

11 Other products

This chapter provides a market overview and a description of the current market situation for roots and tubers (i.e. cassava, potato, yams, sweet potato, taro), pulses (i.e. field peas, broad beans, chickpeas, lentils), and banana and major tropical fruits (i.e. mango, mangosteen and guava, pineapple, avocado, and papaya) markets. It then highlights the medium term (2021-30) projections for production, consumption and trade for these products and describes the main drivers of these projections.

11.1. Roots and tubers

11.1.1. Market overview

Roots and tubers are plants that yield starch derived from either their roots (e.g. cassava, sweet potato and yams) or stems (e.g. potatoes and taro). They are destined mainly for human consumption (as such or in processed form) and, like most other staple crops, can also be used for animal feed or industrial processing, notably in the manufacturing of starch, alcohol, and fermented beverages. Unless they are processed, they are highly perishable once harvested, which limits the opportunities for trade and storage.

Within the roots and tubers family, potato dominates in worldwide production, with cassava a distant second. With respect to global dietary importance, potato ranks fourth after maize, wheat and rice. This crop provides more calories, grows more quickly, uses less land, and can be cultivated in a broad range of climates. However, potato production, which forms the bulk of the root and tuber sectors in developed countries, has been declining over several decades, with growth in production falling well below that of population.

Output of cassava is growing at well over 3% p.a., almost three times the rate of population growth. Cultivated mainly in the tropical belt and in some of the world's poorest regions, cassava production has doubled in a little over two decades. Once considered a subsistence crop, it is now seen as a commodity and key for value-addition, rural development and poverty alleviation, food security, energy security; and for bringing important macroeconomic benefits. These factors are driving rapid commercialisation of this crop and large-scale investments in upscaling the processing of cassava, both which have contributed significantly to its global expansion.

11.1.2. Current market situation

The largest producing regions of roots and tubers in the base period are Asia (98 Mt) and Africa (92 Mt). In Sub Saharan Africa, roots play a significant role as a staple crop. Globally, about 125 Mt are used as food, 54 Mt as feed, and 61 Mt for other uses, mostly biofuel and starch. As the perishable nature of these crops prohibits significant international trade in fresh produce, countries tend to be self-sufficient. About 14 Mt are currently traded internationally, mostly in processed or dried form. Thailand and Viet Nam are the leading exporters and the People's Republic of China (hereafter "China") is the main destination.

Global production of roots and tubers reached 237 Mt (dry matter) in the base period (2018-20); about 5 Mt has been added annually in the past years and consumed mainly as food. The prices of roots and tubers (measured by the Cassava (flour) wholesale price in Bangkok) decreased in 2020 as yields in many major-producing regions were favourable. Global quantities traded increased by 0.5 Mt.

11.1.3. Main drivers for projections

Producing cassava requires few inputs and affords farmers greater flexibility in terms of timing the harvest as the crop can be left on the ground well after reaching maturation. Cassava's tolerance to erratic weather conditions, including drought, makes it an important part of climate change adaptation strategies. Compared to other staples, cassava competes favourably in terms of price and diversity of uses. In the form of High Quality Cassava Flour (HQCF), cassava is increasingly targeted by governments in Africa as a strategic food crop which does not exhibit the same levels of price volatility as other imported cereals. Mandatory blending with wheat flour helps reduce the volume of wheat imports, thereby lowering import bills and conserving precious foreign exchange. The drive towards energy security in Asia, combined with mandatory blending requirements with gasoline, has led to the establishment of ethanol distilleries that use cassava as a feedstock. With regard to trade, processed cassava manages to compete successfully in the global arena, e.g. with maize-based starch and cereals for animal feeding applications.

Potatoes are generally confined to food use and are a substantial component of diets in developed regions, particularly in Europe and North America. As overall food intake of potato in these regions is very high and may have reached saturation, the scope for consumption increases to outpace population growth remains limited. Developing regions, however, provide some growth momentum to potato production at the world level.

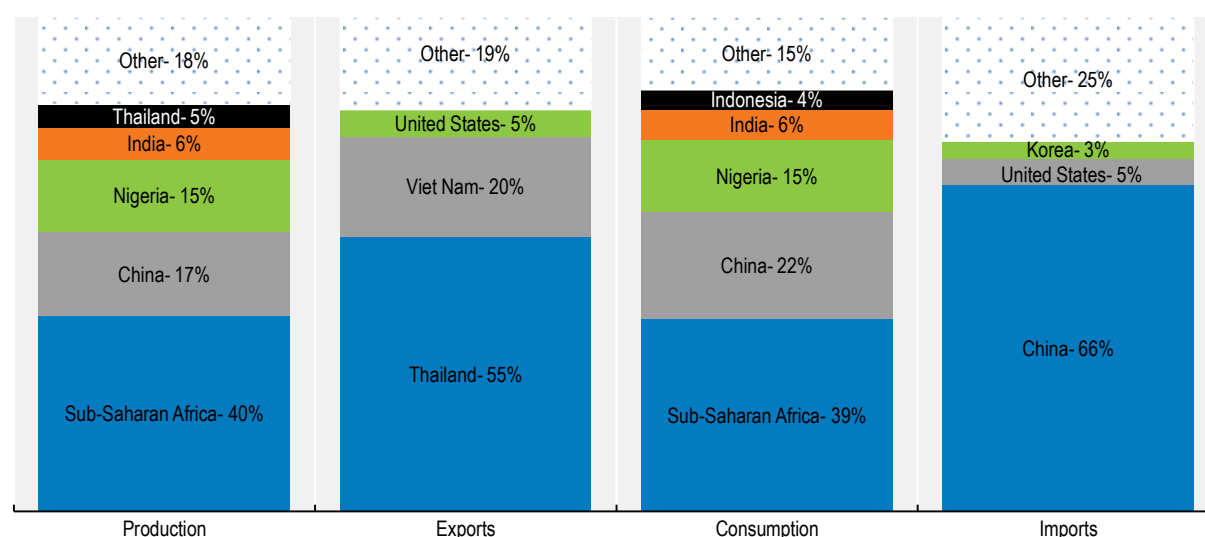
Global sweet potato cultivation has declined in recent years, mostly due to a sharp decline in acreage (which shows no sign of abating) in China, the world's foremost producer. Food demand largely defines the growth potential of sweet potato and other less prominent roots and tuber crops given the limited commercial viability for diversified usage. Consequently, consumer preferences along with prices play important roles in shaping consumption.

