OECD-FAO Agricultural Outlook 2018-2027

SPECIAL FOCUS: MIDDLE EAST AND NORTH AFRICA

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2018-2027

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Foreword

The Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO) have come together for the 14th year to prepare the *OECD-FAO Agricultural Outlook 2018-2027*. This report is enriched by our close collaboration with contributing member country institutions, specialised commodity bodies, and other partner organisations, and has become an annual benchmark that provides a consistent picture of medium-term trends in global agriculture.

By bringing together evidence-based market and policy information from experts across a wide range of countries, the OECD and FAO are supporting our Members in the pursuit of their shared global priorities. This is particularly the case for the Sustainable Development Goals (SDGs), which aim to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture by 2030. Our joint work on agricultural market projections helps to identify and assess opportunities and threats related to the SDG targets and to the commitments made in the UN Framework Convention on Climate Change's 2015 Paris Agreement. Agriculture not only contributes to climate change (the sector still accounts for more than a fifth of all greenhouse gas emissions), but will also be impacted by climate change. So it is fundamental to promote the adaptation of agricultural sectors through sustainable practices that can also mitigate the impacts of climate change.

Global agro-food trade will also play an increasingly important role in ensuring food security, especially for import-dependent regions. An enabling trade policy environment is a crucial condition to achieve the SDGs and make progress towards zero hunger, particularly in the context of climate change. Building on these efforts, Agriculture Ministers convened at the OECD in 2016 and adopted a Declaration on Better Polices to Achieve a Productive, Sustainable and Resilient Global Food System, which places a high priority on policies that underpin competitive, sustainable, productive and resilient farm and food businesses.

This year's edition of the *Agricultural Outlook* includes a special chapter on the Middle East and North Africa (MENA), a region where conflict and political instability have amplified issues of food insecurity and malnutrition. The need for the region to address these challenges, with limited land and water resources, will be further compounded by the expected impact of more frequent extreme climate-related events. We need to improve the resilience and sustainability of food systems in times of conflict, to valorise resources which are becoming ever more fragile and scarce.

Our partners in the G20 and G7 likewise continue to prioritise food security and agricultural issues on their policy agendas. Along with the *Agricultural Outlook*, the Agricultural Market Information System (AMIS) is part of our wider efforts to provide timely market information to policy makers and global stakeholders. It represents a vital tool that enhances transparency and helps to prevent unexpected price hikes by co-ordinating policy action. AMIS was championed by the G20 and is housed at the FAO with support by numerous international organisations like the OECD.

The challenges we face today cannot be tackled alone. We hope that our collaborative effort on this annual publication will continue to provide governments and all other stakeholders with the evidence base they need to achieve the ambitious and important goals we must meet together.

Angel Gurría
Secretary-General
Organisation for Economic
Co-operation and Development

José Graziano da Silva
Director-General
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The *Agricultural Outlook 2018-2027* is a collaborative effort of the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) of the United Nations. It brings together the commodity, policy and country expertise of both organisations and input from collaborating member countries to provide an annual assessment of prospects for the coming decade of national, regional and global agricultural commodity markets. The baseline projection is not a forecast about the future, but rather a plausible scenario based on specific assumptions regarding the macroeconomic conditions, the agriculture and trade policy settings, weather conditions, longer term productivity trends and international market developments.

The *Agricultural Outlook* is prepared jointly by the OECD and FAO Secretariats.

At the OECD, the baseline projections and *Outlook* report were prepared by members of the Trade and Agriculture Directorate: Marcel Adenäuer, Jonathan Brooks (Head of Division), Koen Deconinck, Annelies Deuss, Armelle Elasri (publication co-ordinator), Gen Furuhashi, Hubertus Gay (Outlook co-ordinator), Céline Giner, Gaëlle Gouarin, Claude Nenert, Arnaud Pincet and Grégoire Tallard of the Agro-Food Trade and Markets Division, and for fish and seafood by James Innes of the Natural Resources Policy Division. Michael Ryan provided input for the antimicrobial resistance box. The OECD Secretariat is grateful for the contributions provided by visiting experts Joanna Hitchner (United States Department of Agriculture), Roel Jongeneel (Wageningen Economic Research, the Netherlands) and Yu Wen (Chinese Academy of Agricultural Sciences). The partial stochastic modelling builds on work by the Economics of Agriculture Unit of the European Commission's Joint Research Centre, namely Sergio René Araujo Enciso, Simone Pieralli, Thomas Chatzopoulos and Ignacio Pérez Domínguez. The organisation of meetings and publication preparation were provided by Kelsey Burns, Helen Maguire and Michèle Patterson. Technical assistance in the preparation of the *Outlook* database was provided by Eric Espinasse and Frano Ilicic. Many other colleagues in the OECD Secretariat and member country delegations provided useful comments on earlier drafts of the report.

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The complete *Agricultural Outlook*, including the fully documented *Outlook* database, including historical data and projections, can be accessed through the OECD-FAO joint internet site: www.agri-outlook.org. The published *Agricultural Outlook 2018-2027* is contained in the OECD's iLibrary.

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Acronyms and abbreviations

ACP	African Caribbean and Pacific countries
AI	Avian Influenza
AEU	Additional ethanol use
AMIS	Agricultural Market Information System
AMR	Antimicrobial resistance
ARC	Agricultural Risk Coverage (US Farm Bill Instrument)
ASF	African Swine Fever
bln	Billion
bln L	Billion litres
BRIC	Emerging economies of Brazil, Russian Federation, India and China
BRICS	Emerging economies of Brazil, Russian Federation, India, China and South Africa
BRIICS	Emerging economies of Brazil, Russian Federation, India, Indonesia, China and South Africa
bln t	Billion tonnes
CAP	Common Agricultural Policy (European Union)
CFP	Common Fisheries Policy (European Union)
CETA	Comprehensive Economic and Trade Agreement
ChAFTA	China-Australia Free Trade Agreement
CIF	Cost, insurance and freight
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
CPIF	Consumer Price Index for Food
CPTPP	Trans-Pacific Partnership
CRP	Conservation Reserve Program (United States)
cts/lb	Cents per pound
CVD	Countervailing duty
c.w.e.	Carcass weight equivalent
DDGs	Dried Distiller's Grains
dw	Dry weight
dwt	Dressed weight
EBA	Everything-But-Arms Initiative (European Union)
EISA	Energy Independence and Security Act of 2007 (United States)
El Niño	Climatic condition associated with the temperature of major sea currents
EMEs	Emerging Market Economies
EPA	US Environmental Protection Agency
EPAs	Economic Partnership Agreements
ERS	Economic Research Service of the US Department for Agriculture
ESCWA	United Nations Economic and Social Commission for Western Asia
est	Estimate
EU	European Union
EU15	Fifteen member states that joined the European Union before 2004
EU28	Twenty eight member states of the European Union
FAO	Food and Agriculture Organization of the United Nations
FDP	Fresh dairy products

FDI	Foreign direct investment
FFV	Flex-fuel Vehicles
FOB	Free on board (export price)
FMD	Foot and Mouth Disease
FTA	Free Trade Agreement
G-20	Group of 20 important developed and developing economies (see Glossary)
GCC	Gulf Co-operation Council
GDP	Gross domestic product
GDPD	Gross domestic product deflator
GHG	Greenhouse gas
GIEWS	Global Information and Early Warning System on Food and Agriculture
GM	Genetically modified
GVCs	Global value chains
ha	Hectares
HFCS	High fructose corn syrup
hl	Hectolitre
IEA	International Energy Agency
IFA	International Fertilizer Association
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGC	International Grains Council
ILUC	Indirect Land Use Change
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IUU	Illegal, unreported and unregulated (fishing)
kg	Kilogrammes
kha	Thousand hectares
kt	Thousand tonnes
La Niña	Climatic condition part of El Niño-Southern Oscillation (see Glossary)
LAC	Latin America and the Caribbean
lb	Pound (weight)
LDCs	Least Developed Countries
LED	Light-emitting diode
lw	Live weight
MBM	Meat and bone meal
MDGs	Millennium Development Goals
MENA	Middle East and North Africa
MERCOSUR	Mercado Común del Sur / Common Market of South America
MFA	Multi-fibre Arrangement
Mha	Million hectares
Mn	Million
Mn L	Million litres
MPS	Market Price Support
Mt	Million tonnes
NAFTA	North American Free Trade Agreement
NCDs	Non-communicable diseases
NRA	Nominal rate of assistance
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
OLS	Ordinary Least Squares
OPEC	Organization of Petroleum Exporting Countries
p.a.	Per annum
PCE	Private consumption expenditure

PEDv	Porcine Epidemic Diarrhoea virus
PLC	Price Loss Coverage (US Farm Bill instrument)
PoU	Prevalence of Undernourishment
PPI	Producer Price Index
PPP	Purchasing power parity
PSE	Producer Support Estimate
R&D	Research and development
RED	Renewable Energy Directive in the European Union
RFS / RFS2	Renewable Fuels Standard in the United States, part of the Energy Policy Act
RIN	Renewable Identification Numbers prices
rse	Raw sugar equivalent
RTA	Regional Trade Agreements
r.t.c.	Ready to cook
r.w.e.	Retail weight equivalent
SDG	Sustainable Development Goals
SFP	Single Farm Payment (European Union)
SMP	Skim milk powder
SPS	Single payment scheme (European Union)
SSA	Sub-Saharan Africa
SSR	Self-sufficiency Ratio
t	Tonnes
t/ha	Tonnes/hectare
TFP	Total Factor Productivity
TPP	Trans-Pacific Partnership
tq	Tel quel basis (sugar)
TRQ	Tariff rate quota
UN	The United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
URAA	Uruguay Round Agreement on Agriculture
US	United States
USDA	United States Department of Agriculture
VIFEP	Vietnam Institute of Fisheries and Economic Planning
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization
WITS	World Integrated Trade Solution
WMP	Whole milk powder
wse	White sugar equivalent
WTO	World Trade Organization
WWF	World Wide Fund for Nature

Currencies

ARS	Argentinean peso
AUD	Australian dollars
BDT	Bangladeshi taka
BRL	Brazilian real
CAD	Canadian dollar
CLP	Chilean peso
CNY	Chinese yuan renminbi

DZD	Algerian dinar
EGP	Egyptian pound
EUR	Euro (Europe)
IDR	Indonesian rupiah
INR	Indian rupees
JPY	Japanese yen
KRW	Korean won
MXN	Mexican peso
MYR	Malaysian ringgit
NZD	New Zealand dollar
PKR	Pakistani rupee
RUB	Russian ruble
SAR	Saudi riyal
THB	Thai baht
TRL	Turkish lira
UAH	Ukrainian grivna
USD	US dollar
UYU	Uruguayan peso
ZAR	South African rand

Executive Summary

The *Agricultural Outlook 2018-2027* is a collaborative effort of the OECD and FAO prepared with input from the experts of their member governments and from specialist commodity organisations. It provides a consensus assessment of the ten-year prospects for agricultural and fish commodity markets at national, regional and global levels. This year's edition contains a special chapter on the prospects and challenges of agriculture and fisheries in the Middle East and North Africa.

A decade after the food price spikes of 2007-8, conditions on world agricultural markets are very different. Production has grown strongly across commodities, and in 2017 reached record levels for most cereals, meat types, dairy products, and fish, while cereal stock levels climbed to all-time highs. At the same time, demand growth has started to weaken. Much of the impetus to demand over the past decade came from rising per capita incomes in the People's Republic of China (hereafter "China"), which stimulated the country's demand for meat, fish and animal feed. This source of demand growth is decelerating, yet new sources of global demand are not sufficient to maintain overall growth. As a result, prices of agricultural commodities are expected to remain low. Current high stock levels also make a rebound unlikely within the next few years.

The weakening of demand growth is expected to persist over the coming decade. Population will be the main driver of consumption growth for most commodities, even though the rate of population growth is forecast to decline. Moreover, per capita consumption of many commodities is expected to be flat at a global level. This is notable for staple foods such as cereals and roots and tubers, where consumption levels are close to saturation levels in many countries. By contrast, demand growth for meat products is slowing due to regional variation in preferences and disposable income constraints, while demand for animal products such as dairy is set to expand faster in the coming decade.

For cereals and oilseeds, the foremost source of demand growth will be feed, closely followed by food. A large share of additional feed demand will continue to come from China. Feed demand growth is nevertheless projected to slow globally, despite livestock production intensification. Much of the additional food demand will originate in regions with high population growth such as Sub-Saharan Africa, India, and the Middle East and North Africa.

The demand for cereals, vegetable oil and sugar cane as inputs into the production of biofuels is expected to grow much more modestly than in the last decade. Whereas in the past decade the expansion of biofuels led to more than 120 Mt of additional cereals demand, predominately maize, this growth is expected to be essentially zero over the *Outlook* period. In developed countries, existing policies are not likely to support much further expansion. Future demand growth will therefore come predominantly from developing countries, several of which have introduced policies favouring biofuels use.

The exceptions to the broad pattern of slowing per capita demand growth come from sugar and vegetable oils. The per capita intake of sugar and vegetable oil is expected to increase in the developing world, as urbanisation in developing countries leads to a greater demand for processed and convenience foods. Changes in levels of food consumption and the composition of diets imply that the “triple burden” of undernourishment, over-nourishment and malnutrition will persist in developing countries.

Global agricultural and fish production is projected to grow by around 20% over the coming decade, but with considerable variation across regions. Strong growth is expected in Sub-Saharan Africa, South and East Asia, and the Middle East and North Africa. By contrast, production growth in the developed world is expected to be much lower, especially in Western Europe. The growth in production will be achieved primarily from intensification and efficiency gains and partially from an enlargement of the production base through herd expansion and the conversion of pasture to cropland.

With slower consumption and production growth, agriculture and fish trade is projected to grow at about half the rate of the previous decade. Net exports will tend to increase from land abundant countries and regions, notably in the Americas. Countries with high population densities or high population growth, in particular in the Middle East and North Africa, Sub-Saharan Africa and in Asia, will see rising net imports.

For nearly all agricultural products, exports are projected to remain concentrated among stable groups of key supplying countries. A notable change is the emerging presence of the Russian Federation and Ukraine on world cereal markets, which is expected to persist. The high concentration of export markets may increase the susceptibility of world markets to supply shocks, stemming from natural and policy factors.

As a baseline projection, the *Agricultural Outlook 2018-2027* assumes policies currently in place will continue into the future. Beyond the traditional risks that affect agricultural markets, there are increasing uncertainties with respect to agricultural trade policies and concerns about the possibility of rising protectionism globally. Agricultural trade plays an important role in ensuring food security, underscoring the need for an enabling trade policy environment.

Middle East and North Africa

This year’s special chapter focuses on the Middle East and North Africa, where rising food demand and limited land and water resources lead to rising import dependence for basic food commodities. Many countries spend a large share of their export earnings on food imports. Food security is threatened by conflict and political instability.

The region’s agriculture and fish production is projected to increase about 1.5% p.a., mainly through productivity improvements. Policies in the region support grain production and consumption, with the result that 65% of cropland is planted with water-thirsty cereals, in particular wheat, which accounts for a large share of calorie intake. Diets are projected to remain high in cereals and sugar, with low protein intake from animal sources.

An alternative approach to food security would reorient policies away from supporting cereals towards rural development, poverty reduction and support for production of higher-value horticulture products. Such a change would also contribute to more diversified and healthier diets.

Chapter 1. Overview

This chapter provides an overview of the latest set of quantitative medium-term projections for global and national agricultural markets. The projections cover consumption, production, stocks, trade and prices for 25 agricultural products for the period 2018 to 2027. The weakening of demand growth is expected to persist over the coming decade. Population will be the main driver of consumption growth for most commodities, even though the rate of population growth is forecast to decline. Per capita consumption of many commodities is expected to be flat at a global level. Consequently, the slower growing demand for agricultural commodities is projected to be matched by efficiency gains in production which will keep real agricultural prices relatively flat. Beyond the traditional risks that affect agricultural markets, there are increasing uncertainties with respect to agricultural trade policies and concerns about the possibility of rising protectionism globally

Introduction

The *Agricultural Outlook* presents a baseline scenario for the evolution of agricultural and fish commodity markets at national, regional and global levels over the coming decade (2018-2027). The projections rely on input from country and commodity experts and from the OECD-FAO Aglink-Cosimo model of global agricultural markets. This economic model is also used to ensure the consistency of baseline projections.

The projections are influenced both by current market conditions and by assumptions on the macro-economic, demographic and policy environment. These assumptions are detailed at the end of this chapter (Box 1.6) and in the commodity chapters. The sensitivity of the *Outlook* to these assumptions is discussed later in the chapter.

For the coming decade, economic growth of 1.8% per annum is expected for OECD countries, broadly the same pace as over the last decade (1.7% p.a.). Growth is projected to slow for the People's Republic of China (hereafter "China") but accelerate in India compared with the past decade. Following the strong increase in 2017, nominal oil prices are expected to increase at an average rate of 1.8% per year over the outlook period, from an average price of USD 43.7 per barrel in 2016 to USD 76.1 per barrel by 2027.

The *Outlook* assumes current policy settings continue into the future. In particular, the decision of the United Kingdom to leave the European Union is not included in the projections as the terms of departure have not yet been determined. Projections for the United Kingdom are therefore retained within the European Union aggregate.

Current market conditions for the different commodities included in the *Outlook* are summarised in Figure 1.1, which shows the evolution of production and prices during the base period (2015-17) compared to average levels over the past decade. For most cereals, meat types, dairy products and fish, 2017 production levels exceeded even the high levels recorded last year.

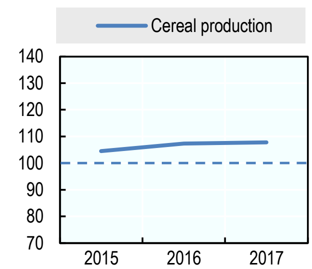
Despite a global economic recovery and higher oil prices, prices for most agricultural commodities did not change much in 2017 compared to the previous year, except for dairy and sugar. Dairy markets were in flux, with low prices in 2016 followed by a recovery in 2017 and a 65% spike in butter prices in the first half of the year which eventually came back down by the end of the year. The recovery of sugar production after two years of shortage contributed to a decline in prices.

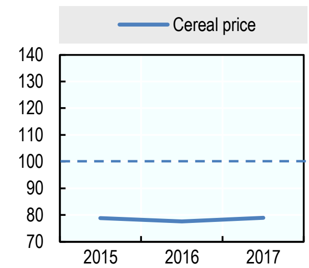
These current market conditions form the backdrop for the ten-year projections of consumption, production, trade and prices presented in the next sections.

Figure 1.1. Market conditions for key commodities

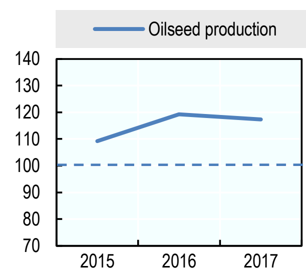
Current market conditions	Production Index Average 2008-2017 = 100	Nominal Price Index Average 2008-2017 = 100

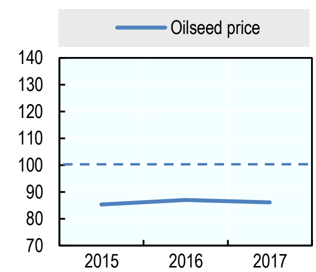
Cereals: World production reached a new record in 2017, as maize and rice output levels surpassed historical levels. Global supplies have exceeded demand for several years, resulting in a significant build-up of inventories and low prices.



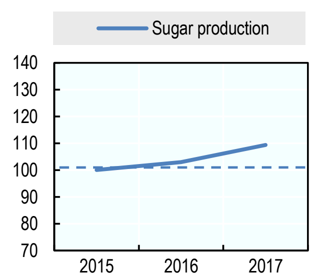


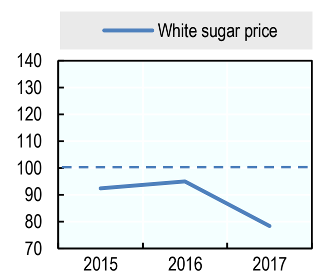
Oilseeds: Soybean production declined slightly in the 2017 marketing year, although aggregate production of other oilseeds remained stable. Demand growth for protein meals was lower than in 2016. Overall, there were no major disruptions.



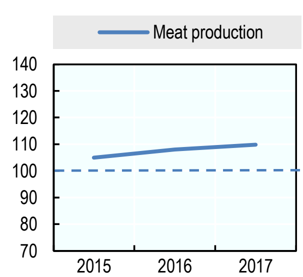


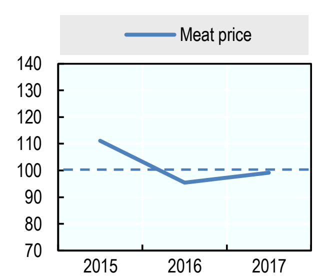
Sugar: After two years of supply shortage, production in 2017 rose and was close to the 2012 record. Sugar prices fell after having increased strongly in 2016. The growth in demand increased in countries with low per capita consumption. Global import demand continued to decline, in part as demand from China waned.



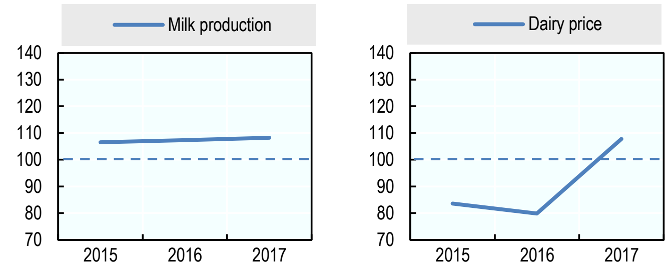


Meat: World meat production increased by 1.2% in 2017. Much of the increase in production originated in the United States, but other main contributors to growth include Argentina, China, India, Mexico, the Russian Federation and Turkey. After declining in 2016, international meat prices increased by 9% in 2017 (as measured by the FAO Meat Price Index), as import demand grew. The highest price increase was noted for sheep meat.

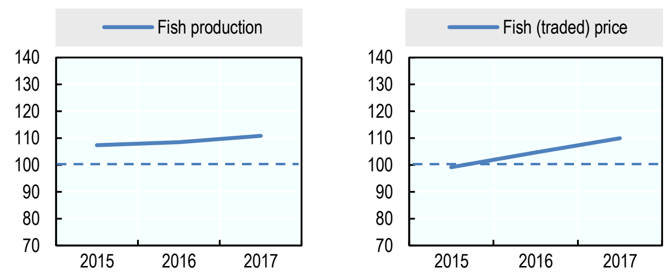




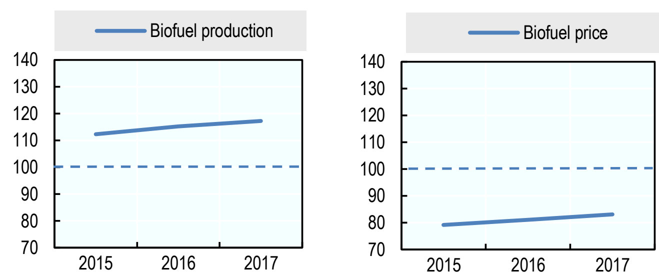
Dairy: Global dairy markets experienced strong price increases in 2017. After an initial increase of 65% in the first half of the year, butter prices came back down by the end of 2017. The price of whole milk powder increased by 46%; the price of skim milk powder, by contrast, only increased by 3%. World production experienced a modest growth of 0.5%, below the average growth rate of the last decade.



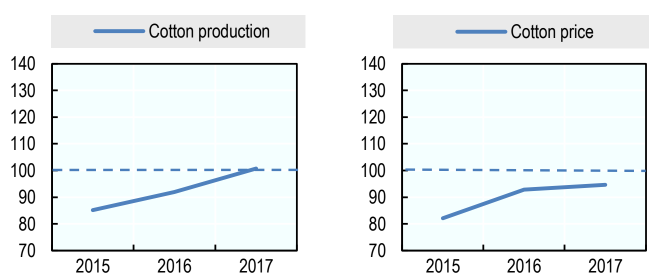
Fish: Production grew faster than in 2016, as catches of anchoveta in South America recovered while aquaculture continued to grow at 4% per year. As in recent years, aquaculture was responsible for most of the growth in production. Despite these higher production levels, fish prices increased globally as improving economic conditions stimulated demand.



Biofuels: Demand for biofuels was sustained by obligatory blending and by higher demand for fuel due to relatively low energy prices, despite increasing crude oil prices in 2017. Several countries announced policy decisions to stimulate demand for biofuels in 2017. Prices for ethanol and biodiesel diverged: ethanol prices fell by 2.3% while biodiesel prices increased by 8%.



Cotton: Production continued to recover from the strong drop in 2015, growing by around 9%. Production increased in almost all major cotton producing countries except for China. Despite an increase in world demand, global stocks grew and remained at a high level of almost nine months of world utilisation.



Note: All graphs expressed as an index where the 2008-2017 average is set to 100. Production refers to global production volumes; price indices are weighted by the average global production value in the preceding decade as measured at international prices. More information on market conditions and evolutions by commodity can be found in the commodity snapshot tables in the Annex and the online commodity chapters.
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/10.1787/888933741903

Consumption

Agricultural commodities are consumed mainly as food, feed, and in industrial applications including fuel. Food demand is influenced by population and income growth, and increasingly also by trends in dietary patterns and consumer preferences. Demand for animal feed is closely linked to the human consumption of livestock products, such as meat, eggs and milk, but also by the evolution of livestock production technology. Industrial uses of agricultural commodities (mostly as biofuel and as input in the chemical industry) are shaped by general economic conditions, as well as regulatory policies and technological advances. Moreover, the relative importance of each use varies by commodity, by region, and by level of economic development.

Over the last ten years, agricultural markets experienced a strong increase in demand across a wide range of commodities. Much of that growth was attributable to non-food uses of agricultural commodities, mostly feedstock for biofuel and animal feed. While food demand stagnated in the developed world, biofuel mandates led to increased demand for maize, sugarcane and vegetable oils as feedstock. In parallel, rising incomes in China and other emerging economies raised demand for meat. This in turn drove an intensification of livestock production which boosted demand for animal feed on global markets. Together, these sources of demand growth contributed to real agricultural prices remaining above the levels seen in the early 2000s, fuelling production growth worldwide.

Biofuels and Chinese demand growth will continue to play a role in global agricultural markets. However, their relevance is diminishing and they are not fully being replaced by new sources of demand growth, whether for food, feed, or fuel uses.

In terms of food demand, per capita consumption of many commodities is expected to be flat at a global level. This is not only expected for staple foods such as cereals and roots and tubers, where consumption levels are close to saturation levels in many countries, but also for meat. Some low-income regions which currently have low per capita consumption levels of meat, such as Sub-Saharan Africa, are not expected to increase these levels significantly due to a lack of sufficient income growth. Some emerging economies, in particular China, have already transitioned to relatively high levels of per capita meat consumption. In India, where income growth is stronger, dietary preferences translate rising incomes into an increased per capita demand for dairy as preferred animal protein, rather than meat.

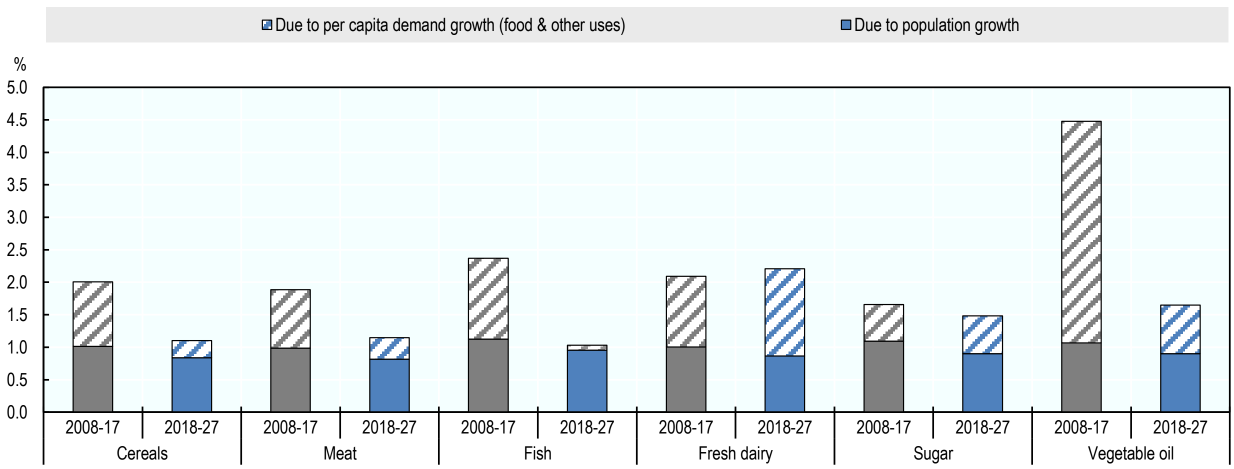
One implication of relatively flat per capita food consumption is that population growth will be the principal determinant of food demand growth, even though global population is projected to grow at a lower rate in the coming decade. The bulk of additional food consumption in the coming decade will originate in regions with high population growth such as Sub-Saharan Africa, India, and the Middle East and North Africa (the focus of Chapter 2). Demand patterns in these regions will increasingly influence international agricultural markets.

The demand for feed, meanwhile, will continue to outpace food demand as livestock production intensifies. A large share of additional feed demand will come from China, as in the previous decade. Yet, compared with the previous decade, demand growth for feed slows down.

Finally, recent developments in biofuel policies combined with the assumption of a relatively moderate increase in the crude oil price suggest a more modest growth in the use of agricultural commodities in the production of biofuels.

As a result of these developments in food, feed, and fuel uses of agricultural commodities, a slower growth in global demand for agricultural commodities is expected in the coming decade (Figure 1.2).

Figure 1.2. Annual growth in demand for key commodity groups, 2008-17 and 2018-27



Note: The population growth component is calculated assuming per capita demand remains constant at the level of the year preceding the decade. Growth rates refer to total demand (for food, feed and other uses).
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

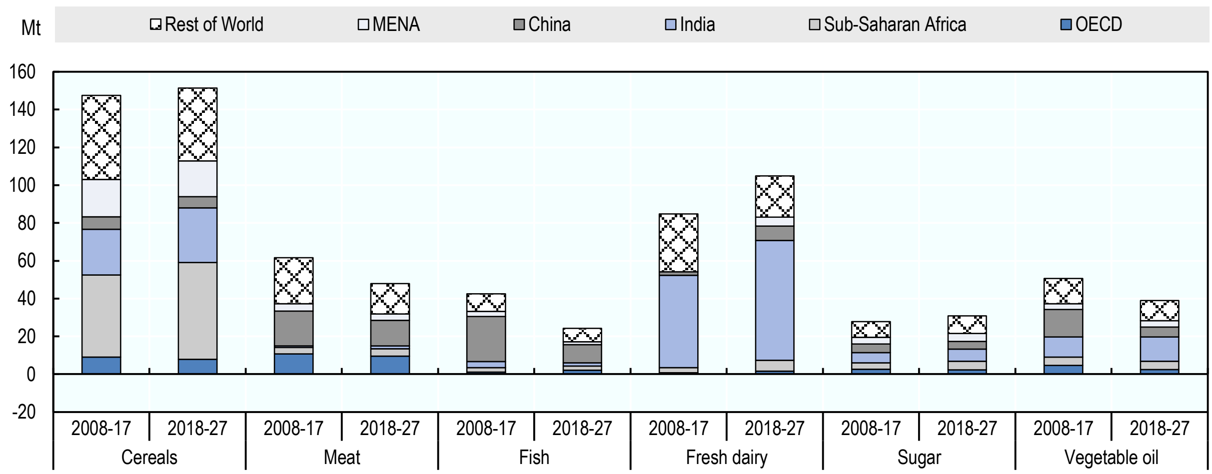
StatLink http://dx.doi.org/10.1787/888933741922

For cereals, meat, fish, and vegetable oil, growth rates are around half their rates in the previous decade. The slowdown is particularly pronounced for vegetable oil, which was the fastest-growing commodity over the past decade, as biofuel policies, industrial uses (for paints, lubricants, detergents, etc.) and a strong growth in food use supported demand. Despite the slowdown, vegetable oil remains one of the fastest growing commodities in the *Outlook*, together with fresh dairy products and sugar.

Food: Population and income growth spurs demand in the developing world

Food consumption will continue to expand due to population growth and higher per capita income for most commodities with the developing world as the source of most demand growth over the coming ten years (Figure 1.3). Sub-Saharan Africa and India will account for a large share of the additional food demand for cereals in the coming decade. Consumption of dairy products and vegetable oil in India will underpin growth in these commodities over the next ten years, while China continues to account for a large share of demand growth for meat and fish.

Figure 1.3. Regional contributions to food demand growth, 2008-17 and 2018-27



Note: Each column shows the increase in global demand over a ten-year period, split by region, for food uses only. MENA stands for Middle East and North Africa, and is defined as in Chapter 2.
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

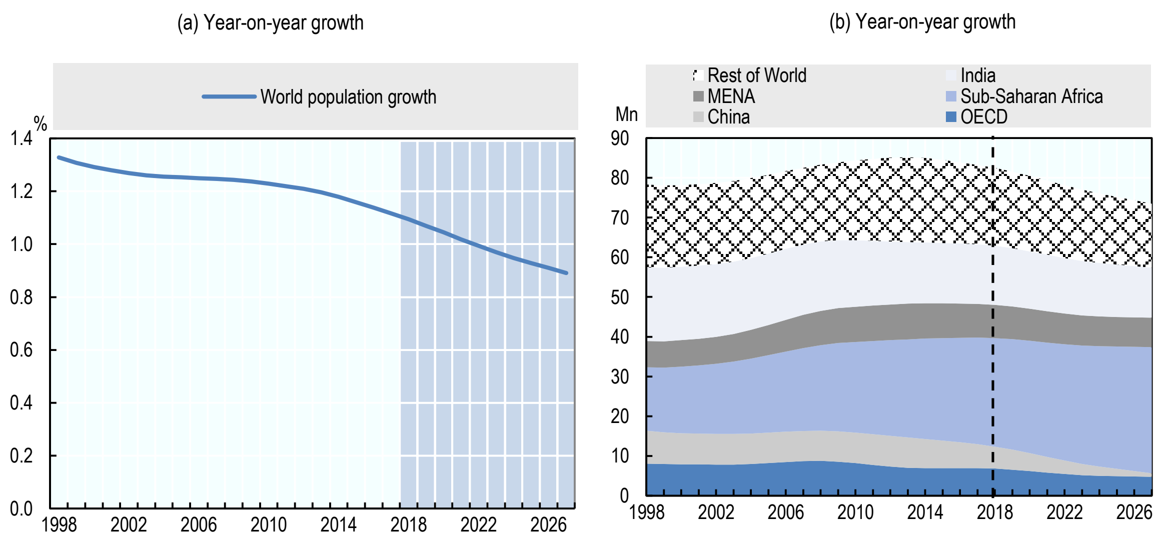
StatLink http://dx.doi.org/ 10.1787/888933741941

The important contribution from Sub-Saharan Africa and India reflects in large measure continued strong population growth in these regions (Figure 1.4). The global population growth rate is expected to fall from 1.1% at present to 0.9% per year in 2027. Since around 2013, growth has also been falling in absolute terms, although world population will still grow by around 74 million people per year by 2027. Most of this growth occurs in Sub-Saharan Africa and India, as well as the Middle East and North Africa. Population growth in Sub-Saharan Africa is accelerating in absolute terms: while the region's population increased by 27 million in 2017, this rate will increase to 32 million extra people per year in 2027.

In addition to population growth, food demand is influenced by the growth of per capita incomes. The macro-economic assumptions underlying this *Outlook* suggest strong growth in per capita GDP in India (6.3% p.a.) and China (5.9% p.a.). For Sub-Saharan Africa, 2.9% p.a. per capita growth is expected over the coming decade, but with variations across the continent. Moreover, high growth in average incomes does not necessarily translate to income growth for poorer households. Per capita food demand in Sub-Saharan Africa is therefore expected to remain at relatively low levels.

Finally, differences in dietary preferences shape demand patterns. While income growth in China in the last decade led to increased demand for meat and fish, rising incomes in India are mostly expected to lead to higher consumption of dairy products as the preferred source of animal proteins. The interplay of such regional differences in population growth, income growth and dietary preferences thus result in different developments for individual commodities.

Figure 1.4. World population growth, 1998-2027



Note: MENA Middle East and North Africa.
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/ 10.1787/888933741960

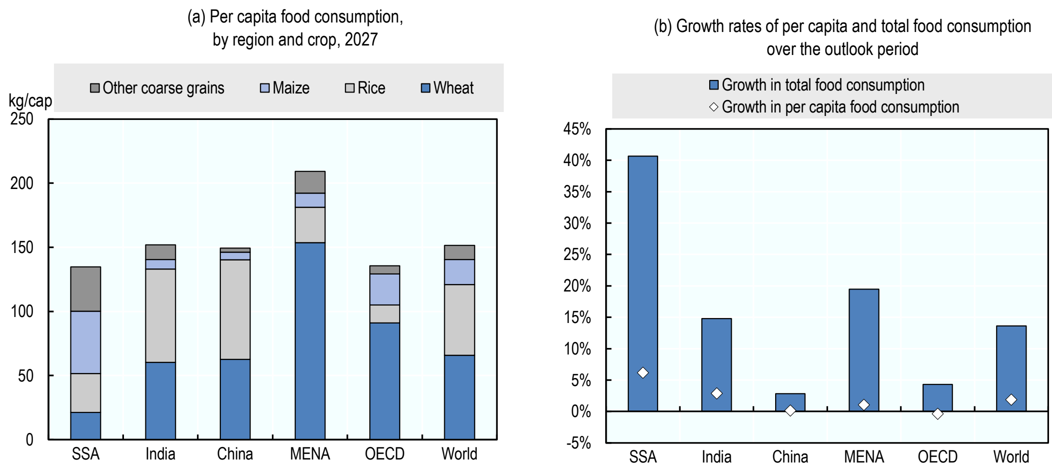
Cereals: Growth in food consumption determined mainly by population growth

Figure 1.5 shows the level and composition of per capita consumption of cereals in main regions, illustrating the high per capita consumption of cereals around the world, especially in the Middle East and North Africa. It also shows the continued dominance of wheat and rice across regions, except in Sub-Saharan Africa. In this region, white maize plays a major role in cereals consumption, and in calorie intake, as discussed in Box 1.1.

Globally, per capita cereals consumption increases by less than 2% over the coming decade. This slow growth is explained in large part due to the near-saturation level of cereals consumption in many regions across the world. Per capita food consumption of cereals is expected to grow only in low-income regions such as Sub-Saharan Africa, where per capita consumption increases by 6% over the next decade. In such low-income regions, cereals account for about two-thirds of dietary energy, compared to about one-third in developed regions.

Given relatively flat per capita consumption, population growth is the main determinant of growth in the coming decade, and the regions with the greatest population expansion (Sub-Saharan Africa, India, the Middle East and North Africa) will also account for the bulk of the additional food consumption of cereals.

Figure 1.5. Cereals: Availability for food consumption



Note: SSA is Sub-Saharan Africa; MENA is Middle East and North Africa. The *Agricultural Outlook* measures consumption in terms of food availability and hence does not account for waste.
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/10.1787/10.1787/888933741979

Box 1.1. White maize and food security in Sub-Saharan Africa

Maize is a primary source of calories in Sub-Saharan Africa[1], contributing about 19% of calorie availability on average (Table 1.1). Consumers prefer non-GMO white maize, typically produced locally or imported from within the region. Production is mostly low-input, rain-fed and smallholder-based, resulting in significant local yield variability. Local deficits are offset mostly through intra-country and regional trade; where such flows are impeded, production volatility threatens local food security.

Regional trade within Sub-Saharan Africa accounts for about 5% of food consumption, but this figure varies considerably by country. South Africa, Zambia, Uganda and Ethiopia are consistent surplus producers; Malawi, Mozambique and Tanzania are either exporters or importers depending on weather conditions. Yet other countries, such as Kenya and Zimbabwe, have steadily increased imports in recent years and depended on imports for as much as 27% of domestic consumption in 2015-17.

Most trade occurs within the region. Trade policies tend to prioritise a stable supply for domestic markets, e.g. by imposing export controls during perceived production shortages. Such restrictions often limit access to local and regional supplies, amplify price swings, and add to import costs as countries have to source supplies internationally.

In the coming decade, white maize will continue to play a pivotal role for the region's food security (Table 1.1). The *Outlook* foresees further increases in food demand as growing per capita consumption of maize combines with strong population growth. This is expected to result in 18.4 Mt of additional maize food use over the coming decade, about half of the global growth in food consumption for maize.

Productivity growth among regional suppliers is key to ensuring progress towards the Zero Hunger target. Additionally, open and reliable trade relationships are crucial to sustain food security. Sub-Saharan Africa will be increasingly dependent on imports from other regions, as not all of the rising demand can be satisfied through local production.

Table 1.1. Per capita calorie availability for maize versus other food products

	2015-17		2027	
	Calories per capita	Share of total	Calories per capita	Share of total
Maize	491	19%	515	19%
Other cereals	784	30%	827	31%
Other crops	530	20%	536	20%
Animal products	188	7%	194	7%
Sugar	130	5%	137	5%
Vegetable oil	217	8%	235	9%
Other	255	9%	268	10%
Total	2 596	100%	2 711	100%

Note: Data refers to the average value for Sub-Saharan Africa.
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.
1. This box summarises a more extensive analysis of the white maize market in Sub-Saharan Africa, available at www.agri-outlook.org.

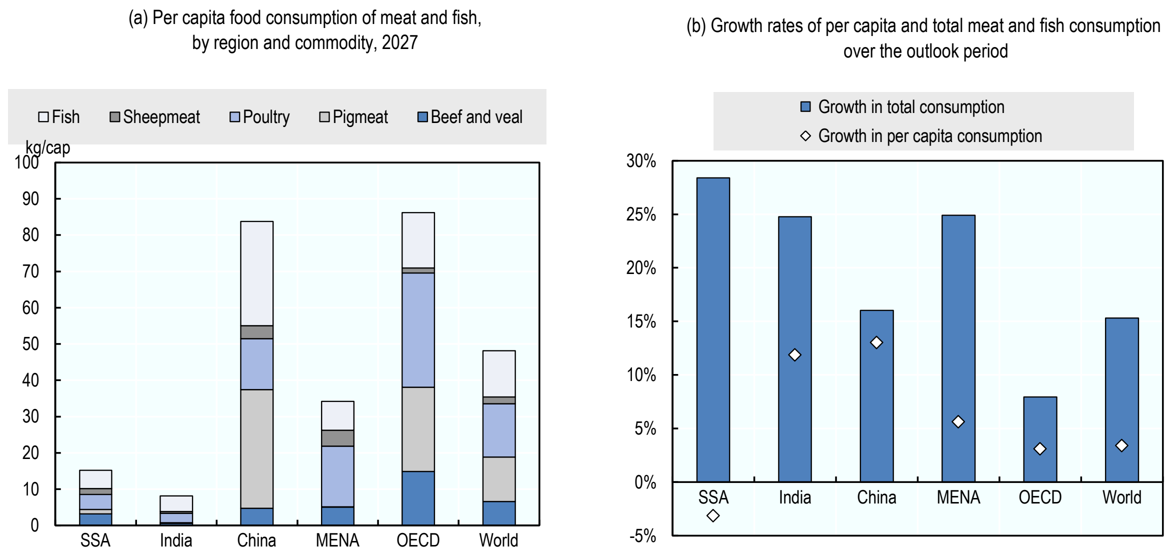
Meat and fish: Global convergence in consumption patterns remains limited

Compared with cereals, which are an important food source across the world, consumption of meat and fish differs significantly across regions according to dietary patterns and income levels (Figure 1.6). The availability of meat and fish is particularly low in Sub-Saharan Africa, where low incomes limit consumption, and in India, where dairy constitutes an important part of protein intake. Availability is high in advanced economies and in Latin America (not shown on the chart), but also in China, where fish and pig meat account for more than half of the total.

At a global level, total consumption of meat and fish is expected to increase by 15% over the outlook period, while per capita consumption of meat and fish rises by only 3%, with stark variations across regions (Figure 1.6). The strongest growth in total consumption is expected in Sub-Saharan Africa (+28%), although this reflects exclusively the impact of population growth; per capita consumption is expected to decline by 3%. By contrast, per capita consumption growth is higher in India (+12%, albeit from a low base) and China (+13%).

For meat, per capita consumption will grow most strongly in absolute terms in the developed world (+2.9 kg/capita over the outlook period), facilitated by lower prices. A growing gap thus exists with developing countries, which expand availability by 1.4 kg/capita. This smaller expansion is partly a reflection of income constraints, supply chain issues in some areas (e.g. lack of a cold chain infrastructure) and, in some regions, dietary preferences where protein is obtained more from non-meat sources. Within the developing world, least developed countries will add only 0.3 kg/capita, due to slow growth in disposable income. Asian countries in this group are projected to show some growth while Sub-Saharan Africa is expected to experience declining per capita consumption of both meat and fish.

Figure 1.6. Meat and fish: Per capita availability for food consumption



Note: SSA is Sub-Saharan Africa; MENA is Middle East and North Africa. Consumption is defined here in terms of food availability, and hence does not account for waste. Per capita consumption data refers to edible weight, estimated using conversion factors of 0.7 for beef and veal; 0.78 for pigmeat; 0.88 for poultry and sheep; and 0.6 for fish.

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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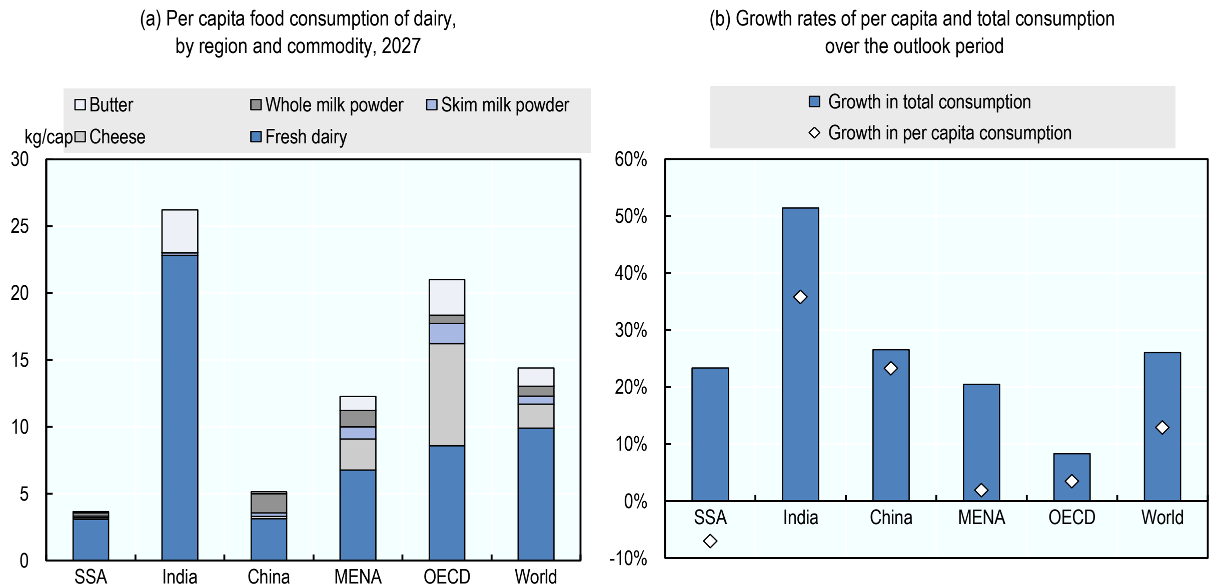
The past decade saw strong growth in the global per capita consumption of poultry (+16%), while the per capita consumption of beef and veal decreased by almost 5% between 2008 and 2017. For the coming decade, per capita consumption of poultry (typically the least expensive meat) is expected to increase by 5.5%, while beef and veal is projected to recover, with growth of 3.5% over the next decade, notably in China. Per capita pigmeat consumption will be flat at the global level, but growth is expected to be strong in regions and countries where pork is popular, such as Latin America and the Philippines, Thailand and Viet Nam. The role of China in global pork consumption growth is anticipated to diminish due to an already-high level of per capita consumption. Whereas China accounted for 65% of the increase in the previous decade, it will only contribute 45% of the expansion in the next ten years. Sheepmeat will remain a niche market in most countries, despite per capita consumption growth of 8% over the next ten years, concentrated mostly in China and other Asian countries as diets in the region diversify.

Dairy: Consumption of fresh dairy products expands in emerging economies

Dairy products can be consumed as fresh dairy products, butter, cheese, or as milk powders (e.g. for use in food processing). Fresh dairy products dominate consumption in developing regions and at a global level, while processed products such as butter and cheese dominate dairy consumption in the developed world (panel (a) (Figure 1.7).

Figure 1.7. Global consumption of dairy (in milk solids)



Note: Food consumption of dairy products in milk solid (fat and non-fat solid) equivalents. SSA is Sub-Saharan Africa; MENA is Middle East and North Africa. The Agricultural Outlook measures consumption in terms of food availability and hence does not account for waste.
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/10.1787/888933742017

The dominance of fresh dairy products will increase in the coming decade, with 2.2% p.a. growth in consumption, the highest growth rate among the commodities covered in the *Agricultural Outlook*. This increase can be attributed largely to India, where dairy is an integral component of the diet. In Ukraine and Kazakhstan, per capita consumption is also expected to grow strongly from already-high levels.

While developing countries are increasingly consuming fresh dairy products, adding 8.4 kg/capita by 2027, fresh dairy consumption in developed countries will fall by 1.7 kg/capita as consumers continue shifting towards processed dairy products, such as milk powders, cheese and butter.

A growing preference for butter in higher-income countries has been attributed in part to changing perceptions of the health implications of consuming dairy fat. Despite strong price movements in the past year, global demand for butter is expected to grow at nearly 2.2% per year. This growth will be supported by high and expanding consumption in India.

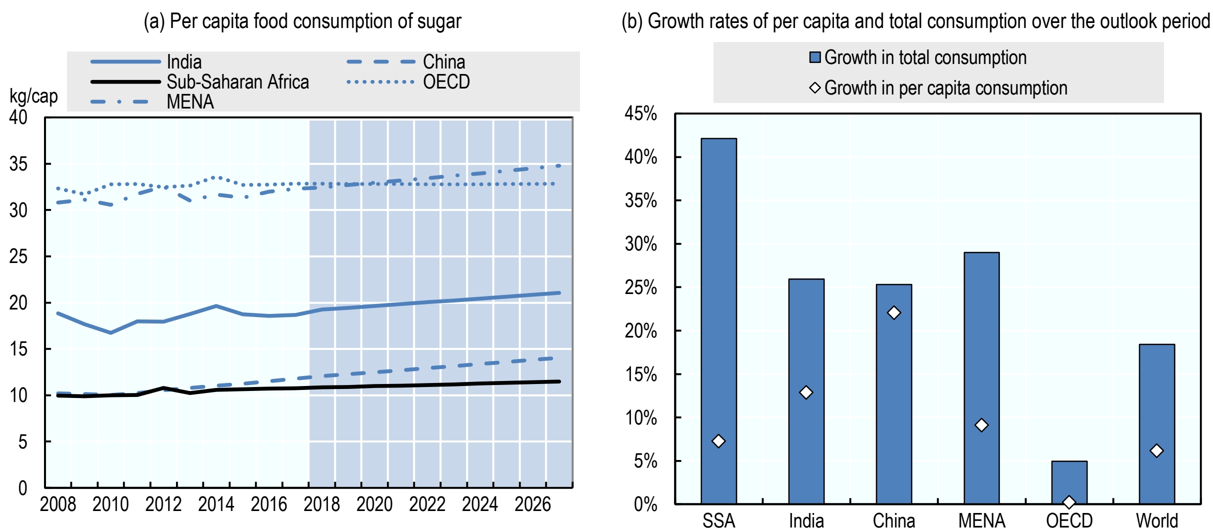
Sugar and vegetable oil: Consumption rising despite mounting health concerns

In addition to fresh dairy products, relatively high growth rates are also expected for sugar and vegetable oil, as urbanisation in developing countries leads to greater demand for convenience foods, typically characterised by a higher sugar and oil content.

Most of the additional demand for sugar will originate from the developing world (94%), in particular Asia (60%) and Africa (25%), two sugar-importing regions. Per capita consumption is projected to grow by 2.4 kg/capita in India, 2.5 kg/capita in China and 2.9

kg/capita in the Middle East and North Africa, compared with flat consumption in developed countries (Figure 1.8). In Sub-Saharan Africa, per capita consumption is projected to increase by 7% or 0.8 kg/capita over the next decade. Combined with strong population growth, total consumption in the region is expected to grow by 42%. While the increase in per capita consumption in Sub-Saharan Africa is relatively small, it contrasts with the projected decline in per capita consumption of meat, fish and dairy.

Figure 1.8. Food consumption of sugar



Note: Charts show food consumption of sugar from sugarcane and sugar beet (i.e. excluding other sweeteners such as high-fructose corn syrup). SSA is Sub-Saharan Africa; MENA is Middle East and North Africa. The Agricultural Outlook measures consumption here in terms of food availability and hence does not account for waste.

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

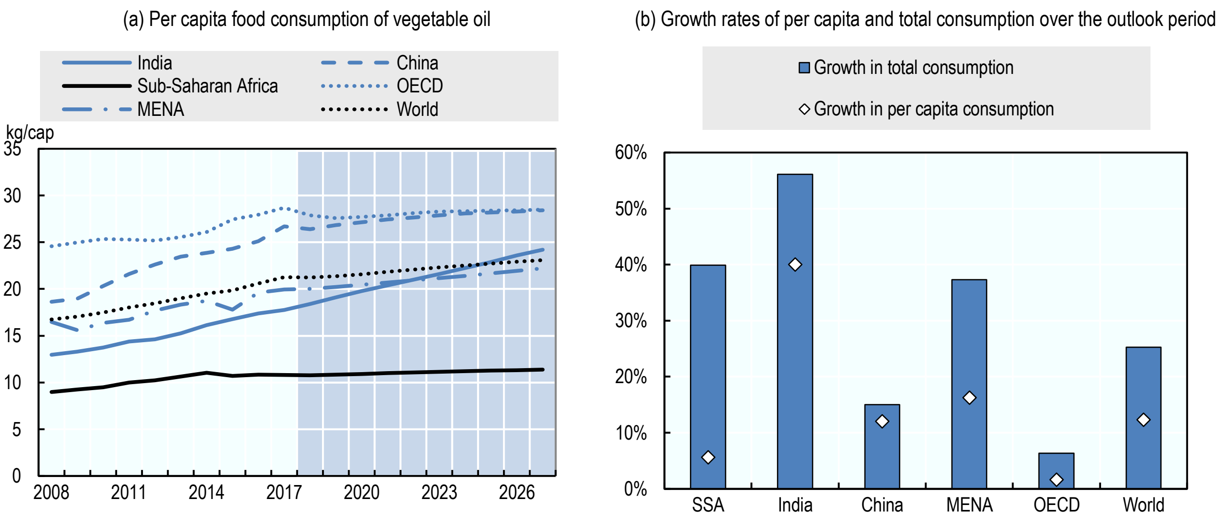
StatLink http://dx.doi.org/10.1787/888933742036

As for other commodities, patterns of sugar consumption are influenced by local factors as well as by incomes and preferences. For instance, per capita consumption is high in Brazil (the world's largest sugar producer) and other Latin American countries, and projected to continue increasing. Per capita consumption levels are also high in OECD countries, but projected to remain flat. This stagnation may partly be due to the identification of high levels of sugar consumption as a contributory factor to rising rates of obesity and non-communicable diseases. By contrast, even though per capita consumption levels in the Middle East and North Africa are similar to those in OECD countries, those factors are not expected to limit sugar consumption over the next ten years, which will continue to rise.

Compared with other commodities, expected growth in food demand is strong for vegetable oil, at 2.0% per year, although this represents a considerable slowdown compared with last decade's 3.9% annual growth rate.

For the world as a whole, per capita food use of vegetable oil is projected to increase from 21 to 23 kg per capita (Figure 1.9). In several developing countries, per capita consumption is approaching levels seen in the developed world. This is especially true for China, but also for India and the Middle East and North Africa. By contrast, per capita consumption in Sub-Saharan Africa will remain at levels much below those in the rest of the world, although it is projected to increase by 6% over the outlook period, or 0.6 kg/capita.

Figure 1.9. Food consumption of vegetable oil



Note: Charts show food consumption of vegetable oil (i.e. excluding use as feedstock for biodiesel and other uses). SSA is Sub-Saharan Africa; MENA is Middle East and North Africa. The *Agricultural Outlook* measures consumption here in terms of food availability and hence does not account for waste.
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/10.1787/888933742055

As the preceding discussion shows, the strong demand growth in the developing world does not always correspond to increasing per capita availability of food. In Sub-Saharan Africa, high growth rates for fish and meat are the result of strong population growth, while per capita availability is expected to fall; while in the Middle East and North Africa, per capita availability of meat and fish is not expected to increase much. By contrast, in these regions per capita availability of sugar and vegetable oil are expected to increase. More generally, Least Developed Countries (LDCs) are expected to increase their calorie availability at a slower rate in the coming decade, and this increase is due mostly to increased sugar and oil consumption while per capita intake of animal proteins is expected to remain low. As a result, malnutrition will remain an important problem in LDCs, as detailed in Box 1.2.

Box 1.2. Prospects for food consumption and nutrition in Least Developed Countries

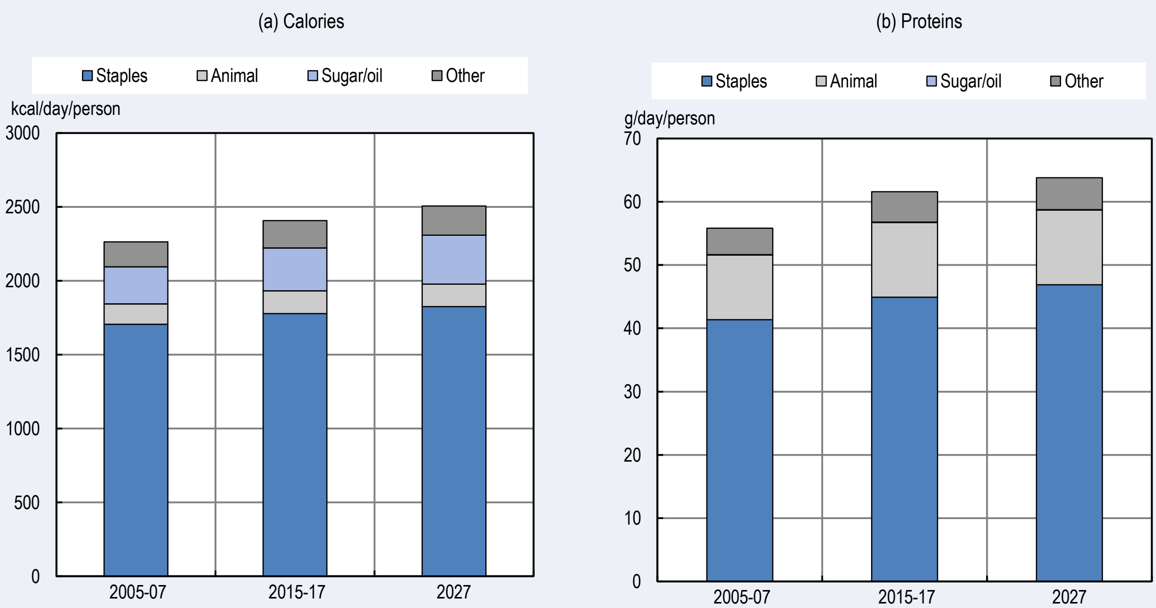
The United Nations recognise Least Developed Countries (LDCs) as particularly disadvantaged and deserving of special international support. Currently, countries with an annual per capita income below USD 1 025, a low level of human capital, and a structural vulnerability to economic and environmental shocks are classified as LDC. Of these, 33 are located in Africa, 13 in Asia and the Pacific, and one in Latin America. They are home to 12% of the global population, but account for less than 2% of global GDP and only about 1% of global merchandise trade.

Economic conditions in several LDCs have improved over the last decade, as average per capita income growth in LDCs exceeded 3% per year. Subsequently, the Prevalence of

Undernourishment (PoU) in LDCs as a group fell from 32.8% in 2000-2002 to 23.8% in 2010-2012. However, estimates for 2014-2016 suggest a rebound to 24.4%, equivalent to 232 million undernourished people.

Conflict and weather-related production shocks have been identified as the main factors driving the recent rise in undernourishment, particularly in the Middle East and North Africa. Wars and civil strife have been disrupting domestic economic activities and foreign exchange earnings as well as damaging local food production. Food import dependency, particularly for cereals, remains high in several of the most food insecure LDCs. Countries that are simultaneously affected by conflict and climate-related shocks have seen a particularly large toll on their food security. In 2016, these factors severely compromised the food security of 45 million people in eight LDCs (Afghanistan, Burundi, Central African Republic, Democratic Republic of the Congo, Somalia, South Sudan, Sudan, and Yemen).

Figure 1.10. Sources of calories and proteins in Least Developed 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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The macroeconomic outlook for LDCs projects a 3% annual growth of per capita income over the next decade. This rate is expected to support a further increase in the calorie availability of LDCs, but at a slower rate. In the last decade, daily calorie availability grew 115 kcal to 2 415 kcal/day. In the coming decade, daily calorie availability in LDCs is projected to rise by 85 kcal, reaching 2 505 kcal/day by 2027. This is 30% lower than the projected level in developed countries, which should reach 3 482 kcal/day by 2027.

Not only has progress been limited in expanding calorie availability, it was also unevenly distributed across countries and regions – and will continue to be so. In Asian LDCs, calorie availability is estimated to reach almost 2 700 kcal/day, while African LDCs are expected to reach only 2 450 kcal/day by 2027 despite a higher growth rate. Food availability in LDCs in the Middle East and North Africa fell in recent years, but it is expected to recover from an current average of 2 270 kcal/day to 2 420 kcal/day by 2027.

Staples (cereals, pulses, roots and tubers) are expected to remain the main source of calories in LDCs, even if their share is expected to gradually decline to 73% in 2027, down from 75% in 2005-2007. The additional dietary energy is expected to come from more sugar and fats, which are predicted to increase their share from 12% in 2015-2017 to 13% in 2027.

Even less progress is expected in improving the protein intake. Average protein availability will remain about 64 grams per day in 2027, mostly from cereals, with the availability of high-quality animal proteins reaching only about 12 grams per day. Consumers in LDCs will continue to have access to only a limited variety of foods and therefore their diets will still lack macronutrient diversity and essential micronutrients, adding to the burden of persistent calorie deficits.

The slow growth in dietary energy and continued poor nutrition prospects also suggest that many LDCs will not be able to meet the UN's Sustainable Development Goal of eliminating all forms of malnutrition by 2030. Achieving this goal would require substantial progress in reducing conflicts while helping smallholders to improve local production and bring about resilience to climate change and weather-related shocks.

Non-food uses affect demand for several agricultural commodities

For most agricultural commodities reviewed in the *Agricultural Outlook*, the demand for food uses dominates overall demand. However, non-food uses, particularly feed and fuel, are important for several agricultural commodities, and often show faster growth rates than food demand. In the case of feed, this will remain true in the coming decade. Biofuels by contrast were a major factor stimulating demand for agricultural commodities in the past decade, but growth is slowing down in the coming decade.

Feed: Rising share of global crop output directed towards feed use

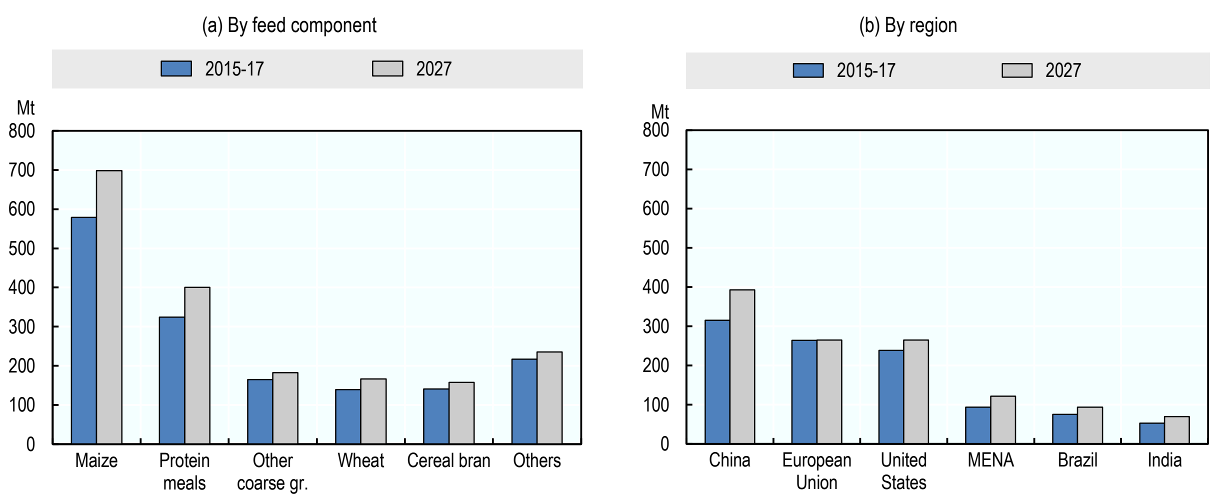
The global demand for feed reached 1.6 bln t in 2015-17, and is expected to increase further to 1.9 bln t by 2027, at an annual growth rate of around 1.7%. Demand for feed is thus expected to grow faster than the demand for several commodities shown in Figure 1.11 and markedly faster than food demand for cereals, for which 1.1% p.a. growth is expected. This growth results in about 260 Mt of additional feed demand by 2027; slightly less than the expansion of the previous decade in which demand grew by more than 300 Mt. Demand for feed also outpaces the growth in demand for meat, indicating an intensification of meat production.

The main set of agricultural commodities used for feed includes maize, protein meal, other coarse grains (especially barley and sorghum), wheat, and by-products of cereal processing such as cereal bran. As shown in Figure 1.11, maize and protein meal will remain the most important commodities used as feed, accounting for 60% of all feed by 2027 (up from 58% in the base period). Feed demand for maize is expected to grow by 21% over the outlook period, and demand for protein meal is expected to expand by 23%, considerably faster than the other commodities used as feed.

Projections for protein meal, which is derived from crushing oilseeds, will be influenced by developments in feed systems and in agricultural policies. For instance, Least Developed Countries' total demand is expected to grow around 45% between 2015-17 and 2027, reflecting the intensification of livestock production as these countries move towards compound feed-based livestock production. Yet, global demand growth for protein meal is expected to fall below the average annual rate of the past decade (1.7% compared to 4.2%). That high growth rate was in large part due to China, where the intensification of meat production coincided with a high support price for grains. This discouraged the use of maize as feed. The reduction of maize support prices in China since 2016 means that maize will play a more important role in the Chinese feed mix in the next decade.

Overall growth patterns in the demand for feed will vary across geographic regions. Around 30% of the additional demand for feed will originate in China, where feed demand is expected to grow 25% over the outlook period. Strong growth in feed demand is also expected in the Middle East and North Africa (+29%, with the region expected to account for around 10% of additional global demand), as well as Brazil (+25%) and India (+31%). Growth rates in the European Union and the United States are considerably lower at 0.4% and 11% over the outlook period respectively. For the European Union, this rate reflects the expected decline in domestic meat consumption over the outlook period.

Figure 1.11. Demand for feed



Note: MENA stands for the Middle East and North Africa.
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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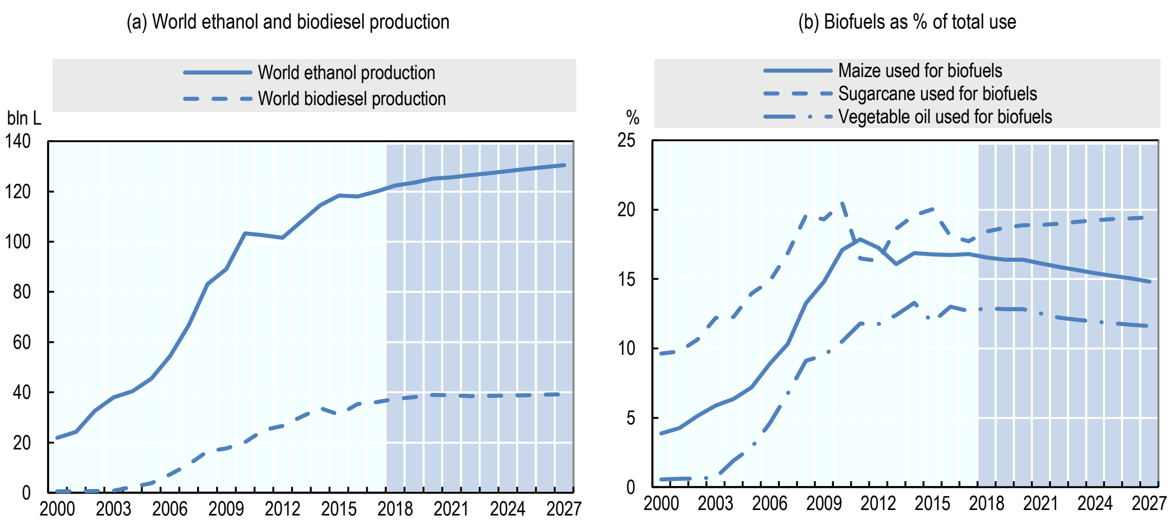
Fuel: Growth in Brazil and emerging producers

Agricultural commodities are not only used as food and feed, but also as fuel in the form of biofuels. These include ethanol, based mostly on maize and sugarcane, and biodiesel, produced mostly from vegetable oil. The evolution of biofuels is highly sensitive to potential changes in policy, as well as to overall demand for transport fuel, which in turn depends on the crude oil price. In many countries, mandatory blending rules impose a minimum share of ethanol and biodiesel to be used in transport fuel. The link between oil prices and biofuel prices is therefore complex, as explained in more detail in Box 1.3 The baseline projections in the *Outlook* are based on the policies currently in place in the key regions. Projections are clearly sensitive to changes in that policy environment.

In the second half of the 2000s, various policies started to stimulate biofuel production, leading to a strong increase in world ethanol and biodiesel output. As a result, a growing share of global sugarcane and maize production was used for ethanol production, while a growing share of vegetable oil was used for biodiesel production (Figure 1.12). This policy-induced expansion of biofuels was a major driver of increased demand for maize, sugarcane and vegetable oil over the past decade.

Over the next ten years, the demand for these commodities as inputs to biofuel production is expected to stabilise, as mandatory blending requirements are not expected to rise at the same pace as over the past ten years. As such, the production of biofuels is expected to grow more slowly over the coming decade. In the past ten years, global production of ethanol grew by 64 billion litres (bln L), equivalent to 3.9% p.a. growth; over the next ten years, only an addition of 12 bln L (0.7% p.a.) is projected. For biodiesel, the past decade saw an increase of 29 bln L (9.5% p.a.), whereas only 5 bln L (0.4% p.a.) is expected to be added over the outlook period.

Figure 1.12. Biofuels and the demand for feedstock, 2000-2027



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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The composition of the demand for biofuels is also changing, with a shift towards developing countries which are increasingly putting in place policies favouring the domestic biofuel market. For ethanol, the main markets are the United States, Brazil, China, and the European Union. Declining demand for transport fuel is expected to decrease the demand for ethanol in the United States and the European Union, while strong growth is expected in Brazil, China, and Thailand, spurred by favourable policies. The demand in China could increase further with the implementation of the country's proposed new ethanol mandate (discussed in the Biofuels chapter). Overall, 84% of the additional demand for ethanol in the coming decade will come from developing countries.

For biodiesel, the main markets are the European Union, the United States, Brazil, Argentina and Indonesia. As with ethanol, demand is expected to decline in the European Union and the United States, which will drive down demand for vegetable oil as feedstock. Instead, an expansion is expected in Brazil, Argentina, Indonesia, and other developing countries, again mainly through favourable policy measures.

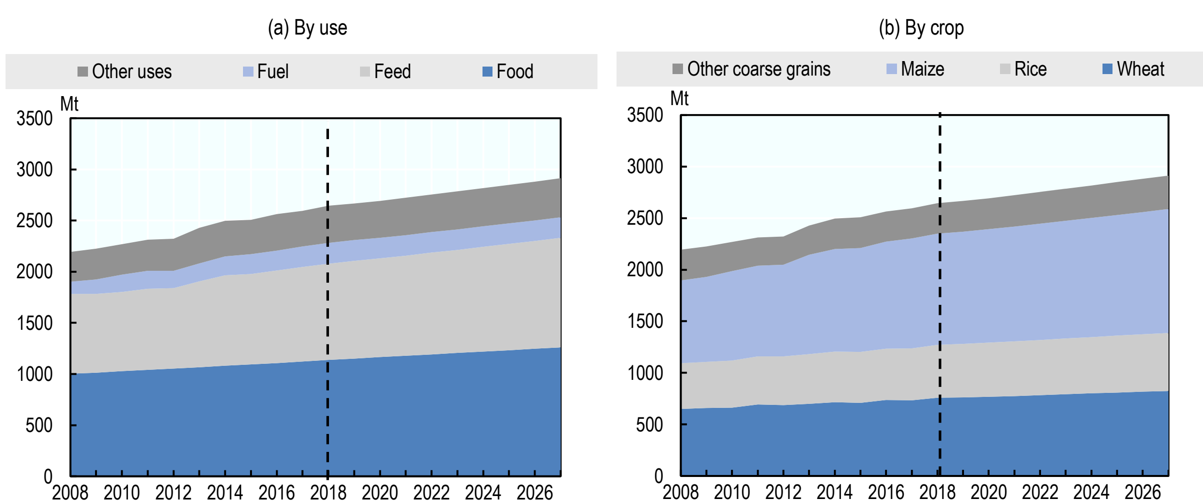
Food, feed and fuel: Competing sources of cereal demand

In addition to being an important and relatively low-cost source of calories, cereals are widely used for feed and fuel, in large part because of the ease with which cereals can be processed into other forms. This versatility also implies that food use of cereals may come into competition with non-food uses, especially when non-food uses expand rapidly.

As shown in Figure 1.13, between 2005-7 and 2017 the global demand for cereals increased by around 520 Mt to around 2.6 bln t. Over the coming decade, demand will grow by around 360 Mt, but the composition of this demand growth is changing. While fuel was a major component of demand growth in the past decade (contributing more than 120 Mt to demand), this is no longer expected to be the case over the outlook period. Instead, food and feed uses are driving growth, together accounting for almost all additional demand over the coming decade.

Panel (b) shows cereal demand by crop. In the past decade, maize accounted for almost 330 Mt of the 520 Mt of additional cereals demand, or more than 60%. Over the outlook period, demand for maize will grow by 164 Mt, accounting for 46% of demand growth only. This slowdown in growth is consistent with the evolution of biofuel markets over the coming decade. For both rice and wheat, demand growth is expected to be more robust, with 97 Mt of additional wheat demand and 66 Mt of additional rice demand, most of it for food uses. Following flat demand over the last decade, renewed interest is expected in other coarse grains, which are projected to grow by more than 32 Mt over the coming decade. The projected trends in cereals are thus a reflection of the demand trends in food, feed and fuel.

Figure 1.13. Global demand for cereals, 2008-2027



Note: The *Agricultural Outlook* measures demand in terms of availability, and hence does not account for waste.
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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Production

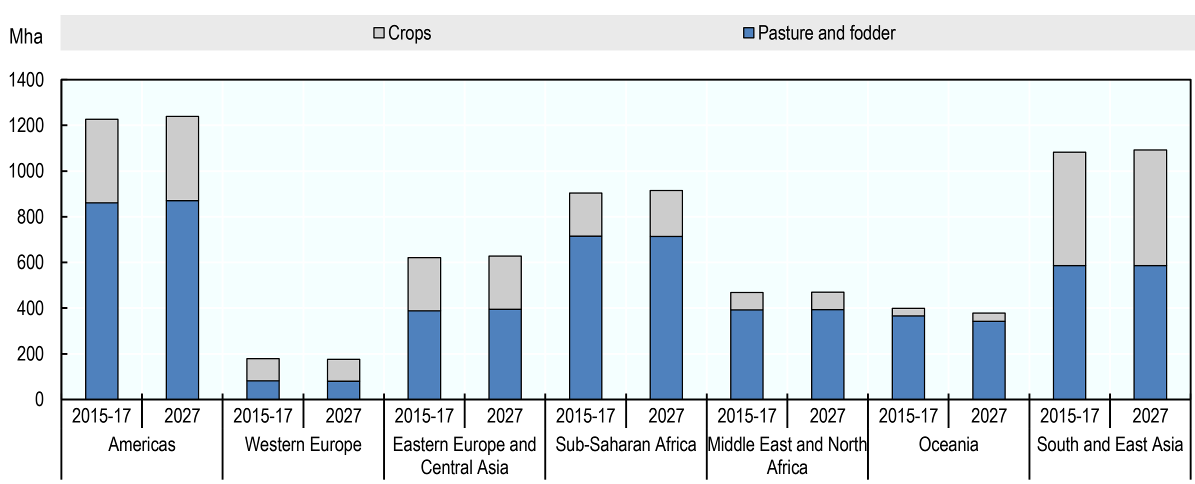
While the last decade was characterized by robust demand and high agricultural prices, leading to strong production growth across commodities, the coming decade will see global agricultural production grow more slowly. Under the current set of assumptions, agricultural and fish production is expected to grow by 1.5% p.a. over the coming decade, or a total growth of 16% over the outlook period. Most of this growth will be due to increasing productivity, with no major increase in agricultural land use at the global level, although this varies by commodity and by region. Trends across main producing regions are discussed in more detail below.

Agricultural output will grow with little change in global land use

Land is an important input into agricultural production, both for arable crops and for grazing. Production growth in agriculture can come from taking more land into production, or from increasing the output per unit of land. Since land use is largely defined according to agro-ecological characteristics, the availability of agricultural land and the relative share of cropland versus pasture differ strongly across regions (Figure 1.14). Since 1960, global agricultural land is estimated to have increased by around 10%, with most of this increase occurring before 1990 and relative stability since. At a global level, this relative stability is expected to continue over the coming decade.

Pasture land, used for grazing ruminants such as cattle, sheep, or goats, is mainly concentrated in three regions: the Americas, which hold over one-fourth of the world's pasture land; Sub-Saharan Africa, which accounts for 21% of global pasture; and South and East Asia, home to 17% of global pasture. While the Americas and South and East Asia also lead in global ruminant meat output, jointly producing more than 60% of global supplies in 2015-17, Sub-Saharan Africa only contributes about 8%. This low share is indicative of the small-scale and in large part traditional nature of the sector. Western Europe, by contrast, reports the lowest share of global pasture at 2%, yet accounts for 11% of global ruminant meat in 2015-17, an indication of the industrial nature of meat production in the advanced economies of that region.

Figure 1.14. Land use in global agriculture, 2015-17 and 2027



Note: Western Europe includes the European Union, Norway, and Switzerland; Eastern Europe and Central Asia includes the Russian Federation, Ukraine, Kazakhstan, Turkey, Israel, some smaller non-EU countries in Eastern Europe, and some smaller Central Asian countries); Middle East and North Africa is as defined in Chapter 2; Oceania includes Australia, New Zealand and some smaller countries in the region; South and East Asia includes all other 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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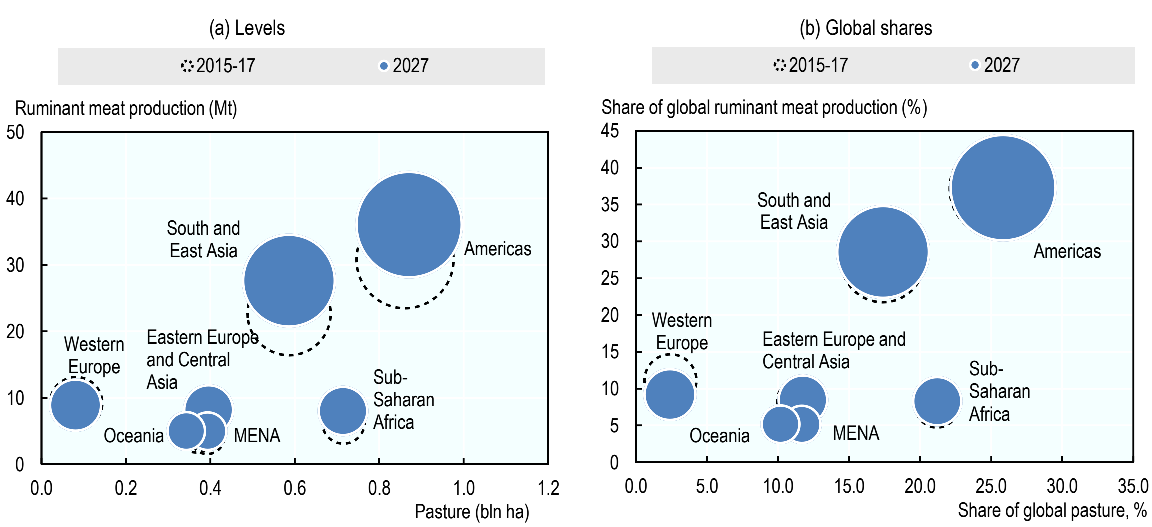
Changes in ruminant meat production will not be accompanied by corresponding shifts in global pasture area over the outlook period. While global production is projected to increase 16% for beef and veal and 21% for sheepmeat, largely due to increases in output in the Americas, South and East Asia and Sub-Saharan Africa, the land allocation to pasture remains largely unchanged. Moreover, the non-ruminant meat sector, which does not require pasture, is also set to expand over the coming decade, with global poultry and pigmeat production growing 18% and 11% respectively.

About half of global crop land is dedicated to cereals and oilseeds. Given arable land constraints, the overall area of crop land is not expected to change substantially over the coming decade, and productivity growth will be essential for sustaining crop production growth. Nevertheless, changes in area allocation and yields will vary across crops and regions. For maize and other cereals, most of the production increase will come from higher yields, not from greater land use (except for maize in Latin America). For other crops, soybeans in particular, land use will play a greater role, as area expansion and greater cropping intensity is expected in Latin America (Brazil, Argentina) (Figure 1.15).

Yields are set to rise fastest for Sub-Saharan Africa, albeit from a low base, with high growth rates across practically all crops. This trend is indicative of the production potential of the region, but also of the relatively low yields experienced today for most major commodities. In comparison, Western Europe and the Americas will record more moderate yield growth rates, as productivity is already high for most crops. Figure 1.16 indicates that maize yields will reach 8.0 t/ha in Western Europe by 2027, and in the Americas 8.6 t/ha, compared to only 2.5 t/ha in Sub-Saharan Africa.

Figure 1.15. Pasture and ruminant meat production by region



Note: MENA stands for Middle East and North Africa. The size of e ach bubble is proportional to the region's ruminant meat production level.
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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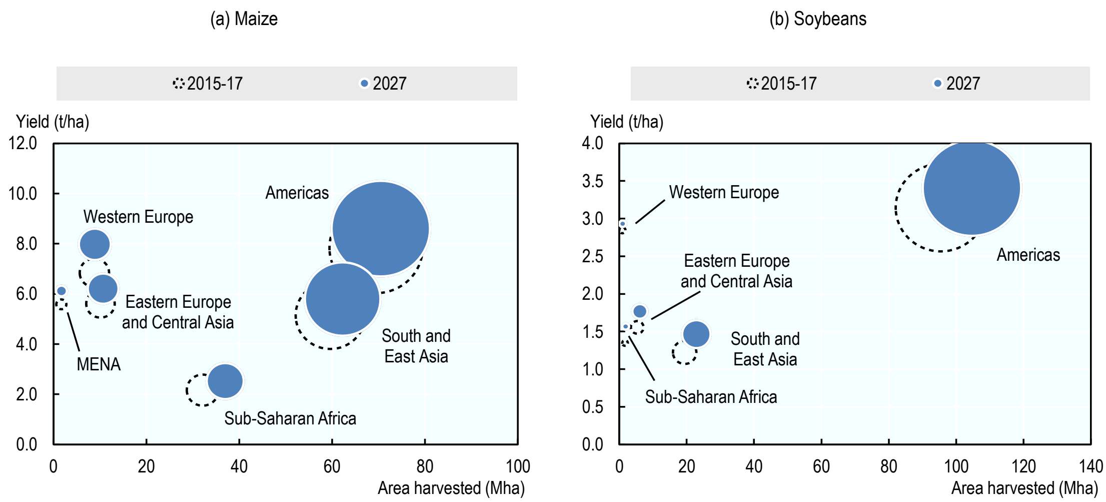
Figure 1.16. Crop land and yield trends for maize and soybeans



Note: MENA stands for Middle East and North Africa. The size of each bubble is proportional to the region's crop production.

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

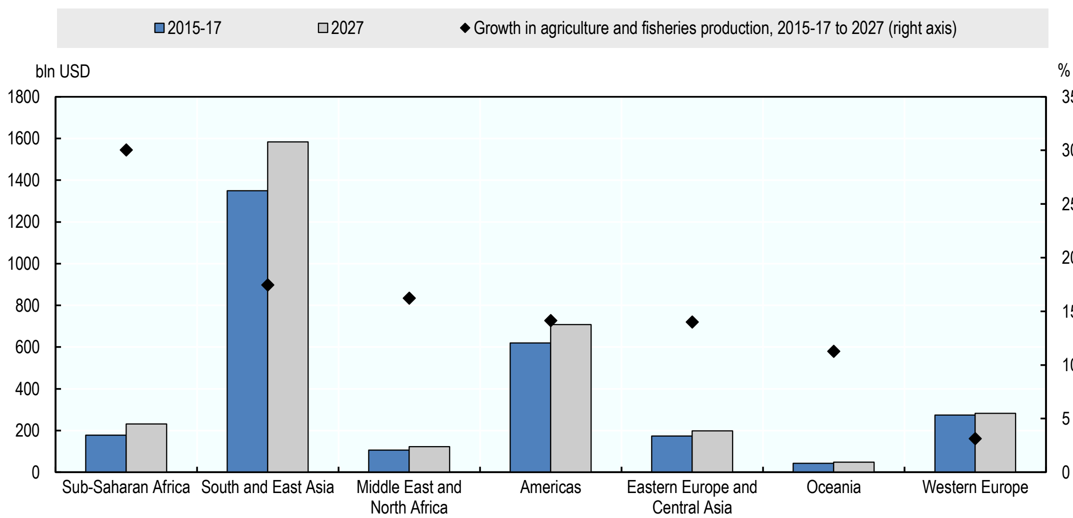
StatLink http://dx.doi.org/10.1787/888933742188

Developing regions expand and intensify agricultural production

Over the coming decade, the expansion of agricultural production will be disproportionately concentrated in the developing world (Figure 1.17). The fastest growth is expected in Sub-Saharan Africa and South and East Asia, with the latter also expected to show the greatest growth in absolute terms. Overall, output will expand less in developed economies, notably in Western Europe, where agricultural and fish production is only projected to grow by around 3% over the outlook period.

The improved availability of high-quality seeds, fertilisers and other technologies will favour production, while sustainability concerns may impose constraints. Agricultural policies worldwide will also shape global production decisions. India's agricultural policies are focused on stimulating agricultural growth in order to meet domestic food security objectives, while other countries such as China and Argentina are aligning more closely with global markets. Since such trends do not affect all regions and commodities in the same way, the factors underlying these regional trends are discussed in more detail below.

Figure 1.17. Regional trends in production



Note: Figure shows the estimated net value of agricultural and fish production, in billions of USD, measured at constant 2004-6 prices. Regions as defined in Figure 1.14.
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/10.1787/888933742207

Sub-Saharan Africa: Productivity gains in basic foods

Despite accounting for over 13% of the world population and close to 20% of global agricultural land, Sub-Saharan Africa's share of global agricultural output is relatively low. Agricultural production is constrained by challenging agro-ecological conditions, limited access to and utilisation of technology, and the fact that economic growth in many cases remains only marginally ahead of population increases. Its most important commodity, among those analysed by the *Outlook*, is 'other coarse grains' (including millet, sorghum and teff) for which Sub-Saharan Africa today accounts for 14% of global production.

However, robust growth in agricultural production is expected for the coming decade. Crop production will expand by 30%, while meat, dairy and fish will respectively grow by 25%, 25% and 12%. This output growth will be accompanied by area expansions for maize, soybeans, and sugarcane and improved productivity across the board. Fertiliser, pesticides, improved seeds, and other technologies such as mechanisation and irrigation have the potential to introduce substantial productivity gains, as adoption is typically low among the small-scale production units that characterise the region.

Even with the projected strong growth, the region's food security will continue to depend on global markets as domestic production capacity will remain insufficient to meet the region's growing consumption needs. At the same time, there are some commodities for which African countries have become regional providers. Maize is one example, where Zambia consistently produces an exportable surplus. Vegetable oil is another example, as West African countries seek to promote their palm oil sectors, and production is expanding rapidly, notably in Nigeria. Yield improvements are expected to contribute to a 22% growth in output of palm oil in Sub-Saharan Africa over the outlook period. Similarly, yield improvements in teff production in Ethiopia will allow the country to account for nearly one-fifth of the world's production growth in other coarse grains.

Robust production growth is also expected for cotton (+33% over the outlook period), sugarcane (+18%) and sugar (+34%). Yield improvements will account for the cotton production expansion, notably in the case of Burkina Faso. Although the growth in sugar and sugarcane production marks the region among the fastest growing for these two commodities, by 2027 Sub-Saharan Africa will still account for less than 5% of global output.

Emerging challenges to agricultural production could threaten any of these projections for the region. The recent emergence of the Fall Armyworm, which has affected 28 countries across the region, could have serious implications for the region's expansion of maize, rice, sorghum, sugarcane and soybean production and, by extension, its food security (Box 1.4).

South and East Asia: Production growth remains strong amid sustainability challenges

South and East Asia (which includes China, India, Japan, Korea, and the countries of Southeast Asia) is the world’s main producer for an array of agricultural products. Despite facing serious constraints in terms of land, water, and workforce shortages, the region produces almost 40% of the world’s output of cereals (including nearly 90% of global rice output); close to 40% of global meat production; more than half of vegetable oil supplies; and nearly 70% of combined global capture and aquaculture fish production.

The coming decade is likely to add new challenges, in particular the need to reconcile high output levels with increasingly stringent standards for sustainable production. Nonetheless, the region is expected to expand agricultural and fish production by 17% over the outlook period.

Yield improvements will underlie a large part of the expansion of crop production, with yield growth over the outlook period of 10% for wheat, 12% for maize and rice, 15% for cotton and 20% for soybeans. While these figures are in line with global trends, oilseed yields are set to rise strongly in India, led by investment in production and information technologies, such as eNAM, an online trading platform for agricultural commodities. Oilseed production and crush are anticipated to expand as India seeks to meet growing domestic demand for vegetable oil.

Indonesia and Malaysia will continue to supply most of the world’s palm-oil sourced vegetable oil. Intensification of production on existing palm oil plantations is foreseen as area expansion possibilities are limited, especially in light of global pressure to improve the sustainability of palm oil production.

South and East Asia will remain a major global supplier of meat and dairy commodities, accounting respectively for 39% and 44% of global output by 2027. Dairy production is set to expand by 41% over the outlook period with butter rising 44% and milk expanding 40%. Meat production will grow by 18%. China, India and Thailand will lead output growth of poultry and sheep meat, while slower growth in pork for the region is explained by a slowdown in China’s production.

Fish production from capture and aquaculture will expand by 15% in South and East Asia, despite China’s plans to scale back fisheries production over the coming decade and introduce sustainable practices to the sector. If China’s 13th five-year-plan is fully implemented, capture fisheries from China will contract by about 29% by 2027, and aquaculture will expand by 20%, instead of 31% in the absence of the plan. With limited global capacity to fill China’s production gap under the five-year-plan, upward pressure will be placed on global fish prices (as discussed in more detail in the Fish and seafood chapter).

Biofuels production expansion in the region is also led by China, which is expected to become the world's third largest ethanol producer, with output of 11 bln L by 2027. About half of that output will be directed to biofuel production; the remainder is allocated to industrial uses. This projection does not take into account the possible impact of a recently proposed new nationwide E10 ethanol mandate. If implemented, this could raise Chinese ethanol output to 29 bln L by 2027, similar to the expected output for Brazil. (The possible impacts of this mandate are explored in more detail in the Biofuels chapter). Thailand is also projected to play a prominent role in regional and global ethanol markets producing 3.2 bln L in 2027. In terms of biodiesel, Indonesia will continue to be the region's main producer (4.3 bln L in 2027).

In India, policy makers focus on promoting agricultural growth to meet domestic food security objectives, and policies will likely seek to stimulate investment in the domestic agricultural sector both through protection against import competition through import tariffs and through producer support. While India's policies may impact domestic production more than global markets, China's policies, in particular regarding cereals, are likely to affect global markets through price movements, stock releases and import regulations. The reduction in maize support prices since 2016 will have implications in the coming decade for domestic and global production of maize, soybean, and other coarse grains.

Middle East and North Africa: Improved economic growth set to stimulate agricultural output

The agricultural sector in the Middle East and North Africa has historically been constrained by unfavourable agro-ecological conditions for crop production as well as political instability. However, over the coming decade, the region is projected to enter a period of improved economic growth, which should underpin 16% growth in agricultural and fish output over the coming decade. Greater agricultural production will depend on innovation to enhance productivity growth in the face of scarcity of water and arable land across the region.

Livestock activities serve as the main source of agricultural value added in the region, with regional production of meat and dairy largely taking place in Iran and Egypt. Poultry is the main type of meat produced by these countries, each of which will pursue both extensive growth and productivity improvements over the coming decade. Production of milk, maize and oilseeds will expand at faster rates than over the previous decade. Nonetheless, the region will remain a net importer of these and most major commodities, given its various production constraints.

More details on the region's production trends can be found in Chapter 2, which offers an in-depth discussion of the agricultural sector with disaggregated projections for most countries in the region.

Americas: Export-oriented agricultural sectors respond to global demand

Alongside South and East Asia, the Americas are major producers of most commodities analysed by the *Outlook*. The region accounts for nearly 90% of global soybean production, and also holds large shares of global production in cereals (28%), specifically maize (52%). The region is a large producer of commodities with a high value added, such as protein meal, sugar, and biodiesel, where it accounts for 41%, 39%, and 42% of global output, respectively. With area harvested expanding and crop intensities rising over the next ten years, crop production in the region is anticipated to grow by 14%.

Area expansion will lead sugar production from Brazil, the world's leading producer, to grow 1.9% p.a., contributing to a 1.8% p.a. growth for the region as a whole. This growth occurs despite replanting setbacks and the competition between sugar and sugarcane-based ethanol production, as Brazil is also a global leader in biofuel production. Ethanol production in Brazil is set to expand by 1.5% p.a. over the outlook period. However, its global share will decline from 90% to 88%, given a rapid expansion of production in Asia.

Global soybean production will remain dominated by the United States and Brazil. In Brazil, higher cropping intensity will sustain its position, as it obtains soybean as a second crop on land cultivated with maize. These expansions will provide an input to regional dairy production and the global supply of protein meals and vegetable oils. In this context, Colombia is expected to become a net exporter of vegetable oil over the outlook period, expanding its area for oil palm cultivation, while Paraguay will follow trends in Brazil, expanding the area dedicated to soybean production and increasing oilseed crush.

The development of protein meal production will be essential for feeding the region's growing livestock sector. The United States and Brazil will continue to produce most of the world's meat supplies, with herd expansions in both regions. Production is expected to grow by 17% for beef and pork, 16% for poultry and 9% for sheep. Animal products such as milk and eggs will grow at similarly robust levels. Fish production is expected to expand by 9% over the outlook period, with a major expansion in aquaculture (+35%), in particular in Brazil and Chile.

Eastern Europe and Central Asia: Growing prominence in global cereals market

Agricultural production in Eastern Europe and Central Asia (a region which includes the Russian Federation, Ukraine, Kazakhstan and Turkey as main agricultural producers) expanded rapidly over the previous decade, due to an overall economic recovery and considerable investments into the modernisation of agriculture. In the coming decade, agricultural and fish production will expand by 14%.

In terms of arable crops, the region will maintain its position as second-largest wheat producer, increasing its share of global production to almost 22% by 2027. Maize output will also expand by 17% over the outlook period, although the region's global share will remain relatively low, at less than 6% by 2027. The region's share in global production of sunflowers and rapeseed will increase from 22% in 2015-17 to 25% by 2027, underpinned by an expansion in area harvested, which will be offset by a reduction in the area for roots and tubers.

These shifts in crop production are largely attributable to the evolutions in the Russian Federation, with area expansion underpinning growth in production of soybeans, other oilseeds, cereals and sugar beet. For the rest of the region, yield improvements will contribute disproportionately to output growth.

Livestock production will grow both in terms of meat and dairy products, accompanied by an increase in pasture area of 2% over the outlook period. The meat sector will expand 16% for the region, despite much slower output growth for the Russian Federation. Dairy production in the Russian Federation will be flat over the next ten years (following a contraction of 0.7% p.a. in the last decade). For the region as a whole, milk production will grow 1.1% p.a., and dairy processing is expected to focus on cheese production, leading to a growth of 1.7% p.a.

In contrast to the trends in the Russian Federation, Turkey should experience a production expansion for meat. Herd size expansion and yield improvements will characterise beef, sheep and poultry production for Turkey, in part driven by a self-sufficiency policy for red meat over the outlook period. In parallel, Turkey's cotton sector, one of the highest-yielding globally, will also see production growth. Its output is based on non-GM seeds, and yield improvements will come from mechanisation, irrigation, and the use of improved seeds.

Oceania: Environmental regulations constrain growth of livestock sector

Oceania is an important agricultural producer and net exporter of meat, dairy and cereals. As is the case in most other regions, Oceania will expand production of its main commodities at a slower rate than in the last decade.

Despite productivity improvements foreseen over the coming decade, the global share of sheep meat from Australia and New Zealand will decline as developing countries expand output. This relative decline will occur in parallel to a slowdown in milk production from the region, emerging from land constraints and environmental restrictions. Consequently, milk output in New Zealand will expand at 1.5% p.a., down from 3.3% p.a. over the last decade. The region is also an important producer of skim milk powder (SMP) and whole milk powder (WMP); by 2027, it will account for 17% of SMP and 27% of WMP global supplies.

Coconut oil production will become the focus of niche production by countries in the region over the coming decade, yielding per annum growth in vegetable oil production of 2.2%. For cotton, an increase of 16% in area harvested over the outlook period will underpin output growth in the region. In Australia, cotton production is expected to expand by 23%, due in part to the adoption of GM varieties.

Total fish production will increase by 19%, and will continue to play a major role in the food security of many Small Island Developing States in the region.

Western Europe: High productivity maintained within tight regulatory and resource base

The countries of Western Europe (which includes the European Union, Switzerland, and Norway) hold significant shares in the global production of other coarse grains (barley, oats, rye; 31% of global production); other oilseeds (rapeseed, sunflower; 20%); wheat (20%); milk (21%); and meat (15%). The coming decade will see declines in these global shares as other countries and regions report faster growth.

The decline will be especially pronounced for biodiesel, where the region's share of global production will fall from 40% to 34%, as output falls by around 4% over the outlook period, in line with lower demand for diesel. Despite this diminishing share in global production, Western Europe will remain the world's second largest producer of biodiesel. A major uncertainty in the region is the potential reduction in obligatory blending which, if implemented, would drastically reduce production.

Total agricultural and fish production for the region will grow by about 3% by 2027, making it the region with the slowest expansion of production for the projection period. Despite this slow growth, and the region's limited potential for area expansion, its strength as a region of high productivity and continued high yields allows it to remain a major global provider of numerous agricultural commodities.

As the area harvested for various crops such as other oilseeds, sugar beet, and roots and tubers is expected to contract over the outlook period, crop production growth will come predominantly through yield improvements, which is notable for a region that already reports some of the highest yields in the world across commodities. Fish production will also show limited growth, mainly due to strict management and environmental policies.

The EU system of sugar quota was abolished in 2017. In the past, the quota system kept EU sugar prices above the world market price while limiting producers' ability to respond to these higher prices. The anticipated end of the quota system led to a 14% increase in sugar beet area in 2017 compared to the previous year, but in the coming decade, as EU prices fall in line with global markets, the area dedicated to sugar beet is expected to contract again to pre-2017 levels. At the same time, sugar beet yields will continue to grow. The net result is that sugar beet output in the European Union will expand by 2.5% between the base period (2015-17) and 2027.

Strict management and environmental policies will constrain growth in fish, livestock and dairy production. Policies such as the EU nitrate directive, which imposes constraints on nitrates from agricultural production to protect water quality, is expected to constrain growth in milk output, and in turn beef production, over the outlook period. Despite the slowdown in fresh milk production, which will grow by 8% over the next decade (compared to 10% for the past ten years), SMP and WMP output for the region will expand by 10% and 18% by 2027. For WMP, this growth is substantially above that of the previous decade.

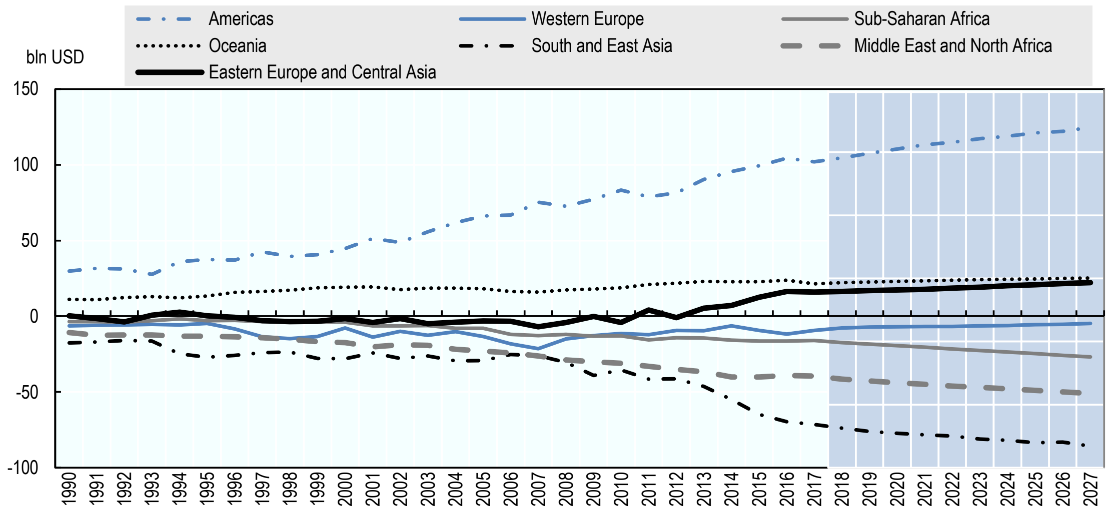
Trade

Specialisation between regions is increasing

Differences in climate and geography, including the availability of good agricultural land, determine the pattern of comparative advantage in producing different agricultural commodities. Together with differences in population density and population growth, as well as policy factors, this determines trade flows between regions. Countries with slow population growth, low population density and favourable natural endowments tend to become exporters of agricultural commodities, while countries with rapid population growth, greater population density, and less favourable natural endowments tend to become importers.

Figure 1.18 shows the historic and projected evolution of agricultural trade balances by region. These balances broadly reflect the forces described above and are projected to become more accentuated over time in most regions.

Figure 1.18. Agricultural trade balances by region, in constant value, 1990-2027



Note: Net trade (exports minus imports) of commodities covered in the *Agricultural Outlook*, measured at constant 2004-06 USD. Regions are as defined in the Production section.

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/10.1787/888933742226

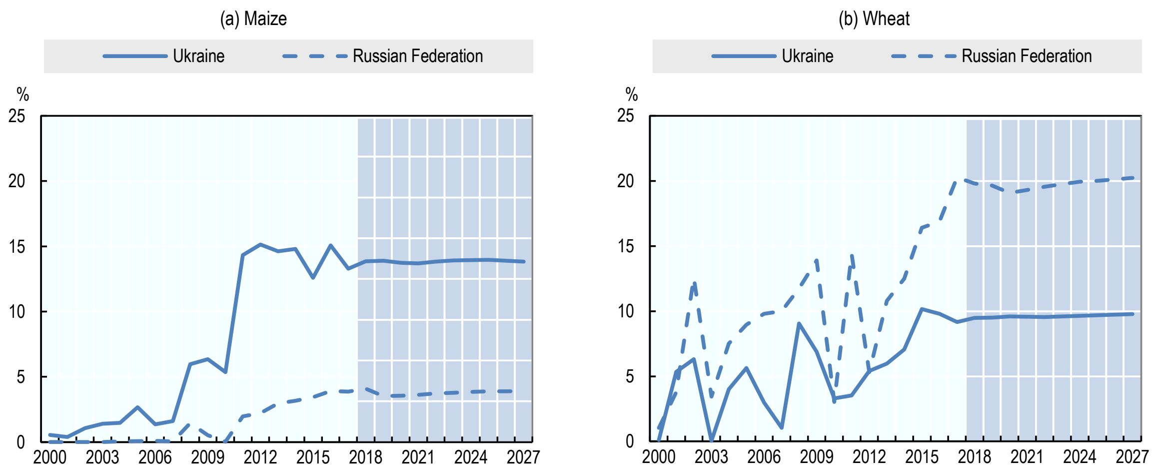
Net exporters: Traditional suppliers expand market shares for most commodities

The Americas and Oceania are traditionally net exporters of agricultural commodities. The overall surplus for the Americas is split roughly equally between North America (United States and Canada) and Latin America and the Caribbean (most notably Brazil and Argentina). In Oceania, Australia accounts for roughly 60% of the overall surplus, with New Zealand accounting for the remainder.

While Oceania's agricultural trade surplus has remained stable over time, there has been a strong growth in the agricultural trade surplus of the Americas. Net exports have increased over time as producers responded to higher international demand for maize, soybean, and meat, among other commodities. The positive trade balance of the Americas is expected to expand further over the projection period.

In recent years, Eastern Europe and Central Asia has emerged as an important agricultural exporter. This change can be traced to improved export performance of the Russian Federation and Ukraine. The Russian Federation has switched from being a net importer to net exporter since around 2013. Agricultural trade in Ukraine was roughly balanced until 2007, when a strong growth in net exports began. The strong growth in Russian and Ukrainian exports is reflected in these countries' shares of global maize and wheat exports (Figure 1.19). Before 2008, Ukraine accounted for less than 5% of global maize exports. By 2011, this share had grown to 15%. The Russian Federation's share of global maize exports remains more modest, but nonetheless has grown from practically 0% in 2010 to 4% of the global total. In wheat, the relative positions are reversed. Both Ukraine and the Russian Federation have a history of exporting wheat surpluses globally, although export shares tended to be highly variable before 2012. Since then, the export shares have grown while becoming less volatile. Ukraine now accounts for 9% of global wheat exports, while the Russian Federation is now the largest exporter, providing 19-20% of global exports.

Figure 1.19. Ukraine and the Russian Federation: Share of global exports for maize and wheat



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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Net importers: Rising trade deficits among countries with rapid population growth

South and East Asia is a major net importer, although aggregate figures for the region hide considerable heterogeneity across countries. While Indonesia and Malaysia are established as net exporters (in large part due to palm oil), Japan is historically a net importer, although its agricultural trade deficit has been broadly constant over time. Conversely, since 2000 the Chinese agricultural trade deficit has grown strongly, accounting in 2017 for USD 40 billion of the region's USD 70 billion trade deficit (in constant 2004-06 dollars). Net imports in China (and hence in South and East Asia as a whole) are expected to grow in the coming decade, but at a slower rate.

Two regions which have similarly experienced increasing agricultural trade deficits are the Middle East and North Africa, and Sub-Saharan Africa. However, the role of imports in satisfying the consumption needs of these two regions varies considerably. While imports represent nearly 20% of consumption of major food commodities in Sub-Saharan Africa, approximately 57% of consumption is met through imports in the Middle East and North Africa region. The evolution of import dependence in the Middle East and North Africa is discussed in more detail in Chapter 2.

Western Europe's agricultural trade deficit (mostly attributable to the European Union) peaked in 2007. Since then, the deficit has fallen by around half to some USD 10 billion (at 2004-06 prices), and is expected to further decrease by around half over the outlook period.

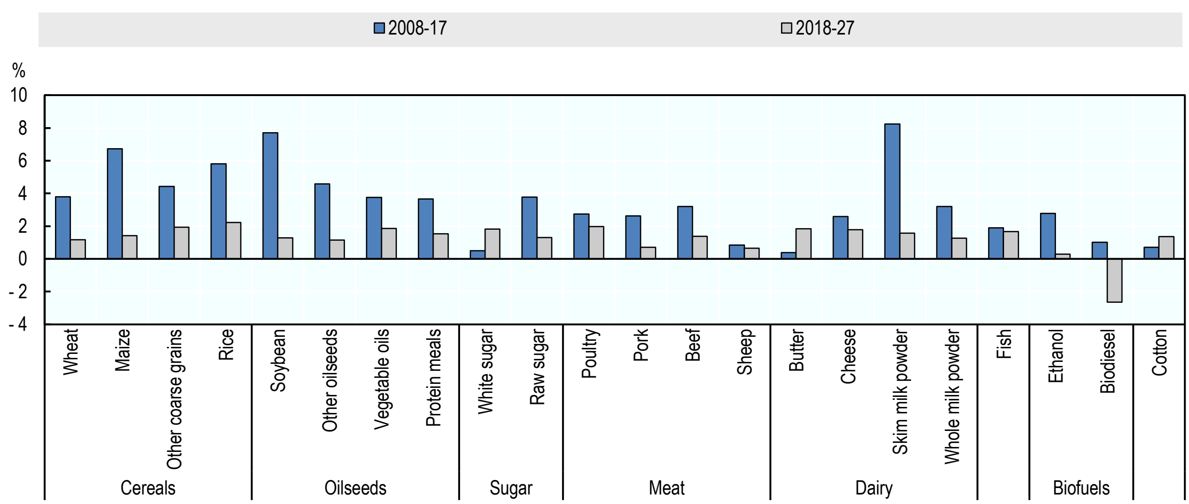
Trade in fish and seafood

Regional trends in the overall agricultural trade balance may mask differences in the pattern of net importers and net exporters of specific commodities, such as fish and seafood, one of the most intensively traded products covered in the *Outlook*. Whereas the United States is a large net exporter of agricultural commodities and China a large net importer, the situation is reversed for fish and seafood. Over time, such regional differences have become more pronounced; since the early 1990s, net imports have increased in the European Union, the United States and Sub-Saharan Africa (among others), while net exports have increased in Norway, Viet Nam and China. For net exports, Viet Nam and Norway are expected to continue increasing their exports but a decline is projected for China due to a reduction in its fish production coupled with growing domestic demand.

Agricultural trade growth is slowing

Across the commodities covered in the *Agricultural Outlook*, the growth of trade volumes is expected to slow down significantly, as shown in Figure 1.20. For some commodities such as skim milk powder, soybeans, and cereals, trade volumes grew strongly in the past decade with growth rates of 4% to 8% per year. In the coming decade, consistent with the slower growth of demand, trade volumes will grow at a much slower pace. The highest expected growth rate (for rice) is only 2.2% per year, while some commodities (e.g. biofuels) will barely register any trade growth at all.

Figure 1.20. Growth in trade volumes, by commodity



Note: Annual growth rate of trade volumes.
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

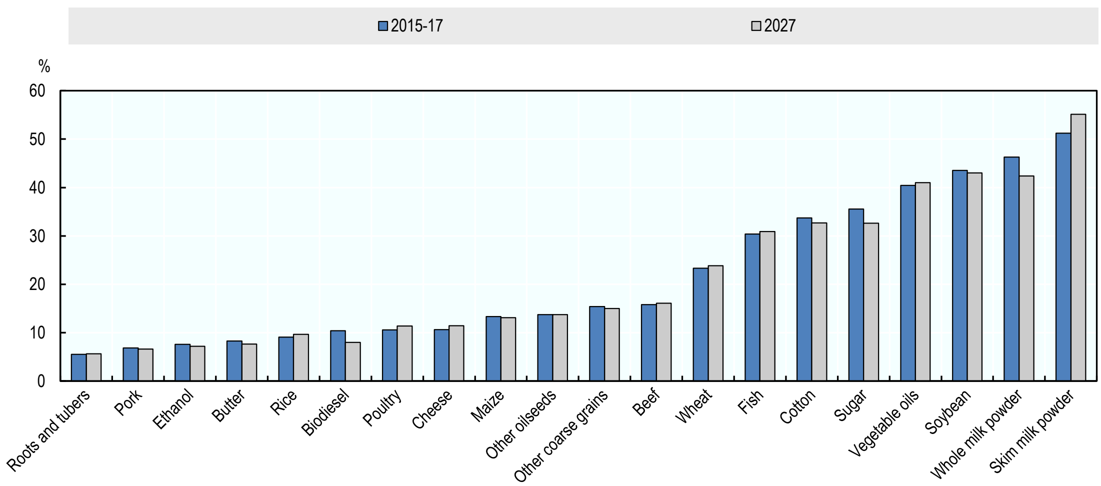
StatLink http://dx.doi.org/10.1787/888933742264

The importance of trade differs by commodity, as shown in Figure 1.21. For many agricultural commodities the share of production traded is low. Less than 7% of global pork production is traded internationally, and only around 8% of global butter production; the share is 9% for rice and 10% for biodiesel. Only for some commodities does trade represent at least one-third of global production. This is the case for cotton, sugar and soybeans, and also for vegetable oils and milk powders, which have a higher degree of processing.

Milk powders in particular are used as a low-cost way of shipping dairy, which explains their high trade share. As shown earlier, most dairy is consumed in the form of fresh dairy products (Figure 1.7), which are typically consumed domestically.

A low trade share at the global level does not mean that trade is not important. For many developing countries, imports of agricultural commodities are essential to guarantee food security. Import dependence is particularly high in the Middle East and North Africa, as discussed in Chapter 2.

Figure 1.21. Share of production traded



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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Agricultural exports to remain concentrated among a few key suppliers

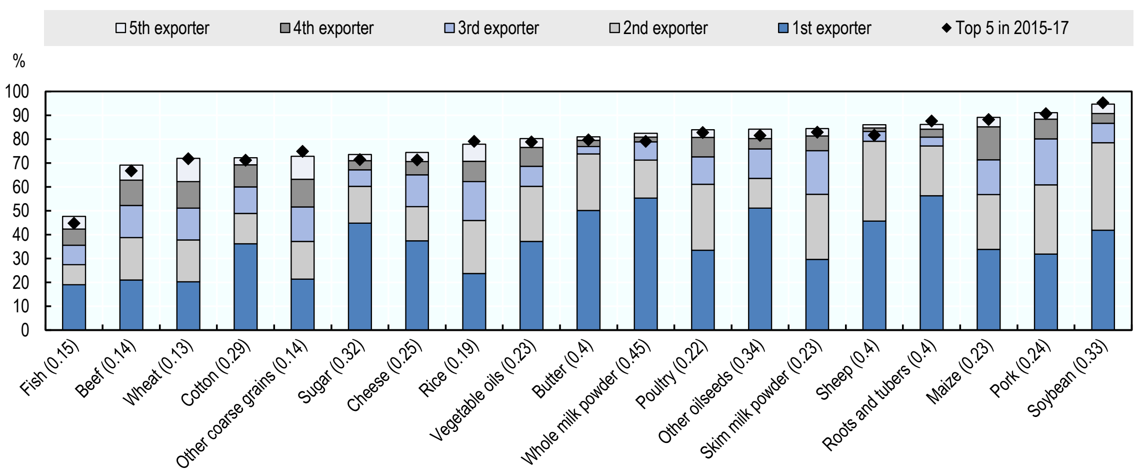
A small number of countries with a comparative advantage in production often account for most of the global exports of agricultural commodities, a situation which is expected to continue during the next decade (Figure 1.22). Even for commodities with relatively less concentrated exports such as beef or wheat, the five leading exporters account for more than two-thirds of the global total. For soybean and pork, this share even exceeds 90%.

Moreover, even for some commodities where the share of the five main exporters is more modest, a single country often dominates. This is the case for sugar (where Brazil by itself accounts for 45% of global exports), other oilseeds (where Canada accounts for 54% of global exports), roots and tubers (where Thailand accounts for 56% of global exports), and several dairy products. For cheese, the European Union exports almost a third of the global total, a share which is expected to increase further. For butter and whole milk powder, New Zealand accounts for more than half of global exports.

Conversely, exports for skim milk powder are more equally distributed among key exporters. In 2015-17, the European Union, the United States and New Zealand had export shares of 30%, 25% and 19% respectively; in the coming decade, the United States is expected to increase its share of global exports but without changing this overall ranking. Exports are also less concentrated for fish for human consumption, where the top 5 exporters are expected to account for less than half of global export volumes by 2027.

Figure 1.22 also denotes for each commodity the value of the Hirschman-Herfindahl Index, a commonly used indicator of market concentration. Higher values of the Hirschman-Herfindahl index indicate greater concentration of exporters, whereas lower values are indicative of greater "evenness" with market shares more evenly distributed among participants. This measure conveys the relative dominance of exporters, complementing the information conveyed by the sum of market shares of the top 5 exporters. The Hirschman-Herfindahl Index will report relatively greater concentration when a single large exporter dominates the market, as is the case for sugar, other oilseeds, and whole milk powder.

Figure 1.22. Export shares of the top 5 exporters in 2027, by commodity



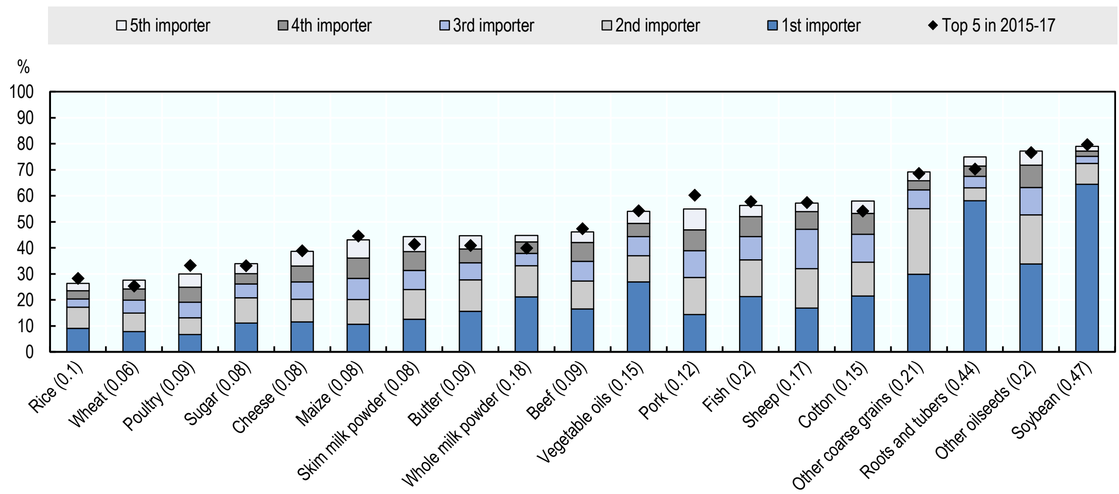
Note: The number in the brackets denotes the value of the Hirschman-Herfindahl Index of concentration of exports across countries for 2027. The Hirschman-Herfindahl Index equals the sum of squared market shares, here rescaled between 0 and 1, where a value closer to 0 corresponds to the absence of concentration and a value of 1 would correspond to a single country being the sole exporter.
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/10.1787/888933742302

Overall levels of concentration tend to be stable, and little change is expected over the coming decade. The high concentration of agricultural exports creates a risk of significant impacts on global markets if exports are interrupted, for instance because of adverse production shocks (e.g. poor harvests) or policy changes in the major exporting countries. Such interruptions could affect prices and local availability, with implications for food security.

Compared with exports, agricultural imports are typically more dispersed – that is, agricultural trade typically flows from a small number of exporters to a large number of importers (Figure 1.23). For rice and wheat, for instance, the five largest importers jointly account for less than 30% of global imports; for most commodities in the *Agricultural Outlook*, the share of the five largest importers is less than 60%. Similarly, the Hirschman-Herfindahl Index is generally lower for imports than for exports.

