mt). Global food use is projected to expand 51 Mt and remain stable at about two-thirds of total consumption, but growth will be slower compared to the prior decade as world population increases at a more moderate pace. Feed use is expected to grow more slowly, increasing by 27 Mt compared to the base period (Figure 3.4).

In developed countries, the increase in feed use of wheat is about five times the increase in food use; in developing countries, the increase in food use is over two times larger than the increase in feed use. Food use is expected to expand in Asia where there is increasing demand for non-staple food products, like pastries and noodles. These products call for higher quality and higher protein wheat, which is produced in the United States, Canada, Australia and to a lesser extent in the European Union and potentially the Russian Federation. Further, countries in the Middle East, like Egypt, Algeria and the Islamic Republic of Iran, will remain major consumers with high levels of per capita consumption. Global production of wheat-based ethanol is not expected to increase significantly, as biofuel policies in the European Union – the major user of wheat in ethanol processing – are assumed to no longer support growth of first generation biofuels.

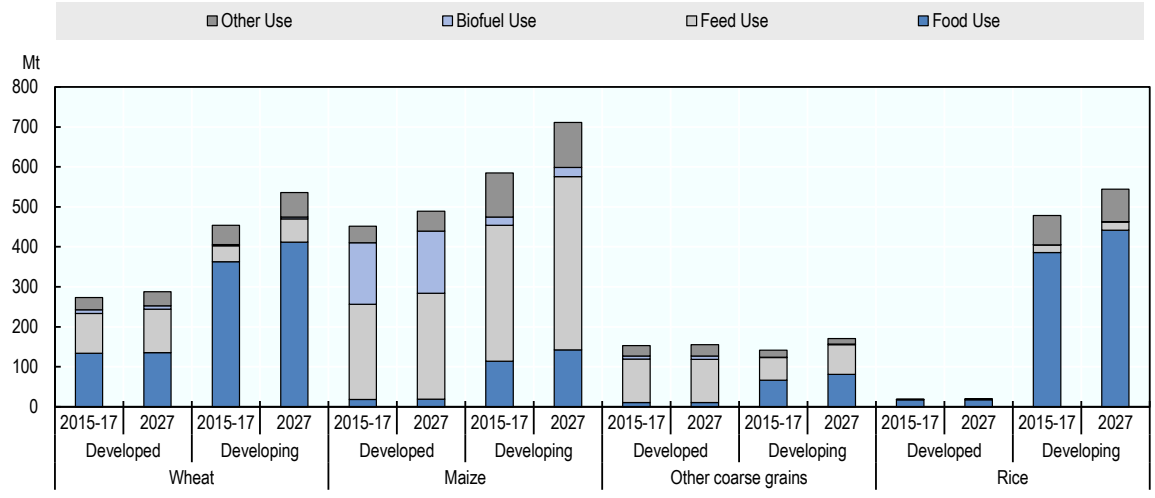
Global maize consumption is projected to increase by 1.3% p.a. over the projection period, a slower pace compared to 3.3% p.a. in the previous decade. This increase is principally driven by higher feed demand, which holds the largest share of total utilisation, rising from 56% in the base period to around 58% in 2027. Developing countries account for over three quarters of the increase in feed consumption due to fast expanding livestock and poultry sectors. Feed demand is expected to rise 120 Mt to 699 Mt, and major countries that account for the increase are China (+32 Mt), the United States (+20 Mt), Argentina (+5 Mt), Indonesia (+5 Mt) and Viet Nam (+5 Mt). Production in Viet Nam and Thailand, in particular, will grow due to fast-expanding poultry industries.

Food use of maize is expected to expand mostly in developing countries where there are growing populations and maize is becoming increasingly important in diets, especially white maize. Maize will remain an important staple for Sub-Saharan Africa, where consumption of white maize is expanding and where maize accounts for about a quarter of total caloric intake. Overall, African countries show the strongest growth in maize consumption for food among all developing countries at about 3% p.a.

Maize use for biofuel production more than doubled between 2007 and 2017. During the outlook period, however, growth is expected to be limited as the international ethanol market is restrained given current biofuel policies (Figure 3.4). Lower biofuel consumption is partly driven by a decline in gasoline use in the United States, but consumption could increase given uncertainty regarding the expansion of the maize-based ethanol industry in Brazil.