11.1.4. Projection highlights

World production and utilisation of roots and tubers is projected to increase by about 18% over the next decade. Production growth in low-income regions could reach 2.3% p.a. while supply in high-income countries should grow at only 0.3% annually. Global land use is projected to increase by 2 Mha to 65 Mha, but there will be some regional shifts. African countries are expected to increase their cultivation area, while reductions are projected for Europe and America. Production growth is mainly attributed to investments in yield improvements in Africa and Asia, as well as an intensification of land use in these regions.

By 2030, an additional 1 kg/capita per year of root crops will enter diets at the global level, driven mostly by consumers in Africa where per capita intake of roots and tubers could surpass 40 kg per year. Biofuel use, albeit from a low basis (3% of use), is expected to grow by more than one-third over the next ten years driven by the Chinese biofuel industry. Feed and other industrial use will remain significant, albeit with slower growth of about 12% and 18% respectively, over the outlook period.

Figure 11.1. Global players in roots and tubers markets in 2030



Note: Presented numbers refer to shares in world totals of the respective variable

Source: OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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International trade in roots and tubers comprises about 6% of the global market production. Over the medium term, this share is expected to remain constant. Exports from Thailand and Viet Nam are growing and are expected to reach a combined total of 13 Mt, mainly to supply the growing biofuel and starch industries in China.

Given the substitutability between roots and tubers and cereals on food and feed markets, prices of roots and tubers are projected to follow a similar path to cereal prices in the medium term; namely, an increase in nominal prices but a decline in real terms.

11.2. Pulses

11.2.1. Market overview

Pulses are the edible seeds of plants in the legume family. Commonly, eleven types are recognised.¹ They provide protein, dietary fibre, vitamins, minerals, phytochemicals, and complex carbohydrates. Apart from the nutritional benefits, pulses help to improve digestion, reduce blood glucose, minimise inflammation, lower blood cholesterol, and prevent chronic health issues such as diabetes, heart disease, and obesity. However, their consumption levels differ from region to region depending on the dietary patterns, availability and prevailing conditions.

Cultivation of pulses has a long tradition in almost all regions of the world. For centuries, legumes have played a fundamental role in the functioning of traditional agricultural systems. Prior to 2000, global production of pulses stagnated due to the widespread disappearance of small farms in developing countries which led to a decline of traditional farming systems that included pulses in their crop rotation. Production was further hampered because of their weak resilience to diseases due to a lack of genetic diversity, limited access to high-yield varieties, and the lack of policy support to pulses growers. The sector began to recover in the early 2000s and has since seen an annual increase of about 3% globally, led by Asia and Africa. These two regions combined accounted for about 63% of the 18 Mt production increase in the past decade.

Global per capita consumption of pulses started to decline in the 1960s (Figure 11.2) due to slow growth in yields and resulting increases in price. Income growth and urbanisation shifted preferences away from pulses as human diets became richer in animal proteins, sugar, and fats. Nonetheless, pulses have remained an important source of protein in developing countries, and average global per capita consumption has increased to about 8 kg/year to date. This growth has been driven mainly by income gains in countries where pulses are an important source of protein; this particularly true of India where vegetarians account for about 30% of the population.

Pulses can be processed into different forms such as whole pulses, split pulses, pulse flours, and pulse fractions like protein, starch and fibre. The flour and fractions have diverse applications in industries related to meat and snack food, bakery and beverages, and batter and breadings.

11.2.2. Current market conditions

India is by far the largest producer of pulses, accounting for about 24% of global production in the past decade. Canada (8%) and the European Union (5%) are the next largest producing countries. The Asian market accounts for more than half of all consumption, but only about 45% of production, making it the most significant import destination. About 12% of global production is traded internationally with Canada (38% of global trade) by far the largest exporter and India the largest importer (29% of global trade). Africa has further expanded its production and consumption in the past decade, and has remained largely self-sufficient.

In 2020, the global pulses market reached a volume of 92 Mt, after an average annual growth of 3% p.a. during the previous decade; this growth was led by Asia and Africa. Growth between 2019 and 2020 was high in the European Union (+10%). World trade volumes were registered at 18 Mt, 0.5 Mt higher than in 2019. Due to an ample supply situation, international prices for pulses, approximated by the Canadian field pea price, have dropped to USD 186/Mt, its lowest value since 2009.

11.2.3. Main drivers for projections

As pulses are associated with various health benefits, health-conscious consumers are increasingly integrating these in their daily diets, which in turn is propelling the growth of the global pulses market. Rapid urbanisation, changing lifestyles, and hectic work schedules are also making healthy snack foods popular amongst the working population, and pulses are increasingly used in the processing of ready-to-eat (RTE) food products.

Health and environmental benefits are reasons why governments of pulses-producing countries are providing assistance to farmers, and thus supporting growth of this market. Support to the production of pulses production plays an important role in the Protein Strategy of the European Union, and are a major ingredient in products such as meat substitutes. Depending on the future dynamics of demand for such products, this could significantly change the future importance of pulses in the agricultural production mix.

11.2.4. Projection highlights

Pulses are expected to regain importance in the diets in many regions of the world. This *Outlook* foresees the global trend in this area to continue and projects global average annual per capita food use to increase to 9 kg by 2030. Per capita consumption is projected to level off in Latin America and Africa at around 12 kg/year, but is expected to increase in many other regions over the coming decade. (Figure 11.2)

Global supply is projected to increase by 22 Mt. Almost half of this increase is expected to come from Asia, particularly India, the world's largest producer. Sustained yield improvements are projected to raise India's domestic production by an additional 6.6 Mt by 2030. India has introduced high-yielding hybrid seeds, supported mechanisation, and implemented a minimum support price aimed at stabilising farmer's income. In addition, the central government and some state governments have included pulses in their procurement programmes, although not with the same geographical coverage as in the case of wheat and rice.