Figure 1.23. Import shares of top 5 importers in 2027, by commodity



Note: The number in the brackets denotes the value of the Hirschman-Herfindahl Index of concentration of imports across countries for 2027. The Hirschman-Herfindahl Index equals the sum of squared market shares, here rescaled between 0 and 1, where a value closer to 0 corresponds to the absence of concentration and a value of 1 would correspond to a single country being the sole importer.

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/10.1787/888933742321

Notable exceptions are oilseeds (soybeans and other oilseeds), roots and tubers, and other coarse grains, where Chinese demand dominates. China currently is responsible for 63% of all global soybean imports, a share which is expected to increase somewhat in the coming decade. For roots and tubers, China is projected to increase its share of global imports from 53% to 58%. Soybeans and roots and tubers also have a high level of exporter concentration. Global soybean trade is hence dominated by US and Brazilian exports to China, while global trade in roots and tubers (cassava) is dominated by Thai and Vietnamese exports to China.

As with exports, the degree of import concentration by product will change over the next decade but without a clear trend towards higher or lower concentration. Greater import concentration is projected for skim milk powder, cotton and roots and tubers, among other commodities; while greater import dispersion is projected for poultry, beef and especially pork. For pork, while global trade is expected to continue growing, the volumes imported by the two main importers (China and Japan) are expected to decline over the outlook period. China is projected to fall below Japan as largest pork importer; together, these countries are expected to account for 29% of global imports in 2027 as opposed to 34% in the baseline period.

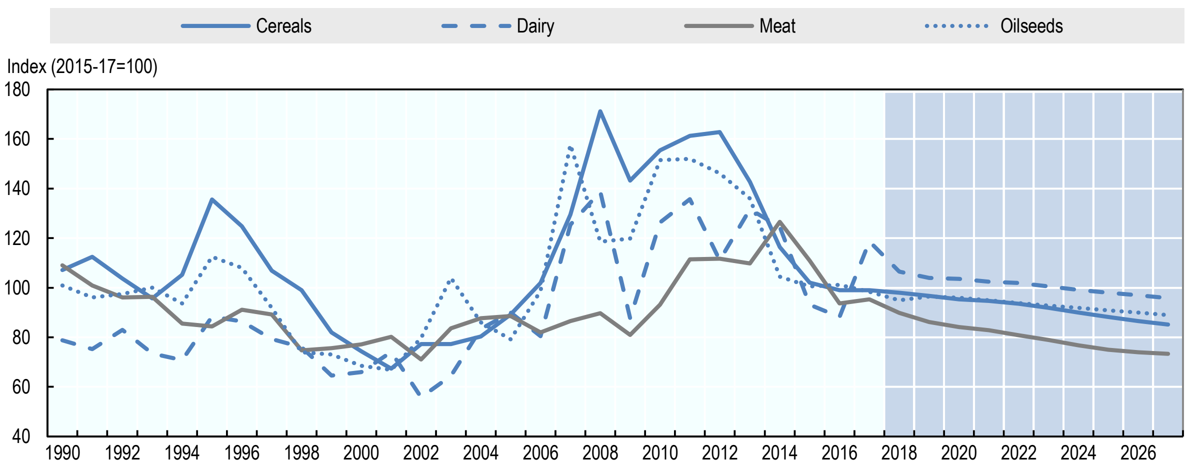
Prices

Real prices for most commodities are expected to fall

The *Outlook* uses recorded prices at main markets (e.g. US gulf ports, Bangkok) of each commodity as international reference prices and provides projections for these prices. Near-term price projections are still influenced by the effects of recent market events (e.g. droughts, policy changes), whereas in the outer years of the projection period, they are driven by fundamental supply and demand conditions.

Prices of different commodity groups such as cereals, oilseeds, dairy, and meat are highly correlated. In the coming decade, prices for these key commodity groups are projected to fall in real terms (Figure 1.24). This implies real prices are expected to be below the peaks seen in 2006-8 for cereals and oilseeds and in 2013-14 for meat and dairy, yet above the levels of the early 2000s.

Figure 1.24. Medium-term evolution of commodity prices, in real terms



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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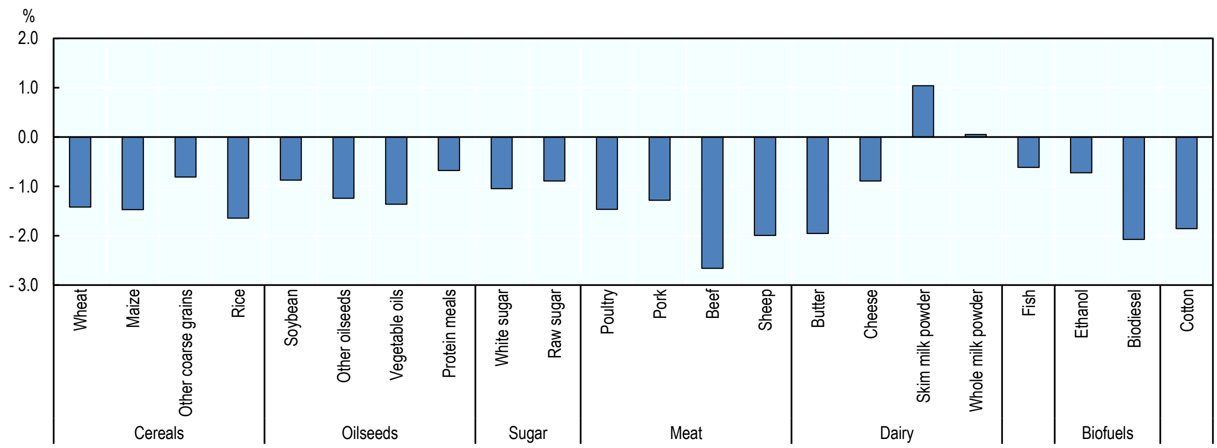
A more detailed view per commodity is provided in Figure 1.25 which shows the projected average annual real price change over the outlook period. Among generally declining real prices, projected trends for dairy stand out. Following the "butter bubble" in 2017, real prices for butter are expected to exhibit an average annual decline of 2% per year as prices come down further at the beginning of the projection period, but prices of skim milk powder are expected to increase by 1% per year. Along with whole milk powder, it is one of the only commodities covered in the *Agricultural Outlook* where prices are not projected to fall in real terms.

Trends in real prices for agricultural commodities reflect a balance of factors which would lead to higher prices (such as higher demand induced by population growth and higher incomes) and factors which would tend to reduce prices (such as productivity improvements, which allow greater output without using additional inputs). The pattern of real price decreases shown in Figure 1.25 indicates that under the assumptions made in the *Agricultural Outlook*, price-reducing factors, principally productivity growth, are expected to dominate in the coming decade.

Figure 1.25. Average annual real price change for agricultural commodities, 2018-27



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/10.1787/888933742359

Despite a downward trend, risk of price peaks remains

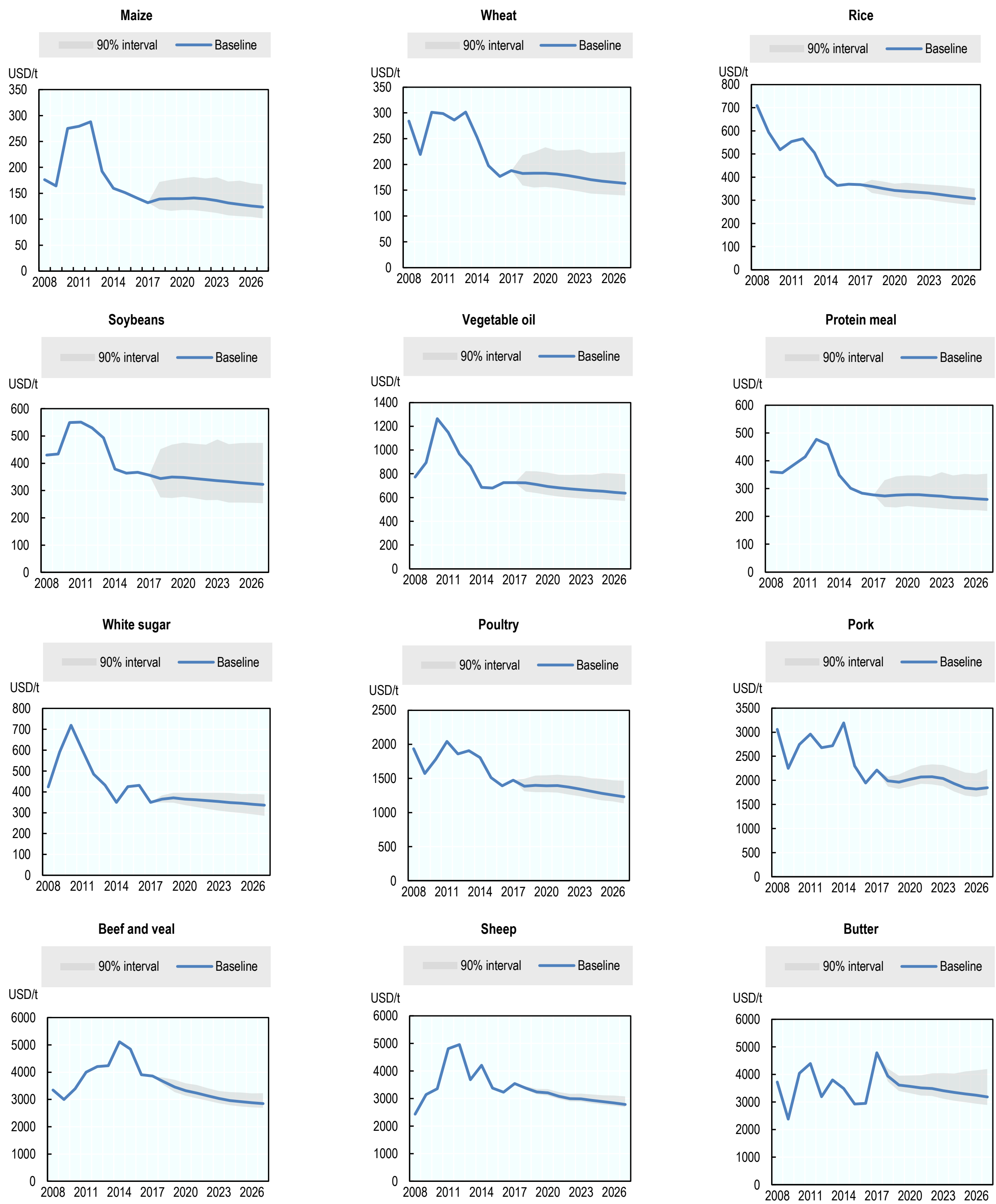
Agricultural commodity prices tend to be volatile, as both demand and supply are relatively insensitive to short-term price movements. This implies that temporary shocks or uncertainty in the projections will have a relatively greater impact on prices than on consumption or production levels. The price trends presented here summarise the interplay of fundamental supply and demand factors, but short-term volatility may lead to considerable deviations from the trend.

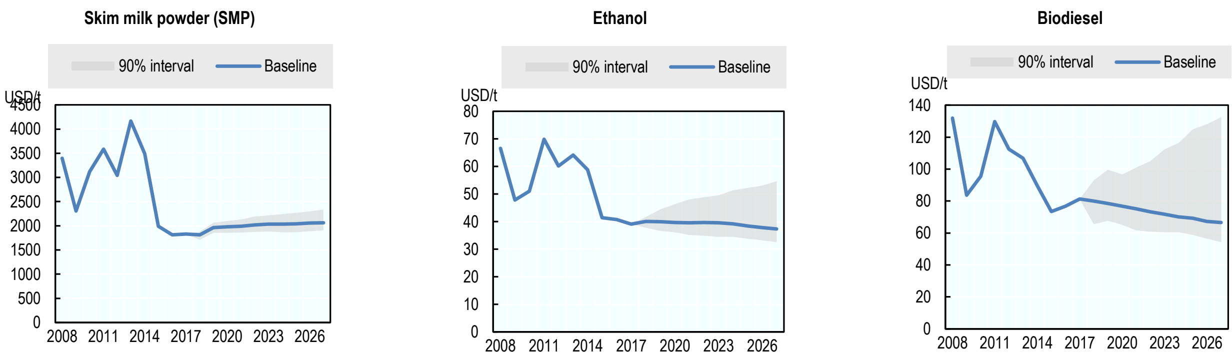
To assess the uncertainty around prices, a partial stochastic analysis was performed on the projections of the *Agricultural Outlook*. The stochastic analysis simulates the potential variability of agricultural markets using 1 000 different scenarios for macroeconomic and other variables, such as oil prices, economic growth, exchange rates and yield shocks. In each scenario, the Aglink-Cosimo model underlying the *Outlook* projects different outcomes for prices. These can be used to provide an indication of the sensitivity of the estimates in the *Outlook*.

The degree of variation included in the stochastic analysis is based on the historical variability, which means more extreme shocks than those observed in the past are not incorporated in the stochastic analysis. Moreover, the analysis is only partial in that it does not capture all the sources of variability that can affect agricultural markets. For example, uncertainty related to animal diseases is not captured, as this factor is hard to quantify. The major sources of uncertainty in agricultural markets included in the stochastic analysis are (Araujo-Enciso et al, 2017):

- *Global macroeconomic drivers:* Values of 32 variables including the real Gross Domestic Product (GDP), the Consumer Price Index (CPI) and the GDP Deflator in the United States, the European Union, China, Japan, Brazil, India, the Russian Federation and Canada; national currency-US dollar exchange rates for these regions; and the world crude oil price.

Figure 1.26. Evolution of real prices for selected commodities





Note: Charts show the evolution of real prices over the outlook period in the baseline projection (solid blue line) as well as the 90% interval from a partial stochastic analysis (see text for details). Cotton and fish are not included in the stochastic analysis and are hence not shown here. Real prices are defined as nominal world prices deflated by the US GDP deflator (2010=1).

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/10.1787/888933742378

- *Agricultural yields*: Uncertainty affecting the yields of 17 crops in 20 major producing countries is also analysed, giving a total of 78 product-country-specific uncertain yields.

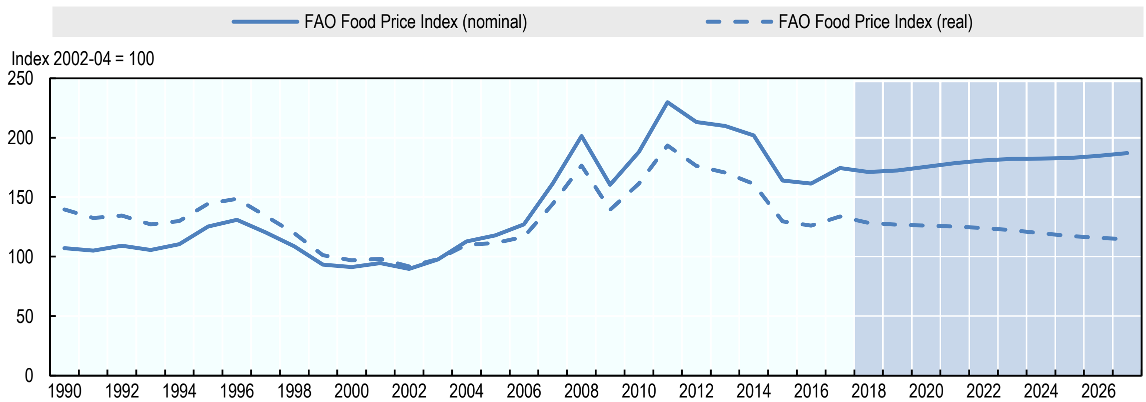
Figure 1.26 shows the expected evolution of real prices for selected commodities under the baseline scenario of the *Agricultural Outlook* as a solid line in each chart. The sensitivity of the price projections is shown as a 90% confidence interval around the projection; 90% of simulated prices in the stochastic analysis fall in this grey range. Under the assumptions of the stochastic analysis, the likelihood that prices will remain within the range is 90% in any given year. The likelihood that prices remain in this range throughout the decade is therefore much lower, at $(0.90)^{10}$ or around 35%. The likelihood that prices will fall outside the range (either above or below) at some point in the next decade is therefore 65%.

Importantly, this grey range does not capture all uncertainty around the projected prices, only the uncertainty coming from the variables included in the stochastic analysis. As a result, the range tends to be larger around crops than livestock, given the susceptibility of yields to weather conditions. Among crops, the price of rice varies least across the different simulations of the stochastic analysis, in part because paddy rice yields are less sensitive to weather conditions once planting decisions have been made. (Weather shocks instead affect area planted, since flooding paddy fields is a precondition for planting, but such area variations are not currently included in the stochastic analysis). By contrast, the variation is highest for biofuels (ethanol and biodiesel), which combine uncertainties affecting physical production with greater uncertainty on the demand side. In general, the degree of uncertainty tends to be asymmetric, as there is more upside potential for price spikes than for price declines.

Projected evolution of the FAO Food Price Index

Another way of assessing the evolution of prices is through the expected future path of the FAO Food Price Index. This index, introduced in 1996, captures the development of nominal prices for a range of agricultural commodities in five commodity groups, weighted with the average export shares of these groups in 2002-2004. As this commodity price index is similar in commodity coverage to the *Agricultural Outlook*, it is possible to project the future evolution of the FPI as a summary measure of the evolution of nominal agricultural commodity prices (Figure 1.27).

Figure 1.27. Projected evolution of the FAO Food Price Index



Note: Historical data is based on the FAO Food Price Index, which collects information on nominal agricultural commodity prices; these are projected forward using the Agricultural Outlook baseline. Real values are obtained by dividing the FAO Food Price Index by the US GDP deflator (2002-04 = 1).
Source: FAO World Food Situation (http://www.fao.org/worldfoodsituation/foodpricesindex/en/) and 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/10.1787/888933742397

Based on the supply and demand conditions projected in the *Outlook*, nominal agricultural commodity prices as summarised by the FAO Food Price Index are expected to grow by only 0.7% per year over the coming decade. In real terms, the FAO Food Price Index is expected to decline over the coming decade. Both nominal and real prices are expected to remain below the peaks reached between 2008 and 2014, but above the levels seen in the early 2000s.

Risks and uncertainties

The *Agricultural Outlook* combines projections using the Aglink-Cosimo model with expert judgment on the likely evolution of drivers of agricultural markets. The projections in the *Outlook* are therefore sensitive to the underlying assumptions, such as the assumptions on macro-economic conditions and relevant policies discussed in Box 1.6. While based on the best available information at the time of preparation, these assumptions are inherently uncertain. Moreover, a number of factors not explicitly taken into account could affect global agricultural markets in the coming decade. Uncertainty on such issues tends to accumulate over time. Over the ten-year horizon of the *Outlook*, temporary deviations from the trend may hide the actual trend, even if the projections of the *Outlook* are sound.

Some of the uncertainties can be quantified. For instance, the impact of a different oil price scenario is explored in Box 1.3. Moreover, the partial stochastic analysis introduced in the previous section can provide useful information on the sensitivity of the projections in the *Outlook* to changes in global macroeconomic conditions and agricultural yields. Finally, several other factors are harder to quantify; their potential impact is discussed below.

Box 1.3. The impact of an alternative oil price scenario

The assumption on crude oil prices during the projection period is based on the average crude oil price projected by the World Bank Commodities Price forecasts, as released in October 2017. These projections imply that nominal oil prices increase at an average annual rate of 1.8% over the outlook period, from USD 54.7 per barrel in 2017 to USD 76.1 per barrel by 2027.

To test the sensitivity of the *Outlook* projections to this assumption, a scenario analysis was conducted with an alternative oil price based on the "New Policies Scenario" developed by the International Energy Agency (IEA) in its *World Energy Outlook 2017*. Under this alternative scenario, nominal oil prices increase to USD 122.2 in 2027, or 61% higher than in the baseline scenario.

A large change in oil prices would also affect the GDP assumptions underlying the *Outlook*, especially for oil-exporting economies. To incorporate these effects, the scenario analysis included GDP responses to oil prices based on a recent study by the Joint Research Centre of the European Commission (Kitous et al., 2016).

Higher oil prices increase agricultural production costs through higher prices for fuel and fertiliser, as well as through general cost increases induced by higher inflation. Higher fuel prices can also affect demand for agricultural commodities through biofuels markets, through two opposing effects. On the one hand, higher prices depress the demand for transportation fuels, which in turn reduces the demand for biofuels that is due to mandatory blending. On the other hand, a higher crude oil price leads to a substitution in favour of biofuels. This effect would be more pronounced for biodiesel than for ethanol, for which the share in gasoline fuel is already close to its technical maximum in several main markets.

The scenario suggests that higher crude oil prices would have a negative but small impact on the production of most agricultural commodities. For instance, for maize, global production would be 0.7% lower than under the baseline projections. Stronger effects are found for biofuels. Higher oil prices would stimulate the global production of biodiesel by 2.5% compared to the baseline while global ethanol production would decrease by 1.5%.

Higher crude oil prices would also affect agricultural prices. Nominal prices of maize, wheat, soybeans and vegetable oil would all be 10-11% higher than under the baseline while nominal livestock and dairy prices would be 6-8% higher. A stronger price increase is expected for biodiesel, where higher demand, production costs and inflation lead to nominal prices that are 27% above those in the baseline.

Several factors affect the "pass-through" of oil prices to agricultural commodity prices. The scenario assumes that the higher oil price is caused by supply-side factors, so that higher oil prices reduce demand for transportation fuel, in turn reducing the demand for biofuels due to mandatory blending. If higher oil prices were caused by an increased demand for transportation fuel, it would be accompanied by a stronger growth in biofuels demand and hence a stronger increase in agricultural prices.

A second factor is the impact of higher oil prices on fertiliser prices. Traditionally, high oil prices led to high prices of natural gas, a main input for nitrogen-based fertilisers. The price of natural gas was in the past often indexed to crude oil prices, creating a direct link. In recent years, however, natural gas prices have shown signs of becoming "decoupled" from oil prices. This would weaken the link between oil and fertiliser prices. On the other hand, it seems likely that a large increase in crude oil prices sustained over a decade, as considered in the scenario, would be accompanied by higher natural gas prices – whether due to the way in which natural gas is priced, or due to substitution effects. The scenario therefore assumes that crude oil prices will indeed affect fertiliser prices.

Source: Kitous, A., et al. (2016) Impact of low oil prices on oil exporting countries, *JRC Science for Policy Report*, EUR 27909 EN (doi:10.2791/718384).

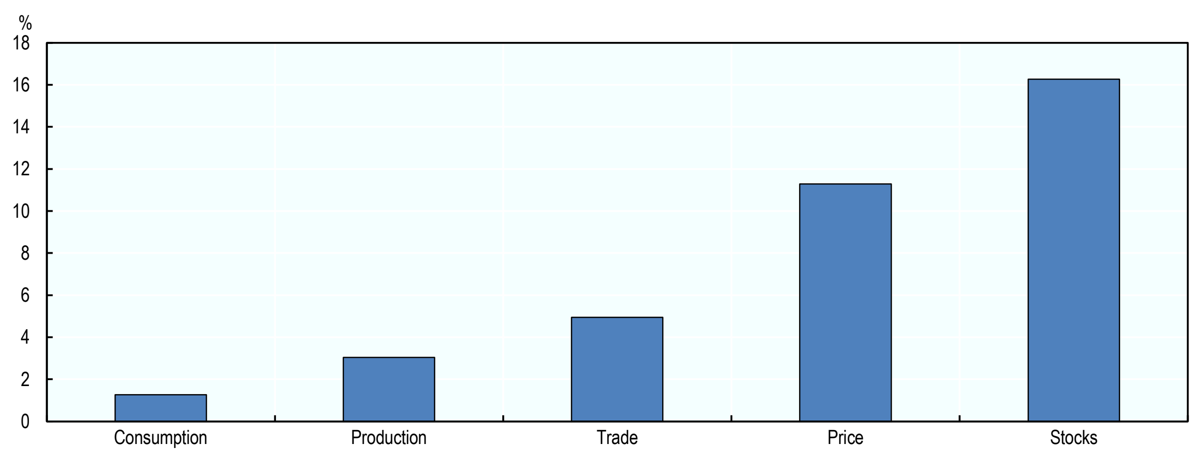
Partial stochastic analysis

In the previous section, a partial stochastic analysis was used to provide an indication of the range of uncertainty around projected real prices for various commodities. The stochastic analysis also offers insights on other aspects of the *Outlook*. One way of representing and comparing the impact of uncertainty on projected outcomes is the coefficient of variation in the last projection year, 2027. The coefficient of variation (CV) is defined as the standard deviation divided by the mean, and can therefore be interpreted as a percentage deviation from the "central" projection in the *Outlook*.

Figure 1.28 compares the coefficients of variation of global consumption, production, trade, (nominal) prices and stocks of maize. Whereas the coefficient of variation for global consumption is around 1%, variability of production is larger at almost 3%. For trade, the coefficient of variation is around 5%. Variability of prices is much larger at 11%, while the highest variability is for stocks, at 16%.

This result captures two essential characteristics of global agricultural markets. First, the demand and supply of many agricultural commodities are relatively less sensitive to prices. Shocks to demand or supply therefore lead to relatively large adjustments in prices. Second, trade and stocks serve as buffers and are therefore more variable. Stocks can be used to smooth consumption in the face of fluctuations in production. Likewise, trade allows countries to increase imports to keep consumption more stable in years where production is low.

Figure 1.28. Maize: Coefficient of variation in 2027



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/10.1787/888933742416

Other uncertainties affecting the Outlook

While the partial stochastic analysis captures uncertainty around a range of factors affecting the evolution of agricultural markets, many other uncertainties are harder to quantify but no less important, in particular those associated with government policies.

Demand

On the demand side, an important source of uncertainty relates to biofuel policies in major markets, notably China. The Chinese government recently proposed a new nationwide ethanol mandate, which would expand an earlier mandate that had been in force in 11 trial provinces to the entire country by 2020. The potential implications are discussed in more detail in the Biofuels chapter, but preliminary estimates show that the policy would increase Chinese ethanol use by 18 bln L to 29 bln L. To put this increase in context, world ethanol production in 2027 is currently projected at 131 bln L. If inputs are sourced domestically, Chinese maize reserves could be used in large part; but if the additional demand is instead satisfied by imports, the effect on agricultural markets could be large.

Changing consumer preferences could also impact markets. Some evolutions in consumer demand can be projected from current trends, such as the decreasing role of cereals and the increasing demand for proteins as average incomes grow. Other changes, such as a rise in vegetarian or vegan lifestyles or an increasing preference for local or organic food, are harder to assess, but these tend to be relatively slow-moving trends and are often of limited importance to global markets. Food health scares, by contrast, have the potential of reducing consumer demand in the short run, sometimes with lasting consequences.

Obesity and overweight are increasingly recognised as public health problems in a large number of countries. Various policies have been introduced to stem the rise of obesity, varying from the provision of information and education to labelling and product formulation requirements, and subsidies and taxes (most notably on sugar and sweetened beverages). Further measures may be deployed over the projection period, with a view to affecting the levels of calorie consumption as well as the composition of diets.

Supply

The production of agricultural commodities is unique in its vulnerability to natural elements, including bad weather and diseases which can affect plant and animal production. Historically, such diseases have often presented important disruptions to agricultural markets; it is possible that similar disruptions will occur over the outlook period (see Box 1.4 for a discussion of the threat posed by the Fall Armyworm in particular). As noted above, agricultural exports tend to be concentrated among a small number of countries; all else equal, this raises the risk that a shock in a single country will affect world markets.

Regulatory changes can impact agricultural production, for instance through the introduction of measures that ban or raise the costs of certain production practices (e.g. the use of neonicotinoid pesticides). Similarly, policies to mitigate climate change could impact agriculture, in particular ruminant production, which contributes to methane emissions. On the other hand, developments of new technologies such as digital and precision agriculture or new plant breeding techniques could improve agricultural productivity beyond the rate currently projected in the *Outlook*.

Agricultural input industries are currently witnessing a trend of increasing consolidation and market concentration. Such trends have been seen in crop protection chemicals, seeds and biotech, and fertiliser markets, among others, raising concerns that less competition may reduce private spending on research and development (R&D).

For the fisheries and aquacultures sector, an important source of uncertainty relates to changes in policies being implemented by China, which can have an impact on global supply, demand, and prices due to the key role played by China in the sector. The potential implications are discussed in more detail in the fish and seafood chapter.

Box 1.4. Combatting the expanding Fall Armyworm infestation in Sub-Saharan Africa

Fall Armyworm (*Spodoptera frugiperda*) is an insect native to the Americas that was first detected in Central and Western Africa in early 2016. Since then, it has spread to most countries in Sub-Saharan African and is likely to reach North Africa (FAO, 2017). In the medium term, experts fear that infestations could extend into Southern Europe and Asia and, during the summer season, even reach Northern Europe. In the Americas, farmers, researchers and governments have been combatting Fall Armyworm for decades, keeping losses to a minimum. However, in Sub-Saharan Africa the majority of maize farmers are smallholders and do not have access to the necessary knowledge or inputs to fight this new pest. While some studies based on farmer's perceptions claim that in the absence of any control method Fall Armyworm can cause maize production losses up to 53% (Day et al., 2017), the majority of the field trials show yield losses below 20%.

The Fall Armyworm outbreak in Sub-Saharan Africa does not appear to have impeded the recovery in maize production following two consecutive years of severe drought conditions in Southern Africa. In 2017, cereal production increased by about 16 Mt compared to 2016, putting the aggregate output at 80 Mt, an above-average level. The *OECD-FAO Agricultural Outlook* foresees a continuation of this positive trend, with maize production projected to reach about 93 Mt in 2027 for the region. The projections assume Fall Armyworm control methods become effective enough to allow continued yield gains.

Nonetheless, such methods are not easily implemented and Fall Armyworm could become a threat to food security in the region. It holds the potential to endanger the production of cereals and other crops because, unlike the Americas, small-scale producers represent the vast majority of cereal production in Sub-Saharan Africa. Their crops are typically more vulnerable to pests and diseases, and their ability to cope with infestations is limited.

The *OECD-FAO Agricultural Outlook* projections take the Fall Armyworm into account as an important uncertainty. At the same time, severe production losses are expected to be prevented by initiatives already underway, notably FAO's five-year programme of "Sustainable Management of the Fall Armyworm in Africa." The programme incorporates the participation of researchers, governments, and small producers in Latin America with vast experience on managing Fall Armyworm. The methods and tools developed in Latin America are expected to prove effective in containing Fall Armyworm in Sub-Saharan Africa.

There is a possibility that the Fall Armyworm gradually moves to North Africa and from there to Europe and Asia. Unlike Sub-Saharan Africa, which is more of a regional market, the spread of Fall Armyworm to North Africa, Europe and Asia could pose problems for the global maize market, as those regions comprise major importers and exporters of maize. While it is still too early to assess the implications of such an outcome, efforts are already underway to ensure an effective monitoring and early detection of the pest. These efforts should eventually enable farmers and governments to take adequate and timely actions to contain the spread and mitigate the effects of Fall Armyworm.

Sources

FAO (2017), "Sustainable Management of the Fall Armyworm in Africa", FAO Programme for Action, 6 October, http://www.fao.org/3/a-bt417e.pdf

Day, R. et al. (2017), "Fall Armyworm: Impacts and Implications for Africa", *Outlooks on Pest Management*, Vol. 28, No. 5, pp. 196-201.

Trade

The international trade environment is facing increasing uncertainty in recent years, which may impact agricultural trade flows.

A number of current trade issues involving agricultural commodities (such as the Russian import ban, the dispute around Argentine and Indonesian biodiesel exports to the US, and China's anti-dumping probe into imports of US sorghum) may have important bilateral effects for specific commodities, but are not likely to have large effects at a global level and across different commodities (Box 1.5). However, even if such disputes are eventually resolved, they may end up permanently changing trade flows between countries, as exporters find new markets and importers find new sources of supply.

Brexit – the announced exit of the United Kingdom from the European Union – is currently still being negotiated; little is known about the exact arrangements that will govern agricultural policy in the United Kingdom and its trade relations with the European Union and other countries. While Brexit is likely to have a big impact on certain bilateral agricultural trade flows (most notably for beef, dairy and lamb), the effect on global agricultural trade is likely to be small.

In March 2018, eleven countries (Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Viet Nam) signed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership. Parties to the agreement are reducing tariffs on each other's agricultural imports, which is likely to intensify trading relations among participant countries. The agreement is also likely to have a negative effect on exports to countries that are party to the agreement by countries that are not. Again, these changes will impact individual countries and bilateral trade flows more than global agricultural markets.

The renegotiation of NAFTA, which is currently ongoing, could impact agriculture in North America. Agricultural trade has grown strongly because of NAFTA, leading to a highly integrated region. Currently, more than 25% of US maize exports go to Mexico, and one-third of US beef exports go to Canada and Mexico; disruptions to these trade flows could impact not only North American but global markets as well.

Box 1.5. Potential impacts of China imposing additional import tariffs on US agricultural products

China is the United States' largest trading partner. Total merchandise exports to the United States rose from USD 84 billion in 2000 to USD 506 billion in 2017. In terms of net trade, the United States has an annual deficit of about USD 375 billion in total merchandise trade, while it maintains a surplus of about USD 20 billion on agricultural products, with soybean exports accounting for USD 13 billion.

In March 2018, the United States imposed additional import duties on steel and aluminium products, and announced possible actions to respond to alleged unfair treatment of US companies seeking to do business in China on grounds of intellectual property infringement. Chinese authorities, in turn, suspended tariff concessions on multiple US products – including fruits, nuts and pigmeat – and announced eventual further duties on other agricultural products. Additional *ad valorem* duties of 25% have been put in place for pigmeat imports, and announced for soybeans and sorghum.

About 60% of US soybean exports are destined for China, which is highly dependent on imports for its domestic needs. In 2017, China imported an estimated 96 million tonnes, accounting for 64% of global soybean imports, while it produced around 13 million tonnes. Additional duties on soybeans would lower imports from the United States, but are likely to be offset by larger purchases from other suppliers, notably Brazil and Argentina. This could lead to a wider reallocation of trade, with US exports redirected to other markets, notably in Europe and Latin America, when the price spread between United States and Brazilian soybeans substantially widened. Indications of this have already been observed.

China has taken further measures to curb sorghum imports from the United States. In 2017, 80% of US sorghum exports were shipped to China, accounting for around USD 957 million. In February 2018, China self-initiated an antidumping and countervailing duty investigation on imports of United States sorghum, and therefore in principle outside the scope of retaliatory measures announced by Beijing. As of early April, China requests a provisional deposit on sorghum imports from the United States, equivalent to an *ad valorem* duty of 178.6%. This measure, applied to all US companies, has led to a halt of US exports and a redirection of vessels already underway to China. Higher trade barriers on China's sorghum imports could trigger secondary effects, potentially leading to a reduction in China's high maize stocks or stimulating the import of other feed grains, notably barley, which would open up opportunities for alternative suppliers.

China is the world's largest producer and importer of pigmeat. In 2017, it produced more than 53 million tonnes, about 45% of the global production, and imported an estimated 1.6 million tonnes. The industry relies heavily on soybean meal to feed pigs. Over the medium term, higher tariffs and hence higher costs for soybeans and feed grains would raise the costs of production for China's pigmeat industry. This, combined with the higher tariffs and hence higher prices for imported pork, could lead to noticeable increases in domestic pork prices. China may elect to source its needs from alternative suppliers such as the European Union, Canada and Brazil.

Across these major product categories, additional import tariffs would imply some immediate losses to both US suppliers and Chinese consumers. Beyond immediate dislocations the overall market effects should be modest as these are highly tradable products and China has the potential to source from other countries, while the United States has the potential to supply other markets. Nevertheless, diverting trade comes at a cost, especially due to the size of the United States - China soybean relationship and lack of alternative partners. The impact would be greater if China were to seek to meet the demand shortfall from domestic production.

Highlights of the commodity projections

Cereals

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.

Oilseeds

Global oilseeds production is expected to expand at around 1.5% p.a., well below the growth rates of the last decade. Brazil and the United States will be the largest soybean producers, with similar volumes. Protein meal use will grow more slowly due to slower growth in livestock production and as the protein meal share in Chinese feed rations has reached a plateau. Demand for vegetable oil is expected to grow more slowly due to slower growth in per capita food use in developing countries and the projected stagnation in demand as feedstock for biodiesel. Vegetable oil exports will continue to be dominated by Indonesia and Malaysia, while soybean, other oilseeds and protein meal exports are dominated by the Americas. Prices are projected to increase slightly in nominal terms over the outlook period, with slight declines in real terms.

Sugar

Production of sugarcane and sugar beet are projected to expand at a slower pace than in the previous decade. Brazil is projected to remain the largest producer with strong growth prospects foreseen in India, China and Thailand. Demand for caloric sweeteners (sugar and high fructose corn syrup) is expected to grow faster than for most commodities. Per capita consumption is stagnant in developed countries and in some developing countries where consumption has reached levels that raise health concerns. In Asia and Africa, population growth and urbanisation are expected to sustain growth in sugar consumption. Brazil will continue to account for some 45% of global exports, making it the largest exporter. Sugar prices are projected to follow a moderate upward trend in nominal terms but a downward trend in real terms.

Meat

Global meat production is projected to be 15% higher in 2027 relative to the base period. Developing countries will account for 76% of the output growth, with poultry seeing the most rapid expansion. However, consumers in developing countries are expected to increase and diversify their meat consumption towards more expensive meat such as beef and sheepmeat. Import demand is expected to remain strong in Asia, with significant growth in the Philippines and Viet Nam; other main importers include China, Korea and Saudi Arabia. The combined export share of the two largest meat exporters, Brazil and the United States, is expected to increase to around 45%. Nominal meat prices are projected to gradually increase until 2027, while real prices are expected to trend downwards.

Dairy

Growth in world milk production is projected to increase by 22% over the projection period, with a large share of the increase coming from Pakistan and India. In 2027, these two countries are expected to jointly account for 32% of global milk production. Most of the additional production in these countries will be consumed domestically as fresh dairy products. Over the projection period, the European Union's share in global exports of dairy commodities is expected to increase from 27% to 29%. As the 2017 butter bubble continues to deflate, nominal and real prices for butter will decrease over the projection period. With the exception of milk powders, dairy prices are expected to decrease in real terms.

Fish

Global fish production will continue to grow, albeit at a much reduced pace compared with last decade. Additional output derives completely from continued but slowing growth in aquaculture, while capture fisheries production is expected to fall slightly. Policy changes in China imply a potentially large reduction in the growth of its aquaculture and capture fisheries output. Asian countries will account for 71% of the increase in fish consumption as food, and per capita fish consumption will increase in all continents except Africa. Fish and fishery products will continue to be highly traded; Asian countries will continue to be the main exporters of fish for human consumption while OECD countries will remain the main importers. Fish prices will all increase in nominal terms but remain broadly flat in real terms.

Biofuels

Given current policy developments and trends in diesel and gasoline demand, global ethanol production is expected to expand from 120 bln L in 2017 to 131 bln L by 2027, while global biodiesel production is projected to increase from 36 bln L in 2017 to 39 bln L by 2027. Advanced biofuels based on residues are not expected to take off over the projection period due to lack of investment in research and development. Trade in biofuels is projected to remain limited. Global biodiesel and ethanol prices are expected to decrease respectively by 14% and 8% in real terms over the next decade; however, the evolution of ethanol and biodiesel markets will continue to be shaped by policies and demand for transport fuel, which implies considerable uncertainty on these projections.

Cotton

World cotton production is expected to grow at a slower pace than consumption during the first few years of the outlook period, reflecting lower prices and releases of global stocks accumulated between 2010 and 2014. India will remain the world's largest country for cotton production, while the global area devoted to cotton is projected to recover slightly despite a decrease of 3% in China. Processing of raw cotton in China is expected to continue its long-term downward trend, while India will become the world's largest country for cotton mill consumption. In 2027, the United States remains the world's main exporter, accounting for 36% of global exports. Cotton prices are expected to be lower than in the base period (2015-17) in both real and nominal terms, as the world cotton price is continuously under pressure due to high stock levels and competition from synthetic fibres.

Box 1.6. Macroeconomic and policy assumptions

The main assumptions underlying the baseline projection

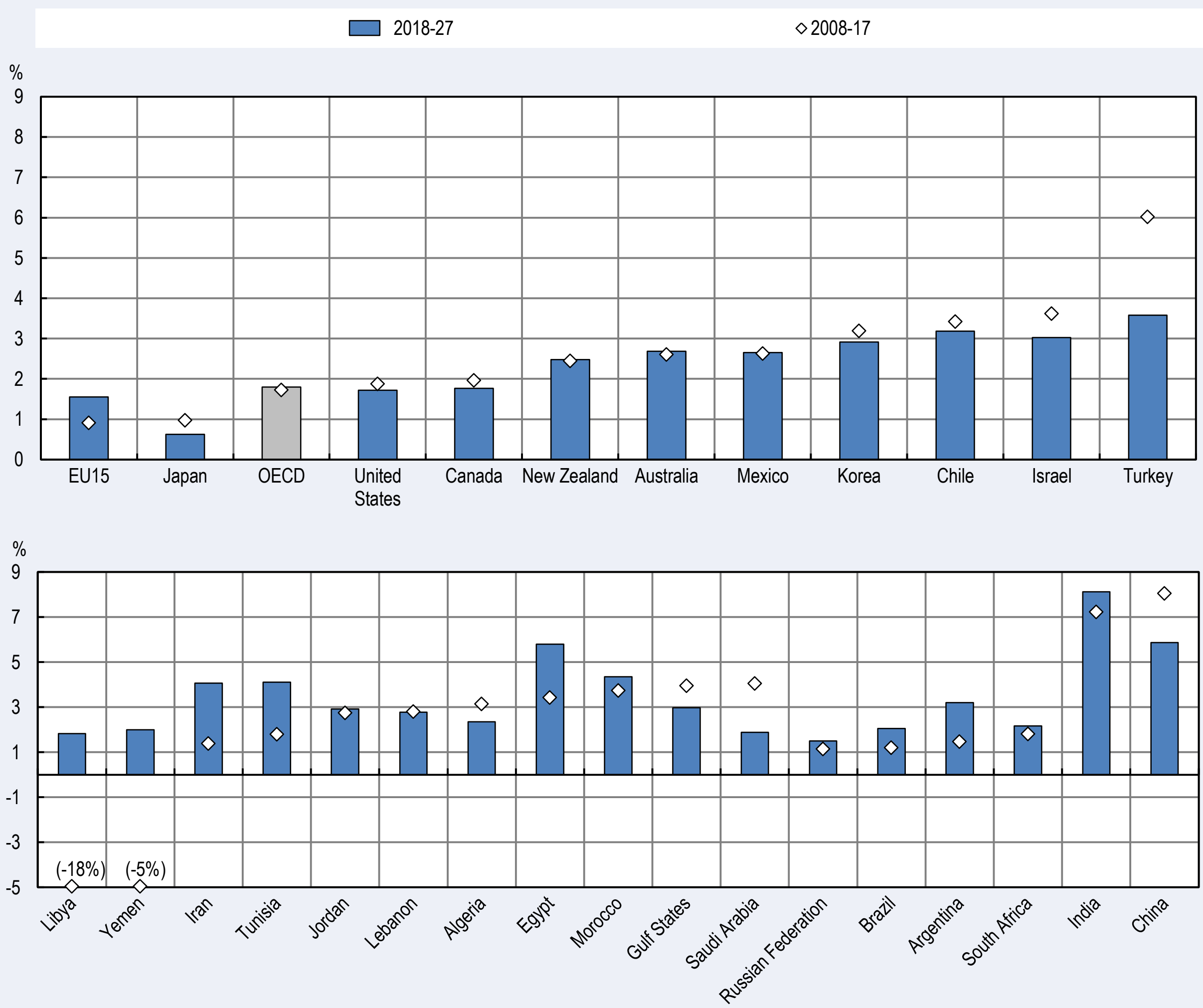
The *Outlook* presents a scenario that is considered plausible given assumptions on the macro-economic, policy and demographic environment, which underpins the projections for the evolution of demand and supply for agricultural and fish products. The macro-economic assumptions used in the *Agricultural Outlook* are based on the *OECD Economic Outlook* (November 2017) and the IMF's *World Economic Outlook* (October 2017). These and other assumptions are detailed in this box.

Global growth

After particularly weak growth in 2016, the upturn of the global recovery gathered strength in 2017, with growth of 3.6%. Similar rates of growth are expected in 2018 and 2019. In advanced economies, growth is accelerating in Europe, Canada, Japan and the United States, and inflation is still subdued, but growth at these rates may not be sustainable in the medium-term. World growth is mostly driven by emerging market and developing economies, but that growth remains uneven, in particular for some commodity exporters.

Growth in the United States is projected to increase to 2.2% in 2017 and 2.5% in 2018, boosted by fiscal stimulus, favourable financial conditions, and greater confidence among consumers and investors. Over the next ten years, growth is expected to be moderate at an average annual rate of 1.7%.

Figure 1.29. GDP growth rates in OECD and selected developing countries



Note: Only selected developing countries shown in second panel. Assumptions for all countries are available in the online Statistical Appendix.

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/10.1787/888933742435

The recovery in the euro area is expected to gather strength this year, with growth at 2.1%, and be slightly down in 2019 at 1.9%, but is expected to remain moderate in the next decade due to weak productivity and low population growth. For EU15 members as a group, an annual average growth rate of 1.6% is expected during the projection period.

After a rebound of 1.5% in 2017, growth in Japan is projected to decrease again in 2018 and 2019, to 1.2% and 1.0%, respectively. Annual average GDP growth is expected to weaken further to 0.6% over the projection period due to a reduced labour force.

Among OECD countries, Turkey is expected to experience the highest growth rate over the next ten years, with an average annual rate of 3.6%, followed by Chile at 3.2%, Israel at 3.0%, Korea at

2.9%, and Australia and Mexico at 2.7%. Growth in Canada shows a strong recovery in 2017 at 3.0% but is projected to decrease in 2018 to 2.1% and not exceed 1.8% on average during the next decade.

Growth is projected to continue to slow down in China to an average of 5.8% over the next ten years compared to 8.0% during the last decade, while growth in India is anticipated to be strong at 8.1% p.a. on average.

After recessions in 2016, growth in Brazil, Argentina and the Russian Federation recovered in 2017 and is expected to average 2.0%, 3.2% and 1.5% p.a. respectively over the projection period. Growth in South Africa should average 2.2% over the ten-year period.

Economic growth in the Middle East and North Africa region is recovering following a recession induced by weak crude oil markets. Modestly stronger growth is projected through the medium term, with the region as a whole growing at an average of 3% p.a. over the outlook period, although growth is uneven among countries due largely to geopolitical factors. Egypt is anticipated to be the strongest growing country, with GDP increasing at 5.9% p.a. Other countries are projected to grow at between 2% and 5 % p.a., but some may not recover ground lost in the previous decade.

Emerging developing countries in Southeast Asia are projected to continue experiencing robust growth over the medium term, at least matching their performance of the previous decade. Growth in Viet Nam, Indonesia, and the Philippines is anticipated to be in the 5-7% p.a. range, while that in Thailand is at around 3.1% p.a.

In countries of the Latin America and Caribbean region, economic growth varies considerably by country. While Brazil and Argentina may grow relatively slowly in the next decade, other countries including Colombia and Chile are projected to average between 3% and 4% p.a.

Growth in developing and least developed African countries, while highly diverse, is projected to continue at higher rates in the next decade, and on a per capita basis may average over 3% p.a. Continued growth in most African countries will be contingent on firm commodity markets, and domestic policy reforms.

Population growth

World population growth is expected to slow to 1% p.a. over the next decade, compared to 1.3% in the last decade. Developing countries continue to drive this growth, particularly Africa which is expected to have the fastest growth rate at 2.4% p.a. The Asia and Pacific region will account for nearly half the world's population, and India, with an additional 138 million people by 2027, should overtake China as the most populous country.

Among OECD countries, the population of Japan is expected to decrease by more than 4 million over the next ten years and that of the Russian Federation by 2.1 million. The population of the European Union is expected to remain stable. Australia has the highest projected population growth among OECD countries at 1.1% p.a., followed by Mexico at 1.1% p.a.

Inflation

Inflation rates are projected to increase over the next few years in both advanced and emerging market and developing economies, reflecting the recovery in demand and the increase in commodity prices, including energy prices. Inflation increased in OECD countries in 2017, averaging around 2%, but remained weak in Australia and Canada at around 1% and was close to zero in Japan.

Inflation is projected to increase gradually in the United States, averaging 2.3% p. a. during the next ten years. For the EU15 members as a group, the annual average inflation rate is projected at 1.8% for the next ten years. Inflation is expected to increase slightly in Japan, averaging at 1.6% p.a. Among the major emerging economies, consumer price inflation is projected to remain stable in China at around 2.6% p.a. on average over the projection period, and ease slowly in Brazil at 4.1% p.a., while inflation in the Russian Federation rates should decline to 4.0% p.a. on average.

Exchange rates

Nominal exchange rates for the period 2018-27 are assumed to be mostly driven by the inflation differential in relation to the United States (with minor or no changes in real terms).

The Euro appreciated slightly in nominal terms against the US dollar in 2017 and should appreciate more in 2018, before depreciating again over the next ten years. The currencies of China and Japan are expected to appreciate in nominal terms relative to the US dollar over the next ten years. Conversely, strong depreciation is projected in the currencies of Argentina, Brazil, India, South Africa, Turkey, Paraguay and Nigeria, with lesser depreciations in Korea, Australia, Mexico, the Russian Federation, and Canada.

Energy prices

Historical data for world oil prices to 2016 is based on Brent crude oil prices obtained from the short-term update of the *OECD Economic Outlook* N°102 (November 2017). For 2017, the annual average monthly spot price in 2017 was used, while the estimate for 2018 is based on the average of daily spot prices in December 2017. Oil prices during the projection period follow the path of the World Bank average crude oil price projected by the World Bank Commodities Price forecasts, released in October 2017.

In 2017, crude oil prices started to recover following the extension of the production agreement by the Organization of the Petroleum Exporting Countries (OPEC). Despite strong shale production in the United States, oil prices are projected to continue to increase moderately over the next few years. The baseline projections assume that nominal oil prices increase at an average annual rate of 1.8% over the outlook period, from USD 54.7 per barrel in 2017 to USD 76.1 per barrel by 2027. (Implications of an alternative oil price scenario are explored in Box 1.3).

Policy considerations

Policies play an important role in agricultural, biofuel and fisheries markets, with policy reforms often changing the structure of markets. This *Outlook* assumes that policies will remain as they are throughout the projection period. The decision by the United Kingdom to exit the European Union is not included in the projections, as the terms of that departure have not been determined. In the current *Outlook*, projections for the United Kingdom are retained within the European Union aggregate. In the case of bilateral trade agreements, only ratified or implemented agreements are incorporated. Thus, the North American Free Trade Agreement (NAFTA) remains unchanged throughout the *Outlook* projection period, while the partly implemented but not yet ratified Comprehensive Economic and Trade Agreement (CETA) is incorporated. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which was signed in March 2018 and replaced the Trans-Pacific Partnership (TPP) following the withdrawal of the United States, has not been ratified and is not included. The ban by the Russian Federation on imports originating from specific countries was announced as a temporary measure and this *Outlook* assumes that the ban will be revoked at the end of 2018. The specific assumptions on biofuel policies are elaborated in the biofuel chapter.

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Araujo-Enciso, S.R., S. Pieralli, and I. Pérez Domínguez (2017), “Partial Stochastic Analysis with the Aglink-Cosimo Model: A Methodological Overview”, *JRC Technical Report*, EUR 28863 EN, doi:10.2760/680976

Chapter 2. The Middle East and North Africa: Prospects and challenges

This chapter reviews the prospects and challenges facing the agricultural sector in the Middle East and North Africa (MENA) region. A dominant concern in the MENA region is its high and growing dependence on international markets for key staple food products, as arable land and water grows scarcer. Policies in the region support grain production and consumption, with the result that 65% of cropland is planted with water-thirsty cereals, in particular wheat which accounts for a large share of calorie intake. The outlook for the MENA region projects slow growth in food consumption, gradual changes in diet to include higher livestock consumption, continued water use at unsustainable rates, and continued and increasing reliance on world markets. An alternative approach to food security would reorient policies towards rural development, poverty reduction, and support for production of higher-value horticulture products. Such a change would contribute to more diversified and healthier diets, but would require building the capacity of farmers to minimise risk while raising higher value crops

Introduction

The Middle East and North Africa (MENA) region[1] consists of a heterogeneous group of countries ranging from the high-income oil-exporting countries in the Gulf, to middle-income and lower middle income countries as well as least developed countries such as Sudan, Yemen and Mauritania (Table 2.1, col. 1). As one of the largest global net food importing regions, it faces considerable uncertainties on both the supply side and the demand side. The former include limitations on, and sustainability of, the production base. Demand side concerns include the impact of ongoing geopolitical conflict, instability in global oil markets which provide the primary source of economic wealth in the region, and rising diet and nutritional issues.

A dominant concern in the MENA region is its high and growing dependence on international markets for key staple food products. This concern has led to a suite of policies which appear strikingly inappropriate given the region's resources. For example, while MENA is one of the most land and water constrained regions of the world, it has the lowest water tariffs in the world and it heavily subsidises water consumption at about 2% of its GDP. As a result, the productivity of water use is only half the world average (World Bank, 2018). Cropping patterns in the region are also difficult to reconcile with the degree of water scarcity. While fruits and vegetables both consume less water and provide higher economic returns per drop, about 60% of harvested land remains in water-thirsty cereals, despite the fact that most countries in the region have a comparative advantage in the export of fruits and vegetables. A key reason for the seeming inconsistency between policy and water scarcity is a vision of food security that aims to reduce dependence on imports, particularly for cereals. At the same time, many countries subsidise the consumption of basic foodstuffs, which in conjunction with rising incomes is contributing to excess consumption of starches and sugars leading to dietary and health concerns such as obesity (FAO, 2017c).

This chapter first considers some of the principal characteristics of agriculture and fish in the MENA region, and reviews performance in terms of resources, production, consumption and trade. The chapter then presents medium-term projections (2018-27) for the agriculture and fish sectors, and then concludes with a discussion of how market balances may evolve, and key risks and uncertainties that may affect this assessment.

The context

Despite their heterogeneity, countries in the MENA region share a number of characteristics, highlighted in Table 2.1. Growth in the region has underperformed, with GDP per capita growing at only 1.6% per year from 2001 to 2016, while middle income countries overall grew by 4.3% p.a. over the same period (col. 2). This is partly due to relatively high population growth in the region which was still over 2% p.a. in the last decade, higher than the global average growth rate of middle income countries during that time of 1.3% p.a. The region also suffers from severe land constraints. Less than 5% of land is arable in two-thirds of the countries of the region, while many countries (Saudi Arabia, Lebanon, Tunisia, Morocco, Yemen, Mauritania and Syria) have huge desert pastures for livestock grazing. The region is the most water-stressed in the world, and two-thirds of countries continue to use groundwater at rates exceeding renewable internal freshwater resources (col. 4).[2] Yet the region has the lowest water prices in the world, spends massive resources on water subsidies (about 2% of GDP) and has total water productivity of only half the world average (World Bank, 2018).

Table 2.1. Contextual indicators for the Middle East and North Africa, 2014

	GDP per capita		Agricultural land	Arable land	Renewable internal freshwater resources	Annual freshwater withdrawals	Exports (2014)	Imports (2013)
	Current USD*	Growth in % per year, 2000-16	% of total land area (2014)		(2014) billion m3		Share of mineral fuels, lubricants and chemical products (%)	Self-sufficiency ratio (%)
	(1)	(2)	(3)		(4)		(5)	(6)
Qatar	86 853	0.6	6	1	0.06	0.44	87	3
United Arab Emirates	44 450	-2.1	5	0	0.15	4.00	38	
Kuwait	42 996	0.1	9	1	0.0	0.9	94	
Bahrain	24 983	-0.1	11	2	0.0040	0.3574	48	
Saudi Arabia	24 575	1.2	81	2	2	24	90	33
Oman	20 458	-0.2	5	0	1.40	1.32	79	5
Lebanon	8 537	0.4	64	13	4.8	1.3	13	41
Iraq	6 703	2.7	21	12	35	66	95	54
Libya	5 603	-2.4	9	1	0.7	5.8	77	
Iran, Islamic Rep.	5 541	2.5	28	9	129	93	77	85
Algeria	5 466	2.0	17	3	11	8	98	64
Tunisia	4 270	2.3	65	19	4	3	14	75
Jordan	4 067	1.1	12	3	0.7	0.9	32	38
Egypt, Arab Rep.	3 328	2.2	4	3	2	78	31	72
Morocco	3 155	3.0	69	18	29	10	16	80
Palestinian Authority	2 961	0.6	50	11	0.81	0.42	6	16
Sudan	2 177	4.2	29	8	4	27	64	85
Syrian Arab Republic	2 058	2.1	76	25	7	17	24	
Yemen, Rep.	1 647	-2.4	45	2	2	4	41	50
Mauritania	1 327	1.4	39	0.4	0.4	1.4	4	

Note: All GDP per capita estimates are for 2014, except for Libya (2011) and Syria (2007), for which conflict affected availability of reliable data. GDP per capita growth for Syria is 2000-2007, and for Libya, 2000-11. Arable land includes land under temporary crops, temporary meadows, kitchen gardens and land temporarily fallow. Agricultural land includes arable land, as well as land under permanent crops, and under permanent pastures. The self-sufficiency ratio for Table 2.1 is in value terms: (value of gross agricultural production in current US dollars)*100/(value of gross agricultural production in current US dollars + value of imports in current US dollars – value of exports in current US dollars).
Source: World Bank (2018); UNCTAD (2018); FAO (2018a, 2018b).

The scope of merchandise exports from the region remains limited, with over two-thirds of exports consisting of mineral fuels, lubricants and chemical products (col. 5). This narrow range of products makes exports from the MENA region nearly ten times more concentrated than in the rest of the world. Whereas the concentration index of exports in the world was 0.06 in 2014, the index was 0.44 in the MENA region (UNCTAD, 2018).[3] However, there is a great diversity in the reliance on petroleum exports in the region. Such countries as Iraq, Algeria, Saudi Arabia, Qatar and Kuwait export little else but mineral products, lubricants and chemicals, while Mauritania, the Palestinian Authority, Lebanon, and Morocco export very few of such products.

Finally, though the region has dramatically increased its participation in global agricultural markets as a share of GDP in the past 50 years, this surge was predominantly due to rising imports. In 2013, domestic agricultural production accounted for 65% of the value of agricultural products consumed domestically, though this share varied from 3% in Qatar to 85% in Sudan and Iran (col. 6). The remaining agricultural products were supplied from imports.

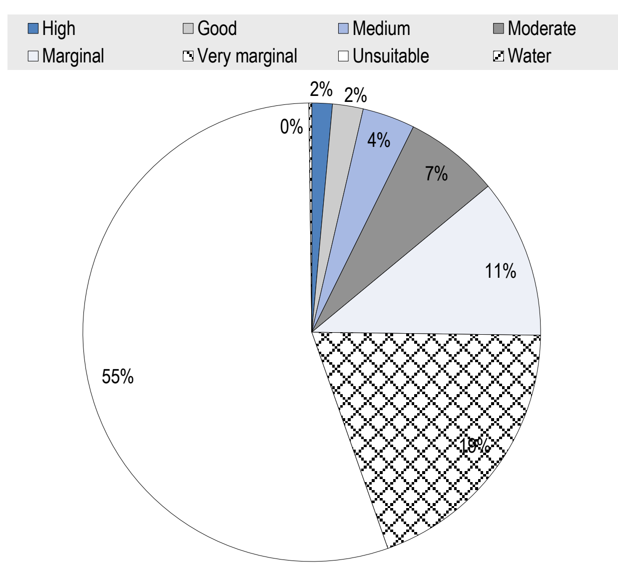
Agricultural use of natural resources in the MENA region

The MENA region is a difficult environment for agriculture. Land and water are scarce, and both rain-fed and irrigated land in use suffer from ongoing degradation caused by wind and water erosion and unsustainable farming practices. In most countries, farms are quite small and hence subject to the challenges experienced by smallholders everywhere. Furthermore, the region is predicted to become hotter and drier in the future due to climate change.

Only a small share of land in the region is arable

Of the total land area of the MENA region, only one-third is agricultural land (cropland and pastures), while only 5% is arable (cropland) (Table 2.1). The rest of the land is either urban or dry desert. Due to the dry climate, about 40% of cropped area in the region requires irrigation (FAO, 2018a, 2018b). Figure 2.1 shows that only 4% of land in the region has soils judged of high or good suitability for rain-fed cereal cultivation and 55% is unsuitable.

Figure 2.1. North Africa and West Asia crop suitability index (class) for low-input rain-fed cereals, 1961-1990



Source: FAO (2018c).

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In addition to the dearth of suitable land for cultivation, soils currently used for farming are severely degraded to the point where their productivity is estimated to have been reduced by up to 30 to 35% of potential productivity (Box 2.1). Soil degradation in rain-fed systems is caused by wind and water erosion, while in irrigated systems the farming practices themselves are responsible for soil salinity and sodicity.[4] Three-quarters of the region's 30 million ha of rain-fed cropland are estimated to be degraded. Recent studies have estimated the economic cost of land degradation in the region at USD 9 billion each year (between 2% and 7% of individual countries' GDP). Losses from salinity alone across the region are estimated at USD 1 billion annually, or USD 1 600 to USD 2 750 per ha of affected lands (ESCWA and FAO, 2018).

Box 2.1. Initiatives to address land quality issues in the MENA region

Zero tillage. Ploughing up soil can have many deleterious effects, such as loss of moisture and organic matter, which increase the vulnerability to wind and water erosion. Farming with zero or minimum tillage can avoid these problems by eliminating ploughing, leaving the soil undisturbed. Roots left from the previous crop stabilise the soil, hence protecting against erosion, while the organic matter above ground adds to the fertility and water holding capacity of the soil. Seed drills are used to insert seeds and fertiliser directly into the soil without ploughing. However, seed drills are expensive, and most smallholder farms are not able to afford the cost of about USD 30 000. A recent project by ICARDA and the Australian government has addressed this problem. Working with local farmers and craftsmen, the project has produced and distributed almost 200 affordable seed drills which are now being used across the Syrian Arab Republic, Iraq, Lebanon, Jordan, Algeria, Tunisia and Morocco.

Soil maps. Soil data is important for farmers and policymakers. However, soil maps are often outdated, of low resolution and not easily understandable. The Amman-based Institute of Digital Soil Mapping is serving as a regional hub for a global consortium of scientists and researchers. The consortium is developing GlobalSoilMap.net, which can combine data from several sources and present it in a user-friendly format for a broad range of audiences. The data can include soil pH, water storage electrical conductivity and carbon content data derived from remote sensing, near- and mid-infrared spectroscopy and field sampling. The initiative can also make use of the Global Soil Partnership system of the International Network for Soil Information Institutes. In addition, the European Union, the African Union and FAO have recently published a Soil Atlas of Africa (Jones et al., 2013).

Sources: www.icarda.org/conservation-agriculture/zero-tillage-seeders, cited in ESCWA and FAO (2018).

Land productivity is low compared to other regions

An overall indicator of the productivity of land use is the value of gross agricultural production per ha of agricultural land, which is lower in MENA than in most areas of the world (Table 2.2).[5] Of the major regions, only Sub-Saharan Africa has a worse performance. The low value of production per hectare reflects the high share of arable land devoted to low-yield temperate crops, as well as the low productivity of desert pastures. Not all countries perform so poorly. Egypt, with rich soils, irrigated cereals production and virtually no pastures, produces over USD 6 000 worth of products on each hectare of agricultural land, while Bahrain, which produces only horticultural crops and livestock, produces over USD 4 000 worth of product. Jordan, Lebanon, the Palestinian Authority, the UAE and Kuwait also produce over USD 1 000 worth of product per hectare, with very little area devoted to cereals.[6]

Table 2.2 also allows a comparison of the growth in land productivity in the MENA region versus other developing regions. While progress was good in the 1970s, the relative performance of MENA has been less impressive in more recent decades. Since the 1980s, decade to decade growth in the MENA region has ranked at the bottom of the four developing regions in Table 2.2, indicating a relative deterioration of its performance compared to other developing regions.

Table 2.2. Value of gross production per hectare of agricultural land (constant 2004-2006 prices in thousands of international dollars per year)

	1961-70	1971-80	1981-90	1991-00	2001-14
World	189	234	286	334	449
Western Europe	1 284	1 541	1 810	1 878	1 962
North America	261	326	375	449	540
East Asia	209	269	364	518	829
Latin America and Caribbean	138	169	213	258	373
Sub-Saharan Africa	55	67	79	104	146
MENA	85	111	142	162	226

Source: FAO (2018b).

For horticultural crops (such as oranges and tomatoes) the MENA region has yields similar to the world average. However, average yields of temperate crops such as wheat and oilseeds are far below world levels (Table 2.3). This low average hides differences across countries however, as yields differ depending on irrigation and the application of fertiliser and other inputs. Egypt, Kuwait, Saudi Arabia, the UAE, Oman and Lebanon all achieved wheat yields over 3 tonnes per ha in 2010-16 (Figure 2.2). Each of these countries has irrigated wheat production and applied between 100 kg and 600 kg of fertiliser (in nutrient weight terms) per ha of arable land per year in the period 2010-15 (FAO, 2018b).

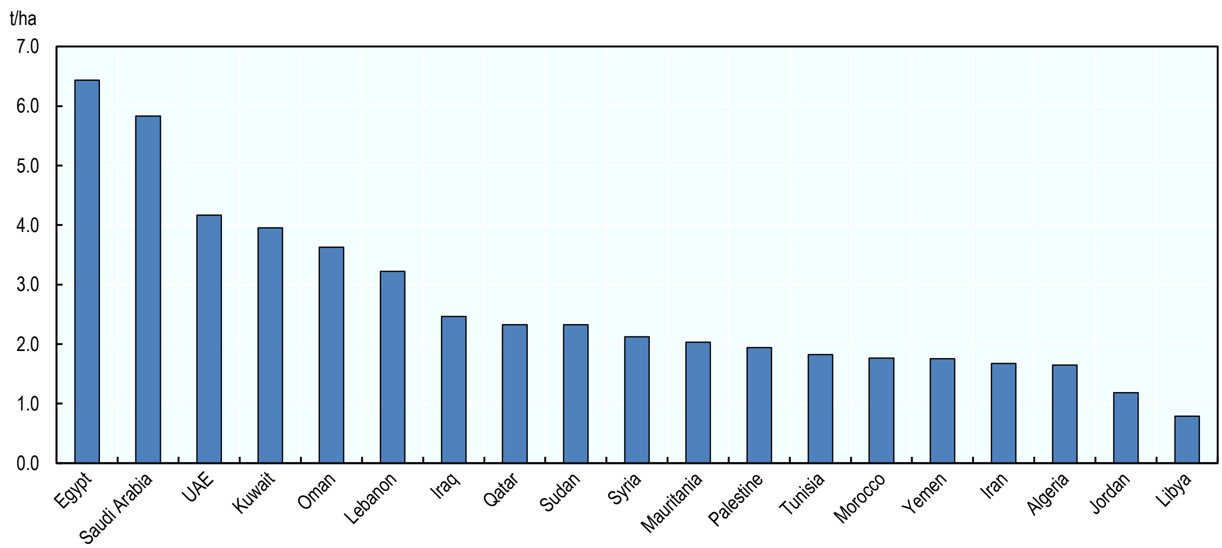
Production of horticultural crops and cereals has increased over the period 1971-2016 through both area expansion and higher yields. This is not the case for oilseeds, where production declined over time. For oranges, tomatoes and wheat, yields in MENA have grown at a slightly higher rate than the world average. Moreover, the growth in area has been stronger for horticultural crops than for temperate crops such as wheat and oilseeds (Figure 2.5).

Table 2.3. Average yield of oranges, tomatoes, wheat and oilseeds, by region, 2010-16 (tonnes per ha)

	Oranges	Tomatoes	Wheat	Oilseeds
World	17.9	35.2	3.2	3.2
Western Europe	5.8	269.5	7.2	3.2
North America	28.3	91.1	3.1	2.0
East Asia	15.3	52.1	5.0	2.8
Latin America and Caribbean	19.3	38.7	3.1	4.5
Sub-Saharan Africa	17.6	7.8	2.5	1.8
MENA	17.9	37.8	2.2	0.9

Source: FAO (2018b).

Figure 2.2. Average wheat yield in the MENA region, by country, 2010-16



Note: Saudi Arabia was largely out of wheat production by 2015.
Source: FAO (2018b).

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Table 2.4. World and MENA: Average annual growth in production, yield and area for oranges, tomatoes, wheat and oilseeds, 1971-2016 (%)

	Oranges	Tomatoes	Wheat	Oilseeds
World				
Production	2.3	3.5	1.7	4.4
Yield	0.4	1.4	1.7	2.2
Area harvested	1.9	2.1	0.1	2.2
MENA				
Production	3.1	4.2	2.4	-1.0
Yield	0.6	2.5	2.2	-1.2
Area harvested	2.5	1.6	0.2	0.2

Source: FAO (2018b).

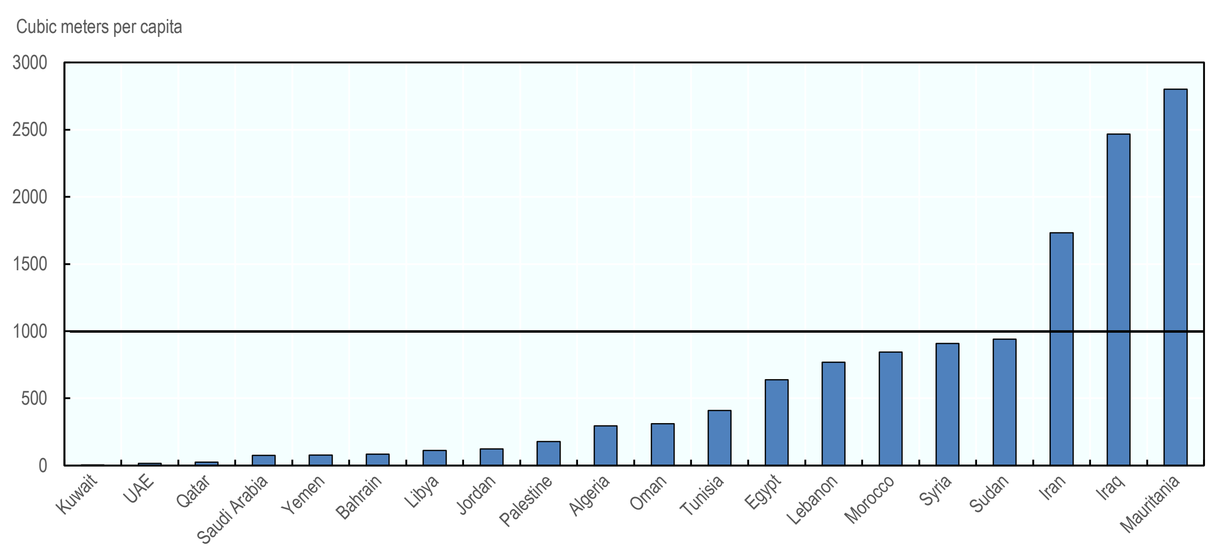
As discussed in more detail below, farms are quite small in most countries in the region, and these small farms tend not to specialise. They have a comparative advantage in labour-intensive horticultural crops, since they have plentiful household labour, but are limited in their ability to adopt new technology and access investment. Moreover, smallholders are averse to specialising in horticulture because of the higher risks involved. Horticultural crops have potentially high payoffs, but also have higher input costs; in a bad year, a farm can lose its entire investment on seeds, fertiliser and pesticides. By contrast, cereals are more robust, low-input, low-yield crops. Smallholders thus often cultivate both horticultural crops and cereals as a diversification strategy to lower their risk, ensure a minimum income and provide for direct consumption. In combination with poor natural growing conditions, the low degree of specialisation contributes to lower yields in both horticultural and cereal crops. The low productivity of smallholder farms in the MENA region is consistent with this analysis.

Agricultural water policies and use are increasingly unsustainable

It is difficult to overestimate the importance of the water issue in the MENA region. Along with conflict, it is the most profound man-made threat to the region's future. The problem is not limited to scarcity, but of long-term unsustainable surface and groundwater abstraction, leading to the depletion of underground aquifers on which the Middle East depends heavily (World Bank, 2018). Out of the 20 countries/areas listed in Table 2.1, 13 withdrew more freshwater in 2014 than could be had from renewable resources. Unsustainable abstraction is supported by policy and deficient water governance. The region has the lowest water tariffs in the world, subsidises water consumption (about 2% of GDP) and has total water productivity of only half the world average (World Bank, 2018).

Most countries in the MENA region fall below the generally accepted water scarcity line of 1 000 m3 per capita per annum of renewable water resources (Figure 2.3).[7] Agriculture is the predominant user of water in each country. In addition, improving the management of water in agriculture is key to arresting soil degradation and for adapting to climate change.

Figure 2.3. Annual renewable water resources per capita, 2014



Source: FAO (2018a).

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Water productivity is one of the main concerns in MENA agriculture

The productivity of water used in agricultural production may be measured in two main ways.[8]

- *Physical water productivity* is the *volume* of agricultural production per unit of water consumed in the production of that output. Table 2.5 (col. 1) illustrates that in the MENA region the physical water productivity is highest for vegetables and fruits, followed by cereals, groundnuts and livestock products. There is a wide range of physical water productivities for each product, because of differences in soil fertility, plant disease, pests, and the timing of watering and planting, which all influence water productivity. The more a farmer can control these factors (e.g. through irrigation, proper agronomic practices, fertilisation and control of plant disease and pests), the higher the physical water productivity that can be attained.

- *Economic water productivity* may be defined as the *value* of production per unit of water used. In the MENA countries, the highest value per cubic meter of water used is obtained for vegetables and fruits, followed by olives, dates, lentils, cereals, and beef (Table 2.5, col. 3).

Table 2.5. Average water productivity for selected agricultural products in the MENA region

	Physical water productivity, midrange value (kilograms per M3)*	Average producer price in MENA, 2010-16 (USD per kg)**	Average economic water productivity (USD per M3 of water in producing agricultural commodity)
	(1)	(2)	(1)*(2)=(3)
Tomato	12.5	0.40	4.98
Onion	6.5	0.42	2.76
Apples	3.0	0.88	2.64
Potato	5.0	0.45	2.23
Olives	2.0	0.90	1.80
Lentils	0.7	1.17	0.82
Dates	0.6	1.33	0.80
Fava beans	0.6	0.98	0.54
Maize	1.2	0.45	0.51
Rice	0.9	0.59	0.51
Bovine meat	0.1	7.48	0.49
Wheat	0.7	0.51	0.33
Groundnut	0.3	1.33	0.33

Note: *Calculated as mean of minimum and maximum from Molden, et al., 2010. **MENA country average, 2010-16, from FAO (2018b).
Source: Molden et al. (2010); FAO (2018b).

Water is not the only input in agricultural production, and other factors influence the decision of which crops or livestock to produce. Decisions on product selection also depend on the type of land available (e.g. pasture *vs*. cropland), the location of the farm (e.g. in rain-fed or irrigated areas), and farmers' attitudes towards risk. However, if other costs are similar, a farmer in the MENA region would obtain the highest payoff per drop of water by producing fruits and vegetables.

Impact of climate change on production conditions varies within the region

Climate change in the MENA region only adds to the hazards of farming in an already exceedingly dry area of the world. The MENA countries are prone to frequent droughts and face future water shortages due to unsustainable withdrawal of groundwater. In addition, mean temperatures over the past century have risen by 0.5°C, and precipitation over the past several decades has decreased by up to 10% in some parts of North Africa and Sudan. Climate change projections expect the entire region to become hotter and drier in the future, with a reduction of precipitation particularly evident in the western part of the region (Bucchignani et al., 2018). Higher temperatures and reduced precipitation will accelerate the loss of surface water, and droughts will become more frequent. The already low average yields of rain-fed crops will decline and become more variable. By the end of the century, total agricultural production in the region could decrease by up to 21% from a 2000 base.[9]

While all farming systems will become increasingly arid and water scarce, rain-fed systems are most at risk.[10] However, some areas may benefit from warmer temperatures which extend growing seasons and increase the productivity of winter crops. In Yemen, for example, where there are summer rains, an increase in average temperatures of 2ºC could be expected to extend the growing season by about six weeks (Verner and Breisinger, 2013). Furthermore, some areas are expected to receive more rainfall, which may raise yields, though they may also increase the frequency of floods. These trends have already been observed in Oman, Saudi Arabia and Yemen.

The common denominator of climate change will be a general increase in temperature in this region with varying rainfall effects across countries. However, the effects of climate change on agriculture are expected to vary by farming system (Table 2.6). In some cases, farmers can respond to changes through adaptation. In other regions, agriculture may become untenable, and rural inhabitants will need to transition to off-farm employment or relocate.

Table 2.6. Climate change impact on farming systems in the MENA region

Farming system	Exposure: Expected climate change-related events	Sensitivity: Likely impact on farming systems
Irrigated	Increased temperatures Reduced supply of surface irrigation water Dwindling of groundwater recharge	More water stress Increased demand for irrigation and water transfer Reduced yields when temperatures are too high Salinisation due to reduced leaching Reduction in cropping intensity
Highland mixed	Increase in aridity Greater risk of drought Possible lengthening of the growing period Reduced supply of irrigation water	Reduction in yields Reduction in cropping intensity Increased demand for irrigation
Rain-fed mixed	Increase in aridity Greater risk of drought Reduced supply of irrigation water	Reduction in yields Reduction in cropping intensity Increased demand for irrigation
Dryland mixed	Increase in aridity Greater risk of drought Reduced supply of irrigation water	A system very vulnerable to declining rainfall Some lands may revert to rangeland Increased demand for irrigation
Pastoral	Increase in aridity Greater risk of drought Reduced water for livestock and fodder	A very vulnerable system, where desertification may reduce carrying capacity significantly Non-farm activities, exit from farming, migration

Structure and performance of agriculture, fisheries and aquaculture in the Middle East and North Africa

Uneven farm size distribution across the region

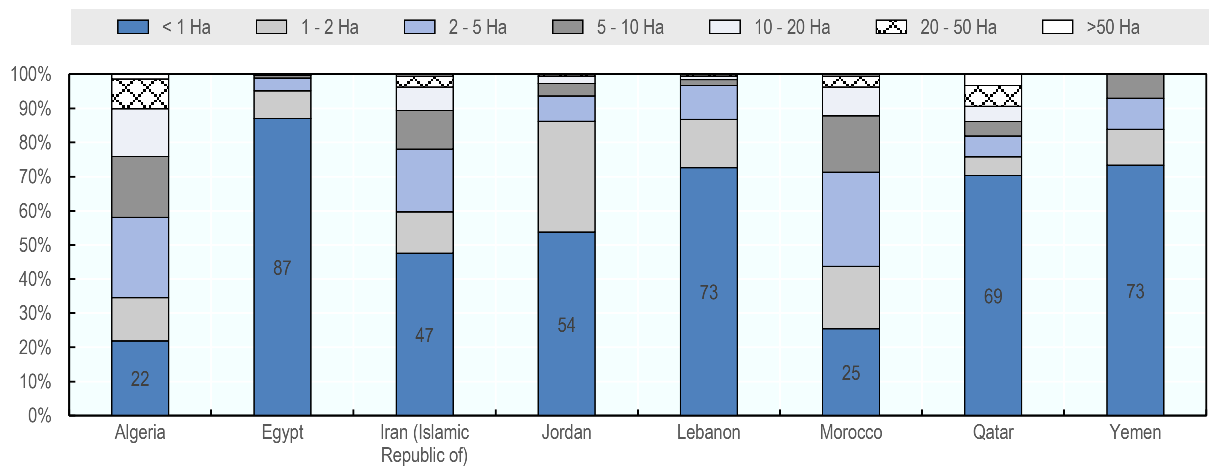
The Middle East and North Africa has one of the most uneven farm size distributions in the world. In some of the countries in the region — Egypt, Yemen, Jordan, Lebanon and Iran — the majority of farms are smaller than one hectare (Figure 2.4). At the other end of the size spectrum are a relatively small number of large farms owned by a small number of landowners or the state (Rae, n.d.).

The inequality of landholding is illustrated in Figure 2.5 using Lorenz curves, which plot the cumulative share of farms against the cumulative share of agricultural land. The diagonal line illustrates a theoretical case in which each holding is of an equal size such that, for instance, 50% farms occupy 50% of total agricultural area. The more bowed-out the actual Lorenz curve, the more unequally holdings are distributed. For instance, 80% of farms occupy only 20% of total agricultural area in the Middle East and North African region, indicating that the overwhelming majority of farms are quite small. On the other hand, another 10% of farms holds 60% of agricultural area, implying that a small number of large farms cultivate over half of agricultural land area. Only in Latin America, the distribution of land is even more unequal: less than 10% of farms hold 80% of agricultural land area.

Two policies can be observed in the MENA region that support the concentration of farmland through supporting the development of large-scale farm enterprises. First, the predominant policy in the region for the development of rural areas is the sectoral modernisation of agriculture, which includes the promotion of large intensively cultivating corporate or private farms. Public support to agriculture and access to credit de facto favours large farms, often for sound business reasons. Due to their size, small farms are often not eligible to benefit from public support or bank loans. Sectoral "modernisation" policies have largely excluded smallholders from public support, which have left them small, technologically backward and poor. Alternative policies of rural development focused on supporting small farms through technical and business training, and small and medium rural enterprise and community development is often absent or poorly funded.

A second policy that supports the concentration of holdings in large farms is state facilitation for the large-scale acquisition of land by both domestic and foreign investors. This policy has been pursued most intensively in Sudan and Egypt, though land has also been made available in Mauritania or Morocco. In the MENA region most land acquisitions have been pursued by corporations with the support of governments and banks from water-scarce, wealthy GCC (Gulf Cooperation Council) countries with the largest dependence on food imports. Foreign land acquisition in the region developed during the 2007-2014 period of high commodity prices, and is aimed at limiting exposure to world commodity markets and ensuring access to food and feed supply in the GCC countries. Case studies from Sudan indicate that the terms of large-scale purchase or leasing contracts often lack transparency, and are reached with little or no consultation with local communities. Large tracts of communal land in Sudan were sold or leased to local or foreign investors, with little attention to the social cost and environmental impacts from turning communal pasture land into foreign owned cropland (Elhadary and Abdelatti, 2016).

Figure 2.4. Farm size distribution in selected MENA countries, 1996-2003



Note: Figures in the <1 ha portion of the bars show the share of holdings of less than 1 ha. Estimates refer to the size distribution of holdings in Algeria (2001), Egypt (1999-2000), Iran (Islamic Rep. of) (2003), Jordan (1997), Lebanon (1998), Morocco (1996), Qatar (2000-2001) and Yemen (2002). The figures in the bars indicate the share of holdings under 1 ha.
Source: Lowder et al. (2014).

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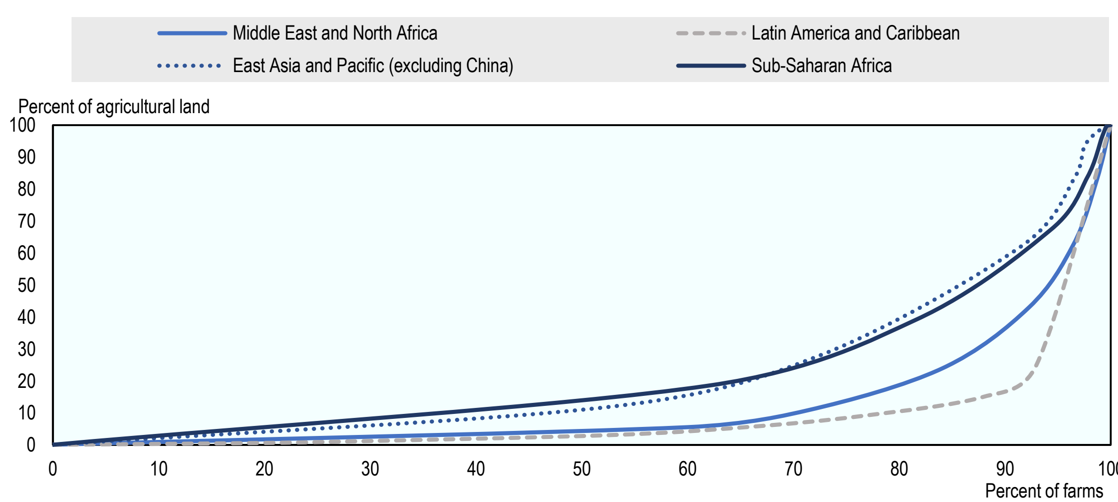
Figure 2.5. Concentration of agricultural land in farm holdings: MENA in comparative perspective



Source: Lowder et al. (2014).

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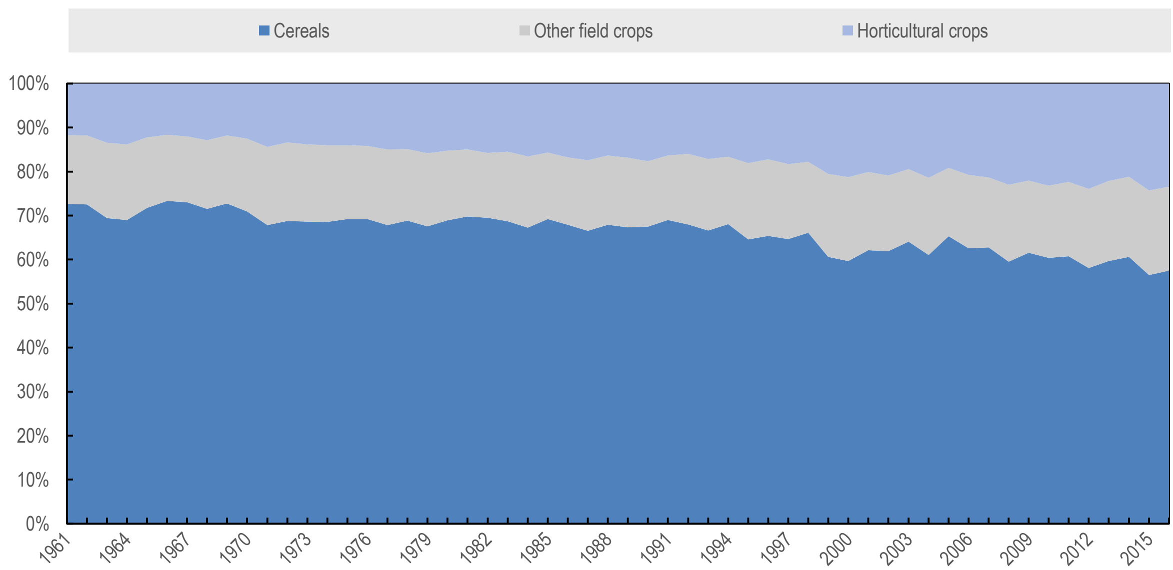
Agricultural production dominated by cereals

The scarcity of water, the shortage of suitable land and the constraints of smallholder farming all impact on production in the MENA region by limiting yields. Low-yield agriculture in the region is characterized by low diversity such that harvested area is dominated by cereals (Figure 2.6).[11] Cereals occupied about 60% of the harvested land area in the region, but contributed only 15% of the value of gross agricultural production in 2014. Cereal production has been encouraged by policies to lower import dependence.

Figure 2.6. MENA Harvested area, share by commodity type, 1961-2016



Note: Horticulture includes citrus, fruits, berries, vegetables, melons, tree nuts, herbs, tea, coffee, spices, stimulants, beverage crops and olives. Other field crops include fibres, beans, peas, sugar crops, roots and tubers, pulses, and oilseeds.
Source: FAO (2018b).

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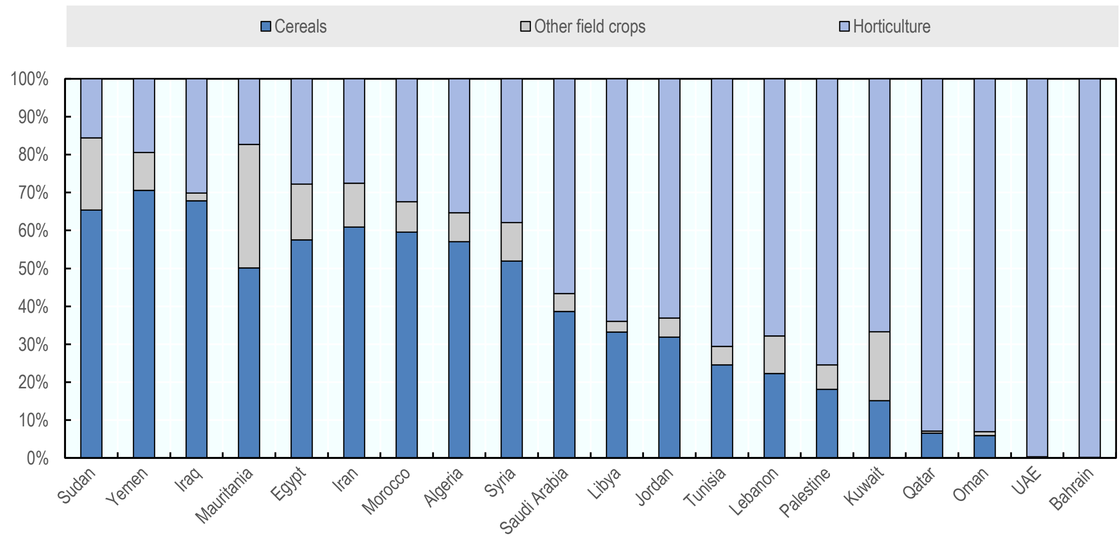
Although cereals occupy about 60% of total harvested area, this share varies widely by country (Figure 2.7). The poorer countries, such as Sudan, Yemen, Iraq and Mauritania, devoted most of their land to cereals. However, other countries, including those in the GCC, Lebanon, Tunisia, Libya, the Palestinian Authority, and Jordan, devoted over 50% of harvested area to horticultural crops, and cereal production is low.[12]

While land area in the region is dominated by cereals, most of the value of production in the region comes from horticultural crops and livestock (Figure 2.8). Generally, about 40% of the value of agricultural production now comes from horticulture.

Finally, MENA agriculture is dominated by two regional giants (Iran and Egypt), which together produce half of the total value of agricultural production (Figure 2.9). The next three producers by size are Sudan, Morocco and Algeria, which together produce 27% of agricultural production. The remaining 15 countries produce 23% of the total value of agricultural production in the MENA region.

Figure 2.7. MENA Harvested area share, by country and crop type, 2016 (percent)



Source: FAO (2018b).

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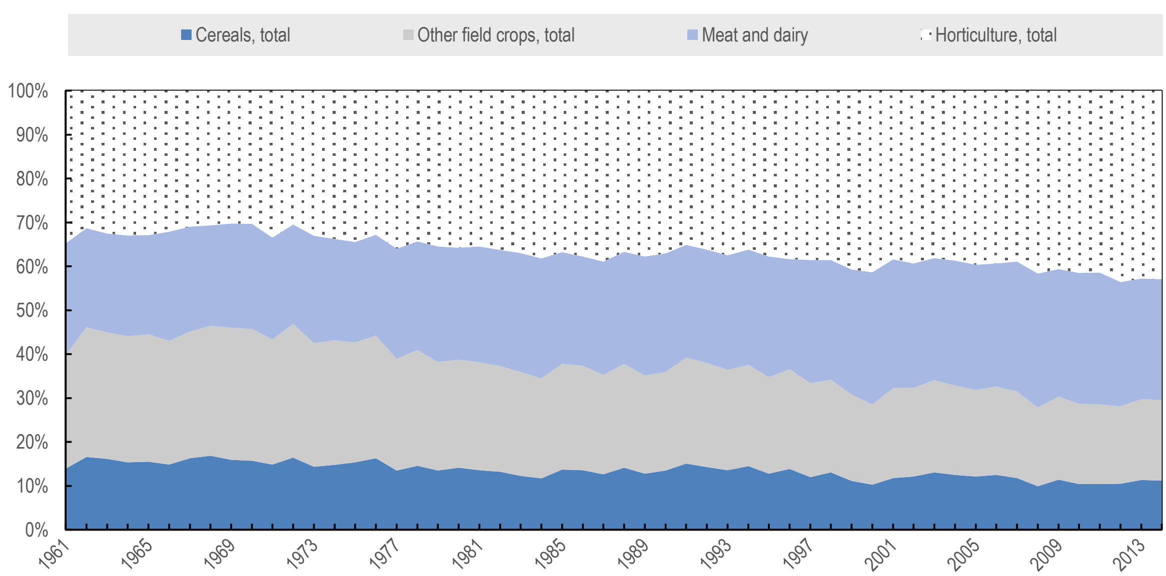
Figure 2.8. MENA value of agricultural production, share by commodity type, 1961-2014, percent



Note: Horticulture includes citrus, fruits, berries, vegetables, melons, tree nuts, herbs, tea, coffee, spices, stimulants, beverage crops and olives. Other field crops include fibres, roots and tubers, beans, peas, pulses, sugar crops and oilseeds.
Source: FAO (2018b).

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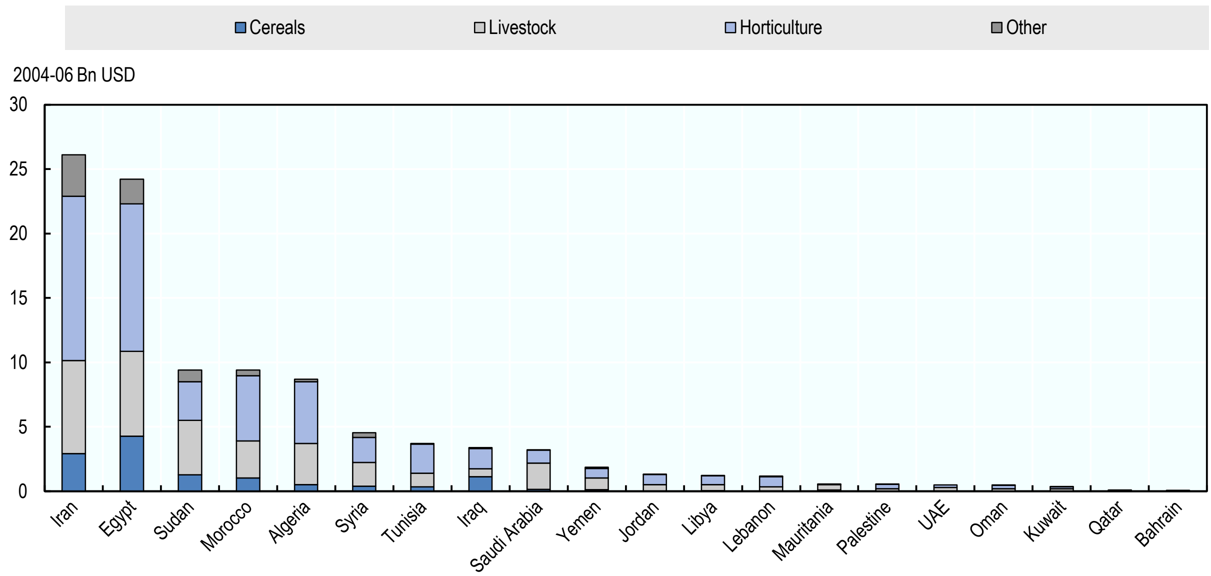
Figure 2.9. The value of agricultural production in the MENA region, by country and commodity type, 2014



Note: Data for Syria in 2014 may not be reliable.
Source: FAO (2018b).

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Fisheries and aquaculture in the MENA region

The MENA region includes diverse marine and freshwater ecosystems. Although the region is generally arid, it also encompasses major transboundary waterways such as the Euphrates, the Tigris, the Nile, and other river systems. However, overall freshwater resources remain scarce, particularly in areas away from river systems. Capture fisheries and aquaculture are important in the MENA region as providers of livelihoods and as sources of nutritious food. During the last two decades, total capture fisheries and aquaculture production increased significantly from 2.2 Mt in 1996 to 5.9 Mt in 2016. Most of the increase originated from capture fisheries (from 2.0 Mt to 4.0 Mt), but aquaculture registered strong growth as well (from 0.1 Mt to 1.9 Mt), with its share in total fish production increasing from 6% to 32% during the 1996-2016 period. Despite this increase in production, the region is dependent on imports of fish and fish products to satisfy domestic consumption.

The aquaculture and fisheries sector in the MENA region faces many challenges with marked differences among and within countries. Marine capture fisheries in the MENA coastal countries range from the large annual production of countries with long coastlines and large fleets that access highly productive upwelling systems, to the countries with smaller production, and smaller fleets. Coastal areas across the region are important for small-scale fisheries that support the livelihoods of hundreds of thousands of people and overall fisheries are overwhelmingly small scale. Biomass assessments, undertaken on only a limited number of the main stocks fished throughout the region, found that most are under pressure. Regional fisheries management organisations (RFMOs), such as the Indian Ocean Tuna Commission (IOTC) and the International Commission for the Conservation of Atlantic Tunas (ICCAT), are implementing adaptive management measures to maintain stocks within safe biological levels and the Regional Commission for Fisheries (RECOFI) recently adopted binding recommendations for minimum fisheries and aquaculture data reporting. In addition, many countries in the region, such as Mauritania, Morocco and Oman, have worked to implement fisheries and aquaculture strategies and legislation with increased focus on ensuring the sustainability of their resources. Inland fisheries production, which amounted to 0.4 Mt in 2016, representing 7% of total production, also faces challenges with regard to their environmental management. To address this, countries such as Mauritania, Morocco, Egypt, Iran and Sudan are undertaking efforts to explore inland fisheries opportunities and address existing constraints.

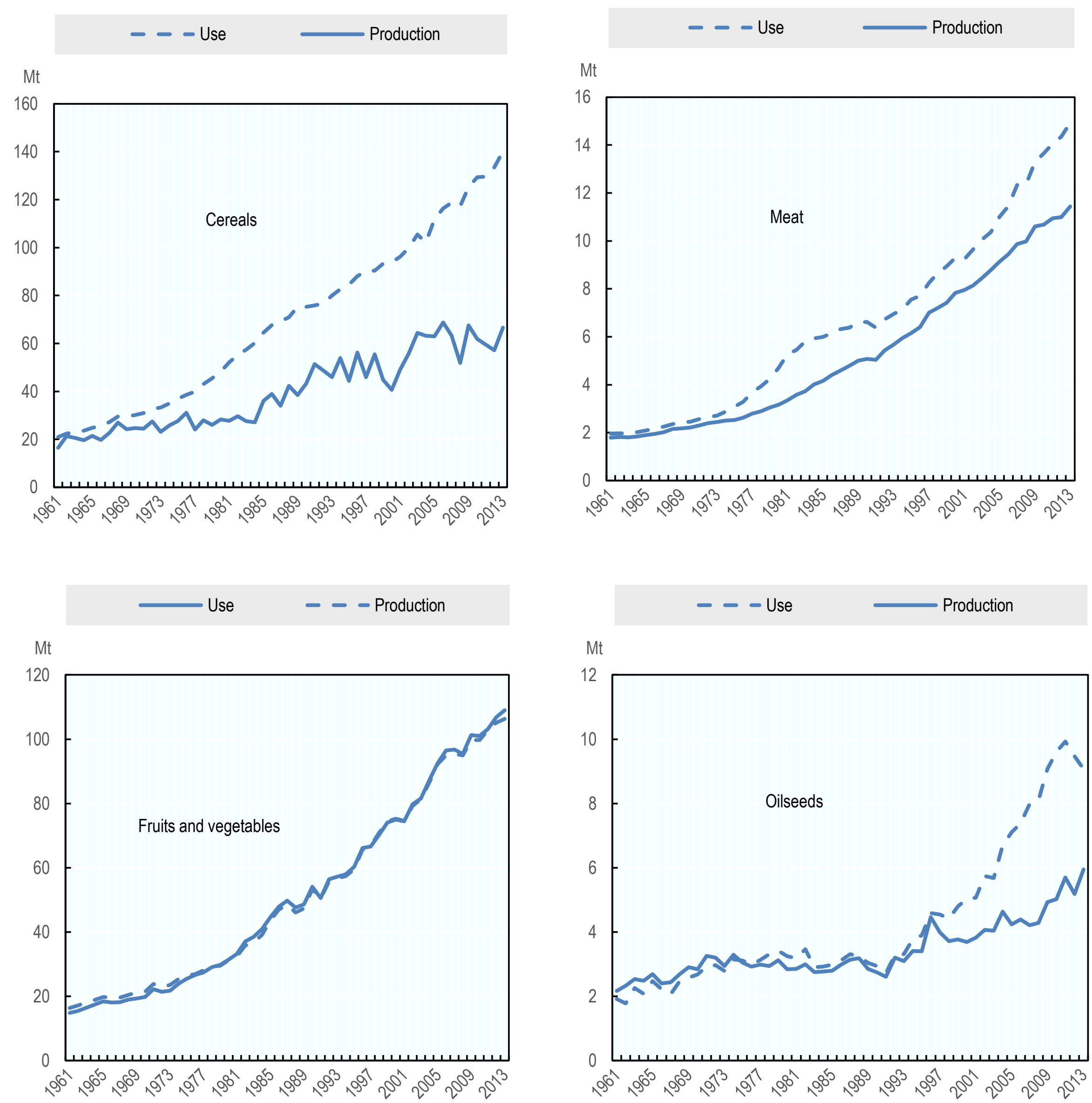
The bulk of aquaculture production still comes from Egypt and Iran, with a share of 73% and 21% respectively in 2016, with the majority of fish farms in the region as small-scale operations. There have been recent actions taken across the region to create an enabling environment for aquaculture to develop through private investments and with industrial-scale marine and freshwater aquaculture gaining attention. A number of countries have finalised strategic aquaculture development plans, conducted spatial analysis for the identification and allocation of suitable sites for the sector, and have enacted clear regulations to assist with the establishment of commercial facilities. The aquaculture sector faces several constraints including limited access to appropriate locations and to sustainable production technologies, inappropriate freshwater fish hatchery installations and management, inadequate seed production in terms of quantity and/or quality and poor handling and transportation. Animal health control systems for aquaculture are also scarce and access to credit, loans and insurance for aquaculture business is almost non-existent in most countries of the region. Furthermore, the expansion of the aquaculture industry in the region has increased environmental concerns and public awareness about food security issues and environmental conservation. In addition, fisheries in the MENA region are particularly vulnerable to the impacts of climate change and variability as well as those induced by human activities. In this respect, the aquaculture sector can be particularly vulnerable as there is a lack of farmer's adaptability to climate change and resilience to natural disasters and socioeconomic risks.

Growing import dependence for basic foods

Low yields and a narrow scope for increases in arable area in the MENA region set limits to crop production for temperate crops, such as wheat and oilseeds. Coupled with income growth and a particularly strong population growth of 2.5% over the period 1971-2016, demand growth has far outstripped production growth for these crops for which the MENA region is ill-suited (Table 2.7). The growing gap between consumption and domestic production (Figure 2.9) has been covered by imports. Growth in horticultural crop production has kept pace with demand, such that the region is self-sufficient in fruits and vegetables (Figure 2.10).

Table 2.7 details that the region is far from self-sufficient in cereals, vegetable oils, oilseeds and sugar and sweeteners, but is self-sufficient or nearly so for fruits and vegetables and meats (including animal fats and offal).

Figure 2.10. Domestic production and use of selected commodities in the MENA region, 1961-2013



Source: FAO (2018b).

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Table 2.7. Food self-sufficiency ratios (SSR) in MENA countries, average, 2011-13 (%)

SSR	Cereals[1]	Meats[2]	Fruits, vegetables	Milk[3]	Vegetable Oils	Oil crops	Sugar, Sweeteners
Algeria	30	91	93	51	11	88	0
Egypt	58	83	107	89	26	35	73
Iran (Islamic Republic of)	61	95	104	106	15	58	58
Iraq	50	34	86	45	2	80	0
Jordan	4	72	139	51	17	80	0
Kuwait	2	34	36	14	1	0	0
Lebanon	14	77	111	49	20	67	0
Mauritania	27	89	18	65	0	95	0
Morocco	59	100	116	95	29	98	28
Oman	7	32	52	32	4	0	0
Saudi Arabia	8	45	73	76	18	1	0
Sudan (2012-13)	82	100	98	96	89	112	72
Tunisia	42	98	110	90	91	65	1
United Arab Emirates	2	26	21	14	82	0	0
Yemen	17	79	90	35	5	63	1
MENA Total	46	79	99	82	25	64	37

Note: The self-sufficiency ratio is defined as food production/(production+imports-exports).
1. Excluding beer.
2.Includes meat and offals.
3.Excluding butter.
Source: FAO (2018b).

Table 2.8. Share of agricultural imports in merchandise exports, 2011-13 (%)

	Agricultural imports as a percentage of merchandise exports (%)	Stability
Total MENA	8	Stable
Palestinian Authority	74	Volatile, 1990-2002
Syria	58	Volatile since 2007
Lebanon	58	Stable
Egypt	49	Stable
Jordan	44	Stable
Yemen	39	Stable
Sudan	34	Stable
Morocco	25	Stable
Mauritania	17	Stable
Tunisia	15	Stable
Algeria	15	Stable
Iran	11	Stable
Libya	9	Stable
Iraq	9	Volatile, 1990-99
Bahrain	8	Stable
Saudi Arabia	6	Stable
Oman	5	Stable
UAE	4	Stable
Kuwait	3	Stable
Qatar	2	Stable

Source: FAO (2018b).

The share of total food imports in total merchandise exports can be used as an indicator to assess the capacity of a country to sustain food imports (Table 2.8). Globally, this share is about 5%. The MENA average has been about 8% in recent years (2011-13), and has shown a downward trend from earlier years. For the countries whose share of total merchandise export earnings spent on food imports is high and volatile, the stability of international food prices is a major concern. Even if export earnings can be maintained, these countries face significant risks associated with spikes in world food prices. The implications of this vulnerability were realised during the 2007-2008 global food crisis, when prices spiked dramatically. The importing countries of the world, including those in the MENA region, were faced with high prices impacting household and government budgets. While world food commodity markets have since returned to more normal conditions, the experience of the crisis brought increased attention to the vulnerabilities of importing countries – and particularly for countries such as the Palestinian Authority and Syria for which food imports constituted a large and volatile share of total export earnings in 2011-13.

The pattern of trade in cereal, oilseed and meat products is consistent with findings based on the Balassa Export Revealed Comparative Advantage Index (XRCA) applied to agricultural products. Table 2.9 shows the comparative strength of exports of six MENA countries in 2011-2013. Though each country is different, most countries have an advantage in the export of fruits, vegetables and nuts, while they have a disadvantage in meats, cereals, and fish (except Morocco). Small farms are suited to producing labour-intensive crops, and the highest value per ha and per drop of water come from producing fruits, milk and vegetables.

Table 2.9. Coefficients of revealed comparative advantage for selected countries in the MENA region

	Egypt	Lebanon	Morocco	Jordan	Tunisia	Algeria
Vegetables	10.21	8.80	10.56	16.07		0.09
Fruits and nuts	6.71			4.53	3.36	0.09
Fish	0.15	0.06	3.00	0.08		
Meat	0.01	0.10	0.01		0.02	
Cereals		0.11	0.08		0.00	

Note: The table shows the Balassa Export Revealed Comparative Advantage Index (XRCA) applied to agricultural products. The XRCA is defined as the ratio of a product category's share in a country's total exports divided by the product category's share of global exports. An XRCA>1 implies that the country is specialised in the export of that product, while an XRCA<1 implies the opposite.
Source: Santos and Ceccacci (2015).

Food security situation

Households are food secure when they have year-round access to the amount and variety of safe foods their members need to lead active and healthy lives. Changes in food security, then, are driven mainly by events or conditions that affect families' ability to access safe food. Chief among these are incomes, the working of food markets to ensure food availability, and state public services to ensure food safety. The largest disrupter of these three factors in the region is conflict, which divides the region into two distinct sub-regions from the point of view of food security – conflict and non-conflict countries (Box 2.2).[13]

The Prevalence of Undernourishment (PoU) estimates the share of the population of a country facing absolute food deprivation. It is defined as the probability that a randomly selected individual from the reference population is found to consume less than his or her calorie requirement for an active and healthy life. (FAO, 2017c). Table 2.10 shows the prevalence of undernourishment in conflict and non-conflict countries in the MENA region.

As a rule of thumb, countries with a PoU of less than 5% are considered to be relatively food secure. As highlighted in Table 2.10, the non-conflict countries of the region are, in fact, relatively food secure. According to the PoU, in 2014-2016, the conflict countries of the MENA region were less food secure than the average level for least developed countries (LDCs). Whereas 28.2% of the population of the MENA conflict countries faced absolute food deprivation, only 24.4% of the population of the LDCs faced such insecurity (FAO, 2017c).

Though the high level of food insecurity in the conflict countries accords with expectations, care should be taken in interpreting these data for the prevalence of undernourishment. The PoU is a good indicator of hunger during periods when the income or consumption distribution is relatively constant, but it is not a good indicator of hunger when sharp changes in the distribution of food occur. The PoU likely underestimates the actual prevalence of undernourishment during times of conflict, because the inequality in food consumption parameters used to calculate it are derived from national household survey data, which are usually not available or accurate during times of conflict (FAO, 2017c).

Setting aside these caveats for the moment, the level of measured PoU in the conflict countries has been over three times the level in the rest of the MENA countries since 1999-2001, and has been rising gradually *vis-à-vis* the other countries in the region since 2003 (Table 2.10). This pattern in the evolution of the PoU in the conflict countries is consistent with it being partially driven by conflict, but it is also clear that they had relatively high levels of food insecurity even before conflict arose.

Table 2.10. Prevalence of undernourishment in conflict and non-conflict regions in MENA, 1999-2001 to 2014-16

	1999-2001	2001-2003	2003-2005	2005-2007	2007-2009	2009-2011	2011-2013	2013-2015	2014-2016
All MENA	9.7	9.8	10.0	10.0	9.6	8.9	8.4	8.4	8.8
Non-conflict countries	6.3	6.4	6.5	6.3	6.0	5.5	5.0	4.7	4.7
Conflict countries	29.0	28.4	28.9	29.1	28.5	26.6	25.3	26.1	28.2
Of which:									
--Yemen	29.9	30.7	30.9	28.9	27.1	25.7	24.6	25.2	28.8
--Iraq	28.3	26.6	27.4	29.3	29.6	27.2	25.9	26.7	27.8
--Sudan							25.9	25.7	25.6

Note: Undernourishment data exist for only three of the five conflict countries, and the aggregate is constructed from these data.
Source: FAO (2017c).

Box 2.2. Conflict and food security in the MENA Region

At the end of 2017, over 30 million people in this region were in need of assistance to satisfy their basic food needs. Among those, the food security situation was most critical in countries with lingering or escalating conflicts: Yemen, Syrian Arab Republic, Iraq and Sudan. In Yemen, according to the latest assessment carried out in March 2017, about 17 million people, corresponding to 60% of the total population, required food assistance. In the Syrian Arab Republic, some 6.5 million are estimated to be food insecure, and an additional 4 million at risk of food insecurity as they are using asset depletion strategies to meet their consumption needs. In Iraq and Sudan, about 3 million are food insecure. Smaller figures are reported for Libya and Mauritania, about 0.4 million each.

Residents in conflict zones often have to resort to food coping strategies to cover the severe food shortages they are facing. Households tend to reduce the number of meals and restrict the consumption of adults to prioritise children. If the crisis lingers, households deplete their assets and are no longer able to draw on stocks or other reserves. They resort to child labour, which often includes the withdrawal of children from school to carry out agricultural activities in order to cope.

Economic activity, including agricultural production, suffers in a conflict environment and further impairs livelihoods. While agricultural production is often one of the most resilient activities in an economy, those continuing to farm are often confronted with high production costs, lack of inputs and damaged or destroyed infrastructure. Agricultural activities, particularly those related to irrigated crops, suffer when fuel prices are high, with consequent increases in the share of rain fed crops, which in turn bear lower yields. Fertilisers are often subject to international sanctions. Farmers tend to plant seeds saved from the previous harvests, further constraining yields. Many rural households tend to rely on casual labour opportunities as their main source of income. In many conflict-affected areas, hired agricultural labour tends to be replaced by family labour in order to cope with the increased costs of production. While agricultural production improves household and local food availability, limited infrastructure including cold chain and transportation links often prevents deliveries to urban markets. Consequently, prices of local products tend to be low in producing regions, and high in the urban markets, despite availability.

The impact of lower agricultural production on world agricultural markets may be small, but has been dramatic in the affected countries. Before the conflict, Syria – one of the larger producers – produced on average about 4 Mt of wheat, but reached only 1.8 Mt in 2017. In Yemen, total domestic cereal production covers less than 20% of the total utilisation (food, feed and other uses). The country is largely dependent on imports from the international markets to satisfy its domestic consumption requirement for wheat, the main staple. The share of domestic wheat production in total food utilisation in the last ten years is between 5% to 10%, depending on the domestic harvest. While conflict did not substantially increase the country's dependence on imports, conflict-related decrease in production deteriorated livelihoods of farmers and pushed many to food insecurity.

The unpredictability of conflict threatens food security and local livelihoods but also livelihoods in the host countries. In addition to the millions who have fled countries due to the conflict, many are on the move internally, many multiple times. Internally displaced people and their host communities are often the most vulnerable to food insecurity. In Syria, about two in five people are on the move inside the country. In Iraq, in the first half of 2017, close to 1 million people were internally displaced, mostly due to the military operations in Mosul, in addition to the 3 million people already displaced by November 2016. As of early February 2018, over 5.5 million refugees were registered in the region covering Egypt, Iraq, Jordan, Lebanon and Turkey. In addition, a large share of the population lives abroad without seeking refugee registration.

Agricultural support policies

The vulnerability of countries to perceived risk from dependence on imported food has prompted some governments to support the cultivation of staple crops in the region (Box 2.3). Unfortunately, rigorous recent calculations of government support to (or implicit taxes on) producers have not been widely undertaken for the region, and to date have been made for only three countries with the latest year of available data from 2010. The nominal rate of assistance (NRA) is defined as the percentage by which government policies have raised gross returns to farmers above what they would be without the government's intervention (or lowered them, if NRA<0). The NRA considers only gross returns, and therefore does not consider input subsidies or taxes that may come through government-set prices for inputs. Estimates for wheat show a range of support from -28% (2010) in Sudan indicating effective taxation of their sector, to 44.7% in Egypt (2010) indicating strong support (World Bank, 2013). Support for wheat in Morocco was a more moderate 15% (2009). In addition to assistance to farmers, most countries in the region maintain consumer prices for selected types of bread and other staples at artificially low levels, effectively subsidising consumers. While these programs are often viewed as social support programs, they are extremely costly for government budgets and largely regressive (with the largest benefits accruing to the non-poor), and thus of dubious effectiveness and efficiency as social protection measures to reduce poverty. Between 2008 and 2013, the cost of non-targeted subsidies for fuel and food ranged from less than 1% in Lebanon to over 20% of GDP in the Islamic Republic of Iran. Though there have been efforts in most countries to reduce these subsidies since 2010, for most countries prices on energy products and basic foods are still controlled, albeit at a higher level, which reduces their fiscal impact (FAO, 2017c).

A comparison of farm gate producer prices and border import prices for wheat for the years since 2010 showed that producer prices in Algeria, Jordan, Kuwait, Oman, Saudi Arabia and Yemen were consistently significantly higher than the prices of imported wheat (from 60% to 250% higher). No firm conclusions can be based on these price differences, because the two prices are measured at different stages of the wheat value chain (producer prices at the farm gate and import prices at the border). However, such large price differences do suggest that domestic policies continue to raise prices for wheat above world prices.

Box 2.3. MENA government support for wheat

MENA governments have subsidised wheat production for many years using three main policy interventions: guaranteed prices, input subsidies, and import tariffs. The purpose of these policies is to raise the price and lower the costs for domestic production of wheat in order to increase self-sufficiency in wheat production.

In Iraq, for example, the Ministry of Trade supports wheat producers through a guaranteed price for no. 1 wheat that exceeds the import price of wheat. In 2015, the Ministry offered 795 000 Dinars (approximately, USD 681), in 2016, 700 000 Dinars (approximately USD 592) and in 2017, 560 000 Dinars (approximately USD 487) (USDA, 2017b). In Iran, the government also sets a minimum purchase price for wheat purchased by the state. State purchases at minimum prices have encouraged farmers to increase their production from 2.2 Mt in 2013 to 8.5 Mt in 2016. In Morocco in 2017, the government subsidised wheat production by establishing a reference price for purchasing domestic wheat (MAD 2 800 per tonne in 2017, equivalent to USD 286 per tonne). In October 2017, the government also introduced subsidies to millers and elevators that purchase domestic wheat. Furthermore, the government raised the import duty on soft wheat from 30% to 135% (Reuters, 2017). Tunisia’s Cereal Board controls the marketing of 40% to 60% of total domestic wheat production and 10% to 40% of total barley production. The government sets guaranteed minimum prices for wheat and barley. For the 2017/18 marketing year, the Ministry of Agriculture set minimum prices of USD 329 per tonne for durum wheat and USD 236 for common wheat. The Ministry also subsidises irrigation water and provides technical advice to farmers targeted at increasing irrigated wheat area. Furthermore, in 2017, the Ministry subsidised agricultural machinery and irrigation equipment by 50% in order to encourage investment in irrigated cereals production (USDA, 2017a).

The Egyptian government heavily regulates wheat production, storage and marketing through many policy instruments. As of 2015, the Egyptian government subsidised the production of wheat through four main channels: (1) input and output subsidies for farmers, i.e. subsidised fertiliser prices and wheat procurement prices at higher than import prices; (2) consumer support in the form of highly subsidised prices for baladi bread; (3) government investment in improvements in grain storage and state grain trading; and (4) government support of wheat yield research, phytosanitary control, and other public goods. The government is also the sole purchaser of domestically produced wheat and imports about one third of total wheat imports. The government owns a large share of storage capacity and over half of the milling capacity of the country.

Saudi Arabia has undertaken the largest policy change. It gradually reduced its wheat production quotas and purchase programs because of strong concerns over the depletion of local water reserves which were used to irrigate wheat production. The country's production fell from around 2.5 Mt in 2005 to less than 30 000 t by 2015. Farmers have been encouraged to engage in alternative sustainable production activities such as greenhouse farming or production of fruits and vegetables using advanced drip irrigation techniques.

Sources: USDA (2017a, b); FAO and EBRD (2015); FAO (2017b); Reuters (2017).

Medium-term outlook

The previous sections introduced the food and agriculture and fish sectors of the MENA region and discussed the major issues the region has been facing. These include the region's challenges to improve food security and nutrition while sustainably raising productivity and managing the deepening dependence on foreign markets. This section expands on the discussion by exploring the potential future trends in consumption, production and trade of agriculture and fish commodities.[14]

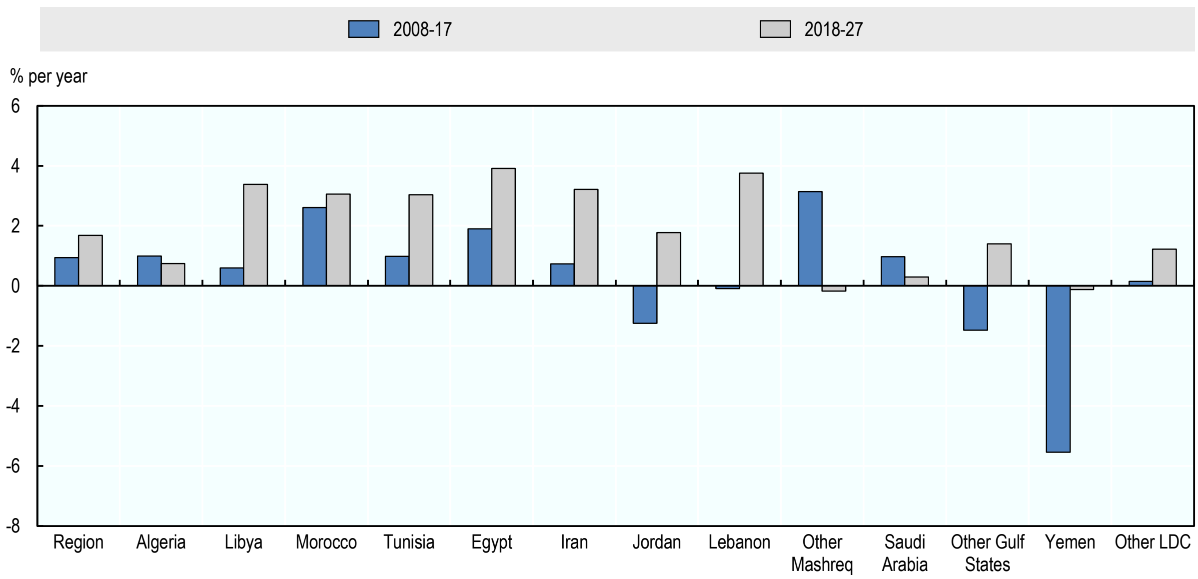
Key economic and social factors shaping the outlook

The outlook for agriculture, food and fish in the MENA region is mainly driven by the region's macroeconomic performance, its demographic developments, the presence and extent of conflict and the evolution of policies.