Rice is mostly utilized for direct human consumption and continues to be a major staple food in Asia, Africa, and Latin America and the Caribbean. World rice consumption is expected to increase by 1.1% p.a. over the next ten years, compared with 1.5% p.a. in the last decade. Asian countries account for more than 70% of the projected increase in global rice consumption. This growth is largely due to population increases rather than per capita gains, as per capita consumption is expected to remain flat or decrease in many countries in the region, with diversification of diets as income increases (Table 3.1). One exception is India where per capita consumption is below the regional average. Rice consumption will also increase in the Middle East and West Africa where rice is gaining importance as a major food staple and source of calories. Due to difference in per capita incomes, demand in the Middle East is driven by both the quality and price of rice, while price plays more of a role in West Africa. Worldwide, food per capita rice consumption is projected to maintain a similar level to the base period at around 55 kg per year.

Figure 3.4. Cereal use in developed and developing countries



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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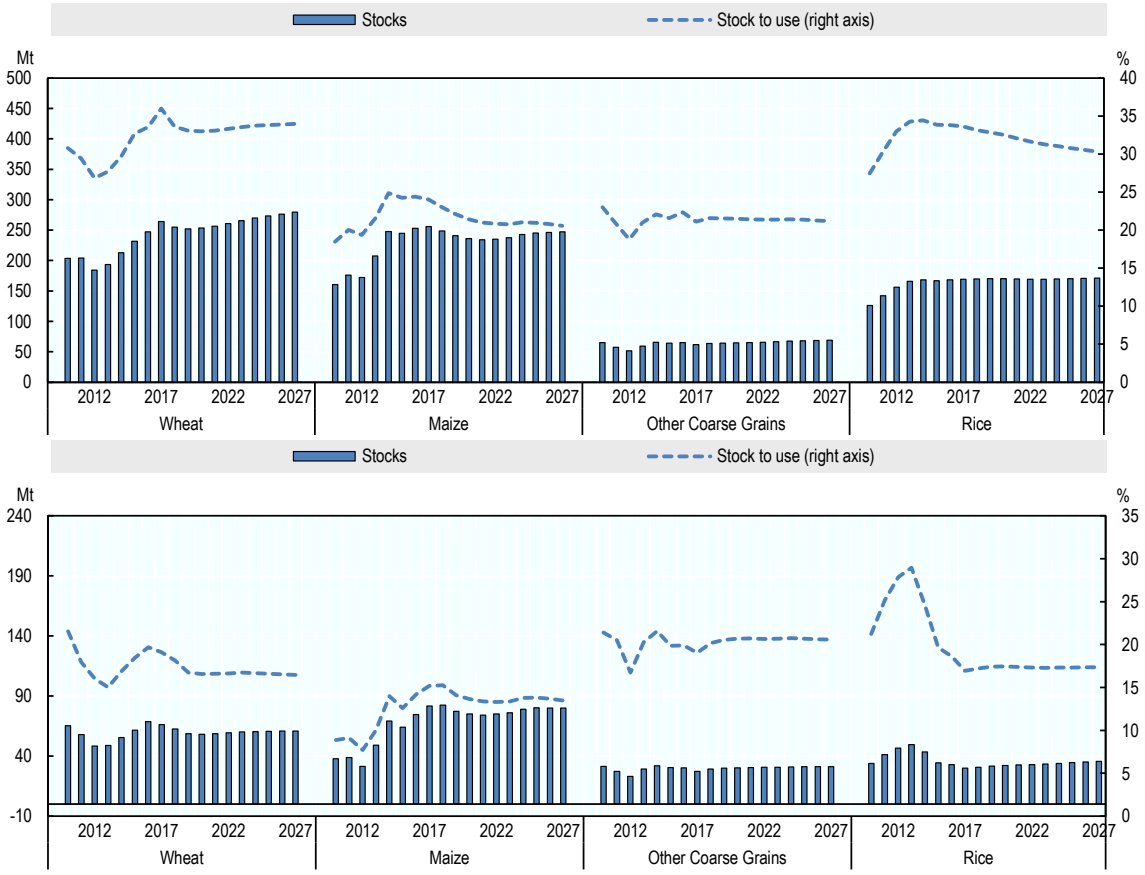
Figure 3.5. Major exporter stocks and stocks-to-use



1. Top 5 exporters, wheat (2015-2017): Australia, Canada, the European Union, the Russian Federation, the United States.
2. Top 5 exporters, maize (2015-2017): Argentina, Brazil, the Russian Federation, the United States, Ukraine.
3. Top 5 exporters, other coarse grains (2015-2017): Australia, Canada, the European Union, Ukraine, the United States.
4. Top 5 exporters, rice (2015-2017): India, Pakistan, Thailand, the United States, Viet Nam.

Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Table 3.1. Rice per capita consumption

kg/person/year

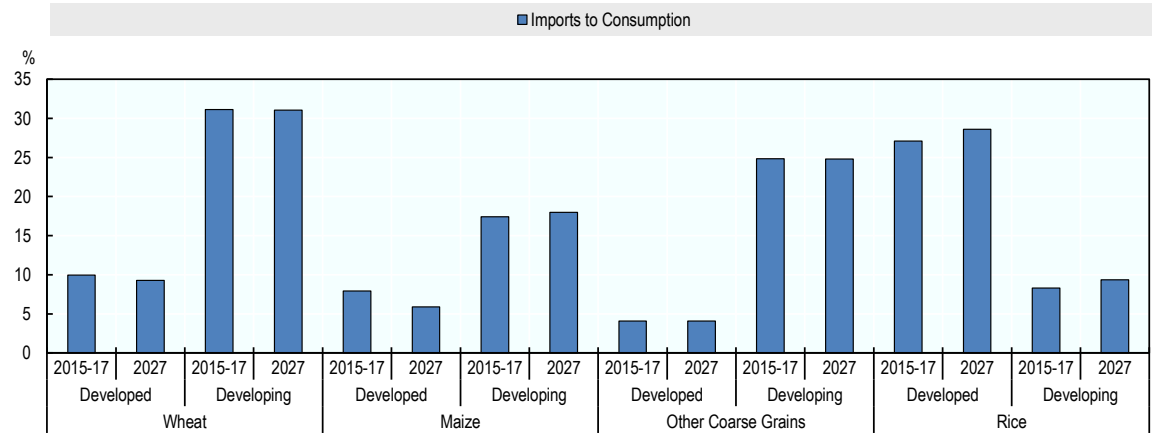
	2014-16	2026	Growth rate (% p.a.)
Africa	24.7	28.2	1.22
Asia and Pacific	77.8	78.9	0.08
North America	13.1	14.0	0.49
Latin America and Caribbean	28.5	28.7	0.24
Europe	5.5	5.9	0.63

Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

Trade

Trade of wheat, maize and other coarse grains accounts for about 17% of global consumption throughout the projection period and is an important source of food and feed for importing countries (Figure 3.6). Traditionally, the developed world supplies cereals to developing countries, where growing food demand from increasing populations and higher feed demand from expanding livestock sectors mean that domestic demand expands faster than domestic supply. This situation is expected to intensify in the next decade as combined exports of cereals are set to increase by 13% by 2027.

Figure 3.6. Trade as a percentage of consumption



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Wheat exports are expected to grow by 24 Mt to reach 199 Mt by 2027. The Russian Federation surpassed the European Union as the top exporter in 2016 and is expected to maintain this position, accounting for 20% of global wheat exports by 2027. Supply in the major wheat-producing members of the Commonwealth of Independent States (CIS) – the Russian Federation, Kazakhstan and Ukraine – has been volatile in the past decade mainly due to yield fluctuations. Nonetheless, in the recent past, production growth has on average outpaced consumption growth, so further increases of wheat production and exports are expected. The Russian Federation's growing presence on wheat export markets over the past few years has had a larger impact on international prices, and further growth in its market share will continue to influence prices over the next ten years.

World utilisation of other coarse grains is projected to increase by 32 Mt or 1.1% p.a. over the next ten years, a notably faster pace than the 0.2% p.a. over the past decade. This acceleration is driven by developing countries (+29 Mt) as consumption is expected to remain stable in developed countries. The food share of total consumption is projected to increase from about 26% in the base period to 28% in 2027, and the main driver is increasing food demand in Africa (2.7 p.a.), followed by Latin America and the Caribbean (0.9% p.a.) and Asia (0.5% p.a.). Ethiopia and the remaining Sub-Saharan African region rely heavily on millet as a source of calories. Saudi Arabia will continue to contribute to global demand as its feed sector expands. With other coarse grains

utilisation growing faster than supply, the global stocks-to-use ratio is expected to decline to 21% by 2027, compared to 22% in the base period.