This expected production expansion is driven by the assumption of continued intensification of the pulses production systems due to improved yields and intensified land use. About 70% of production growth can be attributed to yield improvements during the projection period, and the remaining 30% to land use intensification, mainly in Asia, Africa and Europe. Particularly in Africa, a combination of area expansion and yield growth is estimated to add about 0.5 Mt annually to the regional production.

This *Outlook* assumes that growth will be sustained by increased intercropping of pulses with cereals, in particular in Asia and Africa where smallholder farmers represent a large share of producers. The projected yield improvements of pulses will continue to lag cereals and oilseeds because in most countries pulses are not included in the development of high-yielding varieties, improved irrigation systems, and agricultural support policies.

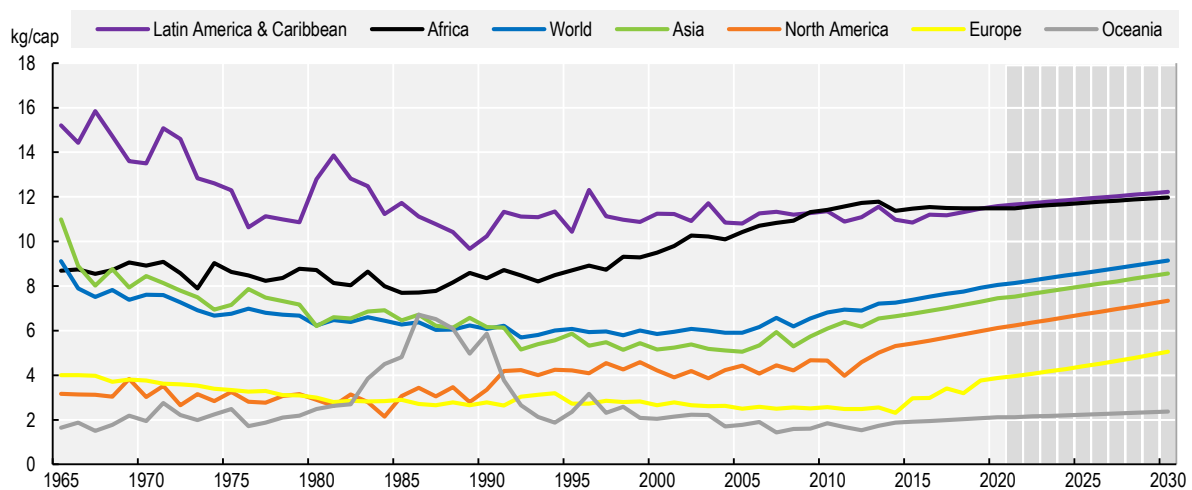
World trade of pulses grew from 13 Mt to 17 Mt over the past decade and is projected to reach 19 Mt by 2030. India's recent efforts to become self-sufficient in pulses are the major factor driving the anticipated slowdown in global pulses trade. After a continued increase in the near term, imports by India are expected to level off by 2030 when they are projected to reach 5 Mt.

Canada remains the main exporter of pulses, with volumes expected to grow from 6.7 Mt at present to 8 Mt by 2030, followed by Australia with 2.4 Mt of exports by 2030. However, given that Canada's major

trading partner is India, which is expected to slow its import growth, they will need to diversify their export markets.

International prices are expected to increase in nominal terms over the coming decade, while real prices will decline slightly.

Figure 11.2. Per capita food consumption of Pulses per continent



Source: OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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11.3. Bananas and major tropical fruits

11.3.1. Market overview

Bananas and the four major fresh tropical fruits – mango, pineapple, avocado, and papaya – play a vital role in world agricultural production, and especially in securing the nutrition and livelihoods of smallholders in producing countries. In recent decades, income growth and changing consumer preferences in both emerging and high-income markets, alongside improvements in transport and supply chain management, have facilitated fast growth in international trade in these commodities. Against this backdrop, export quantities of the four major fresh tropical fruits have experienced some of the fastest average annual growth among internationally traded food commodities, while export quantities of bananas have increased to unprecedented heights.

Based on 2019 figures, the global banana and major tropical fruit export industries respectively generate around USD 9.1 billion and USD 10 billion per year. Although only approximately 15% of global banana production and 5% of global major tropical fruit production are traded in international markets, in exporting countries, which are mostly low-income economies, revenue from production and trade can weigh substantially in agricultural GDP. For instance, banana represented about 42% of agricultural export revenue in Ecuador in 2018, and 17% in Guatemala. As such, trade in bananas and major tropical fruits has the potential to generate significant export earnings in producing countries. For all these underlying reasons, it is important to assess the potential future market development of these agricultural commodities.

11.3.2. Constraints under COVID-19

Since the onset of the COVID-19 pandemic, a smooth continuation of global supplies of bananas and major tropical fruits has been jeopardized by the impact of the disease itself as well as by the disease mitigation measures that have been implemented. Both of these factors discernibly affected the production, transport, distribution, marketing and consumption of fresh bananas and major tropical fruits in 2020, with disruptions and contractions widely reported. At the same time, surges in consumer demand for vitamin-rich fruits have facilitated fast growth in trade for some commodities in some markets.

On the supply side, the adverse effects of not only the disease spread but also of the physical distancing measures have tended to be more immediate and pronounced for the relatively labour-intensive production and trade of fruits and vegetables than for most other food commodities, particularly staple foods. Given their typically high perishability, fresh fruits and vegetables require timely and well-coordinated harvesting and post-harvest handling, as well as uninterrupted cold chains. Some major tropical fruits, such as fresh mangoes, furthermore, partly rely on airfreight for export. In many producing countries, quarantine-related delays at ports and borders, border closures, as well as extreme shortages of reefer containers and airfreight belly-capacity, have slowed trade, while market closures have interrupted producers' access to local and national distribution outlets. Reports of produce remaining unsold and going to waste have been widespread, particularly for more perishable varieties such as papayas and pineapples. With input factories and import routes disrupted, reduced availability and higher costs of key inputs for production and distribution have further jeopardized a smooth continuation of supply. Under these circumstances, the profitability of many farms and plantations has been severely affected, with industry sources reporting difficulties arising from cancelled orders, particularly for small- to medium-sized producers.