According to World Bank data, on average, households in the region spend about 44% of their income on food and beverages.[15] Because of this high share, economic prospects will remain a critical factor affecting food consumption and food security in the coming decade. Based on the assumptions of improving energy markets, the continuation of structural policy reforms and no major changes in the favourable geopolitical climate, average income growth per capita in the region is projected at 1.6% p.a. for the coming decade, up from 1% p.a. in the previous one (Figure 2.11).[16] However, these income growth prospects are unlikely to lead to significant changes in dietary patterns.

Demographic developments are a second major driver of aggregate food demand. Population growth is expected to slow across the region, falling in aggregate from 2% p.a. in the last decade to 1.6% p.a. in the coming one (Figure 2.12), although this still represents almost 100 million additional people. The share of rural population is declining, but it will remain above 60% in the LDC countries while falling to around 10% in the Gulf region. The larger proportion of urban consumers will increase the demand for prepared foods, typically containing more fat and sugar.

Figure 2.11. Past and projected GDP per capita growth in the Middle East and North Africa



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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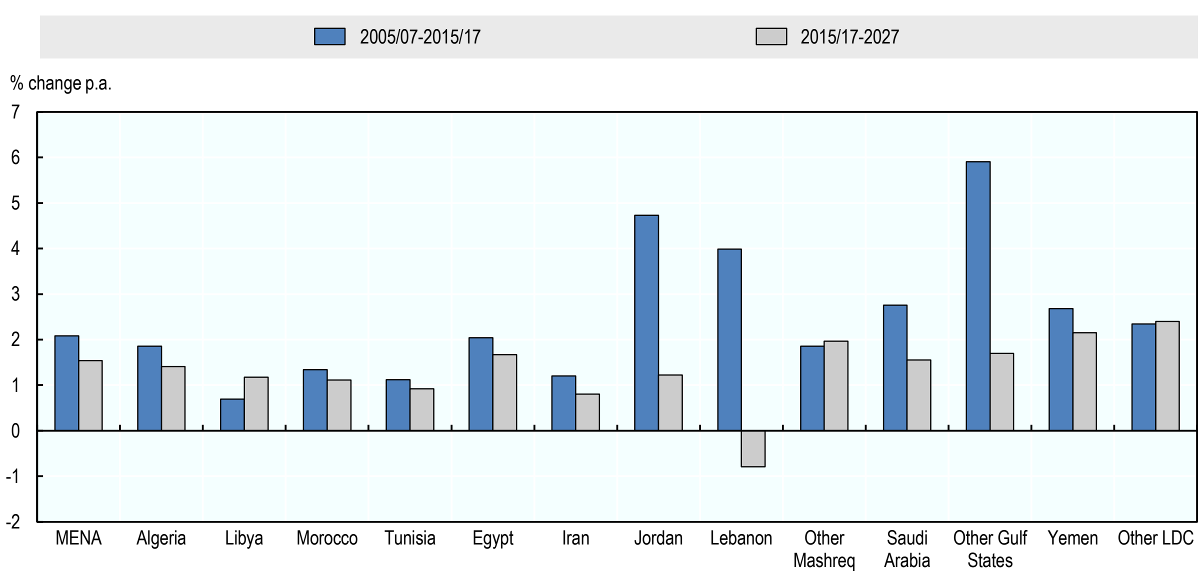
Figure 2.12. Population growth to slow, but unevenly across the region



Source: World Population Prospects 2015: Revision from the UN Population Division and 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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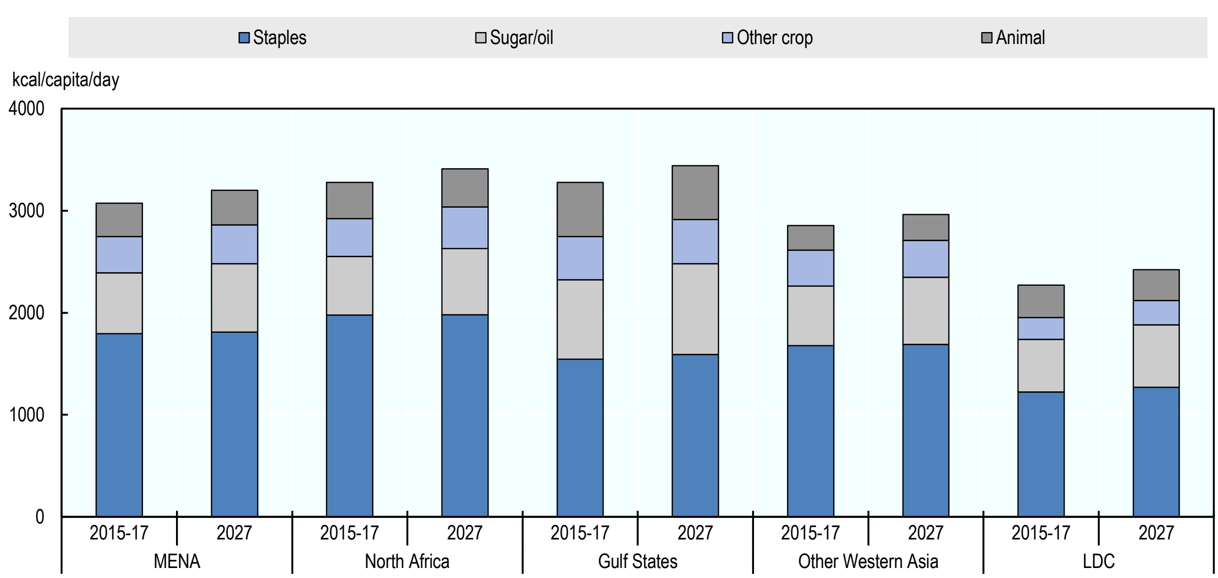
Food consumption trends

Slow growth in per capita consumption

Food consumption in the region, measured in per capita calorie availability per day, is projected to grow at 0.4 % p.a., due mainly to modest income gains. Saturation effects in many high and medium income countries will slow consumption growth during the coming years, but higher growth (0.6% p.a.) is projected in the LDCs in the region, where it was stagnant or declining in the last decade. These improvements are predicated on higher income growth and no major changes in political stability. Average daily calorie availability (intake and consumer waste) per person in the region is projected to reach 3 200 kcal, varying from 3 440 kcal in the Gulf region, 3 412 kcal in North Africa, and 2 962 kcal in Other Western Asia to 2 420 kcal in the LDCs.

Diets in the MENA region are dominated by vegetal foods. The *Outlook* projects that animal foods will increase in share, due to higher meat, fish and dairy product consumption, but the transition will be slow (Figure 2.13). It is estimated that 89% of calories in the region will still stem from vegetal sources by 2027, only slightly down from the current level. Eating patterns across the region will remain relatively similar, and differences between the sub-regions are mainly due to their income differences. The countries of the Gulf region consume the highest share of animal foods at 15%. Second are the LDCs at 12%, as a result of their large animal husbandry sectors, while the countries of North Africa and Other Western Asia only reach about 10% by 2027. These shares of calories from animal sources compare with the stable 24% share which has been experienced in developed countries for many years.

Figure 2.13. Calories availability from various sources



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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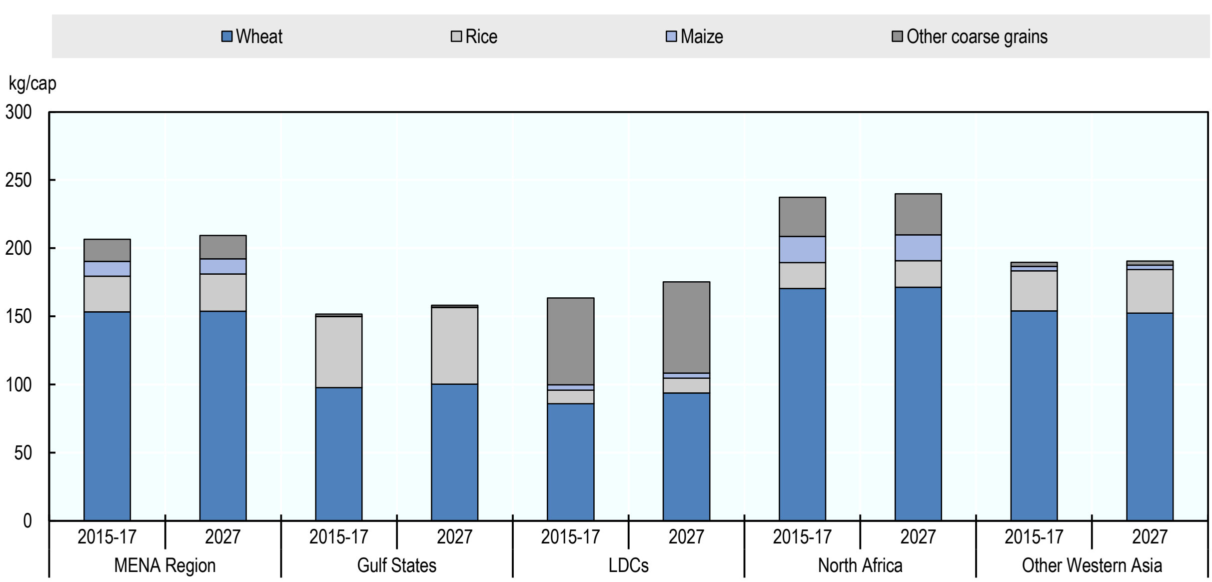
Dominance of cereals in diets will continue

Average annual food consumption of cereals is currently about 200 kg per person in the region, almost 60 kg higher than the world average. It is projected to stay roughly at this level over the projection period. Wheat is the traditional food staple in the region, yet its per capita consumption is projection to be flat. Rice is expected to show continued growth in the Gulf region, due to the consumption by migrants from southern and eastern Asia. In LDC countries, the use of locally grown coarse grains (primarily millet) is also expanding (Figure 2.14).

The share of calories from cereals in the diets continues to fall slowly, as growth in food demand comes from higher value products, especially vegetable oil and sugar.[17] The increased consumption of processed foods and prepared meals is expected to drive per capita vegetable oil use in the region from currently 19 kg to 22 kg per year by 2027. It will remain highest in the Other Western Asia region at 25 kg and lowest in the LDC countries where consumption will attain only 7 kg, as the population will still be largely rural and oilseeds are not grown locally.

Diets in the MENA region are traditionally very high in sugar and they are expected to stay that way, despite mounting health concerns. Consumption levels in countries such as Egypt, Saudi Arabia and Tunisia are around 40 kg/person/year. Average annual consumption of sugar is anticipated to grow, as lifestyles become more affluent, from 32 kg/person to 34 kg by 2027, at which level it will be on par with developed countries.

Figure 2.14. Wheat remains the most important cereal in the region



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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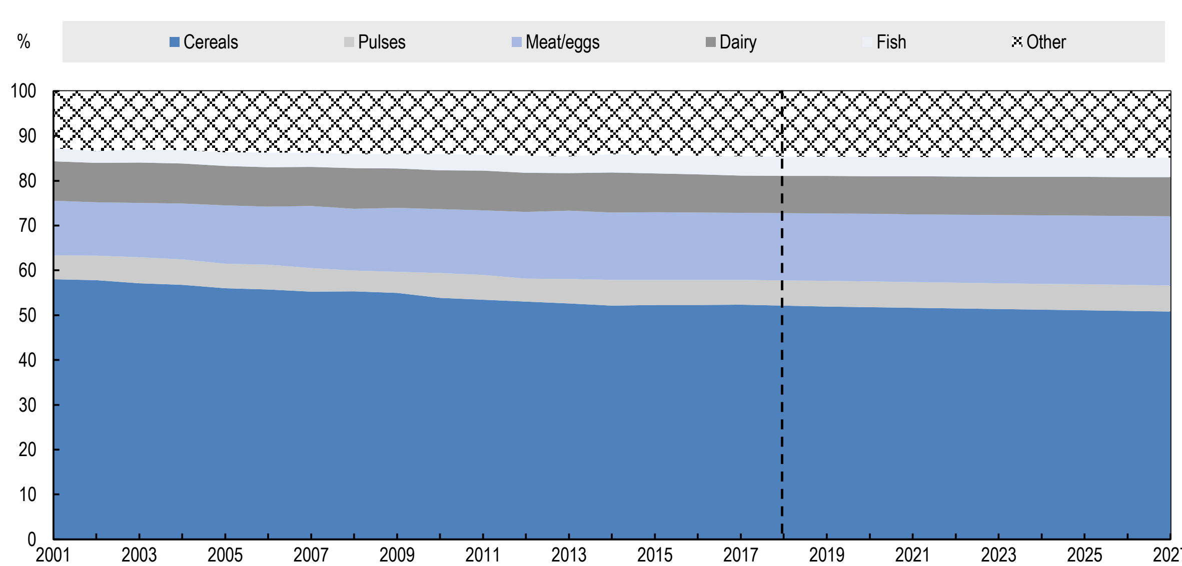
Low intake of proteins from animal sources

Meat is a distant second as a source of protein in the average MENA diet (Figure 2.15). The average meat consumption in the region is currently 25 kg/person p.a. (retail weight). Driven by income growth, it is projected to grow 0.6% per year over the medium term, led by growth in poultry, which is by far the most important meat consumed currently at 18 kg, growing at almost 1%. Meat consumption is highest in the Gulf region where it will increase marginally to 54 kg. Meat consumption in the LDC region will be largely driven by progress in the domestic sheep and cattle sector. It is expected to recover from recent declines to about 17 kg/person/year in 2027 based on projected productivity improvements by pastoralists.

Fish consumption in the MENA region has grown rapidly in recent years, at 4% p.a. in the last decade, and become second to poultry in providing protein in the MENA diet. While consumption is low and stagnant in LDC countries, growth elsewhere continues to outpace meat consumption.

Dairy products have become an important source of nutrition in the region, but per capita consumption fell in the last decade at a rate of 1.1% p.a. due to difficult production conditions especially in Other Western Asia and the Least Developed countries. In contrast, consumption grew strongly in the Gulf region at 4.9% p.a. and 1.8% in North Africa. Dairy product consumption continues to expand in the MENA region as producers enter more markets with a wider range of products. Fresh dairy products will continue to make up the largest share of the dairy market in the region, but there are growing markets for processed products including butter and cheese in more affluent countries. In lower income regions, particularly in North African countries, the demand for milk powders is significant. These are reconstituted into processed dairy products.

Figure 2.15. Share of animal protein in MENA diets is rising



Source: FAOSTAT, 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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The outlook for production

The medium-term evolution of agricultural production in the MENA region will be shaped by a wide range of domestic and international factors. Agricultural production needs to address a series of domestic challenges in order to achieve sustainable development including aridity, limited cultivable land, scarce water resources and serious implications of climate change. Additionally, for almost all agriculture and fish products, price competition from international markets is high and in real terms, prices in these markets are trending down.

Due to these factors, agricultural and fish production in the region, measured in constant international prices, grew slowly at an annual rate of 1.3% p.a. over the last decade.[18] This slow rate of growth is due to falling real prices, but also to weak policies, insufficient investment in science and technology and agricultural development and conflict which have contributed to the impoverished state of agricultural resources and to their inefficient use and low productivity.

A modest improvement in production growth over the medium term is projected based on a generally improved economic setting, no deepening of conflict in some countries, and more stability in others which should improve investment and productivity. Average annual growth for the region as a whole is projected at 1.5% p.a. Critical to the region's growth prospects is the performance of its two main producer countries, Egypt and Iran, which together account for over half of the value of the MENA region's agricultural and fishery production. They are projected to grow 2.0% p.a. and 1.0% p.a. respectively.

Box 2.4. The future of food production in controlled environments

Many MENA countries are confronted with a dual challenge: they need to conserve their often small and fragile resource base, while also facing high and rising food import dependencies. Climate change will add to these challenges, further limiting production capacities and adding to import needs. These challenges are most pronounced in the countries of the Gulf Cooperation Council (GCC), where import dependencies can exceed 90% of domestic food needs and where both fertile cropland and renewable water resources are practically exhausted. In fact, many of these countries have grown food on irrigated desert land and with fossil water and, unsurprisingly, were forced to cease production completely soon after they had started. While adverse natural production environments have rendered these practices unsustainable, production in so-called "controlled environments" promises new and sustainable options to re-embark on domestic food production.

"Controlled environments" is a term commonly used to denote agricultural production independent of natural production environments. Typically, these are fully climate-controlled greenhouses, closed or semi-closed, where soil is replaced by an inert medium such as gravel or perlite and water supply is based on hydroponics. Nutrient supplies are managed either through fertiliser or "natural" plant nutrient sources such as animal or fish manure. Controlled environments are high-tech production plants that combine a whole range of different technologies, from fully automatic fertilisation, pest and weed control, robotic harvesting systems, LED lighting, solar-based heating, adiabatic cooling and energy-efficient desalination. They also use high ambient CO2 levels to boost yields, which can reach extra-ordinarily high levels of, for example, up to 100 kg of tomatoes/m^2. In analogy to smartphones, these production plants are also called "smart farms".

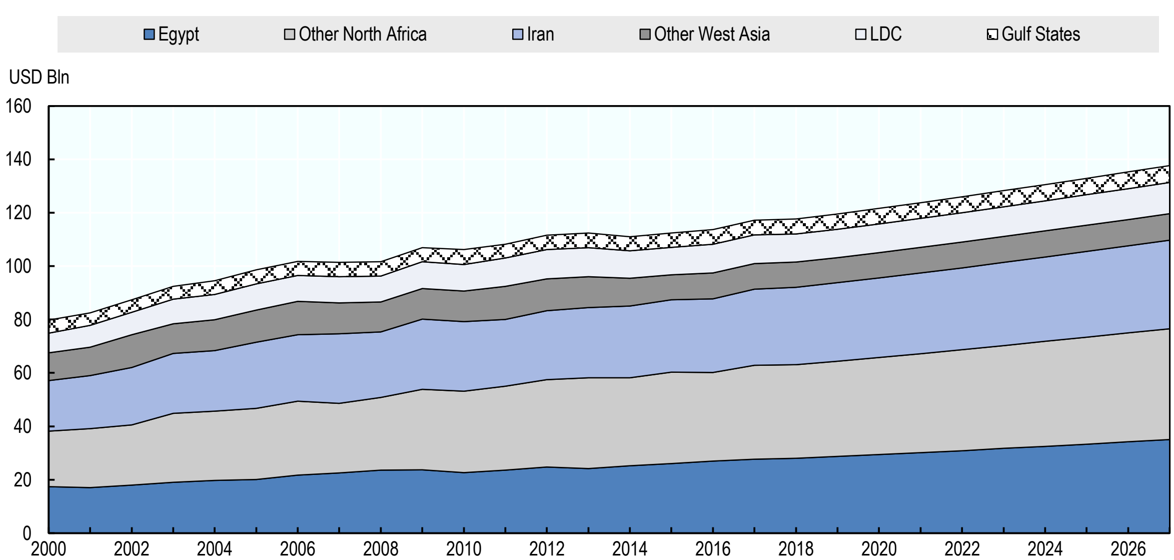
The combination of different technologies allows for location-independent and fully controlled production at high resource efficiency. These properties enabled controlled environments to make inroads in hot and arid environments, including the deserts of Arizona, Australia, and more recently also the GCCs.

The costs of production for some fruits and many vegetables are surprisingly low. Solar energy provides cheap electricity for cooling and LEDs, for desalination and N-fertiliser. CO_2 is available as a by-product from the hydro-carbon and cement industry, while migrant workers offer access to low cost labour for harvesting, grading and other labour-intensive processes. On the demand side, supermarkets provide cold chains and access to a large consumer base either through retail consumers or the large hospitality sector. Preliminary calculations suggest that products like tomatoes, eggplants, peppers or micro-herbs can be produced at costs of about 30-40% below the prices of airfreighted produce. A number of start-ups but also well-established companies are now seizing these new opportunities, apparent in the swiftly rising investments in controlled environments.

There are, however, risks and GCC-specific limits to producing in controlled environments. They include the need to have a highly-skilled operator ("head-grower") to run such a plant, the need to manage a complex supply chain from seedlings to spare parts, or the need to establish joint ventures with local partners, as foreign land ownership is heavily circumscribed or completely impossible in many GCCs.

Figure 2.16. Net value of agricultural production to grow more strongly

In constant (2004-06) USD billion



Source: FAOSTAT, 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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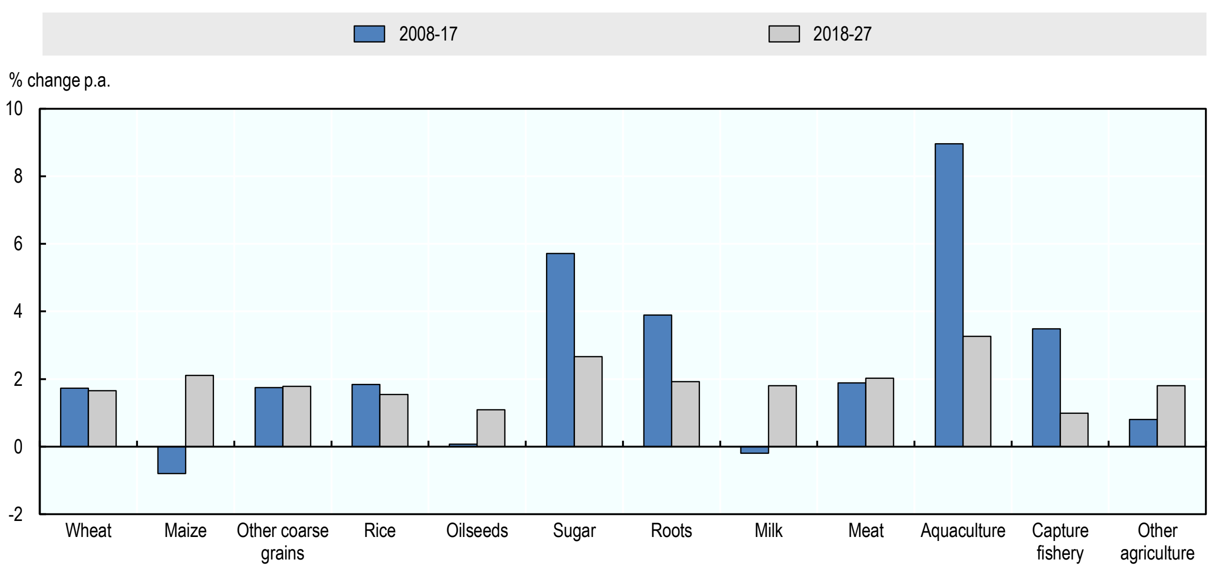
Agricultural production in the region is dominated by cereal production. While in the past production growth was achieved mainly by area expansion, yield improvements are seen as the major source of gains in the future. Cultivated land is projected to remain unchanged to 2027. Yields of the main crops, wheat, coarse grains and rice, are expected to grow at about 1.5% p.a., which is associated with improvements in seed potential, increased input intensity and improved management. Subsequently, the production of wheat, the region's major crop, is projected to reach 45 Mt by 2027, up from 37 Mt currently. Iran, the region's largest producer, will increase its share from 32% to 35% as its production will reach 16 Mt in 2027. Maize production, which fell in recent years due to severe declines in Iran, is set to recover in the medium term due to improved yields and will reach 10.5 Mt. Rice production, of which two-thirds takes place in Egypt, will attain 7.6 Mt by 2027, growing at 1.5% p.a., due to slower growth in cultivated area.

Sugar production, from sugar cane and increasingly sugar beets, has been the most rapidly growing commodity in the region. Sugar beet production grew rapidly at 6.4% p.a. in the last decade, underpinned by 10% p.a. area expansion in Egypt. It is projected to grow 3.0% p.a. over the outlook period, as sugar prices remain flat and fewer additional hectares will be cultivated. Growth in sugar cane production is mainly based on yield improvements, and is expected to grow slowly at about 0.8% p.a.

Milk production in the region was stagnant in the last decade, due to production declines in both Other West Asia and LDC countries, which were offset by growth in the other sub-regions. For the coming decade, the *Outlook* projects milk yield improvements of 1.6% p.a. and a cow herd enlargement by 0.2% p.a. As a result, milk production is expected to attain 38.4 Mt by 2027. Iran will continue to hold the largest share of production at about 20% followed by Egypt at 18%. As in the past, about 50% of milk will be consumed fresh, while 18% are going to be processed into cheese and 16% into butter, with the remaining share used in milk powder production.

Figure 2.17. Changes in major production activities in the MENA region



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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Current meat production in the region is about 10 Mt (carcass weight), with poultry meat accounting for about 60%, followed by bovine meat and sheep meat with about 20% each. Investments into new livestock production facilities together with higher carcass weights are expected to expand meat production across the region on average at 2.0% p.a., slightly higher than in the previous decade. In order to satisfy the fast growing domestic demand, poultry production is expected to increase at 2.8% p.a., led by strong growth in the North Africa region, where Egypt's poultry sector is dominant. The livestock sector of the LDC sub-region is characterised by a very large cattle inventory, which is currently estimated at about 45 million head, accounting for over 60% of the total MENA cattle inventory. Nevertheless, due to traditional herding practices with low offtake ratios, the sub-region produces just 22% of the bovine meat of the MENA region.

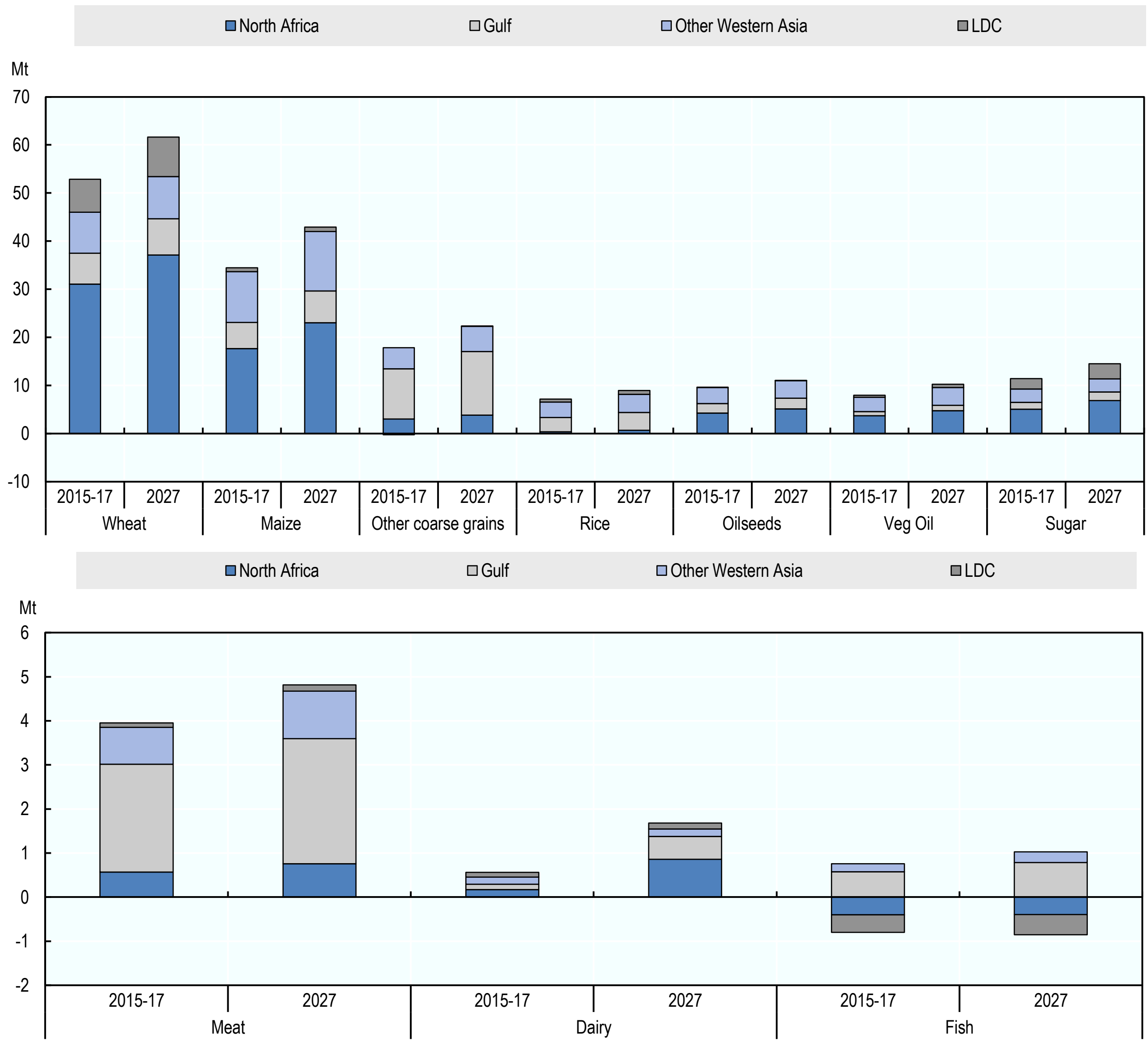
Capture fisheries still dominates fish production in the MENA region. Currently, almost 4 Mt are landed per year, with Morocco accounting for almost 40%. Growth in the next decade is limited to 0.5% p.a. due to dwindling fish stocks. Aquaculture production in the region more than doubled during the last decade, standing currently at almost 2 Mt. It is set to increase by another 50% over the ten years, with growth expected in all sub-regions, particularly North Africa (Egypt) which contributes 75% of the total supply.

The outlook for trade

The MENA region is one of the largest net food importing regions of the world, with significant net imports of virtually all food commodities; trade has been and will remain the most important contributor to additional food supplies in the region. Currently, about 27% of international shipments of cereals, 21% of sugar, 20% of poultry meat, 39% of sheep meat, 20% of skim milk powder and 30% of whole milk powder go to the MENA region. Domestic markets in the region are generally tightly integrated into global agricultural markets and this interdependence is certain to continue and expected to deepen for products such as wheat and maize.

Large increases in net imports are projected, as consumption will continue to outpace production for most basic food commodities. The deficit is projected to reach 58 Mt for wheat and 65 Mt for coarse grains in 2027. The largest share of MENA imports for almost all commodities will continue to go to North Africa, followed by Other Western Asia. Other coarse grains and rice are the exception, as the Gulf region dominates for them (Figure 2.19). The Gulf region dominates meat and fish imports, given its low production and relatively high consumption levels. The LDC countries are the only net exporter of fish in the region, and these exports are projected to increase.

Figure 2.18. Rising net imports for all commodities and in all regions



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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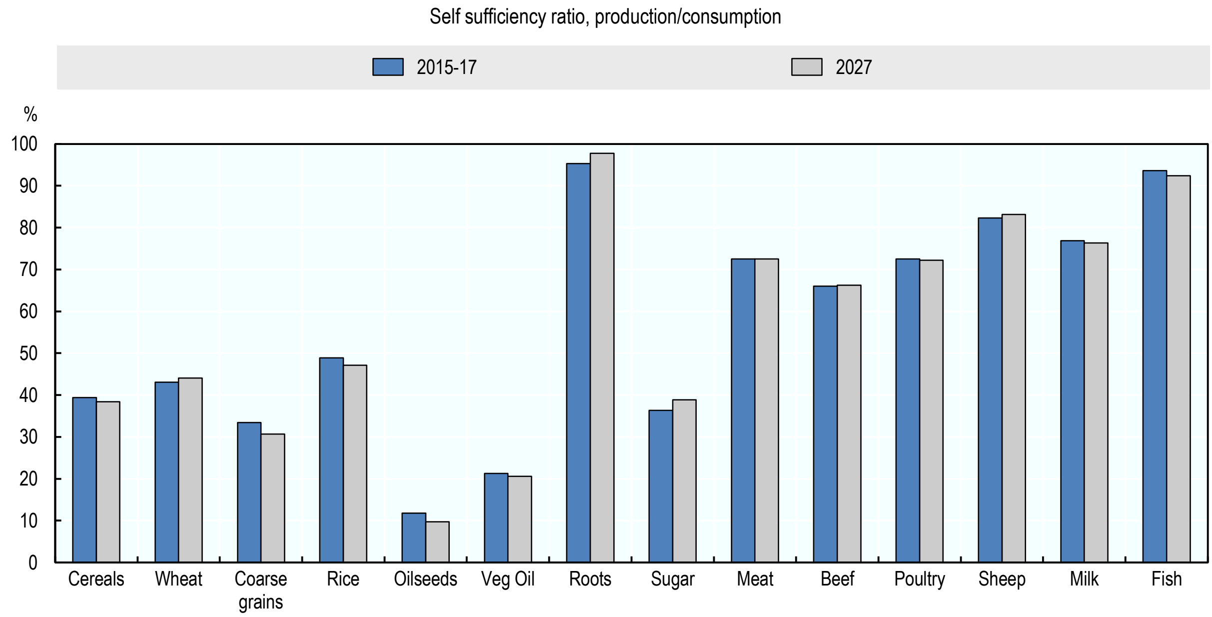
Figure 2.19. High dependence on foreign markets for basic foodstuffs



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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Risks and uncertainties

The medium-term outlook projections for the Middle East and North Africa region are subject to risks and uncertainties associated with internal and external issues. Conflicts critically impact food consumption as well as agricultural production. Other uncertainties include, for example, nutritional concerns or volatility in crude oil prices. These issues are analysed below to illustrate their potential impact on the projections.

Addressing nutritional concerns

Parts of the MENA region face what is referred to as the "triple burden" of malnutrition: undernourishment, over-nourishment or obesity, and malnutrition (Box 2.5). Albeit slowly, undernourishment is diminishing, at least where conflicts are not present. But the latter two nutritional outcomes are rising, and governments are considering policy measures to address these.

The United Nations report "Arab Horizon 2030" undertook scenario analysis to examine a radical change in diets of the Arab region (which broadly corresponds to the MENA region as defined here, but excludes Iran).[19] Addressing the diet problem has implications for the dependence on foreign markets for basic foodstuffs. A so-called "Healthy Diet Scenario" was constructed that assessed the impacts of an improved diet on domestic and international markets. Using the OECD-FAO Aglink–Cosimo model, a scenario was simulated in which eating patterns were assumed to conform to FAO and WHO "healthy diet" recommendations of 2 200 kilocalories per day which would be achieved through a 50% decrease in cereal availability for food consumption, a doubling of meat and egg consumption, a tripling of dairy products and reduced sugar and vegetable oil consumption. Assuming a "waste" factor of 30% that is implicit in the baseline calorie availability estimate, such changes involve a decrease in total caloric availability from 3 100 kcal per day to 2 860 kcal per day.

Box 2.5. The triple burden of malnutrition in the MENA region

The Middle East and North Africa (MENA) region comprises 22 countries at very different levels of development, income, health and social protection.[1] The range goes from high levels of development in Gulf Cooperation Council (GCC) countries, moderate levels in Mashreq and Maghreb countries to very low levels in the three LDCs of the region. Unsurprisingly, nutritional problems and the ability of the various countries to cope with the burdens of malnutrition also differ across the region. While the LDCs of the region face serious chronic hunger challenges or outright famines, the GCC alongside many of the middle income countries, in contrast, confront a growing problem of over-consumption and, as a consequence, rising levels of overweight and obesity. Almost all MENA countries have rather undiversified diets with high levels of micronutrient deficiencies, notably iron, which can result in anaemia. The table below summarises the prevalence of the various forms of malnutrition. What the table fails to capture is the fact that the various forms of malnutrition are not confined to, nor even concentrated in a given country, but they occur simultaneously in many countries, sometimes within the same household and in a few cases afflicting the same individual

	Middle East		North Africa*	
	2005	2015	2005	2015
		%		
Prevalence of undernourishment in the total population	9.1	9.1	4.6	6.7
Prevalence of food insecurity in the adult population (>=15)	30.9	8.7	27.9	11.2
Prevalence of wasting in children (< 5y)		3.9		7.9
Prevalence of stunting in children (< 5y)	20.6	15.7	21.6	17.6
Prevalence of overweight in children (< 5 y)	7.0	8.0	8.9	10.0
Prevalence of obesity in the adult population (>=18 y)	20.3	25.8	17.5	22.6
Prevalence of anaemia among women of reproductive age (15-49)	34.1	37.6	36.7	32.6

* Including Sudan.

The simultaneous occurrence of the various forms of malnutrition is known as the "triple burden of malnutrition." It takes a growing toll on the region's health sector and even on overall economic performance. On the one hand, anaemia and undernourishment reduce a person's ability to undertake physical work and thus can create poverty traps, particularly but not only in LDCs. On the other hand, overweight and obesity have become increasingly visible through the high prevalence levels of non-communicable diseases (NCDs), observed notably in GCC but also in Mashreq and Maghreb countries.

The simultaneous occurrence of the various forms of malnutrition also makes it difficult to address the three problems efficiently. Past programmes often took a "wholesale" approach, e.g. by lowering food prices for all consumers, particularly for basic foods (bread/flour/sugar). While this resulted in improved access to basic food energy even for the poorest consumers, it also added to a growing problem of overweight and obesity and, not unrelated, food waste. A number of factors make policy choices particularly difficult for the MENA region. They include high inequality of wealth and incomes, hence different responsiveness to price and policy incentives; high shares of migrant populations and different ethnicities particularly in the GCC, hence different genotypic predispositions to develop NCDs; weak institutions as well as deficiencies in food delivery systems and physical infrastructure, hence rendering the administration of food supplementation and fortification programmes difficult. Consequently, addressing the triple burden demands much more targeted and innovative policy instruments than those applied in the past.

1. Estimates are adjusted to definitions of indicators and regions based on data from the *State of Food Insecurity and Nutrition* (FAO, 2017f).

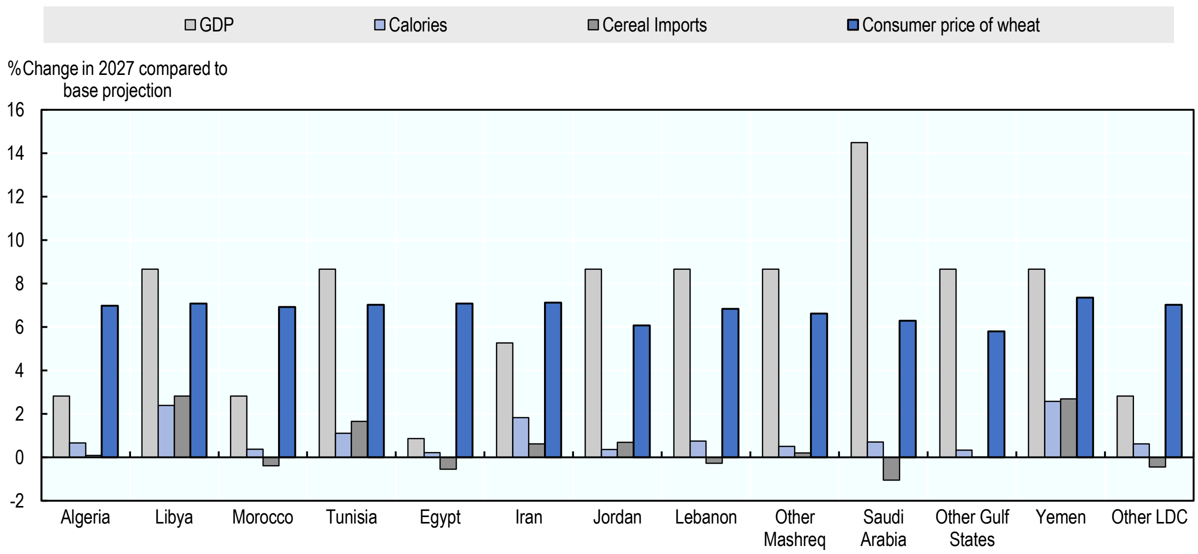
The effect on domestic production was simulated under the assumption of an unconstrained expansion of the supply in the region. Under this scenario, meat production in the Arab region would, by 2030, increase from 2 Mt to 13 Mt in the healthy diet scenario. Dairy product production (fluid milk equivalent) would increase from 5 Mt to 25 Mt by 2030. Though food consumption of cereals under the healthy diet scenario would decrease substantially, overall demand for cereals under the scenario would increase. The large increase of the livestock sector and subsequent domestic feed use of grains would drive this increase. Feed demand for cereals would grow six times faster under the healthy diet scenario than under the business as usual baseline. Production of feed within the Arab region would not be able to grow this fast, so that the region would require additional feed imports. Consequently, the self-sufficiency rate for cereals would be lower under the healthy diet scenario than under the baseline projection.

While such a substantial change in the average diet would affect the nutrition status of the average consumer in the Arab region in a positive way, it would not lessen the region's dependence on foreign markets, as either feed grains or alternatively livestock products would have to be imported.

Analysis of alternative crude oil price projections

The foreign exchange balance of many MENA countries is critically influenced by crude oil prices. A simulation as presented in the Overview, using a rise in the crude oil price to USD 122/barrel rather than the baseline value of USD 76/barrel by 2027, illustrates the significance of oil prices for the region. Figure 2.20 illustrates the estimated impacts on consumption and trade. Higher oil prices lead to higher world reference prices for cereals of around 10%, which in turn lead to higher retail prices in MENA of about 6%. The estimated increases in per capita GDP range from 2% for Egypt to 15% for Saudi Arabia. The result is that on average for the region, daily calorie availability increases by 0.6% in 2027, meaning that the income effect of higher oil prices outweighs the hike in food prices, generating overall higher food consumption in the region. Among the least developed countries of the region, Yemen's estimated increase in GDP is 8% by 2027, which leads to a 2.5% increase in calorie intake. The estimated trade impacts for cereals vary by country but for the region as a whole, net wheat imports increase marginally.

Figure 2.20. Impact of higher oil prices on food prices consumption and trade



Source: OECD/FAO Secretariats.

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Implications for food security prospects in the region

According to recent estimates (FAO, 2017f) for 2014-16, the prevalence of undernourishment is highest in the region for Sudan (25.6%), Iraq (27.8%), and Yemen (28.8%), with no reliable data for Syria. Projections of higher calorie and protein availability, based on the assumption of stable economic development and a stable income distribution, should imply a decline of the prevalence of undernourishment over time, particularly in the least developing countries.

Conclusions

The outlook for the MENA region assumes little change in agricultural, natural resource and economic growth policies. Its implications for the region are that food demand, supply and trade outcomes will continue along a similar trajectory that has been observed in the past—slow growth in food consumption, gradual changes in diet to include higher consumption of animal products, continued water use at unsustainable rates, and continued and increasing reliance on world markets. The main difference to past trends would be higher meat, milk, maize and oilseeds production associated with higher consumption of animal proteins. While increasing maize and milk production represent a recovery from quite poor performance over the past decade, increasing meat production is based on the assumption that an improved economic environment will lead to more investments and subsequent productivity improvements in the region. These developments are anticipated to limit, but not reverse, increases in the dependence of the region on imports.

Current agricultural policies in the region emphasize wheat price support bolstered by import protection (Box 2.1). These policies are aimed at limiting import dependency for cereals. At the same time, consumer policies emphasise subsidised prices for staple foods and are viewed as social protection measures. The results of these policies can be seen in the pattern of harvested land, of which 60% remains in water-thirsty cereals.

An alternative approach to food security and agricultural policies would emphasise rural development, support for production of higher-value horticulture products on small farms, supported by a more robust technical extension system. This approach is rooted in the conviction that the level of food security of a country hinges more on the elimination of poverty than on wheat self-sufficiency. Fruits and vegetables both consume less water and provide higher economic returns per drop, and many countries in the region have a comparative advantage in their production. While such higher-value crops and livestock products could potentially increase farmer incomes, improve nutrition, and use water more sparingly, they require a higher level of agronomic and export market knowledge and present higher levels of risk. A revision of food security policies away from self-sufficiency towards poverty elimination would focus the attention of policymakers on rural development and on building the capacity of farmers to minimise risk while raising higher value crops.

From a nutritional perspective, diets in the MENA region will remain very rich in in cereals, and wheat in particular. The share of vegetable oil and sugar, as well as meat, fish and dairy products will grow, albeit slowly. Barring increased conflict, undernourishment should decline slowly as average food consumption levels increase. However, the evolution of diets is also expected to contribute to increased rates of obesity with associated health consequences. The current structure of policy support toward consumers of cereals limits needed diet diversification, and should be altered to redress rising health issues.

Notes

[1] In this chapter, the Middle East and North Africa region includes countries/areas of FAO's North Africa and Near East region: Algeria, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, the Palestinian Authority, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates (UAE), and Yemen

[2] Water stress is indicated when annual freshwater withdrawals are high compared to renewable internal freshwater resources. If freshwater withdrawals exceed renewable internal resources then either non-renewable groundwater resources are being withdrawn or desalinated and other supplemental water resources are being used that are not included in the total annual water resources figures (World Bank, 2018).

[3] The Herfindahl-Hirschmann concentration index, is a measure of the degree of product concentration. The index ranges between 0 and 1. An index value closer to 1 indicates a country's exports or imports are highly concentrated on a few products. On the contrary, values closer to 0 reflect exports or imports are more homogeneously distributed among a series of products. For worldwide evidence of systematically high concentration index values for natural resource rich countries, see Bahar (2016).

[4] Sodicity refers to high concentrations of sodium in soils. Sodic soils have a poor structure as sodium causes soils to swell and disperse. A dispersed soil structure loses its integrity, becomes prone to waterlogging, and is usually harder, making it difficult for roots to penetrate.

[5] The value of gross production includes all livestock and crop production, including crops used for feed. The proper land comparator for gross production is agricultural land, which includes both arable land and pastures.

[6] All values are expressed in dollars using average international prices of 2004-2006.

[7] The "water scarcity line" is defined in UNDP (2006).

[8] Generally, water "used" means that it (1) is depleted through evapotranspiration; (2) is absorbed into a product; (3) flows to a location where it cannot be readily reused; or (4) becomes heavily polluted (Molden et al., 2010).

[9] Cline (2007). Calculations are based on the IPCC Third Assessment Report published in 2001.

[10] Verner and Breisinger (2013); FAO (2015); Ward and Rucksthuhl (2017).

[11] Cereal area is mostly planted with wheat. In 2014, of total cereal area, wheat accounted for 43%, sorghum 23%, barley 18% and millet 8%. The current mix of wheat and coarse grains area is only slightly different from that in the 1960s when wheat made up half of all harvested area of cereals.

[12] The Gulf Cooperation Council includes the countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

[13] Conflict countries include Sudan, Syria, Yemen, Libya and Iraq.

[14] In this section, countries are often aggregated into regional groups. The North Africa region is Morocco, Algeria, Tunisia, Libya and Egypt. The Gulf region includes the states of the Gulf Cooperation Council: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE. The Other Western Asia region includes Iran, Lebanon, Jordan and other Mashreq countries of Syria, the Palestinian Authority, and Iraq. The least developed country (LDC) region includes Yemen, Sudan and Mauritania.

[15] See www.worldbank.org, Global Consumption Database. Shares are based on 2016 values.

[16] See IMF *World Economic Outlook*, January, 2018, and World Bank Global Economic Prospects, January, 2018 for more detailed discussion.

[17] Excluding olive oil which is not included in this projection.

[18] See FAOSTAT "Net agricultural production" which weights agricultural production of each commodity by international reference prices during the period 2004-06. The value of production is net of the value of seed and feed inputs. The value of fish production is added, and is need of feed inputs.

[19] Based on Food and Agriculture Organization of the UN (FAO) and United Nations Economic and Social Commission on West Asia (ESCWA). 2018. Arab Horizon 2030 (Beirut, ESCWA).

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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.

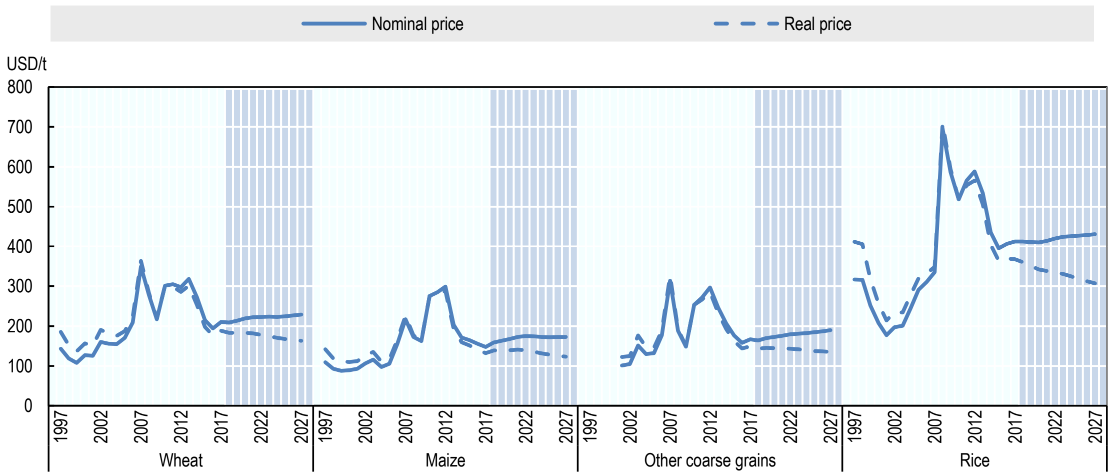
Projection highlights

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.

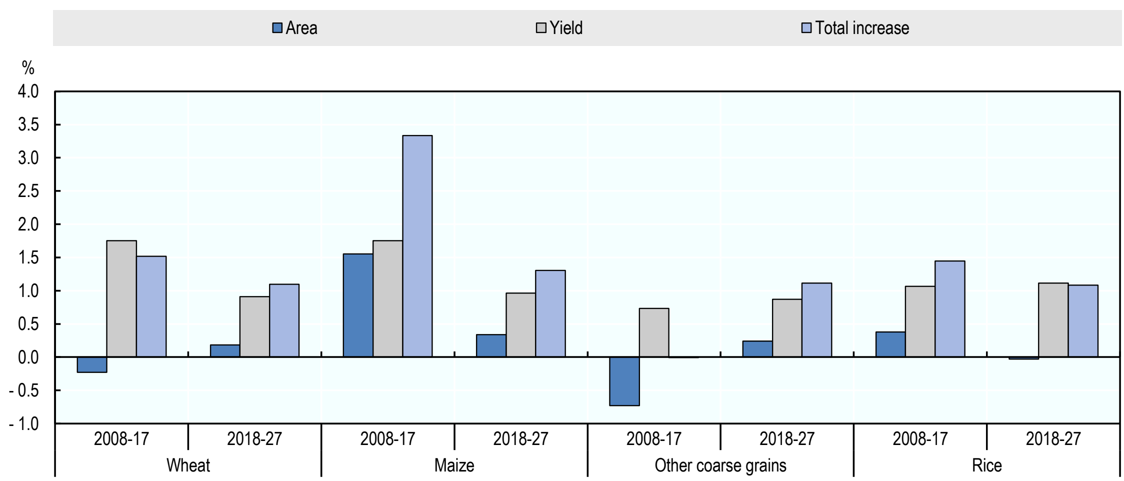
The world price for rice (milled, 100% B, fob Bangkok) increased to USD 412/t in the 2017 marketing year, the highest level since 2014. With large global supplies, the rice price is projected to remain flat in the short term, but then recover to reach USD 431/t by 2027 with growing demand from countries 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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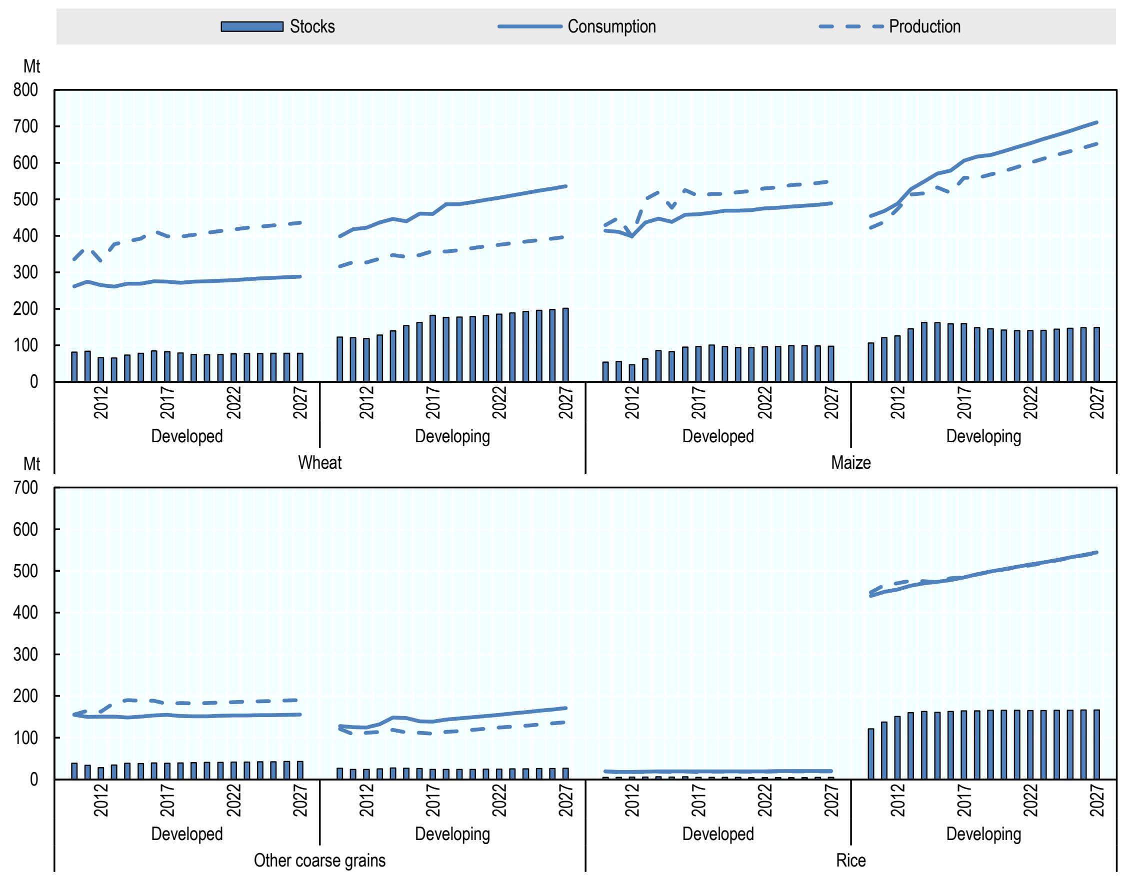
Global wheat production is expected to increase by 82 Mt to 833 Mt by 2027, a more moderate pace compared to the last decade. While developed countries are set to increase production by 34 Mt by 2027, developing countries are expected to add 48 Mt to global output thus increasing their share of global 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.

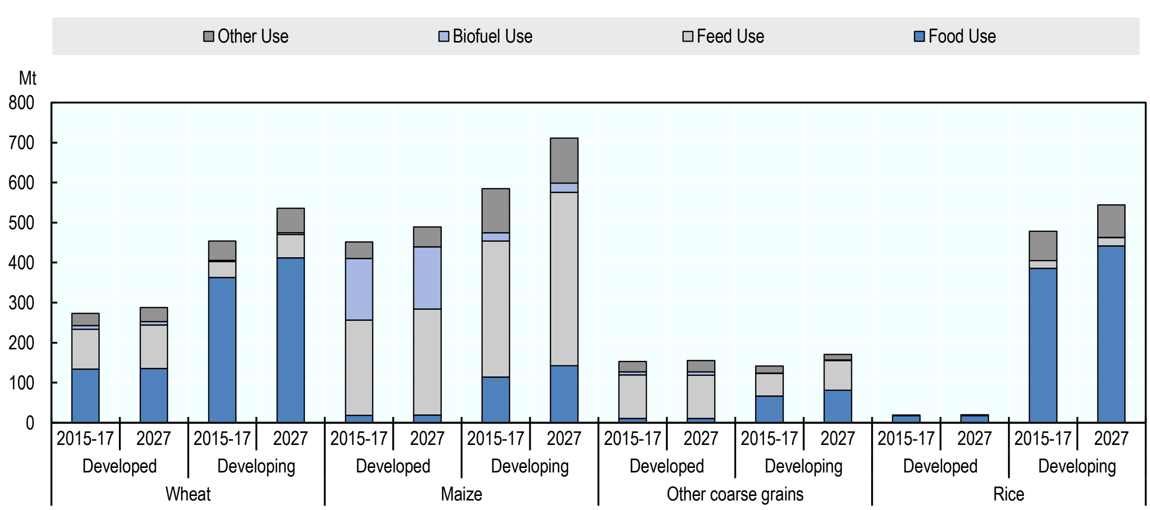
Global maize consumption is projected to increase by 1.3% p.a. over the projection period, a slower pace compared to 3.3% p.a. in the previous decade. This increase is principally driven by higher feed demand, which holds the largest share of total utilisation, rising from 56% in the base period to around 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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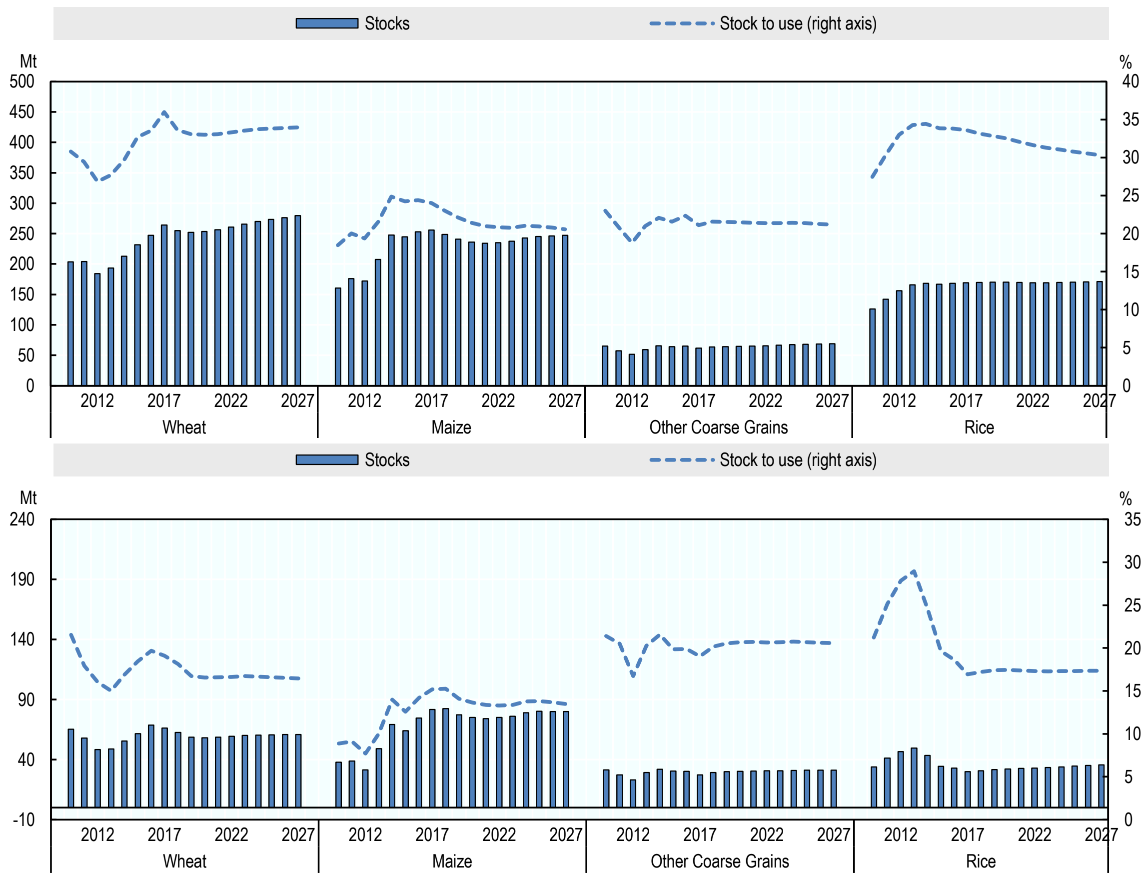
Figure 3.5. Major exporter stocks and stocks-to-use



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

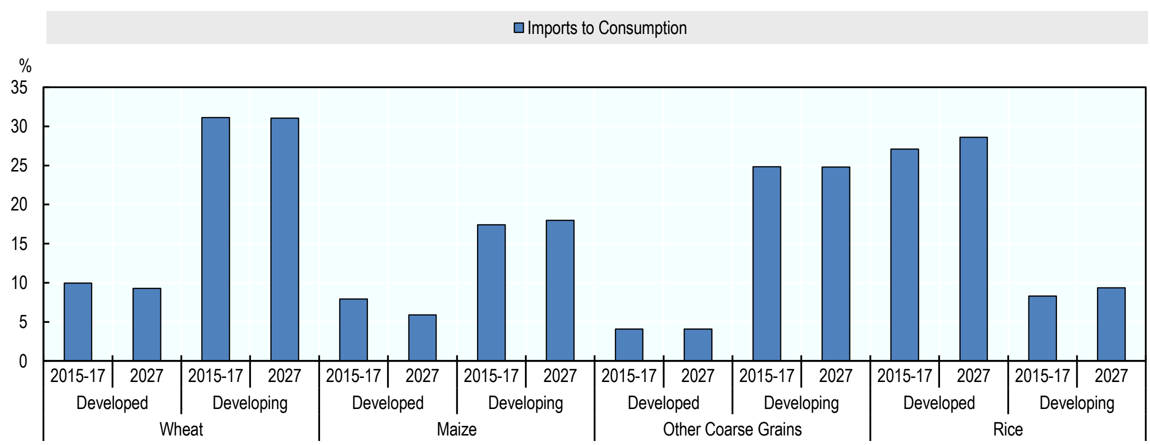
	2014-16	2026	Growth rate (% p.a.)
Africa	24.7	28.2	1.22
Asia and Pacific	77.8	78.9	0.08
North America	13.1	14.0	0.49
Latin America and Caribbean	28.5	28.7	0.24
Europe	5.5	5.9	0.63

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.

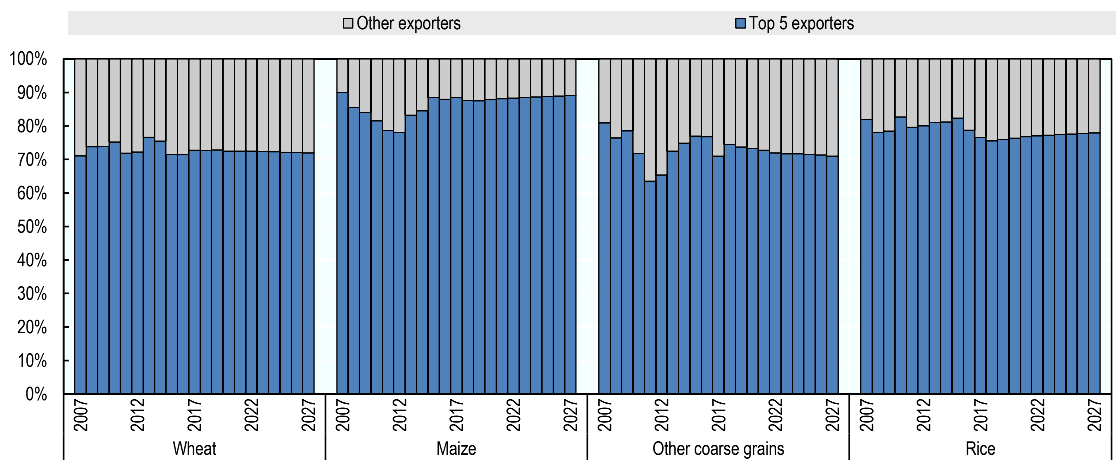
Maize exports are expected to grow by 19 Mt to 157 Mt in 2027. The export share of the top five exporters – the United States, Brazil, Ukraine, Argentina, and the Russian Federation – accounts for nearly 90% of total trade through the projection period. The United States is projected to remain the top 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.

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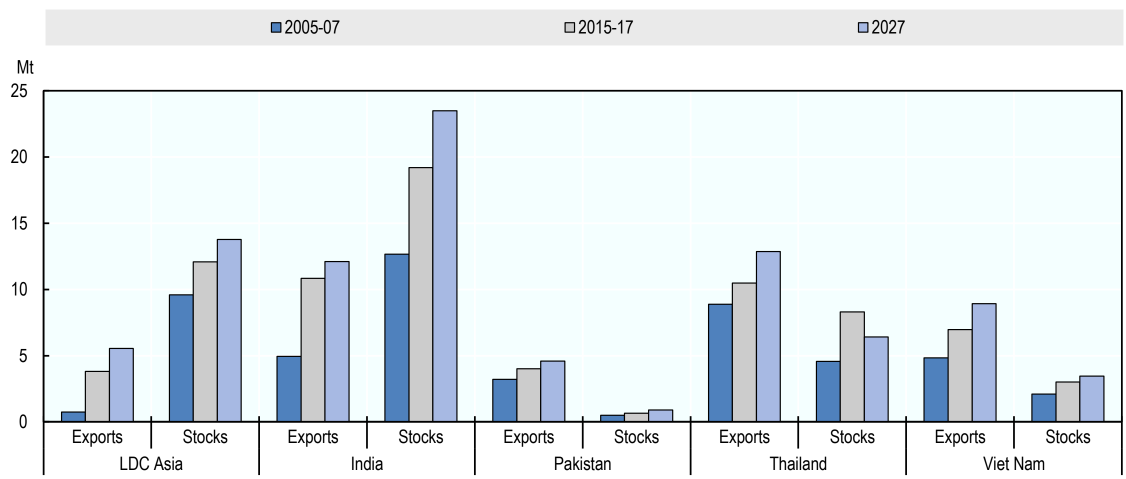
During the past ten years, rice trade grew robustly at near 6% p.a. This expansion is expected to slow to about 2% p.a. with export volume rising 9 Mt to reach 54 Mt by 2027. The export share of the top five major rice exporters – India, Thailand, Viet Nam, Pakistan and the United States – is expected 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.

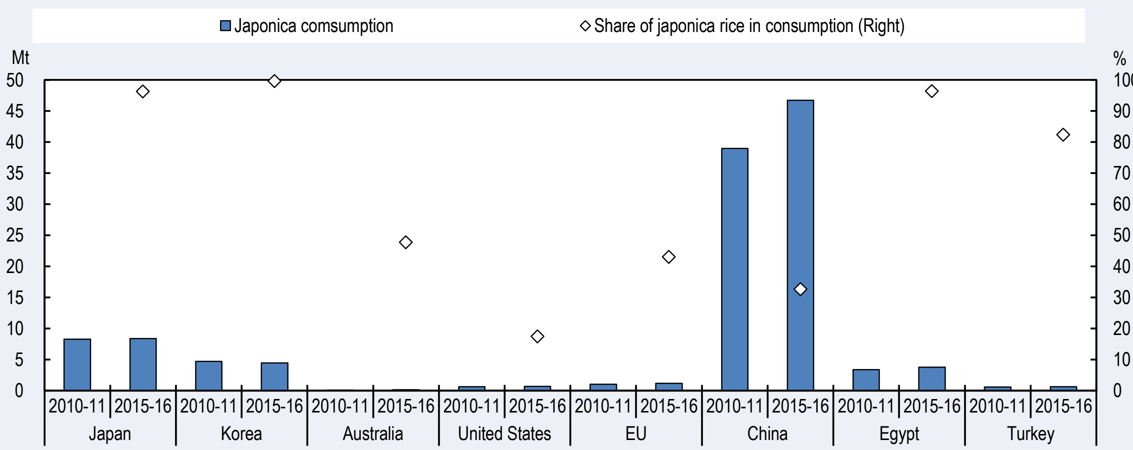
The major japonica rice producing countries are China, Japan, Korea, the United States, the European Union, Australia, Egypt and Turkey. Among these, China, the United States and the European Union also produce considerable amounts of indica rice (Calpe 2006; Rakotoarisoa 2006; Hansen et al., 2002; Wailes 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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Chapter 4. Oilseeds and oilseed products

This chapter describes the market situation and highlights the latest set of quantitative medium-term projections for world and national oilseeds markets for the ten-year period 2018-27. Global oilseeds production is expected to expand at around 1.5% p.a., well below the growth rates of the last decade. Brazil and the United States will be the largest soybean producers, with similar volumes. Protein meal use will grow more slowly due to slower growth in livestock production and as the protein meal share in Chinese feed rations has reached a plateau. Demand for vegetable oil is expected to grow more slowly due to slower growth in per capita food use in developing countries and the projected stagnation in demand as feedstock for biodiesel. Vegetable oil exports will continue to be dominated by Indonesia and Malaysia, while soybean, other oilseeds and protein meal exports are dominated by the Americas. Prices are projected to increase slightly in nominal terms over the outlook period, with slight declines in real terms

Market situation

Global soybean production declined slightly in the 2017 marketing year (October 2017 to September 2018), as the harvest in South America (in the first months of 2018) fell short of the year before. Soybean production in the People's Republic of China (hereafter "China") and also in Canada increased considerably, due to the increased attractiveness of soybeans compared to other crops. India, by contrast, saw a decline in production. The aggregate world production of other oilseeds (rapeseed, sunflower seed and groundnuts) in 2017 remained almost unchanged.

The growing demand for protein meals, especially in China, has been the main driver behind the expansion of global oilseed production. However, growth in soybean imports by China has been only moderate in the marketing year 2017, in part due to the destocking of maize.

Vegetable oil production continued to increase in 2017 compared to 2016, although the growth was smaller than in previous years, due to a slow recovery in palm oil production after the 2015 *El Niño*. Increasing import demand around the world became evident and led to the refilling of stocks, including in importing countries. Per capita food use of vegetable oils also continued to grow both in developed and developing countries, though at a much faster rate for developing countries.

Overall the oilseeds and products markets were stable during the marketing years 2016 and 2017 with no major disruptions.

Projection highlights

In nominal terms, all oilseeds and oilseed product prices are projected to increase slightly over the outlook period. Due to saturated per capita food demand, stagnation in the biodiesel sector and ongoing livestock intensification in many emerging economies, vegetable oil prices will decline at a faster rate than protein meal prices in real terms over the outlook period. Prices for soybeans and other oilseeds are also projected to decline in real terms. Nevertheless, volatility should be expected due to market uncertainties.

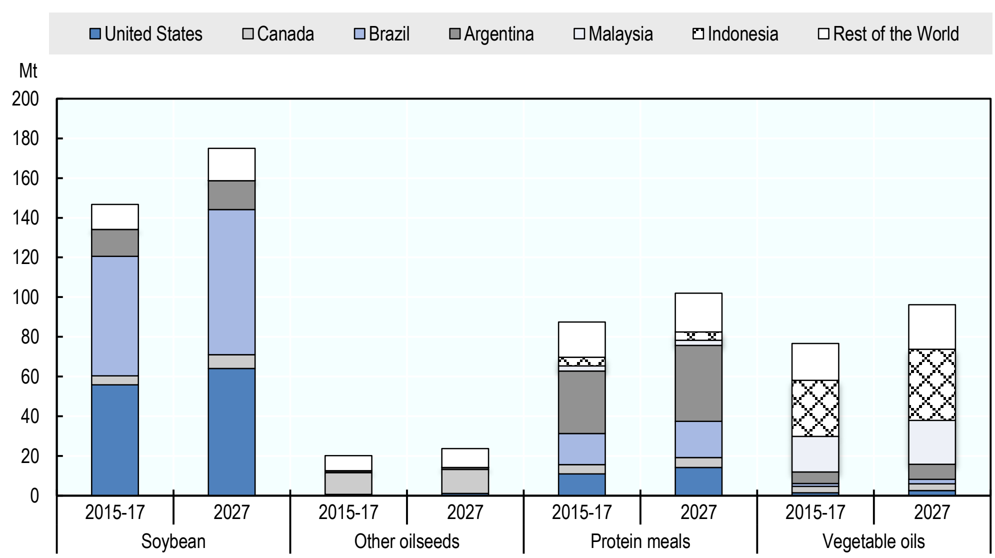
During the outlook period, global soybean production is expected to continue to expand, but at 1.5% p.a., which is well below the growth rate of 4.8% p.a. of the last decade. This slowdown is due mainly to a slower area expansion. Brazil and the United States are expected to compete throughout the projection period for the place as largest producer, with production reaching 129 Mt and 131 Mt respectively by 2027. Production of other oilseeds increases by 1.6% p.a. over the next decade, below the 3.1% p.a. growth rate of the previous one. Crushing of soybeans and other oilseeds into meal (cake) and oil continue to dominate usage and will increase faster than other uses, in particular direct food consumption of soybeans, groundnuts and sunflower seeds as well as direct feeding of soybeans. Overall, 90% of world soybean production and 86% of world production of other oilseeds are projected to be crushed in 2027.

Vegetable oil includes oil obtained from the crushing of soybeans and other oilseeds (about 55% of world vegetable oil production), palm oil (35%), as well as palm kernel, coconut and cottonseed oils. Despite a slowdown in the expansion of the mature oil palm area, significant production growth is projected in Indonesia (1.8% p.a. vs. 6.9% p.a. in the previous decade) and Malaysia (1.4% p.a. vs. 1.3% p.a.). Growth in demand for vegetable oil is expected to be slower in the coming decade due to (i) reduced growth in per capita food use in developing countries (1.2% p.a. compared to 3.2% p.a. in the previous decade) as consumption levels are approaching saturation levels, and (ii) the projected stagnation in demand for vegetable oils that are used to produce biodiesel.

Protein meal production and consumption is dominated by soybean meal. Compared to the past decade, consumption growth of protein meal (1.6% p.a. vs. 4.2% p.a.) will be limited by slower growth in global livestock production and by the fact that the protein meal share in Chinese feed rations has reached a plateau. Chinese consumption of protein meal is projected to grow by 1.7% p.a. compared to 7.2% p.a. in the previous decade, a rate which still exceeds the growth rate of animal production.

Vegetable oil has one of the highest trade shares (41%) of production of all agricultural commodities. This share is expected to remain stable throughout the outlook period, with global vegetable oil exports reaching 96 Mt by 2027. Vegetable oil exports will continue to be dominated by Indonesia and Malaysia (Figure 4.1), which are strongly export-orientated: nearly 70% of Indonesian and more than 80% of Malaysian vegetable oil production is exported. In both countries the share of exports is expected to slightly decline as more vegetable oil will be used as feedstock for biofuels and vegetable oil consumption for food use will gain importance. Indonesian exports will grow at 1.6% p.a. compared to 5.8% p.a. in the last decade.

Figure 4.1. Exports of oilseeds and oilseed products by region



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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Soybean, other oilseeds and protein meal exports are dominated by the Americas. Growth in world trade of soybeans is expected to slow considerably in the next decade, a development directly linked to the projected slower growth in soybean crushing in China. In parallel, Brazil will overtake North America as the world's largest exporter of soybean by 2027, its share in the global soybean exports rises to 41.8%, with that of Canada and the United States combined declines to 40.6% by 2027.

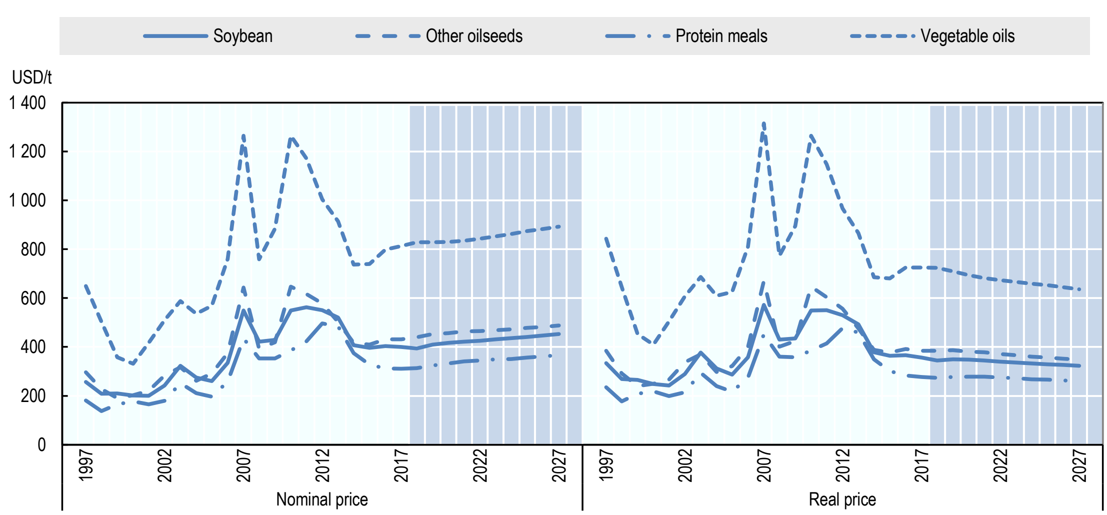
Productivity improvements will be necessary to sustain production growth. The scope for increasing soybean and palm oil production will depend on replanting activities and the availability of additional land. Palm plantation replanting has been sluggish given low profitability of the sector, especially in Malaysia given rising labour costs. The implications of replanting delays will be seen over the projection period in terms of muted growth in vegetable oil output. Area expansion could be constrained by new legislation seeking to protect the environment. A new certification schemes for sustainable palm oil proposed by importing countries could override current certifications from major exporters. Biofuel policies in the United States, the European Union and Indonesia are also major sources of uncertainty because they account for a considerable share of the vegetable oil demand in these countries. In addition, the issues and uncertainties common to most commodities (e.g. the macroeconomic environment, crude oil prices, and weather conditions) have considerable influence on the oilseed complex.

Prices

Nominal prices of oilseeds and oilseed products are expected to recover over the medium term due to rising demand for vegetable oil and protein meal, although they are not expected to attain previous highs. Vegetable oil consumption is driven mainly by food demand in developing countries as a consequence of population and income growth. Additionally, the assumed low crude oil prices and the limited additional policy support imply a very small growth in vegetable oil uptake for biodiesel production. The demand for protein meals is driven mainly by growth in non-ruminant livestock and milk production, and the incorporation rate of protein in feed rations in emerging markets.

In real terms, a slight decline in oilseeds and oilseed products prices is expected over the projection period (Figure 4.2), but volatility should be expected due to market uncertainties.

Figure 4.2. Evolution of world oilseed prices



Note: Soybeans, US, c.i.f. Rotterdam; Other oilseeds, Rapeseed, Europe, c.i.f. Hamburg; Protein meal, production weighted average price for soybean meal, sunflower meal and rapeseed meal, European port; Vegetable oil, production weighted average price for palm oil, soybean oil, sunflower oil and rapeseed oil, European port. Real prices are nominal world prices deflated by the US GDP deflator (2010=1).
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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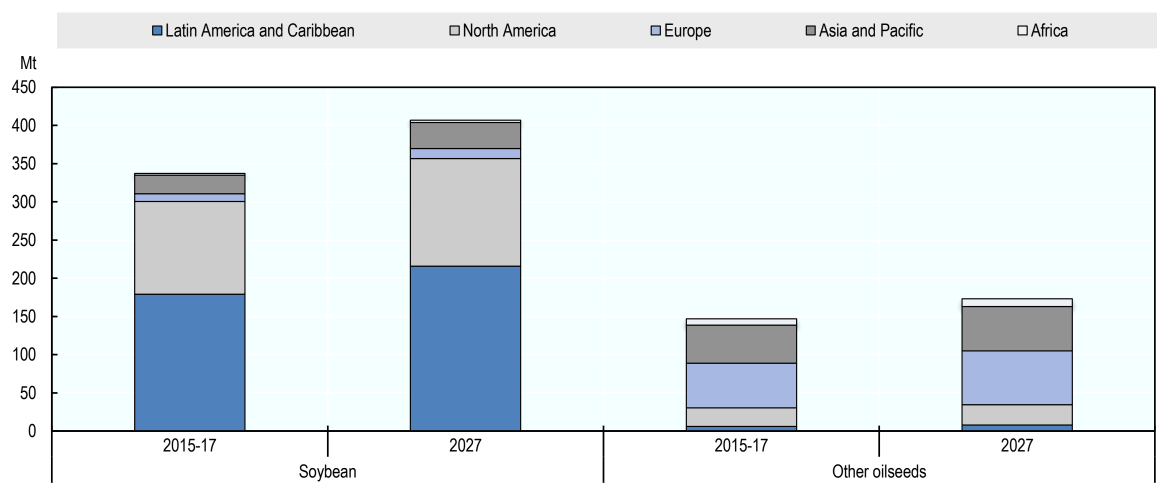
Oilseed production

The production of soybeans is expected to grow by 1.5% p.a., compared to 4.8% p.a. during the last decade. The production of other oilseeds (rapeseed, sunflower seed and groundnuts) will grow marginally faster than the production of soybeans, at 1.6% p.a. compared to 3.1% p.a. over the past ten years. Growth in other oilseeds is dominated by yield increases, which will account for about 60% of production growth, compared to 55% of overall production growth coming from yield in the case of soybeans.

Brazil and the United States are expected to have similar levels of soybean production throughout the next decade, with production in both cases reaching around 130 Mt in 2027. Their respective annual growth rates are 1.2% p.a. in the United States and 1.3% p.a. in Brazil. Overall, the production of soybeans will continue to grow strongly in Latin America, with Argentina and Paraguay producing 66 Mt and 12 Mt by 2027 (Figure 4.3). In China soybean production is expected to resume growth after decreases over the past decade due partly to reduced policy support for the cultivation of cereals. Soybean production is also expected to grow in the Russian Federation, Ukraine, and several countries in Sub Saharan Africa.

Figure 4.3. Oilseed production by region



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 (which produces mainly rapeseed and groundnuts) and the European Union (a major producer of rapeseed and sunflower seed) are the most important producers of other oilseeds, with projected output of 32 Mt and 30 Mt in 2027. However, limited growth in output is expected for both regions, with China expected to have a small production expansion at 1.0% p.a., and production in the European Union increasing by only 0.3% p.a. Canada, another major producer of rapeseed, is projected to increase its production by 0.7% p.a. By contrast, faster growth in other oilseed production is projected for Ukraine, the Russian Federation and India. Ukraine and the Russian Federation, world leaders of sunflower seed production, are expected to continue expanding their production of other oilseeds faster than the world average at 4.3% and 2.2% p.a., respectively. India will also expand its oilseeds output at 2.6% p.a. through further yield improvements as well as a continued expansion of soybean area and a recovery in the area planted to other oilseed. This expansion should allow it to meet growing domestic consumption needs for vegetable oil.

Soybean stocks are expected to remain largely unchanged which implies that the world stock-to-use ratio would decline from 11.6% in 2015-17 to around 10.6% in 2027. Given the global trend to gradually concentrate oilseed production in a few major producing countries, the declining stock-to-use ratio could result in increased price volatility.

Oilseed crush and production of vegetable oils and protein meal

Globally, the crushing of soybeans and other oilseeds into meal (cake) and oil dominates total usage. The demand for crush will increase faster than other uses, notably direct food consumption of soybeans, groundnuts and sunflower seeds as well as direct feeding of soybeans. Overall, 90% of world soybean production and 86% of world production of other oilseeds will be crushed in 2027. The crush location depends on many factors, including transport costs, trade policies, acceptance of genetically modified crops, processing costs (e.g. labour and energy), and infrastructure (e.g. ports and roads).

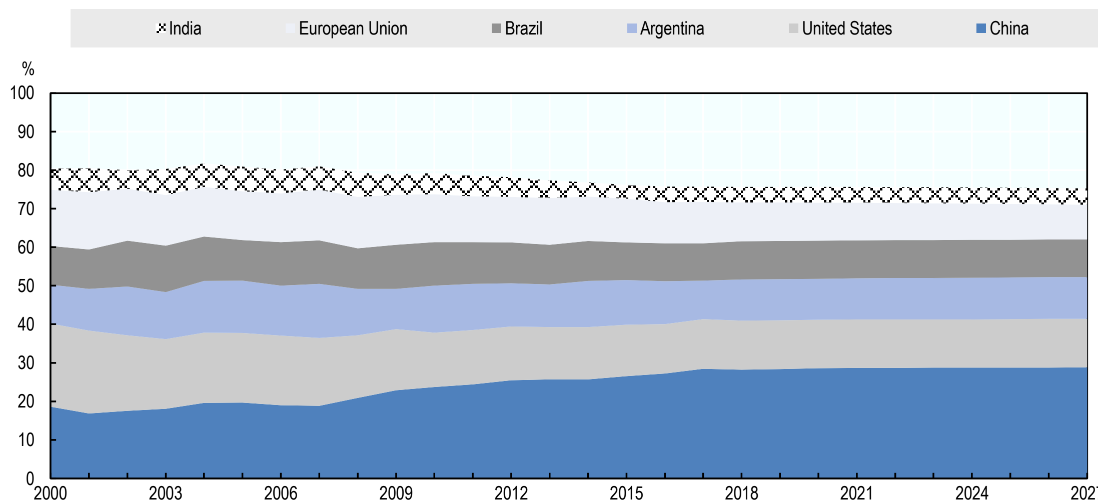
Based on the projected small growth rate in global soybean production, the annual average growth in world soybean crush is expected to be 1.5%, compared to 5.0% in the previous decade. In absolute terms, this translates into an expansion of 70 Mt over the outlook period, well below the 109 Mt expansion of the previous decade. Chinese soybean crush is expected to increase by 26 Mt, accounting for about 37% of the world's additional soybean crush, the bulk of which will utilise imported soybeans. Crush of other oilseeds is expected to grow at a slower rate than the last decade, expanding by 1.6% p.a., equivalent to an increase of 24 Mt by 2027, relative to 2015-17, mainly fuelled by additional crush in Ukraine (+6.9 Mt), China (+6.8 Mt) and India (+3.3 Mt).

With a large increase in imports and oilseed production, China will to continue to increase its oilseed crush. Its share of in the total global oilseed crush will reach 28.8% by 2027 (Figure 4.4). The share of the United States is expected to decline only slightly to 12.6% by 2027. Argentina and Brazil maintain their respective shares of world oilseed crush at 10.8% and 9.8% of global crush in 2027. The European Union is expected to account for a declining share of world crush as demand for protein meal and vegetable oil is growing slower than in the rest of the world. Crush in other developing countries, partly based on imported oilseeds, increases faster in the coming decade than in the major countries shown.

Global vegetable oil production depends on both the crush of oilseeds and on the production of perennial tropical oil plants, especially oil palm. Global palm oil output has outpaced the production of other vegetable oils in the past decade; however the position of palm oil weakens slightly over the projection period. Production of palm oil is concentrated in Indonesia and Malaysia, which together account for more than a third of world vegetable oil production.

Palm oil production in Indonesia is expected to grow by 1.8% p.a. over the projection period compared with 6.9% p.a. in the previous decade. Increasingly stringent environmental policies from the major importers of palm oil and the mainstreaming of global sustainable agricultural norms, brought on by the 2030 Agenda for Sustainable Development, are expected to slow the expansion of the oil palm area in Malaysia and Indonesia. In parallel, delayed replanting of plantations due to labour shortages in Malaysia is expected to constrain production over the outlook period, so growth in production will be sourced from productivity improvements. Palm oil production in other countries is expanding more rapidly from a low base, mainly for domestic and regional markets. This includes Thailand producing 2.9 Mt by 2027, Columbia 2.0 Mt and Nigeria 1.2 Mt. At a global level, palm oil supplies will expand at the annual rate of 1.8%.

Figure 4.4. Share in global oilseed crush for leading regions



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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In addition to palm oil and oil extracted from the crush of oilseeds analysed previously, palm kernel, coconut and cottonseed oil complete the vegetable oil aggregate. Palm kernel oil is produced alongside palm oil and follows the trend of the latter. Coconut oil is mainly produced in the Philippines, Indonesia and Oceanic islands. For Indonesia, output will grow at 2.2% p.a. while for the Philippines and Oceanic Islands, output will expand by 1.8% and 1.7% p.a., respectively over the outlook period. Cottonseed oil is a by-product of cotton, with global production concentrated largely in India, the United States, Pakistan and China. Output is set to expand for India and Pakistan, at 2.4% and 1.4% p.a. respectively over the outlook period. Modest growth in production is projected for the United States at 0.8% p.a. and for China at 0.6% p.a. Overall, vegetable oil production is expected to increase globally by 1.7% p.a.

Global protein meal output is projected to expand by 1.6% p.a., reaching 400 Mt by 2027. World production of protein meals is dominated by soybean meal which accounts for more than two-thirds of world protein meal production. Production is concentrated in a small group of countries. The projections indicate that Argentina, Brazil, China, the European Union, India, and the United States will account for 75% of global production by 2027. In China, meal production is projected to rise by 23.8 Mt over the outlook period, mostly based on imported soybeans from Brazil and the United States.

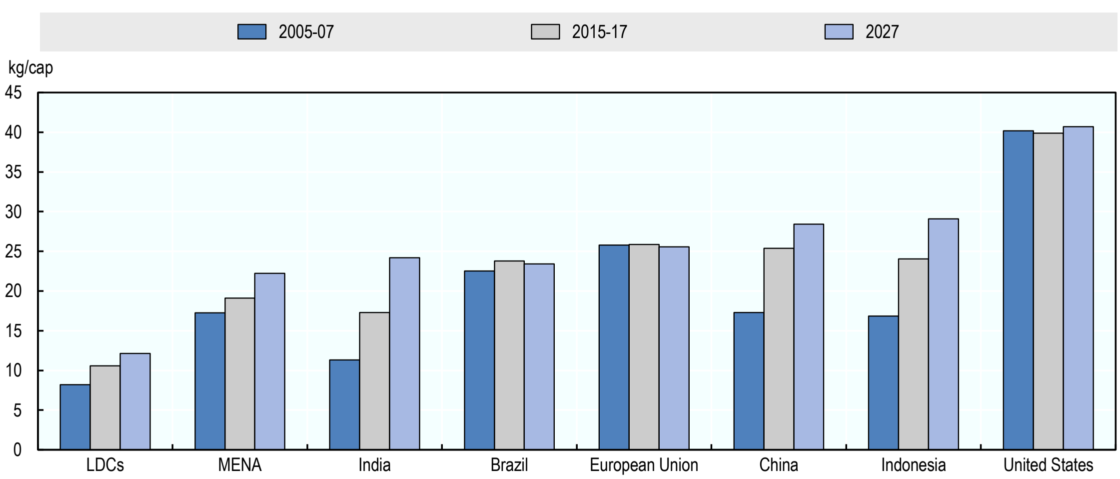
Vegetable oil consumption

Rising per capita income is expected to lead to a 1.0% p.a. increase in per capita vegetable oil consumed as food in developing economies, which is considerably less than the 2.7% p.a. increase observed during 2008-17. This slowdown reflects the saturation in per capita uptake in many emerging economies. For example, in China it will reach 28 kg per capita in 2027 with a 0.8% growth p.a.; for Brazil, the figure remains unchanged at 23 kg; and in South Africa, consumption will reach 25 kg, growing at 0.6% p.a.

In most emerging markets, the per capita level of vegetable oil food availability is set to reach levels comparable to those of developed countries, for which growth in vegetable oil food consumption will level off at 27.7 kg per capita, growing at 0.4% p.a.

India, the second largest consumer country in the world, closely behind China, and the world's top importer of vegetable oil, is expected to maintain a high per capita consumption growth of 3.1% p.a. and reach 24 kg per capita in 2027. India's vegetable oil consumption will reach 37 Mt by 2027, up from 24 Mt in 2015-17. This substantial growth will be filled by both an expansion of domestic production, sourced in the intensification of oilseed cultivation, and a further increase in imports of mainly palm oil from Indonesia and Malaysia. For MENA countries and LDCs, the per capita availability of vegetable oil will increase considerably, respectively reaching 22 kg and 12 kg per capita in 2027.

Figure 4.5. Per capita food availability of vegetable oil in selected 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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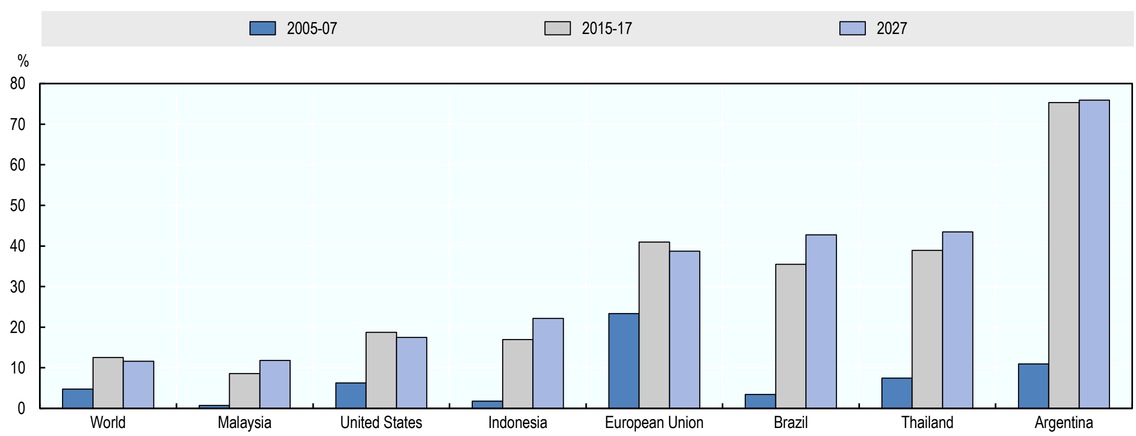
The uptake of vegetable oil as feedstock for biodiesel will remain virtually unchanged over the next ten years (0.3% p.a. growth), as compared to the 8.5% p.a. increase recorded over the previous decade when biofuel support policies were taking effect. In general, national targets for mandatory biodiesel consumption are expected to increase less than in previous years, while low crude oil prices are likely to limit non-mandatory biodiesel production. In addition, used oils, tallow and other feedstocks are increasing their share in the production of biodiesel to a large extent due to specific policies. Given the diversification of feedstock in the European Union into waste and tallow oil, the use of vegetable oil for biodiesel production is expected to account for 39% of domestic vegetable oil consumption by 2027, declining from a current share of about 41%. The lower shares expected in the European Union and the United States will be offset by greater uptake among emerging market economies. Argentina is expected to maintain an export-oriented biodiesel industry (over 40% of produced biodiesel is exported). Vegetable oil uptake by Argentina's biodiesel industry is projected at 2.9 Mt by 2027, equivalent to 75% of domestic vegetable oil consumption (Figure 4.6). Indonesia, Brazil and Thailand recorded strong growth in biodiesel production over the last decade, but it is expected to taper off in the coming decade. However, in the case of Indonesia and Brazil, growth in biodiesel production over the coming decade is anticipated to exceed overall food demand growth for vegetable oil.

Figure 4.6. Share of vegetable oil used for biodiesel production



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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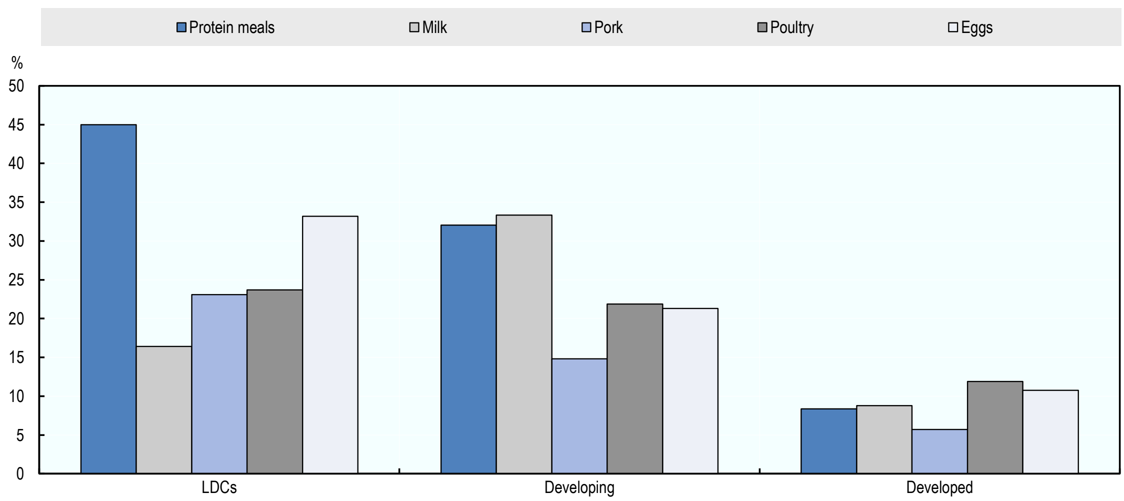
Protein meal consumption

Protein meal consumption is expected to continue to grow at 1.6% p.a., considerably below last decade's growth rate of 4.2% p.a. The growth in protein meal consumption is closely linked to the development of feed demand, as protein meal is exclusively used as feed. The link between animal production and protein meal consumption is associated with a country's degree of economic development (Figure 4.7). Because of a shift to more feed-intensive production systems in developing countries, growth in protein meal consumption tends to exceed growth in animal production. In LDCs, where the use of protein meals is still very low, it is expected that the intensification in the livestock production with more widespread use of commercial feed will continue. The use of protein meal per unit of livestock production should increase considerably leading to a fast growth in total demand in these countries. In developed countries, where most of the animal production is compound feed-based, protein meal consumption grows at similar rates as animal production.

Among emerging economies, Viet Nam, Indonesia and India are expected to expand their consumption of protein meal over the projection period, with growth rates of 3.8% p.a. for Viet Nam, 2.8% for Indonesia and 2.6% p.a. for India. Only for Viet Nam will this consumption growth be linked to a comparable expansion of protein meal imports.

Protein meal consumption growth in China is projected to decline from 7.2% p.a. in the last decade to 1.7% p.a., adding about 2.2 Mt annually. Growth in China's compound feed demand is expected to shrink due to declining growth rates for animal production and the existing large share of compound feed-based production. Furthermore, the share of protein meal in China's overall feed use surged in the last decade and now considerably exceeds the shares in the United States and European Union.

Figure 4.7. Growth in protein meal consumption and animal production



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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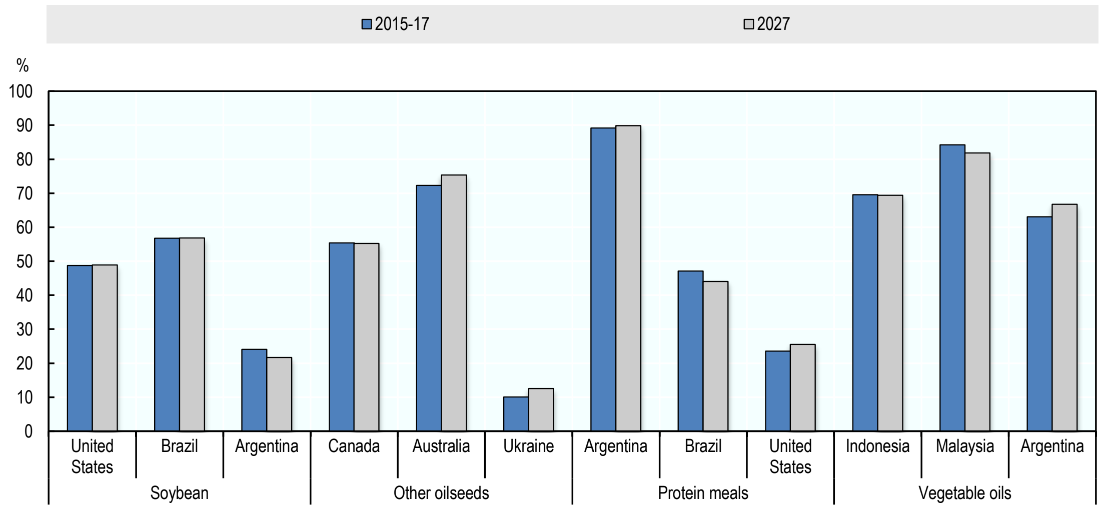
Trade

Over 40% of world soybean production is traded internationally. Compared to the previous decade, the expansion in world soybean trade is expected to decelerate considerably during the outlook period. This development is directly linked to projected slower growth of the soybean crush in China. Chinese soybean imports are expected to grow by only 1.5% p.a. to about 113 Mt in 2027, accounting for about two-thirds of world soybean imports. Exports of soybeans originate predominately from the Americas; together, the United States, Brazil and Argentina will account for 87% of world soybean exports in 2027. Whereas the United States was historically the largest global exporter of soybeans, Brazil has taken that role with steady growth in its export capacity; by 2027, Brazil will account for 42% of total global exports of soybean.

For other oilseeds, the share of production entering trade is much lower than that for soybeans, at about 14% of world production. Important exporters are Canada, Australia and Ukraine, which account for more than 75% of world exports by 2027. In Canada and Australia, more than half of the other oilseeds (rapeseed) production is exported (Figure 4.8).

Figure 4.8. Share of exports in total production of oilseeds and oilseed products for the top three exporting countries



Note: The main three exporting countries are United States, Brazil and Argentina (Soybeans), Canada, Australia and Ukraine (Other oilseeds), Argentina, Brazil and the United States (Protein meal) and Indonesia, Malaysia and Argentina (Vegetable oil); The figure only shows the direct share of exports and does not include the export of further processed products, which would lead to higher export shares.

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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Vegetable oil exports, which amount to 41% of global vegetable oil production, continue to be dominated by a few players. Indonesia and Malaysia will continue to account for almost two-thirds of total vegetable oil exports during the coming decade. Argentina is the third largest exporter reaching about 7.9% of the world vegetable oil exports in 2027. In all three countries, exports account for more than two-thirds of the domestic production of vegetable oil. However, this share is projected to contract slightly in Indonesia and Malaysia as domestic food consumption plus biofuel and oleochemical consumption is expected to grow more than exports. India is expected to continue its strong growth in imports at 4.7% p.a., reaching 26 Mt in 2027, or about 27% of world vegetable oil imports.

As the global expansion of meat production is projected to be concentrated in the main oilseed processing countries, domestic use of protein meal will increase and trade will only expand slightly in the coming decade, resulting in a declining share of trade in world production. The expected growth in world trade is around 1.5% p.a. over the projection period, down from 3.6% p.a. during last decade. Argentina will remain by far the largest meal exporter because it is the only country among the large protein meal producers with a clear export orientation. However, export growth for Argentina is expected at 1.9% p.a. during the projection period, down from 4.3% p.a. In Brazil and the United States, export growth is also expected to slow down markedly. The largest importer is the European Union, with imports remaining almost unchanged at 25.9 Mt in 2027. Half of the 17 Mt global import growth in protein meal will occur in Asia, with Viet Nam, Pakistan and Thailand increasing their imports by 3.4 Mt, 1.8 Mt and 1.1 Mt respectively from 2015-17 to 2027.

Main issues and uncertainties

The uncertainties common to most commodities (e.g. macroeconomic environment, crude oil prices, and weather conditions) also apply to oilseeds. Due to the concentration of production in a few regions of the world, the production impact of weather variations is more pronounced in the oilseeds and palm oil complex than in other major crop markets.

The intensification of domestic oilseed production in India to meet the consumption needs of a growing population will rely on an important expansion in area and productivity of the sector. Such outcomes will be conditioned on the evolution of oilseed prices and the adoption of new policies that sustainably incentivise domestic agricultural production.

The gradual reduction of export taxes in Argentina opens new opportunities for that country's soybeans and sunflowers and their products, although some reallocation of land might take place in favour of competing grain crops, especially maize, that also benefit from export liberalisation.

Consumer concerns regarding soybeans and palm oil production stem, respectively, from the high share of soybean production derived from genetically modified seeds and the expansion of oil palm plantations into rain forests. Certification schemes, labelling, and environmental legislation might curb area expansion in key palm oil producing countries and purchases by major importers, which would eventually affect supply growth. These concerns present specific constraints to the further expansion of oil palm plantations and their exports for Malaysia and Indonesia.

The demand for vegetable oil as feedstock for biodiesel is levelling off following a rapid growth since 2000 due to domestic policies in a number of countries. Indeed, biofuel policies in the United States, the European Union and Indonesia, and the development of mineral oil prices remain a source of major uncertainty in the vegetable oil sector given that about 12% of vegetable oil is destined to biodiesel production. The link between vegetable oil and crude oil prices results from the use of vegetable oil as a major feedstock used for biodiesel and can induce price volatility.

The demand for protein meal experienced exceptional growth due to the intensification of animal production in emerging markets. The pace of intensification of animal production is currently slowing down (especially in China), leading to a less dynamic development for protein meals and oilseeds over the coming decade.

Protein meals compete in part with other feed components in the production of compound feed and are thus reactive to any change in cereal prices. In addition, changing feeding habits, especially in the cattle sector, can alter the demand for protein meals. Ongoing adjustments in domestic cereal prices in China, for example, will affect the composition of its compound feeds, which currently contain a higher share of protein meal than in developed countries and other major emerging economies.

Chapter 5. Sugar

Market situation

After two consecutive seasons of supply shortage, global sugar production rebounded in the 2017 marketing year (October 2017-September 2018), with growth close to that recorded five years ago. Good weather conditions in India and Thailand, increased production in the People's Republic of China (hereafter "China") and the end of production quotas in the European Union are the main reasons for this increase. But the largest producer, Brazil, experienced a decline in sugar output as processing sugarcane into ethanol became more profitable than sugar production.

Global sugar imports dropped by 10% in 2016 and despite the lower prices in 2017, imports continued to decline, mainly due to lower imports in China. On the demand side, there is no growth in per capita consumption in high consuming countries, where consumers' attitude towards sugar has changed because of health concerns associated with high consumption levels. Prices increased during the first months of the 2016 marketing year, but started to decline during the first quarter of 2017. As a result, annual average prices during the 2017 marketing year are expected to be lower than in 2016, but still slightly above the average of the last 25 years.

Projection highlights

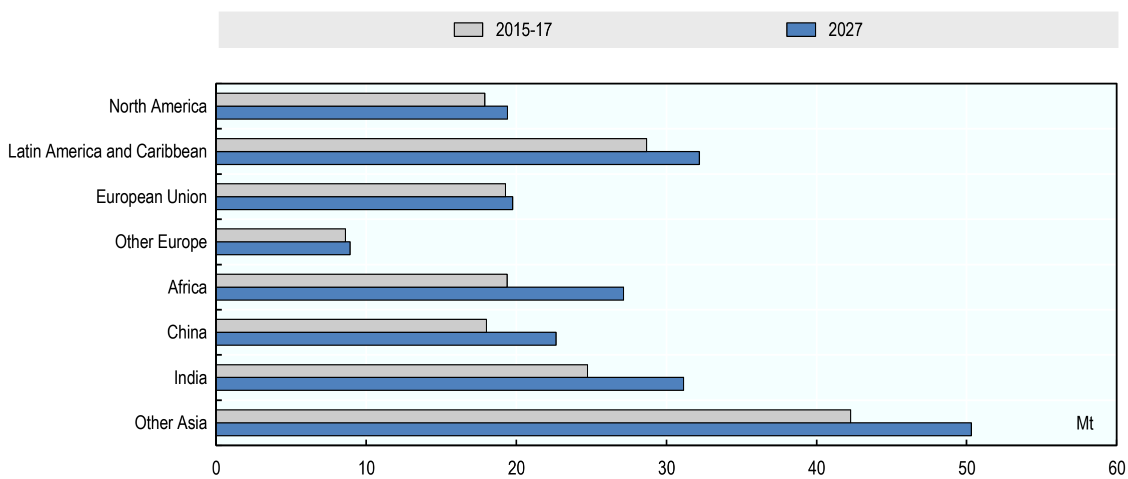
Starting at relatively low levels, the price of raw sugar in USD is projected to increase in nominal and real terms during the next marketing year (2018). Over the remainder of the medium term, it is projected to follow a moderate upward trend in nominal terms, in line with the inflation rate of 2.3% p.a., but a downtrend in real terms. The white sugar price is foreseen to follow a similar pattern. A relatively tight white sugar premium (the difference between white and raw sugar prices) at the start of the projections (USD 62/t) is expected to widen slightly for a couple of years to USD 81/t, but will stay relatively low compared to the average over the last decade (USD 93/t).

Both sugarcane and sugar beet are foreseen to continue to expand in producing countries, driven by remunerative returns in comparison to alternative crops. Sugarcane will remain the main crop to produce sugar (about 86%) and is cultivated largely in tropical and sub-tropical countries in Africa, Asia and Latin America and the Caribbean. The remainder will come from sugar beet, which is grown in more temperate zones, mainly Europe. The share of sugar from sugar beet relative to sugarcane is expected to remain relatively constant on the outlook period, at around 14%.

Over the next ten years, 83% of the increase in sugar output is projected to originate in developing countries. In absolute terms, major changes in global production are expected in India (+20%), followed by China (+11%), Brazil (+11%), Thailand (+9%) and the European Union (+5%). Brazil is projected to remain the main producer, providing more than a fifth of the world's sugar production, although its sugar sector could face increased competition from the use of sugarcane for ethanol. A slower growth of production compared to the previous decade is foreseen in Asia (India, Pakistan and Thailand) and Europe, which explains the slower annual growth in global sugar production over the outlook period (+1.5%) compared to the previous decade (+2.0%).

Demand for caloric sweeteners – sugar and high fructose corn syrup (HFCS) – is projected to grow by 33 Mt over the outlook period to reach 213 Mt in 2027 (Figure 5.1). The annual growth rate of 1.5% over the projection period is slightly lower than the one experienced during the last decade (1.6% p.a.). This lower growth rate is the result of the slowdown in global population growth and stagnant per capita consumption growth in developed countries and certain developing countries (Brazil, Egypt, Mexico, Paraguay, South Africa, Turkey), where per capita consumption has reached levels that raise health concerns (obesity, diabetes and other associated health issues). In countries with lower consumption levels, particularly in Asia and Africa, population growth and urbanisation are expected to sustain growth in sugar consumption, driven by increased consumption of sweetened beverages and prepared food products, particularly in Asia and Africa.

Figure 5.1. Global caloric sweetener consumption



Note: Sweeteners include sugar and high fructose corn syrup
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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The distribution of global trade is expected to remain fairly constant over the projection period, with Brazil keeping its role as the main sugar exporter (45% of global trade). White sugar exports will represent nearly 34% of global trade over the outlook period, an increase from the 31% observed during the base period. Exports of white sugar are expected to increase in the European Union in the short term following the end of production quotas, and in countries that have built refineries (Middle Eastern countries and Algeria). Imports will remain diversified, mostly driven by demand from Africa and Asia.

The outlook for sugar markets depends on several factors on the supply side. These include climatic conditions, prices of other competing crops or products, the evolution of input prices and exchange rates, domestic policies and also import tariffs (which have increased in China). The demand side is more stable with stronger prospects in countries where consumption is still relatively low, but weak projections in countries where high levels of per capita consumption have been reached. Many developed countries and some developing countries, including Mexico, Chile, Thailand and Saudi Arabia, have introduced a sugar tax on soft drinks in an attempt to reduce over-consumption of sugar. These taxes have prompted the food industry and manufacturers to adapt through product reformulation or the use of alternative sweeteners. The projections do not take into account unsigned policies.

Market trends and prospects

Prices

With a global sugar surplus expected for the current marketing year, international sugar prices are rather low at the start of the outlook period, reversing the uptrend observed over the last two crop years. Over the medium term, prices are expected to recover due to increased demand in countries where per capita consumption is low compared to the world average. However, price increases will be modest as supplies are expected to remain abundant following high prices in recent years.

Sugar prices are foreseen to be higher than the average of the last 25 years in nominal terms, but lower when expressed in real terms. By 2027, the nominal world price is projected to be USD 392/t (USD 17.8cts/lb) for raw sugar and USD 472/t (USD 21.4cts/lb) for white sugar (Figure 5.2). The white sugar premium is currently low with higher white sugar deliveries from the European Union and increasing refining capacities in Middle Eastern countries and Algeria. The premium is expected to average around USD 79/t over the outlook period.

Figure 5.2. Evolution of world sugar prices

Note: Raw sugar world price, Intercontinental Exchange contract No.11 nearby futures price; Refined sugar price, Euronext Liffe, Futures Contract No. 407, London. Real sugar prices are nominal world prices deflated by the US GDP deflator (2010=1).
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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Year-to-year sugar price variations are expected to be dampened by the phasing out of trade-distorting sugar support policies in several key sugar markets. Recent policy changes on the supply side include the elimination of the sugar quota system in the European Union in October 2017 and the removal of production quota and price support in Thailand at the end of 2017. India had already introduced policies in 2013 to counteract recurring production cycles, the results of which are still to be assessed. Reforms on the demand side are also expected to take place, with cuts to sugar consumption subsidy programmes in response to budgetary pressures (e.g. Malaysia and Egypt). In addition, demand for sugar is expected to be influenced by sugar taxes on sugar-sweetened beverages that are already in place in several countries.

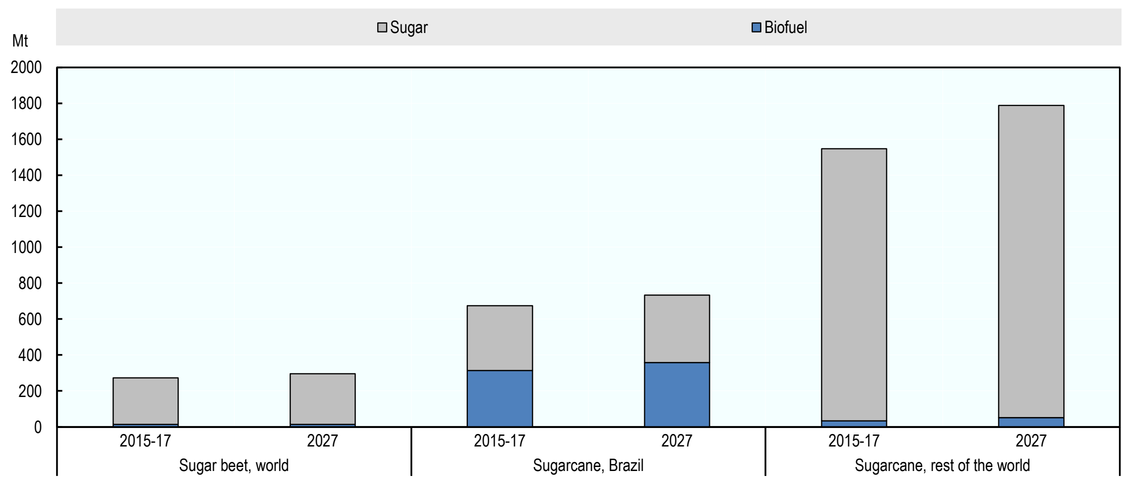
Production

Given its favourable returns per hectare compared to competing crops, production of sugar crops is foreseen to expand in many parts of the world. Production of sugarcane, the main sugar crop, is expected to grow by 1.1% p.a., compared to 2.1% p.a. during the last decade. Increases are projected to come from a combination of higher yields and area expansion. Prospects are less robust for sugar beet, with nearly no growth in production (+0.1% p.a.) compared to the last decade (+2.5% p.a.) (Figure 5.3). Some expansion is anticipated in Egypt, China, the Ukraine, Eastern Europe and Turkey. In the European Union, sugar beet production reached maximum levels in 2017 due to the abolition of production quotas, but its share in global sugar beet production is projected to decrease from 45% in 2017 to 40% in 2027.

At the global level, the share of sugar crops allocated to sugar production is expected to remain flat over the projection period (81% for sugarcane and 95% for sugar beet), which means that the share of world sugar crops used for world ethanol production is not expected to change much. But Brazil will continue to be the main producer of sugar and sugarcane based ethanol, producing 34% of the world's sugarcane by 2027, which will be used for 20% of global sugar production and 88% of global sugarcane based ethanol production (versus 22% and 90%, respectively, during the base period).

Growth in world sugar production is expected to slow to 1.5% p.a. over the projection period compared to 2.0% p.a. in the previous decade. Most of the production increases are expected to occur in developing countries which will represent 77% of global sugar production in 2027 (compared to 76% during the base period). The leading regions are Asia and Latin America and the Caribbean. Asia is projected to expand its share in global production from 36% during the base period to 38% in 2027. Latin America and the Caribbean, on the other hand, are expected to play a smaller role in global production with their share decreasing from 35% during the base period to 33% in 2027. The drop in Latin America and the Caribbean is mostly due to lower growth in Brazil, the biggest supplier. Brazil's dominance as the world's top producer and exporter will be maintained over the outlook period but its production will continue to be challenged by domestic ethanol production (from sugarcane). The crop will also continue to suffer from a lack of renewal of plants for several years. At the end of the projection period, sugar production in Brazil is expected to reach 42 Mt (+4 Mt compared to the base period, about 3 Mt less than the increase foreseen in India).

Figure 5.3. World sugar crops



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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The world's second largest producer is India, where sugar production is expected to expand more steadily as a result of recent sugar policy reforms that have ensured greater stability in terms of prices paid to farmers. Driven by sustained domestic demand for sugar, production is expected to increase by 7 Mt over the next decade, reaching 31 Mt in 2027. Thailand will maintain its market position as the world's fourth largest producer (the European Union is the third largest), but is projected to experience a slower growth compared to recent years due to the elimination of price supports from January 2018 onwards and due to the fact that sugarcane expansion occurs in areas less suitable for production. By 2027, Thailand is projected to produce 13.5 Mt, which is close to China's production level. China is projected to experience an accelerated growth in sugarcane and sugar beet production during the first years of the projection period, supported by the 2015-2020 National Plan. By 2027, production in China is expected to reach 13.4 Mt, mainly through increases in yields and area. Strong prospects are also foreseen in Pakistan, where the government will continue to support sugar production through guaranteed prices to farmers and subsidized exports.

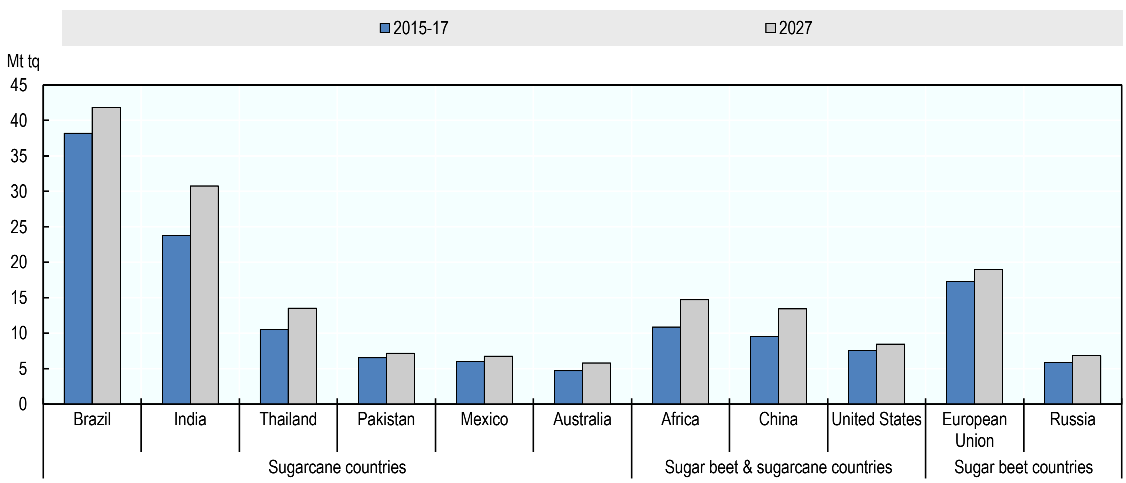
In Africa, growth in output will be driven by strong domestic demand for sugar as well as trade opportunities. Sugar output is projected to increase by 36% by the end of 2027 compared to the base period (+4 Mt) as a result of production expansion in Sub Saharan countries supported by investments at the farm and mill levels. Despite this production growth, the continent will continue to represent a small share of the world market (7% in 2027).