By 2027, the European Union, the second largest wheat exporter, will account for 18% of global trade, followed by the United States (13%), Canada (11%), Australia (10%) and Ukraine (10%). The Russian Federation, Ukraine, Argentina, Kazakhstan and Turkey, will increase export market share while developed country exporters, mainly the United States, Canada, and Australia, may lose overall export share but are expected to maintain the higher quality and higher protein wheat markets, particularly in Asia. The Russian Federation and Ukraine may also play a role in higher quality markets, but will be more competitive in soft wheat markets, such as the Middle East and Central Asia, due to proximity to those regions. Wheat imports for the top five importers – Egypt, Indonesia, Algeria, Brazil and Japan – will maintain a stable share of 25-27% over the next ten-year horizon.

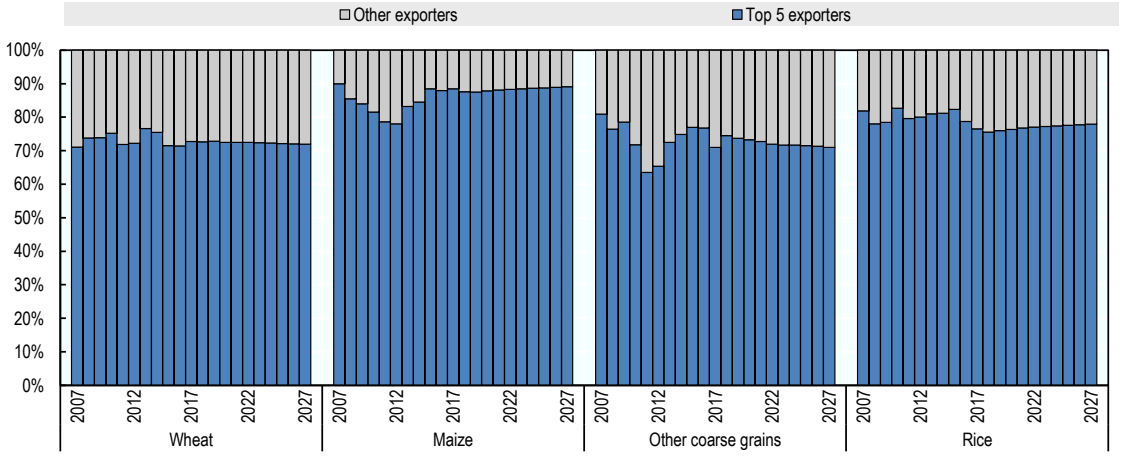
Maize exports are expected to grow by 19 Mt to 157 Mt in 2027. The export share of the top five exporters – the United States, Brazil, Ukraine, Argentina, and the Russian Federation – accounts for nearly 90% of total trade through the projection period. The United States is projected to remain the top maize exporter, with exports flat compared to the base period at 53 Mt by 2027, but the US export share will decline (from 38% to 34%) with higher exportable supplies in Brazil, Argentina, Ukraine and the Russian Federation. Brazil will increase its export market share from 19% in the base period to 23% in 2027 as production of second-crop maize following soybeans increases. Shipments from Argentina, the third-largest exporter, will continue to increase incentivised by the termination of export taxes in 2016. Ukraine and the Russian Federation are also projected to increase exports as supplies increase faster than domestic consumption leading to surpluses entering the global market. The LDC Sub-Saharan African region will continue to play a major role supplying white maize for food consumption in the region. South Africa will also remain as a regional supplier, but expansion is limited as they produce GMO varieties that face barriers in neighbouring countries.

The top five maize importers during the base period – Japan, the European Union, Mexico, Korea, and Egypt – account for 45% of world imports during the base period; this share is expected to decrease to 41% due mainly to lower imports in the European Union where higher domestic maize production supports the growth in feed demand and in Japan where consumption growth is limited by the declining population. Viet Nam is expected to become the third largest maize importer by 2027 after a strong increase in maize imports since 2012, with further demand growth coming from the strengthening livestock sector. Malaysia will also increase imports to sustain the growth in the livestock sector, increasing from imports of 3.6 Mt in the base period to 4.7 Mt by 2027.

The international trade volume of other coarse grains, such as barley and sorghum, is much smaller than for maize or wheat. Other coarse grain exports are expected to increase by 3 Mt to 49 Mt in 2027. The top five exporters – the European Union, Australia, the United States, Ukraine and Canada – had an export share of 75% of global trade during the base period, and this share is expected to decline to 71% by 2027 as lower exports for Australia and Canada are offset by higher exports by Argentina and the Russian Federation (Figure 3.7). In contrast to maize and wheat markets, imports of other coarse grains are much less widespread among countries. The five major importers – China, Saudi Arabia, Japan, the Islamic Republic of Iran and the United States – absorb almost 70% of global trade, with China alone accounting for 30% in 2027.