On the demand side, the rapid decline in global economic activity has resulted in negative impacts on the global incidence of unemployment, poverty, inequality and undernourishment. Reduced consumer incomes have resulted in reports of reduced demand in the major tropical fruits sector globally, given the high income elasticities of demand for the majority of these high-value commodities. In addition to income effects, the closure of schools, canteens, restaurants, bars and hotels around the world has severely affected food consumption patterns. While precise figures are not currently available, away-from-home consumption of tropical fruits, especially avocados and pineapples, can account for a substantial share of total consumption in key import markets.² This has most notably been observed in the United States and the European Union, where distributors reported difficulties in selling produce, most notably pineapples, throughout the duration of lockdowns.

Up to this point, in the presence of significant delays and discrepancies in data reporting, the short-term impact of COVID-19 continues to be difficult to gauge. The medium-term impact is similarly uncertain as it depends on the recovery path following the current pandemic, and since projections of trade in tropical products would be sensitive to different economic growth assumptions. Adverse weather and climate-related factors, given their mostly unpredictable nature, bring additional uncertainty to the outlook, as further discussed below. However, despite these uncertainties, global production and trade of bananas and major tropical fruits are projected to expand solidly over the medium term. Demand growth in high-income countries, where nutritional awareness is becoming stronger, and increasing demand also in emerging countries such as China and India, are expected to drive investments and expansion in banana and major tropical fruit production zones. The outlook accordingly indicates that bananas and major tropical fruits would continue to be among the fastest growing and most valuable agricultural industries in terms of their international trade prospects.

11.3.3. Bananas

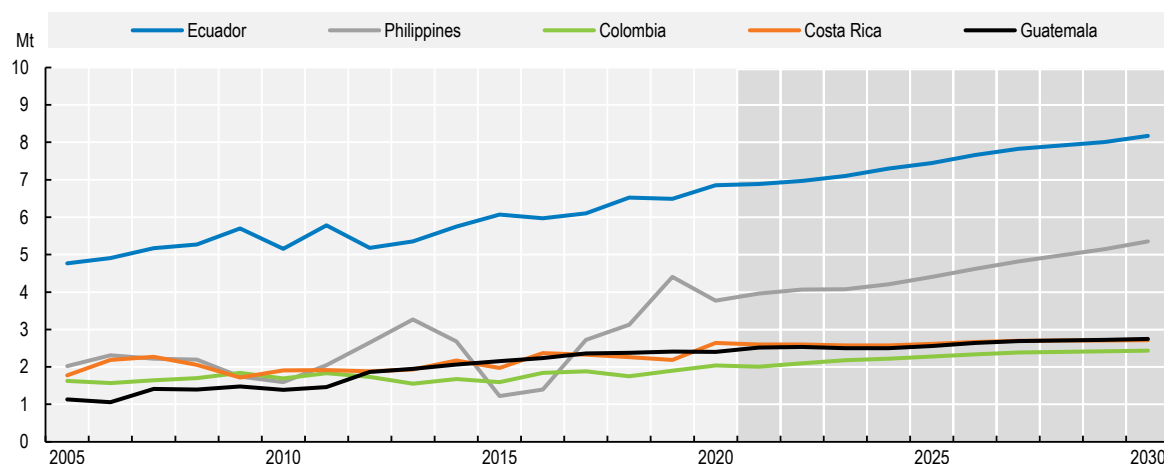
Market situation

Preliminary estimates indicate that global exports of bananas, excluding plantain, reached a new record high of 22.2 Mt in 2020, an increase of 1.7% compared to 2019. Strong supply growth in Ecuador, Costa Rica, and Colombia, three of the five leading exporters, was chiefly accountable for this rise. All three countries reportedly implemented disease mitigation strategies in their plantations at early stages of the pandemic and were thereby able to minimize disruptions to their ability to supply bananas to world markets. Meanwhile, exports from the Philippines, the second leading global exporter, were affected by severe difficulties arising from the impact of the pandemic on the country's banana production, which reportedly had a particularly detrimental effect on small-scale producers. Preliminary data and information accordingly indicate a contraction of 14% in Philippine banana exports in 2020.


On a provisional basis, global net import quantities of bananas stood at approximately 18.9 MT in 2020, a mere 0.2% increase from 2019, reflecting pandemic-induced strains on global supply chains as well as strains on demand in several key import markets. While demand in the European Union reportedly remained strong, preliminary data indicate a contraction in imports of 0.1% in the United States, the second largest importer behind the European Union, due to reduced demand. More drastically, imports by China, the third largest importer of bananas globally, contracted by an estimated 10% on account of the supply disruptions experienced in the Philippines. However, it needs to be noted that reported trade data for bananas currently display a large discrepancy between exports and imports for 2020, which may also be caused by data reporting lags or errors. FAO is continuously monitoring global trade flows of bananas and will correct these estimates in the event that more precise data become available.

Projection highlights

Assuming normal weather conditions and no further spread of banana plant diseases, the current baseline projections expect world production of bananas to grow at 1.4% p.a., to reach 138 Mt in 2030. As in previous projections, demand for bananas is forecast to become increasingly saturated in most regions and primarily driven by population growth. However, in some rapidly emerging economies – principally in India and China – fast income growth is anticipated to stimulate changing health and nutrition perceptions and support demand for bananas beyond population growth. Accordingly, Asia is expected to remain the leading global producing region at a quantity share of 53%, with India projected to reach 36 Mt and a per capita consumption of 24 kg in 2030. Production from the leading exporting region of Latin America and the Caribbean is expected to reach 36 Mt, encouraged by rising demand from key importing markets, most importantly the European Union, the United States, China, and the Russian Federation. The largest exporters from the region – critically Ecuador, Guatemala, Colombia, and Costa Rica – all continue to be well positioned to benefit from this rise, assuming that production growth can be shielded from the adverse effects of erratic weather events and disease outbreaks. Rising import demand is similarly expected to benefit some Caribbean exporters, most notably the Dominican Republic and Belize, as well as exports from Africa, which are projected to expand at 1% p.a. over the outlook period – led by Ivory Coast –, to reach a total quantity of approximately 750 000 t in 2030.