Developed countries account for less than a quarter of global sugar output (Figure 5.4). Compared to the developing world, growth in sugar production will be much lower over the projection period (0.4% p.a. versus 1.9% p.a.). Relative to the base period, the main increases in volume are projected to occur in the European Union, the world's third largest producer (+1.7 Mt), followed by Australia and the Russian Federation (both nearly 1 Mt more) and the United States (+0.9 Mt). The sugar sector in the United States remains heavily influenced by government policy, which is based on domestic support (the Sugar Loan Program, Sugar Marketing Allotments, and the Feedstock Flexibility

Program) as well as trade barriers (TRQs, regional agreements and Export Limits for Mexico). On the other hand, a decline is projected in the European Union (-0.85% p. a), following the surge in production that occurred with the abolition of sugar quotas during the base period, in October 2017.

World sugar stock levels are projected to diminish moderately, partly due to the release of some of China's stocks on the market. The global stock-to-use ratio is expected to decline to 43% in 2027, from 47% in the base period.

Figure 5.4. Sugar production classified by crop



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Consumption

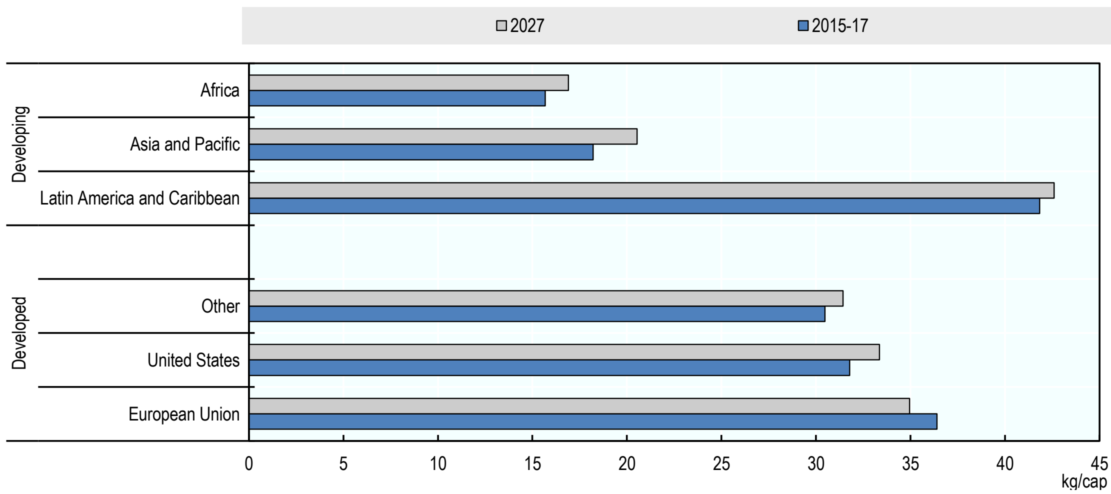
Global consumption of sugar is projected to grow at around 1.48% p.a., slightly lower than in the previous decade, to reach 198 Mt in 2027. It will be influenced by the slight slowdown in population growth and sluggish global economic growth. Over the outlook period, the average world level of per capita consumption is expected to increase from 22.4 kg/cap to 23.8kg/cap, although considerable variations between regions and countries occur (Figure 5.5).

Increases in global sugar consumption over the next ten years are expected to come mainly from the developing countries who will account for 94% of the additional demand. The largest contributions to additional demand will occur in Asia (60%) and Africa (25%), two sugar deficit regions. With higher demand for processed products, sugar-rich confectionery and soft drinks, growth prospects are high in urban areas in Asian and African countries where the levels of consumption are low compared to other regions. Conversely, little growth is foreseen in Latin America and the Caribbean where consumption is already high.

In Asia, it is expected that India, followed by China, Indonesia and Pakistan, will experience the largest increases in sugar consumption. Per capita consumption is very low in China and LDC Asia, less than 12 kg per year during the base period, but the annual growth rate in those countries will not change much compared to the last decade. In

Africa, the highest increases in total consumption are projected in Egypt and several Sub-Saharan countries but per capita consumption will stay below 10 kg per year in LDC Sub-Saharan countries.

Figure 5.5. Per capita sugar demand in major countries and regions



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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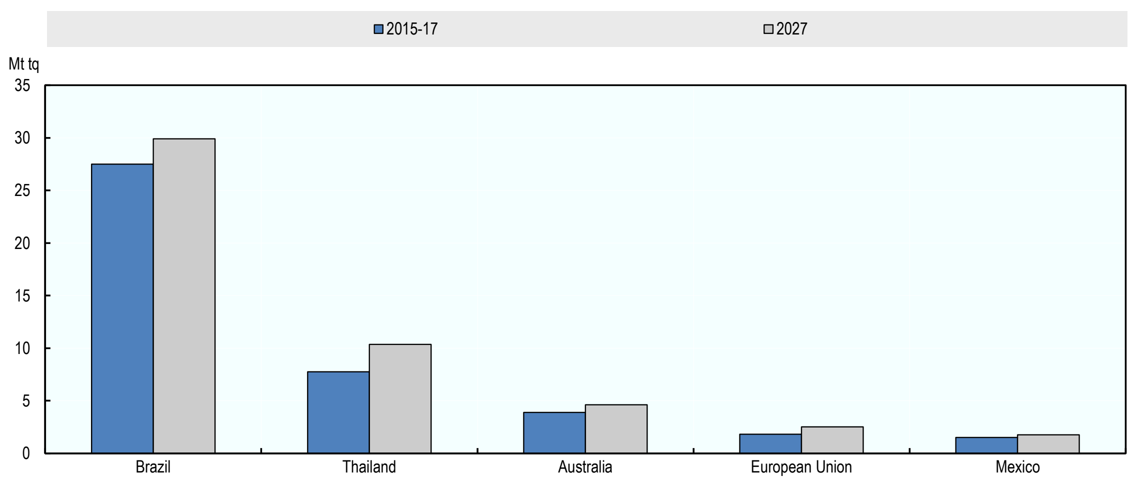
In contrast, the level of sugar intake per person in many developed countries is projected to show a decline, consistent with their status as mature or saturated sugar markets. Slowing population growth, dietary changes based on increased health consciousness and nutritional commitments taken by multinationals will continue to impact their markets. The decline will be the strongest in the European Union where sugar markets will face, in addition, increased competition with isoglucose (HFCS) after the abolition of sugar quotas in 2017. The reverse will however occur in the United States where even if sweetener consumption is expected to be steady, the share of sugar in sweetener consumption is expected to increase at the expense of that of HFCS. Rapid expansion of sugar demand is, however, foreseen in the Russian Federation and Ukraine where sugar will be considered as a staple product as long as slow economic growth persists.

Owing to its competitiveness in producing sugary soft drinks, HFCS consumption (dry weight) is projected to grow by 16% or 2 Mt by 2027. The European Union will be the main driver of this increase as the abolition of the HFCS quota in 2017 will lead to a surge in isoglucose availability in the sugar deficit countries of the region. Consumption growth is also expected in China and – to a lesser degree – in Mexico. In the latter, the share of HFCS in the demand for sweeteners is expected to remain stable over the outlook period due to the Export Limit policy implemented in the United States which limits sugar exports from Mexico to the United States. However, in the United States, the leading HFCS producer, demand for HFCS as a share of total sweetener consumption is expected to continue to decline from 38% during the base period to 36% in 2027. This reduced demand is a direct result of the contraction of the market for carbonated soft drinks and the desire of some consumers to avoid this sweetener.

Trade

Over the coming decade, sugar exports (Figure 5.6) are expected to remain highly concentrated, with Brazil keeping its position as the leading exporter (45% of world trade). The weakening of its currency *vis-à-vis* the US dollar over the projection period will help maintain the industry's competiveness, but the country will be challenged by Thailand, an established Asian competitor. Brazil and Thailand are each foreseen to expand their exports by 2.5 Mt compared to the base period. Thailand, the world's second largest exporter, will benefit from steady growth in production and will as a result continue to gain market share, accounting for 16% of world exports in 2027 versus 13% during the base period. In Australia, investments in irrigation, expansion of the sugarcane area and increased milling capacities will lead to higher production, which will in turn boost export sales over the medium term.

Figure 5.6. Sugar exports for major countries and regions



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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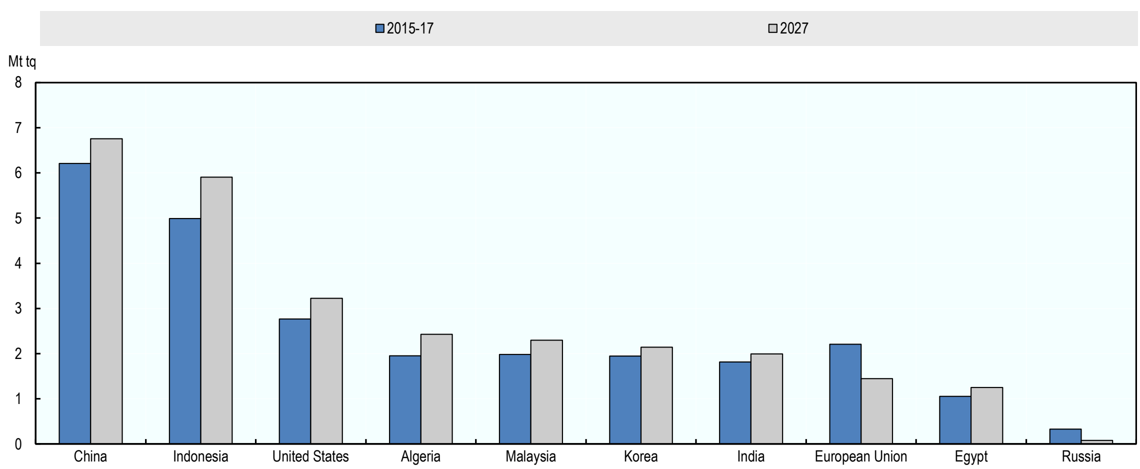
In the European Union, the abolition of sugar and isoglucose quotas will lead to higher sugar and HFCS production, which will result in an increase of its renowned high quality white sugar exports (+38% in 2027 compared to the base period), even at a premium price. Those exports will reach sugar mainly deficit countries in the MENA and Far East regions, but will also face competition from traditional sugarcane refineries in the MENA region.

World sugar imports are more dispersed than exports (Figure 5.7). According to the outlook projections, Asia and Africa will see the strongest growth in sugar demand and this will influence the growth in imports for those regions. During the base period 2015-2017, China and Indonesia were the leading importers followed by the United States and the European Union, but over the projection period, China is expected to become the leading sugar importer, followed by Indonesia and the United States (respectively 6.8 Mt, 5.9 Mt and 3.2 Mt). EU sugar imports are projected to drop by 34% over the next ten years due to the abolition of the sugar quotas. The EU HFCS trade will not change much as the production increase that will occur after 2017 will mostly satisfy internal demand.

The United States, traditionally a sugar deficit region, will continue to be influenced by its policies which tend to foster domestic production and control the level of imports. The projected low sugar prices during the outlook period provide little incentive to expand sugar production. This will result in a continuation of imports established under the TRQ duty-free imports through WTO and FTAs agreements, and the Export Limit set by the US Department of Commerce that defines Mexico's market access to the United States. Given the relatively higher sugar prices in the United States, Mexico will continue to export its sugar primarily to the United States, but the share allocated to the world market is foreseen to expand from 25% during the base period to 29% in 2027. In return, Mexico would resort to US HFCS imports (+19% or 176 kt by 2027) to fill its demand for sweeteners.

Figure 5.7. Sugar imports for major countries and regions



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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Main issues and uncertainties

The projections in this *Outlook* assume stable macro-economic and weather conditions and make specific assumptions with respect to crude oil prices. A shock to any of these variables could create significant variability in the market because large producers are concentrated in a small number of countries.

The projections for Brazil are uncertain due to the ongoing financial consolidation as well as a potential recovery in investment in the sector. The country is also challenged by the evolution of biofuel policies and prices that could indirectly affect the sugar markets. In addition, the increased planting of genetically modified sugarcane plants, whose commercial use was approved a year ago, could also impact sugarcane yields in a couple of years and therefore change the level of production of the sub-products.

The outlook for Thailand is rather positive, but the competitiveness of its sugar sector depends on the extent to which sugar producers will adapt to the new policy environment with less support to the industry. This could also create some instability on world markets, given the country's large contribution to sugar exports.

Trade distortions in international sugar markets will persist, which creates an additional source of uncertainty. Changes in international sugar prices are not fully transferred to domestic sugar producers and consumers, even if some world sugar markets have undergone a number of reforms and structural changes (i.e. the recent elimination of sugar quotas in European Union and Thailand, the fair price paid to farmers in India since 2013). To protect their domestic markets, many countries use trade policy instruments: high out-of-quota tariffs (China); adjustment to WTO TRQ and Export Limit for Mexico (United States); exports subsidies to protect sugar domestic sugar prices (Pakistan, India); high import tariffs (European Union, Russian Federation, United States); regional agreements (NAFTA agreements, European EPAs and EBA).

Prospects for demand are also uncertain. In view of growing evidence on the detrimental effect of excessive sugar consumption on human health, consumption levels could go down in the future. This could also be reinforced by government policies (such as taxes) and pro-active actions taken by the food industry, such as product reformulation or use of alternative sweeteners.

Chapter 6. Meat

Market situation

Overall world meat production increased by 1.25% to 323 Mt in 2017, with moderate increases in the production of bovine and poultry meats and more modest gains in pig and sheep meat. Much of the world meat production expansion originated in the United States but other main contributors were Argentina, India, Mexico, the Russian Federation and Turkey. Meat production in the People's Republic of China (hereafter "China"), the world's largest meat producer, increased little overall mainly because of the lower growth in poultry meat production as several Avian Influenza (AI) outbreaks affected the country. Nevertheless, China remained the second largest contributor to the 2017 increase in meat production.

Measured by the FAO Meat Price Index, the monthly average for the whole of 2017 was 9% higher than in 2016, but 2.3% below the average of the preceding three years.. International meat prices rose in the first half of 2017, underpinned by a significant increase in import demand for bovine and pigmeat categories. Short availability of export supplies of sheepmeat provided some additional support. As of July, prices began to level off and declined moderately as export supplies increased and import demand weakened. Across the four main meat categories, from January to December 2017, ovine meat prices rose by 35%, and bovine, poultry and pigmeat increased, respectively, by 7.7%, 3.2% and 2.9%.

World meat trade increased to 31 Mt in 2017, 1.5% higher than in 2016, but growth was slower than the 5% registered in 2016. Across categories, world trade expanded in bovine meat by 4.7% and poultry by 1%, while those shipments of pigmeat declined by 0.7% and sheepmeat by 3%. Somewhat sluggish growth in trade in 2017 compared to 2016 reflects a slowdown in imports by China, the European Union, Egypt, Saudi Arabia, Turkey, and the United States, in some cases caused by larger domestic supplies and in others due to falling demand. Meat imports, however, increased in several countries, notably Angola, Chile, Cuba, Japan, Mexico, Korea, Indonesia, Iraq, the United Arab Emirates, Ukraine, and Viet Nam. The expansion of world meat trade exports in 2017 was largely led by Argentina, Canada, India, Thailand, the United States, and Ukraine whereas sales by the European Union and New Zealand declined.

Projection highlights

This year's *Outlook* projects an expansion in meat supply which should result in short-term meat prices declining relative to 2017. The herd rebuilding cycle observed in several regions is nearing an end and additional supply is expected to enter the market in the early years of the projection period. Feed grain prices are also projected to remain low during this period, benefitting regions – such as the Americas, Australia and Europe – where feed grains are more intensively used in meat production. Over the medium term prices will strengthen as per capita meat consumption expands in key developing countries, in particular Latin America and Asia. The projection indicates that per capita consumption growth, when compared to the base period (average 2015 to 2017), will increase by 2.8 kg retail weight equivalent (r.w.e.) in developed countries and by half this amount in developing countries. Incomes in least developed countries (LDC) are projected to increase somewhat, leading to a small increase in per capita meat consumption in LDC countries. At the global level, per capita meat consumption will increase slightly more than 1 kg r.w.e.

Global meat production is projected to be 15% higher in 2027 relative to the base period. Developing countries are projected to account for the vast majority of the total increase, with greater use of a grain-intensive feeding system in the production process, resulting in increased carcass weight. Poultry meat remains the primary driver of the growth in total meat production, but in the coming decade this growth will slow significantly compared to that of the previous one. Growth in global demand for animal protein in the next decade is projected to slow down for poultry and pigmeat, but increase for beef and sheep meat. Lower product prices have contributed to making poultry and pigmeat the meat of choice, particularly for consumers in developing countries. With income growing over the projection period, those consumers are expected to increase and diversify their consumption towards more expensive meat protein such as beef and sheep.

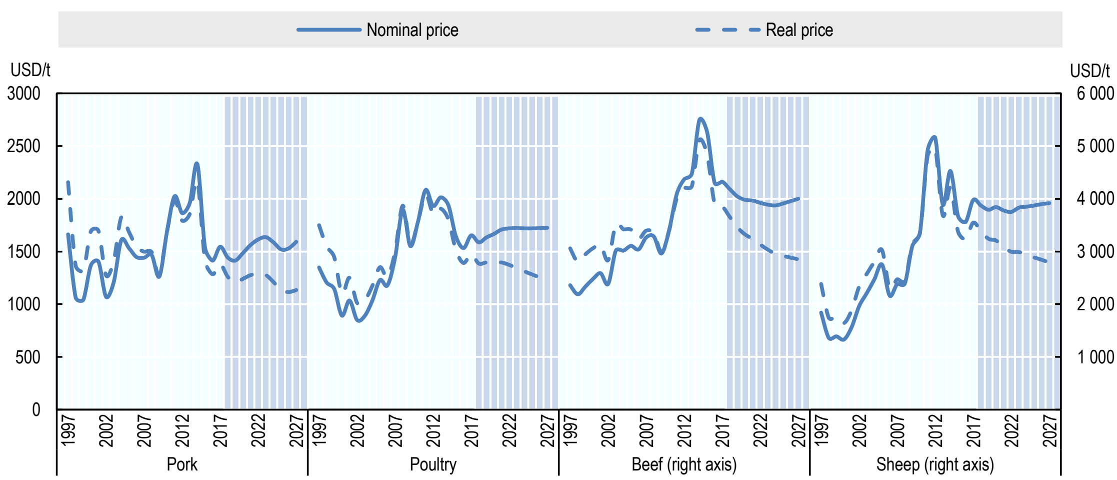
In the bovine meat sector, cow herds have been rebuilt faster than expected in North America, which will lead to rising slaughter numbers and ample supply of meat on the world market for the coming years. Production will further increase as countries in the herd rebuilding phase, such as Australia, and Brazil are further along the cycle, providing additional supplies of meat in the early years of the projection period. Pigmeat production will also increase, driven by steady herd expansion in China which was slowed by more stringent environmental regulations and animal welfare concerns affecting the pork sector.

The year 2017 was affected by numerous outbreaks of Avian Influenza (AI) around the world which resulted in a slower increase in world output. China, the second largest producer after the United States, was particularly affected by several outbreaks over the last years and this *Outlook* assumes a return to historical trend growth in China poultry production from 2018 onwards. Production is also expected to increase in the sheepmeat sector with an expected global growth of 1.8% p.a., a higher rate than in the last decade. Production increases will be led by China, but increases will also occur in India, Nigeria, Oceania, Pakistan, Turkey, and Yemen.

Globally, the share of meat output traded is expected to remain constant over the projection period, at around 10%, with most of the increase in volume coming from poultry meat. The projected production growth in developing countries remains insufficient to satisfy demand growth, particularly in Asia and Africa. Consequently, import demand is expected to remain strong throughout the outlook period. The most significant growth in the share of additional meat import originates from the Philippines and Viet Nam. Developed countries are still expected to account for more than half of global meat exports by 2027, but their share decreases slightly relative to the base period. The combined share of the two largest meat exporting countries, Brazil and the United States, is expected to increase to around 47%, contributing nearly two-thirds of the expected increase in global meat exports over the projection period.

At the start of the outlook period, nominal meat prices are projected to be marginally lower as the supply expands and exerts downward pressure on prices. Meat nominal prices are projected to gradually increase until 2027 relative to the earlier years of the projections. By 2027, the price for beef is projected to increase to USD 4 000/t carcass weight equivalent (c.w.e.) and to increase to USD 3 900/t c.w.e. for sheepmeat, while world pigmeat and poultry prices are expected to rise to around USD 1 600/t c.w.e. and USD 1 700/t product weight (p.w.) respectively. In real terms, prices are expected to trend downwards for all meat types (Figure 6.1), although meat-to-feed price margins will generally remain within historical levels.

Figure 6.1. World meat prices



Note: US Choice steers, 1 100-1 300 lb dressed weight, Nebraska. New Zealand lamb price dressed weight, all grade average. US Barrows and gilts, No. 1-3, 230-250 lb dressed weight, Iowa/South Minnesota. Brazil: Export unit value for chicken (f.o.b.) product weight.

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 meat consumption per capita is expected to increase to 35.4 kg r.w.e. by 2027, an increase of 1.1 kg r.w.e. compared to the base period. Despite high population growth rates in much of the developing world, total consumption is also expected to increase by 1.4 kg r.w.e., half of the increase expected in developed countries. Additional per capita consumption at the global level will consist mainly of poultry with 0.8 kg r.w.e., while beef, sheepmeat and pigmeat will change marginally. In per capita terms the growth will be fastest in Latin America, with an increase of 3.7 kg r.w.e. In absolute terms, total consumption growth quantities in developed countries over the projection period is expected to be approximately a fourth of that in developing regions, where rapid population growth and urbanisation remain the core drivers. These drivers are particularly important in Africa, where the rate of total consumption growth over the outlook period is faster than any other region. Import demand is also expected to grow the fastest in Africa.

Globally, animal disease outbreaks (e.g. swine fever), sanitary restrictions, and trade policies remain the main factors driving the evolution and dynamics in world meat markets. The projections reflect the implementation of various trade agreements, domestic policies and sanitary and phytosanitary restrictions announced or in place by 1 January 2018. Uncertainties related to existing or future trade agreements over the outlook period could impact and diversify meat trade patterns. Domestic policies development could also impact the meat sector such as the review in 2018 of the US

Farm Bill. Further factors that could impact the meat outlook include consumer preferences and attitudes towards meat consumption. Consumers are showing a preference for free-range meat and antibiotic-free meat products, but the extent to which they are willing and able to pay a premium for them remains unclear.

Prices

Despite rising during the first half of 2017, meat prices have declined from recent peaks, in both nominal and real terms. Over the outlook period, meat prices will increase marginally in nominal terms due to sustained economic growth in developing countries. Real term meat prices will continue to trend down following the recent price peak. The actual path over time will differ by meat type.

In the short term, beef prices will decline due to ample beef supply from North America following the rapid rate of herd rebuilding. In line with the expansion of output in key production regions, nominal bovine meat prices will decline until 2024. However, as the beef cow herd declines and the rate of production growth slows down, prices will start to increase until the end of the projection.

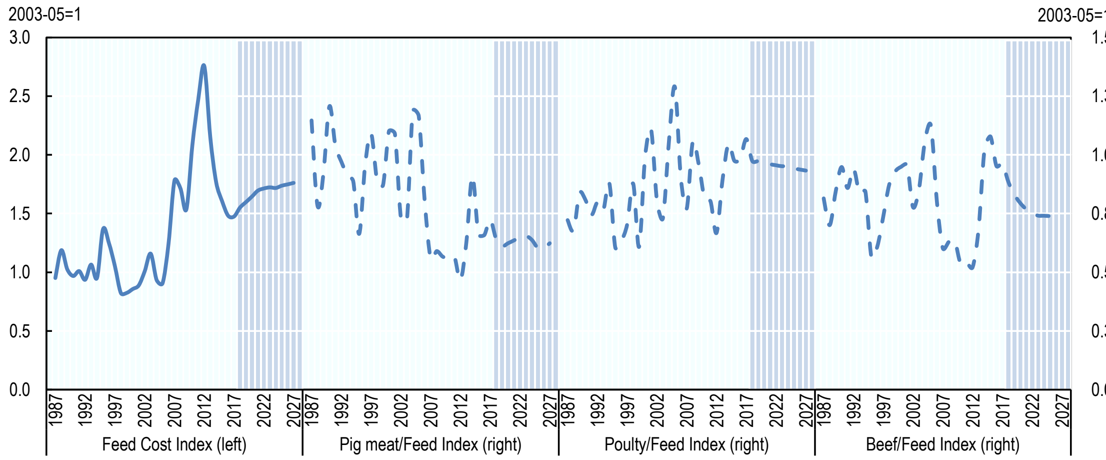
Nominal pigmeat prices will decrease from 2017 and are expected to oscillate in a typical cycle for the projection period, declining in real terms. Notable features of the global sector that shape this trend are increased supply from Brazil, China, the United States and Viet Nam, and higher imports from Mexico and Philippines.

The effect of an increasing poultry flock – the spread of AI is assumed to be contained by 2018 – combined with slowly rising feed costs (Figure 6.2) result in a moderate poultry price increase in the medium term. This is further supported by increasing income over the projection that will stimulate demand growth, particularly from Asia, Latin America and Africa. In real terms, prices will decline throughout the projection period.

Nominal sheepmeat prices are expected to increase marginally, due partly to weak import demand growth from China and the Middle East combined with a gradual increase in lamb production in Algeria, Australia, China, Ethiopia, India, New Zealand, Nigeria, Pakistan and Turkey. After several years of decline, the European Union's declining trend in production was reversed in 2015, and is projected to increase marginally from the current level with an increased profitability of sheep farms in Romania and Cyprus, and implementation of voluntary coupled support in the main sheep producing Member States.

For the medium term, production will benefit from positive meat-to-feed price ratios (Figure 6.2) resulting in herd and flock expansion in key producing regions. Increased productivity in those regions will also support a supply-driven market that will lower meat prices over the early part of the projection period. However, prices are expected to increase moderately in the latter part of the projection period as per capita meat consumption grows. Lower product prices have contributed to making poultry and pigmeat the meat of choice for consumers in developing countries but rising income levels allow those consumers to diversify meat consumption, gradually consuming more of the more expensive meat varieties such as beef and lamb. Nevertheless, poultry meat remains the primary driver of the growth in total meat production. Low production costs, high feed conversion ratios, and low product prices have contributed to making poultry the meat of choice, both for producers and consumers.

Figure 6.2. Feed cost index and meat to feed price ratios



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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Production

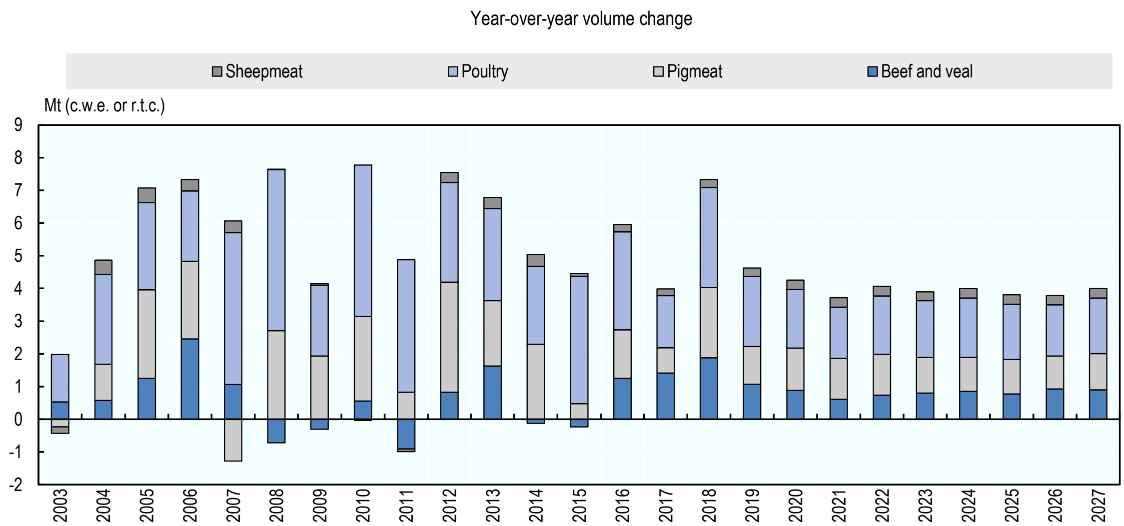
Livestock supply responses to market signals are mainly influenced by the availability of natural resources and the possibilities for increases in productivity; however, both of these factors are increasingly controlled by environmental legislation, such as the Paris climate agreement and food safety regulations (Box 6.1). As such, there is potential for production growth in many developing countries where natural grasslands and agricultural land abound for producing feed grains, e.g. South America.

Total meat production is projected to expand by slightly more than 48 Mt by 2027, reaching nearly 367 Mt. The yearly increase in the overall quantity of meat produced should be relatively constant after 2018 (Figure 6.3). This development occurs predominantly in developing countries which will account for 76% of the additional output (Figure 6.4).

In some developing countries, production growth is supported by increasing productivity in the form of higher carcass weight per livestock unit and improving feed use efficiency. Least developed countries are not foreseen to improve productivity at the same rate as smallholder structures and lack of investments in the livestock sector limit technological improvements and commercialisation of production.

Meat production continues to be dominated by Brazil, China, the European Union, the Russian Federation, and the United States. Brazil's production growth will benefit from abundant supply of natural resources, feed, grassland availability, productivity gains, and to some extent the devaluation of the Real. China's production will benefit mostly from growing economies of scale as small production units grow into larger and increasingly commercial enterprises. United States production will benefit from strong domestic demand and higher slaughter weight, while production in the European Union will remain stable reflecting a decline in fresh domestic meat consumption balanced by increasing use of meat products as ingredients in processed products. Finally, the meat import ban put in place by the Russian Federation increased domestic prices and stimulated domestic meat production.

Figure 6.3. Annual growth of meat production by type



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
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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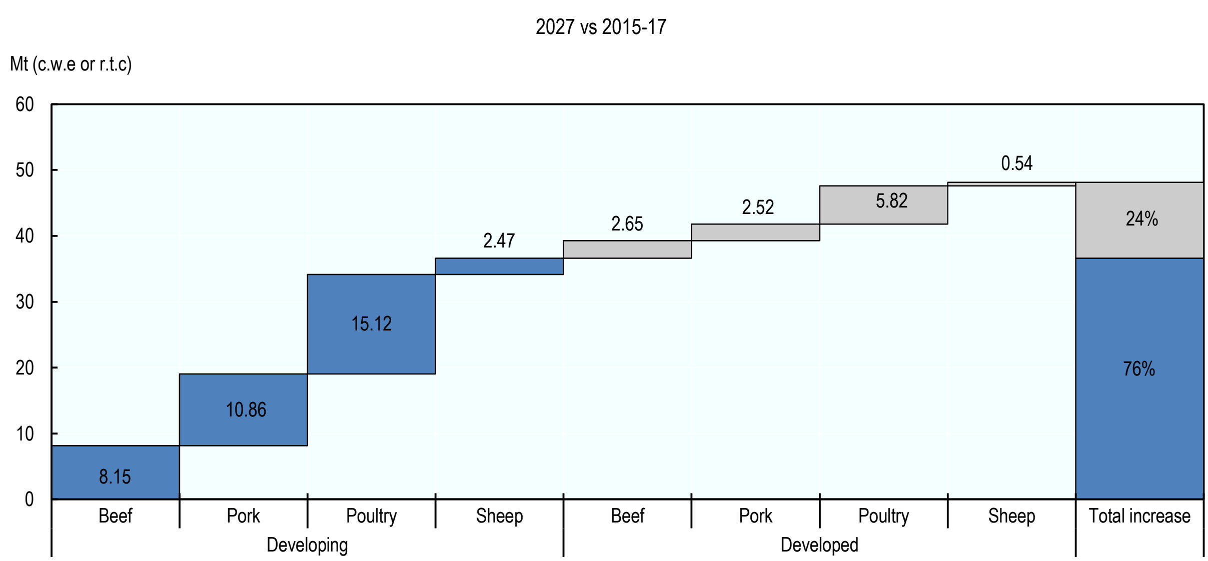
Figure 6.4. Growth of meat production by region and meat type



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
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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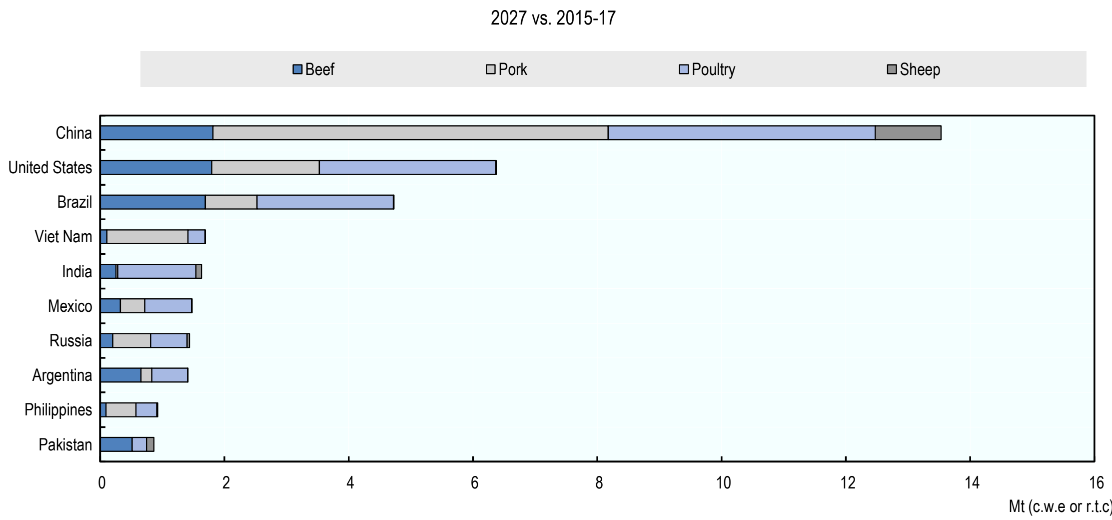
Other developing countries with noteworthy potential contributions to additional meat production include Argentina, which benefits from favourable policies for exports, which stimulates herd expansion; India, Mexico and Viet Nam (Figure 6.5).

Figure 6.5. Countries with the greatest share of additional meat production by meat type



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
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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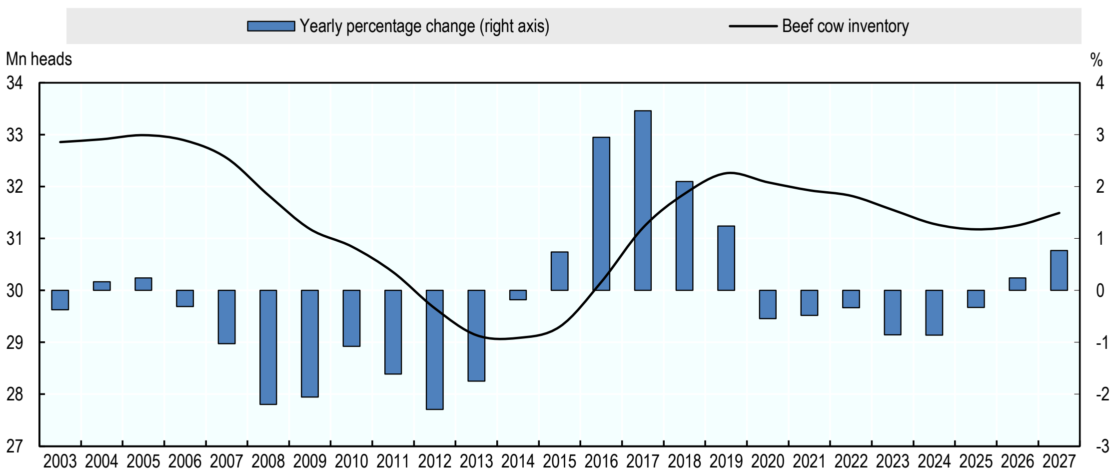
For the outlook period, beef production continues to grow across the main producing countries (Figure 6.5). Beef production in developing countries is projected to be 21% higher in 2027, relative to the base period, with these countries accounting for 75% of the additional beef produced. The majority of this expansion is attributed to Argentina, China, Brazil, Pakistan, and Turkey. While India is an important bovine producer, production growth is projected to slow down as sales of cattle for slaughter remains a sensitive issue that is creating significant uncertainty amongst producers. In developed countries, production will be 9% higher by 2027 compared to the base period, virtually all of this increase being due to high growth in the United States. Whilst the expansion cycle in the United States is nearing its end, the herd expansion cycle in other countries, such as Australia, Brazil, Mexico, is expected to slow down at a later time. Moreover, the removal of export taxes on beef has promoted beef herd rebuilding in Argentina which is expected, in turn, to increase the beef production back to historical levels over the medium term. The feeder cattle and bovine for breeding import and distribution policies favouring young farmers in Turkey are expected to lead to growth in production in the medium term. However, beef production in the European Union[1] is expected to enter a downward trend as dairy breeds make up approximately two-thirds of the bovine meat supply, and productivity gains in the milk sector will somewhat decrease beef production. This limits the sector's potential to adjust to changes in market signals.

In the short term, production will be supported by both higher carcass weights arising from low feed costs and improved genetics, as well as increased slaughter numbers as final herd rebuilding in several producing regions becomes evident in higher livestock numbers. In the United States, the total beef cow number is projected to increase and reach its peak, much faster than expected in last year's *Outlook*. Domestic and foreign demand has been stronger in the near term, but is expected to slow in the latter years of the outlook period. Declining domestic per capita beef consumption in the latter part of the next decade underpins the projection that the US cow herd will enter a declining cycle post-2020 (Figure 6.6)

Figure 6.6. US beef cow inventory



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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The expansion in global pork production will decelerate over the next decade. China's production growth is expected to provide nearly half of the additional global output. The total global volume will remain in line with the demand recovery, which is significantly lower relative to the past decade. Strong production growth rates over the outlook period are also expected in Brazil, Mexico, Philippines, the Russian Federation, the United States and Viet Nam. The European Union's pigmeat production is projected to decline marginally, as domestic consumption stabilises and competition from the world market increases.

Poultry will continue to strengthen its dominant position within the meat complex, accounting for nearly 45% of all additional meat that will be produced over the next decade. Its short production cycle allows producers to respond quickly to market signals, while also allowing for rapid improvements in genetics, animal health, and feeding practices. Production will expand rapidly in countries producing surplus feed grains, such as Brazil, the European Union and the United States. Rapid expansion is also foreseen in Asia, led by China (where the *Outlook* assumes no further outbreaks of AI) and India.

Sheepmeat production will experience a higher rate of growth than that of the previous decade, with developing countries accounting for the bulk of the additional output. Growth in domestic sheepmeat production in the MENA region is projected to increase despite limitations linked to urbanisation, desertification and the availability of feed in some countries. China, the leading sheepmeat-producing country, will contribute slightly more than 36% of additional production as domestic demand continues to grow. Australia and New Zealand's global share of sheepmeat production is expected to slightly decline throughout the outlook period, despite increasing domestic output. The EU flock is expected to increase in the first half of the outlook period, as profitability improves, followed by a marginal decline towards 2027, as competition from Oceania limits exports potential. The share of the African region in sheepmeat production will slowly increase and contribute up to 26% of the additional global supply.

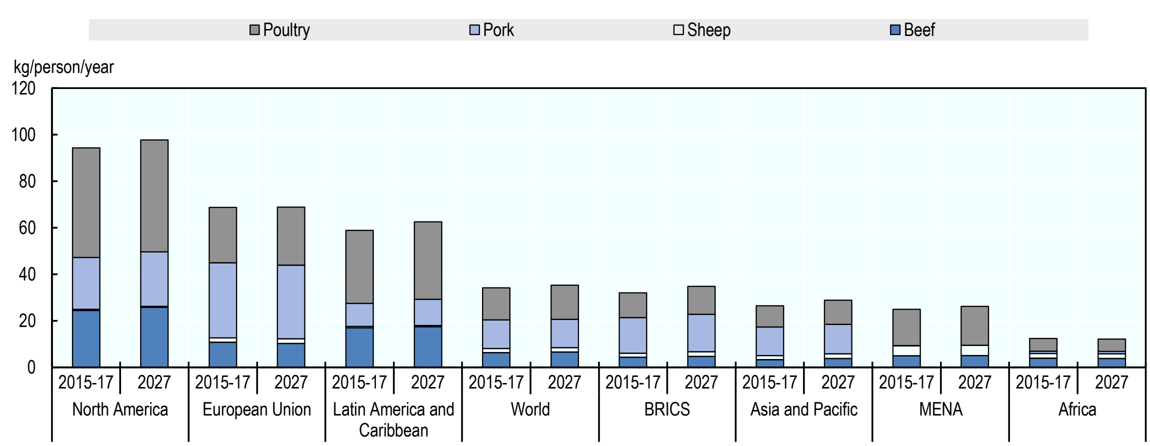
Consumption

In much of the developing world, per capita meat consumption remained stable in 2017 as income growth slowed, particularly in regions highly dependent on commodity imports. Although growth in the demand for meat is expected to recover over the outlook period, particularly in the developing world, growth rates are generally expected to be lower than in the past decade. Growth will stem from a combination of income and population growth, especially in countries with large middle classes. Africa's rate of growth in consumption will be the highest of all continents however, dominated by population growth resulting in a decline in per capita consumption. In developed countries, consumption levels are already high, but meat demand generally continues to increase, particularly in the United States where per capita consumption and meat prices will return to the same levels as a decade ago. Nevertheless, growth rates are generally lower than those in the developing countries (Figure 6.7).

In LDCs with high population growth rates, meat consumption has been growing rapidly, albeit from a low base. This is notably the case in Africa, where poultry accounts for the bulk of additional consumption in the region, followed by beef. Whereas the bulk of the sheep consumption is produced within the African region, a substantial share of additional beef, pigmeat and poultry consumption will be imported.

Beef consumption will increase gradually over the next ten years. By 2027, it is expected to be 8% higher than in the base period in developed countries, whereas in developing regions it is expected to increase be 21% higher. In per capita terms, beef consumption in the developing world remains low relative to developed countries, at about one-third in volume terms. Population increases in Asia are the major driver of growth, together with the positive perception of Chinese buyers' that bovine meat is healthier and disease-free. Increased beef and buffalo consumption levels are also expected in Kazakhstan, Turkey, and Viet Nam. The result is an expected 24% increase in beef consumed in Asia over the next decade.

Figure 6.7. Per capita meat consumption by region



Note: Per capita is expressed in retail weight.
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 pigmeat consumption on a per capita basis remains stable over the outlook period with consumption in most developed countries reaching saturation levels. Within developing countries, significant regional differences are evident in per capita pigmeat consumption. Growth is sustained in most of Latin America, where it has grown rapidly over the past few years. Growth is fuelled by favourable relative prices that have positioned pork as one of the favoured meats, along with poultry. Several Asian countries with favourable economic conditions which traditionally consume pork such as China, Philippines, Thailand, and Viet Nam – which is projected to become the highest consumer of pork on a per capita basis – are increasing consumption on a per capita basis at the regional level. Population expansion still supports growth in total pork consumption in these regions.

Consumption of poultry meat increases regardless of region or income level. Per capita consumption will grow, even in the developed world, but growth rates will remain higher in developing regions. In China, consumption suffered from the AI virus outbreaks which affected humans in the last years. The *Outlook* assumes that consumption will not be much affected in 2018 and will return to the historical trend afterwards. Among all the additional meat consumed over the next decade, poultry is expected to account for 44%.

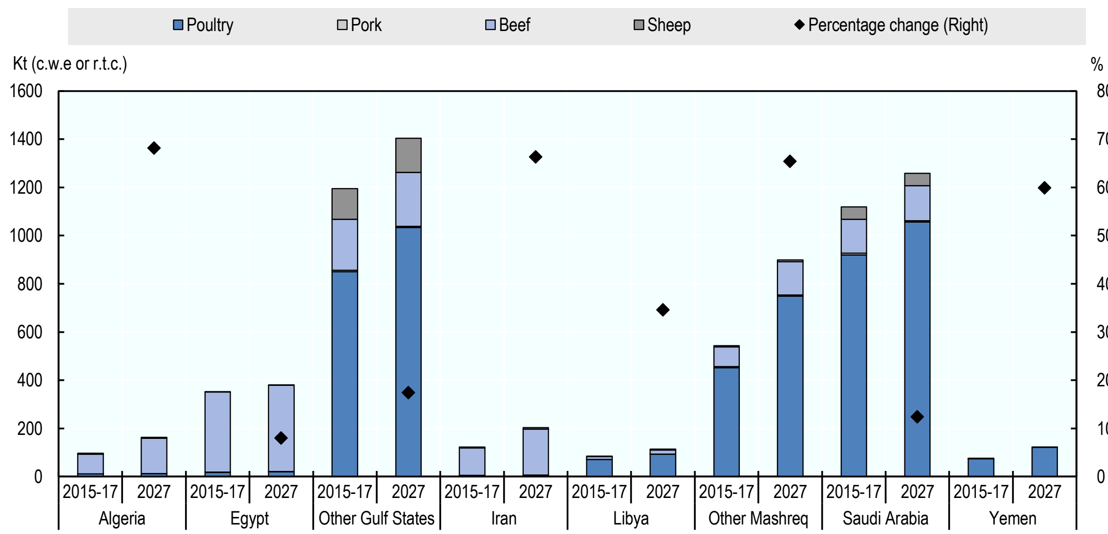
Sheepmeat consumption worldwide on a per capita basis will reach 1.8 kg r.w.e. by 2027. Sheepmeat consumption per capita in Africa, North and Latin America, and Oceania is expected to decline slightly. In contrast, sheepmeat will continue to expand in several Asian countries, such as China, where consumers associate sheepmeat with quality and nutritional benefits. An increase in per capita consumption of sheepmeat is projected for the MENA region, where it is traditionally consumed. Demand growth in this region is tightly linked to the oil market which heavily influences both the disposable income of the middle class and government spending patterns.

Trade

At the global level, meat exports (excluding live animals) are projected to be 20% higher in 2027 than in the base period. This represents a slowing down of meat trade growth to an annual average rate of 1.5% compared to 2.9% during the previous decade. However, the share of total meat output traded on the global market will remain similar in 2027 to the base period, at slightly below 10%. Global imports will increase, particularly for poultry and bovine meat which will account for the majority of the additional meat traded in 2027. Asia will account for the greatest share of additional imports, with the greatest increases in the Philippines and Viet Nam, where consumption growth is outpacing domestic production expansion. Meat imports into Asia account for 56% of global trade, and poultry will constitute more than half of this additional import demand. Rapid growth in imports from Africa is projected to increase the import share of the region by 2027. The MENA region will also increase its import of meat, the bulk of this growth will accrue to Saudi Arabia and the other Gulf States (Figure 6.8).

Although by 2027 developed countries are expected to account for slightly more than half of global meat exports, their share will decrease steadily relative to the base period. Meat exports will become increasingly concentrated, with Brazil expected to capture more than one third of total trade expansion and the United States more than a quarter. Exports from the European Union, strongly influenced by the exchange rate, will grow at a much slower rate. The European Union has improved its access to Asian markets, but competition from North and South America will prevent it from taking full advantage of this opportunity. In the Americas, traditional exporting countries are expected to retain a high share of the global meat trade. Argentina, Brazil, Mexico and the United States are expected to increase their share of world meat exports somewhat benefiting from the depreciation of their currencies.

Figure 6.8. Meat imports in selected MENA countries



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent. Other Gulf States are Bahrain, Kuwait, Oman, Qatar and the United Arab Emirates.
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/10.1787/888933743423

The highest meat import demand in 2017 was from Japan, which saw a rapid expansion of beef imports that triggered special safeguard (SSG) for frozen beef imports from countries without free trade agreements. Import demand from Japan will slowly decrease as its population declines by nearly 4 million by 2027. For the projection period, China's increase in meat production will not be enough to meet its increasing domestic demand, which implies the need to continue importing at current high levels. Viet Nam and the Philippines are expected to capture a larger share of additional imports for all meat types, supported by favourable economic growth. Africa is another fast-growing importing region, although many countries start from a low base. In the Russian Federation, the long-term effects of the 2014 import ban on meat have permanently reduced the level of imports, which are projected to decline further as a result of the stimulus to domestic production.

Meat import growth in volume at the global level is driven by poultry meat, the bulk of which is imported by developing countries. The vast majority of the additional growth in bovine meat will be traded between developing countries; however, developed countries will supply the bulk of additional exports in pigmeat.

It is anticipated that Brazil and the United States will benefit from strong poultry demand from the developing world where diets are diversifying towards higher animal protein consumption levels.

Australia and New Zealand will continue to supply global sheepmeat markets as the middle class in China and the Middle East continues to expand. Australia is expected to increase lamb production at the expense of mutton. In New Zealand, export growth will be marginal as land use has shifted from sheep farming to dairy.

Main issues and uncertainties

Trade policies remain a major factor impacting the dynamics of world meat markets. As a result, the projection and implementation of various trade agreements over the outlook period could diversify or consolidate meat trade considerably. Multilateral trade agreements are proving difficult to ratify, which may favour bilateral trade agreements.

Unilateral and/or unexpected trade policy decisions are another risk factor in the projections. For example, in 2017 the Russian Federation extended until the end of 2018 the ban on imports of food from the United States, Australia, Norway, Canada, and the European Union in response to economic sanctions. This ban has resulted in a large decline in meat imports, higher producer price volatility, and higher consumer prices. Domestic policies also influence the competitiveness of meat producers. For example, the Turkish government increased domestic beef production by subsidising feeder cattle and bovine for breeding import and distribution which helped to rebuild the domestic cattle inventory. Another example is found in Argentina which in 2017 introduced a refund scheme on turnover and other provincial value added taxes that are applied to meat and other products that are exported. This should increase Argentina's competitiveness on the world meat market and open new opportunities for exports.

An important factor that could impact the outlook relates to sanitary and food safety concerns arising from animal diseases outbreaks (e.g. swine fever). For example, Brazil could be declared free of Foot and Mouth Disease (FMD) with vaccination in 2018 and FMD-free without vaccination in 2023, which could open a larger market for Brazilian beef and pork from countries which prohibited imports from areas where the disease existed. Depending on the duration, intensity, potential government and consumer reactions, and trade restrictions, diseases could impact domestic and regional meat production, consumption and trade. For example, the outlook for meat production and consumption will depend on how quickly the Human AI virus will be contained in China. A concern is the further spread of the virus during the outlook period. The Chinese government is closely monitoring the situation in all provinces affected by AI outbreaks.

Finally, changing consumer preferences, such as the rise in vegetarian or vegan lifestyles, are relatively new and difficult to assess. They, however, somewhat affect global meat markets if they are adopted by an increasing share of the population.

Box 6.1. The economics of antimicrobial resistance in livestock production

There is growing global awareness that the high level of antibiotic use in food animal production is closely linked to the risk of antimicrobial resistance (AMR) as bacteria mutate and develop traits that become resistant to the commonly used antibiotics. Not only are there concerns over the AMR effects on animal production and productivity, but on the transmission of resistant genes and bacteria between different species. At issue is the frequent and inappropriate use of antibiotics on animals and humans which accelerates the emergence and spread of resistant pathogens. Indeed, many antibiotics used in animal husbandry are used also in human medicine, thus increasing the risks of cross-over and the emergence of multi-resistant pathogens. Studies have estimated this problem could generate up to ten million deaths by 2050 and a reduction in global GDP of 2%-3.8% (WHO, 2015; WB, 2016). Estimates also show that by 2050 the potential impact of AMR on animal production could reduce global animal production by 2.6% to 7.5%, with the most severe impact likely to occur in low-income countries, which would suffer an estimated decline of up to 11% (WB, 2016).

Antibiotics have been widely used over the last 30-40 years in animal production to treat (therapeutic), prevent (prophylactic) and control (metaphylactic) disease outbreaks, and to increase the growth rate of animals and improve their productivity. The use of antibiotics in animal production is complex and difficult to estimate at the industry and species level due to lack of reliable data. At the farm level, the optimal level of use is largely an economic decision by the farmer within the context of good animal health and animal welfare. As large intensive animal production operations, particularly in emerging economies, have developed over the last 30 years, global demand for veterinary antibiotics has increased sharply. In many countries, the use of antibiotics in animal production is substantially larger than in human medicine.

OECD and the BRIICS account for about four-fifths of global meat production, with poultry, pig meat and beef accounting for more than 70% of the total. The use of antibiotics is closely related to the size of the farm animal population, the intensity of the production system, and how that system is managed. Four countries – China, the United States, India, and Brazil – are estimated to account for over three-fifths of global antibiotic use in animal production. Studies of the productivity impacts from such use in feed or water have concluded that the benefits are declining in most countries in view of improvements in animal management, nutrition, breeding, and biosecurity measures. For example, although several recent studies have estimated the gains from using antibiotics at 1% and 3% for pig and poultry production, respectively, producers in emerging economies often experience much higher gains due to the lower starting point in terms of management and biosecurity standards.

Much of the current AMR focus is on the potential cost burden to the public health sector, and the benefits and costs for livestock production. Findings from recent studies in Denmark, Netherlands, Belgium, France, and Sweden show that the use of antibiotics in pig and poultry production can be reduced by more than 50% without adversely affecting animal productivity, animal health, or the profitability of the farm provided that good management and biosecurity measures are implemented. Alternatives to antibiotics currently under review include vaccinations, probiotic, bacteriophages, and the use of heavy metals, as well as other substitutes including better management and hygiene measures.

At the international level, AMR is a high priority at the UN General Assembly (2016) and for the G20 countries. The WHO's Global Action Plan 2016 (GAP) on antimicrobial resistance sets out several broad recommendations to contain the growth in AMR and which is implemented through the work of the Tripartite (WHO/OIE/FAO) which seeks to improve awareness, education and training, in addition to developing measurement standards and surveillance systems. The work of the Tripartite is undertaken in close co-operation with the OECD and World Bank, both of which assess in particular the potential economic impacts of AMR on human health and food animal production. As AMR is a global issue, the "One Health Framework" has been adopted by most countries tackling this issue. Most WHO member countries have developed specific National Action Plans with specific targets to reduce antibiotic use and, consequently, AMR in human medicine and animal food production.

Sources: OECD (2018, forthcoming), The economics of antimicrobial resistance in livestock production, OECD Publications, Paris.
World Bank (2016), "Drug-Resistant Infections: A Threat to Our Economic Future. Part VI", in *Antimicrobial Use in Animals and AMR*, pp 65—78, The World Bank, Washington, D.C.
World Health Organisation (2015), *Global Action Plan on Antimicrobial Resistance*, World Health Organisation, Geneva.
See also Workshop on Economics of Antimicrobial Use and Resistance in the Livestock Sector website. http://www.oecd.org/tad/events/workshop-economics-antimicrobial-use-resistance-livestock-sector-october-2015.htm.

Note

1 Insight on beef sector developments in EU Member States is explained in more detail in Box 4.1 of the European Union (2017), “EU Agricultural Outlook for the EU agricultural markets and income 2017-2030”.

Chapter 7. Dairy and dairy products

This chapter describes the market situation and highlights the latest set of quantitative medium-term projections for world and national dairy markets for the ten-year period 2018-27. Growth in world milk production is projected to increase by 22% over the projection period, with a large share of the increase coming from Pakistan and India. In 2027, these two countries are expected to jointly account for 32% of global milk production. Most of the additional production in these countries will be consumed domestically as fresh dairy products. Over the projection period, the European Union's share in global exports of dairy commodities is expected to increase from 27% to 29%. As the 2017 butter bubble continues to deflate, nominal and real prices for butter will decrease over the projection period. With the exception of skim milk powder (SMP), dairy prices are expected to decrease in real terms.

Market situation

International dairy prices continued to increase in 2017, driven by declines in milk production in the last quarter of 2016 and first quarter of 2017, and by a strong demand for fat solids. Butter prices showed a spectacular jump in the first half of 2017, but came down by the end of 2017, that on average butter prices were 65% higher than in 2016. During 2017, the prices of whole milk powder (WMP), cheese and skim milk powder (SMP) increased by 28%, 25% and 3%, respectively.

In the short term, butter prices are expected to decline further during 2018 but remain higher than in recent years. The price of cheese is expected to come down, as the supply of fat solids increases relative to its demand and the price of fat solids declines. The prices of milk powders are expected to increase in 2018, although the recovery of the SMP price is likely to be slow given the still relatively high stock levels, especially in the European Union.

World milk production experienced a modest growth rate of 0.5% during 2017, which is much lower than the average growth rate of 2.1% during the last decade. Major exporters such as the European Union, New Zealand, Australia and Argentina witnessed a decrease in production during the first half of 2017 followed by a partial rebound in the second half. In the same period EU milk production declined in some key dairy producing Member States such as France and Germany, due to adverse weather impacts, low milk prices and herd declines. In the United States, stagnant growth in milk cow numbers and in yield per cow curbed supply growth. Despite low feed prices, the US milk margin fell in 2017 following the decline in the farm gate milk price. In Argentina milk production in 2017 recovered slowly from the more than 10% fall in production in 2016. An expected rebound in New Zealand milk production for 2017 has been delayed due to wet and cold spring weather (August-September). In Australia the growth of milk production was hampered by a contraction in the number of dairy farms and herd, due to poor seasonal factors and a low farm gate milk price.

Trade in dairy products is benefiting from stronger GDP growth, though trade growth has slowed down during recent years. The People's Republic of China (hereafter "China"), the largest importer of milk products, increased its 2017 imports of WMP and SMP combined by 6% relative to 2016, but this is still lower than the highs of 2013-2014. In contrast, China's cheese imports increased by 16%, continuing a decade long growth pattern (China is the world's fifth largest cheese importer). Oceania's dairy exports were below their 2016 values, with the exception of New Zealand's cheese exports, which increased for the second year in a row. New Zealand has reduced its production of WMP, but increased its production of cheese in response to growing world demand. Fluid milk exports have been rapidly expanding in recent years and, following a 16% increase in 2016, grew by a further 4% in 2017.

Trade measures affecting dairy trade are India's extended import ban (until 23 June 2018), the Russian import ban (extended till the end of 2018), an import ban by Mexico on all dairy imports from Colombia due to a Foot and Mouth disease outbreak, non-tariff measures (e.g. by Indonesia to US dairy products), and the free trade agreement between the European Union and Canada (CETA), in place since 21 September 2017. In addition, stocking and destocking strategies may have short-term market impacts. During the period 2015-2017, the European Union built up a public intervention stock of SMP of 378 000 tonnes (which is about 6.5% of world SMP production and about 20% of world SMP trade). SMP stocks also increased in the United Sates and India.

Projection highlights

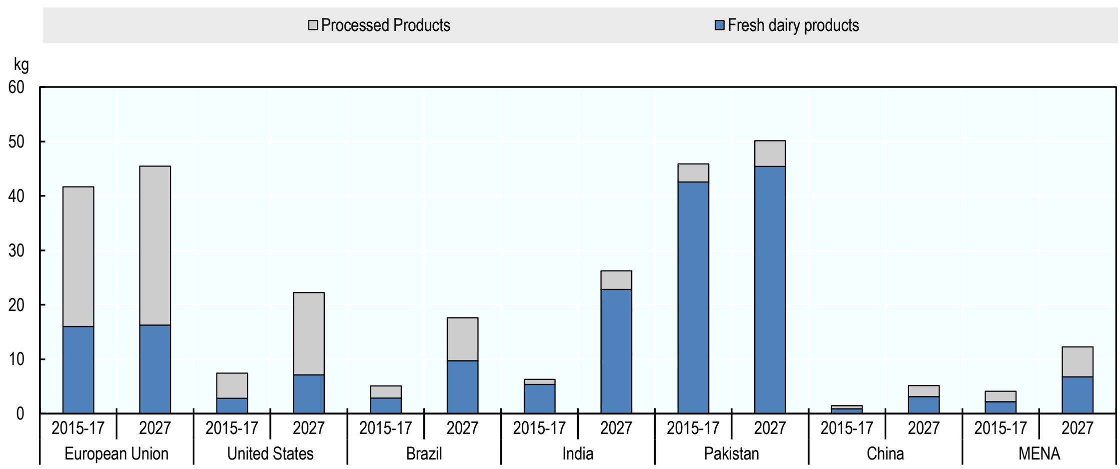
Although growth in world milk production has been limited in recent years, it is projected to increase by 22% in 2027, compared to the 2015-17 base period. The majority of the increase in milk production (80%) is anticipated to come from developing countries, in particular Pakistan and India, which are expected to jointly account for 32% of total milk production by 2027, compared to 26% in the base period. Milk production in developing countries is projected to expand at a rate of 3.0% p.a., but most of this additional production will be consumed domestically as fresh dairy products[1]. The share of production from developed countries is projected to decrease from 48% in 2017 to 43% in 2027. As compared to the previous *Outlook*, dairy product prices are lower, which curbs supply growth, in particular of developed countries. At the world level, production of butter, WMP, SMP and cheese are projected to increase by 2.2% p.a., 1.6% p.a., 1.3% p.a., and 1.3% p.a. respectively.

Dairy demand in developed countries has been shifting for several years towards butter and dairy fat and away from substitutes based on vegetable oil. This trend can be attributed to a more positive health assessment of dairy fat and a change in taste. As incomes and population increase, and diets become more globalised, more dairy products are expected to be consumed in developing countries. In developed countries, per capita consumption is projected to grow from 22.2 kg in 2015-17 to 23.1 kg in 2027 in milk solids, compared to an increase from 10.6 kg to 13.5 kg in developing countries. There are, however, significant regional disparities amongst developing countries, where predominantly fresh dairy products are consumed; this contrast with developed countries, where consumer preferences tend towards processed products (Figure 7.1).

Whereas the butter price is expected to continue its decline after the butter bubble in the first quarter of 2017, after that the price of cheese will increase by about 2.1% p.a. over the projection period. The prices of milk powders are expected to show a stronger increase (SMP 3.4% p.a., WMP 3.4% p.a.), but in the case of the SMP price this percentage should be put in perspective as it starts from a low base in 2017 and is expected to recover only slowly in the short run due to stock levels that hang over the market. Despite the relatively strong growth in milk powder prices in nominal terms, they are not foreseen to return to the highs of 2013-2014 and hence will remain stable in real terms.

Currency depreciations (2027 relative to 2015-17, with respect to the United States dollar) in Argentina (104%), Brazil (14%), and Mexico (13%) will encourage growth in exports from these countries as they become more competitive relative to the United States, but also compared to the European Union and Oceania. On the import side, the currencies of most large importers – in particular China, Philippines and Indonesia – are expected to be stable or even slightly appreciate and are not likely to negatively affect their dairy product import demands. An exception is Egypt, whose currency is projected to depreciate strongly. In Japan, import demand is constrained by an ageing population, while in Canada it is limited by domestic dairy policies. Between the base period and 2027, the European Union's share in global exports of dairy commodities is expected to increase from 24% to 28%. India –the world's largest milk producing country – has a large expanding domestic market, but is not projected to become an important player on the international market.

Figure 7.1. Per capita consumption of processed and fresh dairy products in milk solids



Note: Milk solids are calculated by adding the amount of fat and non-fat solids for each product; Processed products include butter cheese, skim milk powder and whole milk powder.
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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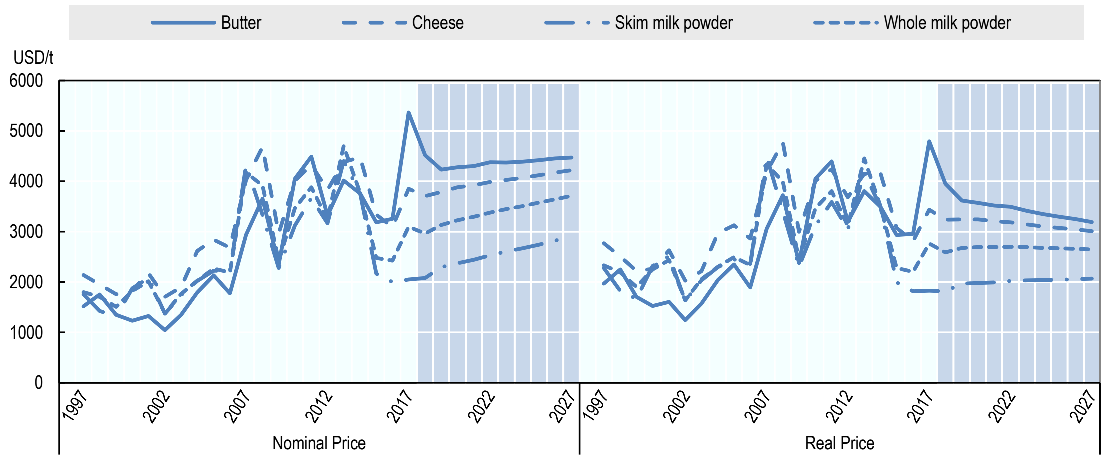
Prices

International dairy commodity prices surged during the second half of 2016, in particular for fat-based products, following sharp declines from their 2013-2014 highs, which stemmed from a contraction in demand and excess supply. On the demand side, China – the largest importer of WMP and SMP – increased its imports in 2017, while the Russian Federation prolonged its ban for several dairy products on several major exporters (including the European Union and United States). Unfavourable weather conditions limited the increase in the 2017 milk supply for some major exporters, thereby putting upward pressure on prices. Both in 2016 and 2017 world supply growth lagged behind the demand growth.

World prices of dairy products will be supported by strong but slowing demand increases for milk and dairy products, which will be 19% higher in milk-solid basis by 2027 compared to the base period. Over the next decade, the real price of butter will decline relative to its peak value of 2017. In the short term, as the 2017 butter bubble dissipates, butter prices will decline relative to other dairy products, though they are expected remain at a higher level than before due to structural changes in demand for milk fat solids. The price of SMP starts from a low level in the base period and is expected to recover only very slowly during the coming years as stock levels in the European Union (and to a lesser extent in the United States) are high (Figure 7.2). Over the projection period, the SMP price is the only dairy product price that shows an increase in real terms. Nominal prices will increase for all products except butter, but they are not expected to return to previous highs (with cheese being the product coming closest). As compared to the previous *Outlook* dairy product prices are lower, inducing a lower production increase for major exporters.

Figure 7.2. Dairy product prices



Note: Butter FOB export price, butter, 82% butterfat, Oceania, Skim Milk Powder, FOB export price, non-fat dry milk, 1.25% butterfat, Oceania; Whole Milk Powder, FOB export price, 26% butterfat, Oceania; Cheese, FOB export price, cheddar cheese, 39% moisture, Oceania. Real prices are nominal world prices deflated by the US GDP deflator (2010=1).

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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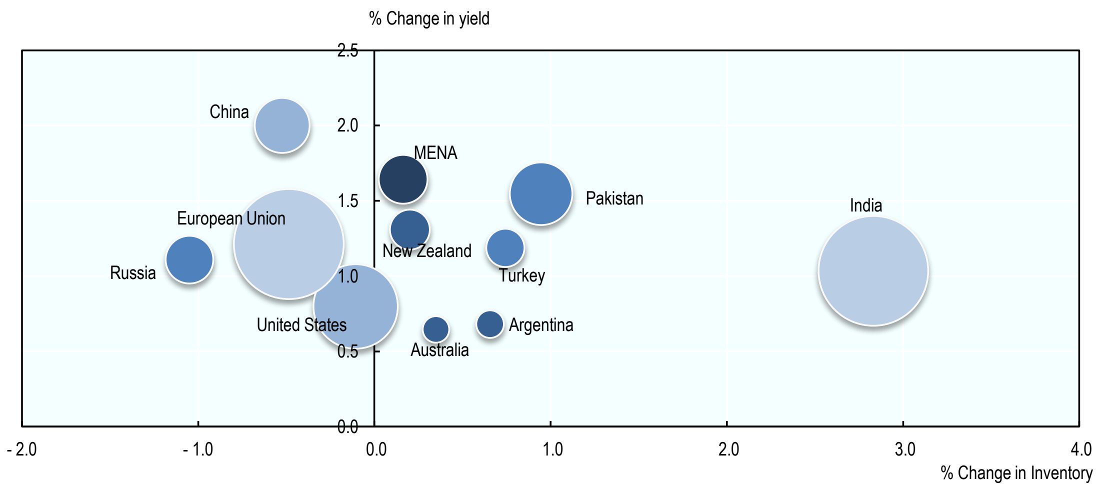
Production

Growth in world milk production is expected to average 1.8% p.a. over the next ten years, compared to 2.1% p.a. during the previous decade. A 22% increase in milk production is projected by 2027 compared to the base period. Developed and developing countries will respectively produce an additional 9% and 33% of milk output by 2027. Dairy product prices are lower in this *Outlook* than in last year's report, with the lower prices curbing production growth, especially in the developed countries. Developed countries' share of milk production will, however, drop from 48% to 43% in 2027. Although dairy herds in developed countries are projected to decrease by 0.2% p.a., milk yield per dairy cow will grow by 1.0% p.a. over the medium term. Production growth in developing countries will be based on an increase in dairy herds of 1.1% p.a. and a yield increase of 1.6% p.a. Despite these projected yield improvements, the absolute increases in productivity will remain small given that many developing countries start from a low base. For most countries, increases in milk production over the medium term will come from yield increases rather than larger herds (Figure 7.3).

The five largest milk producers during base period are the European Union (with a 20%) share in global production, India (20%), the United States (12%), Pakistan (6%), and China (5%). Around 70% of the increase in world milk production will take place in Asia, with India and Pakistan accounting for most of the increase in production. India is poised to have the largest growth in milk production, outpacing the European Union to secure its position as the largest milk producer with a global share of 25% in 2027, followed by Pakistan with an average growth rate of 2.5% p.a. and a global share of 7% in 2027. In both countries, the vast majority of production is consumed domestically as fresh products. The shares of the European Union and the United States in world milk production are projected to decline from 20% to 18% and 12% to 11%, respectively. However, they will remain major players in export markets for processed dairy products.

Figure 7.3. Annual changes in inventories of dairy herd and yields between 2017 and 2027



Note: The size of the bubbles refer to the total milk production in the base period 2015-17.
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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European Union milk production is projected to grow at 0.7% p.a. in the coming decade, which is slower than the 1.2% p.a. observed during the previous decade. Although the producer price of milk declines, growth is expected in 2018, mainly due to a recovery in production in EU member states that were affected by adverse weather in 2017. The European Union's medium term growth is due to an increase in domestic demand (cheese, butter, cream and other products) as well as an increase in global demand for dairy products. The European Union's milk production growth stems from an increase in milk yields, which grow at 1.2% p.a. over the next decade, while the dairy herd is on a declining trend again (-0.5% p.a.) after earlier increases as a response to the milk quota abolition. The European Union's share in global cheese production decreases from 44% to 43%, its share of butter production from 21% to 19%, SMP production from 34% to 33% and WMP production from 14% to 13%. The growth rates of SMP production, cheese and butter declined relative to 2008-2017 rates, while that of WMP will increase from zero annual growth during the 2008-17 period to 1.7% p.a. for the projection period.

Milk production in the United States is expected to increase by 0.7% p.a. during the next decade through an increase in milk yields (0.8% p.a.). Compared to the past decade, production growth is slower, at 1.5% p.a. for SMP, 1.6% p.a. for WMP, 1.8% p.a. for cheese and 1.7% p.a. for butter.

Although China will increase its production at 1.5% p.a., its share of world production remains at the same level (5%) in 2027. Most of the production will go towards fresh dairy products. China will remain a major importer of dairy products and is projected to increase its imports over the next decade but at a slower pace.

Milk production in Latin American and Caribbean countries will increase by 18% compared to the base period, and their share in world production remain at 9%. Argentina – a major producer – suffered from one of its worst crises in the last 20 years (*El Niño-*

induced adverse weather in 2016 and poor economic conditions in 2017), causing a more than 10% decrease in milk production in 2016, with only a slight recovery in 2017 (+2%) and 2018 (+2%). Over the medium term, production is projected to increase by 1.3% p.a. as the sector recovers. Brazil's 2017 production recovered from drought conditions experienced in 2015-2016, and its milk production is projected to expand by 2.2% p.a. over the projection period.

The share of Oceania in world milk production is only 3.8% during the base period and is projected to decline to 3.6% by 2027. Nevertheless, the region is the world's largest dairy exporter. Milk output growth in New Zealand is expected to be lower compared to the previous decade, with growth slowing from 3.3% p.a. during the previous decade to 1.5% p.a. over the projection period. The main constraining factors are land availability and increasing environmental restrictions. During the last decade the milk solids produced per hectare of land steadily increased by 2% p.a., while for the next decade this will decline to 1.8% p.a. New Zealand is both a leading producer and exporter of WMP, and is projected to account for 24% of global production and 55% of global exports in 2027. Over the next decade, most of the growth will come from a further increase in the dairy herd (0.2% p.a.) and yield (1.3% p.a.).

The share of developing countries in world dairy production in the base period varies from 19% (cheese) and 25% (SMP and WMP) to 38% (butter). In all cases their share in the world's 2027 production level increases, indicating that production tends to follow demand, though for SMP and WMP there still remain big gaps between production and consumption levels.

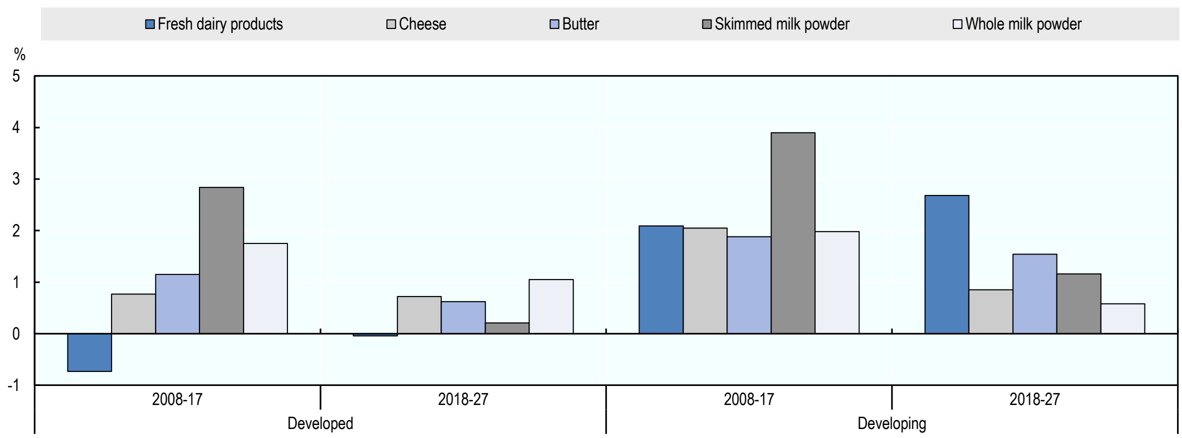
In developed countries, the majority of milk production is transformed into butter, cheese, SMP and WMP. In terms of milk-solid basis, developed countries will increase milk production by 9%, with 37% of that increase going to cheese production, around 23% to SMP, 20% to butter, 10.5% to WMP and 8.5% to fresh dairy products. In developing countries, of the 33% increase in milk production in 2027, 85% will go to the production of fresh dairy products, 7% to butter, 4% to WMP, 3% to cheese and 0.6% to SMP.

Consumption

World consumption of fresh dairy products and processed dairy products is poised to grow by 2.1% p.a. and 1.7% p.a. respectively, over the next decade. The largest share of milk and dairy product consumption is in the form of fresh dairy products, taking up about 50% of the world's total milk production. This share continues to increase to 52% over the next ten years due to rising milk consumption in developing countries. Consumption dynamics differ considerably between developed and developing countries. Developed countries consume primarily processed milk products, with per capita consumption of cheese increasing by 0.7 p.a., butter by 0.7% p.a., WMP by 1.1% p.a., fresh dairy products per capita consumption remaining stable and SMP decreasing by -0.3% p.a. (Figure 7.4).

in Asia. This share will rise to 73% over the decade. Per capita consumption of dairy products in developing countries is expected to increase by an average of 0.5% p.a. for WMP, 1.1% p.a. for SMP, 0.8% p.a. for cheese, 1.7% p.a. for butter, and 1.9% p.a. for fresh dairy products. Except for butter, these growth rates are considerably slower than those seen in the last decade. This is partly due to higher initial levels of consumption.

Figure 7.4. Annual growth rates of per capita consumption for dairy products



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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Developing countries consume 68% of fresh dairy products, most of which is consumed

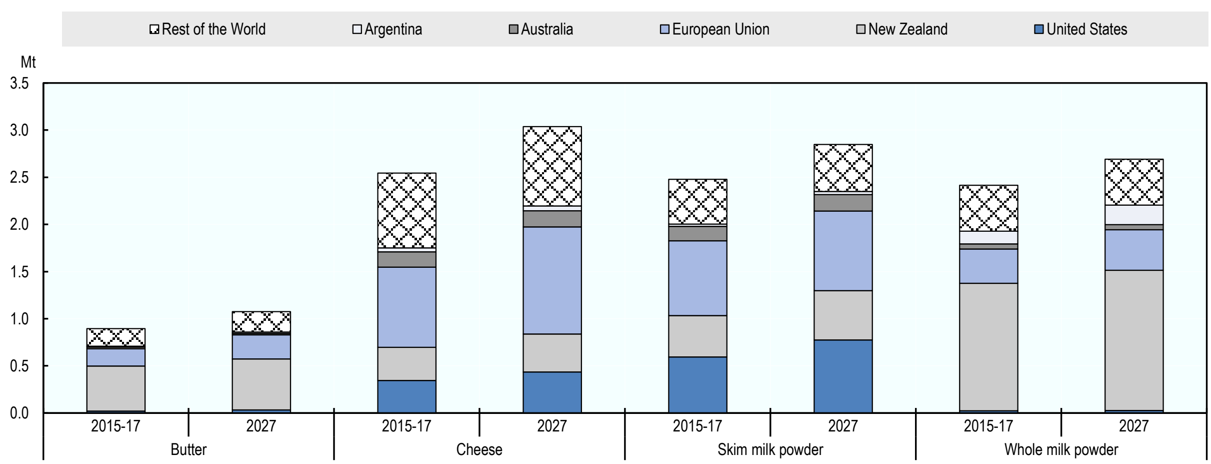
While fresh dairy products intake will still make up more than 75% of the per-capita consumption of milk solids in developing countries by 2027, consumption of processed products differs between regions. Butter and cheese will respectively account for 11% and 18% of dairy consumption in North Africa and 12% and 13% in the Middle East. SMP and WMP will account for 35% and 13% respectively of the per capita consumption of milk solids in Southeast Asia. Per capita consumption of cheese and WMP in South America will remain at respectively 16% and 18% of total dairy per capita consumption. While some regions are self-sufficient, e.g. India, in other parts of the world, such as Africa, Asian countries and the Middle-East, consumption is growing faster than production, leading to an expansion in dairy imports.

In developed countries, increasing per capita consumption of processed dairy products – cheese and WMP – is also expected, although at lower growth rates than in the last decade. The high butter to vegetable oil price ratio is assumed to limit demand growth for butter and milk fat. Nevertheless, consumers in developed countries will consume an additional 0.3 kg of butter in 2027 due to preferences shifting in favour of butter over other oils and fats. Recent studies that have shed a more positive light on the health implications of dairy fat consumption, as well as consumers' preference for taste and less processed food, have encouraged its use in bakery products and recipes. Per capita consumption of fresh dairy products decreases slightly over the outlook period. Most of the increase in consumption of SMP is used in the manufacturing sector, notably in confectionary, infant formula, and bakery products.

Trade

Around 81% of world exports of dairy products come from developed countries; this rate is projected to increase to 82% by 2027. Over the next decade, developed countries are projected to increase exports by 22%, implying an annual growth rate of 1.8% p.a. This is lower than the past decade as the projected growth in consumption of dairy products in developing countries slows down from 3.4% to 2.9% p.a. Growth rates in exports differ among dairy products: 1.8% p.a. for butter; 2.4% p.a. for cheese; 1.7% p.a. for SMP; and 1.3% p.a. for WMP. The four major exporters of dairy products in the base period are New Zealand with a share of 32%, the European Union (24%), the United States (12%) and Australia (6%). Except for Oceania (New Zealand, Australia), which sees its export share decreasing from 38% in the base year period to around 33% in 2027, export shares increase slightly for the United States, the European Union and Argentina. The four developed countries will jointly account for around 69% of world cheese, 80% of world WMP, 79% of world butter, and 81% of world SMP exports in 2027 (Figure 7.5). In the case of WMP, Argentina is also one of the main exporters accounting for 8% of world exports in 2027. While demand for fresh dairy products is much greater than for processed products, higher costs for transport and storage of fresh products generally limit such trade.

Figure 7.5. Exports of dairy products by region



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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New Zealand remains the primary source for butter and WMP on the international market, with market shares of around 53% and 55%, respectively, by 2027. Its market share for WMP remains the same, while that of its butter exports increases to 56% in 2027. Given that China, a major importer of WMP, has drastically decreased purchases, it is projected that New Zealand will have a lower production growth rate of 1.3% over the next decade compared to 9.3% over the last decade. It is also projected that it will diversify and slightly increase its production of cheese over the outlook period.

The European Union will remain the main cheese exporter, accounting for 37% of world exports in 2027, followed by the United States and New Zealand at around 14% and 13% respectively. Over the next decade, export growth for these three countries will average 2% p.a. The European Union's share in the world cheese production is projected to be around 43% in 2027 and is sustained by increased exports to Canada via the CETA agreement, and the assumed end of the ban imposed by the Russian Federation in 2018. China and Egypt are expected to more than double their imports of cheese by 2027. Only about 10% of world cheese production is traded internationally, of which 60% is projected to be imported by developed countries in 2027. The European Union is also an exporter of fresh dairy products, which after a spectacular growth in the past (18.9% p.a.

in the period 2008-2017) will stabilise in the projection period with net trade averaging around 1.3 Mt.

The share of world WMP production that is exported in 2027 is projected to decrease from 46% to 42%, while the share of the other dairy products will remain unchanged. In the case of WMP, it is expected that New Zealand's share of world trade will remain stable at 55% in 2027. The European Union is another main exporter of SMP, and will account for 16% of world exports in 2027. The European Union will slightly increase its share in world SMP exports by 1 percentage point by 2027. Developed countries export 90% and 76% of SMP and WMP, and developing countries import around 45% of the world SMP and WMP production in 2027.

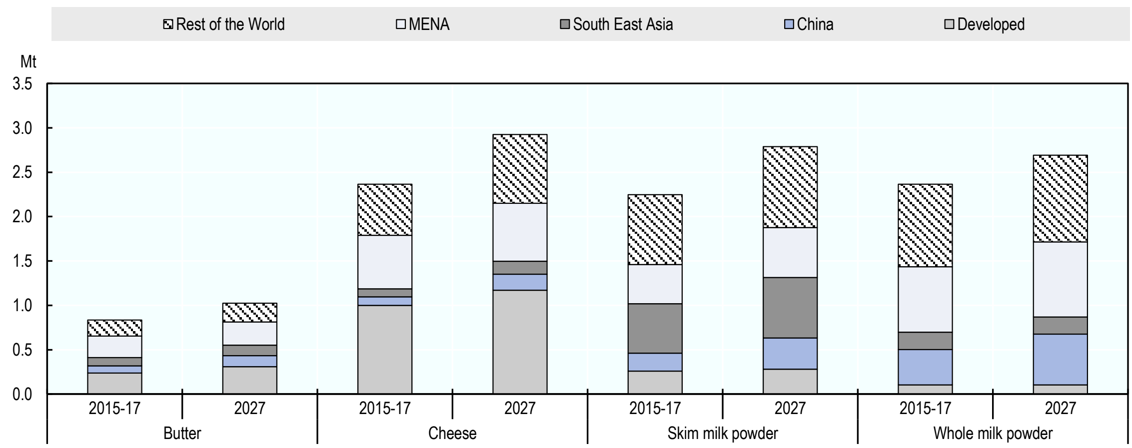
In contrast to dairy exports, imports are spread more widely across countries and the dominant destinations for all dairy products (product weight basis) will be developing countries, with MENA accounting for 24% of world imports in 2027, South East Asia for 12% and China for 13%, whereas the share of developed countries will be 20%. Developed countries import considerable levels of cheese and butter at around 42% and 11% of world imports in 2015-17, respectively; these percentages will remain at similar levels in 2027. The Russian Federation, Japan, China, the United States, and Mexico are projected to be the top five cheese importers in 2027. It is expected that cheese imports in developing countries will grow at a faster rate (2.4% p.a.) than in developed countries (1.0% p.a.). The main importers of butter are the Russian Federation, Egypt, China and Saudi Arabia, a reflection of increases in domestic consumption (Figure 7.6).

Developing countries imported 96% of global shipments of WMP in 2015-17 and this share is expected to remain constant over the medium term. Asia is projected to increase its share of imports from 57% to 59% by 2027. China is the main importer and will import 21% of world trade by 2027. China's imports of cheese and butter should expand annually by 4.8% and 2.4%, respectively; by 2027, its share of world imports will be 12% for butter and 6% for cheese. Most of its dairy imports have been from Oceania, although in recent years, the European Union has increased its exports of butter and SMP to China.

Developing countries account for 88% of total SMP imports. The SMP market was less affected by decreases in China's imports, as there are a large number of importers on the market. China continues to be the world's major importer, with 4.9% p.a. growth in SMP imports over the projection period. China's share in world imports will increase from 9% in the base period to 13% in 2027. China is also a major importer of fresh dairy products: net imports in the base period are about 580 kt, which are expected to increase over the projection period by 44%. Growth in other major importing countries – Egypt, Mexico, Algeria, Indonesia, Malaysia, the Philippines and Viet Nam – are projected to decrease over the outlook period compared to the last decade, due to higher base levels but also to limited growth in demand given the preference for fresh dairy products.

The Middle East and North Africa will remain key destinations, accounting for 35% of world butter imports and 19% of world cheese imports by 2027. The European Union has traditionally been an important trade partner for dairy products and has recently expanded its exports, especially of butter and cheese. Egypt is confirming its position as a major importer of butter, as is Saudi Arabia, which also is a large importer of cheese (see Chapter 2 of the *Outlook* for more details).

Figure 7.6. Imports of dairy products by region



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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Main issues and uncertainties

The relatively high prices for milk fat may induce substitution of milk fat by vegetable fats (e.g. fat-filled powders) for certain uses and destinations, which may not fully reverse when the butter price comes down from its current. This adds to the uncertainty about the long- term relative valuation of fat and non-fat milk solids.

China's role as a major importer of dairy products is a key uncertainty. Small variations in domestic production and consumption can have a significant impact on the world market, as shown in 2011-2015 period when the country's imports of WMP expanded and then decreased rapidly.

High growth in milk production, and growing demand in India is a major feature of the outlook, and such high growth in either one may appear not to be sustainable in the medium term. While India does not currently participate in international dairy markets, if this were to change, it could have major impacts given the size of its market.

Specialisation and restructuring of milk production in the European Union has been given impetus by the removal of milk quotas in April of 2015.

In several countries – Netherlands, Germany, Denmark, France and Italy– concerns about environmental issues may limit milk production increases.

Dairy demand and export opportunities could also be affected by the outcome of free trade agreements (FTA) and regional trade agreements (RTA) currently under discussion. The Russian Federation's embargo on several dairy products from major exporting countries is expected to end in 2018 and imports will increase slightly but will likely not return to the pre-ban levels.

World production may be constrained because of unforeseen weather events. Climate change increases the chances of drought, floods and disease threats which can affect the dairy sector in several ways (price volatility, milk yield, cow inventory adjustments).

Environmental legislation can have a strong impact on the future development of dairy production. Greenhouse-gas emissions from dairy activities make up a high share of total emissions in some countries. Any changes in related policies could affect dairy production. Water access and manure management are additional areas where policy changes could have an impact.

Changes in domestic polices remain an uncertainty. In Canada, the SMP export projections beyond 2021 are uncertain as changes are going on in the dairy industry in reaction to the World Trade Organization Nairobi Decision. In the European Union, the release of its considerable SMP intervention stocks may limit the rise in SMP prices.

Notes

[1] Fresh Dairy Products contain all dairy products and milk which are not included in the processed products (butter, cheese skim milk powder, whole milk powder and for some cases casein and whey). The quantities are in cow milk equivalent.

Chapter 8. Fish and seafood

This chapter describes the market situation and highlights the latest set of quantitative medium-term projections for world and national fish markets for the ten-year period 2018-27. Global fish production will continue to grow, albeit at a much reduced pace compared with last decade. Additional output derives completely from continued but slowing growth in aquaculture, while capture fisheries production is expected to fall slightly. Policy changes in China imply a potentially large reduction in the growth of its aquaculture and capture fisheries output. Asian countries will account for 71% of the increase in fish consumption as food, and per capita fish consumption will increase in all continents except Africa. Fish and fishery products will continue to be highly traded; Asian countries will continue to be the main exporters of fish for human consumption while OECD countries will remain the main importers. Fish prices will all increase in nominal terms but remain broadly flat in real terms

Market situation

The global fishery and aquaculture sector expanded further in 2017, with a faster growth rate than 2016. This increase was primarily accounted for by a recovery in catches of anchoveta (mainly used to produce fishmeal and fish oil) in South America and by a further expansion of aquaculture production, which continues to rise at some 4% a year. As in more recent years, aquaculture was responsible for the major growth of overall production and consumption.

Despite the higher level of production in 2017, additional demand generated by improving economic conditions globally lifted fish prices. The FAO Fish Price Index highlights higher prices in 2017 compared with 2016, in particular in the first nine months of 2017, followed by a slight decline towards the end of the year. This increase in prices, together with higher traded volumes, has made 2017 the year in which the value of total trade of fish and fishery products reached its peak. Despite higher prices, consumption was strong due to sustained consumer demand for fish, supported by the improving economic environment in both developed and developing regions, including recoveries of some major emerging markets such as Brazil and the Russian Federation.

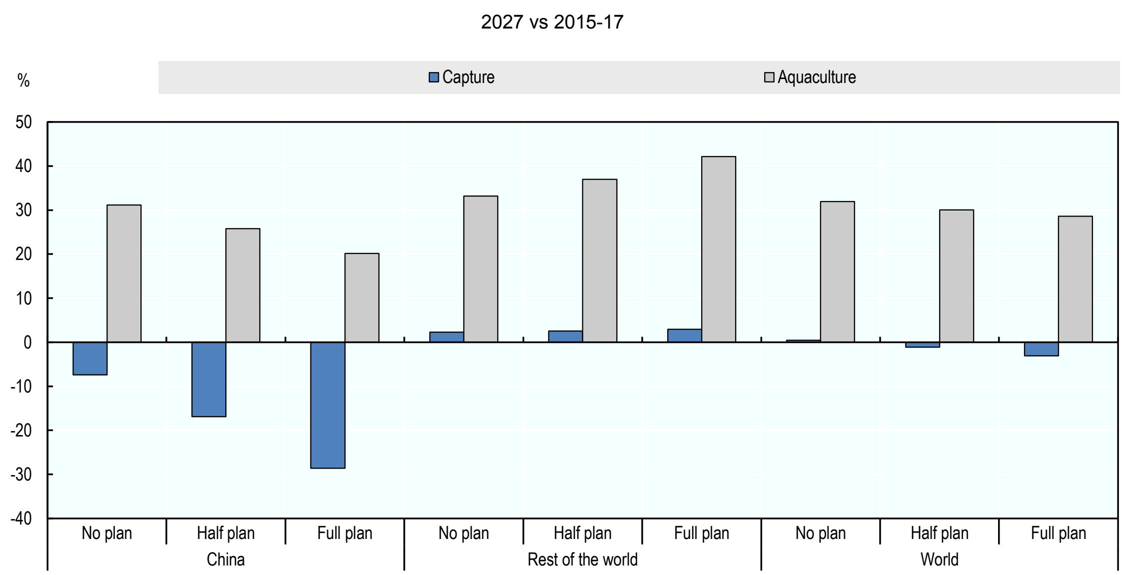
Projection highlights

This *Outlook* contains major changes relative to the preceding years concerning fish production in the People's Republic of China (hereafter "China") for both capture and aquaculture. The first change is that China's 13th five-year plan (2016-2020) aims to, among other things, improve efficiency and sustainability in its fisheries sector, but this also implies potentially substantial reductions in growth for its aquaculture industry and reduced capture fisheries landings. Given China's significance in fisheries at the world level, even accounting for only the most likely outcomes of these objectives in this year's baseline[1] has resulted in total production in China being much lower in this outlook, which has had a visible impact on the projections for world fish production and consequently prices, trade and consumption (Figure 8.1). The second change is that estimates of the value of aquaculture production in China have been substantially upwardly revised since the last outlook, in light of new information, a change that has also affected aquaculture prices at the world average level.

Fish prices will all increase in nominal terms over the duration of the outlook period. The average nominal world price for traded fish[2] will increase by a total of 23.7%, demonstrating a relatively sustained growth trajectory that takes it from USD 2 828/t in the base period to USD 3 499/t in 2027. The weighted average price of aquaculture species is expected to have a lower rate of growth when compared to what was observed in the preceding decade (+1.5% p.a. vs +4.4% p.a.) as it is now starting from a high level, but its rate of growth will still be higher than that for capture species. The aquaculture price is now expected to increase by a total of 19.5% over the period, from USD 2 878/t to USD 3 439/t. Growth in the average nominal price of wild caught fish should remain steady as capture fisheries have limited ability to influence the quantities or compositions of the species they land at the global level. Average nominal capture fishery prices are consequently expected to go from USD 1 557/t to USD 1 819/t over the projection, an increase of 16.8%.

The quantity of fish produced at the world level is also expected to continue growing, increasing every year other than when the second of two assumed *El Niño* events[3] is imposed in 2026. Overall growth is expected to be relatively low, with total production increasing by 13.4% between the base period and 2027, around half the increase seen in the previous decade (27.1%). The annual average rate of growth reflects this slowdown, being only slightly above 1% p.a. World growth will be completely founded upon the continued but slowing growth in aquaculture output. Capture fisheries production is expected to fall slightly over the outlook, period and result in 1.05 Mt less fish being caught in 2027 than in the base period (growth rate of -0.01% p.a.), mainly due to a reduction in catches by China. This decline should be partly compensated by expected growth in other areas also thanks to stricter management measures, which should allow the recovery of certain stocks.

Figure 8.1. The potential impact of the Chinese plan on growth in world aquaculture and capture production



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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A greater share of fish production will go to human food consumption by 2027 (91%) than in the base period (89%). However, mirroring the slowdown in fish production growth, global food fish consumption is anticipated to increase by just 1.2% p.a., a substantial decline when compared to the 3.0 p.a. growth rate witnessed over the previous decade. Overall food fish will increase from 153 Mt in the 2015-17 base level to 177 Mt in 2027. About 72% of this total will be consumed by Asian countries, which will account for 73% of the total increase in food fish consumption. In per capita terms, apparent fish food consumption is projected to rise slightly, from 20.3 kg in the base period to 21.3 kg in 2027, with the annual growth rate declining from 1.8 to 0.3%. Per capita fish consumption will increase in all continents, except Africa (–4% as population growth outpaces growth in supply), with Latin America and Asia showing the highest growth rate.

Fish and fish products for human consumption and non-food products will continue to be highly traded with about 38% of total fishery production (31% excluding intra-EU trade) expected to be exported in 2027. World trade of fish for human consumption is projected to expand by 18% or 7 Mt live-weight equivalent (lw) by 2027. However, its annual growth rate for exports will decline from the 1.9% p.a. observed in the previous decade to 1.6% p.a. over the coming decade partly owing to increasing prices, and the slowdown in production. Asian countries will continue to be the main exporters of fish for human consumption, slightly increasing their share in world exports from 49% in the base period to 50% in 2027.

In addition to the possible consequences of the potential changes to be implemented in the fisheries and aquaculture sector in China, a number of uncertainties and challenges exist that influence the evolution and dynamics of the world fisheries and aquaculture sector. For production, these include issues related to the natural productivity of fish stocks and ecosystems, environmental degradation and habitat destruction, overfishing, illegal, unreported and unregulated fishing (IUU), climate change, weather patterns, transboundary issues with respect to natural resource utilisation, poor governance, invasion of non-native species, diseases and escapes, accessibility and availability of sites and water resources, as well as to technology and finance. Furthermore, trade policies, trade agreements and market access remain important factors influencing the overall dynamics of the fish markets. From the perspective of market access, issues include those related to food safety and traceability, the need to demonstrate that products are not derived from illegal and proscribed fishing operations.

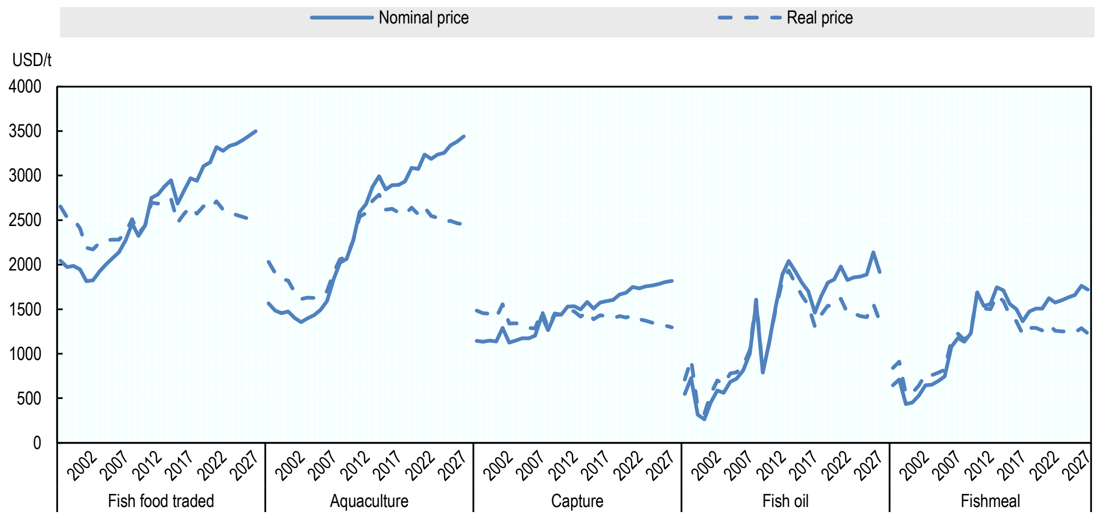
Prices

Fish prices continue to remain at relatively high levels. In nominal terms they are expected to follow an increasing trend over the duration of the projection, with prices for aquaculture, capture and traded fish all growing at averages of less than 2% p.a. over the period 2018-2027. In real terms, average prices for both aquaculture and capture species are expected to fall; aquaculture by 0.7% p.a. and capture by slightly over 1% p.a.). Real prices for traded fish tend to increase over the short term before starting to fall after 2022, resulting in the annual average growth rate falling by 0.6% p.a. over the duration of the projection (Figure 8.2).

World fish prices are determined by both demand and supply side factors; on the demand side these elements include world population, income, and the price of substitutes such as meat. On the supply side prices are influenced by levels of production which, in turn, are affected by input prices, such as energy or feed in the case of aquaculture, and the physical limits of the natural resource base. The last of these is especially relevant for capture fisheries, which are constrained by the levels of production that wild fish stock populations can sustain. The growth of certain aquaculture species also depend upon their ability to reduce their dependence on the use of wild caught fish, transformed into fishmeal.

A major factor influencing prices in the current projection is the expectation that production growth in China will slow substantially and result in upward pressure on global prices. To put this in context, in the absence of China’s reforms the real world price of traded fish would have followed the same downward trend as anticipated for the world poultry price. In this *Outlook*, however, the downward trend only starts in 2022. Within China, nominal fish retail prices are expected to increase by just less than 2% p.a. over the outlook period, a rate that slightly exceeds the world average (1.65% p.a.).

Figure 8.2. World fish prices



Note: Fish food traded: world unit value of trade (sum of exports and imports) of fish for human consumption. Aquaculture: FAO world unit value of aquaculture fisheries production (live weight basis). Capture: FAO estimated value of world ex-vessel value of capture fisheries production excluding for reduction. Fishmeal: 64-65% protein, Hamburg, Germany. Fish oil: any origin, N.W. Europe.

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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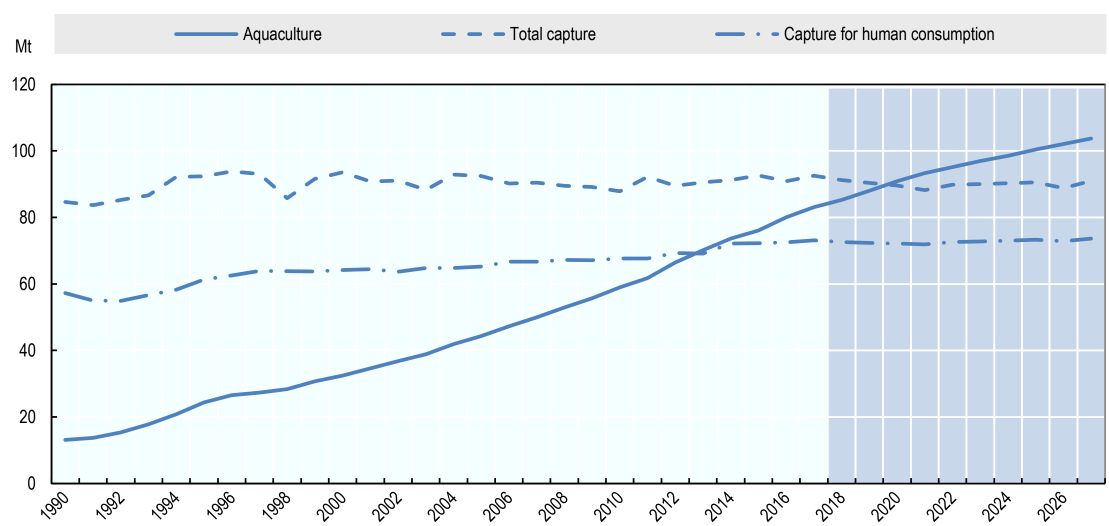
The anticipated increase in world traded prices continues to be driven by aquaculture prices, which are expected to grow by an average of just over 1.5% p.a. in nominal terms over the outlook period. This growth equates to an increase of 19.5% in absolute terms by 2027 when compared to the base period. In this *Outlook*, aquaculture prices and the resultant growth figures are strongly influenced by both the expected slowdown in aquaculture production growth at the world level, mostly caused by the assumed changes in Chinese production, and the upward revision of data on the value of Chinese aquaculture production. The first of these revisions results in upward price pressure at the world level whilst the second has substantially increased the base from where aquaculture prices start in the projection. As before, the ability for aquaculture to influence the species mix it sells is also a factor in it achieving higher average prices than the capture sector (USD 3 439/t *vs* USD 1 819/t). Capture fisheries prices are also anticipated to increase in nominal terms but at a flatter trajectory, averaging 1.2% p.a. over the same period. In real terms, and other than in the assumed *El Niño*[4] years, all prices are expected to fall over the period of the outlook.

The popularity of omega 3 fatty acids in the human food diet and the specific characteristics required for feed by the aquaculture sector are assumed to have permanently increased the fish to oilseed oil price ratio and it is not expected that new feeding techniques will change this in the short to medium term. With slower but continuing growth in demand from aquaculture and rather stable supply, the price of fishmeal is expected to grow by a small amount relative to oilseed meals. No further increase is currently foreseen for fish oil, whose price ratio with oilseed is already high following the structural change observed beginning in 2012. World prices of fishmeal and fish oil are expected to generally follow the price of oilseed products over time as a consequence of strong substitution possibilities on the demand side. World prices for fishmeal and fish oil, which have been in decline since peaking in 2013, are expected to start increasing again in nominal terms over the duration of the outlook, Fishmeal by 1.8% p.a. and fish oil by 1.6% p.a. Real prices will continue to fall but by only just under 0.5% p.a. for fishmeal and 0.7% p.a. for fish oil.

Production

Total fish production at the world level will continue to grow, increasing by slightly more than 1% p.a. over the duration of the outlook to 195 Mt by 2027 and result in an additional 22.9 Mt of fish being produced when compared to the base period (Figure 8.3). This rate of growth and the quantity of additional fish produced are substantially lower than those observed over the previous decade though (2008-2017), when growth was 2.4% p.a. and the increase in quantity of fish produced was 37.4 Mt greater (difference in production between the base period 2005-2007 and 2017). The growth in total fish production is also entirely driven by aquaculture production, which is expected to increase by 30.1% over the outlook period (24 Mt) and overtake total capture fisheries in 2020.

Figure 8.3. Aquaculture and capture fisheries



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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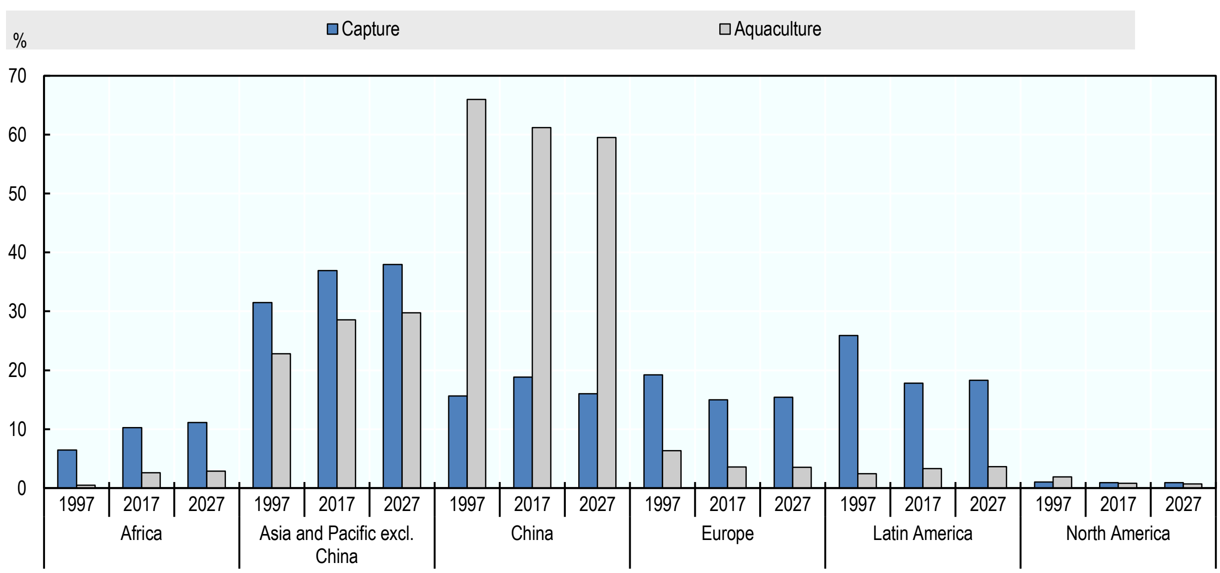
China accounted for 38.8% of world fish production in the current base period (61.5% of world aquaculture production and 19.0% of capture in 2015-2017). Given its significance at the world level, it should be noted that a key factor influencing the fish sector in this *Outlook* is the set of assumptions made relating to the implementation of China's 13th Five Year Plan, which is expected to reduce both the country's level of capture production and the growth rate of its aquaculture production. For example, total Chinese fish production by 2027 as projected in this *Outlook* is expected to be 4.3 Mt lower than potential production without implementation of the plan (*status quo* scenario) of fish (Box 8.1). At the world level, the assumed reduction in Chinese production results in 2.9 Mt less fish being produced by 2027, as some of the reduction is mitigated by increases in production elsewhere. Despite the anticipated changes within China, the majority of world fish production will still originate from Asia, increasing from 70.8% of total production in the base period to 71.8% by 2027.

Aquaculture growth at the world level is expected to continue facing challenges associated with factors that include environmental regulations, diseases related to stocking density, and a reduction in the availability of optimal production locations. World aquaculture production is projected to increase by just over 2.1% p.a. over the duration of the current outlook, this rate of growth is substantially lower than the 5.1% p.a. observed for the previous decade but in line with the observed trend of falling aquaculture growth rates over the last five decades. While the absolute increase in the quantity of fish produced by aquaculture is smaller over this projection (24.0 Mt) than in the previous decade (35.9 Mt) the percentage growth rate calculations are also moderated by continued growth in the absolute size of the underlying base number.

Figure 8.4. Regional contribution to world total production



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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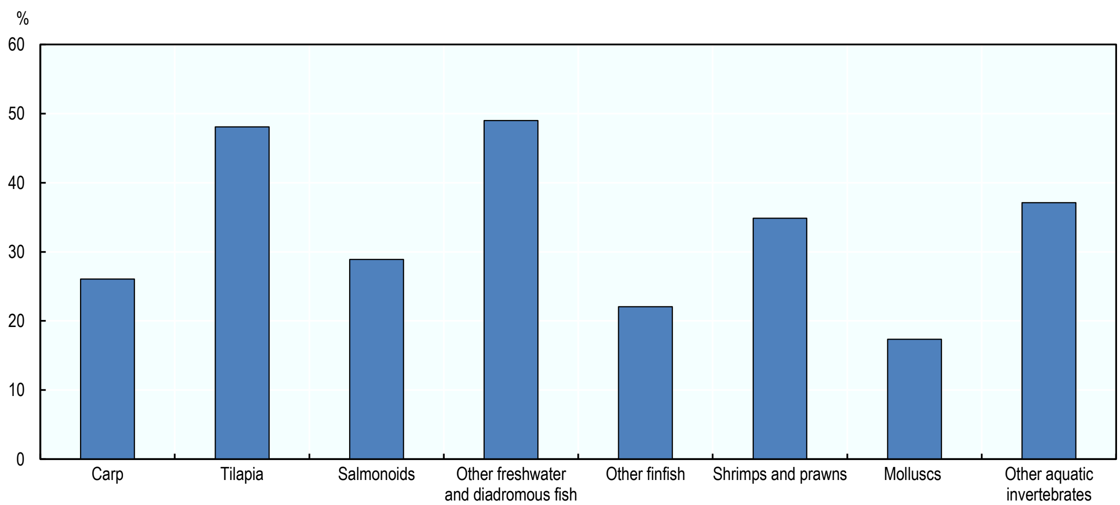
World capture production will be relatively flat over the outlook period, falling by a total of just over 1% between the base period and 2027, from 92.0 Mt to 91.0 Mt. Due to the rapid reduction in capture production by China at the beginning of the outlook period, world aquaculture production is now anticipated to surpass total wild capture fisheries production (food and non-food uses) in 2020, a year earlier than anticipated in the previous *Outlook*.

Pressure for greater fish production at the world level is expected to come about as a consequence of the price effect of lower growth in world fish supply and continuing growth in demand. Increases in production will predominantly be met by aquaculture, where output is expected to increase in areas other than China, particularly within Asia. As it is assumed that quota under-fill is minimal in capture fisheries and current potential for further growth is limited by the resource base. China was responsible for 59% of growth in world aquaculture production over the previous decade but this share is expected to fall to 53% over the current outlook period. Simulations undertaken with the model that consider the *status quo* versus a full implementation of the objectives of the 13th Plan have indicated that other countries potentially have the ability to replace just over 50% of the lost aquaculture production but only 14% of the lower capture production (Box 8.1). This outcome in China will also contribute to a change in the species composition of world aquaculture production. The share of salmon and trout, shrimp, catfish (including pangas) and tilapia will increase while that of carps, marine fish and molluscs will fall. However, all the species groups showed an increase in production even if at different growth rates (Figure 8.5). Given these different growth rates by species, the share of aquaculture production harvested in inland waters is expected to increase over the outlook period, but at a slower pace than in the previous decade. That share went from 60% in 2007 to 64% in 2017 and it is expected to reach about 66% by 2027.

Figure 8.5. Growth in world aquaculture production by species, 2027 vs 2015-17



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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The share of wild fish reduced to produce fishmeal and fish oil is expected continue declining over the next decade, following the fall in world capture production. However, because the use of fish residue to produce fishmeal and fish oil will also continue to increase, as growing market demand for fillets is resulting in more residues being produced, the absolute level of world fishmeal and fish oil produced will gradually increase (except in *El Niño* years) to 5.2 Mt and just under 1.0 Mt respectively in 2027. These increases equate to growth rates of just under 0.9% p.a. for fishmeal and slightly less than 0.6% p.a. for fish oil. The share of fishmeal production that comes from residue will increase from 29% in the base period to 33% in 2027. The consequences of this change on the composition and quality of fishmeal (it will generally result in more minerals and less protein) is not captured by the model.

A notable consequence of the relatively limited ability for fishmeal production to increase and the continued growth of aquaculture is that a new, albeit relatively small, market for oilseed meals emerges to make up the shortfall. The observed price differential between fish and vegetable oil, and the increasing difference between fishmeal and oilseed meals suggest that crushing fish is likely to remain a profitable activity for those who have access to the base resource.

Box 8.1. China's 13th Five-Year Plan (2016-2020) foresees slower growth and greater efficiency for fisheries and aquaculture

The People's Republic of China (hereafter "China") guides its social and economic development through the use of five-year plans, which set out strategic intentions and define major objectives, tasks, and measures for economic and social development. The 13th five-year plan (2016-2020) sets out policies for the "transformation and upgrading" of the fisheries and aquaculture sector. Objectives include a continued shift away from the past emphasis on increasing production and a move towards a more sustainable and market-oriented sector, where the focus is on improving product quality and optimising industry structure. This includes the processing sector, with plans to reduce waste levels and establish industrial clusters.

China is the world's leading fisheries and aquaculture producer and exporter. The capture and aquaculture sector experienced rapid growth in output in the period 1980-2016, with aquaculture production increasing by about 10% per year on average and capture fisheries by almost 5%. A major contributor to this expansion was production oriented government policy, which aimed to expand the output of both aquaculture and capture fisheries, as well as the liberalisation of fish production and trade.

The new five-year plan seeks to address current challenges to the sector, which include limited farming space, scattered small-scale farms, degraded fisheries resources and excess capacity in the capture sector. The objectives for aquaculture development include:

- Demand-oriented production that produces species for which there is a market.
- "Healthy aquaculture" production that is standardised, sustainable and better integrated with the environment.
- Ecologically sound technological innovation to facilitate the sustainable intensification of production.
- For fisheries, the main objectives relate to:
- The protection of marine ecosystems and the restoration of resources within China's exclusive economic zone (EEZ).
- Constraining capacity and landings through licensing and output controls - in the form of Total Allowable Catch (TAC).
- Reducing illegal, Unreported and Unregulated (IUU) fishing, control over fishing gears and vessels.
- Modernising vessels to improve efficiency and reducing fuel subsidies to 40% of 2014 levels by 2019.
- Developing the distant-water fleet.
- Restoration of domestic fish stocks through the use of restocking, artificial reefs, and seasonal closures.

These objectives aim to improve the efficiency and sustainability of the domestic sector by better coordinating activities and implementing policies that ensure the restoration of ecosystems that domestic fisheries and aquaculture depend upon. However, if fully realised, the plan also points to a potentially substantial decrease in Chinese domestic capture fisheries landings and a slowdown in aquaculture production growth.

As the practical measures to implement these objectives are not yet clear, the baseline projections take a conservative approach and factor in only the most likely changes. Under these assumptions, Chinese capture fisheries production is expected to decline during the outlook period, whilst aquaculture output should increase, both in terms of the quantity produced and as a share of total fishery outputs (from 75% in the base period to 81% in 2027), but with a slowdown of its growth rate.

Table 8.1. Scenarios for China and the world

	BASE	NONE Status quo scenario	PARTIAL Baseline	FULL Comprehensive scenario	NONE Status quo scenario	PARTIAL Baseline	FULL Comprehensive scenario
China	2015-2017	2027	2027	2027	(2018-27) % p.a.	(2018-27) % p.a.	(2018-27) % p.a.
Aquaculture[1]	49.0	64.3	61.7	58.9	2.3	1.9	1.4
Capture[1]	17.5	16.2	14.6	12.5	-0.1	-0.8	-2.1
Total production[1]	66.6	80.6	76.3	71.4	1.7	1.3	0.7
Food consumption[1]	59.5	70.7	69.1	67.5	1.4	1.2	1.0
Exports[1]	7.6	10.4	8.7	6.9	3.5	1.9	-0.4
Imports[1]	4.0	3.3	4.1	5.1	-2.5	-0.9	1.4
Per capita (kg)[2]	42.4	49.0	48.0	46.8	1.2	1.0	0.8
World							
Aquaculture[1]	79.7	105.2	103.7	102.6	2.2	2.1	2.0
Capture[1]	92.0	92.4	91.0	89.2	0.1	0.0	-0.2
Total production[1]	171.7	197.6	194.7	191.7	1.2	1.1	1.0
Food consumption[1]	153.2	185.9	183.6	180.7	1.3	1.2	1.1
Exports/imports	38.9	46.1	45.9	45.9	1.7	1.6	1.7
Per capita[2]	20.5	21.6	21.3	21.0	0.3	0.2	0.1
Price:							2.2
Aquaculture[3]	2878	3165	3439	3716	0.9	1.5	1.6
Product traded[3]	2828	3203	3499	3815	1.1	1.7	1.8
Fishmeal[3]	1475	1726	1720	1724	1.9	1.8	2.1
Fish oil[3]	1655	1879	1919	2018	1.4	1.6	

Notes: [1] in Mt; [2] in Kg; [3] USD/t

Source: Own calculations based on OECD/FAO (2018).

In order to gauge the potentially far-reaching consequences for the Chinese and the global fisheries and aquaculture sector, two ad hoc implementation scenarios have been developed: status quo before the plan (none) and another which simulates a comprehensive implementation of the five-year plan objectives (full). The results of the two scenarios and those of the baseline, reported in the fish and seafood section in Chapter 3, are presented for comparison in Table 8.1. The comprehensive scenario points to an overall reduction of fisheries and aquaculture production in China when compared to the baseline results and to the *status quo* (-5 Mt and -9 Mt, respectively in 2027), with an increase of only 4.5 Mt compared to the 2015-17 average level. However, the new policies also point to a reduction of waste which, when combined with China's trade balance falling as a consequence of reduced exports and increased imports, will partially limit the reduction of per capita fish consumption in China. Under the comprehensive scenario per capita consumption is expected to be 46.8 kg in 2027, instead of the potential 49 kg of the status quo or the 48.0 kg indicated in the baseline. The overall reduction in supply will increase fish prices in China by 32% in the comprehensive scenario as compared to 16% in the baseline.

At the world level, China's reduced production and lower net exports will impact prices. Aquaculture prices are expected to increase by 9% when moving from the status quo to the baseline and then by just over a further 8% under the comprehensive scenario, while capture prices are expected to increase by 6% and then just under a further 6%, respectively. The impact on world production will be partially mitigated by higher prices stimulating an increase in aquaculture production in other Asian countries but, given the practical constraints associated with natural capital and management in some of these areas, this response will not be sufficient to prevent world per capita fish consumption from declining from 21.6 kg in the status quo scenario to 21.3 kg in the baseline and to 21.0 kg in the comprehensive scenario.

Consumption

World fish food[5] consumption is anticipated to reach 177 Mt in 2027 with an overall increase of 24 Mt compared to the base period. A growing share of fish consumption is expected to originate from aquaculture production, which is projected to represent 58% of the total food fish consumed in 2027. The driving force behind the growth in food fish consumption will be a combination of rising incomes, population growth and urbanisation, together with a growing recognition of fish as healthy and nutritious food. Demand will also be facilitated by developments in food processing, packaging and distribution. However, the pace of this increase will slow with respect to previous decades. This slowdown is mainly due to lower production growth, leading to higher fish prices, and a deceleration in population growth. Per capita apparent fish consumption is anticipated to reach 21.3 kg in 2027, up from an average of 20.5 kg in 2015-17.