Given policy changes in China aimed at reducing record stock levels, this *Outlook* assumes that maize and other coarse grain imports will limit the downward trajectory of total coarse grain stock levels until China reaches a sustainable stocks-to-use ratio for maize, which is expected to decline to 28% by 2027. With maize production growth in China projected to slow, maize imports are therefore expected to reach 6.7 Mt by 2027. China's imports of barley and sorghum increased from about 3 Mt in 2012 to more than 18 Mt in 2014. Since then, imports of other coarse grains have declined but are expected to reverse this trend starting in 2018 due to lower prices relative to maize and other domestically-produced coarse grains.

Figure 3.7. Cereal trade concentration



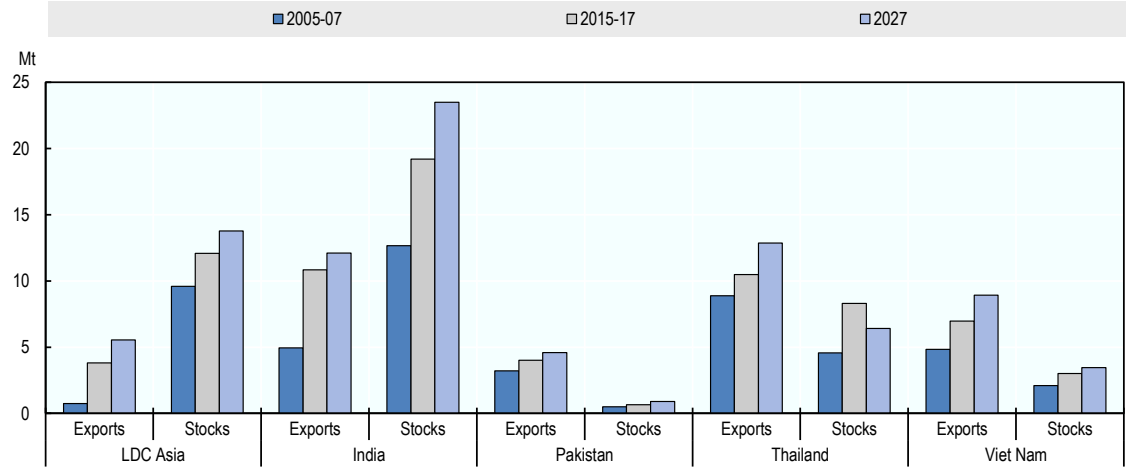
Note: For top exporters, see Figure 3.5
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933742948

During the past ten years, rice trade grew robustly at near 6% p.a. This expansion is expected to slow to about 2% p.a. with export volume rising 9 Mt to reach 54 Mt by 2027. The export share of the top five major rice exporters – India, Thailand, Viet Nam, Pakistan and the United States – is expected to remain above 75%, with Thailand replacing India as the largest global rice exporter (Figure 3.8). Given infrastructure and supply chain improvements as well as production diversification, Viet Nam could reach markets in Africa and the Middle East thus reducing its dependence on the Chinese market. Thailand may continue to focus on exporting high quality rice but could face more competition from India and Viet Nam.

The largest exporters will lose market share to countries in the LDC Asia region, particularly Cambodia and Myanmar, as the region becomes more competitive internationally. Shipments from the LDC Asia region will increase from 4 Mt in the base period to 6 Mt in 2027, amid expectations that ample exportable supplies will allow these countries to capture a greater share of the Chinese and other Asian markets. Historically, rice trade has been mainly dependent on supply, demand and prices of indica rice, the largest rice type traded on the world market; however, given increasing demand for other varieties, particularly in the Middle East, this situation could shift over the next ten years (Box 3.1).

Figure 3.8. Exports and stocks for Asian rice exporters



Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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China will remain the largest importer of rice throughout the next ten years despite imports declining by 16% (-1 Mt) from the base period. The largest import growth will be in African countries where demand is expected to outpace production. While production is expanding in African countries, it is restrained by climate conditions, limited use of inputs and infrastructure development. Nigeria, in particular, is projected to maintain its position as the second largest importer after China, increasing imports by 2 Mt, such that imports account for 55% of domestic consumption by 2027. Overall, imports in Africa are expected to increase from 15 Mt in the base period to 25 Mt in 2027, lifting Africa's share of world imports from 34% to 44%. In addition to China and Nigeria, the group of the five major importers includes the Islamic Republic of Iran, Saudi Arabia and the Philippines. Altogether, these five countries are expected to account for about a third of global rice imports by 2027, compared to 28% in the base period. By region, LDC Sub Saharan Africa represents about 28% of the total imports by 2027.