Figure 11.3. World banana outlook: Exports by the five major exporters

Source: FAO (2021). FAOSTAT Trade Indices Database, <http://www.fao.org/faostat/en/#data/TI>; OECD/FAO (2021), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

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11.3.4. Mango, mangosteen and guava

Market situation

Global exports of fresh mangoes, mangosteens, and guavas³ grew to an estimated 2.3 Mt in 2020, an increase of 5.1% from the previous year, according to preliminary data. This places the commodity cluster as the second fastest growing group among the major tropical fruits in 2020, behind papaya. The main driver is an approximate 12% expansion in exports from South American suppliers, which reached an estimated 530 000 t in 2020. Favourable production conditions in Brazil and Peru resulted in strong supplies, which in turn facilitated growth in exports of 12.8% and 11.4% for these countries, respectively. Exports from Mexico, the leading supplier of mangoes globally, meanwhile registered growth of 3% in 2020. All three of these suppliers benefited from ample import demand from the United States of America, which accordingly reported an estimated increase in imports by 10.7% in 2020. Exports from Thailand, meanwhile, contracted by 18% on account of COVID-19-related supply chain disruptions affecting shipments to China, the main recipient of Thai mangosteens. With an average export unit value of USD 1 700 per tonne for shipments from Thailand to China in 2020 – approximately 30% higher than in 2019 – mangosteens are among the most valuable tropical fruits traded at the global level. Imports by the European Union were similarly constrained by COVID-19-related supply disruptions and experienced an estimated decline of 10.6% compared to 2019. As such, preliminary data indicate a total global import quantity of fresh mangoes, mangosteens, and guavas of 2.1 Mt in 2020. This preliminary estimate may be revised as more data become available.

Projection highlights

Global production of mangoes, mangosteens and guavas is projected to reach 84 Mt by 2030, increasing at 3.3% p.a. over this period. Asia, the native region of mangoes and mangosteens, is expected to account for 75% of global production in 2030 compared to 73% in the base period. This will be primarily due to strong growth in domestic demand in India, the leading producer and consumer of mangoes globally, where rising incomes and associated shifts in dietary preferences will be the main drivers of production growth. Mango production in India is accordingly projected to account for 43 Mt in 2030, or 51% of global production, destined largely for local informal markets. As such, India is expected to experience increases

in per capita consumption of 3% p.a. over the outlook period, reaching 28.4 kg in 2030, while average per capita consumption in Asia overall is expected to reach 14.6 kg in 2030, compared to 10.4 kg in the base period. Global exports of mangoes, mangosteens and guavas are projected to reach almost 3 Mt in 2030, compared to 2.1 Mt in the base period, on account of rising import demand in established and emerging import markets. China, whose domestic mango production is comparatively low at a projected 2.2 Mt in 2030, is expected to experience a growth in imports of 4.9% p.a. This will be mainly due to a strong income-driven increase in Chinese demand for mangosteen, which is expected to be predominantly met by an increase in imports from Thailand, the largest global exporter of mangosteen. Mexico, the leading supplier of mangoes globally, is expected to benefit from further growth in import demand from its major market, the United States, and register 4% p.a. growth in exports over the outlook period, to reach a 22% share of world exports in 2030. Thailand and Brazil, the second and third largest exporters, are projected to have market shares of around 12% by 2030, but will be matched by rising exports from Peru.

11.3.5. Pineapple

Market situation

Global exports of pineapples were strongly impacted by the adverse effects of the COVID-19 pandemic in 2020. Preliminary data suggest a total export quantity of 2.9 Mt in 2020, corresponding to a 13.4% decline compared to 2019. The two main global exporters of pineapples, Costa Rica and the Philippines, both experienced sharp declines in shipments, at -17% and -8%, respectively. Costa Rican exports were primarily affected by lower demand from the European Union and the United Kingdom, where imports declined by 25% and 15% compared with 2019, respectively. Widely implemented closures of the hospitality sector significantly impeded the typical distribution structure for pineapples. The Philippines, meanwhile, experienced substantially lower demand from China and Korea, two major importers of Filipino pineapples. Both of these importing countries had introduced strict lockdowns early in the year, hampering import routes, as ports and warehouses operated at drastically reduced capacity. Amidst these difficulties, global imports of pineapples decreased to an estimated 2.8 Mt in 2020, an approximate decline of 9% compared to 2019.

Projection highlights

Global production of pineapple is projected to grow at 2% p.a., to reach 37 Mt in 2030, on account of a 1.8% expansion in harvested area. Asia is expected to remain the largest producing region and account for 40% of global production; pineapple production being sizeable in the Philippines, Thailand, India, Indonesia, and China. Pineapple cultivation in Asia will continue to cater predominantly to domestic demand and is expected to grow in response to changing demographics and income growth. Only the Philippines, the second leading exporter after Costa Rica, is anticipated to export approximately 20% of its production. Similarly, pineapple production in Latin America and the Caribbean, the second largest producing region at a projected 38% of world production in 2030, will be primarily driven by the evolving consumption needs of the region's growing and increasingly affluent population. Global exports of pineapple are expected to grow at 1.4% p.a., to 3.5 Mt in 2030, predominantly driven by import demand from the United States. With projected imports of 1.3 Mt in 2030 – equivalent to a 37% global share – the country is expected to remain the largest importer, ahead of the European Union, which is expected to account for 22% of global imports. In both key import markets, demand for pineapples is expected to benefit from low unit prices and to some degree also from the introduction of more premium novelty varieties.

11.3.6. Avocado

Market situation

Preliminary data suggest that global exports of avocado declined slightly in 2020, by 0.8% compared to 2019, at a total quantity of approximately 2.3 Mt. The main factors hampering the overall potential of this previously buoyant market, which had seen fast and uninterrupted expansion for more than a decade, were the impact of COVID-19 on global supply chains as well as a poor harvest in Mexico, the largest supplier of avocados globally. Accordingly, Mexico experienced an estimated 8.1% fall in exports in 2020, to 1.3 Mt. Meanwhile, favourable weather and successful investments in production expansion stimulated significantly higher supplies from Peru, Colombia, and Kenya, three emerging avocado exporters. All three suppliers were thus able to achieve double-digit growth in exports in 2020, and together accounted for about 25% of total global exports. Imports by the United States, the largest importer of avocados globally, declined by an estimated 14.3% in 2020, due to the combination of lower demand from the hospitality sector and lower supplies from Mexico. Imports into the European Union, where out-of-home consumption similarly accounts for a substantial share of total avocado consumption, declined by an estimated 2.5% in 2020 due to the impact of COVID-19. Provisional data accordingly indicate a contraction of 0.6% in global imports in 2020, to 2.1 Mt. However, this preliminary estimate may be revised as more data become available.