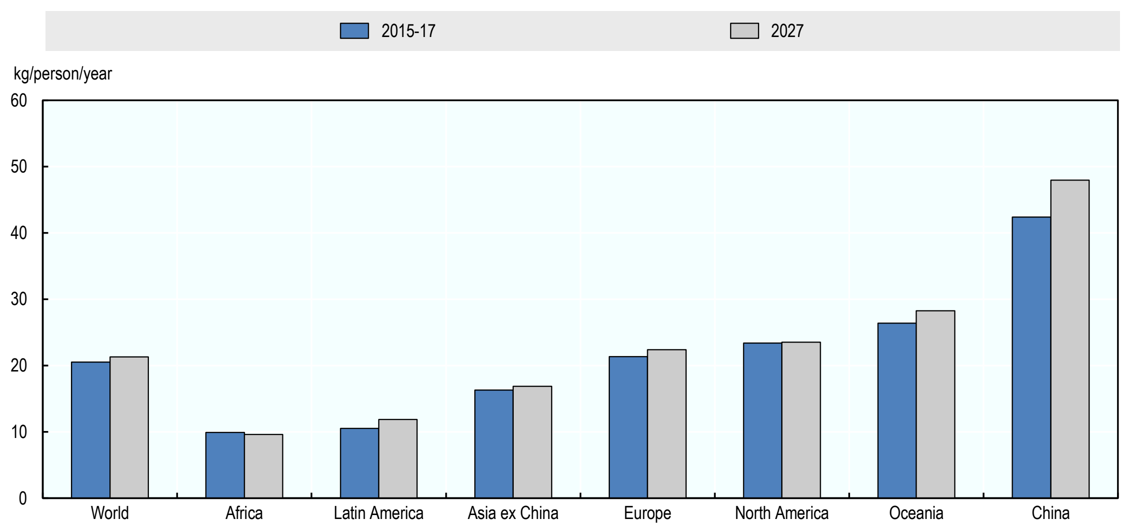
In the next decade, a major expansion in demand is expected to occur in developing countries, which will be responsible for 94% of the increase in consumption and will consume 81% of the fish available for human consumption in 2027. Despite this additional growth, annual per capita apparent fish consumption in developing countries will remain lower than that of more developed countries (21.0 kg *vs* 22.9 kg in 2027). Consumers in developed countries, with ageing populations and already high rates of per capita consumption, are projected to only slightly increase their per capita fish intake (from 22.7 kg to 22.9 kg).

Total fish food consumption should rise in all continents, by 2027 compared to the base period, with major growth expected in Africa (+26%), Oceania (+23%), America (+16%, with +24% in Latin America) and Asia (+16%). Despite the overall increase in the availability of fish to most consumers, marked differences will continue to exist among countries and within countries and regions in terms of quantity and variety consumed at per capita level and the subsequent contribution to nutritional intake Availability and incomes are not the only factors boosting fish consumption. It is evident that socio-economic and cultural factors including food traditions, tastes, seasonality and prices also strongly influence the level and the typology of fish consumed. As the fishery and aquaculture sector is highly globalised, consumers will also be exposed to and subject to the impacts of global trends, with a higher range of products and species available.

In per capita terms, fish consumption will increase in all continents except Africa (Figure 8.6), where it is projected to decline from 9.9 kg in 2015-17 to 9.6 kg in 2027, with a more substantial decrease in Sub-Saharan Africa. This decrease continues a trend that started in 2014 and is mainly caused by population growing faster than supply. Between 2015-17 and 2027, the population in Africa is anticipated to grow at 2.4% p.a., while the supply of fish for food consumption will increase by only 2.1% p.a. In order to satisfy the growing demand, Africa is expected to become further dependent on fish imports for human consumption (overall increase to 26%, at 2.5% p.a.), representing 36%

of total fish consumed in Africa and 43% if considering Sub-Saharan only. The decline in per capita fish consumption in Africa, with the subsequent reduction in the intake of fish proteins and micronutrients, can impact food security and their ability to meet malnutrition targets (2.1 and 2.2) of the United Nations (UN) Sustainable Development Goal (SDG) 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture). This is particularly relevant, considering that, at world level, the prevalence of undernourishment is highest in Africa and that the food security situation has recently worsened in particular in parts of sub-Saharan Africa.[6] Despite Africa currently having a lower per capita fish consumption than the world average, it has a higher proportion of fish to total animal protein intake. Fish represents about 19% of total animal protein intake in Africa and this can be higher than 50% in selected African countries, in particular in West Africa.

Figure 8.6. Per capita fish 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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Fish that is not consumed as food is reduced into fishmeal and fish oil and serves other non-food uses, such as for ornamental fish, culturing, fingerlings and fry, bait, pharmaceutical inputs, and as direct feed for aquaculture, livestock and other animals. Consumption of fishmeal and fish oil is expected to continue to be characterised by the traditional competition between aquaculture and livestock for fishmeal, and between aquaculture and dietary supplements for direct human consumption for fish oil, but to be constrained by the rather stable production. Due to their high prices and major innovation efforts, fishmeal and fish oil will continue to be used in more limited amounts in aquaculture feeds and to be more frequently used as strategic ingredients to enhance growth at specific stages of fish production. The reduction in fishmeal use will continue to expand the market for oilseed meals in the aquaculture industry, where oilseed meal use is anticipated to reach about 9.4 Mt in 2027. China will be the country to utilize the highest quantity of fishmeal as feed with a share of over 39% of the total in 2027. Fish oil is still expected to predominantly be used in the aquaculture industry, but also processed for direct human consumption as reach in omega-3 fatty acids, which are considered beneficial for a wide range of biological functions.

Trade

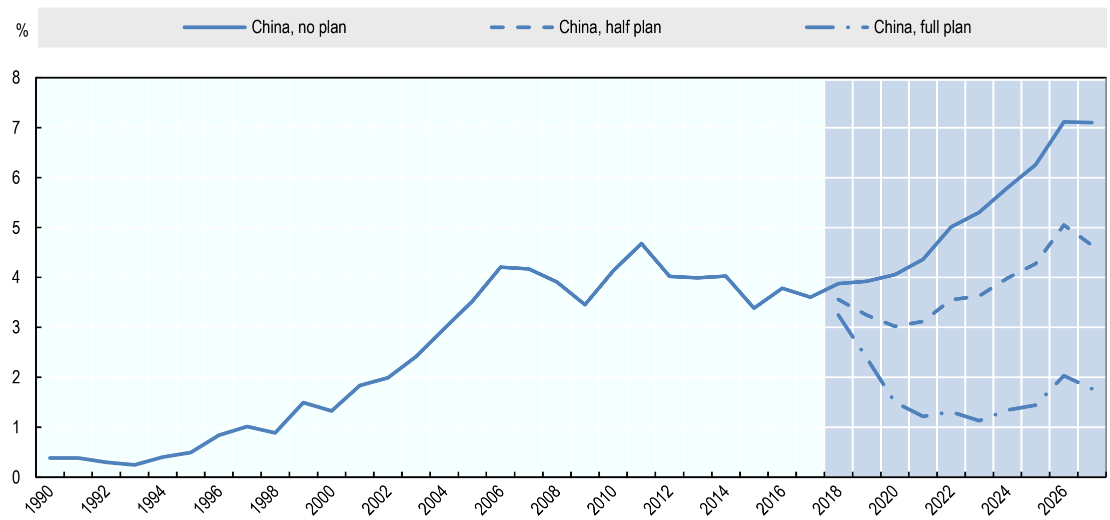
Fish and fish products are among the most traded food commodities worldwide. Trade plays a major role in the fishery and aquaculture sector as a creator of employment, food supplier, income generator, contributor to economic growth and development, and to food security. For many countries and for numerous coastal, riverine, insular and inland regions, fish exports are essential to the economy. The fisheries sector operates in an increasingly globalized environment, with fish that can be produced in one country, processed in a second and consumed in a third. About one third of production is expected to be exported in 2027 in different products forms and species. Sustained demand, trade liberalisation policies, globalisation of food systems, improved logistics and technological innovations will further expand international fish trade, even if at a slower rate than in the previous decade. World exports of fish for human consumption are projected to reach almost 46 Mt lw, 7 Mt more compared to the average 2015-17 level. However, the annual growth rate of exports is expected to slow due to increasing prices, high transportation costs, slower expansion of fish production and more sustained domestic demand in some key countries, including China.

Being the main producers, developing nations are expected to remain the key suppliers to world markets, notwithstanding a slight decline of their share in total trade of fish for human consumption (from 66% in the base period to 64% in 2027). China, Viet Nam and Norway will continue to be the world's largest fish exporters. It is interesting to note that the Chinese 13th Plan can cause quite relevant impacts not only to production, but also to trade. Figure 8.7 illustrates these potential impacts as taking into account different stages of implementation of the plan: no plan, half plan (as included in this fish outlook) and full implementation of the plan that can strongly modify the trade balance for China, with further consequences at world level as well.

International trade has also played an important role in broadening fish consumption by providing wider choices to consumers. A sizeable and growing share of fish consumed in North America, Europe and Africa consists mainly of imports, owing to steady demand, also for non-locally produced species, and static or declining domestic fishery production. The European Union, the United States and Japan will remain the leading importers. OECD countries will consolidate their position as the leading importers of fish for human consumption with a 54% share of world imports in 2027. Overall, developed countries will maintain their 53% share in total imports of fish for human consumption in 2027. Developing countries are expected to increase their imports of fish for human consumption. These will consist of supplies of raw material, which are then processed and subsequently re-exported and, growingly, of products destined to meet surging domestic consumption, in particular for species not produced locally.

Trade of fishmeal is expected to increase by 8%[7] by 2027 as compared to the base period. Peru and Chile are estimated to remain the leading exporters of fishmeal, while Asian countries, and in particular China, are projected to remain the main importers of fishmeal due to their sizeable aquaculture production. European countries will continue to be the main importers of fish oil (mainly for salmon production, but also for pharmaceutical purposes) with a share of 52% of world imports of fish oil.

Figure 8.7. China: Net-trade of fish for human consumption according to the implementation of the plan



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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Main issues and uncertainties

The projections reported and discussed in this chapter represent the anticipated scenario for fish and seafood over the forthcoming decade. Developing these projections depends upon assumptions being made with respect to a range of economic, policy and environmental conditions, and unforeseen changes to these conditions thus have the potential to result in different outcomes, making the projections subject to some level of uncertainty. This section sets out and discusses some uncertainties and potential issues that may arise over the projection period.

The influence of *El Niño* events are explicitly accounted for in the modelling process (in 2021 and 2026) but their frequency and ultimate effect on global fish production are assumed on the basis of previous behaviour[8]. The influence of climate change, weather variability and changes in the frequency and extent of extreme weather events are anticipated to disrupt existing capture fisheries and aquaculture production, contributing to existing sustainability concerns in some cases. For capture fisheries, changes in fish migration patterns have started to generate international jurisdiction issues and to create fisheries management challenges in instances where fish stocks are migrating to other managed areas. As indicated in previous issues of the *Outlook*, climate change is expected to affect not only fish production but the entire value chain, with effects of different kinds and magnitude. A recent FAO study[9] provides a comprehensive analysis of the key climate impacts in the fishery and aquaculture sector. It gives an overview of potential changes in terms of impacts, vulnerabilities and production levels by sectors and regions and also provides methods and tools for climate change adaptation in fisheries and aquaculture. Many other studies and analyses are being undertaken, but the precise mechanics of how, where and when these impacts will occur are too complex to directly account for in the present *Outlook* and, with the exception of *El Niño*, the projection consequently assumes normal weather conditions will continue from 2018.

In addition to climate change, a wide ranging set of other policy and environment-related factors are known to influence the evolution and dynamics of the fisheries and aquaculture sectors. Many of these issues have been discussed at some length in previous editions of the *Outlook* (e.g. stock status, pollution, sector specific issues) and remain relevant.

The global level of fish production, accounting for both aquaculture and capture fisheries, is strongly influenced by management policy and enforcement. On the basis of existing policies, expectations are that capture production at the global level will remain relatively stable over the coming decade, whilst aquaculture production will continue to grow but at a slower rate than seen over the last decade. Governments are increasingly aware of the need for improved fisheries management frameworks, and the better solutions that are available. As a consequence of better and more effective resource management practices in certain regions of the world some stocks and fisheries are showing signs of recovery and this is expected to continue in the next decade. This will help maintain and potentially increase overall capture fisheries by increasing catch in some fisheries and areas. The extent to which this is likely to occur is still subject to some uncertainty but it is also a potentially positive development. Unfortunately, the objective of sustainable fisheries can be undermined by policies that ultimately encourage unsustainable harvest levels and methods, such as those that aim to support incomes or increase production. Reform can also be difficult to achieve in practice due to poor information, insufficient resources, policy incoherence, vested interests and lack of trust[10]. In this respect it is important that countries have set objectives as part of UN SDGs to restore fisheries' sustainability and eliminate harmful support policies. A further noteworthy source of uncertainty with respect to fish production is the eventual impact of China's current five-year plan (Box 8.1). While this change is partially factored into the baseline, it is difficult at this stage to be certain of the eventual magnitude of impact to capture and aquaculture production.

Fisheries subsidies and IUU fishing, especially in the context of the UN SDGs, are ongoing issues of discussion at the international level. Despite an inability to agree to text on subsidy prohibitions relating to IUU fishing and overfished stocks at the World Trade Organization's Eleventh Ministerial Conference (MC11) in December 2017, it is still possible that some progress could be made in the relatively near future. Delegations at MC11 agreed to continue to engage constructively in the fisheries subsidies negotiations, with the objective of adopting an agreement in 2019. If meaningful progress can be made in this area it has the potential to affect capture production from some areas, reducing it in the short to mid-term. There is a high degree of uncertainty though as to whether or when agreement will be reached and the extent of the production related effect it will have if it is.

From a trade perspective uncertainties persist with respect to both global and regional trade agreements. A specific case of trade related uncertainty over the projection period is the yellow card status awarded to Viet Nam by the European Union under its IUU Regulation in October 2017, due the country being assessed as taking insufficient action to fight IUU fishing. The yellow card in itself does not entail any form of trade limiting measures but if sufficient action is not taken to lift it there is the risk of this being followed by a red card, which can be accompanied by a complete ban on products caught by Vietnamese vessels being imported into the European Union. Such an outcome would imply at least short term changes in some trade relationships and flows.

Notes

1 Which results in a scenario that is in-between last year's *Outlook* and the scenario showing the largest decline in the aquaculture growth rate and capture production.

2 The terms "fish" and "fish and seafood" indicate fish, crustaceans, molluscs and other aquatic invertebrates, but excludes aquatic mammals and aquatic plants. All quantities are expressed in live weight equivalent, except those of fishmeal and fish oil.

3 A small *El Niño* is also assumed in 2021 but its effect is not sufficient to reduce world fish production relative to 2020.

4. Set in the model at 2021 and 2026.

5. Fish for food/human consumption indicates fish production, excluding non-food uses, such as fish destined to reduction into fishmeal and fish oil, minus exports, plus imports, plus/minus stock data. Fish consumption data reported in this section refer to apparent consumption, which refers to the average food available for consumption, which, for a number of reasons (for example, waste at the household level), is not equal to edible food intake/edible food consumption.

6 FAO, IFAD, UNICEF, WFP and WHO. 2017. The State of Food Security and Nutrition in the World 2017. Building resilience for peace and food security. Rome, FAO.

7 That percentage is affected by the small trade in 2016 due to a strong *El Niño* event.

8 The assumed magnitude of *El Niño* events in the *Outlook* is determined on the basis of previously observed events using historic Oceanic *Niño* Index values, a measure of the South Pacific water temperature Oscillation.

9 Barange, M., et al. (Eds.) (2018), "Impacts of Climate Change on fisheries and Aquaculture: Synthesis of Current Knowledge, Adaptation and Mitigation Options", *FAO Fisheries Technical Paper 627* (in press).

10 On 2 May 2018 the OECD organised the conference "Making reform happen for sustainable fisheries", which brought together policy-makers and specialists from business, academia and civil society to explore practical ways to accelerate fisheries policy reforms.

Chapter 9. Biofuels

This chapter describes the market situation and highlights the latest set of quantitative medium-term projections for world and national biofuel markets for the ten-year period 2018-27. Given current policy developments and trends in diesel and gasoline demand, global ethanol production is expected to expand from 120 bln L in 2017 to 131 bln L by 2027, while global biodiesel production is projected to increase from 36 bln L in 2017 to 39 bln L by 2027. Advanced biofuels based on residues are not expected to take off over the projection period due to lack of investment in research and development. Trade in biofuels is projected to remain limited. Global biodiesel and ethanol prices are expected to decrease respectively by 14% and 8% in real terms over the next decade; however, the evolution of ethanol and biodiesel markets will continue to be shaped by policies and demand for transport fuel, which implies considerable uncertainty on these projections.

Market situation

Crude oil prices increased by 25% in nominal terms in 2017, but remained weak at USD 54.7 per barrel on average over the course of the year. The evolution of biofuel and biofuel feedstock prices was contrasting. Maize and ethanol prices declined by 5% and 2.3% respectively, while vegetable oil and biodiesel prices increased by 1.8% and 8% respectively. The biofuel-to-biofuel feedstock price ratios increased slightly but remained below their average values over the previous decade.

Policy decisions were globally favourable to biofuels in 2017 with developments such as mandate increases and differential taxation systems or subsidies enacted or announced in several countries. Demand for biofuels was sustained by bioenergy obligatory blending and by important demand for transportation fuels due to continued low energy prices. Unfavourable price ratios of biofuels to conventional fuels resulted in limited demand for non-mandated use of biofuels.

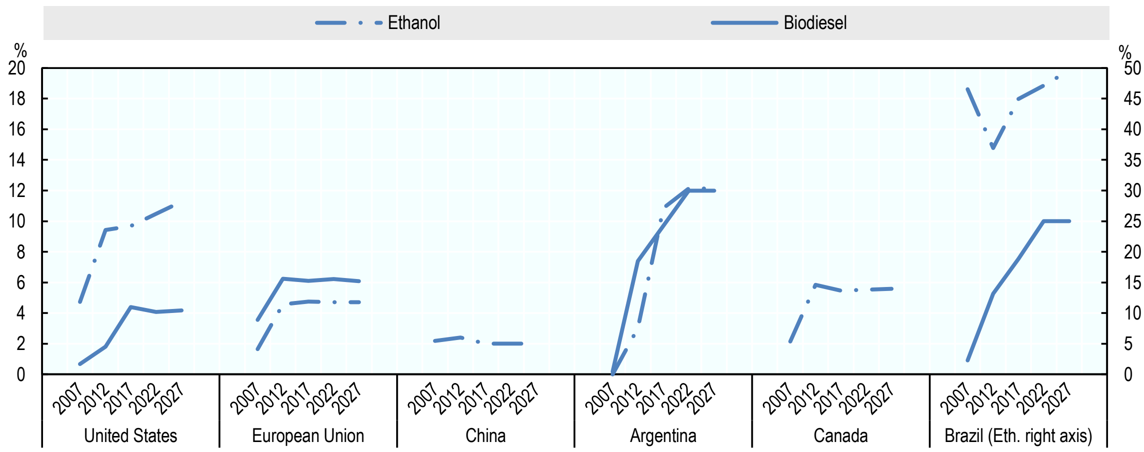
Projection highlights

International crude oil prices are expected to increase by 40% in nominal terms over the baseline period. This should lower demand for gasoline and diesel fuels, especially in developed countries. Biofuel prices, similar to biofuel feedstock prices, should trend slightly upward but at a slower pace than energy prices. Influenced by developments on the vegetable oil markets, biodiesel prices are expected to increase at a slower pace than ethanol prices in nominal terms. Global biodiesel and ethanol prices should decrease respectively by 18% and 4% in real terms over the next decade. The evolution of ethanol and biodiesel markets over the baseline period is expected to continue to be driven by policies. Biofuel policies are subject to uncertainty. Projections presented for biofuel markets in this *Outlook* assume a continuation of current policies over the next ten years, although some general policy targets will not be met owing to the absence of the necessary policy instruments to achieve them.

For the United States, all mandates are assumed to remain at their announced levels for 2018 except the cellulosic mandate. The latter is assumed to more than double over the projection period, but to reach only 4.5% of the level specified in the 2007 Energy Independence and Security Act (EISA) by 2027. The ethanol blend wall[1] is set to increase to 11.3% by 2027. This *Outlook* thus assumes a limited development of mid-blends of ethanol. In addition, biodiesel use is assumed to remain above the biodiesel mandate in the early years of the outlook period to meet part of the advanced mandate[2] (Figure 9.1).

The use of biofuels in the European Union is assumed to be governed by the 2009 Renewable Energy (RED) and Fuel Quality Directives and the 2015 ILUC Directive, as well as by national legislations. The proportion of total transportation energy accounted for by biofuels, including double counting for waste- and residue-based biofuels, is expected to reach 5.9% by 2020 and to decrease to 5.8% by 2027. The remainder of the 10% RED target should be met from other renewable energy sources. This *Outlook* does not take into account the European Parliament’s proposal agreed to on 17 January 2018 to reach 12% renewable energy in transport by 2030. This proposal also places other restrictions on the use of biofuels based on food and feed feedstocks described below.

Figure 9.1. Evolution of ethanol blending in gasoline fuels and of biodiesel blending in diesel fuels



Note: Shares are expressed in volume.

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/10.1787/888933743689

It is assumed that the Brazilian taxation system will remain favourable to hydrous ethanol rather than to gasohol,[3] which corresponds to the mandatory mix of 27% ethanol with gasoline. The Brazilian ethanol demand is expected to increase by 5.4 bln L over the outlook period, and the country's biodiesel mandate should reach 10% by 2020, leading to an increase in biodiesel production of more than 40% over the next ten years. The RenovaBio programme was signed in January 2018 and should be implemented in the course of 2019. The programme targets a fuel ethanol share in the fuels matrix of 55% by 2030, compared to the 50% share assumed in this *Outlook*. In Argentina, it is assumed that the 10% blending mandate for biodiesel and 12% mandate for ethanol will be fulfilled by 2020. The primary focus of Argentinean biodiesel production will probably be domestic, although some biodiesel trade is expected in the early years of the projection period, principally to the European Union as trade barriers will limit US import demand.

In September 2017, the Chinese government announced a new nationwide ethanol mandate that expands the mandatory use of E10 fuel from 11 trial provinces to the entire country by 2020. Mechanisms for implementation have not been announced yet and thus the announcement is not taken into account in this *Outlook*. Box 1.1 provides a description of the potential impact of such a move. Thailand is expected to expand its domestic ethanol production by 1.2 bln L by 2027, becoming a significant player on biofuel markets. The Thai Government plan to increase use of biofuels entails a differential taxation and subsidy system that are favourable to higher blends of ethanol in gasoline.

The Indian government should continue to support the production of ethanol from molasses. It is assumed, however, that the observed blending share of ethanol in gasoline will remain lower than the 5% mandate and will decline over the projection period. The Indonesian government has a 20% biodiesel blending mandate; however this *Outlook* assumes this mandate will not be fulfilled as the development of biodiesel is related to the potential attribution of subsidies to biodiesel producers who depend on vegetable oil exports.

Given these policy assumptions as well as the IEA assumptions concerning future diesel and gasoline demand across the world, global ethanol production should expand from 120 bln L in 2017 to 131 bln L by 2027, while global biodiesel production should increase from 36 bln L in 2017 to 39 bln L by 2027. By 2027, 55% of global ethanol production should be based on maize and 26% on sugarcane. In 2027, about 20% of global biodiesel production should be based on waste vegetable oils. Advanced biofuels based on residues are not expected to take off over the projection period due to lack of investment in research and development.

Trade disputes related to biofuels have had a major impact on the recent evolution of biofuel trade. Following a 2018 WTO ruling, Argentina and Indonesia can again export biodiesel with lower duties to the European Union. However, anti-dumping duties have recently been set up in the United States against these countries' biodiesel, and which may once again be challenged at the WTO. As such, this *Outlook* assumes biofuel trade will remain limited. Potential ethanol exporters are the United States, as the blend wall limits further increases in domestic demand, and Brazil. Brazilian ethanol exports are, however, not expected to increase as US ethanol will likely remain cheaper over the outlook period. On the biodiesel side, Argentina will likely be the major player, but with limited import demand.

Main assumptions

Since the early 2000s, the development of global biofuel markets has been driven by policies encouraging their production and use. Policies were initially motivated by a combination of factors, including the view that biofuel use would improve energy security and reduce greenhouse gas emissions (GHG). Government support for the biofuel industry takes the form of blending mandates, exemptions from taxes applied to corresponding petroleum fuels, and investment support. Biofuel markets are also affected by policies that apply sustainability criteria, fuel quality standards, and import tariffs on ethanol and biodiesel. The projections presented in this *Outlook* are based on a set of assumptions concerning the evolution of biofuel policies around the world in the medium term.

In the United States, the EISA defined in 2007 the Renewable Fuel Standard programme (RFS2).[4] Under this programme, EISA established four quantitative annual mandates up to 2022: the total and advanced mandates that require fuels to achieve at least a 20% and a 50% GHG reduction respectively, as well as the biodiesel and the cellulosic mandates that are nested within the advanced mandate. The Environmental Protection Agency (EPA) establishes on an annual basis the minimum quantities for each of the four classes of biofuels required.

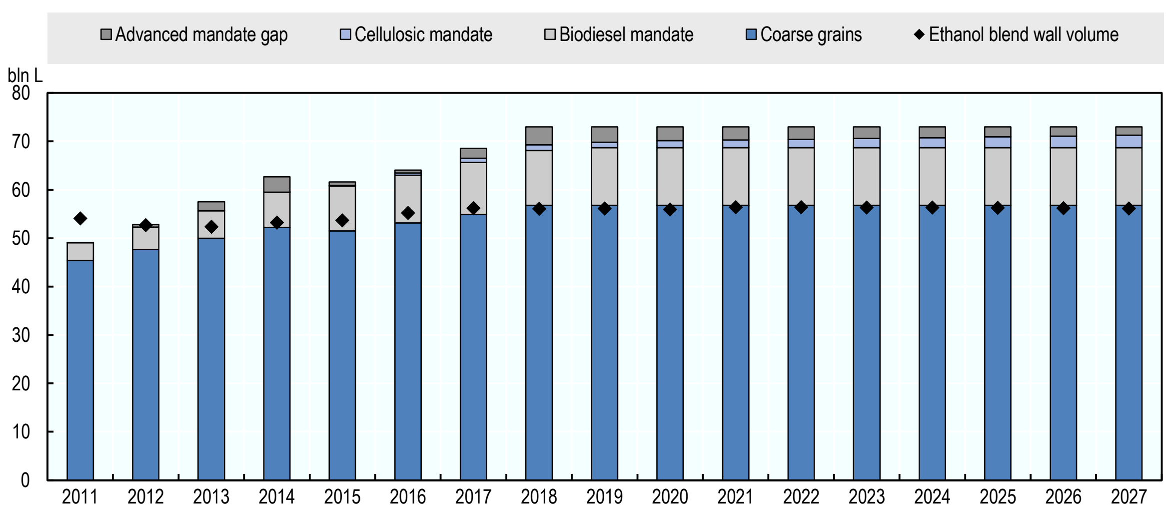
The EPA final rulemaking for 2018 and the biodiesel volume requirement for 2019 were issued in November 2018. Similar to the 2017 final rulemaking, an important part of the initial levels proposed in EISA for the total, the advanced and the cellulosic mandates was waived based on the fact that production capacity for cellulosic ethanol has not developed; the conventional gap,[5] often referred to as an implied coarse grains mandate constant, was maintained at 56.8 bln L. The final standards recently announced were kept at high level; which means that in view of the stagnating or decreasing prospects of gasoline and diesel demand, the availability of higher ethanol blends at the pump will need to be developed somehow over the short- to medium-term. At present, even if the maximum blend of ethanol for conventional petrol vehicles is set in the United States at

15% for vehicles produced in 2001 or later, E10[6] is still the most commonly available gasohol in the United States due to the blend wall constraints.

This *Outlook* assumes that all categories of mandates will remain at their recently announced levels in volume terms despite the decreasing use of transportation fuel. The exception is the cellulosic mandate, which is assumed to more than double over the projection period, even if reaching only 4.5% by 2027 of the level specified in EISA. It is assumed that the cellulosic mandate will be filled, mostly with renewable compressed natural gas and renewable liquefied natural gas. The ethanol blend wall is set to expand moderately beyond 10% to reach 11.3% by 2027.

Figure 9.2 shows the assumed evolution of mandates in the United States and the blend wall ethanol volume, i.e. the ethanol volume that can be consumed in the United States according to the expected evolution in gasoline use and blend wall constraint. In 2018, the conventional gap should be slightly above the volume of ethanol that can be blended according to the blend wall issue. Biodiesel use is thus projected to remain at levels close to 9.5 bln L in the early years of the outlook period, above the biodiesel mandate, in order to meet part of the advanced mandate, while imports of sugarcane-based ethanol should remain limited. In the latter years of the projection period, the advanced mandate gap is expected to narrow. The biodiesel blender tax credit is not assumed to be reinstated over the outlook period, and antidumping duties on Argentinean and Indonesian biodiesel are assumed to limit US biodiesel import demand.

Figure 9.2. Assumptions concerning the US biofuel mandates



Note: The advanced mandate gap, the gap between the advanced mandate and the sum of the biodiesel and cellulosic mandated volumes, can be met by biofuels being able to achieve a 50% greenhouse gas reduction such as cellulosic biofuels, sugarcane based ethanol or biodiesel.
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/10.1787/888933743708

The 2030 Framework for Climate and Energy Policies for the European Union,[7] which targets a 40% cut in GHG emissions by 2030 compared to 1990 and a renewable energy share of 27% by 2030, does not propose concrete targets for the transport sector after 2020. At present, the policy framework concerning biofuels is determined by the 2009 Renewable Energy Directive[8] which states that renewable fuels (including non-liquids) should increase to 10% of total transport fuel use by 2020 on an energy-equivalent basis, and by the Fuel Quality Directive which requires fuel producers to reduce the GHG intensity of transport fuels by 2020. Both directives were amended in September 2015 by a new Directive referred to as the Indirect Land Use Changes (ILUC) Directive,[9] and which introduced a 7% cap on renewable energy in the transport sector coming from food and feed crops.

This *Outlook* assumes a continuation of current policies at the European and Member country levels. In accounting for the fact that each unit of advanced biofuel consumed – including those produced from used cooking oil and tallow – counts double for the purpose of the RED, the projection assumes that the portion coming from biofuels expressed in energy share will reach 5.9% by 2020 and to decrease to 5.8% by 2027. The remainder of the 10% RED target should be met from other renewable energy sources. The portion of renewable energy in the transport sector coming from food and feed crops in the European Union should remain well below the current 7% cap at 4% on average over the projection period.

The evolution of biofuel policies in the European Union is likely to evolve in the near term. The European Parliament proposed on 17 January 2018 to reach 12% renewable energy in transport fuel by 2030. This proposal states that the consumption of biofuels based on food and feed feedstock cannot increase above the 2017 levels[10] and defines a 7% cap for food and feed biofuels at the Member States level. Palm oil-based biodiesel would be prohibited after 2021 and the share of advanced biofuels, including waste-based biofuels, should reach 1.5% by 2021 and 10% by 2030. The current *Outlook* does not take this proposal into account.

In Canada, the federal Renewable Fuels Regulations mandates 5% renewable content in gasoline and 2% in diesel fuel. This regulation could be replaced some time in 2019 by the Canadian Clean Fuels Standard (CFS), the regulatory framework of which was presented in December 2017. The CFS would apply to liquid, gaseous and solid fuels combusted for the purpose of creating energy, in addition to the transportation sector. It would use a lifecycle approach to set carbon intensity requirements. The objective is to achieve 30 Mt of annual reductions in GHG emissions by 2030, contributing to Canada's effort to achieve an overall GHG mitigation target of 30% emission reduction below 2005 levels by 2030.

In Brazil, flex-fuel vehicles can either run on gasohol or on E100 (hydrous ethanol). Over the projection period, it is assumed that the anhydrous ethanol mandatory blending requirement for gasohol will remain at 27% and that the differentiated taxation system will continue to be favourable to hydrous ethanol rather than blended gasohol in key Brazilian states. The 10% biodiesel mandate is assumed to be met by 2020. The RenovaBio program, a follow-up of Brazil's commitment under the 2015 Paris Climate Agreement to reduce greenhouse gas emissions by 37% in 2025 and 43% in 2030 compared to 2005, was officially signed in January 2018 with a not-yet defined implementation plan. The programme defines a minimum blending target for anhydrous fuel ethanol that should reach 30% by 2022 and 40% by 2030 as expressed in volume terms. The fuel ethanol share in the fuels matrix should reach 55% by 2030 according to RenovaBio, compared to the 50% share met in this baseline. This latter objective is not included in this *Outlook*.

Argentina's 10% biodiesel and 12% ethanol mandates are expected to be filled by 2020. Tax exemptions should continue to boost the development of the Argentinean biodiesel industry. However, trade barriers set by the United States on Argentinean biodiesel will likely imply limited export demand for Argentinean biodiesel. In 2017, Colombia ethanol blending share was about 7.5%. While total ethanol demand is expected to increase, the ethanol volume share in gasoline is assumed to reach 8% by 2020 and to remain stable thereafter. Such an outcome is in part due to the limited availability of feedstuffs, in particular sugarcane.

Another major uncertainty on biofuel markets arises from China. In September 2017, the Chinese government announced a new nationwide ethanol E10 mandate by 2020. Mechanisms for implementation and enforcement have not been announced yet and thus this announcement is not taken into account in this *Outlook*. Box 9.1 provides a description of the potential impact of such a move. This *Outlook* assumes that Chinese use of ethanol is to expand by about 1 bln L. Chinese ethanol is expected to be produced domestically from maize – thus helping to lower domestic stocks – and from cassava.

Biodiesel production is also heavily dependent on policies in palm oil producing countries, especially Indonesia. After a decline in production in 2016, the Indonesian government made a strong commitment to reach a 10% biodiesel mandate; the currently rate is around 7%. This *Outlook* foresees that biodiesel demand will expand rapidly, and by 2027 the biodiesel volume share in diesel-type fuels could reach 8%, well below the newly announced target of 20% by 2030. Such a development relies entirely on the capacity of the government to collect the adequate levels of exports taxes and levies applied to palm oil exports.

The government in India is not foreseen to enforce the 10% ethanol mandate. The current volume share of ethanol in gasoline is around 3% and, as ethanol expansion should not keep pace with the strong expected growth in gasoline demand, this share should decrease over the projection period to 2.4%. In Thailand, the government has set targets for ethanol and biodiesel use of 4.1 bln L and 5.1 bln L by 2036. However, due to low oil prices and the potential limited availability of feedstuffs, such target could be reduced to only 2.6 bln L for both, ethanol and biodiesel. This *Outlook* assumes targets of 3.1 bln L for ethanol and 1.8 bln L for biodiesel by 2027. The development of ethanol production should be driven by subsidies and different levels of taxes that lower the prices of high ethanol blends.

Elsewhere in the world, development of the comparatively minor biofuels markets depends on a mix of effective policy support and price trends, leading to mixed prospects across countries.

Box 9.1. Biofuel policy announcement in China

The evolution of biofuel markets over the past decade has been strongly related to the policy environment. This *Outlook* highlights that developing countries are likely to play a more important role on biofuel markets in the coming years. There are several reasons for this. Transportation fuels demand is likely to continue to grow in those countries whereas it should either stagnate or decrease in developed countries. Biofuels being mostly blended in transportation fuels, even a stable biofuel mandate would translate into higher biofuel demand. Trade uncertainty is rising on biofuel markets. Major biofuel producers in developing countries (Brazil, Argentina, Indonesia) had developed their biofuel industries not only for domestic use but also given prospects on key markets in developed countries (United States and European Union). The European Union and the United states have used trade duties to prevent imports of biofuels. Developing countries have responded by an encouragement of domestic biofuel use, in particular through increases in mandates.

Importantly, in September 2017 the Chinese government proposed a new nationwide ethanol mandate that expands the mandatory use of E10 fuel from 11 trial provinces to the entire country by 2020. The underlying rationale for that announcement has not been clearly stated but could be related to abundant grains stocks and to environmental concerns.

Mechanisms for implementation and enforcement have not been announced yet. If fully implemented these policies could have important impacts on biofuel and agricultural markets, reinforcing the potential importance of developing countries in the medium-term projections.

Table 9.1. Potential impacts of an implementation of E10 in China

Comparison of different hypothesis

		Base-line	H1: 100% of AEU produced in China[1]	% change	H2: 90% of AEU imported from the United States[1]	% change	H3: 90% of AEU imported from Brazil[1]	% change
Ethanol markets in 2027 in bln L								
China	Ethanol production	11.1	29.1	163%	12	8%	12	8%
	Ethanol fuel use	4.4	22.4	414%	22.4	414%	22.4	414%
	Ethanol net trade	0.1	0.1	0%	-17	-15585%	-17	-15585%
	Volume share of ethanol in gasoline-type fuels	2%	10%	400%	10%	400%	10%	400%
United States	Ethanol production[2]	60.3			77.5	28%		
	Ethanol net trade	2.7			19.9	626%		
Brazil	Ethanol production[1]	32.8					48.2	47%
	Ethanol net trade	1					16.4	1576%
Agricultural markets in 2027 in Mt								
China	Maize production	241.5	256.3	6%	241.5	0%	241.5	0%
	Maize stocks[3]	71.3	57.1	-20%	69.9	-2%	69.9	-2%
	Maize biofuel use	17.9	46.9	163%	19.3	8%	19.3	8%
United States	Maize production	390.2			431.6	11%		
	Maize biofuel use	145.3			186.7	29%		
Brazil	Sugarcane production	789.5					961.9	22%
	Sugarcane biofuel use	365.4					537.8	47%

Note: This table does not correspond to a scenario run, but to simple calculations based on the baseline.
1. AEU: Additional Ethanol Use in China because of the E10 policy.
2. The share of the various feedstocks in ethanol production is kept constant in the different hypothesis.
3. Maize stocks in China are assumed to be depleted to produce ethanol. In H1, 50% of AEU is produced out of maize stocks. In H2 and H3, 10% of AEU is produced out of maize stocks.
Source: OECD-FAO Secretariats.

Table 9.1 provides an overview of the scale of potential impacts that have been calculated based on the *Outlook* baseline. In China, different hypothesis have been explored: additional ethanol could be mostly produced domestically from grains (with maize remaining the major feedstock and cassava the second major feedstock) (H1) or could be mostly imported from the United States (H2) or Brazil (H3).

The implementation of E10 in China over the next decade would correspond to an additional ethanol use (AEU in the table) of 18 bln L in 2027 when compared to the baseline. In terms of scale, ethanol use in China would then be comparable to ethanol use expected in the baseline for Brazil in 2027. Chinese fuel use of ethanol would quadruple, and Chinese ethanol use in 2027 would be 165% higher than the baseline value.

In H1, the AEU would be entirely met with ethanol produced in China.[1] The impacts on the Chinese maize markets could be substantial as an additional 29 Mt of maize would need to be used to meet the E10 mandate. In the calculations, H1 corresponds to a decrease of maize stocks by 20% when compared to the baseline and to an increase of Chinese maize production by 6% when compared to the baseline for 2027.

In the *Outlook*, Chinese maize stocks should reach 71 Mt by 2027. The scale of the additional volume of maize that needs to be devoted to ethanol in China (around 30 Mt p.a. in a context of rising gasoline demand) if E10 is fully implemented would mean that maize stocks would be quickly depleted. If no maize stocks were available and AEU was to be met by Chinese ethanol, Chinese maize production would need to be 12% higher than in the baseline in 2027.

In H2, 90% of AEU is imported from the United states. This hypothesis corresponds to a decrease by 2% of Chinese maize stocks in 2027 and to an increase of 41Mt of maize use for ethanol production in the United States in 2027. If grown entirely in the United States, the volume of domestic maize production in the United States would need to be 11% stronger than in the baseline in 2027. In H3, 90% of AEU is imported from Brazil. This hypothesis corresponds to a decrease by 2% of Chinese maize stocks in 2027 and to an increase of 168 Mt of sugarcane use for ethanol production in Brazil in 2027. If entirely grown in Brazil, the volume of domestic sugarcane production would need to be 22% stronger than in the baseline in 2027.

In conclusion, all three hypotheses presented in the table are hypothetical. However they provide a good illustration of the potential scale of impacts of an E10 implementation in China at the country-level. The AEU would be likely to be met by a mix of domestically produced and imported ethanol. What is clear however is that the depletion of Chinese maize stocks could meet part of the AEU for few years but certainly not for an extended period of time.

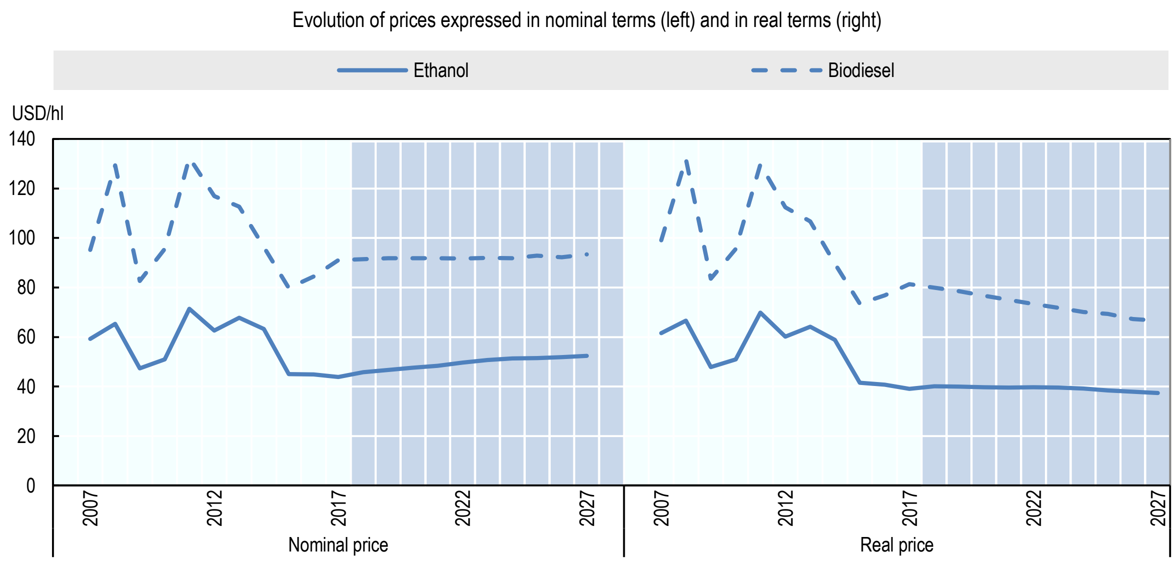
1. The calculations assumed that current ethanol feedstocks used in China (maize, cassava, wheat and other coarse grains) would continue to be used in the same proportion.
Source: Own calculation based on OECD/FAO (2018).

Prices

International crude oil prices are expected to increase by 40% in nominal terms over the baseline period. This should lower demand for gasoline and diesel fuels in developed countries and hence mandated demand for biofuels. Demand for biofuels should remain sustained in major developing countries given expected developments in the transportation fleet and domestic policies in place. Biofuel prices, similar to biofuel feedstock prices, should trend slightly upward but at a slower pace than energy prices.

Influenced by developments on the vegetable oil markets, biodiesel prices are expected to increase at a slower pace (+3%) than ethanol prices (+20%) in nominal terms. Expressed in real terms, biodiesel prices should decrease by 18% over the projection period, while ethanol prices should decline by 4%.

Figure 9.3. The evolution of biofuel prices is related to the evolution of biofuel feedstock prices



Note: Ethanol: wholesale price, US, Omaha; Biodiesel: Producer price, Germany, net of biodiesel tariff and energy tax.
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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Ethanol

Production

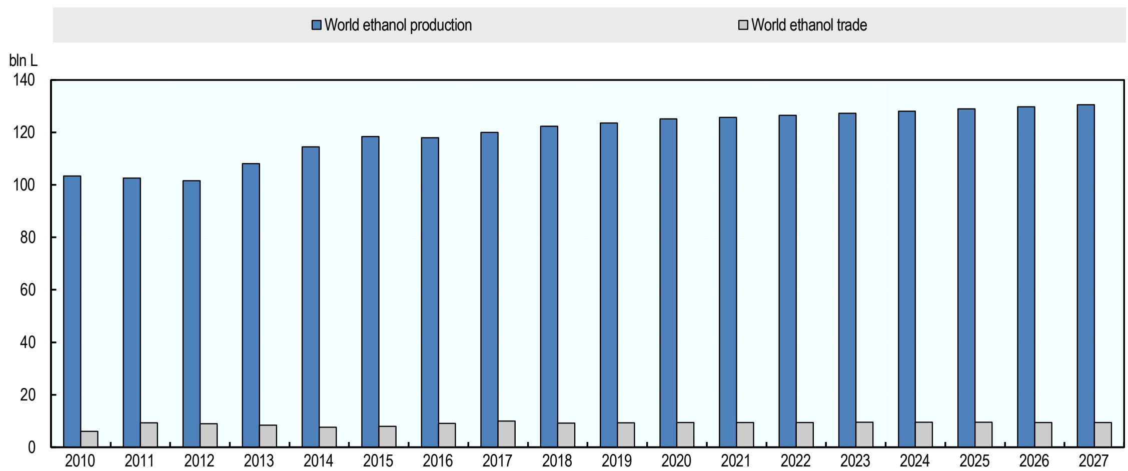
Global ethanol production is projected to increase by 14% during the outlook period from about 120 bln L in 2017 to nearly 131 bln L by 2027 (Figure 9.4). Fifty per cent of this increase is expected to originate from Brazil, to fill domestic demand. The other large contributors to the expansion in ethanol production are Thailand, China, India and the Philippines with respectively a 12%, 10%, 9% and 5% share in the global increase. The United States is expected to remain the major ethanol producer, followed by Brazil, China and the European Union. The evolution of ethanol production in developed and developing countries contrasts with increases in the developing world and stagnation or decreases in developed countries.

Coarse grains and sugarcane will continue to be the dominant ethanol feedstock. Ethanol production is expected to use 15% and 18% of global maize and sugarcane production respectively in 2027. Biomass-based ethanol is projected to account for about 0.3% of world ethanol production by 2027.

In the United States, ethanol production derived mainly from maize should remain around 61.6 bln L in the early years of the projection period, due mainly to domestic demand linked to the conventional gap and to the higher blend wall and also to a lower extent to international demand from Japan, Canada and the European Union. In the latter years of the outlook period, US ethanol production should decrease to 60.4 Bln L with lower domestic and international needs related to decreasing gasoline demand in developed countries.

Ethanol markets in Brazil are expected to be driven by the assumptions concerning blending requirements for gasohol and the differential taxation system which is favourable to hydrous ethanol. Brazilian ethanol production is thus projected to increase from 27.2 bln L in 2017 to 32.7 bln L in 2027.

Figure 9.4. Development of the world ethanol market



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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 should consolidate its role as the third leading ethanol producer, with production reaching 11 bln L by 2027. The expected 1.1 bln L production increase over the projection period should be used to meet domestic use. Chinese ethanol is expected to be produced domestically from maize using domestic stocks and from cassava. These projections do not take into account the E10 announcement made by Chinese authorities in September 2017.

In the European Union, ethanol production for fuel use mainly based on wheat, coarse grains and sugar beet is projected to decrease from 7.3 bln L in 2020 to 7.1 bln L by 2027 given assumptions of decreasing gasoline use. Sugar beet based ethanol production should stabilise around 1.4 bln L. In fact, ethanol production from sugar beet in the European Union should be less profitable than ethanol production from other cereal feedstocks due to higher production costs.

Thailand ethanol production is foreseen to increase at about 6% p.a. While production has historically been based mainly on molasses and cassava, sugarcane could increase its share given the limited availability of the other two feedstuffs to meet the rapid growing domestic demand. By 2027, Thai ethanol production should reach 3.2 Bln L. India is expected to increase ethanol production by 0.8 bln L during the outlook period, with around 95% of the total production coming from molasses.

Use

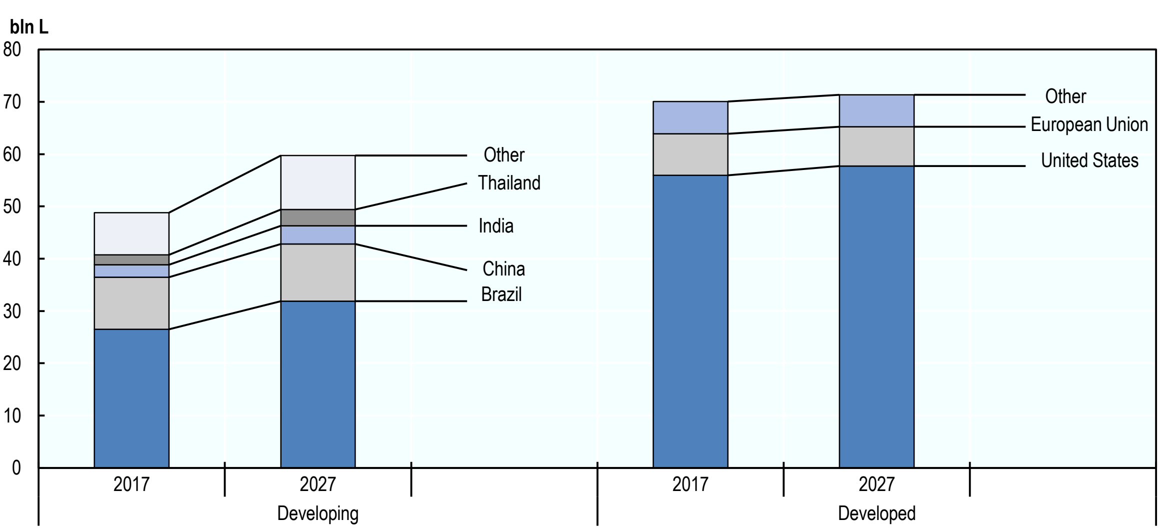
Global ethanol use is projected to expand by about12 bln L during the outlook period; 80% of this increase will take place in developing countries with Brazil, China, India and Thailand playing a key role. Ethanol use in Brazil should expand by 5.4 bln L representing 42% of the global increase. The Brazilian taxation system will remain favourable to hydrous ethanol rather than gasohol, which corresponds to the mandatory mix of 27% ethanol with gasoline. In China, ethanol use is expected to expand by 1 bln L. Because of mandates in place in some provinces, the volume share of ethanol in gasoline-type fuels will be around 2% over the projection period. Box 7.1 provides an overview of the scale of a move to an E10 country-wide policy.

In the last decade, Thailand increased its ethanol fuel use by 1 bln L. This trend is foreseen to continue and it is expected that by 2027 ethanol fuel demand will reach 2.8 bln L. The ethanol volume share in gasoline fuels should increase from 14% in 2017 to 16% by 2027. The expansion of Thai ethanol fuel demand is driven by the subsidies to gasohol with high blends of ethanol, as well as obligatory blending for ethanol. After dropping in 2017, Indian ethanol demand is foreseen to recover increasing 4.5% p.a. for the projection period, adding a total of 0.7 bln L by 2027 with respect to the base period. The volume share of ethanol in gasoline fuels in India is to remain around 2% over the projection period.

Ethanol use in the United States is linked to mandates in place and limited by a marginally expanding blend wall as well as declining petrol use prospects. The share of ethanol (expressed in volume) in gasoline-type fuels should increase to 11.3% by 2027 (Figure 9.5), but ethanol fuel use should decrease to 56 bln L, down from its maximum volume of 56.5 bln L in 2021.

In the European Union, ethanol fuel use is expected to expand in the first part of the projection period to decrease to 5.1 bln L by 2027. This is due to decreasing gasoline use despite a stable average volume share of ethanol in gasoline up to 2020 at 4.8% decreasing to 4.7% by 2027.

Figure 9.5. Evolution of the regional distributions of world ethanol use



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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Trade

Global ethanol trade is expected to remain marginal, decreasing from 8% of global production in 2017 to 7% by 2027. It should decrease to 9.4 bln L by 2027. Ethanol net import needs from the European Union should decrease from 0.6 bln L in 2017 to 0.45 bln L by 2027. Other countries such as Japan and Canada should diminish their import needs because of their decreasing use of transportation fuels.

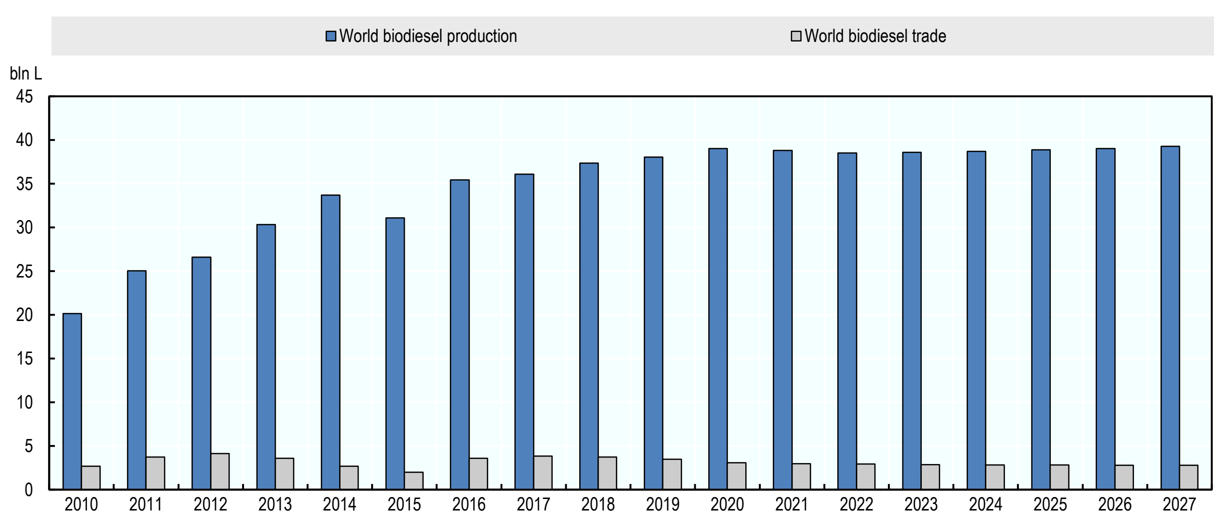
The United States is expected to remain a net exporter of maize-based ethanol and a modest importer of sugarcane-based ethanol. The need for sugarcane-based ethanol imports is related to the Low Carbon Fuel Standard in place in California and to the limited filling of the advanced mandate. US ethanol exports should decrease over the projection period because of a combination of strong domestic demand and weak international demand. Brazilian ethanol exports are not expected to expand over the projection period given that the Brazilian ethanol industry will mostly fill sustained domestic demand and that domestic ethanol prices are expected to remain slightly above international ones.

Biodiesel

Production

Global biodiesel production is expected to reach 39.3 bln L by 2027 corresponding to a 9% increase from the 2017 level (Figure 9.6). Policy rather than market forces will continue to influence production patterns. The European Union is expected to remain by far the major producer of biodiesel. Production should reach 12.9 Bln L by 2027, down from 13.5 bln L in 2017 and 14 bln L in 2020 when the RED target is supposed to be met. This evolution is in particular related to lower diesel use prospects.

Figure 9.6. Development of the world biodiesel market



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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Vegetable oil continues as the feedstock of choice in biodiesel production. Biodiesel production based on waste oil and tallow will continue to play an important role in the European Union and the United States.

In the United States, the second major biodiesel producer, biodiesel production should increase from 6.9 bln L in 2017 to a record 7.2 bln L in 2019 and then decrease to 6.7 bln L by 2027. It will be used to meet the biodiesel mandate as well as part of the advanced mandate gap. It is expected that, despite anti-subsidy duties imposed on Argentine and Indonesian biodiesel, biodiesel imports will be necessary to fulfil the US advanced mandate gap, especially in the early years of the projection period.

Brazil should reinforce its position as the third major biodiesel producer and contribute to more than 50% of the global biodiesel production expansion, in particular because of its 10% domestic mandate. By 2027, Brazil biodiesel production should reach 5.6 bln L. Even if domestic blending is set to rise to 12% in 2020, Argentine biodiesel production is projected to decrease over the next decade from 3.7 bln L in 2017 to 3.3 bln L in 2027 due to lower import demand. Other significant players are Brazil, Indonesia and Thailand.

After a decline in 2015 due to a shift in policies, Indonesian biodiesel production recovered in 2016, driven mainly by growing domestic demand. However in 2017 due to lower exports, production declined although is expected that it will recover in 2018. The *Outlook* foresees that exports will increase slightly over the projection period, notwithstanding they will become a less relevant driver for Indonesian biodiesel production. Indonesian biodiesel production should reach 4.2 bln L by 2027. The main uncertainty surrounding this increase in biodiesel production is the viability to continue collecting the export levy on Crude Palm Oil (CPO) exports, which serves to finance the subsidy to biodiesel producers. Malaysia and the Philippines will continue expanding their biodiesel production. Malaysia domestic demand is expected to accelerate, therefore the exports shares of the domestic production will decline from 32% in the base period to 27.6% in 2027. The Philippines' production is expected to remain focussed on supplying the domestic market.

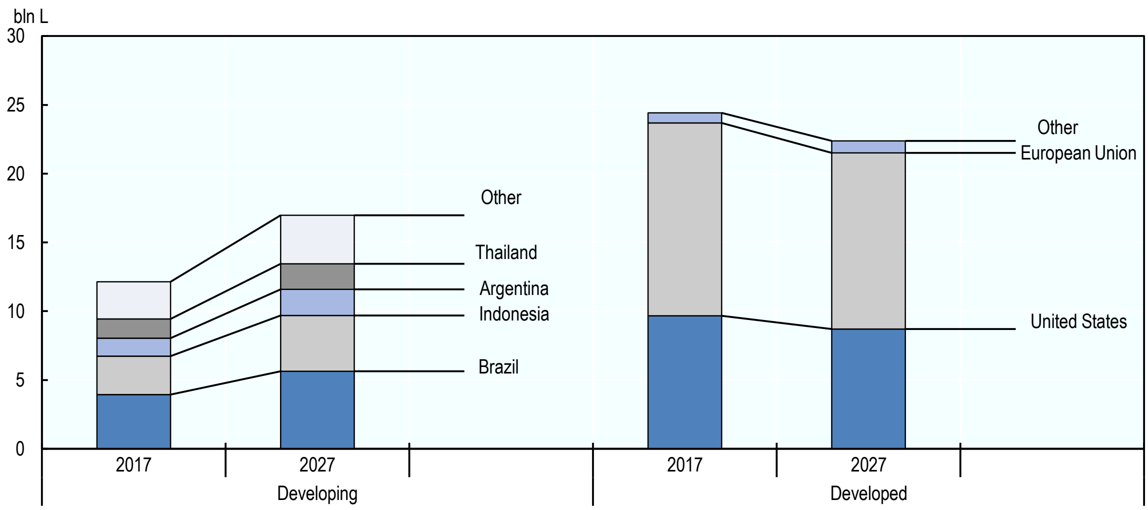
Use

Biodiesel use should decrease in developed countries and expand steadily in developing countries (Figure 9.7). Biodiesel use in Indonesia is foreseen to reach 4.1 bln L in 2027. In Brazil and Argentina it is expected to rise up to 5.6 bln L and 1.9 bln L respectively by 2027 given increases in domestic mandates. Because of biodiesel blending requirements, Colombia, India, Malaysia, Paraguay, Thailand, and Philippines will also see expanding biodiesel use; most countries are starting from very low levels of consumption and their biodiesel volume share in diesel fuels will remain between 1% and 3%, with the exception of Colombia where the blend is expected to remain around 6.5%.

In the European Union, biodiesel use is projected to average around 14 bln L in the period

leading to 2020 when the RED target is met. By 2027, European biodiesel use is expected to decrease to 12.8 bln L due to an expected strong decrease in diesel use. The average share of biodiesel in diesel-type fuels should reach its highest level in 2020 with almost 6.3% and then decrease to 6.1% by 2027.

Figure 9.7. Evolution of the regional distributions of world biodiesel use



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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In the United States, the mandate for biodiesel is assumed to maintain the 7.9 bln L level specified for 2018 and 2019 in the 2018 RFS rulemakings over the outlook period. US biodiesel consumption volume share in diesel-type fuels is projected to decrease from 4.4% in 2017 to 4.1% by 2027. In the early years of the projection period, biodiesel use will remain well above the biodiesel mandate (9.5 bln L on average over the 2017-2020 period) as biodiesel should capture a share of the advanced mandate in a period when additional ethanol use is limited by the blend wall. Biodiesel use should then decrease by about 8%, in a context of declining diesel consumption.

Trade

Biodiesel trade is subject to uncertainties concerning the future of current trade disputes. In this *Outlook*, biodiesel trade is projected to retract by 25% or 1 bln L over the next ten years as most countries with biodiesel mandate or target will fill them domestically and import demand from developed countries and especially the United States and the European Union should diminish.

Argentina should remain the lead biodiesel net exporter followed by Malaysia, Indonesia and Canada. Argentine exports are expected to retract by 43% over the projection period. Indonesia's exports are expected to decline further in the following three years recovering thereafter, however by 2027 the exports would remain below their 2016 levels. Malaysia's exports are projected to increase around 2.7% p.a. reaching 0.225 bln L by 2027, becoming the fifth largest exporter of biodiesel

Main issues and uncertainties

Developments on biofuel markets are strongly related to biofuel policy packages, the macroeconomic environment, and the level of crude oil prices. In the medium term, the policy environment remains uncertain. This *Outlook* expects that most of the biofuels produced will be based on agricultural feedstock. It is thus likely that biofuel production will have direct and indirect effects on the environment, on land use, and to a certain extent on agricultural markets in the medium term.

Revisions to biofuel policies are expected in the near future. Recent policy announcements appear to be favourable to biofuels with a focus on the potential contribution of renewable fuels to greenhouse gas mitigation in the transportation sector. It is not yet clear whether those announcements will mean stronger investments in research and development for advanced biofuels produced from ligno-cellulosic biomass, waste or non-food feedstock.

Notes

1 The blend wall refers to technical constraints that act as an impediment to increased ethanol use in gasoline.

2 The advanced mandate requires fuels to achieve at least a 50% GHG reduction.

3 Gasohol is a mixture of gasoline and anhydrous ethanol.

4. www.epa.gov/OTAQ/fuels/renewablefuels/.

5 The conventional gap is the difference between the total and advanced mandates as defined by the Renewable Fuel Standard (RFS2).

6 E10 refers to gasohol (i.e. the mix of gasoline and ethanol) with 10% volume of ethanol blended into petrol.

7 http://ec.europa.eu/clima/policies/2030/index_en.htm.

8 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF.

9 Directive (EU) 2015/1513.

10 Except for countries whose share of food and feed based renewables in transportation fuels is below 2%.

Chapter 10. Cotton

This chapter describes the market situation and highlights the latest set of quantitative medium-term projections for world and national cotton markets for the ten-year period 2018-27. World cotton production is expected to grow at a slower pace than consumption during the first few years of the outlook period, reflecting lower prices and releases of global stocks accumulated between 2010 and 2014. India will remain the world's largest country for cotton production, while the global area devoted to cotton is projected to recover slightly despite a decrease of 3% in China. Processing of raw cotton in China is expected to continue its long-term downward trend, while India will become the world's largest country for cotton mill consumption. In 2027, the United States remains the world's main exporter, accounting for 36% of global exports. Cotton prices are expected to be lower than in the base period (2015-17) in both real and nominal terms, as the world cotton price is continuously under pressure due to high stock levels and competition from synthetic fibres.

Market situation

The recovery in the world cotton market continued during the 2017 marketing year following the slight increase in production in 2016, with production reaching 25.6 Mt. Global cotton production recovered by about 11.1% in 2017 due to improved yields and recovered areas. In addition, on-going stock releases helped to stabilise world consumption, although total world stocks remain at a very high level (at 19.2 Mt, still about eight months of world consumption). Production increased in almost all major cotton producing countries, including the People's Republic of China (hereafter "China") which recovered by 7% in 2017. Pakistan, the United States, Turkey and India increased production by 24%, 24%, 18% and 9%, respectively due to increases in yields and in the area planted.

Global cotton demand increased slightly during the 2017 marketing year to 25.0 Mt. Mill consumption estimates show an increase of 3% (to 5.3 Mt) in India and in a stable 8.0 Mt in China. Mill consumption increased in Viet Nam by 12% and in Bangladesh by 6.9% as Chinese direct investment in mills continued. The increase in Pakistan was 4%. Global cotton trade recovered by 1.0% in 2017 to 8 Mt. Increases in imports by Bangladesh, Pakistan and Viet Nam were insufficient to offset the decline in many countries' import demand from 2016. China's cotton support policy has continually narrowed the price gap between domestic and imported cotton, and both cotton prices were moving almost in parallel in 2017. In addition, US exports remained stable at 3.1 Mt from 2016, and Australia's exports continued to increase by 3% in 2017 due to a recovery in production from 2014.

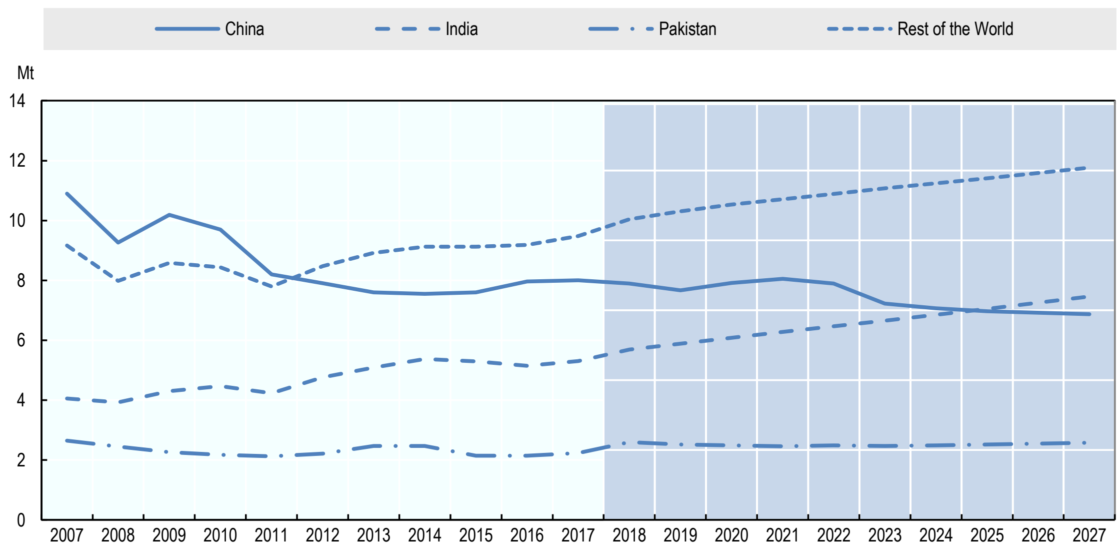
Projection highlights

Although the world cotton price is continuously under pressure due to high stock levels and strong competition from synthetic fibres, cotton prices are expected to be relatively stable in nominal terms during the outlook period. This makes cotton less competitive because prices for polyester are significantly lower than both international and domestic cotton prices. During 2018-27, relative stability is expected as government support policies continue to stabilise markets in major cotton-producing countries. However, world cotton prices are expected to be lower than the average in the base period (2015-17) in both real and nominal terms.

World production is expected to grow at a slower pace than consumption during the first few years of the outlook period, reflecting the anticipated lower price levels and projected releases of global stocks accumulated between 2010 and 2014. The stock-to-use ratio is expected to be 39% in 2027, which is well below the average of the 2000s of 46%. The global land use devoted to cotton is projected to remain slightly lower than the average in the base period. Global cotton yields will grow slowly as production gradually shifts from relatively high yielding countries, notably China, to relatively low-yielding ones in South Asia and West Africa.

World cotton use is expected to grow at 0.9% p.a. as a result of slower economic and population growth in comparison with 2000s, reaching 28.7 Mt in 2027. Consumption in China is expected to fall by 12.5% from the base period to 6.9 Mt in 2027, continuing its downward trend, while India will become the world's largest country for cotton mill consumption with an increase by 42.2% to 7.5 Mt in 2027. Higher cotton mill consumption by 2027 is also foreseen for Viet Nam, Indonesia, Bangladesh, and Turkey, with consumption increasing by 74%, 45%, 34% and 17% from the base period respectively.

Figure 10.1. Cotton consumption by region



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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It is expected that global cotton trade will grow more slowly compared to previous years. Trade in 2027 is expected, however, to exceed the average of the 2000s. To obtain value-added in the textile industry, there has been a shift in the past several years towards trading cotton yarn and man-made fibres rather than raw cotton, and this is expected to continue. Global raw cotton trade will nevertheless reach 9.4 Mt by 2027, 19% higher than the average of the base period 2015-17. In 2027 the United States remains the world's largest exporter, accounting for 36% of global exports, 1% point higher in the base period. Brazil's exports are projected to reach 1.2 Mt in 2027, 0.5 Mt more than in the base period. This makes Brazil the second largest exporter overtaking India. The third largest exporter will be Australia with exports increasing from 0.7 Mt in the base period to 1.0 Mt. Cotton producing countries in Sub-Saharan Africa will increase their exports to 1.6 Mt by 2027. On the import side, China's imports are expected to slightly grow to 1.2 Mt in 2027 which is still a low level in comparison to those reached during the last decade. Suppressed low domestic consumption and releases of stocks, as well as reduced producer support are behind this development. China's dominant role in the world cotton market will be significantly challenged as other importing countries emerge. It is projected that imports in Viet Nam and Bangladesh will increase respectively by 0.8 Mt and 0.5 Mt, and Indonesia and Turkey will import 1.0 Mt and 0.8 Mt by 2027 respectively.

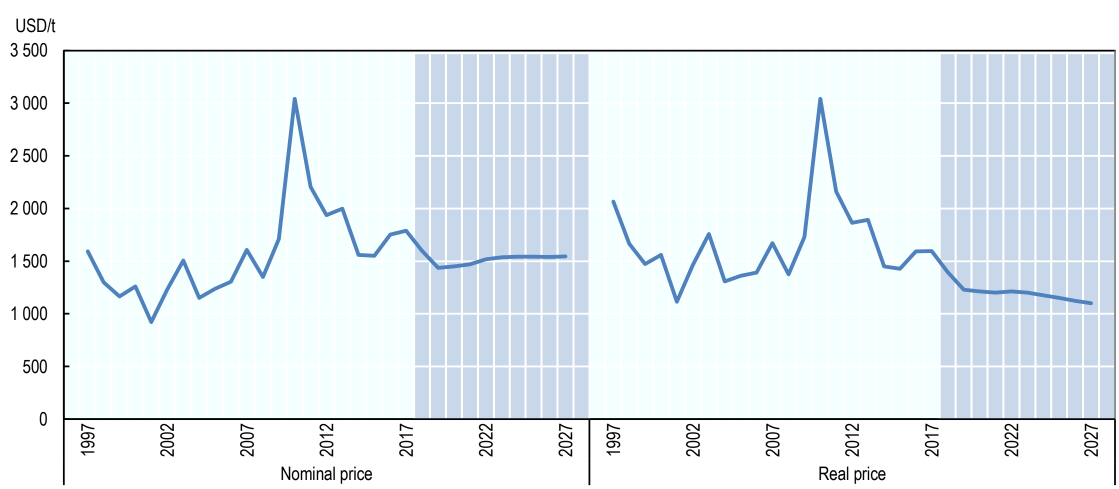
While continuing increases in farm labour costs and competition for land and other natural resources from alternative crops place significant constraints on growth, higher productivity driven by technological progress and the adoption of better cotton practices, including the use of certified seeds, high density planting systems and short duration varieties. Altogether, this creates significant potential for cotton production to expand in the next decade. While the medium-term prospects are for sustained growth, there may be potential short-term uncertainties in the current outlook period which may result in short-term volatility in demand, supply and prices. A sudden slow-down in the global economy, a sharp drop in trade of global textiles and clothing, competitive prices and quality from synthetic fibres, and changes in government policies are important factors that can affect the cotton market.

Price

Cotton prices are expected to be relatively stable in nominal terms especially in the latter half of the projection period, although the world cotton price is continuously under pressure due to high stock levels and competition from synthetic fibres. Cotton markets are expected to stabilise as government support policies continue in major cotton-producing countries during 2018-27.

Global cotton stocks grew slightly in 2017, but are expected to decrease to 11 Mt by 2027, which corresponds to five months of world consumption. The stock-to-use ratio is expected to drop to around 40% in 2027; substantially below the 80% observed in the base period. Relative stability is expected in China's cotton market after the government has been shifting its cotton policy resulting in reduced stock accumulation during the projection period.

Figure 10.2. World cotton prices



Note: Cotlook price A index, Midding 1 3/32".c.f.r. fat Eastern ports (August/July).
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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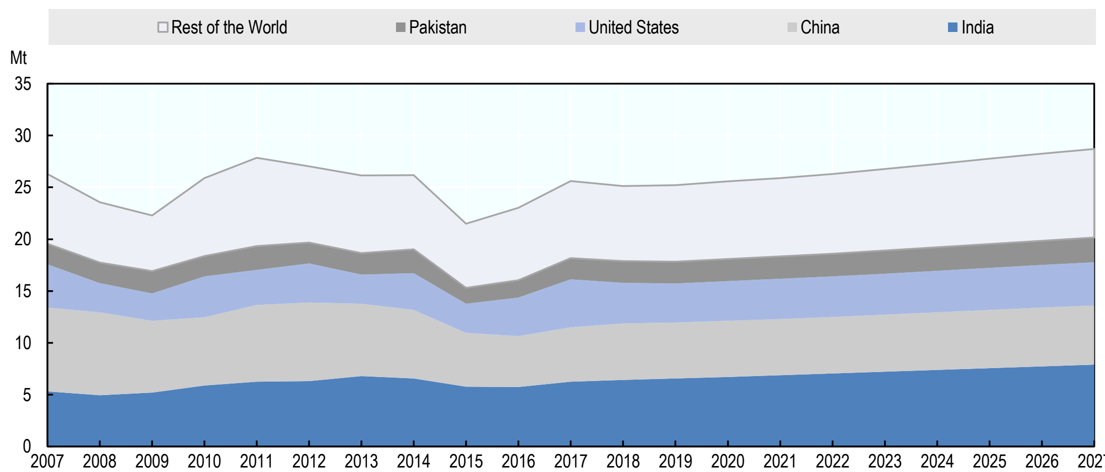
Production

World production is expected to reach 27.7 Mt in 2027, mainly sustained by yield growth, with an average increase of 1.6% p.a. over the projection period. However, world production is expected to grow at a slower pace than consumption during the first years of the outlook period, reflecting the anticipated lower price levels and projected releases of stocks that were accumulated between 2010 and 2014. Additionally, the *Outlook* foresees a slight decline in world cotton area in the first two years of the projection period, which is followed by a gradual increase thereafter.

Figure 10.3. World cotton production



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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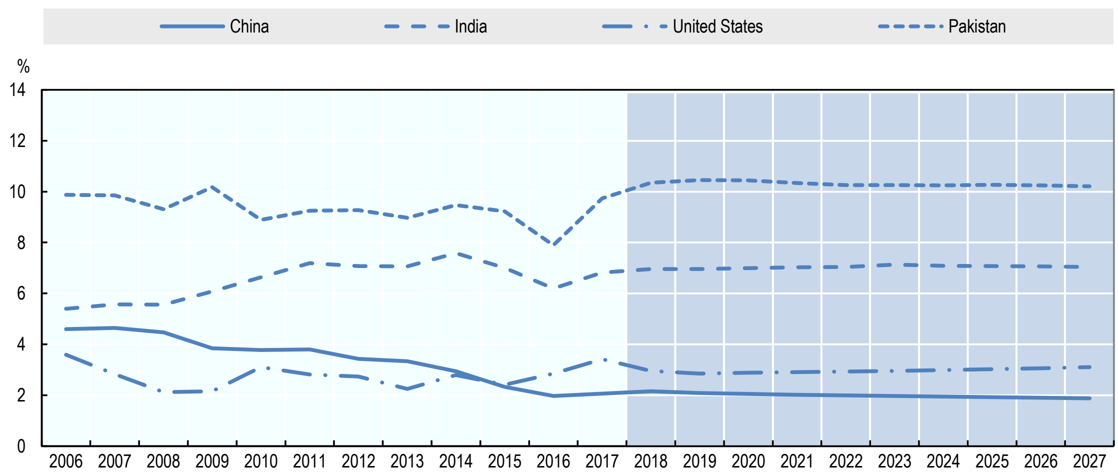
The global cotton area is projected to recover throughout the outlook period, despite a 1% decrease in China. The average global cotton yield will grow slowly, as production shares gradually shift from relatively high yielding countries, notably China, to relatively low-yielding areas in South Asia and West Africa.

Yield growth in China is expected to slow down from over 3% p.a. over the past decade to 1% p.a. for the next ten years. Cotton producers in China still have high per hectare yields (about twice the world average), but they are realised with relatively labour-intensive technologies. Due to small plots with limited water resource and low mechanization, cotton farmers especially in the eastern provinces face high and rising production costs.

The *Outlook* projections foresee that India will produce 7.9 Mt of cotton by 2027, which is approximately one third of the projected world output. Indian farmers continue to apply new technologies to improve their yield potential. The adoption of genetically modified (GM) cotton in India is part of a shift in practices and technology-use that resulted in more than doubling cotton production between 2003 and the base period. Yields are expected to grow by 1.9% p.a. during 2018-2027, which is above the annual growth rate during 2008-17, due to improved management practices. On the other hand, it is important to note that India's variability in cotton yield is determined by the monsoon pattern in rain-fed regions. Climate change could affect this pattern and impact cotton yields in the future.

Pakistan accounts for the fourth largest share of global production. Projections indicate that Pakistan will produce 2.4 Mt of cotton by 2027. Production will increase by about 1.4% annually, as a result of area expansions and yield improvements. Similarly to Pakistan, India is expected to realise faster growth in the cotton area than in other crops. Production is projected to increase with annual growth rates of about 2.3%. However, in absolute terms, production in Pakistan is lower than in India as it lags considerably behind India in the adoption of GM cotton. African countries – mainly Benin, Mali, Burkina Faso, Côte d'Ivoire and Cameroon – are expected to contribute 2 Mt to world production by 2027, 33% above the base period. It is worth noting that the growth reported in Burkina Faso is taking place simultaneously with a move from GM cotton back to non-GM. GM cotton yielded shorter fibres than the conventional variety thus not allowing for smooth and stable thread that is essential for textile production.

Figure 10.4. Cotton harvested area relative to total crop area in major producing 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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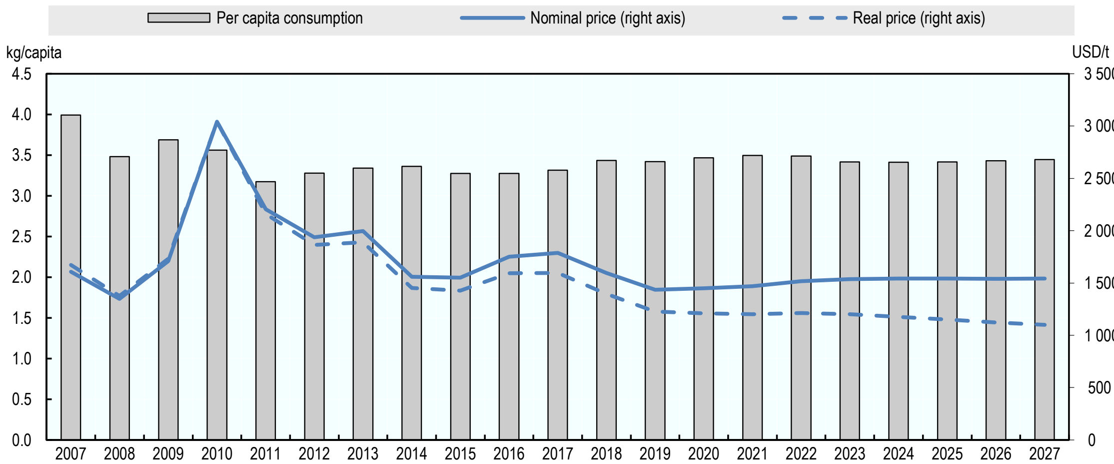
Consumption

Total demand for cotton, which amounted to 24.5 Mt in the base period, is expected to reach 28.7 Mt in 2027. This figure exceeds the 2007 historical consumption record and corresponds to 0.9% p.a. growth over the next ten years. However, this increase is not uniform across the period of analysis. While consumption grows faster than population in the next ten years, consumption on a per capita basis in 2027 is expected to remain below the peaks reached during 2005-07 and 2010 (Figure 10.5). Asia is confirmed as the number one area of the world for cotton consumption, mainly due to cheaper labour, lower electricity costs and weaker environmental regulations.

One of the main factors weakening the cotton consumption recovery is severe competition from synthetic fibres. Based on the assumption of relatively low oil prices, polyester prices are projected to remain significantly lower than cotton, which puts downward pressure on cotton markets throughout the projection period. In addition, cotton consumption will be influenced not only by macroeconomic trends but also by evolving tastes and preferences, including the increasing awareness with respect to marine plastic pollution. Scientific studies have demonstrated how a single synthetic garment can shed thousands of synthetic microfibers in a single wash and these microfibers get past the filter systems in treatment plants and end up in rivers and the ocean.

Figure 10.5. World per capita consumption of cotton and world prices



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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Consumption in China is expected to fall by 13% from the base period to 6.9 Mt following the downward trend that started in 2009. China's share of world cotton consumption is projected to fall to 24% in 2027, from 32% in the base period. As a consequence China loses its position as the largest cotton mill consumer - a position it has maintained since the 1960s – to India. India is expected to consume 7.5 Mt in 2027, increasing its share in total world consumption from 21% in the base period to 26% in 2027. Mill consumption in Pakistan is estimated to increase by 18% over the projection period, while Viet Nam is projected to keep its consumption at high levels. Chinese direct investment in mills might not continue in these countries because local prices are slowly moving closer to global levels behind gradually increasing farm labour costs in these countries for the next decade. Higher cotton mill consumption by 2027 is also foreseen for Bangladesh, Indonesia, Turkey and other Asian countries (mainly Turkmenistan and Uzbekistan).

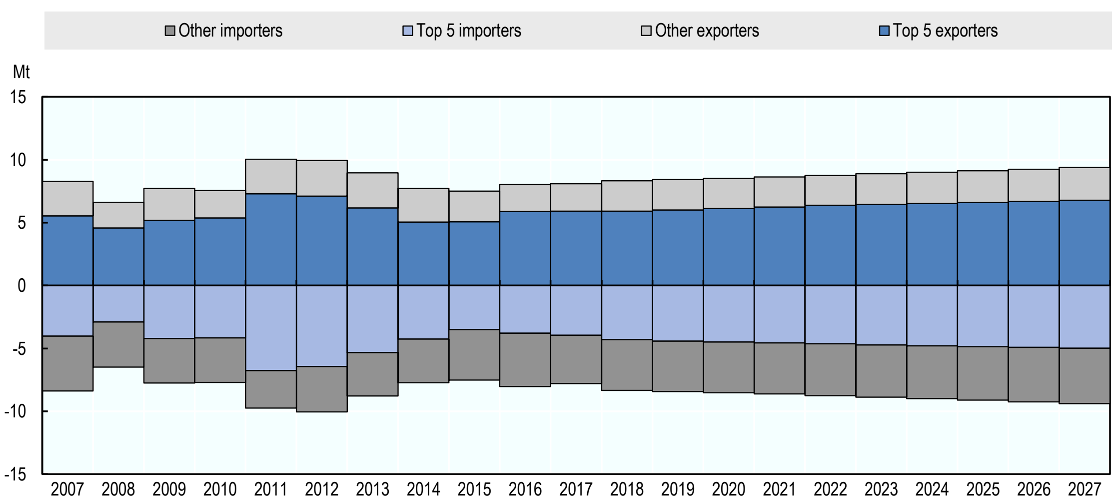
The fastest growth among major consumers is expected in Bangladesh, Viet Nam and Indonesia, where consumption is expected to grow at 3.5%, 2.9% and 2.1% p.a. respectively, as their textile industries are expected to continue the rapid expansion that began in 2010. While Bangladesh had been widely expected to reduce its textile exports after the phase-out of the Multi-Fibre Arrangement (MFA) in 2005, its garment exports and cotton spinning have still flourished.

Trade

Global cotton trade is expected to follow the ongoing transformation of the world textile industry which began several years ago, mainly driven by rising labour costs, cotton support prices, and incentives to obtain added value in the cotton supply chain. There has been a tendency in recent years to gradually replace raw cotton trade with trade of cotton yarn and man-made fibres. However, global raw cotton trade is expected to recover to 9.4 Mt in 2027, about 19% higher than during the base period, even though this would be still below 10.0 Mt, the average level for 2011-12.

The world largest exporter throughout the outlook period is the United States, accounting for 36% of global exports in 2027 (35% in the base period) followed by Brazil and Australia (Figure 10.6). Exports from Brazil will reach 1.2 Mt from 0.8 Mt in the base period. Australia is expected to increase exports by over 2.8% annually to reach 1.0 Mt by 2027. Over the past few years, given its surge in productivity and production, India has become a major player on the world cotton market. However India's exports are expected to fall to 0.9 Mt in 2027 and the country is expected to account for 9% of the world's cotton exports while this share was 14% in the base period due to growing domestic uses.

Figure 10.6. Cotton trade concentration



Note: Top 5 importers (2007-2016): Bangladesh, China, India, Turkey, Viet Nam. Top 5 exporters (2007-2016): Australia, Brazil, European Union, India, and the United States.
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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Sub-Saharan African countries continue to play a major role as cotton exporters. It is expected that their share in world trade will grow to 18% with exports reaching 1.6 Mt by 2027. However, trade in the region has been volatile in the past few decades. Cotton mill consumption is limited throughout Sub-Saharan Africa and many countries export virtually all their production. With the increases in productivity, in particular through the adoption of bio-tech cotton in this region, production and exports are expected to be 25% and 26% higher respectively in 2027 compared to the base period.

The transition in trade also induces changes in the composition of importers in the world cotton economy. Although China lost its position as the world's largest importer in 2015, over the outlook period its share of world cotton imports will remains stable at about 13%. The projected 1.2 Mt of cotton imports entering China in 2027 would be far smaller than the peak imports of about 5 Mt in 2011. In contrast, Bangladesh and Viet Nam are projected to be the leading importers. By 2027, they are expected to increase their imports by 41% and 69%, accounting for over 40% of world trade.

Main issues and uncertainties

While the medium-term prospects for the world cotton market are stable, there will be potential short-term volatilities in demand, supply and prices that may result in significant short-term uncertainties in the projection period.

The demand for raw cotton is derived from the demand for textiles and clothing, which is very sensitive to changes in economic conditions. In the scenario of a sudden slow-down in the global economy, global consumption of textiles and clothing would experience a sharp drop, which would also impact the raw cotton market. As an example, the 2008-09 financial crisis, which caused average global consumption to fall by over 10%, resulted in a 40% reduction of cotton prices.

Despite the intention of the governments of Viet Nam, Bangladesh and India to promote and increase production, factors such as limited area, water scarcity and climate change constrain their efforts. Malaysia is actively pursuing a Free Trade Agreement with the European Union. This should increase Malaysia's textile export to the European Union and subsequently increase domestic consumption of cotton.

China's cotton policies are one of the main sources of uncertainty in the global cotton sector. In particular its stock holdings have an important impact on the world market. Building on the reforms of 2014, China may take further steps to modify its policies in the next decade. This would have important implications for the world market in general, and possibly impact specific industries in partner countries, such as the cotton spinning sector in Viet Nam.

Global cotton yields will grow slowly, as production gradually shifts from relatively high yielding countries, notably China leading to significantly higher yields, to relatively lower yielding ones in India and South Asian countries. GM adoption in the United States has reduced the cost of growing cotton, and the adoption of GM varieties specifically targeted to local production conditions in Australia has also increased productivity. In India producers adopted GM crops and updated their management practices. However, average yields remain far below those of many other cotton producers and the GM varieties are very vulnerable against adverse weather conditions, causing other countries to take a more conservative approach to GM adoption. No trade restrictions have yet been applied to cotton fibre, yarn, or other textile products made with GM cotton, but GM adoption has nonetheless been slow in many countries. The recent example of Burkina Faso, where farmers realised that the applied GM varieties had shorter fibres and led to reduced market revenues, leading them to go back to GM free varieties, shows however another level of uncertainty regarding the GM adoption. Future productivity growth in countries with low yields will in general be determined by their adoption of new technologies, including mechanisation and increased input use.

Glossary

Aquaculture	The farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants, etc. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding and protection from predators. Farming also implies individual or corporate ownership of the stock being cultivated. For statistical purposes, aquatic organisms that are harvested by an individual or corporate body that has owned them throughout their rearing period contribute to aquaculture, while aquatic organisms that are exploitable by the public as a common property resource, with or without appropriate licenses, are the harvest of capture fisheries. In this Outlook data relating to aquatic plants are not included.
African Swine Fever (ASF)	African swine fever (ASF) is a highly contagious haemorrhagic disease of pigs, warthogs, European wild boar and American wild pigs. It is not a human health threat. The organism which causes ASF is a DNA virus of the Asfarviridae family.
Atlantic beef / pigmeat market	The Atlantic market for production and trade of beef and pigmeat consists of countries that are Foot and Mouth Disease (FMD) free with vaccination or contain FMD free zones. Most countries in this market are located around the Atlantic Ocean and typically trade grass-fed beef and grain-fed pigmeat
Avian Influenza (AI)	Avian Influenza (AI) is a highly contagious viral infection which can affect all species of birds and can manifest itself in different ways depending mainly on the ability of the virus to cause disease (pathogenicity) on the species affected
Baseline	The set of market projections used for the Outlook analysis, also used as benchmark to analyse the impact of different economic and policy scenarios. A detailed description on how this baseline was generated is provided in the methodology section
Biofuels	In the wider sense, biofuels can be defined as all solid, fluid or gaseous fuels produced from biomass. More narrowly, the term comprises fuels that replace petroleum-based road-transport fuels. Ethanol is produced from sugar crops, cereals and other starchy crops, and can be used as an additive to, in a blend with, or as a replacement of gasoline. Biodiesel is produced mostly from vegetable oils, but also from waste oils and animal fats.
Biomass	Biomass is defined as any plant matter used directly as fuel or converted into other forms before combustion. Included are wood, vegetal waste (including wood waste and crops used for energy production), animal materials/wastes and industrial and urban wastes, used as feedstocks for producing bio-based products. In the context of the Outlook, it does not include agricultural commodities used in the production of biofuels (e.g. vegetable oils, sugar or grains).
Blend wall	The term blend wall refers to short run technical constraints that act as an impediment to increased biofuel use in transportation fuels.
BRICS	Refers to the emerging economies of Brazil, the Russian Federation, India, the People's Republic of China, and South Africa.
Capture fisheries	Capture fisheries refer to the hunting, collecting and gathering activities directed at removing or collecting live wild aquatic organisms (predominantly fish, molluscs and crustaceans) including plants from the oceanic, coastal or inland waters for human consumption and other purposes by hand or more usually by various types of fishing gear such as nets, lines and stationary traps. The production of capture fisheries is measured by nominal catches (in live weight basis) of fish, crustaceans, molluscs and other aquatic animals and plants, killed, caught, trapped or collected for all commercial, industrial, recreational and subsistence purposes. It should be noted that in this *Outlook* data relating to aquatic plants are not included.
Cereals	Defined as wheat, maize, other coarse grains and rice.
China-Australia Free Trade Agreement (ChAFTA)	The China-Australia Free Trade Agreement (ChAFTA) agreement covers goods, services, investment, financial services, standards and technical regulations. It also outlines a commitment for further negotiations in other areas such as government procurement. ChAFTA came into effect officially on 20 December 2015.

Classical Swine Fever (CSF)	Classical swine fever (CSF) is a highly contagious viral disease of swine (pigs and wild boar) which can spread via trade in live pigs, fresh pig meat and certain meat-based products.
Common Agricultural Policy (CAP)	The European Union's agricultural policy, first defined in Article 39 of the Treaty of Rome signed in 1957
Comprehensive Economic and Trade Agreement (CETA)	CETA is a trade agreement between the European Union and Canada. CETA was signed in October 2016 and is in provisional application as of April 2017. Full ratification and implementation is still pending
Decoupled payments	Direct payments which are not linked to current production of specific commodities or livestock numbers or the use of specific factors of production.
Developed and developing countries	See summary table at the end of the Glossary.
Direct payments	Payments made directly by governments to producers
Domestic support	Refers to the annual level of support, expressed in monetary terms, provided to agricultural production. It is one of the three pillars of the Uruguay Round Agreement on Agriculture targeted for reduction.
El Niño-Southern Oscillation	El Niño-Southern Oscillation (ENSO) refers to periodic but irregular variations in wind and sea surface temperatures in the tropical eastern Pacific Ocean. ENSO consists of a warming phase known as *El Niño* and a cooling phase known as *La Niña*, and occurs typically at intervals of two to seven years. The abnormal warm ocean climate conditions of *El Niño* are accompanied by higher local rainfall and flooding, and massive deaths of fish and their predators (including birds).
Energy Independence and Security Act (EISA) 2007	US legislation passed in December 2007 that is designed to increase US energy security by lessening dependence on imported oil, to improve energy conservation and efficiency, expand the production of renewable fuels, and to make America's air cleaner for future generations.
Ethanol	A biofuel that can be used as a fuel substitute (hydrous ethanol) or a fuel extender (anhydrous ethanol) in mixes with petroleum, and which is produced from agricultural feed-stocks such as sugar cane and maize. Anhydrous alcohol is free of water and at least 99% pure. Hydrous alcohol contains water and usually has a purity of 96%. In Brazil, this ethanol is being used as a gasohol substitute in flex-fuel vehicles.
Everything-But-Arms (EBA)	The Everything-But-Arms (EBA) Initiative eliminates EU import tariffs for numerous goods, including agricultural products, from the least developed countries as of 2009-10.
Export subsidies	Subsidies given to traders to cover the difference between internal market prices and world market prices, such as the EU export restitutions. The elimination of agricultural export subsidies is part of the Nairobi Package adopted at the WTO's Tenth Ministerial Conference in December 2015.
Farm Bill	In the United States, the Farm Bill is the primary agricultural and food policy tool of the federal government. The Agricultural Act 2014 (2014 Farm Bill) has made major changes in the commodity programmes and will remain in force through 2018.
Flexible-fuel vehicles (FFVs)	Vehicles that can either run on gasohol or on hydrous ethanol.
Fresh dairy products	Fresh Dairy Products contain all dairy products and milk which are not included in the processed products (butter, cheese skim milk powder, whole milk powder and for some cases casein and whey). The quantities are in cow milk equivalent.
Foot-and-mouth disease (FMD)	Foot-and-mouth disease (FMD) is a highly contagious, usually non-fatal viral disease of domestic and wild cloven-hoofed animals, but may also affect certain other species. It is widely distributed throughout the world. Animals recovered from the disease may remain carriers of the infectious virus for an extended period of time. FMD is not dangerous to humans, but has a great potential for causing severe economic losses in susceptible animals.
G-20	Group of twenty which brings together important developed and developing economies to discuss key issues in the global economy. Established in 1999 and consists of Finance Ministers and Central Bank Governors from 20 of the world's largest national economies.
Gasohol	Fuel that is a mixture of gasoline and anhydrous ethanol.
High Fructose Corn Syrup (HFCS)	Isoglucose sweetener extracted from maize.
Intervention stocks	Stocks held by national intervention agencies in the European Union as a result of intervention buying of commodities subject to market price support. Intervention stocks may be released onto the internal markets if internal prices exceed intervention prices.
Isoglucose	Isoglucose is a starch-based fructose sweetener, produced by the action of the glucose isomerase enzyme on dextrose. This isomerisation process can be used to produce glucose/fructose blends containing up to 42% fructose. Application of a further process can raise the fructose content to 55%. Where the fructose content is 42%, isoglucose is

	equivalent in sweetness to sugar.
Least squares growth rate	The least-squares growth rate, r, is estimated by fitting a linear regression trend line to the logarithmic annual values of the variable in the relevant period, as follows: Ln(xt) = a + r * t and is calculated as [exp (r) – 1].
Live weight	The weight of meat, finfish and shellfish at the time of their capture or harvest. Calculated on the basis of conversion factors from landed to nominal weight and on rates prevailing among national industries for each type of processing.
Loan rate	In the United States, the commodity price at which the Commodity Credit Corporation (CCC) offers non-recourse loans to participating farmers. The crops covered by the programme are used as collateral for these loans. The loan rate serves as a floor price, with the effective level lying somewhat above the announced rate, for participating farmers in the sense that they can default on their loan and forfeit their crop to the CCC rather than sell it in the open market at a lower price.
Market access	Governed by provisions of the Uruguay Round Agreement on Agriculture which refer to concessions contained in the country schedules with respect to bindings and reductions of tariffs and to other minimum import commitments.
Marketing year	It is common to compare crop production across “marketing years,” which are defined so that one season’s harvest is not artificially split up across different calendar years. In this Outlook, international marketing years are mostly defined starting with their harvest in major supply regions, as follows: • Wheat: 1 June • Cotton: 1 August • Maize and other coarse grains: 1 September • Sugar, soybeans, other oilseeds, protein meal, vegetable oils: 1 October. Whenever the text refers to e.g. the marketing year 2016, it is short for 2016/17 for these commodities. For all other commodities, the marketing year is equal to the calendar year.
Milk quota scheme	A supply control measure to limit the volume of milk produced or supplied. Quantities up to a specified quota amount benefit from full market price support. Over quota volumes may be penalised by a levy or may receive a lower price. Allocations are usually fixed at individual producer level. Other features, including arrangements for quota reallocation, differ according to scheme.
North American Free Trade Agreement (NAFTA)	A trilateral agreement on trade, including agricultural trade, between Canada, Mexico and the United States, phasing out tariffs and revising other trade rules between the three countries over a 15-year period. The agreement was signed in December 1992 and came into effect on 1 January 1994.
Other coarse grains	Defined as barley, oats, sorghum and other coarse grains in all countries except Australia where it includes triticale, and in the European Union where it includes rye and other mixed grains.
Other oilseeds	Defined as rapeseed (canola), sunflower seed, and groundnuts (peanuts).
Pacific beef/pigmeat market	The Pacific meat market consists of countries (or zones within countries) that produce and trade livestock free from Foot and Mouth Disease (FMD) without vaccination. FMD status is determined by the OIE according to strict guidelines (www.oie.int/en/animal-health-in-the-world/official-disease-status/fmd/) and includes, inter alia, Australia, New Zealand, Japan, Korea, North America and the vast majority of Western Europe. The name “Pacific” refers to the fact that most of them are located around the Pacific Rim.
Porcine Reproductive and Respiratory Syndrome (PRRS)	Porcine reproductive and respiratory syndrome (PRRS) is a viral disease that causes a decrease in reproductive performance in breeding animals and respiratory disease in pigs of any age.
Producer Support Estimate (PSE)	Indicator developed and compiled by the OECD showing the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at farm gate level, and arising from policy measures (regardless of their nature, objectives or impacts on farm production or income). The PSE measures support arising from policies targeted to agriculture relative to a situation without such policies, i.e. when producers are subject only to general policies (including economic, social, environmental and tax policies) of the country. The percentage PSE is the ratio of the PSE to the value of total gross farm receipts, measured by the value of total production (at farm gate prices) plus budgetary support.
Protein meals	Defined as soybean meal, groundnut meal, rapeseed meal, sunflower meal, coconut meal, cottonseed meal and palm kernel meal.
Purchasing Power Parity (PPP)	Purchasing power parities (PPPs) are the rates of currency conversion that eliminate the differences in price levels between countries. The PPPs are given in national currency

	units per US dollar.
Renewable Energy Directive (RED)	EU directive legislating binding mandates of 20% for the share of renewable energy in all Member States' energy mix by the year 2020, with a specific target of 10% for the renewable energy share in transport fuels.
Renewable Fuel Standard (RFS and RFS2)	A standard in the United States for the renewable fuel use in the transport sector in the Energy Act (EISA). RFS2 is a revision of the RFS program for 2010 and beyond.
Roots and Tubers	Plants that yield starch, either derived from their roots (e.g. cassava, sweet potato and yams) or stems (e.g. potatoes and taro). They are destined mainly for human food (as such or in processed form) but can also be used for animal feed or for manufacturing starch, ethanol and fermented beverages. Unless they are processed, they become highly perishable once harvested, which limits opportunities for trade and storage. Roots and tubers contain large amounts of water: all quantities in this publication refer to dry weight to increase comparability.
Scenario	A model-generated set of market projections based on alternative assumptions than those used in the baseline. Used to provide quantitative information on the impact of changes in assumptions on the outlook.
Single Farm Payment (SFP)	With the 2003 CAP reform, the European Union introduced a farm-based payment largely independent of current production decisions and market developments, but based on the level of former payments received by farmers. With the reform of the CAP in 2013 SFP will move towards a flat rate amount per hectare in defined regions (mostly member states). Farmers receiving the SFP are obliged to keep their land in good agricultural and environmental condition and have the flexibility to produce any commodity on their land.
SPS Agreement	WTO Agreement on Sanitary and Phyto sanitary measures, including standards used to protect human, animal or plant life and health. This agreement seeks to establish a multilateral framework of rules and disciplines to guide the adoption, development and the enforcement of sanitary and phyto-sanitary measures in order to minimise their negative effects on trade.
Stock-to-use ratio	The stock-to-use ratio for cereals is defined as the ratio of cereal stocks to its domestic utilisation.
Stock-to-disappearance ratio	The stock-to-disappearance ratio is defined as the ratio of stocks held by the main exporters to their disappearance (i.e. domestic utilisation plus exports). For wheat the eight major exporters are considered, namely the United States, Argentina, the European Union, Canada, Australia, Russian Federation, Ukraine and Kazakhstan. In the case of coarse grains, United States, Argentina, the European Union, Canada, Australia, Russian Federation, Ukraine and Brazil are considered. For rice Viet Nam, Thailand, India, Pakistan and the United States enter this ratio calculation.
Support price	Prices fixed by government policy makers in order to determine, directly or indirectly, domestic market or producer prices. All administered price schemes set a minimum guaranteed support price or a target price for the commodity, which is maintained by associated policy measures, such as quantitative restrictions on production and imports; taxes, levies and tariffs on imports; export subsidies; and/or public stockholding
Tariff-Rate Quota (TRQ)	A two-tier tariff regime where imports within the quota enter at a lower ("in-quota") tariff rate while a higher ("out-of-quota") tariff rate is used for imports above this level, As part of the Uruguay Round Agreement on Agriculture, certain countries agreed to provide minimum import opportunities for products they had previously protected by tariffs.
Teff	An annual coarse grain, native to Ethiopia and Eritrea, and cultivated for its edible seeds.
Uruguay Round Agreement on Agriculture (URAA)	An international agreement negotiated as part of the Uruguay Round of the General Agreement on Tariffs and Trade. The URAA entered into force simultaneously with the establishment of the World Trade Organization in 1995. The URAA contains commitments to improve market access, reduce distorting domestic support, and reduce export subsidies. A separate agreement covers Sanitary and Phyto sanitary Measures known as the SPS Agreement.
Vegetable oils	Defined as rapeseed oil (canola), soybean oil, sunflower seed oil, coconut oil, cottonseed oil, palm kernel oil, groundnut oil and palm oil.
World Trade Organization (WTO)	Intergovernmental organisation regulating international trade, providing a framework for negotiating trade agreements, and acting as dispute resolution process. The WTO was created by the Uruguay Round agreement and officially commenced in 1995.

Summary table for country grouping in the statistical annex

North America	Developed	Canada, United States of America
Latin America	Developing	Anguilla, Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bolivia (Plurinational State of), Brazil, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Falkland Islands (Malvinas), French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Turks and Caicos Islands, United States Virgin Islands, Uruguay, Venezuela (Bolivarian Republic of)
Europe	Developed	Albania, Andorra, Belarus, Bosnia and Herzegovina, Channel Islands, European Union, Faroe Islands, Gibraltar, Holy See, Iceland, Isle of Man, Liechtenstein, Monaco, Montenegro, Norway, Republic of Moldova, Russian Federation, San Marino, Serbia, Svalbard and Jan Mayen Islands, Switzerland, The former Yugoslav Republic of Macedonia, Ukraine
Africa	Developed	South Africa
	Developing	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Morocco, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, Saint Helena (Ascension and Tristan da Cunha), Sao Tome and Principe, Senegal, Seychelles, Sierra-Leone, Somalia, South Sudan, Sudan, Swaziland, Togo, Tunisia, Uganda, United Republic of Tanzania, Western Sahara, Zambia, Zimbabwe
Asia	Developed	Armenia, Azerbaijan, Georgia, Israel, Japan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
	Developing	Afghanistan, Bahrain, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China Hong Kong SAR, China Macao SAR, China mainland, Democratic People's Republic of Korea, India, Indonesia, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lao People's Democratic Republic, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nauru, Nepal, Occupied Palestinian Territory, Oman, Pakistan, Philippines, Qatar, Republic of Korea, Saudi Arabia, Singapore, Sri Lanka, Syrian Arab Republic, Taiwan Province of China, Thailand, Timor-Leste, Turkey, United Arab Emirates, Viet Nam, Yemen
Ocenania	Developed	Australia, New Zealand
	Developing	American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall-Islands, Micronesia (Federated States of), New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna Islands
LDC[1]		Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Samoa, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Vanuatu, Yemen, Zambia
BRICS		Brazil, China mainland, India, Russian Federation, South Africa

1. Least Developed Countries (LDC) are a subgroup of developing countries. The names of countries and territories used in this table follow the practice of the FAO.
Source: FAO, http://faostat3.fao.org/browse/area/*/E.

Summary table for regional grouping of countries

South and East Asia	Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China Hong Kong SAR, China Macao SAR, China mainland, Democratic People's Republic of Korea, India, Indonesia, Japan, Lao People's Democratic Republic, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Taiwan Province of China, Thailand, Timor-Leste, Viet Nam, Yemen
Latin America and Caribbean	Anguilla, Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bolivia (Plurinational State of), Brazil, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Falkland Islands (Malvinas), French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Turks and Caicos Islands, United States Virgin Islands, Uruguay, Venezuela (Bolivarian Republic of)
North America	Canada, United States of America
Sub-Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mayotte, Mozambique, Namibia, Niger, Nigeria, Réunion, Rwanda, Saint Helena (Ascension and Tristan da Cunha), Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Western Sahara, Zambia, Zimbabwe
Eastern Europe and Central Asia	Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Channel Islands, Faroe Islands, Georgia, Gibraltar, Holy See, Iceland, Isle of Man, Israel, Kazakhstan, Kyrgyzstan, Liechtenstein, Monaco, Montenegro, Republic of Moldova, Russian Federation, San Marino, Serbia, Svalbard and Jan Mayen Islands, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan
Western Europe	European Union, Norway, Switzerland
Middle East and North Africa	Algeria, Bahrain, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates
Oceania	American Samoa, Australia ,Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, Wallis and Futuna Islands

Note: The names of countries and territories used in this table follow the practice of the FAO.
Source: FAO, http://faostat3.fao.org/browse/area/*/E.

Methodology

This section provides information on how the projections in the *Agricultural Outlook* are generated. First, a general description of the agricultural baseline projections and the *Outlook* report is given. Second, the compilation of a consistent set of the assumptions on macroeconomic projections is discussed in more detail. Section 3 provides reference to the underlying Aglink-Cosimo model, while the last section explains how a partial stochastic analysis is performed with the Aglink-Cosimo model.

The process of generating the *OECD-FAO Agricultural Outlook*

The projections presented in are the result of a process that brings together information from a large number of sources. The projections rely on input from country and commodity experts, and from the OECD-FAO Aglink-Cosimo model of global agricultural markets. This economic model is also used to ensure the consistency of baseline projections. A large amount of expert judgement, however, is applied at various stages of the *Outlook* process. The *Agricultural Outlook* presents a unified assessment judged by the OECD and FAO Secretariats to be plausible given the underlying assumptions and the information available at the time of writing.

The starting point: Creation of an initial baseline

The data series for the historic values are drawn from OECD and FAO databases. For the most part, information in these databases has been taken from national statistical sources. Starting values for the likely future development of agricultural markets are developed separately by OECD for its member states and some non-member countries and by FAO for all remaining countries.

- On the OECD side, an annual questionnaire is circulated in the fall to national administrations. Through these questionnaires, the OECD Secretariat obtains information on how countries expect their agricultural sector to develop for the various commodities covered in the *Outlook*, as well as on the evolution of agricultural policies.
- On the FAO side, the starting projections for the country modules are developed through model-based projections and consultations with FAO commodity specialists.

External sources, such as the IMF, the World Bank and the UN, are also used to complete the view of the main economic forces determining market developments.

This part of the process is aimed at creating a first insight into possible market developments and at establishing the key assumptions which condition the *Outlook*. The main economic and policy assumptions are summarised in the Overview chapter and in specific commodity tables. The sources for the assumptions are discussed in more detail further below.

As a next step, the OECD-FAO Aglink-Cosimo modelling framework is used to facilitate a consistent integration of the initial data and to derive an initial baseline of global market projections. The modelling framework ensures that at a global level, projected levels of consumption match with projected levels of production for the different commodities. The model is discussed in section three below.

In addition to quantities produced, consumed and traded, the baseline also includes projections for nominal prices (in local currency units) for the commodities concerned.[1]

The initial baseline results are then reviewed:

- For the countries under the OECD Secretariat's responsibility, the initial baseline results are compared with the questionnaire replies. Any issues are discussed in bilateral exchanges with country experts.
- For country and regional modules developed by the FAO Secretariat, initial baseline results are reviewed by a wider circle of in-house and international experts.

Final baseline

At this stage, the global projection picture starts to emerge, and refinements are made according to a consensus view of both Secretariats and external advisors. On the basis of these discussions and updated information, a second baseline is produced. The information generated is used to prepare market assessments for biofuels, cereals, oilseeds, sugar, meats, fish and sea food, dairy products and cotton over the course of the *Outlook* period.

These results are then discussed at the annual meetings of the Group on Commodity Markets of the OECD Committee for Agriculture, which brings together experts from national administrations of OECD countries as well as experts from commodity organisations. Following comments by this group, and data revisions, the baseline projections are finalised.

The *Outlook* process implies that the baseline projections presented in this report are a combination of projections and expert knowledge. The use of a formal modelling framework reconciles inconsistencies between individual country projections and forms a global equilibrium for all commodity markets. The review process ensures that judgement of country experts is brought to bear on the projections and related analyses. However, the final responsibility for the projections and their interpretation rests with the OECD and FAO Secretariats.

The revised projections form the basis for the writing of the *Agricultural Outlook*, which is discussed by the Senior Management Committee of FAO's Department of Economic and Social Development and the OECD's Working Party on Agricultural Policies and Markets of the Committee for Agriculture in May, prior to publication. In addition, the *Outlook* will be used as a basis for analyses presented to the FAO's Committee on Commodity Problems and its various Intergovernmental Commodity Groups.

Sources and assumptions for the macroeconomic projections

Population estimates from the 2017 Revision of the United Nations Population Prospects database provide the population data used for all countries and regional aggregates in the *Outlook*. For the projection period, the medium variant set of estimates was selected for use from the four alternative projection variants (low, medium, high and constant fertility). The UN Population Prospects database was chosen because it represents a comprehensive source of reliable estimates which includes data for non-OECD developing countries. For consistency reasons, the same source is used for both the historical population estimates and the projection data.

The other macroeconomic series used in the Aglink-Cosimo model are real GDP, the GDP deflator, the private consumption expenditure (PCE) deflator, the Brent crude oil price (in US dollars per barrel) and exchange rates expressed as the local currency value of USD 1. Historical data for these series in OECD countries as well as Brazil, Argentina, the People's Republic of China and the Russian Federation are consistent with those published in the *OECD Economic Outlook* No. 102 (November 2017). For other economies, historical macroeconomic data were obtained from the IMF, *World Economic Outlook* (October 2017). Assumptions for 2018 2027 are based on the recent medium term macroeconomic projections of the OECD Economics Department, projections of the *OECD Economic Outlook* No. 102 and projections of the IMF.

The model uses indices for real GDP, consumer prices (PCE deflator) and producer prices (GDP deflator) which are constructed with the base year 2010 value being equal to 1. The assumption of constant real exchange rates implies that a country with higher (lower) inflation relative to the United States (as measured by the US GDP deflator) will have a depreciating (appreciating) currency and therefore an increasing (decreasing) exchange rate over the projection period, since the exchange rate is measured as the local currency value of USD 1. The calculation of the nominal exchange rate uses the percentage growth of the ratio "country-GDP deflator/US GDP deflator".

The oil price used to generate the Outlook until 2016 is taken from the short term update of the *OECD Economic Outlook* No. 102 (November 2017). For 2017, the annual average monthly spot price is used, while the average daily spot price for December 2017 is used as the oil price value for the year 2018. Brent crude oil prices from 2019 are projected to grow at the same rate as projected by the World Bank Commodities Price forecasts (October 2017).

The underlying Aglink-Cosimo model

Aglink-Cosimo is an economic model that analyses supply and demand of world agriculture. It is managed by the Secretariats of the OECD and Food and Agriculture Organization of the United Nations (FAO), and used to generate the *OECD-FAO Agricultural Outlook* and policy scenario analysis.

Aglink-Cosimo is a recursive-dynamic, partial equilibrium model used to simulate developments of annual market balances and prices for the main agricultural commodities produced, consumed and traded worldwide. The Aglink-Cosimo country and regional modules covering the whole world, and projections are developed and maintained by the OECD and FAO Secretariats in conjunction with country experts and national administrations. Several key characteristics are as follows:

- Aglink-Cosimo is a "partial equilibrium" model for the main agricultural commodities. Non-agricultural markets are not modelled and are treated exogenously to the model. As non-agricultural markets are exogenous, hypotheses concerning the paths of key macroeconomic variables are predetermined with no accounting of feedback from developments in agricultural markets to the economy as a whole.

- World markets for agricultural commodities are assumed to be competitive, with buyers and sellers acting as price takers. Market prices are determined through a global or regional equilibrium in supply and demand.
- Domestically produced and traded commodities are viewed to be homogeneous and thus perfect substitutes by buyers and sellers. In particular, importers do not distinguish commodities by country of origin as Aglink-Cosimo is not a spatial model. Imports and exports are nevertheless determined separately. This assumption will affect the results of analysis in which trade is a major driver.
- Aglink-Cosimo is recursive-dynamic, and outcomes for one year influence those for the next years (e.g. through herd sizes). Aglink-Cosimo models ten years into the future.

A detailed documentation of Aglink-Cosimo has been produced in 2015 and is available on www.agri-outlook.org.

The model used to generate the fish projections is operated as a satellite model to Aglink Cosimo. Exogenous assumptions are shared and interacting variables (e.g. prices for cross-price reactions) are exchanged. The fish model went through substantial revision in 2016. The aggregated aquaculture supply functions of 32 components of the model were replaced by 117 species-specific supply functions with specific elasticity, feed ration and time lag. The main species covered are salmon and trout, shrimp, tilapia, carp, catfish (including Pangasius), seabream and seabass, and molluscs. A few other minor productions such as milkfish were also included. The model was constructed so as to ensure consistency between the feed rations and the fishmeal and fish oil markets. Depending on the species, the feed rations can contain a maximum of five types of feed; fishmeal, fish oil, oilseed meals (or substitutes), vegetable oil and low protein feeds like cereals and brans.

The methodology of stochastic simulations with Aglink-Cosimo

The partial stochastic analysis highlights how alternative scenarios diverge from the baseline by treating a number of variables stochastically. The selection of variables treated stochastically aims at identifying the major sources of uncertainty for EU agricultural markets. In total, 42 country specific macroeconomic variables, the crude oil price, and 85 country- and product-specific yields are treated as uncertain within this partial stochastic framework. Apart from the international oil price, four macroeconomic variables are considered in major countries: consumer price index (CPI), gross domestic product index (GDPI), gross domestic product deflator (GDPD) and exchange rate (XR).[2] The yield variables are key crop and milk yields in important world markets. Among the key crops, we include wheat, barley, maize, oats, rye, rice, soybeans, rapeseeds, sunflower, palm oil, and sugar beet and cane.[3]

The methodology is thoroughly explained in Araujo-Enciso, Pieralli and Pérez-Domínguez (2017).[4] The three main steps are briefly explained below.

(i) The quantification of the past variability around the trend for each macroeconomic and yield variable separately

For macroeconomic variables, the estimation is based on econometric estimation of vector autoregressive systems of equations for the period 2000-2016. The unexplained portion of uncertainty in each year for the different variables is considered. For yields, the uncertainty is based on the deviation between historical yields and a fitted cubic time trend for the period 2000-2016. Correlation between empirical distributions of yield errors for a given commodity is calculated by regional block, but is assumed to be zero among regional blocks. Both in macroeconomic and yield variables, the empirical distributions of the errors are used as input for step (ii) into hierarchical Archimedean copulas without further assumptions on the shape of the marginal distributions of uncertainty.

(ii) The generation of 1 000 sets of possible values for the stochastic variables

The second step involves generating 1 000 sets of possible values for the stochastic variables, thus reproducing the variability determined in step (i) for each year of the projection period 2018-2027. Macroeconomic and yield errors are separately included in a hierarchical Archimedean copula framework to flexibly simulate the correlation of the variables inside countries and regional blocks, respectively.

(iii) The execution of the Aglink-Cosimo model for each of these 1 000 possible alternative sets of values (uncertainty scenarios)

The third step involves running the AGLINK-COSIMO model for each of the 1 000 alternative "uncertainty" scenarios generated in step (ii). When including both macroeconomic and yield uncertainty, this procedure yielded 994 successful simulations. In the remaining six cases, the model did not solve. This can occur as the model is a complex system of equations and policies that may lead to infeasibilities when exposed to extreme shocks in one or several stochastic variables.

Notes

[1] Trade data for regions, e.g. the European Union or regional aggregates of developing countries, refer only to extra-regional trade. This approach results in a smaller overall trade figure than cumulated national statistics. For further details on particular series, enquiries should be directed to the OECD and FAO Secretariats.

[2] The countries considered are Australia, Brazil, Canada, China, Europe (E15 and New Member States, with a unique exchange rate), India, Japan, New Zealand, Russian Federation, and United States.

[3] Among the key markets, we include Europe (E15 and New Member States), Kazakhstan, Ukraine, Russian Federation, Argentina, Brazil, Paraguay, Uruguay, Canada, Mexico, United States, Indonesia, Malaysia, Thailand, Viet Nam, Australia, China, India, and New Zealand.

[4]. Araujo Enciso, S., Pieralli, S. and I. Perez Dominguez (2017), "Partial Stochastic Analysis with the Aglink-Cosimo Model: A Methodological Overview", EUR 28863 EN, Publications Office of the European Union, Luxembourg, 2017, doi: 10.2760/680976, JRC108837.