Main issues and uncertainties

While normal assumptions for weather lead to positive production prospects for the main grain-producing regions, adverse weather events that are accentuated by climate change may cause higher volatility in crop yields thereby impacting global supplies and prices. Historical deviations of crop yields from expected values are higher for wheat than for other cereals, and wheat yields in Australia, Kazakhstan, the Russian Federation and Ukraine are particularly uncertain. Crop yields in South American countries, such as Argentina, Brazil, Paraguay and Uruguay, also show relatively high variability. Cereal imports comprise of 16% of global consumption and are an important source of food and feed, especially for developing countries. Over the past decade, increased participation of new players in global trade has lessened some of the risks associated with crop shortages in major exporting countries, such as price spikes for countries that are more dependent on imports. Continued growth in export participation over the next decade may further mitigate the risks of volatile yields in certain regions.

Cereal prices could be affected by a potential further slowdown in economic growth of fast-growing economies and lower energy prices caused by the uptake of new energy sources and new extraction technologies. Moreover, the reinforcement of food security and the sustainability criteria in the reform and design of biofuel policies (i.e. the European Union, Brazil or the United States) may also impact the demand for cereals. China's domestic policies that influence their import demand for cereals are also crucial for future developments in the cereal markets. Additionally, political unrest in either exporting countries (notably Ukraine) or importing countries (in particular North Africa and the Middle East) could provoke market reactions that are not reflected in the projections.

The future developments of global wheat markets remain uncertain owing to real exchange rates appreciation or depreciation in exporting countries, which could stimulate or discourage production. Demand for wheat is concentrated in North Africa and the Middle East, but further political instability in these regions could reduce demand and depress international wheat prices.

The outlook for Argentina is also uncertain since recent policy changes concerning the elimination of export taxes might strengthen competitiveness on international cereal markets even more than assumed in the projections.

Maize production in Sub-Saharan Africa is heavily reliant on rain-fed systems, and thereby sensitive to weather fluctuations. In addition, the recent outbreak of the fall armyworm possesses a new source of uncertainty. While the insect prefers maize, it can feed on other cereals, including rice, sorghum and millet, which could undermine food security in the region if not properly managed.

Box 3.1. Japonica rice in the global and domestic markets

Cultivated rice has many varieties and can be categorised into the following rice types: indica, japonica, glutinous and aromatic. Another common classification is into long-grain, medium-grain, short-grain and broken rice (CBI, 2017). Japonica rice mostly produced in more temperate climates, accounts for about 8% of the global rice trade. Indica and aromatic rice account for around 75% and 15% respectively, and glutinous rice accounts for the remainder (USDA ERS, 2016). It can be useful to separate the markets by rice type given that some types (e.g. japonica) command a price premium, reflecting the fact that production faces different climatic condition, while consumer preferences differ. Regardless of this price differential, there is still some substitutability between the different types in domestic markets mainly on the demand side.

The major japonica rice producing countries are China, Japan, Korea, the United States, the European Union, Australia, Egypt and Turkey. Among these, China, the United States and the European Union also produce considerable amounts of indica rice (Calpe 2006; Rakotoarisoa 2006; Hansen et al., 2002; Wailes and Chavez, 2016). Rice balances are separated by type (japonica and other) based on the OECD-FAO agricultural outlook database incorporating following additional material: production data by type available for the United States (California), the European Union and China; consumption and trade data by type derived from linking bilateral trade flows from customs data with production statistics.