Projection highlights

Avocado has the lowest production level among the major tropical fruits but has experienced the fastest growth in output in recent years and is expected to remain the fastest growing commodity of the major tropical fruits over the outlook period. Production is accordingly projected to reach 12 Mt by 2030 – more than three times its level in 2010. Ample global demand and lucrative export unit prices continue to be the main drivers of this growth, stimulating substantial investments in area expansion in both major and emerging production zones. Avocado production has been so far concentrated in a small number of regions and countries, with the top ten producing countries currently accounting for almost 80% of global output, but new growing areas are emerging rapidly. Nevertheless, about 74% of avocado production is expected to remain in Latin America and the Caribbean, given the favourable growing conditions in this region. In response to rapidly growing global demand, avocado is expected to become the most traded major tropical fruit by 2030, reaching 3.9 Mt of exports and overtaking both pineapples and mangoes in quantity terms. Given the high average unit prices of avocado, the total value of global avocado exports would thus reach an estimated USD 8.3 billion in constant 2014-16 value terms, thereby placing avocado as one of the most valuable fruit commodities. Output in Mexico, the world's largest producer and exporter, is expected to grow by 5.2% p.a. over the next ten years due to continued growth in demand in the United States of America, the key importer of avocados from Mexico. As such, and despite increasing competition from emerging exporters, Mexico is expected to further increase its share of global exports, to 63% in 2030. The United States and the European Union, where consumer interest in avocados is fuelled by the fruit's assumed health benefits, are expected to remain the main importers, with 40% and 31% of global imports in 2030, respectively. However, imports are also rapidly rising in many other countries such as in China and some countries in the Middle East, and, as measured by the Herfindahl-Hirschman Index of all importers, the concentration of imports is gradually decreasing.

11.3.7. Papaya

Market situation

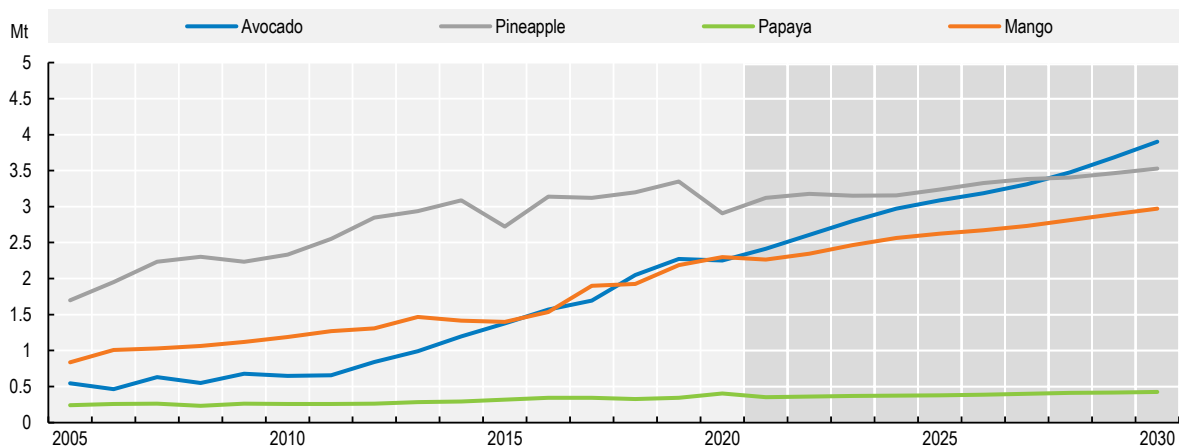
Preliminary data indicate an increase in global exports of papayas of 17.5% in 2020, to approximately 400 000 t. The key reasons behind this significant expansion are substantially higher supplies from Brazil

and a continued recovery from the weather-related production declines experienced in Mexico in 2017 and 2018. Brazil, an expanding exporter, thus reached second place in global supplies of papayas in 2020, at a total quantity of 96 000 t, following growth in exports of more than 115% from 2019. Mexico, the largest global exporter of papayas, meanwhile expanded shipments by an estimated 4.6% in 2020, to approximately 170 000 t. Virtually 99% of Mexican papaya supplies are exported to the United States, which accordingly ranks as the largest importer of papaya globally, at an estimated import quantity of 180 000 t in 2020, an increase of 1.1% from 2019. Imports by the European Union, meanwhile, declined by an estimated 4% in 2020, to approximately 35 000 t, in light of the COVID-19-induced disruptions to international air transport, which proved particularly detrimental to the long-distance shipment of highly perishable papayas.

Projection highlights

Global papaya production is projected to rise by 2.5% p.a., to 18 Mt in 2030. The strongest growth is expected to be experienced in Asia, the leading producing region globally. Asia's share of world production is set to rise to 60% by 2030. The world's largest producer, India, is projected to increase its papaya production at a rate of 3.0% p.a., thereby expanding its share of global output to 49% by 2030. Income and population growth will be the main factors behind this rise, with Indian per capita consumption of papayas expected to reach 5.9 kg in 2030, up from 4.5 kg in the base period. Global exports will predominantly be shaped by production expansion in Mexico, the largest global exporter of papayas, and higher demand from the key importers, the United States and the European Union. However, a major obstacle to a significant expansion in international trade remains the fruit's high perishability and sensitivity in transport, which makes produce problematic to supply to far afield destinations. Innovations in cold chain, packaging and transport technologies promise to facilitate a broader distribution of papaya, particularly in view of rising consumer demand for tropical fruits in import markets.

Figure 11.4. World major tropical fruit outlook: Global exports



Source: FAO (2021). FAOSTAT Trade Indices Database, <http://www.fao.org/faostat/en/#data/TI>; OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

StatLink  <https://stat.link/54jsrd>

11.3.8. Uncertainties

Beyond the impact of COVID-19, several significant threats to global production, trade and consumption of bananas and major tropical fruits are present. The effects of global warming are resulting in a higher occurrence of droughts, floods, hurricanes and other natural disasters, which render the production of bananas and major tropical fruits increasingly difficult and costly. Given the perishable nature of tropical

fruits in production, trade and distribution, environmental challenges and insufficient infrastructure continue to jeopardise production and supply to international markets. This is a particularly acute difficulty since the vast majority of tropical fruits are produced in remote, informal settings, where cultivation is highly dependent on rainfall, prone to the adverse effects of increasingly erratic weather events and disconnected from major transport routes.