Statistical Annex

Part I. ANNEX A

Table A.1. World cereal projections

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WHEAT												
World												
Production	Mt	750.5	754.7	763.7	774.8	783.9	793.3	802.1	810.0	817.1	824.7	832.6
Area	Mha	220.6	220.6	220.9	222.0	222.4	223.1	223.7	223.9	223.9	223.9	224.0
Yield	t/ha	3.40	3.42	3.46	3.49	3.52	3.56	3.59	3.62	3.65	3.68	3.72
Consumption	Mt	726.6	758.4	761.2	767.9	775.2	783.3	791.8	800.3	808.3	816.0	823.8
Feed use	Mt	139.5	146.3	147.6	149.6	152.2	154.6	157.3	159.8	162.3	164.6	166.9
Food use	Mt	496.4	506.1	510.8	515.2	519.9	524.7	529.3	534.1	538.7	543.1	547.4
Biofuel use	Mt	12.4	12.5	12.5	12.4	12.4	12.4	12.5	12.6	12.7	12.8	12.8
Other use	Mt	78.3	93.6	90.2	90.7	90.7	91.6	92.8	93.8	94.7	95.5	96.7
Exports	Mt	175.1	178.6	181.8	183.4	185.5	188.1	190.3	192.4	194.4	196.5	198.7
Closing stocks	Mt	247.6	254.8	251.9	253.3	256.5	260.9	265.7	269.9	273.2	276.4	279.7
Price[1]	USD/t	206.6	209.1	213.8	219.1	222.2	223.2	223.6	223.3	224.7	226.8	229.1
Developed countries												
Production	Mt	401.2	397.8	402.7	408.5	412.9	417.7	421.9	425.5	428.6	432.0	435.6
Consumption	Mt	272.9	271.6	274.3	275.3	276.8	278.7	280.9	282.9	284.6	286.2	288.0
Net trade	Mt	125.4	129.7	132.4	133.6	135.4	137.8	139.9	142.1	143.8	145.6	147.5
Closing stocks	Mt	81.4	78.5	74.5	74.2	74.9	76.0	77.0	77.5	77.8	78.1	78.3
Developing countries												
Production	Mt	349.3	356.9	361.0	366.3	371.0	375.6	380.2	384.5	388.5	392.6	397.0
Consumption	Mt	453.7	486.8	486.9	492.6	498.4	504.6	510.9	517.3	523.7	529.8	535.8
Net trade	Mt	-118.6	-124.2	-126.9	-128.1	-129.9	-132.4	-134.4	-136.6	-138.3	-140.1	-142.0
Closing stocks	Mt	166.3	176.3	177.4	179.1	181.6	185.0	188.6	192.4	195.4	198.4	201.5
OECD[2]												
Production	Mt	292.9	287.0	290.8	295.3	298.1	300.9	303.3	305.3	307.1	309.2	311.3
Consumption	Mt	223.8	222.1	224.6	225.2	226.3	227.8	229.5	231.1	232.3	233.5	234.9
Net trade	Mt	67.6	66.0	68.4	70.3	71.2	72.3	73.0	73.9	74.6	75.4	76.2
Closing stocks	Mt	61.8	57.7	55.6	55.4	56.0	56.8	57.5	57.8	58.0	58.3	58.5
MAIZE												
World												
Production	Mt	1 040.8	1 073.9	1 082.8	1 096.7	1 111.4	1 131.2	1 144.9	1 161.8	1 173.6	1 186.3	1 201.7
Area	Mha	181.2	185.4	185.5	185.9	186.6	187.8	188.5	189.3	189.7	189.9	190.4
Yield	t/ha	5.74	5.79	5.84	5.90	5.96	6.02	6.07	6.14	6.19	6.25	6.31
Consumption	Mt	1 037.0	1 080.4	1 090.2	1 101.3	1 113.2	1 129.5	1 142.4	1 155.7	1 170.8	1 185.0	1 200.7
Feed use	Mt	578.8	606.3	619.1	624.1	631.3	644.1	653.7	664.8	676.1	686.5	698.5
Food use	Mt	132.1	138.3	140.9	143.3	145.7	148.3	150.9	153.5	156.2	158.8	161.6
Biofuel use	Mt	173.9	178.8	178.7	180.6	179.6	179.4	178.7	178.3	178.2	178.1	177.9
Other use	Mt	104.9	108.7	102.7	103.9	106.7	107.7	108.7	108.3	109.3	110.2	111.0
Exports	Mt	138.7	138.5	140.1	142.6	144.8	146.4	148.3	150.5	152.5	155.0	157.2
Closing stocks	Mt	251.1	248.8	241.0	236.0	233.9	235.2	237.3	243.0	245.4	246.4	247.0
Price[3]	USD/t	155.9	158.7	163.2	167.4	172.6	174.6	174.0	172.4	172.2	172.4	173.0
Developed countries												
Production	Mt	504.0	515.2	514.8	519.5	522.7	530.5	532.9	539.2	541.7	544.6	549.9
Consumption	Mt	451.9	463.1	468.6	469.0	470.3	475.7	477.0	479.8	482.9	485.3	489.4
Net trade	Mt	48.4	48.1	50.3	52.2	52.8	53.4	54.9	57.1	58.7	60.1	60.7
Closing stocks	Mt	91.4	100.3	96.1	94.5	94.0	95.3	96.3	98.6	98.7	97.9	97.7
Developing countries												
Production	Mt	536.8	558.7	568.0	577.1	588.7	600.7	612.0	622.5	631.9	641.7	651.8
Consumption	Mt	585.1	617.3	621.6	632.3	642.9	653.8	665.4	675.9	687.9	699.7	711.3
Net trade	Mt	-47.3	-47.7	-49.9	-51.9	-52.5	-53.1	-54.6	-56.7	-58.4	-59.7	-60.4
Closing stocks	Mt	159.7	148.5	144.8	141.5	139.8	139.8	141.0	144.4	146.7	148.4	149.3
OECD[2]												
Production	Mt	475.2	482.2	481.9	486.5	489.6	496.6	498.1	503.6	505.3	507.7	512.5
Consumption	Mt	471.5	486.2	491.7	492.1	493.4	498.8	500.1	503.0	506.2	508.7	512.9
Net trade	Mt	-1.1	-7.6	-5.3	-3.6	-3.1	-3.4	-2.6	-1.5	-0.8	-0.2	-0.1
Closing stocks	Mt	85.9	95.4	90.9	88.9	88.2	89.3	89.9	91.9	91.9	91.0	90.8

Table A.1. World cereal projections *(cont.)*

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
OTHER COARSE GRAINS												
World												
Production	Mt	297.4	297.1	298.4	301.3	305.3	309.3	312.9	316.2	319.5	323.2	326.9
Area	Mha	157.8	158.3	158.2	158.4	159.1	159.6	160.0	160.4	160.7	161.1	161.5
Yield	t/ha	1.89	1.88	1.89	1.90	1.92	1.94	1.95	1.97	1.99	2.01	2.02
Consumption	Mt	294.3	295.0	297.4	300.4	304.3	308.1	311.6	314.9	318.5	322.2	325.9
Feed use	Mt	164.9	167.7	168.1	169.8	171.7	173.4	175.1	176.7	178.5	180.5	182.4
Food use	Mt	77.0	78.9	80.2	81.4	82.9	84.3	85.7	87.2	88.6	90.1	91.6
Biofuel use	Mt	9.4	9.6	9.5	9.6	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Other use	Mt	43.2	38.8	39.6	39.5	40.2	40.9	41.3	41.6	41.8	42.1	42.4
Exports	Mt	45.8	41.5	42.1	43.2	44.2	45.1	46.0	46.8	47.6	48.4	49.1
Closing stocks	Mt	63.8	63.6	64.1	64.6	65.1	65.8	66.7	67.5	68.0	68.6	69.1
Price[4]	USD/t	167.1	163.9	169.8	173.1	176.0	179.3	181.0	182.3	184.4	186.7	189.4
Developed countries												
Production	Mt	186.0	183.2	182.5	182.8	184.1	185.2	186.4	187.3	188.1	189.1	190.1
Consumption	Mt	152.7	151.8	151.3	151.5	152.3	153.1	153.5	153.8	154.2	154.7	155.3
Net trade	Mt	33.2	30.2	30.5	31.1	31.5	31.8	32.4	33.0	33.6	34.1	34.6
Closing stocks	Mt	38.5	39.6	40.3	40.6	40.9	41.2	41.7	42.2	42.4	42.6	42.9
Developing countries												
Production	Mt	111.4	113.9	115.8	118.5	121.3	124.1	126.5	128.9	131.4	134.1	136.8
Consumption	Mt	141.6	143.2	146.1	148.9	152.0	155.0	158.1	161.1	164.3	167.5	170.6
Net trade	Mt	-28.9	-29.8	-30.1	-30.7	-31.0	-31.3	-31.9	-32.6	-33.2	-33.7	-34.2
Closing stocks	Mt	25.3	24.0	23.8	24.0	24.3	24.6	25.0	25.3	25.6	25.9	26.2
OECD[2]												
Production	Mt	151.2	151.7	151.3	151.6	152.8	153.7	154.8	155.5	156.3	157.3	158.2
Consumption	Mt	130.3	130.9	131.7	132.0	132.8	133.7	134.2	134.5	135.0	135.6	136.2
Net trade	Mt	22.4	19.0	18.9	19.4	19.8	20.0	20.4	20.8	21.3	21.7	22.0
Closing stocks	Mt	28.6	28.1	28.8	29.0	29.2	29.2	29.4	29.6	29.6	29.6	29.7
RICE												
World												
Production	Mt	498.3	509.7	516.4	522.2	526.8	532.3	538.1	544.3	550.5	556.5	562.3
Area	Mha	162.1	163.4	163.8	163.9	163.6	163.4	163.3	163.3	163.4	163.4	163.3
Yield	t/ha	3.07	3.12	3.15	3.19	3.22	3.26	3.30	3.33	3.37	3.41	3.44
Consumption	Mt	497.8	511.6	517.9	524.0	529.3	534.9	540.3	546.0	552.0	558.0	564.0
Feed use	Mt	19.8	20.5	20.7	21.0	21.3	21.5	21.6	21.7	21.9	22.1	22.3
Food use	Mt	403.4	415.0	420.0	425.4	430.3	435.3	439.9	444.7	449.8	454.9	459.5
Exports	Mt	45.2	44.7	45.6	46.6	47.6	48.7	49.7	50.9	52.0	53.2	54.4
Closing stocks	Mt	168.1	169.5	170.1	170.4	169.8	169.3	169.2	169.5	170.1	170.6	171.0
Price[5]	USD/t	404.7	412.3	410.6	409.9	414.1	419.6	423.9	425.8	427.2	428.5	431.0
Developed countries												
Production	Mt	17.9	18.6	18.5	18.5	18.6	18.8	18.9	19.1	19.2	19.3	19.4
Consumption	Mt	19.1	19.3	19.4	19.4	19.5	19.5	19.5	19.6	19.6	19.6	19.7
Net trade	Mt	-0.9	-0.7	-0.6	-0.7	-0.7	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5
Closing stocks	Mt	5.5	4.9	4.6	4.4	4.3	4.2	4.1	4.2	4.3	4.5	4.7
Developing countries												
Production	Mt	480.5	491.2	498.0	503.7	508.2	513.5	519.2	525.2	531.3	537.1	542.9
Consumption	Mt	478.7	492.3	498.6	504.6	509.9	515.4	520.8	526.4	532.4	538.4	544.3
Net trade	Mt	1.2	-1.3	-1.5	-1.4	-1.4	-1.4	-1.5	-1.5	-1.5	-1.6	-1.6
Closing stocks	Mt	162.6	164.6	165.4	165.9	165.6	165.2	165.0	165.3	165.7	166.1	166.3
OECD[2]												
Production	Mt	21.1	21.7	21.5	21.5	21.6	21.7	21.7	21.8	21.9	21.9	21.9
Consumption	Mt	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.6	22.6	22.6
Net trade	Mt	-1.0	-1.0	-0.9	-1.0	-1.0	-1.0	-0.9	-0.9	-0.9	-0.9	-0.9
Closing stocks	Mt	6.1	5.3	5.0	4.8	4.6	4.6	4.5	4.6	4.7	4.9	5.2

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. No.2 hard red winter wheat, ordinary protein, United States FOB Gulf Ports (June/May).
2. Excludes Iceland but includes all EU28 member countries.
3. No.2 yellow corn, United States FOB Gulf Ports (September/August).
4. Feed barley, Europe, FOB Rouen (July/June).
5. Milled 100%, grade b, nominal price quote, FOB Bangkok (January/December).

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

Table A.2. World oilseed projections

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
SOYBEAN												
World												
Production	Mt	337.1	355.8	361.9	368.5	374.9	380.9	385.8	390.9	396.3	401.5	406.8
Area	Mha	122.8	128.7	129.7	130.9	131.8	132.9	133.6	134.3	135.1	135.9	136.7
Yield	t/ha	2.74	2.77	2.79	2.82	2.84	2.87	2.89	2.91	2.93	2.95	2.98
Consumption	Mt	332.8	356.3	362.6	368.6	374.7	380.5	385.5	390.7	395.9	401.2	406.4
Crush	Mt	297.5	320.0	326.2	331.9	337.7	343.2	347.9	352.9	357.8	362.8	367.8
Closing stocks	Mt	38.6	41.9	41.1	41.0	41.2	41.6	41.9	42.1	42.4	42.6	43.0
Price[1]	USD/t	399.7	393.7	409.1	416.6	421.1	425.7	430.8	436.4	441.4	447.3	452.5
Developed countries												
Production	Mt	133.3	139.2	140.5	142.6	145.0	146.7	148.5	150.3	152.2	154.0	155.9
Consumption	Mt	88.7	91.7	92.2	93.3	94.2	95.2	96.4	97.3	98.5	99.9	101.2
Crush	Mt	79.6	82.6	83.2	84.3	85.2	86.2	87.3	88.2	89.5	90.8	92.1
Closing stocks	Mt	12.4	15.4	14.6	14.4	14.3	14.3	14.3	14.2	14.2	14.2	14.2
Developing countries												
Production	Mt	203.9	216.6	221.4	225.9	229.9	234.2	237.3	240.6	244.0	247.4	250.8
Consumption	Mt	244.1	264.6	270.5	275.3	280.5	285.2	289.2	293.5	297.4	301.3	305.2
Crush	Mt	217.9	237.4	243.0	247.6	252.5	257.0	260.7	264.7	268.3	272.0	275.7
Closing stocks	Mt	26.2	26.5	26.5	26.6	26.9	27.3	27.6	27.9	28.2	28.5	28.8
OECD[2]												
Production	Mt	124.8	129.8	130.9	132.8	135.0	136.5	138.1	139.7	141.4	143.0	144.7
Consumption	Mt	89.2	92.1	92.7	94.0	95.0	96.1	97.3	98.2	99.5	101.0	102.3
Crush	Mt	80.1	83.0	83.7	84.9	85.9	87.0	88.2	89.2	90.5	91.9	93.2
Closing stocks	Mt	13.0	15.8	15.1	14.8	14.8	14.8	14.7	14.7	14.7	14.6	14.6
OTHER OILSEEDS												
World												
Production	Mt	146.8	150.7	152.9	155.3	157.5	160.0	162.5	165.2	167.8	170.5	173.0
Area	Mha	83.9	86.0	86.5	87.1	87.5	88.1	88.6	89.2	89.8	90.4	90.9
Yield	t/ha	1.75	1.75	1.77	1.78	1.80	1.82	1.83	1.85	1.87	1.89	1.90
Consumption	Mt	147.1	150.7	153.1	155.4	157.5	160.0	162.5	165.1	167.7	170.4	173.0
Crush	Mt	124.6	128.6	130.6	132.8	134.7	136.9	139.2	141.6	144.0	146.4	148.8
Closing stocks	Mt	8.5	8.7	8.5	8.4	8.4	8.5	8.5	8.6	8.6	8.7	8.7
Price[3]	USD/t	424.0	439.2	452.6	456.3	463.3	465.2	469.0	472.3	478.4	481.5	487.7
Developed countries												
Production	Mt	88.2	90.2	91.4	92.8	94.1	95.7	97.1	98.7	100.2	101.8	103.4
Consumption	Mt	80.6	80.4	81.5	82.7	83.7	84.9	86.1	87.3	88.5	89.8	91.2
Crush	Mt	72.9	72.6	73.7	74.8	75.8	76.9	78.1	79.2	80.4	81.6	82.9
Closing stocks	Mt	6.3	6.4	6.3	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Developing countries												
Production	Mt	58.6	60.5	61.5	62.5	63.4	64.4	65.4	66.5	67.6	68.7	69.6
Consumption	Mt	66.5	70.4	71.6	72.8	73.8	75.1	76.4	77.8	79.2	80.6	81.8
Crush	Mt	51.7	55.9	57.0	58.0	59.0	60.0	61.2	62.4	63.7	64.9	65.9
Closing stocks	Mt	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.6
OECD[2]												
Production	Mt	59.5	60.9	61.1	61.5	61.8	62.2	62.6	63.0	63.2	63.5	63.8
Consumption	Mt	56.3	56.1	56.3	56.7	56.8	57.1	57.4	57.6	57.7	57.9	58.1
Crush	Mt	50.9	50.8	51.0	51.3	51.5	51.7	52.0	52.1	52.2	52.4	52.5
Closing stocks	Mt	5.4	5.6	5.4	5.3	5.2	5.3	5.3	5.3	5.3	5.3	5.3
PROTEIN MEALS												
World												
Production	Mt	326.7	348.2	354.1	360.3	366.3	372.2	377.7	383.4	389.0	394.8	400.4
Consumption	Mt	324.7	348.0	354.1	360.1	366.1	372.0	377.5	383.3	389.0	394.7	400.2
Closing stocks	Mt	14.7	14.5	14.5	14.7	14.8	14.9	15.2	15.2	15.3	15.4	15.5
Price[4]	USD/t	316.8	312.9	323.8	333.0	340.7	344.3	349.1	350.7	356.8	360.8	366.0
Developed countries												
Production	Mt	104.6	107.0	107.8	109.2	110.4	111.8	113.3	114.6	116.2	117.9	119.6
Consumption	Mt	120.3	123.3	123.8	124.7	125.7	126.6	127.1	127.9	128.9	129.7	130.4
Closing stocks	Mt	1.8	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2
Developing countries												
Production	Mt	222.1	241.1	246.4	251.1	255.9	260.5	264.5	268.8	272.9	276.9	280.8
Consumption	Mt	204.3	224.7	230.3	235.4	240.5	245.4	250.3	255.4	260.1	265.0	269.8
Closing stocks	Mt	12.9	12.7	12.6	12.8	12.8	13.0	13.1	13.2	13.2	13.3	13.3
OECD[2]												
Production	Mt	96.5	99.1	99.5	100.8	101.8	102.8	104.1	105.0	106.2	107.5	108.8
Consumption	Mt	124.6	127.4	128.2	129.1	130.2	131.3	132.0	132.9	134.1	135.0	135.7
Closing stocks	Mt	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7

Table A.2. World oilseed projections *(cont.)*

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
VEGETABLE OILS												
World												
Production	Mt	189.6	202.0	205.7	209.7	213.5	217.1	220.6	224.2	227.7	231.2	234.6
of which palm oil	Mt	65.1	71.1	72.6	74.2	75.8	77.1	78.4	79.6	80.8	82.0	83.2
Consumption	Mt	191.6	202.6	205.7	209.6	213.2	216.8	220.4	224.0	227.5	231.0	234.5
Food	Mt	153.5	162.0	164.8	168.1	171.9	175.5	179.1	182.4	185.7	189.0	192.3
Biofuel	Mt	24.0	26.1	26.4	26.9	26.7	26.5	26.6	26.7	26.9	27.0	27.2
Exports	Mt	76.7	81.3	83.5	85.3	86.9	88.5	90.1	91.7	93.2	94.8	96.3
Closing stocks	Mt	22.7	22.3	22.3	22.4	22.6	22.9	23.1	23.3	23.4	23.6	23.7
Price[5]	USD/t	783.5	828.6	829.0	829.9	834.3	842.9	852.5	862.8	874.6	883.0	892.0
Developed countries												
Production	Mt	48.3	48.6	49.1	49.9	50.5	51.2	52.0	52.7	53.5	54.3	55.2
Consumption	Mt	53.7	54.0	53.6	53.9	54.1	54.3	54.5	54.6	54.8	54.9	55.0
Closing stocks	Mt	4.8	4.2	3.9	3.8	3.9	4.1	4.1	4.2	4.2	4.2	4.1
Developing countries												
Production	Mt	141.3	153.4	156.6	159.9	163.0	165.9	168.7	171.5	174.2	176.9	179.5
Consumption	Mt	137.8	148.6	152.1	155.7	159.1	162.5	166.0	169.4	172.7	176.1	179.5
Closing stocks	Mt	17.9	18.1	18.4	18.6	18.7	18.8	19.0	19.1	19.3	19.4	19.6
OECD[2]												
Production	Mt	39.3	39.7	39.9	40.3	40.6	41.0	41.3	41.6	42.0	42.4	42.7
Consumption	Mt	53.5	53.9	53.6	53.9	54.1	54.2	54.4	54.6	54.8	54.9	55.0
Closing stocks	Mt	3.9	3.6	3.4	3.3	3.4	3.5	3.6	3.6	3.6	3.6	3.5

Note: Average 2015-17est: Data for 2017 are estimated.
1. Soybean, U.S., CIF Rotterdam (October/September).
2. Excludes Iceland but includes all EU28 member countries.
3. Rapeseed, Europe, CIF Hamburg (October/September).
4. Weighted average protein meal, European port (October/September).
5. Weighted average price of oilseed oils and palm oil, European port (October/September).

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

Table A.3. World sugar projections

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WORLD												
SUGARBEET												
Production	Mt	272.6	291.5	292.9	289.9	289.0	289.7	290.1	291.0	292.3	293.6	295.0
Area	Mha	4.6	4.9	4.8	4.8	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Yield	t/ha	59.51	60.00	60.50	60.63	60.91	61.20	61.47	61.69	61.97	62.23	62.52
Biofuel use	Mt	13.8	15.2	15.1	14.9	14.7	14.7	14.8	14.8	14.8	14.8	14.8
SUGARCANE												
Production	Mt	1 873.7	1 919.1	1 943.3	1 957.5	1 990.7	2 012.1	2 034.4	2 055.3	2 073.7	2 092.4	2 111.4
Area	Mha	27.3	27.8	28.0	28.1	28.3	28.5	28.6	28.8	28.9	29.0	29.2
Yield	t/ha	68.75	68.96	69.45	69.58	70.37	70.68	71.05	71.42	71.74	72.09	72.42
Biofuel use	Mt	348.6	353.8	363.5	369.7	376.2	382.3	389.0	395.5	400.7	405.6	410.4
SUGAR												
Production	Mt tq	170.7	178.6	182.1	184.8	188.6	191.2	193.8	196.5	199.1	201.9	204.7
Consumption	Mt tq	167.1	173.4	176.0	178.7	181.4	184.1	186.9	189.6	192.4	195.1	197.9
Closing stocks	Mt tq	78.9	78.2	78.3	78.5	79.6	80.7	81.7	82.6	83.4	84.2	85.1
Price, raw sugar[1]	USD/t	359.7	346.9	352.7	357.4	362.9	367.8	372.6	377.7	383.2	388.1	392.3
Price, white sugar[2]	USD/t	442.7	417.3	434.0	437.8	443.0	448.1	452.7	457.3	462.4	467.3	471.7
Price, HFCS[3]	USD/t	613.8	503.7	519.5	526.8	538.4	546.5	551.8	555.2	560.6	566.2	572.1
DEVELOPED COUNTRIES												
SUGARBEET												
Production	Mt	226.2	243.2	243.7	240.2	238.4	238.4	238.1	238.3	238.8	239.4	240.0
SUGARCANE												
Production	Mt	81.7	83.5	85.2	86.3	87.0	87.5	87.9	88.6	89.3	89.6	90.2
SUGAR												
Production	Mt tq	41.0	45.1	45.3	45.6	45.6	45.7	45.8	46.0	46.3	46.5	46.7
Consumption	Mt tq	46.3	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	48.1	48.2
Closing stocks	Mt tq	12.2	12.5	12.5	12.4	12.5	12.6	12.7	12.7	12.8	12.9	12.9
HFCS												
Production	Mt dw	9.4	9.7	10.0	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11.0
Consumption	Mt dw	8.1	8.3	8.5	8.8	9.0	9.0	9.0	9.1	9.2	9.2	9.3
DEVELOPING COUNTRIES												
SUGARBEET												
Production	Mt	46.4	48.3	49.2	49.7	50.5	51.3	52.0	52.8	53.5	54.2	55.0
SUGARCANE												
Production	Mt	1 791.9	1 835.6	1 858.1	1 871.2	1 903.7	1 924.6	1 946.4	1 966.7	1 984.4	2 002.8	2 021.2
SUGAR												
Production	Mt tq	129.8	133.5	136.8	139.3	143.0	145.4	148.0	150.5	152.9	155.4	158.0
Consumption	Mt tq	120.8	126.5	129.0	131.6	134.1	136.7	139.3	141.9	144.5	147.1	149.7
Closing stocks	Mt tq	66.7	65.7	65.8	66.0	67.1	68.1	69.0	69.9	70.6	71.3	72.2
HFCS												
Production	Mt dw	4.4	4.7	4.7	4.7	4.8	4.8	4.9	4.9	4.9	5.0	5.0
Consumption	Mt dw	5.1	5.4	5.4	5.5	5.6	5.7	5.7	5.8	5.9	6.0	6.0
OECD[4]												
SUGARBEET												
Production	Mt	171.7	184.6	185.1	181.5	179.0	178.2	177.2	176.5	176.2	175.9	175.8
SUGARCANE												
Production	Mt	121.9	124.1	126.5	128.2	129.8	131.0	131.6	132.6	133.6	134.5	135.7
SUGAR												
Production	Mt tq	39.2	42.8	43.0	43.3	43.3	43.4	43.4	43.5	43.6	43.8	44.0
Consumption	Mt tq	43.7	44.2	44.4	44.6	44.8	45.0	45.1	45.3	45.5	45.7	45.9
Closing stocks	Mt tq	10.8	10.8	10.9	11.0	11.1	11.2	11.2	11.3	11.4	11.5	11.5
HFCS												
Production	Mt dw	10.7	10.9	11.2	11.4	11.6	11.7	11.8	11.9	12.0	12.0	12.1
Consumption	Mt dw	10.2	10.4	10.6	10.9	11.1	11.1	11.2	11.3	11.4	11.5	11.5

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

HFCS: High fructose corn syrup.

1. Raw sugar world price, ICE contract No11 nearby (October/September).
2. Refined sugar price, White Sugar Futures Contract No. 407, Euronext market, Liffe, London, Europe (October/September).
3. United States wholesale list price HFCS-55, dry weight (October/September).
4. Excludes Iceland but includes all EU28 member countries.

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

Table A.4. World meat projections

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WORLD												
BEEF AND VEAL												
Production	kt cwe	68 486	71 724	72 799	73 683	74 296	75 038	75 839	76 697	77 471	78 394	79 292
Consumption	kt cwe	67 977	70 932	72 105	72 908	73 509	74 250	75 056	75 913	76 690	77 617	78 510
PIGMEAT												
Production	kt cwe	117 547	120 708	121 855	123 151	124 401	125 644	126 731	127 759	128 807	129 820	130 930
Consumption	kt cwe	117 354	120 476	121 679	122 975	124 230	125 461	126 537	127 556	128 595	129 597	130 699
POULTRY MEAT												
Production	kt rtc	118 083	123 205	125 350	127 142	128 705	130 491	132 229	134 052	135 752	137 316	139 016
Consumption	kt rtc	118 018	123 121	125 248	127 050	128 624	130 401	132 142	133 966	135 669	137 234	138 921
SHEEP MEAT												
Production	kt cwe	14 417	14 872	15 128	15 413	15 708	16 002	16 276	16 559	16 848	17 138	17 430
Consumption	kt cwe	14 436	14 868	15 124	15 411	15 710	15 998	16 269	16 548	16 834	17 121	17 410
TOTAL MEAT												
Per capita consumption[1]	kg rwt	34.3	34.7	34.9	35.0	35.0	35.1	35.1	35.2	35.2	35.3	35.4
DEVELOPED COUNTRIES												
BEEF AND VEAL												
Production	kt cwe	29 543	30 883	31 167	31 326	31 234	31 330	31 516	31 727	31 839	32 030	32 196
Consumption	kt cwe	28 643	29 805	30 235	30 312	30 138	30 171	30 297	30 481	30 572	30 750	30 896
PIGMEAT												
Production	kt cwe	44 251	45 297	45 244	45 378	45 521	45 816	45 974	46 183	46 402	46 532	46 770
Consumption	kt cwe	40 773	41 634	41 718	41 852	41 992	42 257	42 350	42 468	42 588	42 579	42 739
POULTRY MEAT												
Production	kt rtc	48 947	50 868	51 460	52 063	52 398	52 845	53 262	53 696	54 101	54 430	54 763
Consumption	kt rtc	46 971	48 772	49 165	49 666	49 910	50 244	50 538	50 843	51 097	51 280	51 462
SHEEP MEAT												
Production	kt cwe	3 502	3 624	3 683	3 729	3 793	3 863	3 895	3 932	3 969	4 007	4 045
Consumption	kt cwe	2 846	2 915	2 959	2 994	3 037	3 079	3 101	3 128	3 155	3 183	3 210
TOTAL MEAT												
Per capita consumption[1]	kg rwt	68.0	69.7	70.0	70.2	70.1	70.3	70.4	70.6	70.7	70.7	70.8
DEVELOPING COUNTRIES												
BEEF AND VEAL												
Production	kt cwe	38 943	40 842	41 631	42 357	43 061	43 708	44 323	44 969	45 632	46 364	47 096
Consumption	kt cwe	39 334	41 126	41 870	42 595	43 371	44 079	44 759	45 432	46 118	46 867	47 613
PIGMEAT												
Production	kt cwe	73 296	75 411	76 611	77 773	78 880	79 828	80 756	81 576	82 405	83 288	84 160
Consumption	kt cwe	76 581	78 843	79 960	81 123	82 238	83 204	84 187	85 087	86 008	87 019	87 960
POULTRY MEAT												
Production	kt rtc	69 136	72 337	73 890	75 080	76 307	77 646	78 966	80 356	81 651	82 886	84 253
Consumption	kt rtc	71 047	74 349	76 083	77 385	78 714	80 158	81 604	83 123	84 572	85 955	87 458
SHEEP MEAT												
Production	kt cwe	10 915	11 249	11 446	11 684	11 915	12 139	12 382	12 627	12 878	13 131	13 385
Consumption	kt cwe	11 590	11 953	12 165	12 418	12 673	12 919	13 168	13 420	13 679	13 938	14 200
TOTAL MEAT												
Per capita consumption[1]	kg rwt	26.4	26.8	26.9	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.9
OECD[2]												
BEEF AND VEAL												
Production	kt cwe	27 731	29 331	29 679	29 838	29 724	29 800	29 945	30 119	30 218	30 397	30 554
Consumption	kt cwe	26 736	28 259	28 705	28 777	28 596	28 623	28 741	28 920	29 003	29 176	29 323
PIGMEAT												
Production	kt cwe	42 062	42 982	42 920	42 990	43 107	43 372	43 518	43 720	43 938	44 050	44 271
Consumption	kt cwe	39 307	40 139	40 247	40 336	40 439	40 674	40 782	40 911	41 033	41 052	41 211
POULTRY MEAT												
Production	kt rtc	47 017	48 761	49 421	50 016	50 362	50 831	51 270	51 738	52 165	52 512	52 876
Consumption	kt rtc	44 688	46 380	46 820	47 336	47 626	48 004	48 337	48 686	48 976	49 193	49 424
SHEEP MEAT												
Production	kt cwe	2 721	2 797	2 846	2 877	2 926	2 980	2 997	3 018	3 040	3 062	3 086
Consumption	kt cwe	2 075	2 103	2 135	2 154	2 181	2 206	2 214	2 226	2 237	2 250	2 263
TOTAL MEAT												
Per capita consumption[1]	kg rwt	68.5	70.3	70.5	70.6	70.5	70.6	70.7	70.8	70.9	70.9	71.0

Note: Calendar Year; except year ending 30 September for New Zealand in aggregates.
Average 2015-17est: Data for 2017 are estimated.

1. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.
2. Excludes Iceland but includes all EU28 member countries.

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

Table A.5. World dairy projections: Butter and cheese

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
BUTTER												
World												
Production	kt pw	11 081	11 612	11 844	12 061	12 319	12 586	12 869	13 156	13 449	13 748	14 060
Consumption	kt pw	11 005	11 555	11 770	12 011	12 269	12 536	12 818	13 105	13 398	13 697	14 008
Stock changes	kt pw	-5	5	22	-2	-3	-2	-2	-2	-1	-1	-1
Price[1]	USD/t	3 933	4 514	4 228	4 274	4 300	4 373	4 370	4 386	4 413	4 450	4 469
Developed countries												
Production	kt pw	4 737	4 817	4 856	4 903	4 959	5 007	5 065	5 125	5 182	5 234	5 294
Consumption	kt pw	4 143	4 235	4 249	4 307	4 354	4 397	4 442	4 489	4 534	4 578	4 625
Developing countries												
Production	kt pw	6 343	6 794	6 988	7 157	7 360	7 579	7 804	8 031	8 267	8 514	8 766
Consumption	kt pw	6 861	7 320	7 521	7 704	7 916	8 139	8 376	8 615	8 864	9 119	9 384
OECD[2]												
Production	kt pw	4 562	4 642	4 684	4 734	4 795	4 846	4 908	4 973	5 033	5 090	5 153
Consumption	kt pw	3 976	4 060	4 073	4 131	4 178	4 222	4 267	4 315	4 360	4 404	4 451
Stock changes	kt pw	0	11	28	2	1	0	0	0	0	0	0
CHEESE												
World												
Production	kt pw	22 809	23 713	24 025	24 324	24 653	24 975	25 298	25 602	25 909	26 213	26 507
Consumption	kt pw	22 705	23 654	23 897	24 181	24 518	24 840	25 163	25 468	25 778	26 082	26 376
Stock changes	kt pw	38	-52	16	32	23	24	22	22	19	19	20
Price[3]	USD/t	3 425	3 699	3 787	3 878	3 920	3 985	4 024	4 064	4 115	4 168	4 218
Developed countries												
Production	kt pw	18 174	18 909	19 143	19 351	19 606	19 851	20 095	20 325	20 558	20 786	21 005
Consumption	kt pw	17 192	17 962	18 085	18 255	18 469	18 670	18 874	19 059	19 249	19 437	19 611
Developing countries												
Production	kt pw	4 635	4 805	4 882	4 974	5 047	5 124	5 203	5 277	5 351	5 427	5 502
Consumption	kt pw	5 513	5 691	5 812	5 926	6 049	6 169	6 290	6 408	6 529	6 645	6 764
OECD[2]												
Production	kt pw	17 622	18 336	18 555	18 747	18 997	19 231	19 469	19 693	19 922	20 147	20 365
Consumption	kt pw	16 811	17 543	17 661	17 827	18 037	18 234	18 434	18 616	18 802	18 987	19 153
Stock changes	kt pw	38	-52	16	32	23	24	22	22	19	19	20

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand in aggregates.
Average 2015-17est: Data for 2017 are estimated.

1. FOB export price, butter, 82% butterfat, Oceania.
2. Excludes Iceland but includes all EU28 member countries.
3. FOB export price, cheddar cheese, 39% moisture, Oceania.

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

Table A.6. World dairy projections: Powders and casein

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
SKIM MILK POWDER												
World												
Production	kt pw	4 505	4 595	4 665	4 707	4 764	4 846	4 910	4 974	5 037	5 098	5 163
Consumption	kt pw	4 348	4 570	4 683	4 726	4 749	4 809	4 850	4 913	4 973	5 033	5 096
Stock changes	kt pw	96	-36	-79	-80	-45	-23	0	0	3	5	7
Price[1]	USD/t	2 069	2 077	2 296	2 369	2 438	2 530	2 603	2 668	2 738	2 817	2 895
Developed countries												
Production	kt pw	3 924	3 998	4 048	4 076	4 119	4 185	4 234	4 285	4 336	4 381	4 432
Consumption	kt pw	2 018	2 131	2 188	2 175	2 141	2 148	2 134	2 142	2 145	2 150	2 158
Developing countries												
Production	kt pw	581	597	618	631	644	662	675	689	701	718	731
Consumption	kt pw	2 331	2 439	2 495	2 552	2 608	2 661	2 716	2 771	2 828	2 883	2 938
OECD[2]												
Production	kt pw	3 688	3 767	3 795	3 824	3 868	3 931	3 981	4 034	4 086	4 132	4 184
Consumption	kt pw	2 039	2 101	2 161	2 161	2 127	2 134	2 120	2 128	2 131	2 136	2 143
Stock changes	kt pw	96	-36	-79	-80	-45	-23	0	0	3	5	7
WHOLE MILK POWDER												
World												
Production	kt pw	5 317	5 524	5 635	5 729	5 829	5 927	6 024	6 116	6 207	6 277	6 346
Consumption	kt pw	5 227	5 518	5 635	5 729	5 829	5 928	6 024	6 117	6 208	6 277	6 347
Stock changes	kt pw	-7	6	0	0	0	0	-1	-1	-1	-1	-1
Price[3]	USD/t	2 664	2 961	3 128	3 220	3 290	3 378	3 445	3 502	3 575	3 640	3 710
Developed countries												
Production	kt pw	2 344	2 331	2 363	2 392	2 428	2 460	2 498	2 537	2 574	2 609	2 640
Consumption	kt pw	598	618	635	643	651	660	669	677	685	693	701
Developing countries												
Production	kt pw	2 973	3 193	3 271	3 337	3 401	3 468	3 526	3 579	3 632	3 668	3 706
Consumption	kt pw	4 629	4 899	4 999	5 086	5 178	5 267	5 356	5 439	5 522	5 584	5 645
OECD[2]												
Production	kt pw	2 523	2 514	2 543	2 572	2 608	2 638	2 676	2 715	2 751	2 786	2 816
Consumption	kt pw	793	801	820	830	840	852	863	874	885	895	906
Stock changes	kt pw	-7	6	0	0	0	0	-1	-1	-1	-1	-1
WHEY POWDER												
Wholesale price, United States[4]	USD/t	883	1 081	1 158	1 220	1 178	1 187	1 216	1 244	1 278	1 328	1 359
CASEIN												
Price[5]	USD/t	6 329	6 546	7 313	7 490	7 650	7 832	8 017	8 170	8 364	8 557	8 754

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand in aggregates.
Average 2015-17est: Data for 2017 are estimated.

1. FOB export price, non-fat dry milk, 1.25% butterfat, Oceania.
2. Excludes Iceland but includes all EU28 member countries.
3. FOB export price, WMP 26% butterfat, Oceania.
4. FOB export price, sweet whey non-hygroscopic, Western Europe.
5. Export price, New Zealand.

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

Table A.7. World fish and seafood projections

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
FISH[1]												
World												
Production	kt	171 747	176 476	178 380	180 473	181 458	184 920	187 031	188 820	190 965	190 893	194 675
of which aquaculture	kt	79 729	85 232	87 992	90 883	93 293	95 112	96 980	98 504	100 458	102 070	103 713
Consumption	kt	172 616	177 163	178 969	180 963	181 849	185 212	187 224	188 916	190 960	190 889	194 672
of which for food	kt	153 230	158 492	160 919	163 491	165 558	167 951	169 961	171 648	173 698	174 930	177 343
of which for reduction	kt	14 304	14 334	14 107	13 923	12 911	13 959	13 991	14 024	14 048	12 824	14 173
Price												
Aquaculture[2]	USD/t	2 877.6	2 587.0	2 726.6	2 719.6	2 865.3	2 825.3	2 871.1	2 893.2	2 970.2	3 013.2	3 067.0
Capture[3]	USD/t	1 557.4	1 603.1	1 664.6	1 684.3	1 748.1	1 734.6	1 755.2	1 764.4	1 781.5	1 803.1	1 818.9
Product traded[4]	USD/t	2 827.8	2 942.4	3 106.0	3 147.1	3 319.0	3 278.3	3 332.4	3 354.4	3 398.1	3 447.8	3 499.3
Developed countries												
Production	kt	28 860	28 839	29 011	29 112	29 165	29 183	29 178	29 193	29 211	29 281	29 322
of which aquaculture	kt	4 578	4 765	4 924	5 088	5 188	5 228	5 258	5 311	5 371	5 470	5 549
Consumption	kt	37 018	36 746	36 593	36 586	36 559	37 081	36 875	37 253	37 135	37 579	37 433
of which for food	kt	31 893	32 368	32 266	32 303	32 303	32 860	32 676	33 076	32 981	33 432	33 317
of which for reduction	kt	4 428	3 901	3 850	3 806	3 779	3 745	3 722	3 700	3 677	3 669	3 639
Developing countries												
Production	kt	142 582	147 336	149 069	151 062	151 993	155 437	157 553	159 327	161 454	161 312	165 053
of which aquaculture	kt	75 149	80 466	83 067	85 793	88 103	89 882	91 720	93 191	95 085	96 599	98 162
Consumption	kt	135 555	140 386	142 344	144 346	145 259	148 099	150 319	151 632	153 793	153 279	157 208
of which for food	kt	121 326	126 112	128 641	131 176	133 243	135 080	137 273	138 560	140 704	141 486	144 013
of which for reduction	kt	9 872	10 428	10 252	10 112	9 127	10 210	10 264	10 320	10 366	9 150	10 530
OECD												
Production	kt	28 361	28 530	28 752	28 908	28 688	28 862	29 047	29 137	29 229	28 880	29 364
of which aquaculture	kt	6 197	6 414	6 641	6 846	6 986	7 037	7 081	7 160	7 242	7 364	7 466
Consumption	kt	38 349	38 704	38 584	38 634	38 369	39 017	38 914	39 365	39 296	39 477	39 717
of which for food	kt	33 107	33 610	33 594	33 722	33 696	34 254	34 141	34 607	34 554	35 031	35 025
of which for reduction	kt	4 507	4 472	4 393	4 340	4 151	4 191	4 201	4 186	4 171	3 925	4 120
FISHMEAL[5]												
World												
Production	kt	4 513.0	4 714.1	4 725.1	4 742.1	4 546.5	4 857.2	4 911.1	4 968.0	5 022.4	4 755.8	5 152.5
from whole fish	kt	3 218.7	3 402.3	3 358.7	3 325.0	3 086.6	3 354.9	3 371.5	3 388.6	3 403.1	3 105.5	3 452.5
Consumption	kt	4 551.0	4 839.6	4 803.3	4 842.9	4 875.0	4 850.2	4 860.2	4 961.9	5 017.1	4 949.9	5 045.7
Variation in stocks	kt	-73.3	63.8	86.1	38.5	-204.2	86.3	95.2	25.4	-0.3	-204.8	86.2
Price[6]	USD/t	1 474.7	1 475.7	1 507.2	1 507.5	1 621.9	1 574.3	1 601.9	1 632.4	1 657.5	1 762.9	1 720.3
Developed countries												
Production	kt	1 472.9	1 465.0	1 476.9	1 486.2	1 498.6	1 506.6	1 514.3	1 523.0	1 531.5	1 543.3	1 550.7
from whole fish	kt	1 472.9	1 465.0	1 476.9	1 486.2	1 498.6	1 506.6	1 514.3	1 523.0	1 531.5	1 543.3	1 550.7
Consumption	kt	1 525.7	1 514.9	1 466.5	1 442.3	1 402.4	1 370.5	1 331.7	1 318.0	1 296.6	1 235.9	1 238.9
Variation in stocks	kt	4.7	-16.2	1.1	3.5	-42.2	34.3	10.2	0.4	-0.3	-42.8	34.2
Developing countries												
Production	kt	3 039.5	3 249.1	3 248.2	3 255.9	3 047.9	3 350.6	3 396.7	3 445.0	3 490.9	3 212.6	3 601.8
from whole fish	kt	3 039.5	3 249.1	3 248.2	3 255.9	3 047.9	3 350.6	3 396.7	3 445.0	3 490.9	3 212.6	3 601.8
Consumption	kt	3 219.9	3 324.7	3 336.8	3 400.6	3 472.6	3 479.7	3 528.5	3 644.0	3 720.5	3 714.0	3 806.8
Variation in stocks	kt	-78.0	80.0	85.0	35.0	-162.0	52.0	85.0	25.0	0.0	-162.0	52.0
OECD												
Production	kt	1 470.2	1 575.0	1 576.8	1 580.4	1 551.3	1 575.5	1 592.0	1 603.5	1 615.0	1 571.8	1 633.7
from whole fish	kt	1 470.2	1 575.0	1 576.8	1 580.4	1 551.3	1 575.5	1 592.0	1 603.5	1 615.0	1 571.8	1 633.7
Consumption	kt	1 657.5	1 639.5	1 604.6	1 588.2	1 553.3	1 528.3	1 496.9	1 491.6	1 476.9	1 419.2	1 429.7
Variation in stocks	kt	-70.4	23.8	26.1	28.5	-92.2	44.3	25.2	25.4	-0.3	-92.8	44.2

Table A.7. World fish and seafood projections *(cont.)*

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
FISH OIL[5]												
World												
Production	kt	910.6	935.9	933.8	934.2	902.3	947.7	956.3	964.8	973.2	930.6	993.0
from whole fish	kt	566.5	580.6	572.1	566.8	529.2	569.1	572.0	574.4	576.5	527.5	583.4
Consumption	kt	946.1	933.0	939.6	941.3	993.4	911.0	941.5	974.9	985.4	1 020.2	956.3
Variation in stocks	kt	-21.7	14.6	5.9	4.6	-79.4	48.4	26.5	1.6	-0.6	-77.9	48.4
Price[7]	USD/t	1 654.7	1 645.4	1 798.5	1 833.6	1 979.9	1 825.7	1 857.7	1 864.7	1 888.1	2 137.7	1 919.2
Developed countries												
Production	kt	407.4	380.9	381.4	381.1	381.2	380.8	380.9	381.1	381.3	382.2	382.2
from whole fish	kt	407.4	380.9	381.4	381.1	381.2	380.8	380.9	381.1	381.3	382.2	382.2
Consumption	kt	544.5	499.0	511.9	515.7	585.8	480.1	498.9	517.4	519.9	583.5	485.0
Variation in stocks	kt	7.8	3.6	3.9	2.6	-28.4	23.4	4.5	-0.4	-0.6	-28.9	23.4
Developing countries												
Production	kt	503.3	555.0	552.4	553.1	521.1	566.9	575.5	583.7	591.9	548.4	610.8
from whole fish	kt	503.3	555.0	552.4	553.1	521.1	566.9	575.5	583.7	591.9	548.4	610.8
Consumption	kt	404.7	433.9	427.7	425.6	407.6	431.0	442.6	457.5	465.5	436.7	471.3
Variation in stocks	kt	-29.5	11.0	2.0	2.0	-51.0	25.0	22.0	2.0	0.0	-49.0	25.0
OECD												
Production	kt	466.9	461.6	462.5	464.0	458.7	464.8	469.5	473.3	477.3	469.9	484.8
from whole fish	kt	466.9	461.6	462.5	464.0	458.7	464.8	469.5	473.3	477.3	469.9	484.8
Consumption	kt	635.1	652.5	656.0	651.0	696.3	615.9	637.9	661.1	665.0	697.4	629.5
Variation in stocks	kt	-15.6	9.6	0.9	1.6	-29.4	18.4	6.5	1.6	-0.6	-27.9	18.4

Note: The term "fish" indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, crocodiles, caimans, alligators and aquatic plants.
Average 2015-17est: Data for 2017 are estimated.

1. Data are in live weight equivalent.
2. World unit value of aquaculture fisheries production (live weight basis).
3. FAO estimated value of world ex vessel value of capture fisheries production excluding for reduction.
4. World unit value of trade (sum of exports and imports).
5. Data are in product weight.
6. Fishmeal, 64-65% protein, Hamburg, Germany.
7. Fish oil, any origin, N.W. Europe.

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

Table A.8. World biofuel projections

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ETHANOL												
World												
Production	mln L	118.8	122.4	123.5	125.2	125.7	126.5	127.2	128.1	128.9	129.8	130.5
Consumption	mln L	119.0	123.3	124.1	125.6	126.2	127.0	127.8	128.6	129.4	130.3	131.1
Exports	mln L	9.0	9.2	9.3	9.4	9.4	9.4	9.5	9.6	9.5	9.5	9.4
Price[1]	USD/hl	44.5	45.8	46.7	47.5	48.4	49.7	50.6	51.3	51.5	51.9	52.4
Developed countries												
Production	mln L	70.3	72.1	71.9	72.6	72.1	71.9	71.7	71.5	71.4	71.4	71.3
Consumption	mln L	69.4	72.2	71.8	72.2	72.0	71.9	71.8	71.7	71.6	71.5	71.3
Net trade	mln L	0.7	0.4	0.4	0.4	0.3	0.1	0.0	-0.1	0.0	0.0	0.1
Developing countries												
Production	mln L	48.5	50.3	51.6	52.6	53.6	54.5	55.6	56.6	57.5	58.4	59.2
Consumption	mln L	49.6	51.1	52.3	53.4	54.2	55.1	56.0	56.9	57.8	58.8	59.8
Net trade	mln L	-1.1	-0.7	-0.6	-0.6	-0.6	-0.4	-0.3	-0.2	-0.2	-0.3	-0.4
OECD[2]												
Production	mln L	69.4	71.2	71.0	71.7	71.2	71.1	70.8	70.6	70.6	70.5	70.4
Consumption	mln L	69.4	72.2	71.9	72.3	72.1	72.0	71.9	71.8	71.7	71.6	71.4
Net trade	mln L	-0.2	-0.5	-0.6	-0.6	-0.6	-0.8	-0.9	-1.0	-1.0	-0.9	-0.8
BIODIESEL												
World												
Production	mln L	34.2	37.4	38.0	39.0	38.8	38.5	38.6	38.7	38.9	39.0	39.3
Consumption	mln L	35.0	37.4	38.1	38.9	38.7	38.6	38.7	38.8	38.9	39.1	39.4
Exports	mln L	3.6	4.1	3.9	3.4	3.3	3.3	3.2	3.2	3.2	3.1	3.1
Price[3]	USD/hl	85.1	91.5	91.8	91.9	91.9	91.7	91.9	91.9	92.8	92.3	93.4
Developed countries												
Production	mln L	20.9	21.8	21.9	22.0	21.8	21.3	21.1	21.0	20.8	20.7	20.6
Consumption	mln L	23.7	24.6	24.4	23.9	23.6	23.2	23.0	22.8	22.6	22.5	22.4
Net trade	mln L	-2.9	-2.9	-2.5	-2.1	-2.0	-2.0	-1.9	-1.9	-1.9	-1.8	-1.8
Developing countries												
Production	mln L	13.3	15.6	16.1	17.0	17.0	17.2	17.5	17.7	18.1	18.3	18.7
Consumption	mln L	11.2	12.8	13.7	15.0	15.1	15.4	15.7	16.0	16.3	16.6	17.0
Net trade	mln L	2.1	2.8	2.4	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.7
OECD[2]												
Production	mln L	21.5	22.5	22.6	22.7	22.5	22.0	21.8	21.6	21.5	21.3	21.2
Consumption	mln L	24.3	25.3	25.1	24.6	24.3	23.9	23.6	23.5	23.3	23.1	23.0
Net trade	mln L	-2.8	-2.9	-2.5	-2.1	-2.0	-1.9	-1.9	-1.8	-1.8	-1.8	-1.8

Note: Average 2015-17est: Data for 2017 are estimated.

1. Wholesale price, United States, Omaha.
2. Excludes Iceland but includes all EU28 member countries.
3. Producer price Germany net of biodiesel tariff and energy tax.

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

Table A.9. World cotton projections

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WORLD												
Production	Mt	23.4	25.1	25.2	25.6	25.9	26.3	26.8	27.3	27.8	28.3	28.7
Area	Mha	30.7	32.3	32.2	32.3	32.3	32.3	32.6	32.7	32.8	32.9	32.9
Yield	t/ha	0.76	0.78	0.78	0.79	0.80	0.81	0.82	0.83	0.85	0.86	0.87
Consumption[1]	Mt	24.5	26.2	26.4	27.0	27.5	27.7	27.4	27.6	27.9	28.3	28.7
Exports	Mt	7.9	8.3	8.4	8.5	8.6	8.8	8.9	9.0	9.1	9.3	9.4
Closing stocks	Mt	19.5	18.1	16.9	15.5	13.9	12.4	11.8	11.4	11.2	11.2	11.2
Price[2]	USD/t	1 697.4	1 597.2	1 436.1	1 450.4	1 469.9	1 517.0	1 537.9	1 542.6	1 541.7	1 539.5	1 544.1
DEVELOPED COUNTRIES												
Production	Mt	6.2	6.5	6.3	6.4	6.4	6.5	6.6	6.7	6.8	6.9	7.0
Consumption	Mt	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9
Exports	Mt	4.5	4.9	5.0	5.0	5.1	5.1	5.2	5.2	5.3	5.3	5.4
Imports	Mt	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Closing stocks	Mt	2.1	3.0	2.9	2.8	2.7	2.6	2.4	2.3	2.2	2.2	2.1
DEVELOPING COUNTRIES												
Production	Mt	17.2	18.7	18.9	19.2	19.5	19.8	20.2	20.6	21.0	21.4	21.8
Consumption	Mt	22.8	24.5	24.6	25.2	25.7	25.9	25.5	25.8	26.0	26.4	26.7
Exports	Mt	3.3	3.4	3.5	3.5	3.6	3.6	3.7	3.8	3.9	3.9	4.0
Imports	Mt	7.4	8.0	8.1	8.2	8.3	8.4	8.6	8.7	8.8	8.9	9.1
Closing stocks	Mt	17.4	15.1	14.0	12.7	11.2	9.9	9.4	9.1	9.0	9.0	9.1
OECD[3]												
Production	Mt	5.8	6.2	6.1	6.2	6.2	6.3	6.4	6.5	6.6	6.7	6.8
Consumption	Mt	3.2	3.2	3.2	3.2	3.3	3.3	3.4	3.4	3.4	3.5	3.5
Exports	Mt	3.9	4.3	4.3	4.4	4.5	4.6	4.6	4.7	4.7	4.8	4.8
Imports	Mt	1.6	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Closing stocks	Mt	2.6	3.5	3.4	3.3	3.2	3.0	2.9	2.8	2.7	2.6	2.6

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.
1. Consumption for cotton means mill consumption and not final consumer demand.
2. Cotlook A index, Middling 1 3/32", c.f.r. far Eastern ports (August/July).
3. Excludes Iceland but includes all EU28 member countries.

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

Table A.10. Economic assumptions

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REAL GDP[1]												
Australia	%	2.5	2.8	2.7	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.7
Canada	%	1.8	2.1	1.9	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Chile	%	1.7	2.5	2.7	2.9	3.2	3.3	3.3	3.3	3.3	3.3	3.3
European Union	%	2.1	2.0	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4
Japan	%	1.2	1.2	1.0	0.2	0.7	0.6	0.6	0.6	0.6	0.6	0.6
Korea	%	2.9	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Mexico	%	2.8	2.2	2.3	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
New Zealand	%	3.1	3.2	3.0	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4
Norway	%	1.7	1.8	1.9	1.9	1.8	1.9	1.9	1.9	1.9	1.9	1.9
Switzerland	%	1.1	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Turkey	%	4.8	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.6	3.6	3.6
United States	%	2.2	2.5	2.1	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Algeria	%	2.8	0.8	1.4	1.8	2.3	2.4	2.5	2.5	2.5	2.5	2.5
Brazil	%	-2.2	1.9	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
China	%	6.8	6.6	6.4	6.2	6.0	5.8	5.7	5.8	5.7	5.8	5.7
Egypt	%	4.3	4.5	5.3	5.8	6.0	6.0	5.7	5.7	5.7	5.7	5.7
India	%	7.3	7.4	7.8	7.9	8.1	8.2	8.2	8.2	8.2	8.2	8.2
Indonesia	%	5.0	5.3	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Iran	%	4.8	3.8	4.0	4.0	4.1	4.1	4.0	4.0	4.0	4.0	4.0
Malaysia	%	4.9	4.8	4.8	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Pakistan	%	4.6	5.6	6.0	5.7	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Russia	%	-0.4	1.9	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Saudi Arabia	%	2.0	1.1	1.6	1.8	2.0	2.0	1.9	1.9	1.9	1.9	1.9
South Africa	%	0.8	1.1	1.6	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ukraine	%	-1.8	3.2	3.5	3.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0
OECD[2,3]	%	2.2	2.3	2.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
PCE DEFLATOR[1]												
Australia	%	1.3	1.8	2.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Canada	%	1.1	1.8	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9
Chile	%	3.5	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
European Union	%	0.7	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7
Japan	%	0.0	0.7	1.3	1.6	1.3	1.6	1.6	1.6	1.6	1.6	1.6
Korea	%	1.2	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mexico	%	4.3	4.2	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
New Zealand	%	0.9	1.6	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Norway	%	2.4	1.6	2.0	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Switzerland	%	-0.2	0.2	0.6	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Turkey	%	8.8	9.3	8.8	7.9	7.5	7.5	7.5	7.5	7.5	7.5	7.5
United States	%	1.0	1.9	2.1	2.4	2.2	2.3	2.3	2.3	2.3	2.3	2.3
Algeria	%	5.6	4.4	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Brazil	%	7.5	4.7	5.2	4.1	4.0	4.0	4.0	4.0	4.0	4.0	4.0
China	%	1.7	2.4	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Egypt	%	14.9	21.3	13.5	10.1	7.2	7.1	7.1	7.1	7.1	7.1	7.1
India	%	4.4	4.9	4.8	4.9	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Indonesia	%	4.6	3.9	3.7	3.8	3.6	3.5	3.5	3.5	3.5	3.5	3.5
Iran	%	10.5	10.1	9.5	9.3	9.0	8.7	8.7	8.7	8.7	8.7	8.7
Malaysia	%	2.7	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pakistan	%	3.8	4.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Russia	%	8.9	3.9	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Saudi Arabia	%	1.8	5.0	2.0	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0
South Africa	%	5.4	5.3	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ukraine	%	25.1	10.0	7.0	6.5	5.5	5.0	5.0	5.0	5.0	5.0	5.0
OECD[2,3]	%	1.3	2.1	2.3	2.4	2.3	2.4	2.4	2.4	2.4	2.5	2.5

Table A.10. Economic assumptions *(cont.)*

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
GDP DEFLATOR[1]												
Australia	%	1.5	1.3	1.9	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Canada	%	0.8	2.3	2.0	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9
Chile	%	3.5	2.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
European Union	%	0.7	1.4	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Japan	%	0.7	0.2	1.0	1.6	1.3	1.6	1.6	1.6	1.6	1.6	1.6
Korea	%	2.2	2.3	2.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mexico	%	4.9	5.3	4.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
New Zealand	%	1.4	1.8	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Norway	%	-0.3	0.5	2.1	2.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Switzerland	%	-0.2	0.7	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Turkey	%	8.8	9.3	8.8	7.9	7.5	7.5	7.5	7.5	7.5	7.5	7.5
United States	%	1.4	2.1	2.2	2.4	2.2	2.3	2.3	2.3	2.3	2.3	2.3
Algeria	%	5.6	4.4	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Brazil	%	7.1	4.6	4.9	4.1	4.0	4.0	4.0	4.0	4.0	4.0	4.0
China	%	1.8	4.0	4.0	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Egypt	%	14.9	21.3	13.5	10.1	7.2	7.1	7.1	7.1	7.1	7.1	7.1
India	%	4.4	4.9	4.8	4.9	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Indonesia	%	4.6	3.9	3.7	3.8	3.6	3.5	3.5	3.5	3.5	3.5	3.5
Iran	%	10.5	10.1	9.5	9.3	9.0	8.7	8.7	8.7	8.7	8.7	8.7
Malaysia	%	2.7	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pakistan	%	3.8	4.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Russia	%	5.8	4.2	3.1	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Saudi Arabia	%	1.8	5.0	2.0	2.2	2.1	2.0	2.0	2.0	2.0	2.0	2.0
South Africa	%	5.4	5.3	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ukraine	%	25.1	10.0	7.0	6.5	5.5	5.0	5.0	5.0	5.0	5.0	5.0
OECD[3]	%	1.5	2.1	2.4	2.4	2.3	2.4	2.4	2.4	2.4	2.4	2.5
WORLD INPUT PRICES												
Brent crude oil[4]	USD/barrel	50.3	63.7	67.1	68.3	69.3	70.4	71.5	72.6	73.7	74.9	76.1
Fertiliser[5]	USD/t	259.7	247.3	255.7	262.1	269.1	273.1	275.3	276.8	277.4	280.1	283.2
EXCHANGE RATES												
Australia	AUD/USD	1.33	1.31	1.31	1.31	1.32	1.33	1.34	1.35	1.36	1.37	1.38
Canada	CAD/USD	1.30	1.27	1.27	1.27	1.28	1.28	1.28	1.28	1.29	1.29	1.29
Chile	CLP/USD	664.31	690.55	697.45	704.43	711.47	718.59	725.77	733.03	740.36	747.76	755.24
European Union	EUR/USD	0.90	0.86	0.86	0.86	0.86	0.87	0.87	0.88	0.88	0.88	0.89
Japan	JPY/USD	114.05	113.82	113.82	113.96	113.72	113.37	113.02	112.67	112.32	111.97	111.63
Korea	KRW/USD	1 141.97	1 114.30	1 114.30	1 123.74	1 134.74	1 145.50	1 156.35	1 167.31	1 178.38	1 189.55	1 200.82
Mexico	MXN/USD	17.79	19.06	19.06	19.17	19.32	19.45	19.59	19.72	19.86	20.00	20.14
New Zealand	NZD/USD	1.43	1.44	1.44	1.44	1.45	1.45	1.45	1.45	1.45	1.45	1.46
Algeria	DZD/USD	107.26	113.87	116.14	118.47	120.84	123.25	125.72	128.23	130.80	133.41	136.08
Brazil	BRL/USD	3.34	3.25	3.25	3.32	3.38	3.45	3.52	3.59	3.66	3.73	3.80
China	CNY/USD	6.56	6.63	6.63	6.58	6.54	6.50	6.45	6.41	6.37	6.32	6.28
Egypt	EGP/USD	8.35	11.51	12.73	13.70	14.36	15.04	15.74	16.47	17.24	18.05	18.89
India	INR/USD	67.03	70.49	71.92	73.42	74.95	76.51	78.11	79.74	81.40	83.10	84.83
Indonesia	'000 IDR/USD	13.35	13.53	13.71	13.71	13.50	13.37	13.25	13.12	13.00	12.88	12.76
Malaysia	MYR/USD	4.13	4.24	4.15	4.06	3.99	3.94	3.90	3.86	3.82	3.78	3.74
Pakistan	PKR/USD	102.31	106.96	110.23	113.57	116.91	120.46	124.12	127.89	131.78	135.78	139.91
Russia	RUB/USD	62.23	59.14	59.14	59.92	60.60	61.14	61.69	62.25	62.81	63.37	63.94
Saudi Arabia	SAR/USD	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
South Africa	ZAR/USD	13.62	13.60	14.08	14.59	15.18	15.79	16.43	17.09	17.78	18.50	19.24
Ukraine	UAH/USD	24.88	29.05	29.86	30.71	31.32	31.96	32.60	33.26	33.94	34.62	35.32

Table A.10. Economic assumptions *(cont.)*

Calendar year

		2017est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
POPULATION[1]												
Australia	%	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0
Canada	%	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7
Chile	%	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6
European Union	%	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Japan	%	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4
Korea	%	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Mexico	%	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9
New Zealand	%	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7
Norway	%	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Switzerland	%	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
Turkey	%	1.6	1.5	1.3	1.1	0.8	0.6	0.5	0.4	0.4	0.5	0.5
United States	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Algeria	%	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	1.2	1.1
Argentina	%	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8
Brazil	%	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5
China	%	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1
Egypt	%	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.6	1.5	1.5	1.5
India	%	1.1	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.9
Indonesia	%	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8
Iran	%	1.1	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5
Malaysia	%	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1
Pakistan	%	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.5
Russia	%	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.3
Saudi Arabia	%	2.1	1.9	1.7	1.7	1.6	1.5	1.4	1.4	1.3	1.3	1.2
South Africa	%	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9	0.9
Ukraine	%	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6
OECD[3]	%	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3
World	%	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9

Note: For OECD member countries, as well as Brazil, China and Russia, historical data for real GDP, private consumption expenditure deflator and GDP deflator were obtained from the OECD Economic Outlook No. 102, November 2017. For other economies, historical macroeconomic data were obtained from the IMF, World Economic Outlook, October 2017. Assumptions for the projection period draw on the recent short term update of the OECD Economics Department, projections of the IMF, and for population, projections from the United Nations World Population Prospects Database, 2017 Revision (medium variant). Data for the European Union are euro area aggregates except for population. The price index used is the private consumption expenditure deflator.

Average 2015-17est and 2017est: Data for 2017 are estimated.

1. Annual per cent change.
2. Annual weighted average real GDP and CPI growth rates in OECD countries are based on weights using purchasing power parities (PPPs).
3. Excludes Iceland.
4. Short-term update for crude oil price from the OECD Economic Outlook N°102 (November 2017). For 2017, the annual average monthly spot price is used, while the average daily spot price for December 2017 is used as the oil price value for the year 2018 and oil prices during the projection period follow the path of the World Bank average crude oil price projected by the World Bank Commodities Price forecasts, released in October 2017.
5. World Bank. Data for 2017 are estimated, projections by OECD and FAO Secretariats.

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

Table A.11. World prices

Nominal price

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CEREALS												
Wheat[1]	USD/t	206.6	209.1	213.8	219.1	222.2	223.2	223.6	223.3	224.7	226.8	229.1
Maize[2]	USD/t	155.9	158.7	163.2	167.4	172.6	174.6	174.0	172.4	172.2	172.4	173.0
Other coarse grains[3]	USD/t	167.1	163.9	169.8	173.1	176.0	179.3	181.0	182.3	184.4	186.7	189.4
Rice[4]	USD/t	404.7	412.3	410.6	409.9	414.1	419.6	423.9	425.8	427.2	428.5	431.0
Distiller's dry grains[5]	USD/t	128.3	136.6	141.5	144.9	148.4	150.3	150.4	149.5	149.7	149.9	150.5
OILSEEDS												
Soybean[6]	USD/t	399.7	393.7	409.1	416.6	421.1	425.7	430.8	436.4	441.4	447.3	452.5
Other oilseeds[7]	USD/t	424.0	439.2	452.6	456.3	463.3	465.2	469.0	472.3	478.4	481.5	487.7
Protein meals[8]	USD/t	316.8	312.9	323.8	333.0	340.7	344.3	349.1	350.7	356.8	360.8	366.0
Vegetable oils[9]	USD/t	783.5	828.6	829.0	829.9	834.3	842.9	852.5	862.8	874.6	883.0	892.0
SWEETENERS												
Raw sugar[10]	USD/t	359.7	346.9	352.7	357.4	362.9	367.8	372.6	377.7	383.2	388.1	392.3
Refined sugar[11]	USD/t	442.7	417.3	434.0	437.8	443.0	448.1	452.7	457.3	462.4	467.3	471.7
HFCS[12]	USD/t dw	613.8	503.7	519.5	526.8	538.4	546.5	551.8	555.2	560.6	566.2	572.1
Molasses[13]	USD/t	152.6	157.8	169.5	177.8	182.6	182.9	181.6	179.8	179.5	180.0	181.3
MEAT												
Beef and veal												
Price, EU[14]	USD/t dwt	4 154.7	4 054.3	3 958.8	3 980.7	3 984.3	3 944.9	3 905.0	3 874.2	3 885.8	3 904.3	3 943.0
Price, United States[15]	USD/t dwt	4 628.5	4 179.4	4 041.3	3 978.8	3 964.5	3 921.7	3 886.3	3 872.1	3 909.2	3 954.0	3 999.8
Price, Brazil[16]	USD/t dwt	4 004.3	3 846.5	3 769.8	3 783.3	3 812.2	3 789.9	3 770.1	3 724.5	3 738.5	3 751.5	3 781.0
Pigmeat												
Price, EU[17]	USD/t dwt	1 673.7	1 736.4	1 750.8	1 842.5	1 933.8	1 991.8	2 013.4	1 953.6	1 878.8	1 891.2	1 966.3
Price, United States[18]	USD/t dwt	1 499.0	1 442.2	1 414.5	1 486.5	1 562.0	1 614.2	1 636.1	1 587.0	1 520.1	1 529.8	1 591.4
Price, Brazil[19]	USD/t dwt	2 374.7	2 278.6	2 296.9	2 422.6	2 536.7	2 599.8	2 610.4	2 535.2	2 472.3	2 497.7	2 589.5
Poultry meat												
Price, EU[20]	USD/t rtc	2 025.0	2 006.8	1 968.3	1 986.3	2 019.7	2 025.0	2 025.8	2 009.0	1 998.6	1 992.0	1 972.3
Price, United States[21]	USD/t rtc	1 192.2	1 140.7	1 166.5	1 187.1	1 215.9	1 222.0	1 221.3	1 216.6	1 213.2	1 211.4	1 211.3
Price, Brazil[22]	USD/t rtc	1 609.0	1 586.1	1 633.4	1 666.8	1 708.6	1 719.5	1 721.6	1 719.3	1 719.5	1 721.2	1 725.5
Sheep meat												
Price, New Zealand[23]	USD/t dwt	3 735.0	3 870.5	3 791.3	3 840.5	3 776.0	3 749.9	3 829.2	3 848.7	3 869.9	3 897.7	3 915.6
FISH AND SEAFOOD												
Product traded[24]	USD/t	2 827.8	2 942.4	3 106.0	3 147.1	3 319.0	3 278.3	3 332.4	3 354.4	3 398.1	3 447.8	3 499.3
Aquaculture[25]	USD/t	2 877.6	2 587.0	2 726.6	2 719.6	2 865.3	2 825.3	2 871.1	2 893.2	2 970.2	3 013.2	3 067.0
Capture[26]	USD/t	1 557.4	1 603.1	1 664.6	1 684.3	1 748.1	1 734.6	1 755.2	1 764.4	1 781.5	1 803.1	1 818.9
Meal[27]	USD/t	1 474.7	1 475.7	1 507.2	1 507.5	1 621.9	1 574.3	1 601.9	1 632.4	1 657.5	1 762.9	1 720.3
Oil[28]	USD/t	1 654.7	1 645.4	1 798.5	1 833.6	1 979.9	1 825.7	1 857.7	1 864.7	1 888.1	2 137.7	1 919.2
DAIRY PRODUCTS												
Butter[29]	USD/t	3 932.5	4 514.0	4 228.3	4 274.0	4 300.2	4 373.2	4 370.5	4 385.8	4 413.4	4 449.6	4 468.6
Cheese[30]	USD/t	3 424.5	3 699.4	3 787.1	3 877.7	3 920.4	3 985.0	4 023.9	4 063.7	4 115.3	4 167.5	4 217.7
Skim milk powder[31]	USD/t	2 069.1	2 076.6	2 295.7	2 369.2	2 437.7	2 529.8	2 603.2	2 667.8	2 738.4	2 816.8	2 894.7
Whole milk powder[32]	USD/t	2 664.0	2 960.6	3 127.9	3 220.1	3 290.3	3 377.6	3 445.4	3 502.0	3 574.9	3 639.6	3 710.0
Whey powder[33]	USD/t	883.3	1 080.9	1 158.3	1 219.8	1 178.2	1 186.9	1 215.8	1 244.1	1 278.4	1 328.3	1 359.0
Casein[34]	USD/t	6 329.1	6 546.5	7 313.2	7 489.7	7 649.7	7 831.7	8 017.4	8 170.3	8 364.0	8 556.8	8 754.3
BIOFUEL												
Ethanol[35]	USD/hl	44.5	45.8	46.7	47.5	48.4	49.7	50.6	51.3	51.5	51.9	52.4
Biodiesel[36]	USD/hl	85.1	91.5	91.8	91.9	91.9	91.7	91.9	91.9	92.8	92.3	93.4
COTTON												
Cotton[37]	USD/t	1 697.4	1 597.2	1 436.1	1 450.4	1 469.9	1 517.0	1 537.9	1 542.6	1 541.7	1 539.5	1 544.1
ROOTS AND TUBERS												
Roots and tubers[38]	USD/t	377.0	372.6	388.3	400.9	408.0	410.7	410.4	410.5	413.8	415.5	418.1
USA GDP Deflator (2010=1)	**Index**	**1.103**	**1.144**	**1.169**	**1.197**	**1.224**	**1.252**	**1.281**	**1.310**	**1.340**	**1.371**	**1.403**

Table A.11. World prices *(cont.)*

Real price

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CEREALS												
Wheat[1]	USD/t	187.4	182.7	182.8	183.0	181.5	178.3	174.6	170.4	167.7	165.4	163.3
Maize[2]	USD/t	141.5	138.7	139.6	139.8	141.0	139.5	135.9	131.6	128.5	125.8	123.3
Other coarse grains[3]	USD/t	151.6	143.2	145.2	144.6	143.8	143.2	141.3	139.1	137.6	136.1	135.0
Rice[4]	USD/t	367.0	360.4	351.2	342.4	338.4	335.1	331.0	325.0	318.7	312.5	307.3
Distiller's dry grains[5]	USD/t	116.4	119.4	121.0	121.0	121.3	120.0	117.4	114.1	111.7	109.3	107.3
OILSEEDS												
Soybean[6]	USD/t	362.5	344.1	349.9	347.9	344.1	340.0	336.4	333.1	329.3	326.3	322.7
Other oilseeds[7]	USD/t	384.5	383.9	387.1	381.1	378.5	371.5	366.2	360.5	356.9	351.2	347.8
Protein meals[8]	USD/t	287.4	273.5	277.0	278.1	278.4	275.0	272.6	267.7	266.2	263.2	261.0
Vegetable oils[9]	USD/t	710.3	724.2	709.0	693.1	681.7	673.2	665.7	658.5	652.5	644.0	636.0
SWEETENERS												
Raw sugar[10]	USD/t	326.4	303.2	301.7	298.5	296.5	293.8	290.9	288.3	285.9	283.1	279.7
Refined sugar[11]	USD/t	401.9	364.7	371.2	365.6	362.0	357.9	353.5	349.0	345.0	340.9	336.4
HFCS[12]	USD/t dw	557.7	440.2	444.3	439.9	439.9	436.5	430.9	423.8	418.3	413.0	407.9
Molasses[13]	USD/t	138.6	137.9	145.0	148.5	149.2	146.1	141.8	137.3	133.9	131.3	129.2
MEAT												
Beef and veal												
Price, EU[14]	USD/t dwt	3 768.1	3 543.5	3 385.7	3 324.5	3 255.5	3 150.9	3 049.0	2 957.0	2 899.4	2 847.7	2 811.4
Price, United States[15]	USD/t dwt	4 202.2	3 652.9	3 456.2	3 322.9	3 239.2	3 132.4	3 034.4	2 955.4	2 916.7	2 884.0	2 851.9
Price, Brazil[16]	USD/t dwt	3 632.2	3 361.9	3 224.0	3 159.6	3 114.8	3 027.1	2 943.6	2 842.8	2 789.4	2 736.3	2 695.9
Pigmeat												
Price, EU[17]	USD/t dwt	1 516.6	1 517.7	1 497.3	1 538.7	1 580.1	1 590.9	1 572.1	1 491.1	1 401.8	1 379.4	1 402.0
Price, United States[18]	USD/t dwt	1 359.6	1 260.5	1 209.7	1 241.4	1 276.3	1 289.3	1 277.5	1 211.3	1 134.2	1 115.8	1 134.7
Price, Brazil[19]	USD/t dwt	2 153.8	1 991.5	1 964.4	2 023.2	2 072.7	2 076.5	2 038.2	1 935.1	1 844.7	1 821.8	1 846.4
Poultry meat												
Price, EU[20]	USD/t rtc	1 836.9	1 754.0	1 683.3	1 658.8	1 650.2	1 617.4	1 581.7	1 533.4	1 491.2	1 452.9	1 406.3
Price, United States[21]	USD/t rtc	1 081.6	997.0	997.6	991.4	993.4	976.1	953.6	928.6	905.2	883.6	863.7
Price, Brazil[22]	USD/t rtc	1 459.3	1 386.3	1 396.9	1 392.0	1 396.0	1 373.4	1 344.2	1 312.3	1 283.0	1 255.4	1 230.3
Sheep meat												
Price, New Zealand[23]	USD/t dwt	3 386.2	3 382.9	3 242.4	3 207.4	3 085.2	2 995.2	2 989.8	2 937.6	2 887.4	2 842.9	2 791.9
FISH AND SEAFOOD												
Product traded[24]	USD/t	2 563.6	2 571.7	2 656.3	2 628.3	2 711.8	2 618.4	2 601.9	2 560.3	2 535.5	2 514.8	2 495.0
Aquaculture[25]	USD/t	2 609.8	2 261.1	2 331.9	2 271.3	2 341.2	2 256.6	2 241.8	2 208.3	2 216.2	2 197.8	2 186.8
Capture[26]	USD/t	1 412.2	1 401.1	1 423.6	1 406.7	1 428.3	1 385.5	1 370.4	1 346.7	1 329.2	1 315.2	1 296.9
Meal[27]	USD/t	1 338.5	1 289.8	1 289.0	1 259.0	1 325.2	1 257.5	1 250.8	1 246.0	1 236.7	1 285.8	1 226.6
Oil[28]	USD/t	1 502.4	1 438.1	1 538.1	1 531.4	1 617.7	1 458.3	1 450.5	1 423.3	1 408.8	1 559.2	1 368.4
DAIRY PRODUCTS												
Butter[29]	USD/t	3 556.3	3 945.4	3 616.2	3 569.4	3 513.6	3 493.0	3 412.4	3 347.5	3 293.0	3 245.4	3 186.1
Cheese[30]	USD/t	3 103.5	3 233.4	3 238.8	3 238.5	3 203.2	3 182.9	3 141.9	3 101.7	3 070.5	3 039.7	3 007.3
Skim milk powder[31]	USD/t	1 877.2	1 815.0	1 963.3	1 978.7	1 991.7	2 020.6	2 032.6	2 036.2	2 043.2	2 054.5	2 064.0
Whole milk powder[32]	USD/t	2 413.2	2 587.7	2 675.1	2 689.3	2 688.4	2 697.8	2 690.2	2 672.9	2 667.3	2 654.7	2 645.2
Whey powder[33]	USD/t	800.4	944.7	990.6	1 018.7	962.7	948.0	949.3	949.5	953.8	968.8	969.0
Casein[34]	USD/t	5 741.6	5 721.8	6 254.4	6 255.0	6 250.3	6 255.4	6 259.9	6 236.1	6 240.7	6 241.2	6 241.9
BIOFUEL												
Ethanol[35]	USD/hl	40.4	40.0	39.9	39.7	39.6	39.7	39.5	39.2	38.4	37.8	37.4
Biodiesel[36]	USD/hl	77.2	80.0	78.5	76.7	75.1	73.3	71.8	70.1	69.3	67.3	66.6
COTTON												
Cotton[37]	USD/t	1 538.5	1 395.9	1 228.2	1 211.3	1 201.0	1 211.7	1 200.8	1 177.4	1 150.3	1 122.9	1 101.0
ROOTS AND TUBERS												
Roots and tubers[38]	USD/t	342.3	325.6	332.1	334.8	333.4	328.0	320.4	313.3	308.7	303.1	298.1

Note: This table is a compilation of price information presented in the detailed commodity tables further in this annex. Prices for crops are on marketing year basis and those for products on calendar year basis. See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.

1. No.2 hard red winter wheat, ordinary protein, United States FOB Gulf Ports (June/May).
2. No.2 yellow corn, United States FOB Gulf Ports (September/August).
3. Feed barley, Europe, FOB Rouen (July/June).
4. Milled 100%, grade b, nominal price quote, FOB Bangkok (January/December).
5. Wholesale price, Central Illinois (September/August).
6. Soybean, U.S., CIF Rotterdam (October/September).
7. Rapeseed, Europe, CIF Hamburg (October/September).
8. Weighted average meal price, European port (October/September).
9. Weighted average price of oilseed oils and palm oil, European port (October/September).
10. Raw sugar world price, ICE contract No11 nearby (October/September).
11. Refined sugar price,Euronext,Liffe,Contract No. 407 London, Europe (October/September).
12. United States wholesale list price HFCS-55, dry weight (October/September).
13. Unit import price, Europe (October/September).
14. EU average beef producer price.
15. Choice steers, 1100-1300 lb lw, Nebraska - lw to dwt conversion factor 0.63.
16. Brazil: frozen beef, export unit value, product weight.
17. EU average pigmeat producer price.
18. Barrows and gilts, No. 1-3, 230-250 lb lw, Iowa/South Minnesota - lw to dwt conversion factor 0.74.
19. Brazil: frozen pigmeat, export unit value, product weight.
20. EU average producer price.
21. Wholesale weighted average broiler price 12 cities.
22. Brazil: export unit value for chicken (FOB), product weight.
23. Lamb schedule price, all grade average.
24. World unit value of trade (sum of exports and imports).
25. World unit value of aquaculture fisheries production (live weight basis).
26. FAO estimated value of world ex-vessel value of capture fisheries production excluding for reduction.
27. Fishmeal, 64-65% protein, Hamburg, Germany.
28. Fish oil any origin, N.W. Europe.
29. FOB export price, butter, 82% butterfat, Oceania.
30. FOB export price, cheddar cheese, 39% moisture, Oceania.
31. FOB export price, non-fat dry milk, 1.25% butterfat, Oceania.
32. FOB export price, WMP 26% butterfat, Oceania.
33. FOB export price, sweet whey non-hygroscopic, Western Europe.
34. Export price, New Zealand.
35. Wholesale price, United States, Omaha.
36. Producer price Germany net of biodiesel tariff and energy tax.
37. Cotlook A index, Middling 1 3/32", c.f.r. far Eastern ports (August/July).
38. Thailand, Bangkok, Cassava (flour), wholesale.

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

Table A.12.1. World trade projections, imports

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Wheat												
World Trade	kt	**168 418**	**173 132**	**176 294**	**177 867**	**179 972**	**182 594**	**184 787**	**186 950**	**188 905**	**190 984**	**193 179**
OECD[1]	kt	32 703	33 805	33 835	33 426	33 381	33 309	33 290	33 015	33 027	33 027	33 024
Developing countries	kt	141 188	145 835	148 633	150 358	152 508	155 214	157 542	160 063	162 083	164 203	166 431
Least Developed Countries	kt	14 108	14 993	15 697	16 186	16 591	17 010	17 399	17 806	18 194	18 596	19 000
Maize												
World Trade	kt	**137 645**	**138 163**	**139 741**	**142 269**	**144 478**	**146 097**	**147 980**	**150 158**	**152 190**	**154 626**	**156 881**
OECD[1]	kt	59 217	58 633	57 664	58 100	58 829	58 910	58 701	58 686	58 755	58 928	59 040
Developing countries	kt	101 890	106 076	109 125	111 439	113 365	115 274	117 648	120 303	122 715	125 436	127 981
Least Developed Countries	kt	2 215	2 415	2 363	2 358	2 273	2 227	2 205	2 184	2 181	2 174	2 159
Other coarse grains												
World Trade	kt	**41 452**	**41 019**	**41 633**	**42 721**	**43 784**	**44 692**	**45 520**	**46 351**	**47 133**	**47 920**	**48 659**
OECD[1]	kt	7 063	7 244	7 297	7 338	7 460	7 465	7 465	7 458	7 434	7 395	7 307
Developing countries	kt	35 191	34 822	35 403	36 395	37 296	38 173	39 000	39 851	40 693	41 532	42 340
Least Developed Countries	kt	365	372	385	397	402	408	419	434	451	472	495
Rice												
World Trade	kt	**44 911**	**46 758**	**47 662**	**48 662**	**49 671**	**50 706**	**51 782**	**52 914**	**54 081**	**55 273**	**56 471**
OECD[1]	kt	5 160	5 374	5 430	5 504	5 557	5 609	5 665	5 717	5 773	5 826	5 881
Developing countries	kt	39 725	41 516	42 382	43 318	44 282	45 278	46 315	47 411	48 534	49 686	50 844
Least Developed Countries	kt	9 762	12 239	12 709	13 004	13 401	13 857	14 319	14 778	15 242	15 737	16 259
Soybean												
World Trade	kt	**144 160**	**155 667**	**157 892**	**160 660**	**163 440**	**165 488**	**167 376**	**169 074**	**171 112**	**172 933**	**174 935**
OECD[1]	kt	27 568	27 335	27 146	27 417	27 644	27 813	27 990	28 103	28 321	28 472	28 662
Developing countries	kt	122 360	134 395	136 937	139 609	142 344	144 384	146 289	147 992	149 941	151 723	153 628
Least Developed Countries	kt	1 339	1 911	2 049	2 133	2 196	2 242	2 283	2 317	2 356	2 391	2 427
Other oilseeds												
World Trade	kt	**20 134**	**21 362**	**21 662**	**21 973**	**22 279**	**22 504**	**22 723**	**22 953**	**23 199**	**23 448**	**23 758**
OECD[1]	kt	11 527	11 039	11 181	11 280	11 388	11 340	11 273	11 193	11 141	11 093	11 145
Developing countries	kt	10 569	12 521	12 707	12 931	13 140	13 429	13 750	14 085	14 396	14 713	14 994
Least Developed Countries	kt	143	170	180	191	207	221	236	250	264	277	289
Protein Meals												
World Trade	kt	**85 224**	**89 289**	**90 328**	**91 134**	**92 354**	**93 829**	**95 258**	**97 068**	**98 831**	**100 507**	**101 994**
OECD[1]	kt	45 165	46 523	46 695	46 576	46 468	46 510	46 532	46 805	47 269	47 411	47 418
Developing countries	kt	46 176	49 048	50 120	51 091	52 464	54 017	55 617	57 363	58 799	60 466	62 036
Least Developed Countries	kt	758	777	754	742	777	807	846	876	907	939	959
Vegetable Oils												
World Trade	kt	**77 894**	**81 295**	**83 499**	**85 285**	**86 921**	**88 479**	**90 061**	**91 714**	**93 185**	**94 771**	**96 262**
OECD[1]	kt	21 521	21 373	21 311	21 384	21 391	21 340	21 271	21 219	21 152	21 060	20 964
Developing countries	kt	57 635	61 161	63 451	65 179	66 806	68 421	70 081	71 802	73 354	75 049	76 651
Least Developed Countries	kt	5 973	6 559	6 848	7 138	7 428	7 715	7 999	8 268	8 527	8 788	9 039
Sugar												
World Trade	kt	**54 721**	**52 526**	**53 311**	**54 101**	**55 447**	**56 151**	**56 941**	**57 803**	**58 702**	**59 751**	**60 797**
OECD[1]	kt	11 205	10 440	10 400	10 448	10 568	10 672	10 799	10 905	11 020	11 151	11 268
Developing countries	kt	42 911	41 960	42 856	43 637	44 838	45 453	46 133	46 908	47 717	48 664	49 621
Least Developed Countries	kt	7 073	6 540	6 947	7 151	7 376	7 516	7 684	7 843	8 019	8 220	8 430
Beef[2]												
World Trade	kt	**8 722**	**9 081**	**9 152**	**9 290**	**9 442**	**9 615**	**9 800**	**9 981**	**10 130**	**10 270**	**10 392**
OECD[1]	kt	3 691	3 839	3 799	3 835	3 866	3 911	3 957	4 003	4 031	4 056	4 081
Developing countries	kt	5 180	5 509	5 631	5 753	5 898	6 043	6 207	6 359	6 483	6 603	6 711
Least Developed Countries	kt	135	150	160	167	179	193	208	227	243	259	271
Pigmeat[2]												
World Trade	kt	**7 422**	**7 659**	**7 605**	**7 648**	**7 713**	**7 763**	**7 796**	**7 859**	**7 952**	**8 058**	**8 133**
OECD[1]	kt	3 817	3 879	3 928	3 961	3 997	4 031	4 054	4 071	4 076	4 093	4 106
Developing countries	kt	4 480	4 742	4 672	4 703	4 722	4 742	4 784	4 853	4 950	5 084	5 163
Least Developed Countries	kt	159	147	163	184	200	213	223	234	252	273	289
Poultry meat												
World Trade	kt	**12 459**	**13 026**	**13 519**	**13 819**	**14 029**	**14 275**	**14 548**	**14 834**	**15 128**	**15 418**	**15 716**
OECD[1]	kt	3 261	3 347	3 453	3 470	3 485	3 503	3 509	3 510	3 516	3 522	3 544
Developing countries	kt	8 820	9 241	9 613	9 914	10 143	10 389	10 663	10 948	11 239	11 529	11 812
Least Developed Countries	kt	843	967	1 025	1 072	1 108	1 150	1 200	1 253	1 304	1 355	1 405
Sheep meat[2]												
World Trade	kt	**968**	**986**	**990**	**997**	**1 015**	**1 030**	**1 035**	**1 039**	**1 043**	**1 048**	**1 052**
OECD[1]	kt	372	376	373	376	383	388	386	386	384	384	382
Developing countries	kt	606	620	626	629	640	649	656	662	668	673	679
Least Developed Countries	kt	4	5	5	5	5	6	6	6	6	6	6

Table A.12.1. World trade projections, imports *(cont.)*

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Butter												
World Trade	**kt**	**834**	**861**	**876**	**899**	**917**	**928**	**948**	**968**	**988**	**1 003**	**1 024**
OECD[1]	kt	152	162	162	165	164	162	162	162	163	162	162
Developing countries	kt	597	601	611	626	638	646	660	674	687	698	714
Least Developed Countries	kt	15	13	11	12	13	15	17	19	22	26	31
Cheese												
World Trade	**kt**	**2 364**	**2 477**	**2 525**	**2 571**	**2 617**	**2 663**	**2 712**	**2 764**	**2 818**	**2 870**	**2 924**
OECD[1]	kt	975	1 021	1 037	1 062	1 061	1 069	1 076	1 084	1 092	1 104	1 107
Developing countries	kt	1 365	1 416	1 449	1 473	1 516	1 555	1 594	1 634	1 676	1 712	1 752
Least Developed Countries	kt	27	20	17	19	23	27	32	39	45	51	57
Whole milk powder												
World Trade	**kt**	**2 365**	**2 407**	**2 435**	**2 461**	**2 496**	**2 525**	**2 561**	**2 596**	**2 630**	**2 659**	**2 691**
OECD[1]	kt	97	98	96	94	93	92	92	92	91	92	91
Developing countries	kt	2 261	2 291	2 321	2 350	2 385	2 416	2 453	2 488	2 524	2 553	2 586
Least Developed Countries	kt	168	165	169	175	180	186	192	198	204	211	217
Skim milk powder												
World Trade	**kt**	**2 248**	**2 416**	**2 456**	**2 488**	**2 531**	**2 568**	**2 611**	**2 655**	**2 701**	**2 742**	**2 787**
OECD[1]	kt	439	466	463	466	464	463	462	463	463	463	463
Developing countries	kt	1 987	2 122	2 166	2 210	2 253	2 291	2 334	2 376	2 422	2 463	2 506
Least Developed Countries	kt	102	112	116	120	123	126	130	133	137	140	144
Fish[3]												
World Trade	**kt**	**39 732**	**40 426**	**40 726**	**41 283**	**41 679**	**42 659**	**43 034**	**43 860**	**44 291**	**45 139**	**45 852**
OECD[1]	kt	21 452	21 973	21 993	22 259	22 473	23 122	23 155	23 698	23 878	24 492	24 669
Developing countries	kt	18 717	18 870	19 156	19 454	19 689	19 994	20 270	20 538	20 784	21 083	21 646
Least Developed Countries	kt	1 068	1 076	1 066	1 085	1 098	1 139	1 167	1 197	1 227	1 265	1 302
Fishmeal[4]												
World Trade	**kt**	**2 857**	**2 835**	**2 830**	**2 869**	**2 852**	**2 859**	**2 822**	**2 882**	**2 898**	**2 782**	**2 886**
OECD[1]	kt	998	1 030	985	967	914	928	879	872	856	785	833
Developing countries	kt	2 025	1 932	1 977	2 037	2 074	2 064	2 083	2 155	2 190	2 150	2 209
Least Developed Countries	kt	23	14	14	14	14	14	14	14	15	14	15
Fish oil[4]												
World Trade	**kt**	**742**	**700**	**711**	**718**	**758**	**697**	**716**	**739**	**746**	**772**	**727**
OECD[1]	kt	590	560	566	566	602	544	557	574	578	604	558
Developing countries	kt	248	230	230	233	224	235	244	254	260	242	263
Least Developed Countries	kt	5	6	6	6	6	6	7	7	7	7	7
Ethanol												
World Trade	**kt**	**9 397**	**9 440**	**9 549**	**9 712**	**9 680**	**9 728**	**9 805**	**9 838**	**9 781**	**9 743**	**9 679**
OECD[1]	kt	5 569	5 664	5 739	5 846	5 816	5 885	5 962	5 995	5 910	5 841	5 751
Developing countries	kt	4 410	4 342	4 379	4 436	4 435	4 416	4 417	4 419	4 450	4 482	4 510
Least Developed Countries	kt	31	41	41	41	41	41	41	41	41	41	41
Biodiesel												
World Trade	**kt**	**4 403**	**4 209**	**3 955**	**3 541**	**3 422**	**3 382**	**3 333**	**3 281**	**3 280**	**3 233**	**3 237**
OECD[1]	kt	4 072	3 993	3 738	3 325	3 206	3 165	3 117	3 065	3 064	3 016	3 021
Developing countries	kt	331	217	217	217	216	217	217	217	216	217	216
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Cotton												
World Trade	**kt**	**7 783**	**8 331**	**8 423**	**8 518**	**8 630**	**8 759**	**8 882**	**9 001**	**9 124**	**9 254**	**9 387**
OECD[1]	kt	1 588	1 422	1 425	1 434	1 447	1 433	1 435	1 433	1 432	1 433	1 435
Developing countries	kt	7 397	8 000	8 094	8 184	8 297	8 429	8 554	8 673	8 795	8 925	9 057
Least Developed Countries	kt	1 481	1 503	1 551	1 601	1 653	1 704	1 752	1 800	1 848	1 896	1 944
Roots and tubers												
World Trade	**kt**	**11 036**	**11 381**	**11 609**	**11 744**	**11 871**	**12 033**	**12 206**	**12 381**	**12 569**	**12 742**	**12 937**
OECD[1]	kt	1 841	1 846	1 850	1 816	1 811	1 818	1 828	1 833	1 831	1 827	1 825
Developing countries	kt	9 496	9 866	10 095	10 263	10 398	10 561	10 736	10 919	11 121	11 305	11 509
Least Developed Countries	kt	193	195	204	211	214	217	212	208	209	215	225

Note: The values do not add up to world trade due to double counting of certains countries and statistical differences (i.e. LDC are already included in the Developing countries aggregate).
Average 2015-17est: Data for 2017 are estimated.

1. Excludes Iceland but includes all EU28 member countries.
2. Excludes trade of live animals.
3. Data are in live weight equivalent and refer to trade of food fish i.e. for human consumption.
4. Data are in product weight.

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

Table A.12.2. World trade projections, exports

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Wheat												
OECD[1]	kt	100 275	99 833	102 185	103 717	104 552	105 629	106 280	106 933	107 632	108 387	109 203
Developing countries	kt	22 547	21 597	21 763	22 288	22 594	22 858	23 158	23 479	23 789	24 104	24 450
Least Developed Countries	kt	107	83	80	79	77	76	74	73	72	70	69
Maize												
OECD[1]	kt	58 088	51 076	52 344	54 542	55 716	55 553	56 093	57 198	57 936	58 758	58 946
Developing countries	kt	54 614	58 327	59 184	59 580	60 882	62 175	63 061	63 555	64 350	65 718	67 590
Least Developed Countries	kt	2 756	2 741	2 818	2 851	2 956	3 028	3 084	3 145	3 198	3 270	3 360
Other coarse grains												
OECD[1]	kt	29 448	26 281	26 189	26 787	27 252	27 467	27 849	28 307	28 690	29 058	29 337
Developing countries	kt	6 276	5 044	5 320	5 743	6 298	6 856	7 090	7 280	7 521	7 838	8 187
Least Developed Countries	kt	801	909	854	800	745	694	642	593	546	502	463
Rice												
OECD[1]	kt	4 139	4 371	4 551	4 534	4 584	4 643	4 759	4 822	4 890	4 960	4 972
Developing countries	kt	40 877	40 203	40 911	41 940	42 909	43 882	44 837	45 901	46 996	48 103	49 277
Least Developed Countries	kt	4 111	5 202	5 161	5 292	5 310	5 310	5 352	5 443	5 556	5 665	5 771
Soybean												
OECD[1]	kt	60 580	66 262	66 070	66 496	67 781	68 262	68 866	69 676	70 135	70 591	71 116
Developing countries	kt	83 011	85 679	87 902	90 084	91 474	92 924	94 085	94 846	96 310	97 571	98 944
Least Developed Countries	kt	13	12	11	11	11	11	11	10	10	10	10
Other oilseeds												
OECD[1]	kt	14 764	15 974	16 097	16 221	16 354	16 428	16 505	16 581	16 662	16 737	16 854
Developing countries	kt	2 845	2 594	2 592	2 629	2 674	2 690	2 703	2 705	2 717	2 731	2 750
Least Developed Countries	kt	85	115	104	105	103	101	98	96	95	92	91
Protein Meals												
OECD[1]	kt	17 156	18 095	18 004	18 182	18 035	18 045	18 553	18 840	19 412	19 940	20 407
Developing countries	kt	64 075	65 423	66 296	66 683	67 797	68 982	69 563	70 747	71 546	72 328	72 962
Least Developed Countries	kt	219	192	171	162	145	133	122	113	106	98	93
Vegetable Oils												
OECD[1]	kt	7 296	7 631	7 806	7 899	7 804	7 929	8 097	8 259	8 398	8 592	8 757
Developing countries	kt	61 941	65 982	67 666	69 147	70 550	71 626	72 662	73 749	74 658	75 601	76 465
Least Developed Countries	kt	409	409	389	372	357	343	331	320	309	298	287
Sugar												
OECD[1]	kt	7 684	8 837	8 948	9 083	8 948	9 008	8 950	9 010	9 102	9 215	9 345
Developing countries	kt	53 210	49 834	50 467	51 120	52 580	53 179	53 950	54 682	55 399	56 255	57 125
Least Developed Countries	kt	2 603	1 555	1 802	1 756	1 668	1 606	1 546	1 469	1 404	1 352	1 300
Beef[2]												
OECD[1]	kt	4 286	4 442	4 394	4 428	4 511	4 598	4 667	4 705	4 748	4 782	4 810
Developing countries	kt	4 730	5 157	5 318	5 430	5 503	5 581	5 672	5 788	5 876	5 973	6 059
Least Developed Countries	kt	2	2	2	2	1	1	1	1	1	1	1
Pigmeat[2]												
OECD[1]	kt	6 572	6 671	6 584	6 598	6 653	6 706	6 756	6 838	6 928	7 029	7 096
Developing countries	kt	1 153	1 187	1 209	1 236	1 241	1 235	1 220	1 211	1 225	1 235	1 241
Least Developed Countries	kt	1	1	1	1	1	1	1	1	1	1	1
Poultry meat												
OECD[1]	kt	5 515	5 755	6 055	6 164	6 244	6 347	6 463	6 584	6 728	6 865	7 006
Developing countries	kt	6 905	7 225	7 419	7 607	7 735	7 873	8 022	8 177	8 315	8 458	8 604
Least Developed Countries	kt	19	18	18	17	17	17	16	16	16	16	15
Sheep meat[2]												
OECD[1]	kt	969	977	998	1 020	1 053	1 084	1 090	1 098	1 106	1 113	1 121
Developing countries	kt	84	80	76	73	67	63	64	65	66	67	69
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Butter												
OECD[1]	kt	738	733	745	765	780	786	803	820	836	847	864
Developing countries	kt	84	82	83	83	84	87	88	90	91	93	95
Least Developed Countries	kt	2	3	3	3	2	2	2	2	2	2	2
Cheese												
OECD[1]	kt	1 749	1 866	1 915	1 951	1 998	2 042	2 089	2 139	2 193	2 245	2 300
Developing countries	kt	486	530	520	521	513	510	506	503	498	494	490
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Whole milk powder												
OECD[1]	kt	1 834	1 805	1 820	1 836	1 861	1 879	1 905	1 933	1 959	1 983	2 003
Developing countries	kt	605	585	593	601	608	617	623	628	635	637	648
Least Developed Countries	kt	7	6	6	6	6	6	5	5	5	5	5
Skim milk powder												
OECD[1]	kt	1 992	2 168	2 176	2 209	2 251	2 283	2 324	2 369	2 415	2 454	2 497
Developing countries	kt	237	286	294	293	292	293	293	292	292	292	292
Least Developed Countries	kt	3	3	3	3	3	3	3	3	2	2	2

Table A.12.2. World trade projections, exports *(cont.)*

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Fish[3]												
OECD[1]	kt	11 482	11 799	12 162	12 533	12 792	12 966	13 288	13 470	13 811	13 894	14 316
Developing countries	kt	25 723	25 822	25 883	26 173	26 427	27 338	27 512	28 243	28 454	29 126	29 502
Least Developed Countries	kt	980	935	959	943	937	897	877	857	842	823	812
Fishmeal[4]												
OECD[1]	kt	788	892	891	900	994	911	918	928	965	1 020	973
Developing countries	kt	1 889	1 766	1 793	1 846	1 810	1 862	1 836	1 901	1 930	1 800	1 932
Least Developed Countries	kt	38	32	35	38	43	45	48	50	53	57	58
Fish oil[4]												
OECD[1]	kt	380	360	371	377	393	374	382	384	390	404	394
Developing countries	kt	390	352	365	371	400	358	367	391	398	415	389
Least Developed Countries	kt	5	5	5	5	5	5	6	6	6	6	6
Ethanol												
OECD[1]	kt	5 366	5 117	5 184	5 288	5 175	5 104	5 057	4 973	4 944	4 943	4 943
Developing countries	kt	3 357	3 688	3 730	3 789	3 871	3 991	4 114	4 232	4 203	4 164	4 100
Least Developed Countries	kt	7	20	20	20	20	20	20	20	20	20	20
Biodiesel												
OECD[1]	kt	1 240	1 140	1 232	1 260	1 236	1 236	1 236	1 235	1 235	1 232	1 224
Developing countries	kt	2 383	3 000	2 655	2 212	2 117	2 077	2 028	1 977	1 976	1 931	1 944
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Cotton												
OECD[1]	kt	3 874	4 263	4 345	4 434	4 513	4 594	4 628	4 665	4 705	4 758	4 817
Developing countries	kt	3 342	3 409	3 452	3 496	3 560	3 633	3 710	3 780	3 852	3 924	3 996
Least Developed Countries	kt	888	1 080	1 103	1 126	1 145	1 168	1 197	1 228	1 261	1 293	1 323
Roots and tubers												
OECD[1]	kt	1 313	1 221	1 218	1 287	1 311	1 339	1 359	1 391	1 425	1 469	1 503
Developing countries	kt	10 422	10 797	11 032	11 111	11 229	11 375	11 539	11 687	11 841	11 968	12 128
Least Developed Countries	kt	121	119	113	112	116	117	117	114	113	111	109

Note: Average 2015-17est: Data for 2017 are estimated.

1. Excludes Iceland but includes all EU28 member countries.
2. Excludes trade of live animals.
3. Data are in live weight equivalent and refer to trade of food fish i.e. for human consumption.
4. Data are in product weight.