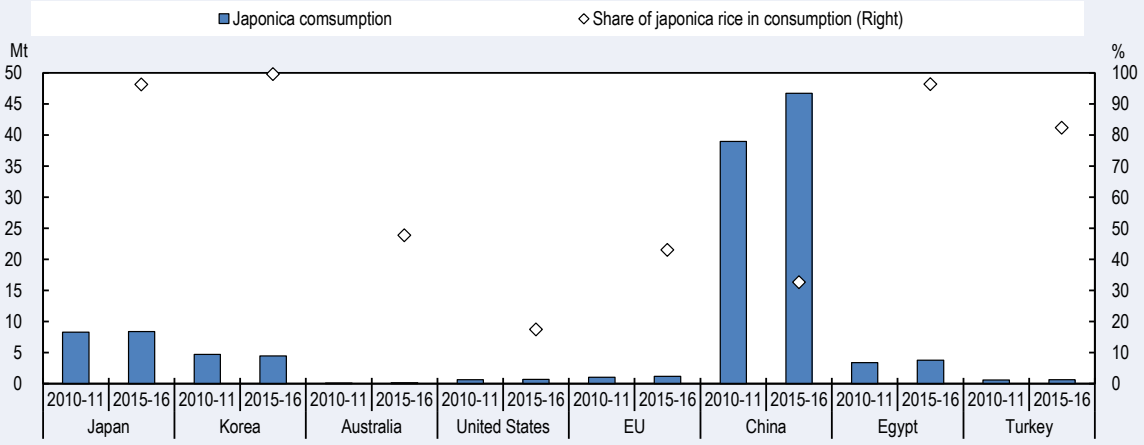
Production and consumption

Japonica accounted for 12-13% of global rice production during the period 2010-2016. In China, japonica production increased by 12 Mt over ten years to 48.9 Mt in 2016. The share of japonica rice in China's total rice area increased from 24.9% in 2006 to 30.5% in 2016, and japonica's share in total rice production increased from 29.0% to 34.5% over the same period. Japonica production in the European Union rose from 1.1 Mt in 2011 to 1.4 Mt in 2016, with japonica's

share of production increasing from 63% to 77% over this period. In the United States, japonica production is mostly concentrated in California and classified as medium- and short-grain rice. US production was 215 000 tonnes in 2016, accounting for 21% of total rice production. Rice production in Japan, Egypt, Korea, Turkey and Australia totalled 7.8 Mt, 4.3 Mt, 4.2 Mt, 0.6 Mt and 0.6 Mt respectively in 2016, and these rice volumes were almost exclusively composed of japonica.

China is the largest consumer of japonica rice, with consumption reaching 46.4 Mt in 2016. However, the share of japonica in total rice consumption is much higher in Japan, Korea and Egypt (Figure 3.9).

Figure 3.9. Japonica rice consumption and its share of total rice in selected countries



Note: The consumption is simply calculated as "consumption = production + import - export - stock change".
Source: own calculation based on domestic statistics, bilateral trade flows and OECD/FAO (2018).

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Trade

Japonica's share in global rice trade was 6-7% during the period of 2010-2016 based on our own estimates. The United States exported 846 000 tonnes in 2016, based on the custom data from California ports. Egypt's exports decreased to 215 000 tonnes in 2016 due mainly to export restrictions, and remained below the average of the period 2010-2016. China's japonica rice exports remained stable at around 200 000 tonnes and are destined mainly for Japan and Korea. Australian exports fluctuate depending on the rice harvest and can reach up 500 000 tonnes. The trade flows of the European Union differ between types. Only 10% of total rice imports or 120 000 tonnes in 2016 were of japonica rice, whereas 90% of rice exports or 264 000 tonnes were japonica rice. Japonica imports in Middle Eastern countries, e.g. Lebanon, Jordan and Saudi Arabia increased and were sourced from the European Union and Egypt, as well as Australia and the United States. The Middle Eastern countries are a growing market for japonica rice.

Discussion

The global rice reference price is Thailand's export price, which corresponds to long-grain indica rice. The US California's medium-grain export price is the best international reference for japonica rice. In the global market both prices move in the long term generally together and the price premium of japonica rice has weakened since 2008 (Chen and Saghaian, 2016). However price movements for indica and japonica rice may move somewhat independently of one another in the short term because of limited substitutability in consumption among the different types and qualities and because of diverging trade flows (John, 2014; Rastegari-Henneberry, 1985; Jayne,

1993).

Rice trade accounts for less than 10% of world production which is low compared with other agricultural commodities. In the case of japonica rice, the share of traded commodity is even lower at below 5% of world production. Consequently, most japonica markets, including those of China, Japan and Korea, are dominated by domestic production and have market price support (MPS) resulting in higher domestic than reference prices for rice. Therefore, potential uncertainties might trigger short-term volatility in demand, supply and prices in the smaller global japonica rice market. These uncertainties in japonica rice producing countries include possible changes in government policies.

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