In the face of rising temperatures, more rapid and more severe spreads of plant pests and diseases are additionally being observed, as for example is the case with the plant fungus Banana Fusarium Wilt. The currently expanding strain of the disease, described as Tropical Race 4 (TR4), poses particularly high risks to global banana supplies as it can affect a much broader range of banana and plantain cultivars than other strains of Fusarium wilt. Furthermore, despite some recent breakthroughs in the engineering of resistant varieties, no effective fungicide or other eradication method is currently available. According to official information, TR4 is currently confirmed in 23 countries, predominantly in South and Southeast Asia, but also in the Middle East and Latin America, with Colombia reporting the first infection in August 2019 and Peru in April 2021. A recently conducted assessment of the potential economic impact of the TR4 disease on global banana production and trade showed that a further spread of TR4 would, *inter alia*, entail considerable loss of income and employment in the banana sector in the affected countries, as well as significantly higher consumer costs in importing countries, at varying degrees contingent on the actual spread of the disease.⁴ Appropriate re-specifications of the model could similarly be employed to investigate the effects of climate-driven changes on global tropical fruit area, changes in actual and attainable yields, as well as the impact of increased frequencies of extreme weather events on production and trade.

Notes

¹ Pulses types: dry beans, dry broad beans, dry peas, chickpeas, cow peas, pigeon peas, lentils, Bambara beans, vetches, lupines and minor pulses (not elsewhere specified).

² For example, in France, the largest avocado consuming country in the European Union, one-third of total avocado supply is reported to be consumed out of the home (www.fruitrop.com/en/Articles-by-subject/Direct-from-themarkets/2020/The-impact-of-covid-19-measures-on-fruit-and-vegetablesdistribution-in-France).

³ International commodity classification schemes for production and trade do not require countries to report the fruits within this cluster separately, thus official data remain sparse. It is estimated that, on average, mango accounts for approximately 75% of total production quantity, guava for 15%, and mangosteen for the remaining 10%.

⁴ An alternative simulation was run in 2019 to assess the potential economic impact of the Banana Fusarium Wilt Tropical Race 4 disease on global banana production and trade. The results of this scenario were published in the November 2019 issue of FAO's biannual publication, *Food Outlook* (<http://www.fao.org/3/CA6911EN/CA6911EN.pdf>).

Table C.45. Roots and tubers projections: Production and food consumption

Calendar year

	PRODUCTION (kt)		Growth (%) ⁴		FOOD CONSUMPTION (kg/cap)		Growth (%) ⁴	
	Average 2018-20est	2030	2011-20	2021-30	Average 2018-20est	2030	2011-20	2021-30
WORLD	236 758	278 679	2.10	1.53	16.3	17.4	0.59	0.62
NORTH AMERICA	5 566	5 816	0.94	0.28	12.6	12.3	0.46	-0.31
Canada	961	1 005	0.95	0.32	16.7	16.2	1.65	-0.47
United States	4 605	4 811	0.94	0.27	12.1	11.9	0.28	-0.30
LATIN AMERICA	14 026	15 143	-0.35	0.81	12.2	12.5	-0.52	0.23
Argentina	619	692	0.92	0.95	9.4	9.4	-0.75	0.01
Brazil	6 062	5 577	-3.74	-0.49	12.0	11.0	-3.97	-0.51
Chile	281	299	0.77	0.73	14.0	15.4	1.11	0.77
Colombia	1 381	1 660	3.50	1.50	22.2	23.1	2.13	0.23
Mexico	402	451	0.51	0.94	3.4	3.4	-0.28	0.02
Paraguay	1 018	1 177	5.47	1.29	40.5	36.3	-0.07	-1.09
Peru	1 696	2 099	3.15	1.98	33.8	38.5	2.10	1.14
EUROPE	27 087	28 388	1.07	0.47	17.8	17.6	0.00	-0.07
European Union ¹	11 787	12 213	0.62	0.17	13.6	12.6	-1.27	-0.58
United Kingdom	1 172	1 277	0.80	0.80	24.7	25.6	1.48	0.27
Russia	7 214	7 315	2.20	0.51	24.7	26.4	1.42	0.51
Ukraine	5 317	5 955	1.87	1.04	28.7	30.0	1.14	0.44
AFRICA	91 504	114 495	2.83	2.16	39.4	40.1	0.36	0.31
Egypt	1 170	1 505	2.27	2.45	8.2	9.3	0.50	1.20
Ethiopia	2 486	3 467	4.32	3.16	18.6	20.2	0.85	0.90
Nigeria	32 546	41 105	2.77	2.08	69.2	71.9	0.50	0.30
South Africa	497	584	1.21	0.99	5.9	6.2	-1.23	0.37
ASIA	97 472	113 550	2.23	1.36	10.4	10.7	0.32	0.24
China ²	43 497	46 973	1.53	0.57	15.3	15.3	-0.08	0.02
India	13 776	17 645	2.85	2.21	7.2	8.1	1.10	0.95
Indonesia	9 600	11 765	2.37	1.81	19.0	19.1	1.35	-0.21
Iran	976	1 141	0.30	1.42	10.1	10.8	-0.70	0.63
Japan	733	711	-1.44	-0.13	6.3	6.2	-0.76	0.02
Kazakhstan	799	970	3.30	1.65	22.7	25.3	0.79	1.02
Korea	268	263	3.59	-0.42	5.3	5.4	3.99	-0.01
Malaysia	39	45	5.38	1.70	3.7	3.3	1.87	-1.03
Pakistan	1 056	1 379	3.38	2.47	3.7	4.3	1.14	1.56
Philippines	1 070	1 247	2.97	1.48	9.7	9.3	1.43	-0.58
Saudi Arabia	78	70	-1.03	-0.95	4.8	5.3	6.71	0.97
Thailand	10 958	13 273	4.38	1.87	5.4	5.8	0.00	0.63
Turkey	752	738	-2.34	-0.12	6.7	5.9	-4.93	-1.00
Viet Nam	4 159	5 323	3.01	2.26	3.9	3.7	0.12	-0.88
OCEANIA	1 102	1 286	1.20	1.37	22.3	22.7	-0.54	0.16
Australia	249	277	-0.34	0.48	10.1	9.2	-1.67	-0.85
New Zealand	138	146	2.85	0.49	11.9	12.6	-0.02	0.56
DEVELOPED COUNTRIES	36 714	38 885	1.07	0.53	14.4	14.3	-0.01	-0.12
DEVELOPING COUNTRIES	200 043	239 794	2.30	1.70	16.8	18.0	0.70	0.72
LEAST DEVELOPED COUNTRIES (LDC)	44 948	55 735	2.82	2.28	31.8	32.3	0.69	0.44
OECD³	22 997	24 139	0.67	0.32	11.7	11.3	-0.36	-0.29
BRICS	71 045	78 095	1.28	0.84	11.9	12.1	-0.10	0.16