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

Table A.13.1. Wheat projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**750 461**	**832 623**	**1.52**	**1.10**	**168 418**	**193 179**	**3.48**	**1.20**	**175 149**	**198 667**	**3.79**	**1.17**
NORTH AMERICA	85 217	85 705	-0.70	0.77	3 611	3 466	2.40	-1.27	46 595	48 368	0.42	0.40
Canada	29 769	30 422	1.95	0.18	109	110	9.59	0.00	21 375	21 975	2.96	0.02
United States	55 448	55 283	-1.99	1.12	3 502	3 356	2.29	-1.31	25 220	26 393	-1.39	0.73
LATIN AMERICA	29 311	32 632	2.50	1.26	23 235	25 878	2.16	0.92	14 165	15 655	2.87	1.19
Argentina	15 897	18 933	6.37	1.22	3	3	0.00	0.00	10 660	12 402	6.07	1.30
Brazil	5 905	5 983	0.96	1.17	6 880	8 276	0.17	1.42	850	1 185	-2.74	3.90
Chile	1 468	1 304	1.31	1.52	1 186	1 269	6.32	-0.55	0	0	..	..
Colombia	16	46	-2.72	0.68	1 767	1 735	2.81	0.49	57	52	12.58	-0.48
Mexico	3 664	3 979	-1.29	1.24	4 645	5 222	5.52	0.58	1 224	1 109	4.20	-1.27
Paraguay	1 048	1 037	-4.17	1.41	1	1	0.00	0.97	730	437	-9.25	1.64
EUROPE	260 133	288 191	1.93	0.98	7 762	7 170	-0.71	-0.37	79 653	96 960	8.47	1.50
European Union	152 281	164 445	0.89	0.71	5 469	5 075	-2.10	-0.37	29 913	34 939	4.84	1.33
Russia	73 391	83 876	3.89	1.39	376	347	33.48	2.09	31 285	40 186	13.65	1.60
Ukraine	26 244	30 647	2.75	1.29	49	50	49.06	0.08	16 989	19 426	10.54	1.48
AFRICA	26 409	31 202	2.28	1.71	47 907	60 402	3.12	2.09	1 031	931	-3.25	-1.07
Egypt	9 136	10 091	1.89	1.33	11 767	15 162	2.14	2.07	0	0	..	..
Ethiopia	4 563	5 671	7.80	2.11	1 340	2 307	-0.66	7.25	0	0	..	..
Nigeria	65	76	-2.83	1.53	4 533	5 422	2.67	2.09	600	509	4.14	-2.05
South Africa	1 614	1 844	-2.41	1.30	1 634	1 827	2.14	0.27	82	128	-12.06	5.26
ASIA	322 664	367 308	1.76	1.19	85 021	95 306	4.61	0.98	15 564	17 283	2.21	1.79
China[1]	129 608	133 275	1.78	0.57	3 852	4 477	25.80	2.46	142	200	-10.43	3.62
India	92 401	112 058	2.20	1.29	2 758	174	62.15	-18.60	631	711	69.23	6.31
Indonesia	0	0	..	..	10 136	13 754	9.28	1.93	130	125	24.85	-1.89
Iran	12 040	15 713	3.51	1.58	1 763	938	-8.07	-5.78	184	431	12.24	1.41
Japan	891	925	2.60	0.44	5 675	5 419	0.65	-0.52	0	0	..	..
Kazakhstan	14 197	16 467	0.27	1.44	68	52	8.91	0.05	7 295	8 501	0.46	1.56
Korea	35	49	7.97	2.37	4 537	5 207	0.35	1.54	50	54	0.00	0.67
Malaysia	0	0	..	..	1 499	1 673	3.95	0.54	108	111	11.19	-0.54
Pakistan	25 439	31 648	1.68	2.03	13	24	-37.29	1.91	750	105	-2.85	-1.91
Philippines	0	0	..	..	5 300	6 498	7.38	1.96	0	0	..	..
Saudi Arabia	17	3	-46.34	-7.21	3 633	4 488	12.27	1.67	0	0	..	..
Thailand	1	1	0.42	1.38	3 833	3 567	13.73	1.64	15	13	8.48	-1.61
Turkey	21 567	26 223	1.27	1.94	4 571	4 027	4.95	-2.77	4 344	5 258	6.40	2.85
Viet Nam	0	0	..	..	4 400	5 854	14.06	2.38	41	44	-27.88	-2.33
OCEANIA	26 727	27 585	1.06	1.14	882	956	4.07	0.71	18 141	19 470	1.00	1.10
Australia	26 299	27 038	1.07	1.09	24	20	8.95	0.00	18 141	19 470	1.00	1.10
New Zealand	427	547	0.14	3.44	507	555	6.63	0.43	0	0	-17.96	0.00
DEVELOPED COUNTRIES	**401 190**	**435 639**	**1.16**	**1.01**	**27 230**	**26 748**	**0.86**	**-0.37**	**152 602**	**174 217**	**3.94**	**1.14**
DEVELOPING COUNTRIES	**349 271**	**396 984**	**1.98**	**1.20**	**141 188**	**166 431**	**4.06**	**1.48**	**22 547**	**24 450**	**2.99**	**1.40**
LEAST DEVELOPED COUNTRIES (LDC)	8 468	9 739	3.44	1.61	14 108	19 000	5.32	2.54	107	69	-3.61	-1.95
OECD[2]	**292 875**	**311 313**	**0.44**	**0.87**	**32 703**	**33 024**	**1.60**	**-0.29**	**100 275**	**109 203**	**1.92**	**0.90**
BRICS	**302 919**	**337 036**	**2.32**	**1.02**	**15 500**	**15 101**	**7.08**	**0.74**	**32 990**	**42 410**	**11.43**	**1.74**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.13.2. Wheat projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**726 564**	**823 813**	**1.42**	**0.97**	**496 386**	**547 425**	**1.22**	**0.88**	**66.5**	**65.8**	**0.03**	**-0.09**
NORTH AMERICA	40 138	40 796	-0.06	0.36	28 699	29 348	0.38	0.28	80.1	75.7	-0.38	-0.43
Canada	8 803	8 573	1.80	0.10	2 789	2 811	-0.04	0.11	76.9	70.7	-1.05	-0.70
United States	31 335	32 223	-0.55	0.44	25 910	26 537	0.43	0.30	80.4	76.3	-0.31	-0.40
LATIN AMERICA	38 020	42 809	1.34	0.94	34 285	38 208	1.48	1.02	53.8	54.4	0.34	0.16
Argentina	5 856	6 520	2.04	0.98	5 152	5 790	1.24	1.06	117.5	120.0	0.20	0.20
Brazil	11 501	13 065	1.11	0.78	10 900	12 095	0.86	1.04	52.5	54.3	-0.05	0.44
Chile	2 432	2 574	2.13	0.37	1 942	1 947	1.16	-0.08	108.4	100.7	0.26	-0.75
Colombia	1 595	1 727	2.05	0.56	1 420	1 504	1.35	0.40	29.2	28.7	0.36	-0.24
Mexico	7 018	8 104	1.31	1.19	6 186	7 211	4.15	1.37	48.5	50.1	2.69	0.31
Paraguay	516	599	2.58	1.41	342	382	1.45	1.12	50.9	50.1	0.11	-0.01
EUROPE	187 291	198 347	-0.10	0.60	79 952	79 709	0.00	-0.04	107.7	107.4	-0.11	-0.02
European Union	128 216	134 464	-0.11	0.56	55 779	56 267	0.11	0.01	109.8	109.8	-0.05	-0.04
Russia	40 560	44 101	0.36	0.66	14 660	13 723	0.14	-0.38	101.8	96.7	0.06	-0.21
Ukraine	10 390	11 260	-2.73	1.06	4 699	4 991	-1.57	0.43	105.7	118.9	-1.08	0.96
AFRICA	73 278	90 315	3.23	1.97	61 016	75 517	2.52	2.01	49.8	47.4	-0.09	-0.38
Egypt	20 917	25 178	2.96	1.74	17 717	21 423	2.24	1.71	185.2	186.6	0.11	0.09
Ethiopia	5 909	7 952	6.02	3.30	4 726	6 433	4.74	3.49	46.2	48.9	2.06	1.20
Nigeria	3 998	4 982	2.33	2.63	3 767	4 717	3.33	2.70	20.3	19.2	0.62	0.15
South Africa	3 266	3 541	1.01	0.64	3 193	3 462	1.23	0.64	57.0	55.0	-0.11	-0.38
ASIA	378 312	442 522	2.03	1.00	289 491	321 705	1.34	0.91	64.9	66.3	0.29	0.17
China[1]	115 190	137 812	0.34	0.39	87 833	90 223	0.19	0.22	62.6	62.6	-0.34	0.02
India	97 195	108 913	3.14	1.00	79 229	89 062	1.57	1.03	59.8	60.3	0.32	0.05
Indonesia	9 840	13 603	8.44	1.97	6 673	8 391	4.25	1.90	25.6	29.0	2.96	0.98
Iran	14 820	16 214	0.78	0.93	13 403	14 689	1.30	0.79	167.0	167.5	0.07	0.05
Japan	6 593	6 334	0.71	-0.37	5 182	5 001	0.27	-0.31	40.6	40.6	0.36	0.03
Kazakhstan	6 955	7 977	-0.53	1.58	2 555	2 807	1.14	0.82	142.1	141.1	-0.36	-0.05
Korea	4 389	5 188	0.94	1.55	2 430	2 506	0.52	0.28	47.8	47.8	0.12	0.01
Malaysia	1 425	1 560	4.64	0.71	991	1 031	2.36	0.20	31.8	28.8	0.60	-1.01
Pakistan	25 269	31 528	1.57	2.00	24 247	30 168	2.18	2.00	125.5	129.0	0.08	0.29
Philippines	5 233	6 479	7.69	1.98	2 400	2 662	2.03	0.81	23.2	22.0	0.39	-0.59
Saudi Arabia	3 683	4 458	3.44	1.44	3 250	3 799	3.51	1.39	100.8	99.4	0.74	-0.06
Thailand	3 569	3 531	14.04	1.58	1 175	1 410	3.86	0.98	17.1	20.2	3.43	0.90
Turkey	22 438	24 985	1.66	0.88	16 680	18 456	1.54	0.73	209.8	212.2	-0.02	0.11
Viet Nam	4 059	5 784	15.62	2.39	1 508	1 977	4.19	2.54	15.9	19.0	3.06	1.65
OCEANIA	9 525	9 024	4.08	1.40	2 943	2 938	3.50	0.69	75.0	65.0	1.89	-0.56
Australia	8 235	7 544	4.28	1.36	2 217	2 146	4.62	0.63	91.9	78.3	3.07	-0.49
New Zealand	944	1 101	4.09	1.91	396	430	0.76	0.76	85.0	84.3	-0.32	-0.05
DEVELOPED COUNTRIES	**272 891**	**287 968**	**0.14**	**0.65**	**133 519**	**135 337**	**0.35**	**0.15**	**94.9**	**93.0**	**-0.07**	**-0.14**
DEVELOPING COUNTRIES	**453 673**	**535 845**	**2.26**	**1.15**	**362 866**	**412 088**	**1.55**	**1.14**	**59.9**	**60.0**	**0.17**	**0.01**
LEAST DEVELOPED COUNTRIES (LDC)	22 135	28 560	4.97	2.18	17 487	22 935	3.77	2.32	22.0	22.5	1.34	0.06
OECD[2]	**223 825**	**234 945**	**0.32**	**0.61**	**121 674**	**125 740**	**0.67**	**0.28**	**92.1**	**90.9**	**0.10**	**-0.12**
BRICS	**267 711**	**307 432**	**1.34**	**0.66**	**195 816**	**208 564**	**0.78**	**0.57**	**62.5**	**62.3**	**-0.06**	**0.01**

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.14.1. Maize projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**1 040 844**	**1 201 713**	**3.33**	**1.30**	**137 645**	**156 881**	**6.35**	**1.41**	**138 724**	**157 227**	**6.73**	**1.41**
NORTH AMERICA	380 709	404 001	2.38	0.62	2 520	2 299	1.53	-0.66	54 306	54 834	2.38	1.52
Canada	13 616	14 980	3.28	0.57	1 047	1 007	-5.60	-1.45	1 465	1 585	27.13	-0.16
United States	367 093	389 021	2.35	0.62	1 473	1 292	18.76	0.03	52 842	53 248	2.20	1.57
LATIN AMERICA	163 051	202 506	5.71	1.90	31 356	36 047	5.38	2.13	49 233	62 888	12.26	1.70
Argentina	36 863	46 731	10.07	2.13	4	4	0.00	0.00	19 347	22 821	8.27	1.63
Brazil	82 663	106 672	5.89	2.01	1 484	697	5.10	0.23	26 152	36 099	16.40	1.68
Chile	1 260	1 401	-1.86	2.53	1 463	1 708	7.71	1.83	107	140	5.00	-1.79
Colombia	1 688	2 894	0.60	3.26	4 613	5 081	5.12	1.00	88	84	17.54	-0.93
Mexico	26 222	27 566	2.44	0.72	12 974	16 717	7.14	2.59	1 166	925	34.11	2.64
Paraguay	4 713	4 590	12.17	1.89	10	10	-5.27	-0.18	2 337	2 784	11.10	2.82
EUROPE	108 166	127 139	2.96	1.32	15 027	9 786	17.48	-2.58	28 301	32 791	16.35	1.44
European Union	59 908	70 929	-0.29	1.15	14 289	9 229	19.31	-2.75	2 367	2 895	4.49	1.46
Russia	13 792	17 115	15.97	2.09	45	53	-3.36	0.06	5 192	6 145	43.07	2.01
Ukraine	25 167	30 538	11.52	1.51	48	25	6.20	-0.10	18 935	21 762	18.75	1.50
AFRICA	77 302	102 018	3.32	2.18	22 522	26 798	6.64	2.28	4 118	4 829	-0.44	-1.77
Egypt	7 635	8 474	0.54	2.14	8 933	12 295	7.33	2.31	0	0	..	..
Ethiopia	7 810	9 516	8.98	2.00	0	0	..	..	650	305	26.23	-6.51
Nigeria	10 686	13 205	4.88	1.83	443	722	24.14	2.38	150	125	-9.49	-0.80
South Africa	12 132	15 426	-0.39	0.60	1 399	0	64.11	..	1 370	1 862	-5.06	-5.22
ASIA	311 012	365 332	3.58	1.52	66 068	81 808	5.36	1.50	2 694	1 809	-7.09	-1.72
China[1]	220 031	250 628	3.70	1.34	3 212	6 689	35.99	4.22	37	12	-23.60	12.82
India	24 853	32 525	3.79	2.27	99	54	25.89	-0.87	547	131	-19.86	-9.19
Indonesia	21 486	28 158	3.18	1.81	1 881	1 052	17.41	3.88	137	77	7.55	-0.49
Iran	989	1 112	-5.81	1.76	6 708	9 815	9.33	2.10	0	0	..	..
Japan	0	0	..	..	14 950	14 924	-1.13	-0.11	0	0	..	..
Kazakhstan	600	632	2.34	1.47	40	33	43.30	1.10	40	49	29.96	-1.10
Korea	77	81	-0.70	0.22	10 210	10 985	4.20	0.33	0	0	..	..
Malaysia	59	71	4.00	1.56	3 621	4 734	3.47	1.63	36	31	17.12	-1.61
Pakistan	5 433	6 842	6.25	1.69	7	30	4.80	23.05	50	2	-31.91	-31.29
Philippines	7 538	9 137	1.52	1.56	463	910	20.93	16.83	0	0	..	..
Saudi Arabia	84	106	-6.28	2.53	3 733	5 523	9.97	1.94	0	0	..	..
Thailand	4 560	5 426	0.01	1.82	146	242	-11.93	1.58	465	186	-3.95	-1.56
Turkey	6 233	7 639	5.63	2.09	1 056	1 268	14.49	-3.29	69	70	3.17	0.63
Viet Nam	5 213	6 215	1.94	1.83	8 476	12 745	33.58	3.17	92	63	39.82	-0.95
OCEANIA	604	717	0.33	2.35	152	143	68.50	1.32	73	76	12.07	0.64
Australia	398	496	1.37	2.51	0	0	..	..	68	71	14.88	0.68
New Zealand	195	209	-1.62	2.04	148	141	118.09	1.37	5	5	-2.05	0.00
DEVELOPED COUNTRIES	**504 032**	**549 906**	**2.44**	**0.78**	**35 755**	**28 900**	**5.25**	**-0.99**	**84 110**	**89 636**	**5.36**	**1.29**
DEVELOPING COUNTRIES	**536 812**	**651 807**	**4.25**	**1.76**	**101 890**	**127 981**	**6.77**	**2.05**	**54 614**	**67 590**	**9.41**	**1.58**
LEAST DEVELOPED COUNTRIES (LDC)	38 163	52 587	4.29	2.71	2 215	2 159	5.34	-1.27	2 756	3 360	5.77	2.24
OECD[2]	**475 206**	**512 530**	**2.02**	**0.72**	**59 217**	**59 040**	**5.37**	**0.16**	**58 088**	**58 946**	**2.65**	**1.52**
BRICS	**353 471**	**422 365**	**4.39**	**1.58**	**6 240**	**7 493**	**21.09**	**3.70**	**33 298**	**44 248**	**12.32**	**1.24**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.14.2. Maize projections: Consumption, feed, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		FEED (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**1 037 043**	**1 200 684**	**3.31**	**1.20**	**578 823**	**698 507**	**3.11**	**1.57**	**17.7**	**19.4**	**0.65**	**0.76**
NORTH AMERICA	323 265	351 941	1.93	0.48	144 072	165 737	1.11	1.08	19.0	18.6	-0.17	-0.26
Canada	12 799	14 405	1.15	0.51	7 174	8 806	-0.16	0.89	44.3	40.9	-0.96	-0.84
United States	310 466	337 536	1.97	0.48	136 898	156 931	1.18	1.09	16.1	16.0	0.03	-0.10
LATIN AMERICA	141 851	175 076	3.75	1.71	91 955	117 868	3.79	2.02	51.1	52.9	0.33	0.33
Argentina	17 635	23 832	11.95	2.65	12 110	17 208	13.57	3.27	34.9	36.6	2.33	0.19
Brazil	57 995	71 123	3.34	1.63	43 679	54 907	2.49	1.86	24.1	24.7	0.39	0.20
Chile	2 497	2 942	1.58	1.93	1 833	2 223	1.15	2.33	21.2	20.9	0.81	-0.17
Colombia	6 173	7 870	3.81	1.84	4 196	5 695	5.06	2.32	39.5	40.3	0.35	0.02
Mexico	36 629	43 332	2.85	1.08	18 467	22 561	4.65	1.02	130.8	133.5	-0.29	0.21
Paraguay	1 369	1 718	8.50	2.16	443	571	17.92	2.20	55.6	61.3	1.33	0.99
EUROPE	97 757	103 899	2.14	0.83	73 965	76 927	2.14	0.45	8.2	8.3	0.19	0.21
European Union	74 348	77 059	1.90	0.65	55 276	55 277	1.91	0.03	9.5	9.8	0.09	0.27
Russia	8 296	11 015	10.56	1.70	6 284	8 704	10.13	2.11	1.4	1.5	4.30	0.58
Ukraine	7 581	8 768	2.43	1.60	5 968	6 994	3.28	1.75	10.7	11.6	-0.16	0.64
AFRICA	94 591	123 687	4.35	2.35	33 414	41 599	5.89	2.18	40.7	43.4	0.65	0.42
Egypt	16 435	20 727	3.83	2.20	12 035	15 612	5.03	2.51	41.5	40.5	-0.75	-0.11
Ethiopia	7 176	9 219	8.29	2.46	1 300	931	20.12	0.02	46.3	54.7	2.67	0.90
Nigeria	10 983	13 788	5.85	1.90	2 133	2 115	15.37	0.53	35.6	36.5	1.32	0.10
South Africa	11 444	13 532	1.43	1.50	5 366	6 751	1.63	2.53	87.5	83.6	-0.31	-0.40
ASIA	378 882	445 297	4.54	1.36	234 935	295 817	4.23	1.90	8.2	8.6	-0.14	0.31
China[1]	227 797	257 482	4.78	1.14	139 667	171 389	4.04	1.89	6.1	6.1	-2.10	0.01
India	24 800	32 419	6.24	2.33	9 731	14 407	10.09	3.62	6.8	7.3	-0.34	0.18
Indonesia	23 297	29 093	4.11	1.86	8 867	13 648	6.73	2.39	28.8	29.5	0.43	0.28
Iran	7 763	10 907	5.81	2.06	7 538	10 639	5.97	2.06	0.9	0.9	-1.21	0.05
Japan	14 929	14 946	-1.16	-0.09	11 312	11 148	-1.15	-0.22	0.8	0.8	0.07	-0.85
Kazakhstan	637	612	5.92	1.87	533	485	4.57	1.97	0.6	0.6	2.32	0.97
Korea	10 119	11 063	3.45	0.21	7 814	8 658	3.57	0.15	1.9	1.9	-0.20	0.01
Malaysia	3 664	4 773	3.48	1.67	3 494	4 597	3.66	1.73	1.6	1.5	-0.84	-0.83
Pakistan	5 507	6 852	6.81	1.63	2 533	3 382	7.97	2.22	8.1	8.2	1.47	-0.21
Philippines	7 794	10 015	1.19	2.35	5 090	6 507	-0.13	2.59	18.5	20.0	1.37	0.78
Saudi Arabia	3 800	5 625	9.11	1.95	3 594	5 403	8.55	2.00	0.2	0.2	-2.57	-1.00
Thailand	4 341	5 475	0.31	1.92	4 002	5 135	0.61	2.04	1.2	1.1	-0.42	-0.09
Turkey	7 253	8 826	6.91	1.25	5 370	7 014	8.36	1.68	16.1	15.7	0.69	-0.03
Viet Nam	13 573	18 868	13.12	2.70	10 367	15 071	11.62	2.98	6.6	8.2	3.22	1.62
OCEANIA	697	784	3.48	2.34	482	559	3.38	3.31	2.4	2.2	-1.26	-0.70
Australia	331	425	0.43	2.85	138	223	-3.43	6.00	3.2	3.0	-1.08	-0.61
New Zealand	353	345	7.66	1.80	339	329	8.01	1.87	1.5	1.5	-1.06	0.00
DEVELOPED COUNTRIES	**451 914**	**489 385**	**1.86**	**0.58**	**238 573**	**264 910**	**1.35**	**0.88**	**12.9**	**13.1**	**0.17**	**0.11**
DEVELOPING COUNTRIES	**585 129**	**711 300**	**4.57**	**1.65**	**340 250**	**433 596**	**4.53**	**2.01**	**18.8**	**20.7**	**0.68**	**0.80**
LEAST DEVELOPED COUNTRIES (LDC)	37 360	51 247	4.76	2.54	8 084	10 281	8.09	1.44	27.8	32.0	0.89	1.11
OECD[2]	**471 534**	**512 850**	**1.98**	**0.56**	**246 347**	**275 056**	**1.61**	**0.80**	**23.0**	**24.2**	**0.34**	**0.50**
BRICS	**330 331**	**385 570**	**4.59**	**1.35**	**204 727**	**256 157**	**3.98**	**2.00**	**8.8**	**9.1**	**-0.65**	**0.15**

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.15.1. Other coarse grain projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**297 420**	**326 887**	**-0.01**	**1.12**	**41 452**	**48 659**	**6.60**	**1.96**	**45 761**	**49 112**	**4.43**	**1.94**
NORTH AMERICA	29 414	27 715	-0.21	0.11	1 800	1 773	-0.52	-0.17	11 032	10 992	4.30	0.45
Canada	12 227	11 469	-1.47	-0.85	145	127	14.39	-0.26	4 461	3 854	0.41	-2.55
United States	17 188	16 247	0.76	0.86	1 655	1 646	-1.24	-0.16	6 572	7 137	7.94	2.57
LATIN AMERICA	18 444	24 662	0.99	2.74	2 868	3 222	-5.63	0.92	3 099	4 920	1.34	8.51
Argentina	7 297	9 972	5.78	4.13	1	1	0.00	0.00	2 924	4 740	1.46	9.16
Brazil	2 769	3 422	2.28	1.43	599	369	4.41	-2.50	19	17	12.17	1.33
Chile	580	871	3.48	1.59	177	85	-16.35	-0.01	46	117	-1.38	0.01
Colombia	21	24	-21.33	1.52	1 049	1 297	10.18	1.78	0	0	..	..
Mexico	5 891	8 537	-2.33	2.42	801	947	-15.95	-0.68	1	0	45.40	..
Paraguay	31	38	-1.00	1.90	0	0	..	..	2	1	-1.57	-6.48
EUROPE	136 110	141 016	-0.39	0.47	1 347	1 619	-0.36	2.85	19 569	21 066	4.73	1.48
European Union	92 281	96 523	-0.17	0.35	801	830	2.57	4.04	10 327	10 498	8.20	1.54
Russia	26 792	25 919	0.62	0.38	58	163	-11.28	9.66	4 147	4 780	6.26	0.87
Ukraine	10 506	11 517	-2.90	1.32	17	15	-2.28	-0.06	5 012	5 669	0.17	1.86
AFRICA	52 403	67 447	0.61	2.37	4 248	4 873	7.84	1.64	2 643	1 805	10.05	-0.99
Egypt	899	902	-1.91	1.82	71	14	7.77	-22.65	0	0	..	..
Ethiopia	12 812	17 905	6.43	3.65	10	0	-15.18	..	1 500	1 005	24.43	8.01
Nigeria	8 306	9 797	-6.15	1.52	20	18	0.00	-0.23	100	122	-3.11	0.56
South Africa	504	541	-0.18	1.42	181	200	7.31	-1.44	21	26	-7.27	1.23
ASIA	47 351	52 472	0.08	1.33	31 083	37 038	9.60	2.17	1 384	2 611	3.29	4.18
China[1]	8 573	7 380	-1.46	1.01	13 289	14 564	34.52	2.82	72	92	-11.20	2.12
India	17 584	20 089	-1.76	1.26	8	4	8.77	-1.11	467	1 378	7.17	8.24
Indonesia	0	0	..	..	90	92	5.55	0.69	0	0	..	..
Iran	3 087	3 471	4.89	1.23	1 854	3 521	9.05	2.62	0	0	..	..
Japan	218	211	0.07	-0.42	2 017	1 738	-5.83	-1.62	0	0	..	..
Kazakhstan	3 530	4 093	6.43	1.36	10	10	-12.22	0.00	829	1 122	9.97	0.89
Korea	92	123	-5.34	1.34	114	126	3.47	0.76	0	0	..	..
Malaysia	0	0	..	..	0	0	..	..	0	0	..	..
Pakistan	615	720	1.97	1.64	204	303	65.80	3.50	0	0	..	..
Philippines	0	0	..	..	37	50	1.17	2.90	0	0	..	..
Saudi Arabia	212	307	-0.45	1.85	9 676	12 216	3.72	2.18	0	0	..	..
Thailand	166	192	-0.16	1.44	24	19	0.00	-3.67	2	2	-0.19	0.72
Turkey	7 969	9 548	0.73	1.62	251	459	14.01	2.18	8	11	-14.85	-0.40
Viet Nam	2	2	3.44	1.66	70	81	5.61	1.36	0	0	..	..
OCEANIA	13 698	13 574	1.40	0.78	106	134	6.34	2.13	8 034	7 718	4.96	2.46
Australia	13 297	13 241	1.47	0.81	0	0	..	..	8 034	7 718	4.96	2.46
New Zealand	397	328	-1.03	-0.47	20	26	49.07	0.52	0	0	-2.85	0.00
DEVELOPED COUNTRIES	**186 007**	**190 115**	**-0.05**	**0.47**	**6 261**	**6 318**	**-2.12**	**0.27**	**39 485**	**40 925**	**4.72**	**1.35**
DEVELOPING COUNTRIES	**111 413**	**136 771**	**0.18**	**2.08**	**35 191**	**42 340**	**9.06**	**2.24**	**6 276**	**8 187**	**3.45**	**5.53**
LEAST DEVELOPED COUNTRIES (LDC)	19 680	25 195	1.59	2.12	365	495	1.78	3.01	801	463	1.10	-7.28
OECD[2]	**151 171**	**158 227**	**-0.09**	**0.53**	**7 063**	**7 307**	**-4.57**	**0.14**	**29 448**	**29 337**	**5.41**	**1.34**
BRICS	**56 223**	**57 350**	**-0.53**	**0.83**	**14 135**	**15 300**	**28.88**	**2.63**	**4 726**	**6 294**	**5.59**	**2.11**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.15.2. Other coarse grain projections: Consumption, feed, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		FEED (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**294 307**	**325 909**	**0.21**	**1.14**	**164 872**	**182 370**	**0.05**	**0.97**	**10.3**	**11.0**	**-0.09**	**0.70**
NORTH AMERICA	20 189	18 422	-2.08	-0.05	10 787	10 273	-4.63	-0.21	3.6	3.1	0.18	-0.92
Canada	7 709	7 751	-2.37	-0.17	6 774	6 960	-2.81	-0.15	9.6	6.4	2.85	-1.74
United States	12 480	10 671	-1.91	0.03	4 013	3 312	-7.18	-0.32	2.9	2.7	-0.73	-0.70
LATIN AMERICA	18 263	22 902	0.12	1.55	13 104	16 872	-1.16	1.86	4.0	4.2	-0.03	0.00
Argentina	4 441	5 214	9.64	0.96	2 822	3 153	8.68	1.01	16.4	18.5	1.34	-0.21
Brazil	3 449	3 764	3.37	1.13	2 171	2 349	2.62	1.75	2.8	2.6	0.29	0.14
Chile	700	831	-4.89	1.70	461	571	-7.27	2.03	3.6	4.2	2.13	1.00
Colombia	1 073	1 321	7.31	1.77	720	925	11.54	2.30	1.5	1.4	-0.98	-0.59
Mexico	6 692	9 480	-4.23	2.06	5 975	8 612	-4.72	2.12	5.6	6.0	-0.15	0.38
Paraguay	29	37	-0.96	2.18	22	27	-2.68	2.01	0.0	0.0	..	..
EUROPE	117 867	121 425	-1.17	0.39	87 388	87 301	-0.78	0.09	11.2	10.9	-0.96	-0.04
European Union	83 942	86 895	-0.65	0.38	63 620	62 588	-0.48	-0.10	9.4	9.7	0.09	0.28
Russia	21 722	21 170	-1.31	0.01	15 039	14 932	-0.32	0.10	13.7	11.8	-2.71	-0.56
Ukraine	5 540	5 820	-5.50	1.20	3 691	3 965	-5.02	1.65	17.8	16.3	-2.66	-0.49
AFRICA	54 410	70 326	0.83	2.41	7 281	8 882	-4.29	2.32	32.6	33.8	0.09	0.29
Egypt	970	915	-1.43	-0.28	615	533	-2.38	-0.96	3.1	2.7	-1.56	-1.11
Ethiopia	11 308	16 827	5.52	3.40	600	1 033	10.31	5.96	91.6	109.7	2.48	1.25
Nigeria	8 308	9 678	-7.20	1.59	598	480	-23.69	2.21	39.0	35.2	-1.78	-0.90
South Africa	670	714	2.18	0.42	35	42	-5.41	2.30	4.0	3.6	-1.85	-1.01
ASIA	77 505	86 846	2.99	1.60	42 319	54 868	5.78	2.55	5.5	5.2	-1.55	-0.22
China[1]	21 658	21 907	10.47	2.18	9 879	14 853	32.35	4.81	3.4	3.1	0.71	-0.67
India	17 603	18 712	-1.79	0.89	503	718	4.07	3.89	12.3	11.5	-2.62	-0.27
Indonesia	90	92	5.55	0.69	0	0	..	..	0.3	0.3	4.25	-0.21
Iran	4 907	6 981	5.49	1.88	4 730	6 768	5.74	1.88	0.3	0.3	-1.44	-0.64
Japan	2 227	1 961	-4.81	-1.48	1 625	1 381	-6.59	-1.54	3.6	3.8	0.73	0.49
Kazakhstan	2 508	2 964	3.95	1.76	1 632	1 943	3.79	2.01	2.6	2.3	-1.48	-1.04
Korea	206	248	-1.39	1.05	59	60	-1.42	-0.19	2.9	3.6	-1.76	1.19
Malaysia	0	0	..	..	0	0	..	..	0.0	0.0	..	..
Pakistan	819	1 023	5.66	2.15	195	266	0.00	2.79	3.0	3.0	6.72	0.28
Philippines	37	50	1.07	2.90	29	39	2.04	2.84	0.0	0.0	..	..
Saudi Arabia	10 154	12 476	4.11	2.10	9 958	12 271	4.21	2.13	2.8	2.5	-2.70	-1.00
Thailand	188	209	-0.14	0.85	52	65	-0.44	2.03	1.4	1.4	-0.74	-0.17
Turkey	8 211	9 984	0.76	1.72	7 125	8 859	0.85	1.90	3.7	3.4	-1.21	-0.69
Viet Nam	72	83	5.48	1.37	0	0	..	..	0.0	0.0	..	..
OCEANIA	6 073	5 988	-0.51	-1.22	3 994	4 175	-0.73	-1.53	7.5	7.0	-2.81	-0.29
Australia	5 557	5 523	-0.66	-1.33	3 631	3 807	-0.92	-1.64	9.0	8.0	-4.43	-0.74
New Zealand	428	354	-0.01	-0.40	344	346	0.64	-0.41	1.7	1.6	-1.06	-0.80
DEVELOPED COUNTRIES	**152 731**	**155 264**	**-1.11**	**0.29**	**108 289**	**108 518**	**-1.11**	**0.05**	**7.6**	**7.1**	**-1.01**	**-0.34**
DEVELOPING COUNTRIES	**141 576**	**170 645**	**1.81**	**1.97**	**56 583**	**73 852**	**2.55**	**2.51**	**11.0**	**11.8**	**0.02**	**0.79**
LEAST DEVELOPED COUNTRIES (LDC)	19 529	25 200	2.53	2.42	922	1 149	4.66	2.57	18.6	19.8	0.26	0.54
OECD[2]	**130 283**	**136 150**	**-1.10**	**0.43**	**95 441**	**98 614**	**-1.41**	**0.18**	**6.2**	**6.2**	**-0.24**	**-0.01**
BRICS	**65 102**	**66 268**	**1.68**	**1.00**	**27 627**	**32 895**	**5.45**	**2.18**	**7.6**	**7.2**	**-1.78**	**-0.20**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.16.1. Rice projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**498 327**	**562 323**	**1.15**	**1.08**	**44 911**	**56 471**	**5.33**	**2.13**	**45 161**	**54 428**	**5.81**	**2.22**
NORTH AMERICA	6 266	7 297	-1.04	0.75	1 137	1 272	2.40	1.12	3 425	3 914	0.22	1.38
Canada	0	0	..	..	369	446	0.02	1.98	0	0	..	..
United States	6 266	7 297	-1.04	0.75	767	826	3.70	0.69	3 425	3 914	0.22	1.38
LATIN AMERICA	18 507	21 004	0.47	1.26	4 142	4 466	2.65	0.45	3 228	3 789	4.14	0.82
Argentina	979	1 289	1.13	3.21	8	8	-0.62	0.00	434	681	-2.00	4.74
Brazil	8 019	8 236	-0.62	0.65	630	664	1.93	-1.17	806	872	3.94	-0.06
Chile	104	99	3.30	1.44	142	153	2.00	0.53	2	3	25.61	-0.21
Colombia	1 731	2 237	1.32	1.13	217	0	27.47	-70.24	1	2	15.34	9.89
Mexico	164	145	0.90	-0.70	710	1 044	-2.39	2.21	29	84	2.94	0.00
Paraguay	618	801	22.41	1.45	1	2	6.61	0.23	488	667	25.07	1.63
EUROPE	2 911	2 967	2.59	0.73	1 764	1 874	3.61	0.80	419	475	7.67	1.10
European Union	1 795	1 717	0.37	0.03	1 244	1 339	4.62	1.11	256	251	8.29	0.37
Russia	1 057	1 179	8.82	1.83	216	210	1.35	-0.15	154	212	7.40	2.10
Ukraine	43	52	-10.15	1.13	70	85	1.76	0.98	1	2	-10.25	-0.55
AFRICA	19 846	25 963	3.14	2.33	15 227	24 826	6.14	4.46	598	384	0.44	-3.41
Egypt	4 273	5 015	0.99	1.49	73	34	4.46	1.71	271	144	-3.16	-4.71
Ethiopia	96	128	8.02	2.52	283	538	30.78	5.06	0	0	..	..
Nigeria	3 010	3 813	4.52	1.05	2 490	4 564	3.53	5.69	0	0	..	..
South Africa	2	2	0.00	1.34	853	946	3.57	0.64	0	0	..	..
ASIA	450 342	504 335	1.11	1.02	22 118	23 464	5.82	0.60	37 216	45 310	6.73	2.50
China[1]	142 448	144 540	0.95	0.27	6 133	5 159	45.28	0.37	768	955	1.54	2.71
India	108 005	128 276	1.72	1.57	1	1	28.22	0.41	10 838	12 100	22.54	2.70
Indonesia	45 984	53 682	2.06	1.28	983	415	6.69	1.78	1	1	-0.18	-0.33
Iran	1 789	2 106	3.74	1.47	1 400	1 804	1.12	2.28	1	1	-4.63	-0.17
Japan	7 640	7 610	-0.31	0.10	780	784	-0.10	0.10	96	109	-7.84	1.38
Kazakhstan	300	385	5.73	1.04	22	16	9.51	0.49	70	98	19.10	-0.49
Korea	4 165	3 678	-1.68	-1.10	402	461	4.14	0.70	7	10	1.56	0.00
Malaysia	1 786	2 135	1.91	1.16	908	1 109	-2.30	2.10	41	4	69.78	-0.90
Pakistan	7 022	8 475	1.75	1.37	10	8	-11.60	-0.01	4 022	4 597	2.28	0.97
Philippines	12 086	14 807	1.83	1.42	1 307	1 581	-4.58	2.86	1	1	7.15	-0.20
Saudi Arabia	0	0	..	..	1 350	1 766	0.80	2.51	0	0	..	..
Thailand	20 670	27 489	-0.88	1.84	247	284	-6.08	1.81	10 490	12 869	3.04	3.44
Turkey	548	630	1.93	1.47	259	274	1.55	-1.06	48	43	1.47	1.07
Viet Nam	28 405	32 585	1.47	1.31	537	686	-1.59	2.66	6 968	8 924	2.39	2.57
OCEANIA	455	757	18.58	2.99	523	569	0.07	0.73	275	555	18.55	2.57
Australia	446	747	20.27	3.01	158	152	-4.62	0.13	275	555	18.75	2.58
New Zealand	0	0	..	..	47	57	2.30	1.59	0	0	..	..
DEVELOPED COUNTRIES	**17 875**	**19 417**	**0.19**	**0.60**	**5 186**	**5 627**	**2.30**	**0.78**	**4 285**	**5 151**	**1.18**	**1.43**
DEVELOPING COUNTRIES	**480 451**	**542 906**	**1.19**	**1.10**	**39 725**	**50 844**	**5.78**	**2.29**	**40 877**	**49 277**	**6.40**	**2.30**
LEAST DEVELOPED COUNTRIES (LDC)	74 730	85 983	0.95	1.34	9 762	16 259	8.91	3.18	4 111	5 771	10.97	1.17
OECD[2]	**21 129**	**21 923**	**-0.52**	**0.21**	**5 160**	**5 881**	**1.45**	**1.00**	**4 139**	**4 972**	**0.97**	**1.41**
BRICS	**259 531**	**282 233**	**1.23**	**0.86**	**7 833**	**6 981**	**22.02**	**0.23**	**12 567**	**14 139**	**17.80**	**2.50**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.16.2. Rice projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**497 793**	**563 981**	**1.47**	**1.07**	**54.1**	**55.2**	**0.02**	**0.16**
NORTH AMERICA	4 186	4 648	-0.21	0.76	11.7	12.0	-0.97	0.05
Canada	369	446	0.02	1.98	10.2	11.2	-0.99	1.15
United States	3 817	4 202	-0.24	0.64	11.8	12.1	-0.97	-0.06
LATIN AMERICA	19 403	21 659	0.58	1.18	28.5	28.8	-0.64	0.27
Argentina	534	618	4.54	1.69	10.3	11.5	3.74	1.01
Brazil	7 976	8 026	-0.34	0.52	38.4	36.1	-1.24	-0.08
Chile	233	249	2.14	0.83	12.5	12.3	1.03	0.16
Colombia	1 791	2 238	1.68	1.25	33.4	35.6	0.16	0.01
Mexico	828	1 101	-1.96	1.97	6.5	7.7	-3.34	0.90
Paraguay	133	136	16.63	0.75	7.2	6.8	3.18	-0.94
EUROPE	4 084	4 362	2.04	0.64	5.5	5.9	1.94	0.66
European Union	2 716	2 807	1.23	0.45	5.3	5.5	1.06	0.39
Russia	1 003	1 171	5.51	1.22	7.0	8.3	5.43	1.39
Ukraine	117	135	-3.40	1.09	2.6	3.1	-2.76	1.62
AFRICA	34 658	50 189	4.61	3.39	25.0	28.5	2.16	1.22
Egypt	4 034	4 891	1.32	1.76	38.2	38.6	-0.27	0.19
Ethiopia	392	662	21.50	4.50	3.6	4.8	19.35	2.34
Nigeria	5 660	8 350	4.18	3.41	26.5	30.6	1.33	1.19
South Africa	895	948	3.52	0.64	15.7	14.9	2.15	-0.38
ASIA	434 799	482 352	1.30	0.86	77.5	79.1	-0.06	0.15
China[1]	142 413	149 651	1.42	0.26	77.1	77.6	0.07	0.06
India	98 051	115 742	1.20	1.47	68.6	72.8	-0.03	0.44
Indonesia	46 833	53 983	2.35	1.29	134.8	139.2	0.07	0.25
Iran	3 155	3 896	1.90	1.82	35.2	40.5	0.46	1.18
Japan	8 637	8 070	0.31	-0.64	54.0	51.1	-1.13	-0.49
Kazakhstan	236	301	3.12	1.84	11.7	13.6	1.39	1.00
Korea	4 704	4 112	-0.34	-0.94	62.5	55.3	-2.35	-1.12
Malaysia	2 700	3 236	0.77	1.51	81.0	85.1	-0.33	0.28
Pakistan	3 000	3 870	0.98	1.86	12.4	13.2	-0.87	0.22
Philippines	13 364	16 334	1.04	1.60	114.6	117.3	-0.24	0.15
Saudi Arabia	1 390	1 762	2.46	2.47	42.3	45.4	-0.21	1.04
Thailand	13 827	14 865	1.55	0.63	99.4	99.6	-0.10	0.03
Turkey	788	861	2.21	0.65	9.2	9.2	0.49	0.01
Viet Nam	21 991	24 326	1.34	0.94	154.6	157.6	-0.94	0.18
OCEANIA	663	771	2.36	1.04	16.7	16.9	0.79	-0.21
Australia	293	344	2.01	1.14	12.2	12.6	0.50	0.01
New Zealand	47	57	2.30	1.59	10.2	11.3	1.21	0.78
DEVELOPED COUNTRIES	**19 123**	**19 664**	**0.85**	**0.20**	**12.3**	**12.2**	**-0.17**	**-0.08**
DEVELOPING COUNTRIES	**478 670**	**544 317**	**1.49**	**1.11**	**63.8**	**64.3**	**-0.12**	**0.05**
LEAST DEVELOPED COUNTRIES (LDC)	80 524	96 239	1.48	1.64	79.5	76.5	0.15	-0.36
OECD[2]	**22 722**	**22 590**	**0.22**	**-0.05**	**14.7**	**14.1**	**-1.16**	**-0.38**
BRICS	**250 338**	**275 537**	**1.30**	**0.76**	**66.6**	**68.6**	**0.01**	**0.24**

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.17. Main policy assumptions for cereal markets

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ARGENTINA												
Crops export tax	%	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rice export tax	%	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CANADA												
Tariff-quotas[1]												
Wheat	kt	350.0	350.0	350.0	350.0	350.0	350.0	350.0	350.0	350.0	350.0	350.0
In-quota tariff	%	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Out-of-quota tariff	%	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7
Barley	kt	399.0	399.0	399.0	399.0	399.0	399.0	399.0	399.0	399.0	399.0	399.0
In-quota tariff	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Out-of-quota tariff	%	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0
EUROPEAN UNION[2]												
Voluntary coupled support												
Wheat[3]	mln EUR	88.9	90.0	89.3	89.7	89.7	89.7	89.7	89.7	89.7	89.7	89.7
Rice[4]	mln EUR	56.4	55.9	55.7	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6
Cereal reference price[5]	EUR/t	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3
Direct payments ceilings[6]	bln EUR	41.5	41.6	41.6	42.2	42.3	42.3	42.3	42.3	42.3	42.3	42.3
Rice reference price[7]	EUR/t	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0
Wheat tariff-quota[1]	kt	4 452.4	4 513.2	4 523.2	4 523.2	4 523.2	4 523.2	4 523.2	4 523.2	4 523.2	4 523.2	4 523.2
Coarse grain tariff-quota[1]	kt	72.8	78.3	69.0	66.4	61.5	53.1	49.4	44.6	39.9	35.3	29.6
JAPAN												
Wheat tariff-quota	kt	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0	5 740.0
In-quota tariff	'000 JPY/t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	'000 JPY/t	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Barley tariff-quota	kt	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0	1 369.0
In-quota tariff	'000 JPY/t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	'000 JPY/t	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Rice tariff-quota	kt	682.2	682.2	682.2	682.2	682.2	682.2	682.2	682.2	682.2	682.2	682.2
In-quota tariff	'000 JPY/t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	'000 JPY/t	341.0	341.0	341.0	341.0	341.0	341.0	341.0	341.0	341.0	341.0	341.0
KOREA												
Wheat tariff	%	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Maize tariff-quota	kt	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0	6 102.0
In-quota tariff	%	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Out-of-quota tariff	%	304.7	304.7	304.7	304.7	304.7	304.7	304.7	304.7	304.7	304.7	304.7
Barley tariff-quota	kt	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
In-quota tariff	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Out-of-quota tariff	%	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4
Rice quota[8]	kt	408.7	408.7	408.7	408.7	408.7	408.7	408.7	408.7	408.7	408.7	408.7
In-quota tariff	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MERCOSUR												
Wheat tariff	%	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Coarse grain tariff[9]	%	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Rice tariff	%	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
MEXICO												
Barley import tariff	%	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNITED STATES												
ARC participation rate												
Wheat	%	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6
Coarse grains	%	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1
Wheat loan rate	USD/t	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0
Maize loan rate	USD/t	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8
CHINA												
Wheat tariff-quota	kt	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636
In-quota tariff	%	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Out-of-quota tariff	%	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Coarse grains tariff	%	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Maize tariff-quota	kt	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200
In-quota tariff	%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Out-of-quota tariff	%	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Rice tariff-quota	kt	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320
In-quota tariff	%	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Out-of-quota tariff	%	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7

Table A.17. Main policy assumptions for cereal markets *(cont.)*

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INDIA												
Minimum support price												
Rice	INR/t	14 988	16 361	16 990	17 651	18 341	19 059	19 806	20 585	21 388	22 225	23 095
Wheat	INR/t	15 714	17 375	18 059	18 582	19 103	19 650	20 209	20 828	21 411	22 031	22 673
Wheat tariff	%	50.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Rice tariff	%	70.1	70.1	70.1	70.1	70.1	70.1	70.1	70.1	70.1	70.1	70.1
RUSSIA												
Wheat ad valorem import tax	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Rice tariff equivalent of import barriers	%	11.7	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Coarse grains tariff equivalent of import barriers	%	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coarse grain specific tariff	RUB/t	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coarse grain ad valorem import tax	%	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.
The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. Year beginning 1 July.
2. Since 2015 the Basic payment scheme (BPS) holds, which shall account for 68% maximum of the national direct payment envelopes. On top of this, compulsory policy instruments have been introduced: the Green Payment (30%) and young farmer scheme (2%).
3. Mainly for durum wheat. Implemented in 6 Member States.
4. Implemented in 6 Member States.
5. Buying-in at the fixed reference price is operable automatically only for common wheat up to a maximum quantity of 3 million tons per marketing year. Above that ceiling and for durum wheat, maize and barley intervention can take place only via tender.
6. Estimated net amounts for all direct payments based on Annex II of EU Regulation No 1307/2013, accounting for the transfers between direct aids and rural development envelopes.
7. Intervention is set at zero tonnes per marketing year. However, the Commission may initiate intervention if market requires.
8. Milled rice basis.
9. Applied by Brazil only.

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

Table A.18.1. Soybean projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**337 111**	**406 773**	**4.85**	**1.48**	**144 160**	**174 935**	**7.75**	**1.29**	**146 781**	**174 935**	**7.70**	**1.29**
NORTH AMERICA	121 337	140 613	4.50	1.23	1 022	928	6.04	-0.07	60 417	71 015	6.08	0.89
Canada	6 902	9 523	9.25	1.42	350	250	0.63	-0.02	4 647	6 917	11.27	1.60
United States	114 434	131 090	4.26	1.22	671	678	9.44	-0.09	55 770	64 098	5.73	0.81
LATIN AMERICA	179 002	215 968	5.75	1.57	6 995	7 999	3.75	0.91	82 534	98 522	8.72	1.52
Argentina	56 739	66 379	2.56	1.97	0	0	..	..	13 665	14 379	1.76	2.89
Brazil	105 937	128 878	7.36	1.31	410	410	24.54	0.00	60 089	73 202	11.63	1.26
Chile	0	0	..	..	383	439	9.71	0.75	2	2	0.00	-0.75
Colombia	70	88	0.70	2.00	850	1 251	9.78	2.70	40	15	-13.65	-2.63
Mexico	399	529	14.34	1.50	3 993	4 692	1.83	1.39	0	0	..	..
Paraguay	9 800	12 338	8.32	1.70	0	0	..	..	5 717	7 139	5.47	1.53
EUROPE	10 355	13 225	16.57	1.66	16 607	16 260	2.17	0.16	3 335	4 933	31.42	2.88
European Union	2 520	2 923	14.86	1.33	14 058	13 960	0.96	0.45	138	71	12.44	0.16
Russia	3 367	4 822	19.25	1.96	2 087	1 823	15.81	-1.88	589	1 179	120.30	5.23
Ukraine	4 003	5 014	19.74	1.73	3	4	17.83	0.11	2 601	3 676	29.63	2.28
AFRICA	2 273	2 936	5.53	2.69	3 643	5 283	6.14	1.64	43	52	-13.03	-0.31
Egypt	40	47	3.93	1.56	1 767	2 385	1.82	1.38	0	0	..	..
Ethiopia	70	91	23.48	2.66	25	51	37.91	7.18	0	0	..	..
Nigeria	630	746	-0.69	1.72	0	0	..	..	1	1	-35.89	-4.80
South Africa	1 051	1 472	13.44	3.60	170	350	59.01	3.14	14	24	-18.70	-0.63
ASIA	24 095	33 954	-1.29	1.86	115 892	144 454	9.18	1.44	448	394	0.53	-0.22
China[1]	13 019	19 052	-2.06	1.83	90 742	112 817	9.68	1.52	183	200	-6.46	0.00
India	8 700	11 954	-0.57	2.04	70	60	76.95	-0.86	85	48	8.13	1.62
Indonesia	751	1 023	-1.93	1.39	2 341	2 402	5.66	0.56	2	2	-45.34	-0.05
Iran	178	200	-1.79	1.15	1 946	2 346	15.36	1.02	80	63	71.21	-1.01
Japan	242	272	0.09	1.01	3 226	3 015	-1.05	-0.72	0	0	..	..
Kazakhstan	220	261	11.95	1.35	10	7	-19.92	0.43	0	0	..	..
Korea	96	116	-3.35	0.51	1 327	1 347	1.35	0.38	0	0	..	..
Malaysia	0	0	..	..	807	1 133	5.76	1.26	30	24	10.62	-1.24
Pakistan	4	4	-9.63	1.02	1 533	2 546	30.85	2.36	0	0	..	..
Philippines	1	1	0.00	2.16	130	1 022	11.67	6.97	0	0	..	..
Saudi Arabia	0	0	..	..	600	844	26.58	1.09	0	0	..	..
Thailand	56	67	-14.58	1.68	2 802	3 561	6.97	0.96	13	17	-2.38	-0.95
Turkey	153	192	17.78	2.01	2 450	3 185	9.50	1.87	19	8	-21.08	-1.84
Viet Nam	148	173	-7.63	1.35	1 684	2 005	36.08	1.42	1	1	-2.37	-0.18
OCEANIA	49	77	-2.65	3.29	2	12	-0.46	12.87	5	20	8.66	11.94
Australia	49	77	-2.65	3.29	1	11	-0.84	15.31	5	20	8.66	11.94
New Zealand	0	0	..	..	1	1	0.00	0.00	0	0	..	..
DEVELOPED COUNTRIES	**133 257**	**155 924**	**5.16**	**1.29**	**21 800**	**21 307**	**1.87**	**0.08**	**63 770**	**75 991**	**6.64**	**1.01**
DEVELOPING COUNTRIES	**203 854**	**250 849**	**4.64**	**1.61**	**122 360**	**153 628**	**9.15**	**1.47**	**83 011**	**98 944**	**8.63**	**1.52**
LEAST DEVELOPED COUNTRIES (LDC)	559	680	0.43	1.98	1 339	2 427	39.67	2.40	13	10	1.80	-1.88
OECD[2]	**124 801**	**144 727**	**4.65**	**1.24**	**27 568**	**28 662**	**1.70**	**0.59**	**60 580**	**71 116**	**6.10**	**0.89**
BRICS	**132 073**	**166 178**	**5.63**	**1.46**	**93 478**	**115 460**	**9.87**	**1.45**	**60 961**	**74 652**	**11.59**	**1.31**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.18.2. Soybean projections: Consumption, domestic crush

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		DOMESTIC CRUSH (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**332 778**	**406 445**	**4.89**	**1.46**	**297 540**	**367 771**	**4.96**	**1.54**
NORTH AMERICA	59 430	70 516	2.35	1.42	53 924	64 643	1.93	1.54
Canada	2 625	2 856	5.42	0.86	1 896	2 129	5.12	1.17
United States	56 805	67 660	2.23	1.44	52 028	62 514	1.83	1.55
LATIN AMERICA	103 702	125 409	3.70	1.56	95 721	115 904	3.73	1.56
Argentina	43 690	51 996	3.78	1.74	42 686	50 926	3.87	1.77
Brazil	45 924	56 084	2.81	1.37	40 823	49 963	2.80	1.34
Chile	383	437	9.65	0.76	383	437	9.66	0.76
Colombia	890	1 322	8.75	2.80	886	1 322	8.84	2.80
Mexico	4 223	5 221	2.05	1.31	3 988	4 973	2.13	1.35
Paraguay	4 150	5 175	12.88	1.99	3 974	4 915	13.00	1.99
EUROPE	23 675	24 558	4.62	0.41	21 044	22 344	4.60	0.49
European Union	16 520	16 816	2.35	0.57	14 425	15 125	1.94	0.68
Russia	4 815	5 469	16.06	0.01	4 726	5 390	15.85	0.02
Ukraine	1 421	1 341	11.65	0.40	1 280	1 200	14.22	0.37
AFRICA	5 793	8 157	6.30	2.04	5 092	7 190	6.80	1.91
Egypt	1 797	2 430	2.06	1.39	1 791	2 420	2.03	1.39
Ethiopia	94	142	25.77	4.08	59	94	27.54	4.62
Nigeria	634	745	-0.02	1.73	317	298	0.07	-0.44
South Africa	1 153	1 793	18.22	3.58	1 055	1 653	18.46	3.74
ASIA	140 131	177 735	7.20	1.53	121 718	157 627	7.79	1.67
China[1]	104 144	131 419	8.39	1.57	89 764	115 839	9.15	1.74
India	8 818	11 961	-0.63	2.03	7 213	9 847	-1.94	2.00
Indonesia	3 127	3 422	3.69	0.80	2 420	2 709	5.39	0.98
Iran	2 021	2 481	11.59	1.10	2 014	2 473	11.90	1.10
Japan	3 443	3 290	-1.28	-0.60	2 678	2 541	-1.14	-0.73
Kazakhstan	233	268	9.83	1.39	122	131	5.31	0.70
Korea	1 414	1 463	0.87	0.39	1 004	1 036	1.61	0.49
Malaysia	777	1 108	5.40	1.40	777	1 108	5.40	1.40
Pakistan	1 497	2 546	29.94	2.40	1 497	2 546	30.03	2.40
Philippines	134	1 023	12.48	6.96	130	1 022	12.12	6.97
Saudi Arabia	598	844	26.47	1.10	598	844	26.47	1.10
Thailand	2 842	3 609	5.76	1.01	2 820	3 609	6.30	1.01
Turkey	2 651	3 365	9.22	1.92	2 550	3 262	9.45	1.95
Viet Nam	1 805	2 172	21.17	1.42	1 732	2 097	27.34	1.48
OCEANIA	47	70	-3.05	2.70	41	64	-3.37	3.00
Australia	46	69	-3.10	2.75	41	64	-3.37	3.00
New Zealand	1	1	0.00	0.00	0	0	..	..
DEVELOPED COUNTRIES	**88 725**	**101 232**	**2.87**	**1.12**	**79 603**	**92 111**	**2.58**	**1.23**
DEVELOPING COUNTRIES	**244 053**	**305 213**	**5.72**	**1.57**	**217 936**	**275 660**	**5.97**	**1.64**
LEAST DEVELOPED COUNTRIES (LDC)	1 864	3 095	15.98	2.36	1 601	2 756	22.08	2.24
OECD[2]	**89 199**	**102 265**	**2.31**	**1.18**	**80 062**	**93 150**	**2.02**	**1.30**
BRICS	**164 854**	**206 726**	**6.16**	**1.51**	**143 581**	**182 693**	**6.46**	**1.60**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.19.1. Other oilseed projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**146 793**	**172 994**	**3.10**	**1.55**	**20 134**	**23 758**	**4.33**	**1.15**	**20 150**	**23 758**	**4.57**	**1.15**
NORTH AMERICA	24 322	26 787	5.63	0.67	949	1 163	0.00	0.36	11 669	13 182	5.07	0.64
Canada	19 824	22 000	6.24	0.69	246	251	-1.74	0.10	10 975	12 143	5.26	0.74
United States	4 498	4 787	3.31	0.58	703	912	0.73	0.44	694	1 039	2.44	-0.41
LATIN AMERICA	5 871	7 723	1.97	1.93	1 703	2 075	1.66	1.83	1 075	1 187	7.30	1.65
Argentina	4 356	5 906	2.58	2.04	1	1	-8.96	0.00	884	936	11.94	1.64
Brazil	433	553	2.98	2.12	5	5	-9.50	0.00	68	62	8.24	0.31
Chile	88	105	0.87	1.53	14	9	-5.87	-3.22	3	4	-1.24	2.05
Colombia	2	3	0.00	1.92	7	7	0.00	-0.02	0	0	..	..
Mexico	112	115	4.16	0.51	1 651	2 037	1.94	1.91	3	3	12.70	0.00
Paraguay	255	308	-0.59	1.46	0	0	..	..	32	55	-11.10	3.49
EUROPE	58 624	70 276	3.65	1.94	5 765	4 750	4.19	-0.65	2 946	4 590	-1.55	3.59
European Union	29 770	30 390	1.58	0.34	5 472	4 470	4.03	-0.73	660	666	1.09	-1.31
Russia	11 825	13 922	6.64	2.22	194	169	7.71	0.69	236	141	3.80	-0.68
Ukraine	15 233	23 642	6.46	4.31	31	33	11.07	-0.16	1 537	2 960	-4.62	5.66
AFRICA	8 185	9 946	1.87	1.75	373	402	6.49	0.16	158	176	-5.10	-2.96
Egypt	152	185	-0.50	1.83	71	88	9.58	1.57	8	5	-9.65	-1.40
Ethiopia	26	32	0.00	2.34	0	0	..	..	0	0	..	..
Nigeria	2 120	2 701	0.47	2.07	0	0	..	..	42	62	-11.84	-4.93
South Africa	940	1 078	1.17	1.20	57	19	5.73	-6.87	4	0	-31.90	..
ASIA	46 509	54 369	1.52	1.50	11 320	15 342	5.21	1.77	1 938	1 701	11.22	0.31
China[1]	29 178	32 280	2.19	1.03	4 618	8 036	10.80	3.47	631	627	2.85	-0.13
India	10 726	13 974	-0.74	2.56	262	270	6.25	-4.94	532	300	13.00	2.59
Indonesia	647	745	-1.97	1.15	256	246	3.96	-0.74	1	1	-2.74	0.06
Iran	252	242	-1.33	-0.47	209	410	52.26	2.66	1	1	0.00	-0.24
Japan	23	26	1.60	0.92	2 508	2 516	0.85	0.06	0	0	..	..
Kazakhstan	827	1 138	11.97	2.43	7	7	-11.62	0.06	293	281	35.05	-0.05
Korea	13	13	2.60	0.00	31	31	-0.80	0.08	0	0	..	..
Malaysia	5	6	3.32	1.30	44	46	2.40	0.69	3	3	2.12	-0.68
Pakistan	852	967	0.01	1.54	1 174	1 287	6.79	1.37	2	5	-30.09	-0.12
Philippines	20	23	0.55	1.26	61	69	2.56	1.22	0	0	..	..
Saudi Arabia	3	3	0.00	-0.22	4	4	0.00	0.91	0	0	..	..
Thailand	90	107	-0.27	1.47	53	44	5.58	-2.34	4	4	11.45	1.71
Turkey	1 753	2 302	8.40	1.75	720	764	-0.97	-1.57	50	55	9.56	0.88
Viet Nam	335	382	-0.66	1.37	26	29	123.61	0.22	40	43	4.98	-0.22
OCEANIA	3 281	3 892	5.86	0.64	25	25	-0.54	0.00	2 363	2 921	9.21	0.70
Australia	3 269	3 879	5.89	0.64	21	20	1.04	0.00	2 363	2 921	9.21	0.70
New Zealand	10	10	0.00	0.00	4	4	-5.19	0.00	0	0	..	..
DEVELOPED COUNTRIES	**88 203**	**103 424**	**4.26**	**1.54**	**9 565**	**8 764**	**2.90**	**-0.30**	**17 305**	**21 007**	**4.13**	**1.21**
DEVELOPING COUNTRIES	**58 590**	**69 570**	**1.52**	**1.58**	**10 569**	**14 994**	**5.67**	**2.09**	**2 845**	**2 750**	**7.68**	**0.67**
LEAST DEVELOPED COUNTRIES (LDC)	5 356	6 467	1.92	1.77	143	289	-4.65	6.28	85	91	6.83	-2.22
OECD[2]	**59 502**	**63 778**	**3.49**	**0.54**	**11 527**	**11 145**	**2.24**	**-0.05**	**14 764**	**16 854**	**5.39**	**0.57**
BRICS	**53 103**	**61 807**	**2.33**	**1.63**	**5 134**	**8 499**	**10.21**	**2.95**	**1 470**	**1 131**	**5.14**	**0.46**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.19.2. Other oilseed projections: Consumption, domestic crush

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		DOMESTIC CRUSH (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**147 068**	**172 955**	**3.20**	**1.54**	**124 603**	**148 768**	**3.41**	**1.64**
NORTH AMERICA	13 732	14 778	6.02	0.67	11 572	12 492	6.66	0.67
Canada	9 281	10 113	7.87	0.61	8 778	9 670	7.73	0.60
United States	4 451	4 664	3.03	0.80	2 794	2 821	4.09	0.89
LATIN AMERICA	6 499	8 610	0.90	1.95	6 025	8 026	0.80	1.97
Argentina	3 477	4 971	0.40	2.11	3 354	4 801	0.13	2.12
Brazil	370	495	2.00	2.45	307	409	1.46	2.36
Chile	99	109	-0.29	1.04	91	99	-0.40	0.98
Colombia	9	10	0.00	0.49	8	8	0.00	0.61
Mexico	1 758	2 149	2.05	1.83	1 638	2 028	2.39	1.93
Paraguay	223	253	3.97	1.15	186	207	4.16	0.93
EUROPE	61 408	70 429	4.20	1.62	56 245	64 832	4.39	1.69
European Union	34 442	34 195	2.10	0.16	31 819	31 556	2.16	0.16
Russia	11 863	13 950	6.82	2.25	11 242	13 113	7.47	2.21
Ukraine	13 720	20 707	9.10	4.13	12 477	19 353	9.21	4.41
AFRICA	8 430	10 170	2.32	1.79	4 621	5 374	2.98	1.33
Egypt	216	268	2.53	1.82	133	159	4.02	1.28
Ethiopia	26	32	0.00	2.34	17	23	0.00	2.90
Nigeria	2 083	2 638	0.88	2.28	729	904	0.88	1.94
South Africa	1 017	1 096	2.30	0.96	917	988	2.41	0.95
ASIA	56 057	67 972	2.07	1.60	45 264	57 116	2.10	1.81
China[1]	33 410	39 690	3.21	1.50	26 027	32 842	3.20	1.83
India	10 321	13 911	-0.90	2.34	8 975	12 276	-0.82	2.46
Indonesia	911	990	-0.55	0.65	302	385	2.87	1.38
Iran	458	651	6.77	1.41	431	624	7.45	1.45
Japan	2 531	2 542	0.70	0.07	2 505	2 522	0.74	0.09
Kazakhstan	549	861	5.49	3.44	424	682	4.98	3.82
Korea	44	44	-0.15	0.06	39	40	-0.07	0.06
Malaysia	46	50	2.51	0.84	45	48	2.44	0.78
Pakistan	2 057	2 248	3.88	1.44	1 882	2 032	4.04	1.34
Philippines	80	92	2.13	1.24	68	78	2.39	1.34
Saudi Arabia	7	7	0.00	0.47	5	5	0.00	0.45
Thailand	140	146	1.38	0.16	84	94	2.96	0.67
Turkey	2 434	3 009	4.87	0.86	2 232	2 761	4.51	0.79
Viet Nam	321	367	-0.37	1.50	203	226	0.33	1.21
OCEANIA	943	995	0.66	0.45	876	928	0.34	0.49
Australia	927	979	0.71	0.46	865	916	0.35	0.49
New Zealand	14	14	-2.23	0.00	11	11	0.00	0.00
DEVELOPED COUNTRIES	**80 590**	**91 179**	**4.31**	**1.40**	**72 895**	**82 854**	**4.51**	**1.47**
DEVELOPING COUNTRIES	**66 478**	**81 776**	**1.97**	**1.70**	**51 708**	**65 914**	**2.00**	**1.86**
LEAST DEVELOPED COUNTRIES (LDC)	5 420	6 665	1.69	2.00	3 101	3 756	2.24	1.77
OECD[2]	**56 265**	**58 078**	**2.96**	**0.39**	**50 928**	**52 546**	**3.03**	**0.38**
BRICS	**56 982**	**69 142**	**2.94**	**1.81**	**47 468**	**59 628**	**3.12**	**2.03**

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.20.1. Protein meal projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**326 717**	**400 370**	**4.24**	**1.56**	**85 224**	**101 994**	**3.29**	**1.54**	**87 419**	**101 994**	**3.66**	**1.54**
NORTH AMERICA	53 140	62 631	2.57	1.39	4 643	5 297	6.77	1.93	15 637	19 255	5.15	1.73
Canada	6 508	7 157	7.14	0.73	792	728	-4.69	-0.23	4 653	5 094	10.40	0.66
United States	46 633	55 474	2.06	1.47	3 851	4 569	11.46	2.32	10 985	14 161	3.56	2.16
LATIN AMERICA	80 105	97 724	3.68	1.61	9 318	11 943	3.72	2.38	51 698	60 833	4.12	1.67
Argentina	35 302	42 496	3.67	1.80	0	0	..	..	31 475	38 189	4.24	1.91
Brazil	33 353	41 300	3.02	1.42	5	5	-32.13	0.00	15 705	18 182	2.51	1.52
Chile	353	401	7.57	0.79	1 131	1 445	4.31	2.70	1	1	-27.58	-0.24
Colombia	844	1 226	6.84	2.73	1 335	1 827	11.26	2.73	113	69	7.40	-2.65
Mexico	4 333	5 292	2.47	1.45	2 175	2 821	5.13	2.63	20	20	4.41	0.00
Paraguay	3 213	3 938	12.37	1.96	2	2	-5.18	-0.05	2 559	2 928	17.05	1.91
EUROPE	44 046	48 468	3.98	1.10	27 961	27 038	-0.09	-0.79	7 534	9 598	7.62	3.39
European Union	29 210	29 586	2.02	0.35	26 198	24 919	-0.14	-0.90	1 063	871	4.40	-2.86
Russia	7 600	8 760	9.21	1.10	399	397	-4.22	-0.57	1 536	1 905	7.61	2.52
Ukraine	6 555	9 550	9.96	3.93	37	46	-10.78	-1.36	4 590	6 583	9.27	5.37
AFRICA	7 855	10 420	5.18	1.79	6 150	8 520	7.66	3.97	493	285	-0.81	-4.71
Egypt	1 519	2 078	1.46	1.53	1 751	2 384	17.04	5.14	5	5	12.37	-0.49
Ethiopia	99	129	13.42	2.53	0	0	..	..	0	0	..	..
Nigeria	922	1 047	1.41	1.28	353	526	32.88	2.31	179	132	6.22	-2.26
South Africa	1 269	1 783	10.96	2.93	933	1 075	-2.14	1.85	23	22	-16.55	-0.57
ASIA	140 525	179 636	5.33	1.69	34 202	45 382	5.04	2.41	11 957	11 924	-0.96	-0.41
China[1]	87 689	111 479	7.10	1.71	1 449	2 389	-0.43	1.60	1 475	1 575	3.41	4.03
India	16 113	21 755	-0.42	2.25	314	405	25.41	0.47	1 623	1 970	-13.80	-1.13
Indonesia	6 848	8 313	5.75	1.60	4 397	4 971	6.71	1.09	4 433	4 187	6.06	-1.08
Iran	1 863	2 320	10.34	1.07	1 667	2 608	0.73	3.89	40	44	-14.51	-1.41
Japan	3 570	3 467	-0.40	-0.41	1 869	1 782	-1.49	-0.78	0	0	..	..
Kazakhstan	334	448	2.99	2.26	5	5	-2.53	0.25	92	118	-6.75	1.78
Korea	890	915	2.01	0.43	3 221	3 324	0.09	0.39	83	80	14.53	0.00
Malaysia	3 223	4 151	1.51	1.43	1 373	1 450	4.95	-0.01	2 548	2 725	1.44	0.01
Pakistan	3 816	5 283	4.32	1.75	634	2 405	4.98	13.33	286	62	9.22	-11.81
Philippines	925	1 803	-0.38	3.76	2 906	3 467	8.21	1.65	365	334	-3.22	-1.62
Saudi Arabia	475	669	122.77	1.09	1 080	1 424	11.99	2.72	57	43	31.20	-2.64
Thailand	2 675	3 463	7.12	1.22	3 179	4 281	1.89	2.77	9	12	2.45	-0.26
Turkey	3 696	4 763	6.89	1.69	2 088	2 978	11.78	2.29	126	89	18.13	-1.58
Viet Nam	1 530	1 885	23.27	1.65	5 628	9 072	9.53	4.22	77	42	32.37	-3.71
OCEANIA	1 046	1 492	2.98	4.12	2 950	3 814	8.12	2.12	99	98	0.50	0.97
Australia	902	1 321	3.26	4.49	787	918	3.98	0.30	28	29	0.75	0.00
New Zealand	8	8	0.00	0.00	2 152	2 886	10.16	2.79	10	0	21.04	..
DEVELOPED COUNTRIES	**104 601**	**119 572**	**3.05**	**1.26**	**39 048**	**39 958**	**1.01**	**-0.07**	**23 344**	**29 032**	**5.71**	**2.25**
DEVELOPING COUNTRIES	**222 116**	**280 798**	**4.85**	**1.69**	**46 176**	**62 036**	**5.59**	**2.72**	**64 075**	**72 962**	**3.00**	**1.27**
LEAST DEVELOPED COUNTRIES (LDC)	3 807	5 432	7.36	2.06	758	959	9.61	2.98	219	93	-0.17	-7.80
OECD[2]	**96 471**	**108 764**	**2.42**	**1.06**	**45 165**	**47 418**	**1.63**	**0.23**	**17 156**	**20 407**	**5.08**	**1.39**
BRICS	**146 024**	**185 076**	**5.15**	**1.69**	**3 100**	**4 272**	**-1.10**	**1.32**	**20 361**	**23 654**	**0.32**	**1.49**

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.20.2. Protein meal projections: Consumption

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27
WORLD	**324 656**	**400 216**	**4.24**	**1.56**
NORTH AMERICA	**42 141**	**48 674**	**2.12**	**1.31**
Canada	2 653	2 791	-0.39	0.60
United States	39 488	45 883	2.31	1.36
LATIN AMERICA	**37 732**	**48 812**	**3.40**	**1.72**
Argentina	3 861	4 308	3.97	0.92
Brazil	17 498	23 122	2.90	1.35
Chile	1 516	1 844	5.59	2.25
Colombia	2 073	2 980	9.37	2.90
Mexico	6 487	8 093	3.29	1.85
Paraguay	669	993	5.85	2.07
EUROPE	**64 479**	**65 836**	**1.76**	**0.02**
European Union	54 345	53 613	0.89	-0.18
Russia	6 436	7 259	8.27	0.66
Ukraine	2 041	2 957	11.40	1.19
AFRICA	**13 472**	**18 641**	**6.60**	**2.88**
Egypt	3 242	4 453	7.47	3.30
Ethiopia	99	129	13.42	2.54
Nigeria	1 096	1 440	5.30	2.07
South Africa	2 185	2 834	4.23	2.52
ASIA	**162 903**	**213 045**	**6.01**	**1.97**
China[1]	87 632	112 293	7.17	1.68
India	14 758	20 208	3.16	2.60
Indonesia	6 818	9 093	6.12	2.79
Iran	3 572	4 884	5.69	2.51
Japan	5 442	5 249	-0.89	-0.53
Kazakhstan	247	334	9.24	2.44
Korea	4 038	4 159	0.20	0.40
Malaysia	2 069	2 854	3.42	2.13
Pakistan	4 147	7 615	3.97	4.56
Philippines	3 471	4 932	6.75	2.65
Saudi Arabia	1 482	2 048	17.63	2.29
Thailand	5 851	7 730	4.18	2.05
Turkey	5 665	7 647	8.58	1.98
Viet Nam	7 176	10 907	12.11	3.76
OCEANIA	**3 929**	**5 207**	**6.77**	**2.68**
Australia	1 683	2 210	3.71	2.60
New Zealand	2 159	2 894	9.96	2.79
DEVELOPED COUNTRIES	**120 346**	**130 425**	**1.93**	**0.64**
DEVELOPING COUNTRIES	**204 310**	**269 791**	**5.83**	**2.04**
LEAST DEVELOPED COUNTRIES (LDC)	**4 343**	**6 297**	**8.28**	**2.45**
OECD[2]	**124 559**	**135 748**	**1.82**	**0.73**
BRICS	**128 509**	**165 717**	**5.99**	**1.70**

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.21.1. Vegetable oil projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**189 591**	**234 643**	**4.11**	**1.67**	**77 894**	**96 262**	**4.08**	**1.85**	**76 710**	**96 262**	**3.75**	**1.85**
NORTH AMERICA	17 057	19 399	3.75	1.23	4 695	5 139	4.11	0.46	4 584	6 026	3.17	1.95
Canada	4 265	4 548	7.83	0.65	282	285	-2.33	0.00	3 147	3 475	6.89	0.37
United States	12 792	14 851	2.68	1.41	4 414	4 854	4.67	0.49	1 437	2 551	-2.15	4.60
LATIN AMERICA	25 557	31 977	3.82	1.81	4 686	4 795	4.23	-0.10	10 711	13 599	3.05	3.01
Argentina	9 226	11 387	3.21	1.92	18	20	6.27	0.00	5 815	7 601	0.92	3.75
Brazil	8 641	10 720	2.42	1.47	501	515	4.65	0.00	1 458	2 142	-2.30	4.78
Chile	104	117	5.15	0.83	444	536	6.04	1.83	1	1	-5.39	-0.28
Colombia	1 719	2 387	7.70	2.44	740	650	12.28	-1.99	621	809	15.47	2.03
Mexico	1 788	2 176	2.71	1.56	1 006	1 088	6.11	0.68	36	36	1.41	0.00
Paraguay	789	966	11.52	1.91	13	11	-0.17	-1.61	671	803	17.90	1.64
EUROPE	27 643	31 668	4.44	1.59	13 045	11 740	2.67	-0.75	9 882	13 406	11.56	3.31
European Union	16 119	16 140	2.14	0.25	10 891	9 693	2.77	-0.78	1 778	1 722	10.50	0.41
Russia	5 400	6 307	8.24	1.96	1 036	1 048	3.15	0.00	2 487	3 221	16.29	3.28
Ukraine	5 831	8 907	9.41	4.29	260	169	-6.61	-4.03	5 372	8 161	10.77	4.20
AFRICA	6 791	8 408	3.33	1.76	10 162	14 174	5.15	3.13	1 148	898	-0.58	-2.69
Egypt	404	555	1.03	1.67	2 023	2 634	3.46	2.30	171	136	-5.09	-2.25
Ethiopia	40	48	9.84	1.69	490	940	30.54	5.87	0	0	..	..
Nigeria	1 719	2 079	1.60	1.88	1 454	2 297	8.22	4.31	53	47	-7.91	-2.57
South Africa	536	674	6.17	2.14	841	944	2.17	1.16	36	20	-14.61	-1.13
ASIA	111 303	141 626	4.23	1.71	44 957	60 085	4.27	2.49	49 565	61 283	2.98	1.39
China[1]	27 066	34 018	5.87	1.70	8 207	7 101	-1.78	-1.63	173	163	-4.41	0.51
India	8 118	10 924	-0.05	2.32	15 511	25 936	8.50	4.68	65	59	-3.80	-0.82
Indonesia	40 559	51 538	6.61	1.80	78	71	0.93	0.04	28 214	35 763	5.79	1.65
Iran	557	714	9.37	1.09	1 287	1 689	0.49	1.87	118	137	-1.74	-1.84
Japan	1 553	1 534	0.60	-0.17	831	924	1.63	0.40	4	4	10.15	0.00
Kazakhstan	239	360	3.74	3.05	108	116	2.01	-0.64	47	52	31.11	0.65
Korea	233	239	1.93	0.40	1 010	1 023	4.42	-0.79	3	3	-9.24	0.00
Malaysia	21 360	27 123	1.27	1.44	1 276	1 110	-5.31	-1.33	17 990	22 198	0.01	1.35
Pakistan	1 851	2 404	2.39	1.55	3 210	4 469	6.22	2.59	88	61	-2.00	-2.47
Philippines	1 627	2 134	-1.07	2.14	1 134	1 488	13.42	1.49	807	751	-2.40	-1.47
Saudi Arabia	110	154	77.48	1.09	627	877	10.45	3.07	1	1	-28.73	-0.41
Thailand	2 970	4 109	6.26	2.17	315	264	19.87	-1.56	172	265	-7.53	1.52
Turkey	1 758	2 266	5.69	1.39	1 660	1 605	8.50	0.14	629	636	13.28	-0.14
Viet Nam	566	753	16.71	2.34	956	1 482	6.08	3.99	155	109	33.46	-3.83
OCEANIA	1 240	1 565	1.55	2.23	349	328	4.88	-0.81	820	1 051	1.98	2.13
Australia	471	614	2.25	3.05	219	197	7.06	-1.26	155	223	7.14	3.70
New Zealand	5	5	0.00	0.00	96	103	3.38	0.39	0	0	..	..
DEVELOPED COUNTRIES	**48 338**	**55 160**	**3.95**	**1.42**	**20 260**	**19 611**	**3.05**	**-0.28**	**14 768**	**19 797**	**8.16**	**2.86**
DEVELOPING COUNTRIES	**141 253**	**179 482**	**4.17**	**1.75**	**57 635**	**76 651**	**4.47**	**2.48**	**61 941**	**76 465**	**2.90**	**1.61**
LEAST DEVELOPED COUNTRIES (LDC)	3 020	3 888	3.52	1.97	5 973	9 039	7.07	3.63	409	287	4.76	-3.77
OECD[2]	**39 337**	**42 744**	**2.92**	**0.83**	**21 521**	**20 964**	**3.84**	**-0.21**	**7 296**	**8 757**	**5.39**	**1.47**
BRICS	**49 762**	**62 643**	**4.27**	**1.79**	**26 096**	**35 544**	**3.83**	**2.74**	**4 219**	**5 605**	**4.76**	**3.66**

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.21.2. Vegetable oil projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**191 590**	**234 515**	**4.48**	**1.65**	**20.6**	**23.1**	**2.69**	**0.98**
NORTH AMERICA	17 123	18 512	3.99	0.75	39.0	39.4	1.67	0.44
Canada	1 310	1 358	5.42	0.66	31.3	27.6	2.16	0.16
United States	15 814	17 154	3.87	0.76	39.9	40.7	1.64	0.46
LATIN AMERICA	19 563	23 169	4.56	0.72	20.9	21.7	1.11	0.02
Argentina	3 435	3 805	8.40	-1.02	18.7	19.0	-0.03	0.15
Brazil	7 649	9 093	3.93	0.62	23.8	23.4	0.04	-0.82
Chile	546	652	5.93	1.65	29.9	33.1	4.99	0.99
Colombia	1 842	2 226	7.29	1.11	24.6	27.3	5.08	0.67
Mexico	2 772	3 228	3.90	1.27	21.7	22.4	2.44	0.21
Paraguay	133	174	-2.22	2.96	19.4	22.4	-3.52	1.85
EUROPE	30 744	30 058	2.09	-0.12	24.8	25.2	1.49	0.34
European Union	25 176	24 170	1.99	-0.27	25.9	25.6	1.08	0.13
Russia	3 908	4 134	3.65	0.31	27.2	29.1	3.57	0.47
Ukraine	756	911	-3.16	2.95	16.2	20.9	-2.89	3.57
AFRICA	15 896	21 665	4.94	2.90	12.3	13.0	2.40	0.59
Egypt	2 296	3 049	4.50	2.45	23.0	25.6	2.87	0.87
Ethiopia	534	989	26.22	5.63	5.1	7.4	22.96	3.36
Nigeria	3 145	4 326	4.82	3.19	14.1	15.2	2.27	1.08
South Africa	1 344	1 598	4.81	1.60	23.3	24.7	3.50	0.60
ASIA	107 489	140 269	5.27	2.19	20.6	25.0	3.69	1.58
China[1]	35 611	40 957	4.53	1.00	25.4	28.4	3.97	0.79
India	23 868	36 782	5.16	3.93	17.3	24.2	3.74	3.06
Indonesia	12 246	15 777	9.14	2.16	24.0	29.1	4.48	1.50
Iran	1 698	2 261	2.81	1.90	21.0	25.6	1.59	1.15
Japan	2 404	2 454	0.85	-0.02	18.8	19.9	0.95	0.33
Kazakhstan	290	423	1.30	2.34	15.8	20.9	-0.28	1.48
Korea	1 237	1 260	4.01	-0.57	12.9	13.0	-1.32	-0.08
Malaysia	4 730	6 008	3.72	1.45	29.1	32.9	2.01	0.96
Pakistan	4 993	6 806	4.88	2.27	24.8	28.1	2.82	0.59
Philippines	1 955	2 866	6.24	3.01	12.2	16.4	6.36	2.11
Saudi Arabia	730	1 029	13.54	2.77	19.5	24.1	11.35	1.59
Thailand	3 171	4 105	9.16	1.95	16.4	24.2	7.37	3.24
Turkey	2 801	3 234	6.07	1.10	29.9	32.2	4.25	0.50
Viet Nam	1 363	2 122	8.08	3.97	14.3	20.3	6.85	3.08
OCEANIA	776	842	2.96	1.06	19.3	18.1	1.07	-0.19
Australia	543	588	3.51	1.20	22.5	21.5	1.98	0.07
New Zealand	101	108	3.20	0.38	21.7	21.1	2.10	-0.43
DEVELOPED COUNTRIES	**53 747**	**55 029**	**2.67**	**0.27**	**27.1**	**27.7**	**1.55**	**0.41**
DEVELOPING COUNTRIES	**137 843**	**179 486**	**5.26**	**2.11**	**19.0**	**22.1**	**3.21**	**1.18**
LEAST DEVELOPED COUNTRIES (LDC)	8 623	12 628	5.87	3.33	10.6	12.1	3.45	1.09
OECD[2]	**53 517**	**55 009**	**2.98**	**0.28**	**28.0**	**28.5**	**1.64**	**0.35**
BRICS	**72 380**	**92 562**	**4.62**	**2.00**	**21.9**	**26.2**	**3.47**	**1.46**

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.22. Main policy assumptions for oilseed markets

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ARGENTINA												
Export tax												
Soybean	%	30.2	21.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Other oilseeds	%	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soybean meal	%	27.3	18.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Soybean oil	%	27.3	18.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
AUSTRALIA												
Tariffs												
Soybean oil	%	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Rapeseed oil	%	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
CANADA												
Tariffs												
Rapeseed oil	%	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
EUROPEAN UNION[1]												
Voluntary coupled support												
Soybean	mln EUR	146	23	24	25	25	25	26	26	26	27	27
Tariffs												
Soybean oil	%	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Rapeseed oil	%	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
JAPAN												
New output payments												
Soybean	JPY/kg	168.5	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2	154.2
Tariffs												
Soybean oil	JPY/kg	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Rapeseed oil	JPY/kg	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
KOREA												
Soybean tariff-quota	kt	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032
In-quota tariff	%	5	5	5	5	5	5	5	5	5	5	5
Out-of-quota tariff	%	487	487	487	487	487	487	487	487	487	487	487
Soybean (for food) mark up	'000 KRW/t	131	131	131	131	131	131	131	131	131	131	131
MEXICO												
Tariffs												
Soybean	%	33	33	33	33	33	33	33	33	33	33	33
Soybean meal	%	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8
Soybean oil	%	45	45	45	45	45	45	45	45	45	45	45
UNITED STATES												
ARC participation rate												
Soybean	%	96.9	96.9	96.9	96.9	96.9	96.9	96.9	96.9	96.9	96.9	96.9
Soybean loan rate	USD/t	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7
Tariffs												
Rapeseed	%	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Soybean meal	%	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Rapeseed meal	%	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Soybean oil	%	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Rapeseed oil	%	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
CHINA												
Tariffs												
Soybean	%	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Soybean meal	%	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Soybean oil in-quota tariff	%	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Vegetable oil tariff-quota	kt	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1
INDIA												
Soybean tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Rapeseed tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Soybean meal tariff	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Soybean oil tariff	%	10.8	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
INDONESIA												
Protein meal tariff	%	1.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
PAKISTAN												
Protein meal tariff	%	10.7	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
VIET NAM												
Protein meal tariff	%	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. Since 2015 the Basic payment scheme (BPS) holds, which shall account for 68% maximum of the national direct payment envelopes. On top of this, compulsory policy instruments have been introduced: the Green Payment (30%) and young farmer scheme (2%).

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

Table A.23.1. Sugar projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**170 736**	**204 724**	**2.05**	**1.50**	**54 721**	**60 797**	**2.40**	**1.63**	**60 685**	**66 762**	**2.63**	**1.47**
NORTH AMERICA	7 687	8 547	2.00	0.76	3 895	4 423	-0.31	1.67	92	75	-13.01	0.00
Canada	91	99	2.91	0.62	1 131	1 201	-0.39	0.70	30	30	-9.82	0.00
United States	7 596	8 448	1.99	0.77	2 764	3 222	-0.28	2.05	62	45	-14.40	0.00
LATIN AMERICA	59 291	67 347	1.00	1.84	2 022	1 703	-2.36	-0.98	35 106	39 072	1.31	2.14
Argentina	2 060	2 730	-0.06	2.73	0	0	..	..	421	733	-1.18	6.24
Brazil	38 198	41 824	0.42	1.86	0	0	0.00	..	27 508	29 907	0.80	2.08
Chile	242	291	-0.95	1.02	536	596	0.99	1.16	0	0	0.00	..
Colombia	2 196	2 871	0.36	2.28	102	36	-11.32	-3.95	451	687	-7.14	4.12
Mexico	6 023	6 743	2.92	1.18	12	10	-32.21	0.01	1 510	1 746	7.00	1.66
Paraguay	160	221	2.13	3.08	26	6	-15.29	-6.15	58	69	-5.34	6.55
EUROPE	25 992	29 243	2.78	0.03	3 313	2 162	-9.17	-0.22	2 995	4 575	4.89	1.09
European Union	17 305	18 975	1.63	-0.56	2 205	1 447	-5.85	0.78	1 813	2 512	1.90	-1.22
Russia	5 886	6 823	7.64	1.28	327	78	-22.83	-9.86	348	888	13.41	6.08
Ukraine	1 875	2 291	2.22	1.13	24	0	-33.92	..	409	654	72.13	7.09
AFRICA	10 858	14 717	2.57	2.42	12 259	16 441	4.13	2.58	4 062	3 775	3.19	-1.17
Egypt	2 500	3 680	5.16	3.09	1 053	1 249	-0.14	1.12	190	137	4.12	-1.11
Ethiopia	511	749	8.99	2.03	86	79	-5.11	3.05	107	121	13.79	-3.21
Nigeria	45	89	2.67	2.94	1 553	2 282	5.26	3.46	0	0	..	..
South Africa	1 722	2 234	-2.31	1.70	335	195	-2.71	-2.21	143	221	-19.00	2.25
ASIA	61 961	78 777	2.72	1.75	32 862	35 660	4.60	1.48	14 360	14 422	6.07	0.79
China[1]	9 546	13 428	-2.61	1.85	6 209	6 757	21.35	2.22	95	90	1.10	3.57
India	23 775	30 742	3.71	1.78	1 816	1 993	1.46	1.83	2 390	1 410	11.67	-2.17
Indonesia	2 225	2 489	-0.52	1.19	4 992	5 906	10.04	2.32	0	0	..	..
Iran	1 630	2 210	9.89	2.57	821	446	-10.13	-5.83	8	0	23.82	..
Japan	715	719	-1.28	0.16	1 370	1 331	0.95	-0.61	4	5	14.46	0.00
Kazakhstan	20	30	-2.33	1.60	488	527	3.30	0.49	10	9	4.55	-0.49
Korea	0	0	..	..	1 944	2 144	2.38	0.67	348	350	1.17	-0.33
Malaysia	8	21	-11.97	3.50	1 982	2 295	3.03	1.43	210	85	-0.79	-1.41
Pakistan	6 559	7 177	8.74	3.27	18	11	-33.44	-2.85	788	426	31.34	12.39
Philippines	2 214	2 443	1.41	0.72	122	498	29.15	10.05	162	73	-6.92	-9.93
Saudi Arabia	0	0	..	..	1 565	1 889	2.96	1.72	305	269	1.66	-1.69
Thailand	10 540	13 516	4.84	1.16	0	0	..	..	7 755	10 351	4.91	1.36
Turkey	2 280	2 634	-0.08	0.61	113	1	44.85	-34.75	8	15	-13.19	4.79
Viet Nam	1 460	2 212	6.13	3.28	226	31	5.04	-11.54	105	269	-2.09	12.93
OCEANIA	4 948	6 092	2.15	1.11	369	408	1.78	0.33	4 071	4 842	3.10	1.04
Australia	4 716	5 785	2.16	1.08	95	120	5.15	0.00	3 878	4 611	3.20	1.05
New Zealand	0	0	..	..	244	256	0.61	0.65	21	20	0.86	0.00
DEVELOPED COUNTRIES	**40 982**	**46 747**	**2.22**	**0.37**	**11 810**	**11 175**	**-2.93**	**0.76**	**7 476**	**9 637**	**1.99**	**1.05**
DEVELOPING COUNTRIES	**129 754**	**157 977**	**2.00**	**1.86**	**42 911**	**49 621**	**4.43**	**1.83**	**53 210**	**57 125**	**2.76**	**1.54**
LEAST DEVELOPED COUNTRIES (LDC)	3 103	3 951	4.47	1.93	7 073	8 430	7.25	2.60	2 603	1 300	9.13	-3.08
OECD[2]	**39 212**	**43 993**	**1.73**	**0.26**	**11 205**	**11 268**	**-1.02**	**0.94**	**7 684**	**9 345**	**2.67**	**0.45**
BRICS	**79 127**	**95 051**	**1.20**	**1.78**	**8 688**	**9 022**	**4.00**	**1.81**	**30 484**	**32 516**	**0.90**	**1.95**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

Sugar data are expressed on a tel quel basis.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.23.2. Sugar projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[3]		PER CAPITA (kg)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**167 118**	**197 870**	**1.66**	**1.48**	**22.3**	**23.7**	**0.47**	**0.51**
NORTH AMERICA	11 416	12 871	1.16	1.07	31.8	33.2	0.38	0.35
Canada	1 175	1 263	-0.09	0.73	32.4	31.8	-1.11	-0.09
United States	10 241	11 608	1.31	1.11	31.8	33.4	0.56	0.40
LATIN AMERICA	26 660	29 906	0.04	1.07	41.8	42.6	-1.09	0.21
Argentina	1 658	1 983	0.23	1.69	37.8	41.1	-0.80	0.84
Brazil	11 038	11 952	-1.10	0.82	53.2	53.7	-1.99	0.22
Chile	780	879	1.23	1.02	43.6	45.5	0.33	0.35
Colombia	1 849	2 214	2.44	1.66	38.0	42.2	1.44	1.01
Mexico	4 462	4 997	0.30	1.03	35.0	34.7	-1.11	-0.04
Paraguay	134	157	1.58	1.38	20.0	20.6	0.24	0.25
EUROPE	27 113	26 830	0.29	-0.15	36.0	35.6	0.19	-0.14
European Union	18 502	17 910	0.60	-0.36	36.4	34.9	0.43	-0.41
Russia	5 713	6 011	0.18	0.48	39.7	42.4	0.10	0.65
Ukraine	1 639	1 639	-1.94	-0.21	36.9	39.1	-1.46	0.32
AFRICA	19 191	26 926	3.63	3.07	15.7	16.9	0.99	0.66
Egypt	3 508	4 739	3.89	2.65	36.7	41.3	1.72	1.02
Ethiopia	491	704	3.75	3.32	4.8	5.4	1.10	1.03
Nigeria	1 593	2 347	5.32	3.59	8.6	9.6	2.56	1.03
South Africa	1 931	2 189	1.32	1.09	34.5	34.8	-0.02	0.06
ASIA	81 254	99 681	2.37	1.75	18.2	20.5	1.31	1.01
China[1]	16 145	20 234	2.38	1.90	11.5	14.0	1.84	1.70
India	24 717	31 124	1.94	1.99	18.7	21.1	0.69	1.01
Indonesia	6 622	8 343	4.06	1.93	25.4	28.8	2.77	1.02
Iran	2 492	2 652	0.99	0.51	31.0	30.3	-0.23	-0.23
Japan	2 108	2 039	-0.46	-0.35	16.5	16.5	-0.37	0.00
Kazakhstan	498	546	1.44	0.81	27.7	27.4	-0.06	-0.06
Korea	1 591	1 784	3.06	0.88	31.3	34.0	2.65	0.60
Malaysia	1 792	2 203	3.81	1.73	57.5	61.7	2.03	0.50
Pakistan	5 085	6 748	2.69	2.63	26.3	28.9	0.58	0.90
Philippines	2 203	2 850	2.59	2.39	21.3	23.6	0.94	0.97
Saudi Arabia	1 225	1 597	3.70	2.31	38.0	41.8	0.92	0.85
Thailand	2 965	3 142	3.03	0.43	43.1	45.1	2.60	0.35
Turkey	2 395	2 624	1.56	0.62	30.1	30.2	0.01	0.00
Viet Nam	1 561	1 960	5.03	1.89	16.5	18.8	3.89	1.01
OCEANIA	1 483	1 656	1.60	1.10	37.8	36.7	0.02	-0.15
Australia	1 163	1 294	1.73	1.05	48.2	47.2	0.22	-0.08
New Zealand	220	236	0.35	0.70	47.2	46.2	-0.72	-0.11
DEVELOPED COUNTRIES	**46 337**	**48 216**	**0.61**	**0.33**	**32.6**	**32.8**	**0.20**	**0.04**
DEVELOPING COUNTRIES	**120 781**	**149 654**	**2.09**	**1.88**	**19.9**	**21.8**	**0.70**	**0.75**
LEAST DEVELOPED COUNTRIES (LDC)	7 573	10 928	5.23	3.19	9.5	10.7	2.77	0.91
OECD[2]	**43 683**	**45 850**	**0.83**	**0.39**	**32.8**	**32.8**	**0.27**	**0.00**
BRICS	**59 545**	**71 511**	**1.24**	**1.60**	**19.0**	**21.4**	**0.39**	**1.03**

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.
Sugar data are expressed on a tel quel basis.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.24. Main policy assumptions for sugar markets

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ARGENTINA												
Tariff, sugar	ARS/t	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
BRAZIL												
Tariff, raw sugar	%	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Tariff, white sugar	%	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
CANADA												
Tariff, raw sugar	CAD/t	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7
Tariff, white sugar	CAD/t	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9
CHINA[1]												
TRQ sugar	kt	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0	1 954.0
In-quota tariff, raw sugar	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
In-quota tariff, white sugar	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Tariff, over-quota	%	55.0	93.3	88.3	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
EUROPEAN UNION												
Voluntary coupled support												
Sugarbeet[2]	mln EUR	176	179	180	169	169	169	169	169	169	169	169
Reference price, white sugar	EUR/t	404.4	404.4	404.4	404.4	404.4	404.4	404.4	404.4	404.4	404.4	404.4
Production quota[3]	Mt wse	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tariff, raw sugar	EUR/t	339.0	339.0	339.0	339.0	339.0	339.0	339.0	339.0	339.0	339.0	339.0
Tariff, white sugar	EUR/t	419.0	419.0	419.0	419.0	419.0	419.0	419.0	419.0	419.0	419.0	419.0
INDIA												
Tariff, sugar	%	86.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
INDONESIA												
Tariff, sugar	%	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6
JAPAN												
Minimum stabilisation price, raw sugar	JPY/kg	153.2	153.2	153.2	153.2	153.2	153.2	153.2	153.2	153.2	153.2	153.2
Tariff, raw sugar	JPY/kg	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8
Tariff, white sugar	JPY/kg	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1
KOREA												
Tariff, raw sugar	%	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Tariff, white sugar	%	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
MEXICO												
Mexico common external tariff, raw sugar	USD/t	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6
Mexico common external tariff, white sugar	USD/t	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4
RUSSIA												
Minimum tariff, raw sugar	USD/t	204.7	203.0	203.0	203.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0
Minimum tariff, white sugar	USD/t	340.0	340.0	340.0	340.0	340.0	340.0	340.0	340.0	340.0	340.0	340.0
UNITED STATES												
Loan rate, raw sugar	USD/t	413.4	413.4	413.4	413.4	413.4	413.4	413.4	413.4	413.4	413.4	413.4
Loan rate, white sugar	USD/t	531.1	531.1	531.1	531.1	531.1	531.1	531.1	531.1	531.1	531.1	531.1
TRQ, raw sugar	kt rse	1 508	1 406	1 409	1 412	1 413	1 415	1 416	1 417	1 418	1 419	1 419
TRQ, refined sugar	kt rse	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0
Raw sugar 2nd tier WTO tariff	USD/t	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6
White sugar 2nd tier WTO tariff	USD/t	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4
VIET NAM												
Tariff, sugar	%	46.3	53.8	53.8	53.8	53.8	53.8	53.8	53.8	53.8	53.8	53.8

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.
The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. Refers to mainland only.
2. Implemented in 10 Member States.
3. Production that receives official support.

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

Table A.25.1. Meat projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[3]		Growth (%)[4]		IMPORTS (kt cwe)[5]		Growth (%)[4]		EXPORTS (kt cwe)[5]		Growth (%)[4]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**318 533**	**366 668**	**1.90**	**1.15**	**29 572**	**35 294**	**2.92**	**1.54**	**30 131**	**36 051**	**2.90**	**1.50**
NORTH AMERICA	47 955	54 825	0.62	0.76	2 783	2 869	2.70	0.83	8 726	10 680	1.04	1.50
Canada	4 754	5 250	-0.28	0.80	692	792	0.37	1.32	1 913	2 198	0.68	0.95
United States	43 202	49 575	0.72	0.75	2 092	2 077	3.60	0.65	6 814	8 482	1.14	1.64
LATIN AMERICA	51 489	61 199	2.02	1.38	4 035	5 053	4.32	1.39	8 363	11 035	0.99	2.13
Argentina	5 410	6 825	1.46	1.66	47	49	-5.57	2.05	414	1 033	-5.55	5.88
Brazil	26 624	31 351	2.22	1.20	75	65	11.00	-1.82	6 320	8 375	0.96	2.27
Chile	1 468	1 646	1.06	1.36	470	641	13.29	1.81	327	275	2.77	-1.28
Colombia	2 653	3 152	3.60	1.45	157	265	14.33	3.19	17	4	-16.56	-18.10
Mexico	6 342	7 821	1.84	1.74	1 769	1 967	5.02	0.65	294	369	15.30	1.37
Paraguay	804	979	3.44	1.75	31	40	6.86	2.43	359	380	7.45	0.52
EUROPE	61 835	64 267	1.76	0.26	3 216	3 097	-6.25	-0.63	5 049	5 528	6.41	0.91
European Union	46 859	47 277	0.96	0.00	1 362	1 571	-1.23	0.85	4 247	4 553	5.27	0.89
Russia	9 966	11 404	5.99	0.97	1 171	799	-10.87	-3.57	159	279	20.78	4.01
Ukraine	2 180	2 399	2.31	1.28	225	250	-9.55	-0.24	268	282	32.10	-0.55
AFRICA	16 323	20 370	2.17	2.27	2 769	3 931	5.88	3.29	317	268	12.78	0.06
Egypt	2 207	2 931	3.33	2.51	352	380	5.59	2.09	10	6	16.10	-1.08
Ethiopia	596	719	0.10	2.24	0	0	-8.59	9.22	17	22	10.08	3.73
Nigeria	1 260	1 514	1.68	2.01	3	3	15.51	1.41	1	1	-12.83	-2.42
South Africa	3 202	3 802	3.15	2.08	600	777	9.82	1.31	185	159	34.05	1.32
ASIA	134 479	158 566	2.41	1.43	16 203	19 698	5.11	1.73	4 413	4 864	8.58	0.79
China[1]	83 280	96 813	2.00	1.27	2 675	2 860	13.35	0.25	534	627	0.97	1.35
India	6 814	8 445	2.46	1.81	1	2	-11.13	3.85	1 696	1 740	12.96	0.02
Indonesia	3 362	4 036	3.91	1.81	147	298	7.72	4.32	1	1	-10.04	-1.21
Iran	2 675	3 245	1.81	1.87	122	204	-4.81	3.70	92	148	14.95	7.53
Japan	3 284	3 350	0.48	0.09	2 871	2 900	2.28	-0.51	15	20	6.06	2.13
Kazakhstan	835	971	0.22	1.42	188	298	-0.15	4.06	1	1	2.01	-1.41
Korea	2 432	2 586	3.56	0.63	1 212	1 376	5.19	1.13	32	10	-0.04	-2.52
Malaysia	1 982	2 272	4.11	1.28	339	460	6.77	2.91	178	187	5.04	0.33
Pakistan	3 236	4 101	3.66	2.31	34	105	17.40	9.49	66	8	9.89	-20.56
Philippines	3 471	4 397	2.93	1.95	480	887	8.33	5.85	11	10	-1.41	-0.72
Saudi Arabia	705	921	2.63	2.21	1 119	1 259	5.04	1.58	103	91	38.65	-1.46
Thailand	3 393	4 101	4.50	1.51	29	20	13.73	-1.20	1 037	1 377	6.62	2.14
Turkey	3 417	4 342	7.96	2.07	18	8	8.86	-3.03	422	444	18.42	0.88
Viet Nam	4 777	6 467	3.02	2.75	1 649	2 291	14.42	3.63	31	20	3.33	-5.93
OCEANIA	6 451	7 441	1.57	1.33	566	648	3.03	2.12	3 262	3 676	2.11	1.71
Australia	4 935	5 837	2.04	1.55	334	365	2.80	2.29	2 186	2 629	2.76	2.39
New Zealand	1 376	1 456	0.11	0.56	77	67	5.92	-1.01	1 073	1 045	0.82	0.17
DEVELOPED COUNTRIES	**126 243**	**137 775**	**1.32**	**0.59**	**10 485**	**10 928**	**-0.74**	**0.28**	**17 258**	**20 078**	**2.74**	**1.36**
DEVELOPING COUNTRIES	**192 290**	**228 893**	**2.30**	**1.50**	**19 086**	**24 365**	**5.52**	**2.16**	**12 873**	**15 973**	**3.12**	**1.69**
LEAST DEVELOPED COUNTRIES (LDC)	8 781	11 054	3.44	2.27	1 142	1 972	5.24	4.94	22	17	4.21	-1.94
OECD[2]	**119 532**	**130 787**	**1.08**	**0.60**	**11 142**	**12 113**	**2.89**	**0.63**	**17 342**	**20 033**	**2.60**	**1.32**
BRICS	**129 885**	**151 814**	**2.36**	**1.28**	**4 522**	**4 503**	**1.25**	**-0.42**	**8 894**	**11 180**	**3.07**	**1.86**

Note: Calendar year; except year ending 30 September for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Gross indigenous production.
4. Least-squares growth rate (see glossary).
5. Excludes trade of live animals.

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

Table A.25.2. Meat projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[3]		FOOD (kg rwe/cap)[4]		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**317 785**	**365 539**	**1.89**	**1.15**	**34.3**	**35.4**	**0.76**	**0.19**
NORTH AMERICA	42 172	47 298	0.63	0.60	94.4	97.7	-0.04	-0.10
Canada	3 136	3 398	0.16	0.70	69.5	69.0	-0.72	-0.08
United States	39 037	43 900	0.67	0.59	97.2	101.0	0.02	-0.10
LATIN AMERICA	46 723	54 683	2.38	1.23	58.9	62.6	1.35	0.37
Argentina	5 044	5 841	2.22	1.06	89.8	94.7	1.45	0.22
Brazil	20 082	22 724	2.64	0.82	76.9	81.3	1.83	0.21
Chile	1 605	2 006	3.10	1.94	71.8	83.2	2.19	1.26
Colombia	2 773	3 391	4.59	1.66	46.3	52.7	3.74	1.03
Mexico	7 601	9 145	2.21	1.50	48.6	51.9	0.88	0.44
Paraguay	477	639	1.19	2.60	53.0	62.2	-0.08	1.41
EUROPE	59 832	61 649	0.74	0.17	64.6	66.8	0.74	0.20
European Union	43 700	44 030	0.51	-0.04	68.7	68.9	0.43	-0.08
Russia	11 070	11 996	1.88	0.52	62.3	68.5	2.07	0.66
Ukraine	2 130	2 356	-1.08	1.37	39.1	45.9	-0.51	1.89
AFRICA	18 822	24 113	2.56	2.47	12.4	12.2	0.04	0.08
Egypt	2 580	3 331	3.69	2.45	21.5	23.2	1.69	0.87
Ethiopia	560	691	-0.44	2.32	4.2	4.1	-2.87	0.14
Nigeria	1 321	1 619	1.47	2.18	5.7	5.3	-1.31	-0.35
South Africa	3 684	4 420	3.35	1.85	54.4	58.2	2.10	0.80
ASIA	146 818	173 817	2.54	1.47	26.5	28.9	1.50	0.75
China[1]	85 401	98 950	2.27	1.24	48.7	55.0	1.72	1.05
India	5 109	6 696	0.19	2.33	3.2	3.8	-0.50	1.38
Indonesia	3 617	4 488	3.85	1.98	11.4	12.8	2.65	1.08
Iran	2 691	3 294	1.18	1.82	28.8	32.2	0.12	1.05
Japan	6 130	6 189	1.28	-0.26	38.5	40.3	1.43	0.08
Kazakhstan	1 025	1 271	0.18	1.98	45.1	50.7	-1.09	1.12
Korea	3 629	3 952	4.00	0.81	56.6	59.8	3.62	0.56
Malaysia	2 153	2 554	4.33	1.63	58.7	60.8	2.56	0.39
Pakistan	3 198	4 192	3.64	2.59	13.0	14.0	1.62	0.86
Philippines	3 944	5 277	3.49	2.51	30.9	35.4	1.97	1.10
Saudi Arabia	1 860	2 240	3.49	1.90	49.8	50.7	0.76	0.45
Thailand	2 199	2 539	3.83	1.17	26.3	30.1	3.72	1.11
Turkey	3 091	3 931	7.14	2.03	31.7	36.6	5.06	1.36
Viet Nam	6 457	8 791	5.23	2.98	53.7	66.4	3.98	2.12
OCEANIA	3 418	3 980	1.50	1.12	71.0	71.9	0.12	-0.07
Australia	2 714	3 171	1.71	1.07	91.7	94.3	0.39	0.01
New Zealand	411	449	0.43	0.80	72.2	71.8	-0.39	0.01
DEVELOPED COUNTRIES	**119 233**	**128 308**	**0.87**	**0.44**	**68.0**	**70.8**	**0.56**	**0.17**
DEVELOPING COUNTRIES	**198 552**	**237 232**	**2.54**	**1.55**	**26.4**	**27.9**	**1.19**	**0.43**
LEAST DEVELOPED COUNTRIES (LDC)	9 836	12 994	3.74	2.69	9.9	10.3	1.44	0.42
OECD[2]	**112 806**	**122 221**	**1.02**	**0.48**	**68.5**	**71.0**	**0.53**	**0.10**
BRICS	**125 345**	**144 786**	**2.23**	**1.18**	**32.1**	**34.8**	**1.43**	**0.62**

Note: Calendar year; except year ending 30 September New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).
4. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.

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

Table A.26.1. Beef and veal projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[3]		Growth (%)[4]		IMPORTS (kt cwe)[5]		Growth (%)[4]		EXPORTS (kt cwe)[5]		Growth (%)[4]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**68 486**	**79 292**	**0.66**	**1.08**	**8 722**	**10 392**	**3.59**	**1.61**	**9 034**	**10 853**	**3.15**	**1.47**
NORTH AMERICA	12 308	14 262	-0.81	0.38	1 605	1 603	2.63	0.62	1 598	1 877	1.99	0.73
Canada	1 364	1 519	-2.18	0.87	190	195	-1.48	0.57	434	523	-1.35	1.08
United States	10 945	12 742	-0.62	0.32	1 416	1 409	3.33	0.62	1 164	1 354	3.53	0.60
LATIN AMERICA	18 010	21 280	0.74	1.31	704	890	-1.57	1.19	2 772	4 090	0.20	2.73
Argentina	2 723	3 379	-1.33	1.57	7	7	4.15	0.00	240	622	-7.95	6.08
Brazil	9 403	11 096	1.21	1.24	47	46	15.14	-0.55	1 428	2 356	-0.24	3.68
Chile	222	246	0.48	1.54	263	353	9.09	2.00	11	9	-2.31	-1.74
Colombia	834	943	-0.18	0.91	4	3	12.71	-3.65	13	1	-14.35	-29.33
Mexico	1 876	2 203	1.35	1.39	132	186	-7.79	0.69	183	218	24.30	0.96
Paraguay	604	739	3.97	1.81	3	3	12.00	0.18	354	375	7.42	0.56
EUROPE	10 785	10 693	-0.37	-0.08	949	850	-4.28	-0.82	401	397	4.00	-0.69
European Union	8 026	7 636	-0.27	-0.61	298	321	-1.20	0.19	240	226	7.07	-1.84
Russia	1 637	1 841	-0.82	1.60	552	423	-6.14	-1.73	11	12	-12.87	0.00
Ukraine	399	416	-1.73	1.08	2	3	-23.74	1.32	28	6	8.42	-11.84
AFRICA	6 185	7 715	1.39	2.34	666	895	2.91	3.09	130	109	14.82	1.97
Egypt	850	1 109	0.33	2.00	332	359	7.34	2.06	7	5	46.57	-0.29
Ethiopia	371	410	-0.67	1.52	0	0	..	..	0	0	0.31	-12.45
Nigeria	330	389	4.50	1.78	2	3	20.83	1.57	1	1	-12.83	-2.42
South Africa	918	1 105	3.12	3.09	25	40	14.55	-4.23	68	62	35.60	8.01
ASIA	17 952	21 726	2.03	1.54	4 744	6 094	7.88	2.14	1 900	1 927	12.13	-0.02
China[1]	7 037	8 850	1.63	1.71	581	889	71.46	3.18	16	10	-22.90	-0.79
India	2 632	2 888	0.86	0.67	0	0	..	-0.01	1 668	1 733	13.60	0.11
Indonesia	386	365	3.38	0.04	135	267	7.55	3.79	0	0	-8.15	-0.29
Iran	193	235	-4.07	1.48	113	190	-3.67	3.86	4	4	28.83	-1.44
Japan	469	456	-1.28	-0.35	765	857	1.69	0.34	3	3	18.29	0.00
Kazakhstan	420	495	0.75	1.54	17	47	-9.10	8.18	0	0	5.25	-2.16
Korea	294	321	1.87	0.31	430	490	4.95	1.04	7	4	14.59	-5.44
Malaysia	23	27	8.43	0.65	206	250	5.31	2.54	11	7	5.60	-2.48
Pakistan	1 762	2 275	2.95	2.40	4	23	4.06	19.50	34	2	8.05	-28.29
Philippines	305	398	0.91	2.57	149	189	1.07	1.61	3	3	-2.86	-0.27
Saudi Arabia	57	72	11.67	1.36	142	145	2.58	1.03	30	28	5.41	-1.02
Thailand	245	292	-1.23	1.14	18	10	15.07	-2.81	40	48	17.95	2.89
Turkey	1 028	1 528	14.27	3.06	11	4	47.23	-5.05	12	19	16.22	5.76
Viet Nam	337	446	-0.82	2.47	926	1 237	22.87	2.57	0	0	-0.29	-0.20
OCEANIA	3 245	3 617	1.04	1.11	54	60	1.74	1.91	2 233	2 453	2.26	1.73
Australia	2 562	2 954	1.19	1.39	14	14	5.14	0.00	1 641	1 892	2.47	2.31
New Zealand	663	648	0.42	0.01	12	10	9.32	0.00	589	559	1.63	-0.01
DEVELOPED COUNTRIES	**29 543**	**32 196**	**-0.15**	**0.43**	**3 543**	**3 682**	**0.03**	**0.47**	**4 304**	**4 794**	**2.52**	**1.16**
DEVELOPING COUNTRIES	**38 943**	**47 096**	**1.30**	**1.56**	**5 180**	**6 711**	**6.73**	**2.29**	**4 730**	**6 059**	**3.74**	**1.73**
LEAST DEVELOPED COUNTRIES (LDC)	3 025	3 859	1.67	2.49	135	271	-2.06	7.14	2	1	4.78	-2.03
OECD[2]	**27 731**	**30 554**	**0.07**	**0.39**	**3 691**	**4 081**	**2.12**	**0.84**	**4 286**	**4 810**	**2.84**	**1.10**
BRICS	**21 627**	**25 780**	**1.21**	**1.43**	**1 205**	**1 398**	**3.98**	**1.13**	**3 192**	**4 173**	**5.03**	**2.07**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Gross indigenous production.
4. Least-squares growth rate (see glossary).
5. Excludes trade of live animals.

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

Table A.26.2. Beef and veal projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[3]		FOOD (kg rwe/cap)[4]		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**67 977**	**78 510**	**0.63**	**1.09**	**6.4**	**6.6**	**-0.56**	**0.12**
NORTH AMERICA	12 539	14 284	-0.75	0.37	24.5	25.8	-1.50	-0.34
Canada	883	920	-1.59	0.40	17.0	16.2	-2.59	-0.42
United States	11 655	13 364	-0.68	0.37	25.3	26.9	-1.41	-0.33
LATIN AMERICA	15 493	17 535	0.64	0.97	17.0	17.5	-0.49	0.12
Argentina	2 490	2 764	-0.38	0.77	39.8	40.1	-1.40	-0.08
Brazil	7 724	8 470	1.46	0.63	26.0	26.6	0.55	0.02
Chile	469	584	4.25	1.89	18.3	21.1	3.32	1.22
Colombia	805	924	0.96	1.17	11.6	12.3	-0.03	0.53
Mexico	1 598	1 885	-0.67	1.27	8.8	9.2	-2.07	0.20
Paraguay	252	367	0.24	3.25	26.3	33.7	-1.08	2.10
EUROPE	11 192	10 994	-1.19	-0.09	10.6	10.4	-1.30	-0.07
European Union	7 871	7 517	-0.69	-0.51	10.8	10.3	-0.85	-0.57
Russia	2 259	2 326	-2.83	0.86	11.0	11.5	-2.91	1.03
Ukraine	364	402	-3.08	1.59	5.7	6.7	-2.61	2.12
AFRICA	6 836	8 622	1.45	2.41	3.9	3.8	-1.13	0.02
Egypt	1 207	1 489	2.12	1.99	8.8	9.1	-0.02	0.37
Ethiopia	352	403	-1.22	1.70	2.4	2.1	-3.74	-0.55
Nigeria	384	489	3.55	2.43	1.4	1.4	0.83	-0.11
South Africa	927	1 070	2.16	2.07	11.6	11.9	0.80	1.03
ASIA	21 188	26 228	2.50	1.77	3.3	3.8	1.44	1.02
China[1]	7 615	9 753	2.87	1.84	3.8	4.7	2.32	1.63
India	964	1 155	-8.98	1.55	0.5	0.5	-10.10	0.57
Indonesia	646	797	2.94	1.50	1.7	1.9	1.67	0.59
Iran	304	422	-4.30	2.51	2.6	3.4	-5.46	1.75
Japan	1 241	1 310	0.60	0.10	6.8	7.4	0.69	0.45
Kazakhstan	440	546	0.19	1.96	17.1	19.2	-1.29	1.08
Korea	729	807	4.22	0.79	10.0	10.8	3.81	0.51
Malaysia	226	278	4.62	2.42	5.1	5.4	2.82	1.19
Pakistan	1 726	2 289	2.85	2.66	6.3	6.9	0.74	0.94
Philippines	455	587	0.96	2.25	3.1	3.4	-0.66	0.83
Saudi Arabia	170	190	1.08	1.49	3.7	3.5	-1.63	0.04
Thailand	168	171	-2.72	-0.08	1.7	1.7	-3.12	-0.16
Turkey	1 107	1 538	14.69	2.51	9.7	12.4	12.94	1.88
Viet Nam	1 325	1 737	12.62	2.45	9.8	11.7	11.39	1.57
OCEANIA	728	847	-2.47	-0.39	13.0	13.1	-3.99	-1.63
Australia	601	709	-2.21	-0.56	17.4	18.1	-3.66	-1.67
New Zealand	83	88	-5.11	0.10	12.5	12.1	-6.12	-0.70
DEVELOPED COUNTRIES	**28 643**	**30 896**	**-0.63**	**0.32**	**14.2**	**14.9**	**-1.05**	**0.03**
DEVELOPING COUNTRIES	**39 334**	**47 613**	**1.63**	**1.62**	**4.5**	**4.9**	**0.25**	**0.49**
LEAST DEVELOPED COUNTRIES (LDC)	3 135	4 131	1.66	2.82	2.8	2.8	-0.71	0.54
OECD[2]	**26 736**	**29 323**	**-0.13**	**0.32**	**14.2**	**14.8**	**-0.69**	**-0.08**
BRICS	**19 489**	**22 774**	**0.68**	**1.27**	**4.4**	**4.8**	**-0.17**	**0.70**

Note: Calendar year; except year ending 30 September New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).
4. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.

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

Table A.27.1. Pigmeat projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[3]		Growth (%)[4]		IMPORTS (kt cwe)[5]		Growth (%)[4]		EXPORTS (kt cwe)[5]		Growth (%)[4]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**117 547**	**130 930**	**1.67**	**0.91**	**7 422**	**8 133**	**3.32**	**0.73**	**7 584**	**8 185**	**3.09**	**0.71**
NORTH AMERICA	13 256	15 111	1.11	0.79	717	788	3.36	1.36	3 708	4 230	2.15	1.04
Canada	2 035	2 159	0.08	0.48	215	290	1.89	2.06	1 308	1 481	1.71	0.89
United States	11 221	12 951	1.31	0.85	502	498	4.07	0.97	2 400	2 749	2.41	1.12
LATIN AMERICA	7 789	9 629	2.48	1.77	1 258	1 564	8.19	1.43	947	1 048	2.56	0.42
Argentina	518	696	9.23	1.88	29	36	-8.68	2.58	5	2	-2.67	1.77
Brazil	3 710	4 541	2.31	1.78	19	11	10.33	-6.84	641	720	1.60	0.43
Chile	514	580	-0.09	1.46	71	102	38.06	0.56	168	157	2.57	-0.55
Colombia	340	436	8.90	1.74	71	114	30.74	3.89	0	0	..	..
Mexico	1 324	1 715	1.91	1.95	763	870	7.96	0.63	109	146	9.04	1.84
Paraguay	178	219	2.61	1.91	2	2	10.82	0.53	3	3	22.90	-1.04
EUROPE	28 829	29 316	1.07	0.18	500	445	-11.73	-1.41	2 652	2 629	5.02	0.41
European Union	23 583	23 298	0.41	-0.04	12	35	-15.28	8.40	2 530	2 488	4.98	0.47
Russia	3 346	3 955	6.38	1.22	369	276	-11.35	-3.45	38	60	118.84	4.03
Ukraine	713	773	2.76	1.39	5	5	-38.24	4.19	13	6	46.09	-9.68
AFRICA	1 373	1 654	2.55	1.62	281	441	5.76	5.82	30	28	18.28	-0.78
Egypt	1	0	-2.64	-2.45	1	1	14.16	2.89	1	0	29.94	-2.81
Ethiopia	2	3	1.69	2.56	0	0	..	13.11	0	0	..	..
Nigeria	255	302	1.78	1.71	1	0	6.11	0.60	0	0	..	..
South Africa	253	325	-0.75	1.95	35	31	0.44	0.71	26	25	30.69	-0.71
ASIA	65 765	74 566	1.94	1.10	4 262	4 461	5.83	0.15	206	194	0.84	-0.58
China[1]	53 068	59 429	1.94	0.98	1 380	1 204	23.05	-1.99	110	111	-1.58	0.31
India	357	386	-0.79	0.65	1	1	-6.72	4.38	0	0	-26.21	..
Indonesia	799	971	2.30	1.83	6	7	26.93	3.59	0	0	-8.65	-2.19
Iran	0	0	..	..	4	5	26.36	0.00	4	5	31.88	0.00
Japan	1 271	1 266	-0.08	-0.04	1 233	1 216	1.69	-0.42	3	4	10.67	0.53
Kazakhstan	93	83	-11.05	-0.86	26	38	1.40	4.77	0	0	..	..
Korea	1 263	1 313	3.03	0.40	626	674	4.92	0.70	3	2	-4.04	0.00
Malaysia	218	229	0.51	0.45	28	43	16.99	3.25	5	5	3.80	-1.37
Pakistan	0	0	..	..	0	0	..	..	0	0	..	..
Philippines	1 863	2 346	1.97	1.78	112	289	9.48	9.32	3	2	2.45	-1.35
Saudi Arabia	2	5	0.00	0.00	6	5	-4.82	0.00	0	0	..	..
Thailand	1 065	1 188	1.38	1.11	2	2	24.26	0.27	28	26	7.61	1.10
Turkey	17	19	30.44	1.04	0	0	5.25	-0.25	9	11	20.09	0.25
Viet Nam	3 633	4 937	3.01	2.82	71	102	9.26	8.68	31	20	3.70	-5.99
OCEANIA	535	655	1.59	1.43	403	434	3.35	1.85	41	56	-2.80	2.22
Australia	396	484	2.30	1.23	320	351	2.71	2.39	41	55	-2.91	2.35
New Zealand	46	67	-0.92	3.49	60	53	6.39	-1.26	0	0	11.76	-11.08
DEVELOPED COUNTRIES	**44 251**	**46 770**	**1.01**	**0.39**	**2 942**	**2 970**	**-1.64**	**0.22**	**6 431**	**6 944**	**3.26**	**0.80**
DEVELOPING COUNTRIES	**73 296**	**84 160**	**2.08**	**1.20**	**4 480**	**5 163**	**8.10**	**1.04**	**1 153**	**1 241**	**2.24**	**0.25**
LEAST DEVELOPED COUNTRIES (LDC)	1 790	2 203	5.40	1.83	159	289	4.21	7.38	1	1	-1.56	-0.57
OECD[2]	**42 062**	**44 271**	**0.74**	**0.37**	**3 817**	**4 106**	**3.78**	**0.61**	**6 572**	**7 096**	**3.23**	**0.82**
BRICS	**60 734**	**68 636**	**2.14**	**1.05**	**1 803**	**1 523**	**5.15**	**-2.27**	**814**	**916**	**2.20**	**0.58**

.. Not available

Note: Calendar year; except year ending 30 September New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Gross indigenous production.
4. Least-squares growth rate (see glossary).
5. Excludes trade of live animals.

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

Table A.27.2. Pigmeat projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[3]		FOOD (kg rwe/cap)[4]		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**117 354**	**130 699**	**1.66**	**0.90**	**12.3**	**12.2**	**0.46**	**-0.07**
NORTH AMERICA	10 264	11 664	0.92	0.76	22.3	23.5	0.15	0.05
Canada	786	795	-0.19	0.08	16.9	15.6	-1.21	-0.74
United States	9 478	10 869	1.02	0.81	22.9	24.4	0.28	0.11
LATIN AMERICA	8 105	10 149	3.20	1.86	9.9	11.3	2.04	1.00
Argentina	542	729	7.83	1.91	9.6	11.8	6.73	1.05
Brazil	3 087	3 831	2.46	2.01	11.6	13.4	1.54	1.40
Chile	417	524	1.22	1.97	18.2	21.2	0.33	1.29
Colombia	410	551	11.10	2.14	6.6	8.2	10.02	1.49
Mexico	1 985	2 446	3.52	1.46	12.1	13.3	2.07	0.39
Paraguay	178	219	2.51	1.93	20.6	22.4	1.16	0.80
EUROPE	26 687	27 132	0.23	0.12	28.0	28.5	0.12	0.14
European Union	21 054	20 826	-0.01	-0.09	32.3	31.7	-0.18	-0.15
Russia	3 678	4 173	1.67	0.79	19.9	22.9	1.59	0.95
Ukraine	705	772	-1.15	1.59	12.4	14.3	-0.66	2.13
AFRICA	1 624	2 067	2.88	2.42	1.0	1.0	0.26	0.03
Egypt	1	1	-0.40	2.85	0.0	0.0	..	..
Ethiopia	2	3	1.78	3.30	0.0	0.0	..	..
Nigeria	257	303	1.84	1.70	1.1	1.0	-0.84	-0.81
South Africa	262	330	-1.84	2.07	3.6	4.1	-3.14	1.03
ASIA	69 773	78 654	2.15	1.04	12.2	12.6	1.09	0.30
China[1]	54 305	60 403	2.24	0.92	30.2	32.7	1.70	0.72
India	358	388	-0.74	0.67	0.2	0.2	-1.96	-0.30
Indonesia	788	968	2.49	1.94	2.4	2.6	1.23	1.02
Iran	0	0	..	..	0.0	0.0	..	..
Japan	2 500	2 426	0.75	-0.47	15.3	15.4	0.84	-0.13
Kazakhstan	119	121	-9.31	0.62	5.1	4.7	-10.65	-0.25
Korea	1 891	1 985	3.22	0.50	29.0	29.5	2.80	0.23
Malaysia	241	268	1.57	0.89	6.0	5.8	-0.18	-0.33
Pakistan	0	0	..	..	0.0	0.0	..	..
Philippines	1 972	2 633	2.29	2.36	14.9	17.0	0.64	0.94
Saudi Arabia	8	10	0.84	0.00	0.2	0.2	-1.79	-1.43
Thailand	915	1 044	0.78	1.15	10.4	11.7	0.36	1.07
Turkey	8	9	58.73	2.07	0.1	0.1	..	..
Viet Nam	3 673	5 019	3.15	2.97	30.3	37.5	2.03	2.08
OCEANIA	900	1 033	2.57	1.56	17.9	17.8	0.98	0.31
Australia	678	780	2.85	1.66	21.9	22.2	1.33	0.53
New Zealand	105	120	2.64	1.16	17.6	18.3	1.55	0.35
DEVELOPED COUNTRIES	**40 773**	**42 739**	**0.43**	**0.30**	**22.6**	**22.9**	**0.01**	**0.02**
DEVELOPING COUNTRIES	**76 581**	**87 960**	**2.37**	**1.21**	**9.9**	**10.0**	**0.98**	**0.08**
LEAST DEVELOPED COUNTRIES (LDC)	1 957	2 500	5.34	2.33	1.9	1.9	2.88	0.07
OECD[2]	**39 307**	**41 211**	**0.65**	**0.30**	**23.2**	**23.2**	**0.08**	**-0.09**
BRICS	**61 690**	**69 124**	**2.18**	**0.97**	**15.3**	**16.1**	**1.32**	**0.41**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).
4. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.

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

Table A.28.1. Poultry meat projections: Production and trade

Calendar year

	PRODUCTION (kt rtc)		Growth (%)[3]		IMPORTS (kt rtc)		Growth (%)[3]		EXPORTS (kt rtc)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**118 083**	**139 016**	**3.03**	**1.33**	**12 459**	**15 716**	**2.34**	**1.99**	**12 455**	**15 820**	**2.75**	**1.97**
NORTH AMERICA	22 297	25 354	1.19	0.95	342	362	1.86	1.03	3 408	4 560	-0.45	2.31
Canada	1 338	1 555	1.43	1.20	265	288	0.77	1.31	170	194	-1.18	1.08
United States	20 959	23 799	1.18	0.94	77	73	6.94	0.00	3 238	4 366	-0.41	2.36
LATIN AMERICA	25 303	29 867	2.91	1.31	2 047	2 577	5.22	1.46	4 628	5 878	1.27	2.06
Argentina	2 107	2 682	4.55	1.73	11	6	-6.86	1.78	166	407	-0.55	5.70
Brazil	13 393	15 585	2.98	1.02	4	3	15.71	0.00	4 251	5 299	1.30	1.95
Chile	716	807	2.22	1.30	135	186	17.65	2.18	143	105	3.64	-2.13
Colombia	1 470	1 762	5.28	1.69	82	148	7.44	2.87	4	3	-12.15	-0.28
Mexico	3 082	3 835	2.11	1.86	863	902	6.71	0.69	2	6	-11.51	6.91
Paraguay	19	16	-2.19	-2.18	26	35	6.11	2.78	2	2	1.30	-2.67
EUROPE	20 920	22 852	4.27	0.53	1 559	1 580	-5.17	-0.46	1 964	2 471	9.11	1.80
European Union	14 312	15 350	2.86	0.37	857	1 002	0.01	0.91	1 454	1 813	5.47	1.96
Russia	4 767	5 356	9.43	0.59	247	99	-16.41	-8.86	111	207	48.89	4.30
Ukraine	1 054	1 190	4.02	1.27	218	243	-3.07	-0.33	227	270	43.32	0.33
AFRICA	5 799	7 264	3.86	2.30	1 789	2 558	7.62	3.00	125	96	15.93	-1.92
Egypt	1 227	1 679	6.58	3.00	18	20	-7.64	2.58	2	1	-2.47	-3.50
Ethiopia	61	84	2.51	3.34	0	0	..	..	0	0	..	..
Nigeria	292	348	2.19	1.99	0	0	..	..	0	0	..	..
South Africa	1 831	2 138	3.98	1.67	531	697	11.23	1.72	90	71	37.52	-1.55
ASIA	42 284	51 907	3.43	1.78	6 640	8 514	2.94	2.41	2 268	2 726	7.44	1.61
China[1]	18 632	22 933	2.21	1.72	488	528	-4.75	1.77	406	502	4.07	1.65
India	3 086	4 343	5.66	2.88	0	0	-4.44	4.40	5	1	8.89	-11.11
Indonesia	2 071	2 565	5.09	2.05	3	10	3.33	10.03	0	0	..	..
Iran	2 171	2 660	2.71	2.00	2	2	-27.01	-0.63	84	139	14.02	8.37
Japan	1 544	1 628	1.58	0.33	853	810	4.29	-1.45	9	13	3.02	3.35
Kazakhstan	160	206	11.32	2.20	145	213	1.66	3.22	1	1	-15.82	-0.32
Korea	874	952	5.15	1.08	144	200	6.75	2.98	22	4	-0.84	0.00
Malaysia	1 740	2 015	4.59	1.39	71	123	7.55	3.85	161	175	5.05	0.52
Pakistan	998	1 230	6.25	2.17	29	83	23.95	7.93	24	5	67.29	-13.38
Philippines	1 247	1 585	5.27	2.06	218	407	17.22	6.25	5	5	-2.16	-0.64
Saudi Arabia	646	844	2.38	2.30	920	1 057	5.85	1.69	71	62	41.74	-1.66
Thailand	2 080	2 618	7.48	1.74	6	6	10.20	0.64	969	1 304	6.30	2.13
Turkey	1 992	2 324	6.45	1.48	5	4	-3.61	0.24	401	415	18.57	0.72
Viet Nam	799	1 075	5.25	2.53	651	947	7.92	4.67	0	0	..	..
OCEANIA	1 480	1 773	4.32	1.63	81	124	7.33	3.57	61	89	7.50	1.36
Australia	1 242	1 509	4.24	1.87	0	0	..	..	41	74	3.51	4.18
New Zealand	212	235	5.21	0.29	0	0	..	..	20	15	24.45	-6.62
DEVELOPED COUNTRIES	**48 947**	**54 763**	**2.66**	**0.81**	**3 639**	**3 904**	**-0.47**	**0.14**	**5 550**	**7 216**	**2.47**	**2.05**
DEVELOPING COUNTRIES	**69 136**	**84 253**	**3.31**	**1.69**	**8 820**	**11 812**	**3.78**	**2.68**	**6 905**	**8 604**	**2.98**	**1.91**
LEAST DEVELOPED COUNTRIES (LDC)	2 646	3 273	5.30	2.14	843	1 405	7.32	4.15	19	15	6.37	-1.99
OECD[2]	**47 017**	**52 876**	**2.11**	**0.88**	**3 261**	**3 544**	**3.58**	**0.45**	**5 515**	**7 006**	**1.84**	**2.00**
BRICS	**41 711**	**50 356**	**3.43**	**1.46**	**1 270**	**1 328**	**-5.26**	**0.35**	**4 863**	**6 081**	**2.07**	**1.94**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.28.2. Poultry meat projections: Consumption, food

Calendar year

	CONSUMPTION (kt rtc)		Growth (%)[3]		FOOD (kg rwe/cap)[4]		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**118 018**	**138 921**	**2.98**	**1.34**	**13.9**	**14.7**	**1.77**	**0.36**
NORTH AMERICA	19 177	21 155	1.48	0.68	47.1	48.0	0.71	-0.04
Canada	1 429	1 649	1.62	1.23	34.7	36.5	0.59	0.41
United States	17 747	19 507	1.47	0.63	48.5	49.3	0.72	-0.07
LATIN AMERICA	22 722	26 566	3.47	1.17	31.4	33.3	2.31	0.31
Argentina	1 952	2 281	5.01	1.16	39.2	41.6	3.94	0.30
Brazil	9 146	10 289	3.83	0.57	38.8	40.7	2.89	-0.03
Chile	708	888	3.67	1.98	34.8	40.4	2.76	1.30
Colombia	1 547	1 907	5.49	1.78	28.0	32.0	4.46	1.13
Mexico	3 943	4 731	3.00	1.62	27.2	29.0	1.55	0.55
Paraguay	43	48	1.96	1.19	5.6	5.6	0.62	0.06
EUROPE	20 525	21 961	2.86	0.32	24.3	26.0	2.75	0.34
European Union	13 715	14 539	2.43	0.23	23.7	25.0	2.26	0.17
Russia	4 914	5 248	4.99	0.16	30.0	32.6	4.90	0.33
Ukraine	1 046	1 163	-0.20	1.14	20.7	24.4	0.29	1.67
AFRICA	7 463	9 726	4.54	2.53	5.4	5.4	1.88	0.14
Egypt	1 243	1 697	6.15	3.00	11.4	13.0	3.93	1.37
Ethiopia	61	84	2.45	3.34	0.5	0.6	-0.16	1.05
Nigeria	292	348	1.78	1.99	1.4	1.2	-0.89	-0.54
South Africa	2 271	2 764	4.79	1.78	35.7	38.7	3.40	0.75
ASIA	46 631	57 704	3.19	1.88	9.2	10.5	2.12	1.14
China[1]	18 715	22 959	1.92	1.72	11.7	14.0	1.38	1.51
India	3 081	4 343	5.66	2.89	2.0	2.6	4.36	1.90
Indonesia	2 074	2 575	5.08	2.07	7.0	7.8	3.78	1.16
Iran	2 089	2 523	2.21	1.75	22.9	25.3	0.97	1.00
Japan	2 368	2 436	2.40	-0.22	16.3	17.4	2.49	0.13
Kazakhstan	304	417	5.82	2.71	14.9	18.5	4.25	1.83
Korea	996	1 148	5.39	1.39	17.3	19.3	4.96	1.11
Malaysia	1 650	1 962	4.66	1.61	46.6	48.3	2.86	0.38
Pakistan	1 003	1 307	6.26	2.60	4.6	4.9	4.08	0.87
Philippines	1 459	1 986	6.52	2.80	12.4	14.5	4.81	1.37
Saudi Arabia	1 495	1 838	3.68	2.10	40.8	42.3	0.91	0.65
Thailand	1 113	1 319	8.74	1.37	14.2	16.7	8.29	1.28
Turkey	1 595	1 913	4.50	1.65	17.7	19.4	2.90	1.02
Viet Nam	1 449	2 022	6.01	3.48	13.5	17.1	4.86	2.59
OCEANIA	1 501	1 808	4.34	1.76	33.6	35.2	2.72	0.50
Australia	1 201	1 436	4.27	1.76	43.8	46.1	2.73	0.63
New Zealand	192	220	4.12	0.99	36.2	38.0	3.01	0.18
DEVELOPED COUNTRIES	**46 971**	**51 462**	**2.38**	**0.60**	**29.4**	**31.1**	**1.96**	**0.31**
DEVELOPING COUNTRIES	**71 047**	**87 458**	**3.40**	**1.80**	**10.3**	**11.2**	**2.00**	**0.67**
LEAST DEVELOPED COUNTRIES (LDC)	3 470	4 663	5.84	2.72	3.8	4.0	3.37	0.45
OECD[2]	**44 688**	**49 424**	**2.22**	**0.71**	**29.8**	**31.4**	**1.65**	**0.31**
BRICS	**38 127**	**45 603**	**3.17**	**1.37**	**10.7**	**12.0**	**2.31**	**0.80**

Note: Calendar year; except year ending 30 September for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).
4. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.