Note: Calendar year. Average 2018-20est: Data for 2020 are estimated. Production and consumption are expressed on dry weight basis.

1. Refers to all current European Union member States (excludes the United Kingdom)
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland and Costa Rica but includes all EU member countries.
4. Least-squares growth rate (see glossary).

Source: OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database). dx.doi.org/10.1787/agr-outl-data-en

Table C.46. Pulses projections : Production and food consumption

Calendar year

	PRODUCTION (kt)		Growth (%) ⁴		FOOD CONSUMPTION (kg/cap)		Growth (%) ⁴	
	Average 2018-20est	2030	2011-20	2021-30	Average 2018-20est	2030	2011-20	2021-30
WORLD	89 184	111 013	2.99	2.02	7.9	9.1	1.80	1.29
NORTH AMERICA	10 582	12 798	4.68	1.69	6.0	7.3	4.02	1.82
Canada	7 774	9 195	4.56	1.45	15.3	17.3	3.90	1.01
United States	2 808	3 602	5.23	2.33	4.9	6.2	4.01	2.05
LATIN AMERICA	8 293	9 470	2.87	1.39	11.5	12.2	1.00	0.53
Argentina	826	1 005	8.69	1.72	0.9	1.1	11.58	1.65
Brazil	3 111	3 337	0.00	0.84	16.2	17.0	-0.10	0.48
Chile	76	89	2.35	1.24	4.9	5.5	4.05	0.97
Colombia	216	244	1.49	1.32	6.7	7.0	-0.28	0.34
Mexico	1 980	2 241	7.31	1.39	10.8	11.2	3.90	-0.01
Paraguay	91	109	4.78	1.47	11.1	11.6	3.87	0.25
Peru	310	336	2.52	1.03	9.7	10.9	2.05	1.00
EUROPE	8 390	11 025	3.78	2.66	3.6	5.0	3.08	2.72
European Union ¹	4 191	6 148	6.88	3.87	4.4	6.6	3.85	3.35
United Kingdom	533	583	1.54	0.77	3.9	4.0	4.40	0.09
Russia	2 660	3 222	1.65	1.67	1.9	2.1	0.57	1.18
Ukraine	362	389	-2.99	0.86	1.4	1.3	-1.25	-0.49
AFRICA	19 577	24 716	2.97	2.19	11.5	12.0	0.48	0.44
Egypt	267	295	-0.23	1.11	5.5	6.0	0.61	0.72
Ethiopia	2 064	2 612	-0.05	2.41	14.5	16.3	-2.46	1.59
Nigeria	3 600	4 887	5.34	2.78	12.6	14.0	2.43	0.92
South Africa	94	144	3.83	4.18	1.9	1.7	-4.18	-0.93
ASIA	39 640	49 708	2.61	2.05	7.3	8.6	2.00	1.43
China ²	4 786	5 270	0.76	0.91	1.5	1.9	2.13	1.98
India	21 871	28 507	3.15	2.31	15.8	18.5	1.91	1.39
Indonesia	190	214	-5.16	2.72	1.1	1.0	-2.05	-1.07
Iran	1 024	1 198	3.21	1.85	11.5	13.0	1.38	1.07
Japan	81	86	0.14	0.91	1.5	1.6	-2.02	0.53
Kazakhstan	69	90	-1.57	2.31	0.5	0.6	-5.45	1.01
Korea	22	31	6.24	3.10	1.4	1.4	0.58	0.03
Malaysia	0	0	3.5	3.7	1.51	0.45
Pakistan	1 279	1 412	6.71	1.43	6.7	6.4	1.85	-0.26
Philippines	77	93	1.87	1.83	1.3	1.2	-2.00	-0.73
Saudi Arabia	17	14	3.28	-0.93	6.2	6.9	0.92	1.00
Thailand	245	268	1.93	0.92	3.9	3.9	5.11	-0.21
Turkey	1 501	1 822	2.53	1.76	14.1	14.0	1.15	-0.29
Viet Nam	332	383	1.04	1.86	3.2	3.4	0.29	1.32
OCEANIA	2 703	3 297	1.11	1.53	2.1	2.4	3.21	1.19
Australia	2 657	3 245	1.10	1.53	1.6	1.9	5.55	1.40
New Zealand	31	33	1.18	0.54	4.1	4.5	0.43	0.84
DEVELOPED COUNTRIES	22 248	27 832	3.74	2.05	3.8	4.9	3.00	2.19
DEVELOPING COUNTRIES	66 936	83 181	2.74	2.01	8.8	10.0	1.58	1.12
LEAST DEVELOPED COUNTRIES (LDC)	18 029	22 610	3.00	2.07	11.9	12.4	1.50	0.44
OECD³	21 950	27 410	4.41	2.07	5.6	6.9	3.20	1.59
BRICS	32 522	40 481	2.31	1.94	8.6	10.2	1.84	1.59

.. Not available

Note: Calendar year. Average 2018-20est: Data for 2020 are estimated. Production and consumption are expressed on dry weight basis.

1. Refers to all current European Union member States (excludes the United Kingdom)
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
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Source: OECD/FAO (2021), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database). dx.doi.org/10.1787/agr-outl-data-en