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

Table A.29.1. Sheep meat projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[3]		Growth (%)[4]		IMPORTS (kt cwe)[5]		Growth (%)[4]		EXPORTS (kt cwe)[5]		Growth (%)[4]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**14 417**	**17 430**	**1.31**	**1.79**	**968**	**1 052**	**1.70**	**0.78**	**1 058**	**1 193**	**1.44**	**1.32**
NORTH AMERICA	94	99	-0.95	0.63	119	115	2.34	-0.28	13	13	9.26	0.04
Canada	17	16	1.15	0.36	21	18	-0.65	-1.34	0	0	-6.88	0.36
United States	77	83	-1.36	0.69	98	97	3.11	-0.06	13	13	9.71	0.04
LATIN AMERICA	387	424	-0.14	0.80	26	21	-5.76	-1.95	16	19	-8.36	0.84
Argentina	62	68	1.47	0.78	0	0	0.26	0.00	2	2	-17.20	0.25
Brazil	118	128	1.11	0.63	6	5	-0.01	-0.31	0	0	..	..
Chile	15	14	-1.20	-1.36	0	0	..	..	5	4	-0.94	-4.36
Colombia	10	10	-1.60	0.04	0	0	..	..	0	0	..	..
Mexico	60	68	1.75	1.28	11	9	-9.32	-2.00	0	0	..	2.37
Paraguay	4	5	1.85	1.63	0	0	..	..	0	0	..	..
EUROPE	1 301	1 406	0.16	0.40	207	221	-4.44	0.62	31	31	14.22	-1.40
European Union	938	993	-0.85	0.23	195	212	-4.19	0.76	24	26	20.23	-0.48
Russia	215	251	2.60	0.86	4	1	-13.59	-10.95	0	..	..	..
Ukraine	15	19	-3.30	2.59	0	0	..	..	0	0	..	..
AFRICA	2 966	3 737	0.69	2.38	32	36	-4.62	1.55	32	35	3.31	1.70
Egypt	129	143	-1.19	1.00	1	0	-17.69	-0.04	0	0	..	..
Ethiopia	162	223	1.13	3.29	0	0	..	..	17	21	10.30	3.99
Nigeria	383	475	-0.44	2.43	0	0	..	..	0	0	..	..
South Africa	200	234	2.17	1.46	9	9	-6.29	0.49	1	1	17.86	-0.07
ASIA	8 478	10 367	2.03	1.88	556	629	6.83	1.10	38	16	-4.92	-7.97
China[1]	4 542	5 601	2.43	1.90	226	238	21.86	-0.11	2	4	-20.27	0.12
India	738	827	-0.95	1.24	0	0	..	..	22	6	-1.11	-12.34
Indonesia	106	135	-1.58	2.52	3	14	17.70	17.62	0	0	..	..
Iran	310	351	0.77	1.18	3	7	11.90	3.97	0	0	..	..
Japan	0	0	..	..	20	17	-8.53	-2.28	..	..	..	..
Kazakhstan	162	187	2.49	1.40	0	0	..	..	0	0	-12.61	-6.83
Korea	1	1	-4.24	0.00	12	11	15.81	0.94	0	0	..	..
Malaysia	1	1	1.01	1.15	34	44	8.88	2.30	0	0	1.53	..
Pakistan	477	596	1.64	2.23	0	0	..	..	8	1	-2.68	-23.61
Philippines	57	68	0.60	1.76	1	3	5.72	15.01	0	0	..	..
Saudi Arabia	0	0	..	..	51	52	-0.79	1.03	2	1	-4.48	-1.02
Thailand	2	2	2.61	1.08	2	2	10.95	2.38	0	0	..	..
Turkey	380	471	3.70	2.07	1	1	6.57	-6.11	0	0	..	..
Viet Nam	8	8	-1.20	0.28	1	5	-17.50	15.33	0	0	..	..
OCEANIA	1 191	1 396	0.14	1.48	28	29	-5.46	0.95	927	1 079	1.71	1.66
Australia	735	889	1.64	1.72	..	..	..	..	463	608	4.43	2.45
New Zealand	455	506	-1.96	1.07	5	4	-3.45	0.00	464	471	-0.58	0.72
DEVELOPED COUNTRIES	**3 502**	**4 045**	**0.95**	**1.23**	**362**	**373**	**-2.93**	**0.28**	**974**	**1 124**	**2.07**	**1.53**
DEVELOPING COUNTRIES	**10 915**	**13 385**	**1.44**	**1.96**	**606**	**679**	**5.42**	**1.06**	**84**	**69**	**-3.83**	**-1.67**
LEAST DEVELOPED COUNTRIES (LDC)	1 320	1 719	1.93	2.66	4	6	-2.92	2.56	0	0	..	..
OECD[2]	**2 721**	**3 086**	**0.21**	**1.08**	**372**	**382**	**-2.48**	**0.28**	**969**	**1 121**	**2.02**	**1.55**
BRICS	**5 813**	**7 042**	**1.92**	**1.75**	**244**	**253**	**15.62**	**-0.18**	**25**	**11**	**-4.59**	**-8.21**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Gross indigenous production.
4. Least-squares growth rate (see glossary).
5. Excludes trade of live animals.

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

Table A.29.2. Sheep meat projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[3]		FOOD (kg rwe/cap)[4]		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**14 436**	**17 410**	**1.47**	**1.78**	**1.7**	**1.8**	**0.28**	**0.79**
NORTH AMERICA	193	195	0.37	0.14	0.5	0.4	-0.39	-0.57
Canada	37	34	-0.33	-0.58	0.9	0.8	-1.35	-1.39
United States	156	160	0.55	0.31	0.4	0.4	-0.19	-0.39
LATIN AMERICA	403	433	-0.07	0.63	0.6	0.5	-1.19	-0.22
Argentina	60	66	2.92	0.80	1.2	1.2	1.87	-0.06
Brazil	125	134	0.97	0.60	0.5	0.5	0.06	0.00
Chile	10	10	-1.11	-0.05	0.5	0.5	-1.99	-0.72
Colombia	10	10	-1.77	0.05	0.2	0.2	-2.73	-0.59
Mexico	75	83	-0.62	0.79	0.5	0.5	-2.01	-0.27
Paraguay	4	5	1.84	1.63	0.5	0.6	0.50	0.50
EUROPE	1 428	1 562	-1.18	0.63	1.7	1.9	-1.28	0.64
European Union	1 061	1 148	-2.30	0.58	1.8	2.0	-2.46	0.52
Russia	219	250	2.18	0.67	1.3	1.5	2.09	0.83
Ukraine	15	19	-3.34	2.61	0.3	0.4	-2.86	3.15
AFRICA	2 898	3 698	0.56	2.48	2.1	2.0	-2.00	0.09
Egypt	129	143	-1.36	1.00	1.2	1.1	-3.42	-0.60
Ethiopia	145	201	0.46	3.22	1.2	1.3	-2.11	0.93
Nigeria	387	479	-0.42	2.39	1.8	1.7	-3.03	-0.15
South Africa	223	255	2.44	1.35	3.5	3.6	1.07	0.33
ASIA	9 225	11 231	2.48	1.84	1.8	2.0	1.42	1.09
China[1]	4 767	5 835	2.99	1.81	3.0	3.6	2.44	1.61
India	706	811	-0.87	1.45	0.5	0.5	-2.09	0.48
Indonesia	109	149	-1.21	3.35	0.4	0.5	-2.43	2.42
Iran	298	349	1.63	1.50	3.3	3.5	0.40	0.75
Japan	20	17	-8.53	-2.28	0.1	0.1	-8.44	-1.94
Kazakhstan	162	187	2.48	1.40	7.9	8.3	0.97	0.53
Korea	13	12	12.23	0.86	0.2	0.2	11.78	0.58
Malaysia	36	46	8.38	2.19	1.0	1.1	6.51	0.96
Pakistan	469	596	1.74	2.34	2.1	2.2	-0.34	0.62
Philippines	58	71	0.68	2.04	0.5	0.5	-0.94	0.62
Saudi Arabia	188	201	3.98	0.65	5.1	4.6	1.20	-0.79
Thailand	3	4	5.84	1.72	0.0	0.1	..	..
Turkey	381	472	3.53	2.06	4.2	4.8	1.95	1.43
Viet Nam	9	13	-5.43	3.72	0.1	0.1	..	2.78
OCEANIA	289	291	-2.06	0.42	6.5	5.7	-3.58	-0.82
Australia	235	246	-0.94	0.42	8.6	7.9	-2.41	-0.71
New Zealand	31	20	-4.34	-0.26	5.8	3.4	-5.36	-1.06
DEVELOPED COUNTRIES	**2 846**	**3 210**	**0.23**	**1.06**	**1.8**	**1.9**	**-0.18**	**0.77**
DEVELOPING COUNTRIES	**11 590**	**14 200**	**1.79**	**1.94**	**1.7**	**1.8**	**0.41**	**0.81**
LEAST DEVELOPED COUNTRIES (LDC)	1 274	1 701	1.87	2.85	1.4	1.5	-0.50	0.58
OECD[2]	**2 075**	**2 263**	**-0.93**	**0.78**	**1.4**	**1.4**	**-1.49**	**0.39**
BRICS	**6 039**	**7 284**	**2.38**	**1.69**	**1.7**	**1.9**	**1.52**	**1.13**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).
4. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.

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

Table A.30. Main policy assumptions for meat markets

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ARGENTINA												
Beef export tax	%	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CANADA												
Beef tariff-quota	kt pw	129.2	129.2	129.2	129.2	129.2	129.2	129.2	129.2	129.2	129.2	129.2
In-quota tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	%	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
Poultry meat tariff-quota	kt pw	89.6	95.7	96.9	98.1	99.3	100.5	101.6	102.8	104.0	105.2	106.4
In-quota tariff	%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Out-of-quota tariff	%	196.6	196.6	196.6	196.6	196.6	196.6	196.6	196.6	196.6	196.6	196.6
EUROPEAN UNION[1]												
Voluntary coupled support												
Beef and veal[2]	mln EUR	1 698	1 694	1 693	1 693	1 693	1 693	1 693	1 693	1 693	1 693	1 693
Sheep and goat meat[3]	mln EUR	481	487	491	496	496	496	496	496	496	496	496
Beef basic price[4]	EUR/kg dwt	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Beef buy-in price[4,5]	EUR/kg dwt	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Beef tariff-quota	kt cwe	332.7	350.6	359.8	369.0	378.3	387.5	389.0	390.6	392.2	392.7	393.2
Pig tariff-quota	kt cwe	167.5	190.1	203.5	216.9	230.3	245.7	246.6	247.5	248.4	249.3	250.2
Poultry tariff-quota	kt rtc	1 008.7	1 014.7	1 017.9	1 021.1	1 024.3	1 026.3	1 028.4	1 030.5	1 032.5	1 034.6	1 036.7
Sheep meat tariff-quota	kt cwe	294.7	295.6	296.1	296.3	296.5	296.7	296.9	297.1	297.1	297.5	297.7
JAPAN[6]												
Beef stabilisation prices												
Upper price	JPY/kg dwt	1 165.0	1 215.0	1 215.0	1 215.0	1 215.0	1 215.0	1 215.0	1 215.0	1 215.0	1 215.0	1 215.0
Lower price	JPY/kg dwt	885.0	900.0	900.0	900.0	900.0	900.0	900.0	900.0	900.0	900.0	900.0
Beef tariff	%	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
Pigmeat stabilisation prices												
Upper price	JPY/kg dwt	595.0	595.0	595.0	595.0	595.0	595.0	595.0	595.0	595.0	595.0	595.0
Lower price	JPY/kg dwt	441.7	440.0	440.0	440.0	440.0	440.0	440.0	440.0	440.0	440.0	440.0
Pig meat import system												
Tariff	%	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Standard import price	JPY/kg dwt	409.9	409.9	409.9	409.9	409.9	409.9	409.9	409.9	409.9	409.9	409.9
Poultry meat tariff	%	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
KOREA												
Beef tariff	%	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Pigmeat tariff	%	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8
Poultry meat tariff	%	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
MEXICO[7]												
Beef and veal tariff-quota	kt pw	220.0	220.0	220.0	..	..	..	..	..	..	..	..
In-quota tariff	%	0.0	0.0	0.0	..	..	..	..	..	..	..	..
Out-of-quota tariff[8]	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Poultry meat tariff-quota	kt pw	300.0	300.0	300.0	..	..	..	..	..	..	..	..
In-quota tariff	%	0.0	0.0	0.0	..	..	..	..	..	..	..	..
Out-of-quota tariff	%	100.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
RUSSIA												
Beef tariff-quota	kt pw	570.0	570.0	570.0	570.0	570.0	570.0	570.0	570.0	570.0	570.0	570.0
In-quota tariff	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Out-of-quota tariff	%	51.7	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Pigmeat tariff-quota[9]	kt pw	430.0	430.0	430.0	..	..	..	..	..	..	..	..
In-quota tariff	%	0.0	0.0	0.0	..	..	..	..	..	..	..	..
Out-of-quota tariff	%	65.0	65.0	65.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Poultry tariff-quota	kt pw	360.7	354.0	354.0	354.0	354.0	354.0	354.0	354.0	354.0	354.0	354.0
In-quota tariff	%	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Out-of-quota tariff	%	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
UNITED STATES												
Beef tariff-quota	kt pw	696.6	696.6	696.6	696.6	696.6	696.6	696.6	696.6	696.6	696.6	696.6
In-quota tariff	%	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Out-of-quota tariff	%	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4

Table A.30. Main policy assumptions for meat markets *(cont.)*

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CHINA												
Beef tariff	%	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Pigmeat tariff	%	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Sheep meat tariff	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Poultry meat tariff	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
INDIA												
Beef tariff	%	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5
Pigmeat tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Sheep meat tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Poultry meat tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
SOUTH AFRICA												
Sheep meat tariff-quota	kt pw	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
In-quota tariff	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Out-of-quota tariff	%	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Since 2015 the Basic payment scheme (BPS) holds, which shall account for 68% maximum of the national direct payment envelopes. On top of this, compulsory policy instruments have been introduced: the Green Payment (30%) and young farmer scheme (2%).
2. Implemented in 24 Member States.
3. Implemented in 22 Member States.
4. Price for R3 grade male cattle.
5. Safety-net trigger.
6. Year beginning 1 April.
7. Intended for countries which whom Mexico has no free trade agreements.
8. 25% for frozen beef.
9. Eliminated in 2020 and replaced by import tariff.

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

Table A.31.1. Butter projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**11 081**	**14 060**	**2.46**	**2.16**	**834**	**1 024**	**1.97**	**1.93**	**915**	**1 076**	**0.38**	**1.83**
NORTH AMERICA	931	1 107	1.80	1.63	43	26	11.78	-5.74	18	34	-10.25	5.75
Canada	93	118	1.33	1.00	18	7	15.01	0.00	0	0	-6.82	-15.99
United States	838	990	1.86	1.71	26	18	10.11	-7.32	18	34	-10.27	5.95
LATIN AMERICA	457	537	3.61	1.64	58	59	0.32	0.08	44	52	2.55	3.07
Argentina	38	54	-4.34	4.72	0	0	..	..	7	16	-8.63	8.14
Brazil	100	110	3.08	0.91	3	3	1.77	-0.58	2	1	-7.71	-0.25
Chile	23	30	3.42	2.25	5	6	36.86	-0.95	4	4	11.61	0.96
Colombia	21	27	0.42	2.23	0	0	..	..	0	0	..	..
Mexico	202	230	8.07	1.25	30	35	-1.24	1.48	12	12	..	..
Paraguay	0	0	..	..	0	0	4.83	0.00	0	0	2.89	0.04
EUROPE	2 960	3 289	1.26	1.04	119	180	-2.88	3.14	296	388	1.52	3.09
European Union	2 343	2 632	1.47	1.17	4	13	-28.18	0.98	187	254	0.54	3.85
Russia	314	326	-0.69	0.24	108	160	3.37	3.55	3	2	-4.81	0.00
Ukraine	104	125	4.26	1.54	1	1	-20.23	0.53	14	28	31.95	4.72
AFRICA	312	322	1.42	0.16	124	162	-1.32	3.35	8	7	-1.35	-1.29
Egypt	123	130	0.10	0.46	55	67	1.23	2.53	1	1	-19.08	-0.44
Ethiopia	18	21	12.78	1.93	0	0	..	..	0	0	..	..
Nigeria	13	15	2.02	1.27	6	9	-12.81	4.84	0	0	..	..
South Africa	12	16	0.23	3.30	5	5	7.53	-1.24	4	3	15.29	1.25
ASIA	5 700	8 027	3.20	3.03	451	535	4.33	1.77	37	40	-0.80	0.66
China[1]	98	124	-1.20	1.50	82	124	21.89	2.44	1	1	-13.04	1.00
India	4 170	5 866	3.82	3.05	4	3	-3.28	-3.85	8	12	-4.48	4.32
Indonesia	0	0	..	..	24	30	11.25	1.45	0	0	..	..
Iran	212	236	0.99	1.02	46	54	-1.75	2.50	1	1	0.34	-0.24
Japan	63	60	-2.52	-0.36	13	10	18.18	-2.34	0	0	..	..
Kazakhstan	13	14	-2.17	0.57	6	8	-1.41	0.72	0	0	..	..
Korea	3	6	0.52	8.33	8	13	7.78	2.84	0	0	..	..
Malaysia	0	0	..	..	20	21	7.27	0.33	8	9	14.49	-0.33
Pakistan	730	1 289	2.12	4.94	0	0	..	..	0	0	0.84	-1.44
Philippines	0	0	..	..	27	40	5.57	2.40	0	0	..	..
Saudi Arabia	5	4	-1.07	0.62	51	52	11.73	1.24	4	3	6.88	-1.23
Thailand	0	0	..	..	13	13	4.19	-0.37	1	1	18.13	0.37
Turkey	209	242	4.92	1.22	14	3	3.63	-10.05	0	0	3.52	0.90
Viet Nam	0	0	..	..	8	12	-1.62	4.69	0	0	..	..
OCEANIA	720	777	2.59	0.74	38	61	6.51	3.49	513	555	0.77	0.87
Australia	109	108	-2.94	-1.90	31	52	8.88	3.89	25	15	-13.06	-10.47
New Zealand	609	667	3.92	1.24	2	2	10.40	0.00	488	540	2.15	1.42
DEVELOPED COUNTRIES	**4 737**	**5 294**	**1.46**	**1.07**	**237**	**310**	**0.67**	**1.98**	**831**	**981**	**0.43**	**1.84**
DEVELOPING COUNTRIES	**6 343**	**8 766**	**3.26**	**2.88**	**597**	**714**	**2.73**	**1.91**	**84**	**95**	**0.09**	**1.75**
LEAST DEVELOPED COUNTRIES (LDC)	184	177	2.17	-0.62	15	31	9.42	11.78	2	2	8.48	-4.56
OECD[2]	**4 562**	**5 153**	**2.01**	**1.19**	**152**	**162**	**0.99**	**-0.10**	**738**	**864**	**0.20**	**1.83**
BRICS	**4 695**	**6 443**	**3.30**	**2.82**	**202**	**295**	**6.34**	**2.83**	**17**	**19**	**-3.73**	**2.71**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.31.2. Butter projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**11 005**	**14 008**	**2.60**	**2.18**	**1.5**	**1.7**	**1.40**	**1.20**
NORTH AMERICA	941	1 100	2.46	1.38	2.6	2.8	1.68	0.66
Canada	104	126	2.08	1.89	2.9	3.2	1.04	1.06
United States	837	974	2.51	1.31	2.6	2.8	1.76	0.61
LATIN AMERICA	477	545	3.68	1.19	0.7	0.8	2.51	0.34
Argentina	36	38	2.16	1.25	0.8	0.8	1.12	0.39
Brazil	101	112	3.23	0.87	0.5	0.5	2.30	0.27
Chile	24	32	5.39	1.77	1.4	1.6	4.45	1.09
Colombia	21	27	0.53	2.23	0.4	0.5	-0.45	1.57
Mexico	220	253	5.69	1.32	1.7	1.8	4.21	0.26
Paraguay	0	0	..	..	0.0	0.0	..	..
EUROPE	2 797	3 081	1.13	0.94	3.8	4.2	1.02	0.96
European Union	2 173	2 391	1.44	0.96	4.3	4.7	1.28	0.90
Russia	419	484	-0.02	1.22	2.9	3.4	-0.10	1.38
Ukraine	92	98	1.63	0.79	2.1	2.3	2.13	1.33
AFRICA	428	477	0.63	1.16	0.3	0.3	-1.93	-1.20
Egypt	177	195	0.77	1.13	1.9	1.7	-1.34	-0.47
Ethiopia	18	21	12.73	1.93	0.2	0.2	-2.60	-0.33
Nigeria	19	23	-6.08	2.47	0.1	0.1	-8.54	-0.07
South Africa	14	18	-0.34	2.22	0.2	0.3	-1.67	1.18
ASIA	6 113	8 522	3.32	2.96	1.4	1.8	2.25	2.21
China[1]	179	247	5.35	1.97	0.1	0.2	4.79	1.76
India	4 167	5 857	3.81	3.04	3.1	4.0	2.54	2.05
Indonesia	24	30	12.17	1.47	0.1	0.1	10.78	0.56
Iran	256	290	0.48	1.29	3.2	3.3	-0.73	0.54
Japan	75	69	-1.22	-0.66	0.6	0.6	-1.13	-0.32
Kazakhstan	19	22	-1.89	0.62	1.1	1.1	-3.34	-0.25
Korea	11	18	4.12	4.77	0.2	0.3	3.70	4.49
Malaysia	12	12	4.32	0.83	0.4	0.3	2.52	-0.39
Pakistan	730	1 288	2.12	4.94	3.8	5.5	0.03	3.18
Philippines	27	40	5.52	2.41	0.3	0.3	3.83	0.99
Saudi Arabia	52	53	9.82	1.37	1.6	1.4	6.88	-0.08
Thailand	12	12	3.57	-0.43	0.2	0.2	3.14	-0.51
Turkey	223	244	4.89	0.99	2.8	2.8	3.29	0.37
Viet Nam	8	12	-1.60	4.71	0.1	0.1	-2.68	3.81
OCEANIA	249	283	6.73	1.02	6.3	6.3	5.07	-0.23
Australia	118	145	5.81	1.53	4.9	5.3	4.25	0.40
New Zealand	123	129	9.84	0.49	26.5	25.3	8.67	-0.32
DEVELOPED COUNTRIES	**4 143**	**4 625**	**1.57**	**1.02**	**2.9**	**3.2**	**1.15**	**0.73**
DEVELOPING COUNTRIES	**6 861**	**9 384**	**3.28**	**2.81**	**1.1**	**1.4**	**1.88**	**1.66**
LEAST DEVELOPED COUNTRIES (LDC)	197	206	2.52	0.50	0.2	0.2	0.13	-1.72
OECD[2]	**3 976**	**4 451**	**2.30**	**1.07**	**3.0**	**3.2**	**1.72**	**0.67**
BRICS	**4 880**	**6 719**	**3.43**	**2.82**	**1.6**	**2.0**	**2.56**	**2.24**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.32.1. Cheese projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)3		IMPORTS (kt)		Growth (%)3		EXPORTS (kt)		Growth (%)3	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**22 809**	**26 507**	**1.58**	**1.25**	**2 364**	**2 924**	**3.93**	**1.85**	**2 430**	**3 036**	**2.58**	**1.78**
NORTH AMERICA	5 716	6 806	2.06	1.73	190	180	0.53	-2.05	329	434	14.70	5.59
Canada	450	530	2.58	1.38	24	31	1.36	1.38	13	0	4.38	-46.73
United States	5 266	6 275	2.01	1.76	166	148	0.38	-2.66	316	434	15.38	6.09
LATIN AMERICA	2 405	2 842	2.58	1.65	330	430	6.83	2.23	144	140	1.16	-0.53
Argentina	547	635	1.03	1.86	1	1	-15.19	0.00	45	52	0.72	1.74
Brazil	753	933	2.71	2.03	34	45	15.82	1.93	3	6	-8.59	5.48
Chile	94	125	5.15	2.52	35	46	23.26	0.65	6	6	-7.92	-0.61
Colombia	59	74	0.30	2.08	3	1	29.86	-8.74	0	0	..	..
Mexico	371	414	5.42	0.79	125	164	7.83	2.59	1	3	16.35	12.35
Paraguay	0	0	..	..	3	4	17.46	1.01	0	0	..	..
EUROPE	11 372	12 968	1.33	0.95	384	521	-3.03	2.40	1 097	1 523	3.57	2.31
European Union	10 057	11 471	1.26	0.93	61	59	-4.40	1.20	789	1 137	4.77	2.30
Russia	624	710	4.59	0.97	214	340	-4.76	3.25	14	10	-1.18	0.00
Ukraine	129	133	-8.47	0.25	7	20	-5.56	10.18	9	3	-26.65	-9.24
AFRICA	984	1 137	0.37	0.87	167	211	3.26	4.37	98	85	-5.95	-3.87
Egypt	642	728	0.27	0.73	32	35	3.72	4.72	66	59	-8.27	-4.51
Ethiopia	6	9	0.22	4.26	0	0	0.78	..	0	0	..	..
Nigeria	11	15	2.68	3.44	1	1	-22.23	5.62	0	0	..	..
South Africa	44	37	0.02	-2.19	13	22	13.45	6.39	9	6	27.69	-6.01
ASIA	1 614	1 936	1.26	1.54	1 172	1 438	7.43	1.92	263	280	-2.11	0.09
China1	252	317	-1.28	1.43	95	179	27.20	4.80	0	0	..	..
India	3	4	3.47	1.12	2	2	12.00	-0.51	5	7	11.11	0.51
Indonesia	0	0	..	..	23	34	8.39	2.95	2	2	15.60	-2.86
Iran	296	331	1.01	1.10	0	0	..	..	49	42	24.82	-2.66
Japan	47	49	0.86	0.30	247	254	3.72	0.30	0	0	..	..
Kazakhstan	26	31	5.34	0.18	20	22	-1.87	3.78	0	0	..	..
Korea	27	28	1.22	-0.27	114	163	11.42	3.61	0	0	..	..
Malaysia	0	0	..	..	22	30	11.51	2.73	0	0	..	..
Pakistan	0	0	..	..	4	5	15.98	4.61	0	0	..	..
Philippines	2	3	0.00	3.06	29	52	9.26	4.65	0	0	-22.61	..
Saudi Arabia	198	233	3.50	1.36	169	194	9.92	1.19	129	116	-6.89	-1.18
Thailand	5	2	0.00	-8.48	14	22	15.06	3.33	0	0	15.45	-3.22
Turkey	201	274	3.74	2.97	11	6	12.09	-4.52	46	81	10.44	4.74
Viet Nam	0	0	..	..	4	6	-1.07	4.56	0	0	..	..
OCEANIA	717	819	0.93	0.83	121	145	6.32	0.93	500	574	1.27	0.69
Australia	348	372	0.11	0.45	107	129	6.67	0.91	168	171	0.65	-0.33
New Zealand	369	447	1.78	1.16	8	9	5.36	0.00	332	403	1.66	1.16
DEVELOPED COUNTRIES	**18 174**	**21 005**	**1.54**	**1.19**	**999**	**1 172**	**0.38**	**1.03**	**1 944**	**2 546**	**4.28**	**2.36**
DEVELOPING COUNTRIES	**4 635**	**5 502**	**1.74**	**1.51**	**1 365**	**1 752**	**7.48**	**2.44**	**486**	**490**	**-2.50**	**-0.81**
LEAST DEVELOPED COUNTRIES (LDC)	186	241	2.55	2.01	27	57	9.97	14.95	0	0	..	..
OECD2	**17 622**	**20 365**	**1.61**	**1.19**	**975**	**1 107**	**4.34**	**0.84**	**1 749**	**2 300**	**4.79**	**2.34**
BRICS	**1 676**	**2 001**	**2.57**	**1.45**	**359**	**588**	**0.35**	**3.69**	**31**	**28**	**3.48**	**-0.65**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.32.2. Cheese projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**22 705**	**26 376**	**1.70**	**1.24**	**3.0**	**3.2**	**0.51**	**0.27**
NORTH AMERICA	5 526	6 532	1.49	1.33	15.4	16.8	0.72	0.62
Canada	451	560	2.04	1.62	12.4	14.1	1.00	0.79
United States	5 075	5 971	1.45	1.31	15.8	17.2	0.70	0.60
LATIN AMERICA	2 591	3 132	3.14	1.84	4.1	4.5	1.98	0.98
Argentina	502	583	0.99	1.86	11.5	12.1	-0.04	1.00
Brazil	784	972	3.08	2.01	3.8	4.4	2.16	1.40
Chile	123	164	9.95	2.10	6.9	8.5	8.98	1.42
Colombia	61	75	1.33	1.87	1.3	1.4	0.33	1.22
Mexico	494	575	5.98	1.24	3.9	4.0	4.49	0.17
Paraguay	3	4	21.37	1.12	0.4	0.5	16.50	0.00
EUROPE	10 675	11 965	0.95	0.84	14.4	16.1	0.84	0.86
European Union	9 344	10 393	0.98	0.80	18.4	20.3	0.81	0.74
Russia	825	1 039	1.40	1.67	5.7	7.3	1.31	1.84
Ukraine	128	151	-4.19	1.50	2.9	3.6	-3.72	2.03
AFRICA	1 054	1 262	1.65	1.81	0.9	0.8	-0.93	-0.57
Egypt	607	705	2.03	1.51	6.4	6.1	-0.10	-0.10
Ethiopia	6	10	0.23	4.35	0.1	0.1	-2.33	2.05
Nigeria	11	16	-6.09	3.53	0.1	0.1	-8.56	0.97
South Africa	47	53	-0.04	1.17	0.8	0.8	-1.37	0.15
ASIA	2 522	3 094	4.27	1.86	0.6	0.6	3.19	1.11
China[1]	347	496	2.44	2.55	0.2	0.3	1.89	2.34
India	0	0	..	..	0.0	0.0	..	..
Indonesia	21	32	7.74	3.48	0.1	0.1	6.41	2.55
Iran	247	289	-0.94	1.80	3.1	3.3	-2.14	1.05
Japan	294	303	3.22	0.30	2.3	2.5	3.31	0.65
Kazakhstan	46	53	1.96	1.50	2.6	2.6	0.45	0.62
Korea	140	191	8.70	2.95	2.8	3.6	8.26	2.67
Malaysia	21	30	11.46	2.82	0.7	0.8	9.54	1.58
Pakistan	4	5	16.01	4.61	0.0	0.0	..	..
Philippines	31	55	10.63	4.58	0.3	0.5	8.85	3.13
Saudi Arabia	238	310	30.78	2.39	7.4	8.1	27.28	0.93
Thailand	18	24	9.27	1.76	0.3	0.3	8.82	1.68
Turkey	166	198	2.69	2.00	2.1	2.3	1.12	1.38
Viet Nam	4	6	-1.06	4.56	0.0	0.1	..	..
OCEANIA	337	391	1.95	1.07	8.6	8.6	0.37	-0.18
Australia	285	330	1.73	1.06	11.8	12.0	0.22	-0.07
New Zealand	45	53	3.41	1.00	9.7	10.4	2.31	0.19
DEVELOPED COUNTRIES	**17 192**	**19 611**	**1.19**	**1.01**	**12.2**	**13.5**	**0.77**	**0.73**
DEVELOPING COUNTRIES	**5 513**	**6 764**	**3.45**	**1.94**	**0.9**	**1.0**	**2.05**	**0.80**
LEAST DEVELOPED COUNTRIES (LDC)	213	299	3.29	3.56	0.3	0.3	0.88	1.27
OECD[2]	**16 811**	**19 153**	**1.46**	**1.02**	**12.7**	**13.8**	**0.89**	**0.62**
BRICS	**2 004**	**2 560**	**2.12**	**1.95**	**0.6**	**0.8**	**1.26**	**1.39**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.33.1. Skim milk powder projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**4 505**	**5 163**	**3.87**	**1.31**	**2 248**	**2 787**	**7.08**	**1.61**	**2 308**	**2 848**	**8.25**	**1.57**
NORTH AMERICA	1 153	1 355	3.36	1.26	2	2	-5.41	-2.35	610	814	8.99	2.23
Canada	102	115	2.83	-1.06	1	1	-9.72	-7.03	28	39	15.59	-2.40
United States	1 051	1 239	3.41	1.51	1	1	14.19	2.24	582	775	8.72	2.54
LATIN AMERICA	298	371	4.20	2.09	398	432	6.49	0.05	88	145	13.58	0.92
Argentina	38	47	3.40	2.80	0	0	..	..	25	33	7.72	3.16
Brazil	155	184	2.87	1.61	21	21	17.18	0.56	0	0	..	..
Chile	28	40	11.99	2.77	11	9	10.36	-2.17	1	1	-4.72	1.39
Colombia	4	6	-5.60	4.62	10	12	47.08	0.42	0	0	..	..
Mexico	43	57	9.76	2.44	288	318	6.31	0.17	40	87	99.69	0.00
Paraguay	0	0	..	..	0	0	..	..	0	0	..	..
EUROPE	1 858	2 065	5.69	1.19	170	188	25.31	-0.52	846	1 034	13.81	1.50
European Union	1 530	1 687	6.79	1.19	3	2	-4.53	-1.02	686	844	18.13	1.52
Russia	70	65	-0.46	-1.97	135	156	35.78	-0.53	1	1	12.68	-3.61
Ukraine	112	132	0.02	1.36	0	0	-22.38	0.17	34	29	2.42	-2.16
AFRICA	19	27	0.11	3.65	361	463	4.60	2.53	11	12	4.97	1.10
Egypt	0	0	..	..	77	109	10.40	3.72	0	0	..	..
Ethiopia	0	0	..	..	0	0	-12.13	..	0	0	..	..
Nigeria	0	0	..	..	48	65	6.91	2.55	0	0	..	..
South Africa	15	22	0.16	4.00	7	6	9.84	-2.67	6	9	11.04	2.74
ASIA	417	487	0.69	1.54	1 304	1 689	6.75	2.08	146	146	8.23	-0.65
China[1]	40	35	-4.32	-0.40	200	351	16.70	4.85	1	0	-1.97	0.00
India	222	286	5.67	2.28	0	0	-31.65	-0.50	15	8	-1.44	-3.15
Indonesia	0	0	..	..	156	205	6.75	2.19	1	1	3.16	-2.14
Iran	0	0	..	..	16	30	7.95	0.00	16	30	23.89	0.00
Japan	125	116	-3.52	-0.65	38	35	3.28	-0.54	0	0	..	..
Kazakhstan	3	2	-0.86	-1.79	16	23	8.70	1.59	0	0	..	..
Korea	12	25	-1.45	8.94	21	19	14.11	-0.92	0	0	..	..
Malaysia	0	0	..	..	139	145	7.38	0.94	36	30	26.77	-0.93
Pakistan	0	0	..	..	44	63	22.06	3.37	1	1	0.12	-3.26
Philippines	0	0	..	..	149	202	5.66	1.49	0	0	..	..
Saudi Arabia	0	0	..	..	59	66	2.36	1.48	11	9	12.98	-1.45
Thailand	0	0	..	..	68	61	1.88	-0.43	6	9	20.55	0.43
Turkey	0	0	..	..	34	39	16.28	0.00	34	39	91.78	0.00
Viet Nam	0	0	..	..	45	68	1.77	4.14	0	0	..	..
OCEANIA	760	858	2.67	1.18	14	14	9.71	0.25	608	697	2.47	1.59
Australia	234	248	1.49	1.05	8	8	8.85	0.00	163	176	1.51	2.62
New Zealand	526	610	3.27	1.23	4	4	12.30	0.00	445	521	2.89	1.27
DEVELOPED COUNTRIES	**3 924**	**4 432**	**3.91**	**1.17**	**260**	**281**	**14.66**	**-0.38**	**2 071**	**2 555**	**8.05**	**1.75**
DEVELOPING COUNTRIES	**581**	**731**	**3.63**	**2.22**	**1 987**	**2 506**	**6.35**	**1.85**	**237**	**292**	**9.97**	**0.08**
LEAST DEVELOPED COUNTRIES (LDC)	0	0	..	..	102	144	10.40	2.74	3	2	4.62	-2.25
OECD[2]	**3 688**	**4 184**	**4.17**	**1.22**	**439**	**463**	**7.47**	**-0.07**	**1 992**	**2 497**	**8.86**	**1.67**
BRICS	**502**	**593**	**2.58**	**1.40**	**364**	**533**	**19.56**	**2.70**	**23**	**18**	**1.14**	**-0.67**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.33.2. Skim milk powder projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**4 348**	**5 096**	**3.45**	**1.13**	**0.6**	**0.6**	**3.14**	**0.37**
NORTH AMERICA	534	543	-0.82	0.01	1.4	1.3	-0.56	-0.64
Canada	64	77	-1.62	0.03	0.6	0.6	-9.16	0.54
United States	470	466	-0.71	0.00	1.5	1.3	0.08	-0.69
LATIN AMERICA	608	658	4.68	0.95	0.9	0.8	3.55	-0.02
Argentina	13	14	2.82	1.97	0.3	0.3	1.77	1.11
Brazil	176	205	3.82	1.50	0.6	0.6	2.74	0.64
Chile	38	48	13.60	1.61	2.1	2.5	12.60	0.94
Colombia	14	18	23.00	1.66	0.3	0.3	9.68	1.01
Mexico	291	288	4.79	0.64	2.3	2.0	3.31	-0.42
Paraguay	0	0	-13.44	1.12	0.0	0.0	..	..
EUROPE	1 096	1 219	3.06	-0.04	1.3	1.5	5.83	0.67
European Union	761	845	1.63	-0.14	1.3	1.5	5.29	0.83
Russia	204	220	11.77	-0.97	1.4	1.5	11.68	-0.81
Ukraine	78	103	-0.91	2.65	1.8	2.5	-0.42	3.19
AFRICA	369	478	4.34	2.63	0.3	0.3	1.68	0.23
Egypt	77	109	10.58	3.72	0.8	0.9	8.27	2.08
Ethiopia	0	0	-12.02	2.26	0.0	0.0	..	..
Nigeria	48	65	7.19	2.55	0.3	0.3	4.38	0.01
South Africa	17	20	0.38	1.98	0.3	0.3	-0.96	0.95
ASIA	1 572	2 023	4.70	2.10	0.3	0.4	3.69	1.40
China[1]	240	386	10.30	4.25	0.2	0.3	8.09	4.04
India	207	278	5.39	2.49	0.2	0.2	4.65	1.50
Indonesia	155	204	6.79	2.21	0.6	0.7	5.47	1.30
Iran	0	0	..	..	0.0	0.0	..	..
Japan	162	152	-1.99	-0.58	1.1	1.0	-2.46	-0.13
Kazakhstan	19	25	7.67	1.22	1.0	1.3	6.07	0.34
Korea	32	37	3.52	-0.28	0.6	0.7	3.11	-0.55
Malaysia	103	115	4.05	1.49	3.3	3.2	2.26	0.26
Pakistan	44	62	22.85	3.46	0.2	0.3	10.73	1.72
Philippines	149	202	5.68	1.49	1.4	1.7	3.98	0.08
Saudi Arabia	48	57	8.02	2.00	1.5	1.5	5.13	0.55
Thailand	62	52	0.69	-0.57	0.9	0.7	0.27	-0.65
Turkey	0	0	..	..	0.0	0.0	..	..
Viet Nam	44	68	1.86	4.17	0.5	0.7	0.75	3.27
OCEANIA	169	174	6.01	-0.37	4.3	3.9	4.36	-1.60
Australia	83	79	5.89	-1.77	3.4	2.9	4.33	-2.87
New Zealand	85	93	6.37	0.99	18.2	18.2	5.24	0.18
DEVELOPED COUNTRIES	**2 018**	**2 158**	**1.63**	**-0.05**	**1.3**	**1.4**	**2.84**	**0.08**
DEVELOPING COUNTRIES	**2 331**	**2 938**	**5.30**	**2.08**	**0.4**	**0.4**	**3.90**	**0.95**
LEAST DEVELOPED COUNTRIES (LDC)	99	141	10.61	2.85	0.1	0.1	2.49	0.58
OECD[2]	**2 039**	**2 143**	**1.47**	**0.01**	**1.4**	**1.4**	**2.48**	**0.04**
BRICS	**844**	**1 109**	**7.59**	**2.05**	**0.3**	**0.3**	**6.94**	**1.48**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.34.1. Whole milk powder projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**5 317**	**6 346**	**3.46**	**1.57**	**2 365**	**2 691**	**2.65**	**1.27**	**2 461**	**2 691**	**3.20**	**1.27**
NORTH AMERICA	55	56	5.90	1.19	17	21	1.17	0.00	20	28	5.51	2.87
Canada	9	8	-3.69	-1.03	2	2	-11.77	0.00	1	1	4.13	0.00
United States	47	48	8.93	1.62	14	19	6.01	0.00	20	27	5.57	2.95
LATIN AMERICA	1 415	1 983	2.30	2.60	336	264	-2.28	-2.22	310	389	2.50	2.51
Argentina	211	320	-0.09	3.23	1	1	-3.06	0.00	128	208	0.00	4.46
Brazil	563	811	1.24	3.24	99	52	11.27	-6.77	24	41	5.68	9.61
Chile	70	60	-2.87	-1.57	8	22	32.97	9.84	6	2	-9.39	-8.96
Colombia	41	70	0.24	4.55	22	12	63.24	-6.12	3	3	4.76	5.91
Mexico	218	254	0.80	1.23	38	10	7.92	-10.79	12	3	10.27	-13.88
Paraguay	0	0	..	..	1	1	7.09	0.00	1	1	-7.31	0.01
EUROPE	821	981	-0.86	1.83	51	43	23.63	-2.81	417	471	-2.73	1.81
European Union	722	854	-0.04	1.73	4	4	15.68	0.00	381	429	-2.65	1.64
Russia	27	47	-11.69	2.05	45	37	31.51	-3.22	1	0	5.83	..
Ukraine	7	4	-10.50	-2.04	0	0	-23.97	11.71	2	1	-16.86	-10.48
AFRICA	25	24	-0.24	-1.42	574	756	1.31	2.49	20	15	7.23	-3.08
Egypt	0	0	..	..	45	67	10.05	3.89	5	4	21.14	-3.74
Ethiopia	0	0	..	..	1	1	-5.50	2.26	0	0	..	..
Nigeria	0	0	..	..	89	120	-3.52	3.49	1	1	21.82	-3.37
South Africa	15	15	-0.44	0.22	4	5	9.00	3.09	6	4	6.48	-3.00
ASIA	1 573	1 746	4.38	0.74	1 357	1 576	4.68	1.61	281	248	-2.53	-0.57
China[1]	1 464	1 609	4.53	0.63	398	570	18.18	2.62	3	2	-20.46	0.01
India	5	7	2.82	3.90	0	0	..	..	1	3	-10.69	5.50
Indonesia	75	92	4.58	2.20	48	61	-3.35	1.68	2	1	-30.04	-0.77
Iran	1	1	0.29	1.10	3	2	-8.34	0.01	2	2	3.14	0.05
Japan	11	13	-3.43	2.60	0	0	-6.37	0.00	0	0	..	..
Kazakhstan	15	17	0.56	1.03	3	4	-2.28	3.65	0	0	..	..
Korea	2	5	-2.34	6.56	3	4	11.68	-1.15	0	0	..	..
Malaysia	0	0	..	..	39	38	1.01	0.07	25	24	0.77	-0.07
Pakistan	0	0	..	..	4	5	-6.20	2.00	1	1	-8.33	-1.96
Philippines	0	0	..	..	36	28	-5.05	1.65	18	4	-15.75	-1.62
Saudi Arabia	0	0	..	..	121	127	4.59	1.56	21	20	-1.67	-1.54
Thailand	0	0	..	..	47	49	8.38	-0.09	2	2	-11.09	0.09
Turkey	0	0	..	..	0	0	-26.93	0.00	0	0	..	..
Viet Nam	0	0	..	..	25	19	-5.91	0.74	9	9	27.78	-0.74
OCEANIA	1 427	1 556	7.21	1.19	29	31	7.10	-0.26	1 414	1 541	7.77	1.17
Australia	57	53	-11.62	-0.48	18	19	9.28	-0.64	57	53	-8.23	-0.92
New Zealand	1 370	1 503	9.26	1.25	4	5	25.01	0.00	1 356	1 487	9.23	1.25
DEVELOPED COUNTRIES	**2 344**	**2 640**	**3.53**	**1.42**	**103**	**105**	**10.22**	**-1.06**	**1 857**	**2 043**	**4.47**	**1.32**
DEVELOPING COUNTRIES	**2 973**	**3 706**	**3.40**	**1.67**	**2 261**	**2 586**	**2.39**	**1.38**	**605**	**648**	**0.00**	**1.11**
LEAST DEVELOPED COUNTRIES (LDC)	2	3	0.19	1.13	168	217	2.00	3.15	7	5	6.36	-2.69
OECD[2]	**2 523**	**2 816**	**3.54**	**1.30**	**97**	**91**	**6.17**	**-0.74**	**1 834**	**2 003**	**4.61**	**1.21**
BRICS	**2 073**	**2 490**	**3.10**	**1.44**	**546**	**664**	**17.14**	**1.09**	**35**	**49**	**-3.40**	**6.14**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.34.2. Whole milk powder projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[3]		FOOD (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**5 227**	**6 347**	**3.21**	**1.57**	**0.7**	**0.8**	**-0.05**	**0.60**
NORTH AMERICA	53	50	3.73	0.57	0.1	0.1	0.83	-0.14
Canada	10	10	-7.06	-0.85	0.3	0.3	-8.01	-1.66
United States	42	40	9.58	0.97	0.1	0.1	-12.55	0.26
LATIN AMERICA	1 442	1 857	0.98	1.78	2.3	2.6	-0.15	0.92
Argentina	84	113	0.15	1.23	1.9	2.3	-0.88	0.38
Brazil	638	822	2.66	2.01	3.1	3.7	1.73	1.40
Chile	72	80	-0.72	0.83	4.0	4.2	-1.60	0.16
Colombia	60	79	6.33	1.97	1.2	1.5	5.29	1.32
Mexico	244	261	1.32	0.77	1.9	1.8	-0.10	-0.29
Paraguay	0	0	..	..	0.0	0.0	..	..
EUROPE	455	553	2.62	1.40	0.6	0.7	2.51	1.42
European Union	345	429	3.67	1.80	0.7	0.8	3.50	1.75
Russia	71	84	0.32	-0.38	0.5	0.6	0.23	-0.21
Ukraine	4	3	-2.48	2.59	0.1	0.1	-3.71	..
AFRICA	579	766	1.07	2.49	0.5	0.5	-1.50	0.09
Egypt	40	63	9.53	4.70	0.4	0.5	7.24	3.04
Ethiopia	1	1	-5.53	2.26	0.0	0.0	..	..
Nigeria	87	119	-3.67	3.57	0.5	0.5	-6.20	1.00
South Africa	13	17	-1.35	2.01	0.2	0.3	-2.66	0.98
ASIA	2 650	3 075	5.59	1.30	0.6	0.6	4.49	0.56
China[1]	1 859	2 177	6.64	1.11	1.3	1.5	6.08	0.91
India	4	5	35.99	3.00	0.0	0.0	..	..
Indonesia	121	152	4.23	1.99	0.5	0.5	2.95	1.08
Iran	1	1	-17.24	0.74	0.0	0.0	..	..
Japan	11	13	-3.33	2.58	0.1	0.1	-3.24	2.94
Kazakhstan	18	21	-0.32	1.44	1.0	1.1	-1.80	0.56
Korea	5	9	1.96	4.03	0.1	0.2	1.29	3.75
Malaysia	15	13	3.05	0.34	0.5	0.4	1.28	-0.87
Pakistan	3	4	-5.81	2.92	0.0	0.0	..	..
Philippines	19	24	23.75	2.40	0.2	0.2	3.80	0.97
Saudi Arabia	100	108	7.12	2.25	3.1	2.8	4.25	0.79
Thailand	45	47	11.09	-0.10	0.7	0.7	10.63	-0.18
Turkey	0	0	..	..	0.0	0.0	..	..
Viet Nam	15	9	-12.15	2.44	0.2	0.1	-8.78	..
OCEANIA	48	45	-1.18	0.86	1.2	1.0	-10.56	-0.39
Australia	25	19	-6.14	0.72	1.0	0.7	-7.53	-0.41
New Zealand	17	20	14.79	1.04	3.6	3.9	5.32	0.23
DEVELOPED COUNTRIES	**598**	**701**	**1.94**	**1.34**	**0.4**	**0.5**	**-0.53**	**1.05**
DEVELOPING COUNTRIES	**4 629**	**5 645**	**3.39**	**1.60**	**0.8**	**0.8**	**1.98**	**0.47**
LEAST DEVELOPED COUNTRIES (LDC)	164	216	1.82	3.29	0.2	0.2	-0.56	1.01
OECD[2]	**793**	**906**	**1.75**	**1.33**	**0.6**	**0.7**	**-1.38**	**0.93**
BRICS	**2 584**	**3 104**	**5.31**	**1.31**	**0.8**	**0.9**	**4.42**	**0.74**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.35. Fresh dairy products projections: Production and food consumption

Calendar year

	PRODUCTION (kt)		Growth (%)[3]		FOOD CONSUMPTION (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**415 523**	**520 846**	**2.09**	**2.19**	**55.4**	**62.3**	**0.89**	**1.22**
NORTH AMERICA	26 625	25 289	-1.31	-0.38	74.3	65.2	-2.07	-1.09
Canada	2 909	3 099	-0.94	0.78	80.2	77.9	-1.95	-0.04
United States	23 716	22 190	-1.36	-0.53	73.6	63.8	-2.08	-1.22
LATIN AMERICA	33 864	39 736	0.20	1.63	52.7	56.2	-0.92	0.78
Argentina	1 601	1 657	-0.76	0.50	29.7	27.8	-2.02	-0.40
Brazil	14 856	18 821	2.67	2.27	71.6	84.6	1.75	1.65
Chile	487	652	-11.66	2.80	27.2	33.7	-12.45	2.12
Colombia	5 914	6 824	0.75	1.22	121.6	130.2	-0.24	0.57
Mexico	3 520	3 344	-1.99	-0.52	27.6	23.3	-3.37	-1.57
Paraguay	533	737	1.91	2.96	79.2	96.7	0.57	1.82
EUROPE	79 324	77 311	-0.67	-0.15	104.1	100.5	-0.93	-0.13
European Union	46 493	45 900	-0.09	-0.20	89.2	86.2	-0.50	-0.25
Russia	16 007	15 189	-1.63	-0.58	111.2	107.1	-1.71	-0.42
Ukraine	7 406	8 413	-1.47	1.51	166.6	200.5	-0.98	2.05
AFRICA	35 484	45 412	0.97	3.03	29.0	28.5	-1.60	0.62
Egypt	1 373	2 290	-1.61	5.08	14.4	20.0	-3.67	3.41
Ethiopia	3 215	5 184	-0.62	5.05	31.4	39.4	-3.16	2.73
Nigeria	250	319	4.27	2.44	1.3	1.3	1.53	-0.09
South Africa	2 628	2 991	0.53	1.21	46.9	47.6	-0.80	0.18
ASIA	237 125	329 571	4.20	3.04	53.3	68.0	3.16	2.29
China[1]	28 367	35 958	-1.12	1.82	20.6	25.4	-1.35	1.60
India	108 248	171 620	5.18	4.29	81.7	116.2	3.89	3.29
Indonesia	767	903	-1.59	1.57	2.9	3.1	-2.81	0.66
Iran	494	626	-14.72	1.71	6.2	7.1	-15.76	0.96
Japan	4 242	4 361	-1.06	0.30	33.2	35.4	-0.97	0.65
Kazakhstan	4 605	5 827	-0.44	2.30	256.1	292.9	-1.91	1.42
Korea	1 351	1 350	-0.15	-0.24	26.6	25.7	-0.55	-0.52
Malaysia	86	111	2.81	2.45	2.8	3.1	1.04	1.21
Pakistan	44 345	54 196	7.61	1.93	229.5	231.7	5.40	0.21
Philippines	8	11	-0.72	1.53	0.1	0.1	-2.32	0.12
Saudi Arabia	1 078	1 490	8.31	2.99	33.4	39.0	5.41	1.52
Thailand	1 050	1 219	3.75	1.10	15.2	17.5	3.32	1.02
Turkey	14 314	17 691	6.99	2.05	180.0	203.4	5.35	1.42
Viet Nam	620	917	10.28	3.59	6.6	8.8	9.08	2.69
OCEANIA	3 100	3 527	1.61	0.95	72.1	70.9	-0.46	-0.29
Australia	2 570	2 923	1.35	1.00	106.5	106.6	-0.16	-0.13
New Zealand	507	579	3.33	0.68	50.7	50.0	-1.75	-0.26
DEVELOPED COUNTRIES	**136 345**	**138 997**	**-0.22**	**0.24**	**95.2**	**93.4**	**-0.73**	**-0.03**
DEVELOPING COUNTRIES	**279 178**	**381 849**	**3.40**	**3.01**	**46.2**	**55.6**	**2.03**	**1.86**
LEAST DEVELOPED COUNTRIES (LDC)	19 535	23 044	3.67	2.69	24.6	22.6	1.25	0.42
OECD[2]	**102 201**	**104 205**	**0.21**	**0.17**	**75.6**	**73.2**	**-0.47**	**-0.21**
BRICS	**170 106**	**244 579**	**2.87**	**3.33**	**54.4**	**73.3**	**2.05**	**2.75**

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.36. Milk projections: Production, inventories, yield

Calendar year

	PRODUCTION (kt)		Growth (%)³		INVENTORIES ('000 hd)		Growth (%)³		YIELD (t/head)		Growth (%)³	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**817 718**	**993 610**	**2.08**	**1.84**	**710 256**	**806 131**	**1.66**	**0.95**	**1.15**	**1.23**	**0.42**	**0.88**
NORTH AMERICA	105 814	116 027	1.56	0.74	10 293	10 241	0.15	-0.11	10.28	11.33	1.40	0.85
Canada	9 577	11 241	1.94	1.16	947	944	-0.24	-0.16	10.11	11.91	2.19	1.32
United States	96 237	104 786	1.52	0.69	9 345	9 297	0.20	-0.11	10.30	11.27	1.33	0.80
LATIN AMERICA	75 066	88 822	0.39	1.67	50 790	52 252	1.38	0.24	1.48	1.70	-0.98	1.43
Argentina	10 308	11 396	0.09	1.34	2 306	2 408	-0.28	0.66	4.46	4.73	0.36	0.68
Brazil	28 771	35 884	0.10	2.18	25 141	25 572	1.76	0.21	1.17	1.40	-1.39	1.97
Chile	2 038	2 486	-2.95	1.72	1 262	1 272	-1.39	-0.04	1.61	1.95	-1.58	1.76
Colombia	7 000	8 323	0.67	1.49	6 662	7 145	4.66	0.20	1.05	1.16	-3.81	1.29
Mexico	12 080	13 105	1.42	0.71	2 482	2 630	0.75	0.51	4.87	4.98	0.66	0.20
Paraguay	533	737	1.92	2.96	239	294	2.59	1.42	2.23	2.51	-0.65	1.52
EUROPE	223 040	237 143	0.70	0.58	42 626	39 722	-0.71	-0.62	5.23	5.97	1.42	1.20
European Union	163 256	176 719	1.22	0.66	23 213	21 928	-0.40	-0.49	6.93	7.99	1.77	1.21
Russia	30 687	30 645	-0.74	0.05	8 305	7 388	-1.20	-1.05	3.70	4.15	0.47	1.11
Ukraine	10 443	11 884	-1.33	1.42	3 159	3 232	-2.88	0.42	3.31	3.68	1.59	0.99
AFRICA	45 772	56 177	0.95	2.47	236 765	273 361	2.00	1.01	0.19	0.21	-1.03	1.45
Egypt	5 623	6 710	-0.46	1.89	6 816	7 152	0.96	0.42	0.82	0.94	-1.41	1.46
Ethiopia	3 603	5 662	-0.11	4.77	16 078	23 075	3.72	3.23	0.22	0.25	-3.69	1.49
Nigeria	576	724	2.99	2.06	2 526	2 910	4.36	0.61	0.23	0.25	-1.32	1.44
South Africa	3 253	3 669	0.43	1.09	942	897	-0.66	-0.50	3.46	4.09	1.11	1.60
ASIA	336 890	460 005	3.89	2.88	363 177	423 735	1.85	1.21	0.93	1.09	2.00	1.65
China[1]	40 767	49 654	0.09	1.49	15 200	14 836	2.70	-0.52	2.42	3.02	-2.89	2.00
India	162 595	244 484	4.79	3.90	128 371	172 606	1.25	2.83	1.27	1.42	3.49	1.04
Indonesia	1 227	1 576	0.43	1.81	14 460	16 319	3.59	0.46	0.08	0.10	-3.05	1.34
Iran	6 457	7 273	-1.23	1.10	20 294	21 780	-0.97	0.61	0.32	0.33	-0.27	0.49
Japan	7 335	7 508	-1.01	0.31	855	841	-1.73	-0.04	8.57	8.93	0.74	0.35
Kazakhstan	5 140	6 415	-0.37	2.13	4 081	4 463	5.23	0.58	1.26	1.44	-5.32	1.54
Korea	2 121	2 264	0.31	0.80	252	256	0.35	0.11	8.41	8.85	-0.05	0.68
Malaysia	86	118	2.81	2.45	174	210	2.43	0.96	0.50	0.56	0.37	1.48
Pakistan	52 900	70 436	6.53	2.51	35 300	41 009	3.73	0.95	1.50	1.72	2.70	1.55
Philippines	21	28	5.36	2.44	5	6	-0.90	0.52	3.86	4.83	6.32	1.91
Saudi Arabia	2 413	3 013	5.11	2.11	5 369	6 083	3.99	1.11	0.45	0.50	1.08	0.99
Thailand	1 080	1 231	3.63	0.94	222	205	-2.06	-0.80	4.86	6.02	5.81	1.76
Turkey	19 727	24 126	6.31	1.94	26 094	28 862	6.99	0.74	0.76	0.84	-0.64	1.19
Viet Nam	620	895	10.28	3.59	269	335	9.45	1.95	2.31	2.67	0.76	1.61
OCEANIA	31 136	35 437	2.17	1.36	6 604	6 820	0.89	0.22	4.71	5.20	1.27	1.13
Australia	9 519	10 402	-0.02	1.00	1 544	1 686	-0.72	0.35	6.17	6.17	0.70	0.65
New Zealand	21 546	24 967	3.28	1.51	5 003	5 087	1.44	0.20	4.31	4.91	1.81	1.31
DEVELOPED COUNTRIES	**393 931**	**428 494**	**1.13**	**0.76**	**80 802**	**79 949**	**0.32**	**-0.23**	**4.88**	**5.36**	**0.81**	**0.99**
DEVELOPING COUNTRIES	**423 787**	**565 116**	**3.04**	**2.75**	**629 454**	**726 182**	**1.84**	**1.09**	**0.67**	**0.78**	**1.17**	**1.64**
LEAST DEVELOPED COUNTRIES (LDC)	23 882	27 799	3.43	2.20	175 284	204 842	4.52	0.89	0.14	0.14	-1.04	1.30
OECD[2]	**350 734**	**384 900**	**1.55**	**0.81**	**72 224**	**73 924**	**2.03**	**0.14**	**4.86**	**5.21**	**-0.47**	**0.67**
BRICS	**266 073**	**364 336**	**2.64**	**2.96**	**177 959**	**221 298**	**1.30**	**2.08**	**1.50**	**1.65**	**1.32**	**0.87**

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.37. Whey powder and casein projections

Calendar year

		Average 2015-17est	2027	Growth (%)[2]	
				2008-17	2018-27
AUSTRALIA					
Net trade, whey	kt pw	86.5	84.8	0.67	-0.31
Exports, casein	kt pw	0.4	1.7	-34.52	9.38
CANADA					
Net trade, whey	kt pw	31.4	35.8	11.28	0.53
EUROPEAN UNION					
Whey powder					
Production	kt pw	1 858.8	2 079.2	1.57	0.92
Consumption	kt pw	1 311.3	1 403.2	0.32	0.50
Net trade	kt pw	547.5	676.0	5.28	1.85
Casein					
Production	kt pw	154.4	149.2	1.65	1.42
Consumption	kt pw	76.8	70.6	-4.95	-0.07
Net trade	kt pw	77.6	78.6	15.64	3.05
JAPAN					
Net trade, whey	kt pw	-57.8	-66.8	..	..
Casein imports	kt pw	13.3	13.5	-1.65	-0.05
NEW ZEALAND					
Net trade, whey	kt pw	-5.4	0.0	..	..
Exports, casein	kt pw	209.0	277.8	3.67	1.03
UNITED STATES					
Whey					
Production	kt pw	491.4	549.3	0.22	1.47
Consumption	kt pw	257.9	274.2	-2.02	0.80
Exports	kt pw	233.5	275.1	3.33	2.19
Imports, casein	kt pw	131.0	157.3	4.09	1.49
ARGENTINA					
Net trade, whey	kt pw	64.4	90.2	3.40	2.45
BRAZIL					
Net trade, whey	kt pw	-24.9	-35.0	..	..
CHINA[1]					
Net trade, whey	kt pw	-417.1	-479.7	..	..
RUSSIA					
Net trade, whey	kt pw	-59.3	-64.4	..	..

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand.
Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Least-squares growth rate (see glossary).

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

Table A.38. Main policy assumptions for dairy markets

Calendar year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CANADA												
Milk target price[1]	CADc/litre	79.8	82.3	84.1	85.9	87.6	89.1	90.6	92.1	93.6	95.2	96.7
Butter support price	CAD/t	7 674.4	8 064.6	8 237.3	8 417.5	8 578.3	8 726.6	8 872.1	9 017.8	9 166.7	9 320.2	9 474.6
Cheese tariff-quota	kt pw	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6	23.6
In-quota tariff	%	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
Out-of-quota tariff	%	245.6	245.6	245.6	245.6	245.6	245.6	245.6	245.6	245.6	245.6	245.6
EUROPEAN UNION[2]												
Voluntary coupled support												
Milk and milk products[3]	mln EUR	835	853	861	846	846	846	846	846	846	846	846
Milk quota	kt pw	0	0	0	0	0	0	0	0	0	0	0
Butter reference price[4]	EUR/t	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5	2 217.5
SMP reference price	EUR/t	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0	1 698.0
Butter tariff-quotas	kt pw	89.2	89.9	90.2	90.3	90.3	90.4	90.4	90.5	90.5	90.6	90.6
Cheese tariff-quotas	kt pw	118.2	118.9	119.2	119.5	119.9	120.2	120.5	120.8	121.2	121.5	121.8
JAPAN												
Direct payments[5]	JPY/kg	12.1	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
Cheese tariff[6]	%	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2	31.2
Tariff-quotas												
Butter	kt pw	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
In-quota tariff	%	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Out-of-quota tariff	%	733.0	733.0	733.0	733.0	733.0	733.0	733.0	733.0	733.0	733.0	733.0
SMP	kt pw	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1	93.1
In-quota tariff	%	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Out-of-quota tariff	%	210.0	210.0	210.0	210.0	210.0	210.0	210.0	210.0	210.0	210.0	210.0
WMP	kt pw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
In-quota tariff	%	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Out-of-quota tariff	%	316.2	316.2	316.2	316.2	316.2	316.2	316.2	316.2	316.2	316.2	316.2
KOREA												
Tariff-quotas												
Butter	kt pw	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
In-quota tariff	%	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Out-of-quota tariff	%	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0	89.0
SMP	kt pw	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
In-quota tariff	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Out-of-quota tariff	%	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0
WMP	kt pw	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
In-quota tariff	%	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Out-of-quota tariff	%	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0
MEXICO												
Butter tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tariff-quotas												
Cheese	kt pw	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
In-quota tariff	%	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Out-of-quota tariff	%	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
SMP	kt pw	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
In-quota tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	%	51.7	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Liconsa social program	mln MXN	1 190.5	1 202.5	1 202.5	1 202.5	1 202.5	1 202.5	1 202.5	1 202.5	1 202.5	1 202.5	1 202.5
RUSSIA												
Butter tariff	%	16.1	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Cheese tariff	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
UNITED STATES[7]												
Butter tariff-quota	kt pw	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
In-quota tariff	%	3.3	2.7	2.9	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8
Out-of-quota tariff	%	41.5	33.9	36.5	36.2	36.1	35.9	35.7	35.5	35.4	35.2	35.0
Cheese tariff-quota	kt pw	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0	110.0
In-quota tariff	%	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1
Out-of-quota tariff	%	44.2	40.7	39.6	39.1	38.6	38.1	37.6	37.2	36.7	36.2	35.7
INDIA												
Butter tariff	%	36.7	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Cheese tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Skim milk powder tariff	%	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Whole milk powder tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SOUTH AFRICA												
Butter tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cheese tariff	%	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9
Skim milk powder tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Whole milk powder tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Average 2015-17est: Data for 2017 are estimated.

The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. For manufacturing milk.
2. Since 2015 the Basic payment scheme (BPS) holds, which shall account for 68% maximum of the national direct payment envelopes. On top of this, compulsory policy instruments have been introduced: the Green Payment (30%) and young farmer scheme (2%). The EU's milk quota system has been abolished since April 2015.
3. Implemented in 19 Member States. The maximum quantity limit is 11.695 million dairy cow heads.
4. Buying-in when market prices go below the reference price for SMP and 90% of the reference price for butter is operable automatically for a maximum quantity of 109 000 tonnes for SMP and 50 000 tonnes for butter (before 2014, this ceiling was set at 30 000 tonnes). Above that ceiling intervention can take place only via tender. For 2018 due to a temporary measure the SMP buying in quantity at fixed prices of is set to 0. Buying in via a tendering procedure may still be possible.
5. In April 2017, in addition to skim milk powder, butter and cheese, milk used for fresh cream, concentrated skim mik and concentrated whole milk production became covered by the direct payments.
6. Excludes processed cheese.
7. A milk margin (all-milk price minus the average feed margin) protection program applies, which has been updated February 2018, and provides a dairy safety net to farmers. Farmers have to decide on enrolment and coverage levels.

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

Table A.39.1. Fish and seafood projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**171 747**	**194 675**	**2.44**	**1.08**	**39 732**	**45 852**	**1.58**	**1.44**	**38 885**	**45 862**	**1.89**	**1.66**
NORTH AMERICA	6 437	6 473	1.02	0.13	5 921	7 037	1.48	1.39	2 736	3 078	0.54	1.44
Canada	1 058	1 104	-0.55	0.41	646	540	0.97	-2.30	828	666	-0.56	-2.00
United States	5 379	5 369	1.36	0.07	5 275	6 498	1.54	1.77	1 907	2 411	1.04	2.64
LATIN AMERICA	13 789	15 556	-3.10	0.45	2 357	3 338	3.52	3.38	4 174	4 959	1.28	1.75
Argentina	781	842	-1.78	0.95	72	75	4.81	0.00	578	646	-2.05	0.99
Brazil	1 284	1 746	1.46	2.88	654	879	4.71	3.45	43	51	-2.01	-0.55
Chile	2 832	3 479	-4.93	0.94	129	183	11.25	3.00	1 433	1 972	3.53	3.11
Colombia	183	221	0.50	1.85	231	306	5.02	2.42	59	67	-5.33	-0.56
Mexico	1 726	1 846	0.05	-0.12	506	906	8.00	5.46	198	171	0.10	-1.48
Paraguay	25	26	2.51	0.00	4	4	6.40	0.00	0	0	..	..
Peru	4 466	4 536	-5.94	-0.92	124	120	5.83	0.00	556	460	-1.03	0.00
EUROPE	17 166	17 979	0.93	0.36	10 321	12 097	-0.13	1.65	9 034	11 616	2.00	1.86
European Union	6 501	6 896	-0.03	0.47	8 260	9 757	0.93	1.73	2 364	3 861	1.50	4.30
Norway	3 515	3 785	0.27	0.63	303	220	3.76	-0.92	2 779	3 156	0.35	0.54
Russia	4 895	5 226	3.42	0.17	746	1 041	-7.19	3.82	2 350	3 122	5.54	1.55
Ukraine	107	81	-11.24	0.00	408	464	-5.58	-0.44	15	22	-17.80	-2.48
AFRICA	11 136	13 060	3.79	1.36	4 391	5 514	1.72	2.45	2 698	2 368	4.85	-0.58
Egypt	1 695	2 476	5.73	3.07	557	427	6.88	-1.28	47	50	28.25	0.00
Ethiopia	46	61	14.94	2.96	2	2	10.73	0.00	1	1	-1.31	0.00
Morocco	1 438	1 681	4.49	0.97	81	110	2.36	4.08	634	661	4.91	0.54
Nigeria	1 039	1 198	4.51	1.16	794	992	-9.23	1.70	14	15	-3.63	0.00
South Africa	612	598	0.35	-0.69	279	571	9.59	6.17	159	205	-0.47	1.33
ASIA	121 597	139 681	3.47	1.26	16 067	17 128	2.53	0.74	19 231	22 706	1.72	1.86
China[1]	66 567	76 253	4.25	1.32	4 027	4 052	4.05	-0.88	7 617	8 694	1.45	1.91
India	10 660	12 737	4.17	1.40	36	35	9.70	0.00	1 131	1 525	6.57	3.00
Indonesia	11 472	14 452	7.18	1.85	177	412	-1.75	6.35	1 286	1 961	3.79	2.84
Iran	1 084	1 320	8.59	1.14	86	115	11.68	5.70	93	86	15.34	-0.29
Japan	3 957	3 490	-2.95	-0.94	3 677	3 548	0.06	0.38	694	920	2.47	1.91
Kazakhstan	43	47	-0.49	0.00	65	71	-3.89	1.00	40	34	-3.58	-1.39
Korea	1 954	1 842	-2.54	-0.02	1 714	1 940	2.66	0.74	595	399	-1.98	-1.14
Malaysia	1 777	1 971	0.61	0.73	500	402	0.56	-1.60	296	229	-1.44	-1.52
Pakistan	667	708	1.77	0.11	13	13	28.90	0.00	162	231	0.75	2.20
Philippines	2 878	3 241	-1.49	0.76	452	475	10.77	2.58	340	302	2.99	-2.24
Saudi Arabia	108	145	2.47	2.11	327	415	8.86	2.90	44	54	6.73	2.04
Thailand	2 455	2 703	-3.66	0.96	1 724	1 782	0.97	1.15	1 903	2 255	-3.91	2.23
Turkey	618	687	-1.13	1.23	119	140	4.97	2.68	197	267	13.80	3.11
Viet Nam	6 390	7 765	4.40	1.65	332	414	13.10	2.00	2 759	3 732	7.30	2.67
OCEANIA	1 622	1 925	2.03	1.53	675	739	1.98	0.44	1 013	1 136	4.11	0.97
Australia	267	288	1.09	1.09	466	548	0.65	0.91	84	80	3.77	0.57
New Zealand	530	554	-0.53	0.43	51	50	0.19	0.00	399	412	-0.65	0.50
DEVELOPED COUNTRIES	**28 860**	**29 322**	**0.30**	**0.14**	**21 025**	**24 206**	**0.45**	**1.44**	**12 901**	**16 095**	**1.50**	**1.76**
DEVELOPING COUNTRIES	**142 582**	**165 053**	**2.92**	**1.26**	**18 717**	**21 646**	**3.00**	**1.45**	**25 723**	**29 502**	**2.07**	**1.62**
LEAST DEVELOPED COUNTRIES (LDC)	11 750	13 676	3.55	1.30	1 068	1 302	10.84	2.34	980	812	1.32	-1.91
OECD[2]	**28 361**	**29 364**	**-1.01**	**0.24**	**21 452**	**24 669**	**1.28**	**1.41**	**11 482**	**14 316**	**1.09**	**2.04**
BRICS	**84 018**	**96 559**	**4.11**	**1.28**	**5 743**	**6 577**	**2.04**	**0.78**	**11 299**	**13 597**	**2.60**	**1.92**

.. Not available

Note: Fish: The term "fish" indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, crocodiles, caimans, alligators and aquatic plants. Imports and exports refer to trade of food fish i.e. for human consumption. All data are in live weight equivalent.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.39.2. Fish and seafood projections: Reduction, food consumption

Calendar year

	REDUCTION (kt)		Growth (%)[3]		FOOD CONS. (kt)		Growth (%)[3]		FOOD CONS. (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**14 304**	**14 173**	**-2.86**	**-0.29**	**153 230**	**177 343**	**3.02**	**1.23**	**20.5**	**21.3**	**1.81**	**0.26**
NORTH AMERICA	800	891	-1.50	0.09	8 400	9 120	1.74	0.66	23.4	23.5	0.97	-0.06
Canada	18	38	-11.75	0.28	835	918	1.38	0.57	23.0	23.1	0.35	-0.24
United States	782	853	-1.10	0.08	7 564	8 202	1.78	0.66	23.5	23.6	1.04	-0.04
LATIN AMERICA	4 779	5 086	-8.90	-1.04	6 697	8 329	2.67	2.07	10.5	11.9	1.52	1.21
Argentina	..	..	..	..	276	271	0.14	0.59	6.3	5.6	-0.88	-0.26
Brazil	49	44	-1.08	-1.56	1 851	2 530	2.73	3.26	8.9	11.4	1.80	2.64
Chile	1 136	1 279	-11.43	-1.15	277	311	1.21	0.76	15.4	16.1	0.32	0.08
Colombia	..	..	..	..	355	459	4.94	2.65	7.3	8.8	3.91	1.99
Mexico	143	291	-13.69	-0.59	1 889	2 290	4.31	1.89	14.8	15.9	2.85	0.82
Paraguay	..	..	..	..	30	30	3.04	0.00	4.4	3.9	1.68	-1.11
Peru	3 189	3 251	-8.12	-1.15	713	825	1.44	1.76	..	..	..	..
EUROPE	2 483	1 789	1.46	-1.36	15 804	16 598	0.01	0.47	21.3	22.4	-0.10	0.49
European Union	656	394	-2.69	-3.59	11 668	12 348	0.78	0.57	23.0	24.1	0.62	0.51
Norway	795	548	5.92	0.00	260	301	0.21	1.46	49.5	51.7	-0.99	0.54
Russia	418	242	3.35	-3.16	2 842	2 903	-1.51	0.21	19.7	20.5	-1.60	0.37
Ukraine	..	..	..	..	503	523	-6.07	-0.27	11.3	12.5	-5.61	0.25
AFRICA	707	942	-0.18	1.84	12 074	15 232	3.21	2.06	9.9	9.6	0.58	-0.32
Egypt	..	..	..	..	2 206	2 853	5.88	2.33	23.0	24.9	3.66	0.71
Ethiopia	..	..	..	..	46	63	15.53	2.90	0.5	0.5	12.58	0.62
Morocco	163	236	-5.96	0.97	720	894	8.75	1.66	20.4	22.4	7.25	0.58
Nigeria	..	..	..	..	1 819	2 175	-2.66	1.41	9.8	8.9	-5.21	-1.10
South Africa	312	437	1.64	3.11	420	527	4.89	1.64	7.5	8.4	3.50	0.61
ASIA	5 420	5 345	3.07	0.31	109 218	126 787	3.65	1.22	24.5	26.1	2.58	0.48
China[1]	2 050	2 001	3.55	-0.18	59 511	69 110	4.80	1.22	42.4	48.0	4.25	1.02
India	523	650	8.13	0.00	8 890	10 596	3.94	1.27	6.7	7.2	2.66	0.29
Indonesia	18	30	-6.55	0.00	9 395	12 023	6.14	2.07	36.0	41.6	4.83	1.15
Iran	94	88	4.17	-1.54	983	1 261	8.68	1.82	12.2	14.4	7.36	1.07
Japan	737	417	-0.64	-2.95	6 102	5 702	-1.90	-0.39	47.8	46.3	-1.81	-0.04
Kazakhstan	..	..	..	..	68	85	-1.90	1.49	3.8	4.2	-3.35	0.62
Korea	80	80	-5.08	0.00	2 970	3 303	0.63	0.57	58.5	63.0	0.22	0.29
Malaysia	121	68	-2.47	-4.64	1 860	2 076	1.82	0.73	59.6	58.1	0.07	-0.49
Pakistan	135	94	3.09	-2.38	382	396	2.15	-0.33	2.0	1.7	0.05	-2.00
Philippines	..	..	..	..	2 990	3 415	-0.74	1.33	28.9	28.3	-2.34	-0.07
Saudi Arabia	..	..	..	..	392	506	6.95	2.76	12.1	13.2	4.09	1.29
Thailand	445	304	-3.21	-2.07	1 734	1 867	0.03	0.32	25.2	26.8	-0.39	0.24
Turkey	63	115	-8.70	2.39	472	445	-1.98	0.35	5.9	5.1	-3.48	-0.26
Viet Nam	830	1 002	17.03	4.02	3 133	3 445	1.24	0.14	33.1	33.0	0.14	-0.72
OCEANIA	114	120	-1.95	0.44	1 037	1 277	1.86	1.65	26.4	28.3	0.28	0.39
Australia	31	42	-6.16	1.36	618	714	0.86	0.99	25.6	26.0	-0.64	-0.14
New Zealand	65	63	-0.77	-0.03	121	130	1.03	0.26	25.9	25.4	-0.05	-0.54
DEVELOPED COUNTRIES	**4 428**	**3 639**	**0.35**	**-0.73**	**31 893**	**33 317**	**0.17**	**0.41**	**22.7**	**22.9**	**-0.25**	**0.13**
DEVELOPING COUNTRIES	**9 872**	**10 530**	**-4.04**	**-0.13**	**121 326**	**144 013**	**3.90**	**1.43**	**20.0**	**21.0**	**2.49**	**0.30**
LEAST DEVELOPED COUNTRIES (LDC)	301	499	6.62	3.75	10 548	13 167	3.88	1.98	13.3	12.9	1.45	-0.27
OECD[2]	**4 507**	**4 120**	**-4.94**	**-1.02**	**33 107**	**35 025**	**0.60**	**0.52**	**25.1**	**25.3**	**0.03**	**0.13**
BRICS	**3 352**	**3 374**	**3.87**	**-0.05**	**73 514**	**85 665**	**4.32**	**1.25**	**23.4**	**25.6**	**3.44**	**0.69**

.. Not available

Note: Fish: The term "fish" indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, crocodiles, caimans, alligators and aquatic plants. Imports and exports refer to trade of food fish i.e. for human consumption. All data are in live weight equivalent.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.40.1. Ethanol projections: Production and use

Calendar year

	PRODUCTION (mln L)		Growth (%)[3]	DOMESTIC USE (mln L)		Growth (%)[3]	FUEL USE (mln L)		Growth (%)[3]
	Average 2015-17est	2027	2018-27	Average 2015-17est	2027	2018-27	Average 2015-17est	2027	2018-27
WORLD	**118 787**	**130 540**	**0.69**	**118 995**	**131 070**	**0.67**	**..**	**..**	**..**
NORTH AMERICA	61 196	62 231	-0.12	58 207	60 669	-0.03	..	..	..
Canada	1 825	1 796	-0.11	2 999	2 952	-0.34	2 770	2 621	-0.59
United States	59 371	60 435	-0.12	55 208	57 717	-0.01	53 549	56 091	-0.01
LATIN AMERICA	32 532	38 542	1.56	32 475	38 099	1.48	..	..	..
Argentina	1 087	1 669	2.81	1 068	1 652	2.73	922	1 442	2.63
Brazil	28 326	32 722	1.46	27 753	31 883	1.40	26 047	30 098	1.42
Chile	9	23	11.08	43	59	3.19	..	..	..
Colombia	465	606	2.34	603	761	1.34	..	..	..
Mexico	213	246	-0.47	350	375	0.16	150	178	0.51
Paraguay	237	329	3.39	233	326	3.32	..	..	..
EUROPE	8 346	8 312	-0.40	9 336	8 780	-0.59	..	..	..
European Union	7 255	7 087	-0.58	8 204	7 539	-0.78	5 701	5 071	-1.14
Russia	582	573	-0.49	487	458	-0.62	..	..	..
Ukraine	386	496	1.99	386	499	1.98	..	..	..
AFRICA	1 010	1 335	2.50	1 006	1 288	2.60	..	..	..
Egypt	33	38	0.89	14	7	5.79	..	..	..
Ethiopia	89	136	2.78	65	62	7.53	..	..	..
Nigeria	17	57	8.77	177	211	1.74	..	..	..
South Africa	291	329	0.63	81	104	2.15	..	..	..
ASIA	15 361	19 787	2.27	17 696	21 983	1.86	..	..	..
China[1]	9 688	11 054	0.88	9 967	10 953	0.89	3 333	4 356	2.12
India	2 265	2 946	3.14	2 456	3 436	2.49	..	..	..
Indonesia	210	276	2.12	136	177	3.52	..	..	..
Iran	0	0	..	0	0	..	..	..	..
Japan	78	76	-0.11	1 469	1 480	-0.81	746	720	-1.59
Kazakhstan	0	0	..	0	0	..	..	..	..
Korea	163	154	-0.06	497	504	-0.02	5	4	-1.67
Malaysia	0	0	..	0	0	..	..	..	..
Pakistan	467	520	1.09	36	35	0.28	..	..	..
Philippines	286	815	10.09	720	1 315	5.10	..	..	..
Saudi Arabia	0	6	32.51	39	40	1.89	..	..	..
Thailand	1 751	3 199	5.64	1 754	3 158	5.44	..	..	..
Turkey	109	210	6.00	201	301	3.81	..	..	..
Viet Nam	187	292	3.88	162	252	3.62	..	..	..
OCEANIA	341	333	-1.59	275	251	-1.96	..	..	..
Australia	333	323	-1.68	270	245	-2.06	198	175	-2.78
New Zealand	3	3	0.00	0	0	..	..	..	..
DEVELOPED COUNTRIES	**70 253**	**71 293**	**-0.15**	**69 394**	**71 317**	**-0.12**	**..**	**..**	**..**
DEVELOPING COUNTRIES	**48 533**	**59 247**	**1.81**	**49 600**	**59 753**	**1.70**	**..**	**..**	**..**
LEAST DEVELOPED COUNTRIES (LDC)	326	458	2.89	350	479	2.74	..	..	..
OECD[2]	**69 400**	**70 405**	**-0.16**	**69 436**	**71 364**	**-0.12**	**..**	**..**	**..**
BRICS	**41 153**	**47 624**	**1.38**	**40 744**	**46 834**	**1.33**	**..**	**..**	**..**

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.40.2. Ethanol projections: Share in volume terms and trade

Calendar year

	SHARE IN GASOLINE TYPE FUEL USE (%)		IMPORTS (mln L)		Growth (%)[3]	EXPORTS (mln L)		Growth (%)[3]
	Average 2015-17est	2027	Average 2015-17est	2027	2018-27	Average 2015-17est	2027	2018-27
WORLD	..	..	**9 397**	**9 679**	**0.28**	**9 038**	**9 396**	**0.29**
NORTH AMERICA	..	..	2 274	2 910	1.57	5 084	4 623	-0.72
Canada	5.6	5.6	1 272	1 242	-0.64	77	86	-0.03
United States	9.6	11.3	1 002	1 668	3.47	5 007	4 537	-0.73
LATIN AMERICA	..	..	2 287	2 472	0.79	2 502	3 010	1.73
Argentina	10.0	12.1	8	19	-0.19	20	36	5.05
Brazil	46.6	49.6	1 062	1 210	2.13	1 801	2 145	2.38
Chile	..	..	35	36	0.00	0	0	0.00
Colombia	..	..	138	155	-1.84	0	0	0.13
Mexico	0.3	0.4	140	132	1.46	3	2	0.00
Paraguay	..	..	0	0	-2.97	5	3	17.24
EUROPE	..	..	1 268	818	-2.01	310	349	0.15
European Union	4.8	4.7	1 118	672	-2.40	203	219	0.23
Russia	..	..	2	4	0.00	96	119	0.01
Ukraine	..	..	4	10	0.00	4	7	0.00
AFRICA	..	..	285	333	0.00	290	381	0.00
Egypt	..	..	1	1	0.00	21	32	0.00
Ethiopia	..	..	0	0	..	25	74	0.00
Nigeria	..	..	160	154	0.00	0	0	..
South Africa	..	..	3	4	0.00	213	229	0.00
ASIA	..	..	3 273	3 134	-0.54	779	939	1.22
China[1]	2.0	2.0	489	47	0.71	70	149	0.01
India	..	..	331	584	-0.53	140	93	0.52
Indonesia	..	..	1	1	0.00	74	99	0.00
Iran	..	..	0	0	..	0	0	..
Japan	1.4	1.7	1 407	1 405	-0.84	1	2	-0.01
Kazakhstan	..	..	0	0	..	0	0	..
Korea	0.0	0.0	338	350	0.01	0	0	..
Malaysia	..	..	0	0	..	0	0	..
Pakistan	..	..	0	0	-0.07	432	485	1.16
Philippines	..	..	434	500	0.00	0	0	0.00
Saudi Arabia	..	..	41	36	0.00	2	3	0.00
Thailand	..	..	24	9	-11.87	21	50	11.63
Turkey	..	..	94	94	0.00	1	3	0.00
Viet Nam	..	..	9	5	-3.93	34	45	4.09
OCEANIA	..	..	10	12	0.02	74	93	-0.30
Australia	1.1	1.2	7	10	0.02	69	88	-0.32
New Zealand	..	..	2	1	0.00	5	4	0.00
DEVELOPED COUNTRIES	..	..	**4 986**	**5 168**	**0.25**	**5 681**	**5 296**	**-0.63**
DEVELOPING COUNTRIES	..	..	**4 410**	**4 510**	**0.31**	**3 357**	**4 100**	**1.55**
LEAST DEVELOPED COUNTRIES (LDC)	..	..	31	41	0.00	7	20	0.00
OECD[2]	..	..	**5 569**	**5 751**	**0.25**	**5 366**	**4 943**	**-0.67**
BRICS	..	..	**1 887**	**1 849**	**1.16**	**2 319**	**2 736**	**1.87**

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.41.1. Biodiesel projections: Production and use

Calendar year

	PRODUCTION (mln L)		Growth (%)[3]	DOMESTIC USE (mln L)		Growth (%)[3]
	Average 2015-17est	2027	2018-27	Average 2015-17est	2027	2018-27
WORLD	**34 188**	**39 269**	**0.37**	**34 957**	**39 361**	**0.39**
NORTH AMERICA	7 034	7 293	-0.95	9 255	9 177	-1.15
Canada	443	620	-0.62	359	487	-0.23
United States	6 590	6 674	-0.98	8 896	8 690	-1.20
LATIN AMERICA	7 489	9 817	0.59	6 034	8 643	2.11
Argentina	2 950	3 259	-1.58	1 217	1 902	3.17
Brazil	3 939	5 644	1.99	3 910	5 627	1.98
Chile	0	0	..	0	0	..
Colombia	568	716	0.64	568	716	0.64
Mexico	0	0	..	0	0	..
Paraguay	12	19	2.70	12	19	2.70
EUROPE	13 723	13 158	-0.71	14 301	13 097	-1.06
European Union	13 437	12 902	-0.69	13 974	12 813	-1.05
Russia	0	0	..	0	0	..
Ukraine	0	0	..	0	0	..
AFRICA	0	0	..	0	0	..
Egypt	0	0	..	0	0	..
Ethiopia	0	0	..	0	0	..
Nigeria	0	0	..	0	0	..
South Africa	0	0	..	0	0	..
ASIA	5 851	8 902	3.38	5 227	8 345	3.51
China[1]	515	821	4.88	512	812	4.97
India	148	189	2.35	101	135	2.59
Indonesia	2 563	4 267	4.29	2 223	4 066	4.56
Iran	0	0	..	0	0	..
Japan	16	12	-1.53	12	8	-2.13
Kazakhstan	0	0	..	0	0	..
Korea	642	642	-1.40	570	619	-1.44
Malaysia	464	815	4.62	315	590	5.45
Pakistan	0	0	..	0	0	..
Philippines	202	266	2.00	202	266	2.00
Saudi Arabia	0	0	..	0	0	..
Thailand	1 301	1 890	2.76	1 292	1 849	2.68
Turkey	0	0	..	0	0	..
Viet Nam	0	0	..	0	0	..
OCEANIA	90	98	-1.59	140	99	-1.57
Australia	90	98	-1.59	140	99	-1.57
New Zealand	0	0	..	0	0	..
DEVELOPED COUNTRIES	**20 863**	**20 562**	**-0.80**	**23 708**	**22 381**	**-1.10**
DEVELOPING COUNTRIES	**13 325**	**18 707**	**1.82**	**11 249**	**16 979**	**2.76**
LEAST DEVELOPED COUNTRIES (LDC)	0	0	..	0	0	..
OECD[2]	**21 505**	**21 204**	**-0.82**	**24 278**	**23 001**	**-1.11**
BRICS	**4 603**	**6 654**	**2.31**	**4 523**	**6 574**	**2.32**

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.41.2. Biodiesel projections: Share in volume terms and trade

Calendar year

	SHARE IN DIESEL TYPE FUEL USE (%)		IMPORTS (mln L)		Growth (%)[3]	EXPORTS (mln L)		Growth (%)[3]
	Average 2015-17est	2027	Average 2015-17est	2027	2018-27	Average 2015-17est	2027	2018-27
WORLD	**..**	**..**	**4 403**	**3 237**	**-2.57**	**3 551**	**3 145**	**-2.64**
NORTH AMERICA	..	..	3 024	2 711	-1.30	718	827	0.10
Canada	1.2	2.0	276	264	-0.27	362	396	-0.85
United States	4.0	4.2	2 748	2 447	-1.41	356	431	1.07
LATIN AMERICA	..	..	307	200	0.00	1 739	1 374	-5.76
Argentina	9.0	12.0	0	0	..	1 732	1 357	-5.84
Brazil	7.4	10.0	0	0	..	7	17	5.28
Chile	..	..	0	0	..	0	0	..
Colombia	..	..	0	0	..	0	0	..
Mexico	..	..	0	0	..	0	0	..
Paraguay	..	..	0	0	..	0	0	..
EUROPE	..	..	993	308	-10.57	442	370	0.98
European Union	6.1	6.1	915	211	-13.17	404	300	1.08
Russia	..	..	0	0	..	0	0	..
Ukraine	..	..	0	0	..	0	0	..
AFRICA	..	..	0	0	..	0	0	..
Egypt	..	..	0	0	..	0	0	..
Ethiopia	..	..	0	0	..	0	0	..
Nigeria	..	..	0	0	..	0	0	..
South Africa	..	..	0	0	..	0	0	..
ASIA	..	..	25	18	-0.11	649	575	1.48
China[1]	0.4	0.6	17	11	1.03	20	20	0.00
India	..	..	2	2	-0.46	49	56	1.68
Indonesia	..	..	0	0	..	340	201	-0.13
Iran	..	..	0	0	..	0	0	..
Japan	0.0	0.0	1	1	0.17	5	5	-0.07
Kazakhstan	..	..	0	0	..	0	0	..
Korea	..	..	0	0	..	72	22	-0.46
Malaysia	..	..	0	0	..	149	225	2.70
Pakistan	..	..	0	0	..	0	0	..
Philippines	..	..	0	0	..	0	0	..
Saudi Arabia	..	..	0	0	..	0	0	..
Thailand	..	..	4	3	-3.28	13	44	6.15
Turkey	..	..	0	0	..	0	0	..
Viet Nam	..	..	0	0	..	0	0	..
OCEANIA	..	..	54	1	0.71	3	0	..
Australia	1.7	1.1	54	1	0.72	3	0	..
New Zealand	..	..	0	0	..	0	0	..
DEVELOPED COUNTRIES	**..**	**..**	**4 072**	**3 021**	**-2.73**	**1 168**	**1 202**	**0.34**
DEVELOPING COUNTRIES	**..**	**..**	**331**	**216**	**-0.01**	**2 383**	**1 944**	**-4.11**
LEAST DEVELOPED COUNTRIES (LDC)	..	..	0	0	..	0	0	..
OECD[2]	**..**	**..**	**4 072**	**3 021**	**-2.73**	**1 240**	**1 224**	**0.32**
BRICS	**..**	**..**	**19**	**13**	**0.80**	**77**	**93**	**1.85**

.. Not available

Note: Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.42. Main policy assumptions for biofuel markets

		2017est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ARGENTINA												
Biodiesel												
Export tax	%	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
BRAZIL												
Ethanol												
Import tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Incorporation mandate[2]	%	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Biodiesel												
Tax concessions[3]	BRL/hl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Import tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CANADA												
Ethanol												
Tax concessions[3]	CAD/hl	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Import tariff	CAD/hl	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Incorporation mandate[2]	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Direct support												
Federal	CAD/hl	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Provincial	CAD/hl	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Biodiesel												
Tax concessions[3]	CAD/hl	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Incorporation mandate[2]	%	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Direct support												
Federal	CAD/hl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Provincial	CAD/hl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COLOMBIA												
Ethanol												
Import tariff	%	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Blending target[1,4]	%	9.0	9.0	9.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Biodiesel												
Blending target[1]	%	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
EUROPEAN UNION												
Biofuel												
Energy share in fuel consumption[5]	%	5.6	5.6	5.7	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.8
Ethanol												
Tax concessions[3]	EUR/hl	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Import tariff	EUR/hl	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Biodiesel												
Tax concessions[3]	EUR/hl	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
Import tariff	%	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
INDIA												
Ethanol												
Import tariff	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
Share of biofuel mandates in total fuel consumption	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Biodiesel												
Import tariff	%	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Share of biofuel mandates in total fuel consumption	%	6.4	7.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
INDONESIA												
Biodiesel												
Blending target[1]	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
MALAYSIA												
Biodiesel												
Blending target[1]	%	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
THAILAND												
Ethanol												
Blending target[1]	%	11.4	12.4	13.5	14.5	15.6	16.6	17.6	18.7	19.7	19.7	19.7
Biodiesel												
Blending target[1]	%	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

Table A.42. Main policy assumptions for biofuel markets *(cont.)*

		2017est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
UNITED STATES												
Renewable Fuel Standard[6]												
Total	mln L	72 983	73 020	73 020	73 020	73 020	73 020	73 020	73 020	73 020	73 020	73 020
advanced mandate	mln L	16 202	16 239	16 239	16 239	16 239	16 239	16 239	16 239	16 239	16 239	16 239
cellulosic ethanol	mln L	1 177	1 090	1 446	1 556	1 690	1 923	2 045	2 229	2 406	2 559	2 739
Ethanol												
Import surcharge	USD/hl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Import tariff (undenatured)	%	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Import tariff (denatured)	%	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
Blender tax credit	USD/hl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biodiesel												
Import tariff	%	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
Blender tax credit	USD/hl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: 2017est: Data for 2017 are estimated.

For many countries, shares for ethanol and biodiesel are not individually specified in the legislation.

Figures are based on a combination of the EU mandate in the context of the Renewable Energy Directive and the National Renewable Energy Action Plans (NREAP) in the EU member states.

1. Expressed in volume share.
2. Share in respective fuel type, in volume.
3. Difference between tax rates applying to fossil and biogen fuels.
4. Applies to cities with more than 500 000 inhabitants.
5. According to the current Renewable energy Directive 2009/28/EC, the energy content of biofuel other than first-generation biofuels counts twice towards meeting the target. It is assumed that other sources than biofuel will help filling the 10% transport energy target.
6. The total, advanced and cellulosic mandates are not at the levels defined in EISA. Details can be found in the policy assumptions section of the biofuel chapter.

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

Table A.43.1. Cotton projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[3]		IMPORTS (kt)		Growth (%)[3]		EXPORTS (kt)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**23 372**	**28 720**	**-0.10**	**1.58**	**7 783**	**9 387**	**0.56**	**1.35**	**7 880**	**9 387**	**0.70**	**1.35**
NORTH AMERICA	3 725	4 185	3.14	0.97	0	0	..	..	2 777	3 391	-0.29	0.98
Canada	0	0	..	..	0	0	..	..	0	0	..	..
United States	3 725	4 185	3.14	0.97	0	0	..	..	2 777	3 391	-0.29	0.98
LATIN AMERICA	1 891	2 476	1.04	2.97	337	340	-4.61	0.80	838	1 307	3.73	6.08
Argentina	187	263	0.47	5.08	3	2	-21.16	-0.17	52	64	10.89	1.02
Brazil	1 460	1 904	0.98	3.01	27	18	-2.07	-0.46	750	1 203	3.99	6.57
Chile	0	0	..	..	0	0	-37.90	2.19	0	0	..	..
Colombia	10	13	-14.55	1.72	33	57	-6.64	4.90	0	0	54.57	..
Mexico	200	259	6.94	1.35	229	201	-2.98	-0.29	31	36	-2.03	2.85
Paraguay	5	5	-13.19	0.76	1	1	-11.47	2.47	3	2	-14.78	-2.41
EUROPE	298	294	1.67	0.59	307	258	-6.21	-0.10	276	279	1.65	0.19
European Union	296	292	1.68	0.59	242	194	-3.54	-0.27	275	278	1.65	0.19
Russia	1	1	0.00	0.00	60	59	-12.11	0.36	0	0	..	..
Ukraine	0	0	..	..	2	3	-13.10	2.21	0	0	..	..
AFRICA	1 469	1 985	5.31	1.92	148	178	-0.64	1.19	1 245	1 721	5.35	1.82
Egypt	53	107	-9.66	4.93	103	100	2.11	-1.28	31	42	-6.05	1.30
Ethiopia	46	45	9.88	-0.46	11	38	39.32	9.86	0	0	-32.53	-1.78
Nigeria	52	58	0.28	0.27	1	1	-18.95	0.65	32	31	1.54	-0.93
South Africa	15	21	6.52	1.17	14	13	-6.26	1.18	10	6	1.22	-1.17
ASIA	15 127	18 719	-1.56	1.48	6 991	8 610	1.40	1.43	2 028	1 645	-2.46	-1.56
China[1]	5 115	5 718	-4.65	0.63	1 029	1 216	-10.04	0.29	18	11	2.30	-0.16
India	5 904	7 877	1.80	2.36	396	446	16.07	2.23	1 106	860	1.18	-2.18
Indonesia	5	6	-4.17	1.88	715	1 007	5.65	2.08	1	0	-16.11	..
Iran	53	47	-3.72	-2.20	56	88	-0.47	4.03	0	0	..	..
Japan	0	0	..	..	60	55	-3.97	-0.26	0	0	..	..
Kazakhstan	63	69	-3.03	-0.86	0	0	..	..	46	51	-6.30	-1.86
Korea	0	0	..	..	241	230	1.27	-0.21	1	0	0.00	..
Malaysia	0	0	..	..	87	103	3.28	2.37	17	11	5.70	-2.32
Pakistan	1 752	2 363	-1.66	1.38	464	239	0.84	-7.86	33	27	-17.44	2.93
Philippines	0	0	..	..	10	15	-3.27	3.48	0	0	..	..
Saudi Arabia	0	0	..	..	0	0	..	..	0	0	..	..
Thailand	1	1	-1.64	1.08	274	294	-3.54	0.47	0	0	-18.72	..
Turkey	724	1 034	5.15	2.22	812	751	1.49	0.34	59	52	7.89	-0.34
Viet Nam	1	1	-22.70	1.58	1 200	2 023	21.12	2.87	0	0	..	..
OCEANIA	863	1 060	7.36	2.26	1	1	0.00	0.00	715	1 045	7.28	2.84
Australia	862	1 059	7.37	2.26	0	0	..	..	714	1 044	7.29	2.84
New Zealand	1	1	0.00	0.00	1	1	0.00	0.00	1	1	0.00	0.00
DEVELOPED COUNTRIES	**6 220**	**6 967**	**2.26**	**1.03**	**386**	**330**	**-5.94**	**-0.08**	**4 538**	**5 392**	**-0.18**	**1.00**
DEVELOPING COUNTRIES	**17 152**	**21 753**	**-0.86**	**1.76**	**7 397**	**9 057**	**1.05**	**1.41**	**3 342**	**3 996**	**2.18**	**1.84**
LEAST DEVELOPED COUNTRIES (LDC)	1 182	1 608	5.88	2.04	1 481	1 944	7.63	2.91	888	1 323	6.58	2.29
OECD[2]	**5 822**	**6 846**	**3.87**	**1.34**	**1 588**	**1 435**	**-0.55**	**0.05**	**3 874**	**4 817**	**0.85**	**1.30**
BRICS	**12 495**	**15 520**	**-1.40**	**1.76**	**1 526**	**1 752**	**-7.33**	**0.74**	**1 884**	**2 080**	**1.73**	**1.97**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Table A.43.2. Cotton projections: Consumption

Marketing year

	CONSUMPTION (kt)[3]		Growth (%)[4]	
	Average 2015-17est	2027	2008-17	2018-27
WORLD	**24 543**	**28 671**	**0.27**	**0.90**
NORTH AMERICA	**729**	**839**	**-0.92**	**1.33**
Canada	0	0	..	..
United States	729	839	-0.85	1.33
LATIN AMERICA	**1 382**	**1 474**	**-3.71**	**0.02**
Argentina	142	167	-2.18	1.73
Brazil	720	716	-4.71	-1.06
Chile	0	0	-40.76	2.19
Colombia	45	70	-9.10	4.23
Mexico	402	424	-0.17	0.44
Paraguay	3	4	-11.30	2.78
EUROPE	**339**	**275**	**-5.80**	**0.77**
European Union	269	210	-2.81	0.84
Russia	65	60	-12.19	0.49
Ukraine	2	3	-14.86	2.22
AFRICA	**339**	**442**	**-0.60**	**2.06**
Egypt	131	164	-2.72	1.52
Ethiopia	55	83	9.19	3.12
Nigeria	24	29	-1.77	1.73
South Africa	21	27	-3.23	1.80
ASIA	**21 745**	**25 635**	**0.76**	**0.92**
China[1]	7 854	6 870	-2.72	-1.85
India	5 249	7 463	3.45	3.04
Indonesia	698	1 013	5.18	2.09
Iran	109	135	-2.63	1.43
Japan	62	55	-4.62	-0.37
Kazakhstan	13	18	0.71	2.82
Korea	245	232	1.45	-0.20
Malaysia	64	93	6.90	3.10
Pakistan	2 176	2 575	-0.40	0.07
Philippines	10	15	-3.71	3.48
Saudi Arabia	0	0	..	..
Thailand	272	296	-3.94	0.47
Turkey	1 479	1 733	2.68	1.45
Viet Nam	1 161	2 024	20.31	2.88
OCEANIA	**8**	**7**	**-4.21**	**-0.06**
Australia	7	6	-4.74	-0.07
New Zealand	1	1	0.00	0.00
DEVELOPED COUNTRIES	**1 710**	**1 944**	**-0.74**	**1.38**
DEVELOPING COUNTRIES	**22 833**	**26 727**	**0.35**	**0.86**
LEAST DEVELOPED COUNTRIES (LDC)	**1 658**	**2 229**	**6.06**	**2.64**
OECD[2]	**3 196**	**3 501**	**0.57**	**1.11**
BRICS	**13 910**	**15 137**	**-0.95**	**0.34**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions.

Average 2015-17est: Data for 2017 are estimated.

1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Consumption for cotton means mill consumption and not final consumer demand.
4. Least-squares growth rate (see glossary).

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

Table A.44. Main policy assumptions for cotton markets

Marketing year

		Average 2015-17est	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ARGENTINA												
Export tax equivalent of export barriers	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Tariff equivalent of import barriers	%	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
BRAZIL												
Producer Minimum Price, lint cotton	BRL/t	3 959.0	4 964.5	4 964.5	4 964.5	4 964.5	4 964.5	4 964.5	4 964.5	4 964.5	4 964.5	4 964.5
Tariff equivalent of import barriers	%	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
EUROPEAN UNION												
Area for coupled payment	kha	301.7	301.7	301.7	301.7	301.7	301.7	301.7	301.7	301.7	301.7	301.7
Coupled payment per ha[1]	EUR/ha	830.0	830.0	830.0	830.0	830.0	830.0	830.0	830.0	830.0	830.0	830.0
Tariff equivalent of import barriers	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAPAN												
Tariff equivalent of import barriers	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KOREA												
Tariff equivalent of import barriers	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEXICO												
Tariff equivalent of import barriers	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RUSSIA												
Tariff equivalent of import barriers	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
UNITED STATES												
STAX participation rate	%	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
CRP area	Mha	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Economic Adjustment Assistance payment level	USD/t	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1
TRQ	kt	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2	73.2
In-quota tariff	USD/t	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
Out-of-quota tariff	USD/t	314.0	314.0	314.0	314.0	314.0	314.0	314.0	314.0	314.0	314.0	314.0
CHINA												
TRQ	kt	894.0	894.0	894.0	894.0	894.0	894.0	894.0	894.0	894.0	894.0	894.0
In-quota tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	%	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Note: Marketing year: See Glossary of Terms for definitions.
Average 2015-17est: Data for 2017 are estimated.

1. If the area is higher than the ceiling, the amount is proportionally reduced.

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

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

Calendar year

	PRODUCTION (kt)		Growth (%)[3]		FOOD CONSUMPTION (kg/cap)		Growth (%)[3]	
	Average 2015-17est	2027	2008-17	2018-27	Average 2015-17est	2027	2008-17	2018-27
WORLD	**213 159**	**241 360**	**2.34**	**1.39**	**14.7**	**15.1**	**0.25**	**0.32**
NORTH AMERICA	5 430	5 713	1.23	0.38	12.2	12.2	0.36	-0.61
Canada	910	943	-0.16	0.45	14.5	13.6	-0.18	-0.57
United States	4 520	4 770	1.53	0.36	11.9	12.0	0.44	-0.62
LATIN AMERICA	14 460	15 323	-0.21	0.75	12.1	12.0	-0.62	-0.06
Argentina	541	597	-1.25	0.69	9.4	9.3	-0.15	-0.06
Brazil	7 429	7 203	-2.05	0.05	14.3	13.4	-2.46	-0.65
Chile	243	282	2.07	1.58	12.5	12.6	1.64	0.08
Colombia	1 204	1 333	1.01	1.44	20.4	20.6	0.63	0.14
Mexico	409	448	0.97	0.83	3.1	3.1	-1.19	-0.13
Paraguay	954	1 094	3.92	1.59	46.2	44.3	1.31	-0.29
EUROPE	24 334	24 620	-0.33	0.11	17.1	16.4	-0.56	-0.44
European Union	11 554	10 824	-1.81	-0.65	14.5	13.0	-1.45	-0.98
Russia	6 686	7 043	2.54	0.23	23.9	25.1	1.02	0.18
Ukraine	4 304	4 821	1.28	1.32	26.2	30.5	0.97	1.66
AFRICA	79 497	96 000	4.17	2.22	32.5	32.2	0.29	0.20
Egypt	1 118	1 406	3.82	2.44	8.1	8.1	1.27	0.35
Ethiopia	2 243	3 037	6.60	3.39	18.6	19.8	3.29	1.10
Nigeria	32 780	39 271	5.63	1.93	69.5	70.3	1.84	0.31
South Africa	479	533	1.76	1.34	6.1	6.6	-0.26	0.99
ASIA	88 763	98 970	2.20	1.12	10.0	9.9	0.00	-0.01
China[1]	40 822	43 017	1.51	0.36	15.2	15.1	-0.29	-0.05
India	11 472	13 170	1.90	1.66	6.6	6.8	0.11	0.43
Indonesia	7 984	8 767	0.80	1.38	17.0	17.1	0.64	0.02
Iran	1 021	1 151	1.94	1.40	10.7	10.3	1.09	-0.19
Japan	785	774	-1.14	-0.25	5.8	5.4	-2.23	-0.57
Kazakhstan	700	782	4.43	1.27	21.7	21.6	-0.16	0.12
Korea	199	229	-0.34	1.83	3.0	3.4	-2.83	1.04
Malaysia	35	39	8.69	1.33	3.3	3.2	3.42	-0.22
Pakistan	941	1 152	4.60	2.53	3.7	3.8	1.81	0.06
Philippines	1 011	1 132	3.09	1.31	9.4	8.8	1.20	-0.41
Saudi Arabia	101	112	1.29	1.60	4.6	5.0	9.41	1.00
Thailand	9 595	12 105	3.11	2.40	4.9	4.5	-1.28	-0.52
Turkey	940	1 042	0.65	1.36	8.9	7.9	-2.04	-0.97
Viet Nam	3 774	4 510	2.78	1.62	3.9	4.5	-0.07	1.74
OCEANIA	675	733	-0.20	1.06	12.4	11.3	-3.79	-0.76
Australia	235	249	-1.70	0.82	9.4	8.3	-3.56	-1.06
New Zealand	101	113	-0.95	0.64	9.9	9.9	-2.98	0.16
DEVELOPED COUNTRIES	**33 592**	**34 544**	**0.11**	**0.27**	**13.9**	**13.5**	**-0.50**	**-0.46**
DEVELOPING COUNTRIES	**179 567**	**206 815**	**2.81**	**1.59**	**14.9**	**15.4**	**0.42**	**0.47**
LEAST DEVELOPED COUNTRIES (LDC)	34 337	41 134	3.75	2.31	22.6	21.7	-0.58	-0.06
OECD[2]	**20 198**	**19 994**	**-0.78**	**-0.11**	**10.9**	**10.2**	**-1.08**	**-0.81**
BRICS	**66 888**	**70 965**	**1.21**	**0.55**	**11.7**	**11.6**	**-0.42**	**-0.11**

Note: Calendar year.
Average 2015-17est: Data for 2017 are estimated.
Production and consumption are expressed on dry weight basis.
1. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
2. Excludes Iceland but includes all EU28 member countries.
3. Least-squares growth rate (see glossary).

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

Part II. ANNEX B

Table B.1. Information on food price changes

	Total inflation % change (year-on-year)		Food inflation % change (year-on-year)[2]		Expenditure share of food		Food contribution to total change in inflation[3]	
	2017	2018	2017	2018	2017	2018	2017	2018
OECD								
Australia[1]	2.1	..	1.9	..	12.8	12.8	0.2	..
Austria	2.0	1.8	1.8	2.0	12.0	12.0	0.2	0.2
Belgium	2.6	1.7	2.1	2.2	17.4	17.4	0.4	0.4
Canada	2.1	1.7	-4.0	1.6	11.5	11.5	-0.5	0.2
Chile	2.8	2.2	2.4	3.9	18.9	18.9	0.5	0.7
Czech Republic	2.2	2.2	3.5	4.5	17.0	17.0	0.6	0.8
Denmark	0.9	0.7	2.0	1.6	11.5	11.5	0.2	0.2
Estonia	2.8	3.4	3.7	5.7	21.7	21.7	0.8	1.2
Finland	0.8	0.8	-2.4	1.5	13.4	13.4	-0.3	0.2
France	1.3	1.3	1.4	1.3	14.7	14.7	0.2	0.2
Germany	1.9	1.6	3.0	2.9	10.4	10.4	0.3	0.3
Greece	1.2	-0.2	1.1	-1.2	17.1	17.1	0.2	-0.2
Hungary	2.3	2.0	1.2	4.5	19.6	19.6	0.2	0.9
Iceland	1.9	2.4	-0.6	-0.1	14.9	14.9	-0.1	0.0
Ireland	0.3	0.2	-2.4	-1.7	11.7	11.7	-0.3	-0.2
Israel	0.1	0.1	-1.6	-1.2	14.3	14.3	-0.2	-0.2
Italy	1.0	0.9	2.3	1.3	16.3	16.3	0.4	0.2
Japan	0.4	1.4	2.2	3.8	19.0	19.0	0.4	0.7
Korea	2.0	1.0	5.3	-0.3	14.4	14.4	0.8	0.0
Luxembourg	1.7	1.1	2.6	1.8	11.1	11.1	0.3	0.2
Mexico	4.7	5.5	3.2	8.6	18.9	18.9	0.6	1.6
Netherlands	1.7	1.5	1.5	2.2	11.3	11.3	0.2	0.3
New Zealand[1]	2.2	..	1.6	..	17.4	17.4	0.3	..
Norway	2.8	1.6	2.0	2.6	13.3	13.3	0.3	0.3
Poland	1.8	2.1	3.3	..	24.1	24.1	0.8	..
Portugal	1.3	1.0	1.3	1.4	18.1	18.1	0.2	0.3
Slovak Republic	0.7	2.4	1.5	6.7	18.4	18.4	0.3	1.2
Slovenia	1.3	1.5	2.8	2.9	17.0	17.0	0.5	0.5
Spain	3.0	0.6	1.0	1.3	18.2	18.2	0.2	0.2
Sweden	1.4	1.6	1.7	2.3	13.9	13.9	0.2	0.3
Switzerland	0.3	0.7	0.9	1.0	10.8	10.8	0.1	0.1
Turkey	9.2	10.3	7.8	8.8	26.8	26.8	2.1	2.3
United Kingdom	1.8	3.0	-0.5	3.7	11.8	11.8	-0.1	0.4
United States	2.5	2.1	-1.9	1.0	7.8	7.8	-0.1	0.1
OECD Total	2.3	2.2	0.4	2.2	..	..	..	..
Enhanced Engagement								
Brazil	5.4	2.9	5.1	-1.5	22.5	22.5	1.2	-0.3
China	2.5	1.5	2.5	-0.5	33.6	33.6	0.8	-0.2
India	1.9	5.1	0.5	4.7	35.4	35.4	0.2	1.7
Indonesia	3.5	3.3	4.1	2.9	19.6	19.6	0.8	0.6
Russia	5.0	2.2	3.9	0.3	32.8	32.8	1.3	0.1
South Africa	6.8	4.3	12.5	3.8	18.3	18.3	2.3	0.7

Table B.1. Information on food price changes *(cont.)*

	Total inflation % change (year-on-year)		Food inflation % change (year-on-year)[2]		Expenditure share of food		Food contribution to total change in inflation[3]	
	2017	2018	2017	2018	2017	2018	2017	2018
Non OECD								
Algeria	8.2	3.6	8.0	1.8	43.8	43.8	3.5	0.8
Bangladesh	5.2	..	6.5	7.1	28.6	28.6	1.9	2.0
Bolivia	3.7	2.9	5.8	18.0	27.6	27.6	1.6	5.0
Botswana	3.4	3.1	4.2	..	23.7	23.7	1.0	..
Bulgaria	0.4	0.9	3.6	0.8	37.2	37.2	1.3	0.3
Colombia	5.5	3.7	6.0	1.5	34.7	34.7	2.1	0.5
Costa Rica	0.9	2.4	0.8	-2.2	21.4	21.4	0.2	-0.5
Dominican Republic	2.3	3.9	-2.0	5.2	29.2	29.2	-0.6	1.5
Ecuador	0.9	-0.1	1.5	-0.1	23.0	23.0	0.3	0.0
Egypt	28.1	17.0	37.1	12.9	26.3	26.3	9.8	3.4
El Salvador	1.3	1.5	2.8	2.9	26.0	26.0	0.7	0.8
Ethiopia	6.9	10.5	6.0	13.7	57.0	57.0	3.4	7.8
Ghana	13.3	10.3	7.0	6.8	37.0	37.0	2.6	2.5
Guatelama	3.8	4.7	5.6	10.5	28.6	28.6	1.6	3.0
Haiti	14.1	13.2	13.9	13.2	50.4	50.4	7.0	6.7
Honduras	3.4	4.6	-1.4	1.7	31.8	31.8	-0.4	0.5
Iraq	-0.8	0.8	-3.3	-0.6	35.0	35.0	-1.2	-0.2
Jordan	2.5	3.0	-1.4	-1.3	35.2	35.2	-0.5	-0.5
Kenya	7.0	4.8	12.5	4.7	36.0	36.0	4.5	1.7
Madagascar	6.9	..	5.6	..	60.0	60.0	3.4	..
Malawi	18.1	4.5	21.0	8.4	50.0	50.0	10.5	4.2
Malaysia	3.2	3.5	4.0	2.7	56.3	56.3	2.3	1.5
Moldavia	3.0	6.5	3.8	8.4	60.0	60.0	2.3	5.0
Morocco	2.1	1.8	2.8	2.2	40.4	40.4	1.1	0.9
New Caledonia	0.9	1.4	2.8	1.4	21.0	21.0	0.6	0.3
Nicaragua	3.8	5.4	0.0	5.6	26.1	26.1	0.0	1.5
Niger	0.4	7.6	-2.9	7.2	40.0	40.0	-1.2	2.9
Nigeria	18.7	15.1	17.8	18.9	51.8	51.8	9.2	9.8
Pakistan	3.7	4.4	2.6	3.7	37.5	37.5	1.0	1.4
Panama	0.6	0.4	0.4	-1.9	33.6	33.6	0.1	-0.6
Paraguay	1.9	4.7	2.6	7.7	39.1	39.1	1.0	3.0
Peru	3.1	1.4	4.1	0.2	25.0	25.0	1.0	0.1
Philippines	2.7	3.9	3.4	4.5	39.0	39.0	1.3	1.8
Romania	0.1	4.3	1.1	3.8	37.4	37.4	0.4	1.4
Rwanda	12.0	0.1	10.0	-2.0	39.0	39.0	3.9	-0.8
Senegal	1.6	-0.3	5.6	-0.3	53.4	53.4	3.0	-0.2
Singapore	0.6	0.0	1.9	1.1	21.7	21.7	0.4	0.2
Sri Lanka	5.5	5.8	4.5	10.5	41.0	41.0	1.8	4.3
Chinese Taipei	2.2	0.9	3.0	0.8	23.7	23.7	0.7	0.2
Tanzania	5.2	4.0	7.6	6.3	38.5	38.5	2.9	2.4
Thailand	2.2	0.7	2.4	0.1	33.0	33.0	0.8	0.0
Tunisia	4.6	6.9	4.7	7.9	28.7	28.7	1.3	2.3
Uganda	5.9	3.0	14.5	2.7	27.2	27.2	3.9	0.7
Zambia	7.0	6.2	7.4	4.6	52.5	52.5	3.9	2.4

.. Not available

1. No data available for January 2018 in Australia and New Zealand.
2. CPI food: definition based on national sources.
3. Contribution is food inflation multiplied by expenditure share, expressed in %.

Source: OECD and national sources.

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OECD-FAO Agricultural Outlook 2018-2027

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World agricultural markets have changed markedly since the food price spikes of 2007-8, as production has grown strongly while demand growth has started to weaken. In the coming decade, real agricultural prices are expected to remain low as a result of reduced growth in global food and feed demand. Net exports will tend to increase from land abundant countries and regions, notably in the Americas. Countries with limited natural resources, slow production expansion and high population growth will see rising net imports. Increasing import dependence is projected in particular for the Middle East and North Africa, where a scarcity of arable land and water constrains agricultural production.

The projections and past trends presented in the statistical annex can be viewed in more detail at *http://dx.doi.org/10.1787/agr-outl-data-en.*

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