OECD-FAO Agricultural Outlook 2019-2028

SPECIAL FOCUS: LATIN AMERICA

OECD

Food and Agriculture Organization of the United Nations

OECD-FAO Agricultural Outlook 2019-2028

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Foreword

Global agriculture has evolved into a highly diverse sector, with operations that range from small subsistence farms to large multinational holdings. Farmers' products are sold fresh in local markets, but also across the world through sophisticated and modern value chains. Beyond their traditional role of providing humankind with food, farmers are important custodians of the natural environment and have become producers of renewable energy.

In order to meet the high expectations society places on agriculture, public and private decision makers require reliable information on the likely trends of global demand, supply, trade and prices and the factors driving them. To this end, the *OECD-FAO Agricultural Outlook* is an annual reference that provides a comprehensive medium-term baseline scenario for agricultural commodity markets at national, regional and global levels.

In addition to providing a plausible baseline scenario for agriculture markets in the coming decade, the *Outlook* identifies a widening set of risks to agricultural markets that can help policy makers better anticipate and manage them. These include the spread of plant and animal diseases and the growing risk of extreme climatic events, as well as possible supply disruptions from growing trade tensions.

This *OECD-FAO Agricultural Outlook 2019-2028* foresees that the demand for agricultural products will grow by 15% over the coming decade. The way in which this demand is met will determine the sector's impact on the natural resource base, notably land, water, and biodiversity. Rising food production also comes with higher greenhouse gas emissions, with nearly one quarter of all emissions coming from agriculture, forestry and land use change.

Unsurprisingly, there are now mounting pressures on agriculture to reduce its carbon footprint, and to help mitigate climate change.

At the same time, roughly two billion people derive their livelihoods from agriculture. Many of the world's poorest people will continue to live in rural areas and will depend on agriculture for an important share of their incomes. Some 820 million people worldwide remain undernourished, while millions suffer from other forms of malnutrition, such as micronutrient deficiencies and obesity.

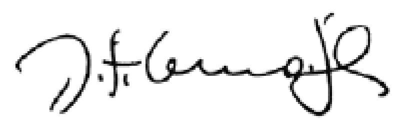
This report supports the work of our Members in their efforts to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture by 2030, as committed under the Sustainable Development Goals (SDGs) and in the 2015 UN Framework Convention on Climate Change Paris Agreement.

This year's *Outlook* includes a special chapter that focuses on the prospects and challenges for agriculture in Latin America and the Caribbean. While highly diverse, the region has become the largest exporter of agricultural commodities in the world and is expected to further reinforce this position in the coming decade. The region is also home to 57% of the world's primary forests and the source of 40-50% of the world's biodiversity. Tailored and concerted policy responses are needed across Latin America and the Caribbean to create an enabling environment that supports rural livelihoods, while protecting the natural resource base and promoting mutually beneficial trade relationships with food importing regions.

This report complements wider collaborative efforts between our two organisations, including through the G20 and G7 processes. In particular, the Agricultural Market Information System (AMIS) complements this medium-term *Outlook* by providing short-term information that contributes to enhanced market transparency and better co-ordination of policy responses for food security.

We hope that this new edition of our joint *Outlook* will once again provide our Member governments, as well as all other stakeholders, with useful forward-looking market information and analysis. These insights can empower countries to make informed policy decisions that will benefit their citizens and protect the natural resources that they depend upon. Our organisations are committed to working together to ensure a sustainable use of our natural resource base for improved global food security and nutrition, and to making a meaningful contribution to help achieve the SDGs.

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



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The *Agricultural Outlook 2019-2028* 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 *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), Hubertus Gay (*Outlook* co-ordinator), Céline Giner, Gaëlle Gouarin, Claude Nenert, Ana-Maria Muresan 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. Csaba Gaspar and Sophia Gnych of the OECD Seed Schemes provided input for the box on plant breeding innovations. The OECD Secretariat is grateful for the contributions provided by visiting experts Abdi Ali (Agriculture and Agri-Food Canada), Aline Gomes de Almeida Gastardelo (Brazilian Ministry of Agriculture, Livestock and Food Supply), 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; Thomas Chatzopoulos and Ignacio Pérez Domínguez provided a box on extreme climate events. 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 Karine Lepron, 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 that includes historical data and projections, can be accessed through the OECD-FAO joint internet site: www.agri-outlook.org. The published *Agricultural Outlook 2019-2028* is available in the OECD’s iLibrary.

Table of contents

Tables

Figures

Boxes

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Abbreviations and acronyms

AFOLU	Agriculture, Forestry and Other Land Use
AI	Avian Influenza
AMIS	Agricultural Market Information System
AMR	Antimicrobial resistance
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
bln t	Billion metric tonnes
CA	Conversion agriculture
CAC	Central America and Caribbean
CAP	Common Agricultural Policy (European Union)
CETA	Comprehensive Economic and Trade Agreement
CIAT	International Center for Tropical Agriculture
CIF	Cost, insurance and freight
CPI	Consumer Price Index
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CSA	Climate-Smart Agriculture
cts/lb	Cents per pound
c.w.e.	Carcass weight equivalent
DDGs	Dried Distiller's Grains
dw	Dry weight
dwt	Dressed carcass weight
EBA	Everything-But-Arms Initiative (European Union)
ECLAC	Economic Commission for Latin America and the Caribbean
EISA	Energy Independence and Security Act of 2007 (United States)
El Niño	Climatic condition associated with the temperature of major sea currents
EMBRAPA	Brazilian agricultural research institution
EPA	US Environmental Protection Agency
EPAs	Economic Partnership Agreements
ERS	Economic Research Service of the US Department for Agriculture
est	Estimate
EU	European Union, except the United Kingdom
EU-14	Pre-2004 members of the European Union excluding the United Kingdom
FAO	Food and Agriculture Organization of the United Nations
FFV	Flex-fuel Vehicles
FOB	Free on board (export price)
FMD	Foot and Mouth Disease
FTA	Free Trade Agreement
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
GSSE	General Services Support Estimate
ha	Hectares
HFCS	High fructose corn syrup
hl	Hectolitre
IBGE	Instituto Brasileiro de Geografia e Estatistica (Brazil)
ICAC	International Cotton Advisory Committee
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
INDAP	El Instituto de Desarrollo Agropecuario (Chile Ministry of Agriculture Institute of Agricultural Development)
IPCC	Intergovernmental Panel on Climate Change
ISO	International Sugar Organization
IUU	Illegal, unreported and unregulated (fishing)
kg	Kilogrammes
kha	Thousand hectares
kt	Thousand metric tonnes
La Niña	Climatic condition part of El Niño-Southern Oscillation (see Glossary)
LA	Latin America
LAC	Latin America and the Caribbean
lb	Pound (weight)
LDCs	Least Developed Countries
lw	Live weight
MBM	Meat and bone meal
MENA	Middle East and North Africa
MERCOSUR	Mercado Común del Sur / Common Market of South America
Mha	Million hectares
Mn	Million
Mn L	Million litres
MPS	Market Price Support
Mt	Million metric tonnes
NAFTA	North American Free Trade Agreement
NGO	Non-governmental organization
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
PPP	Purchasing power parity
PRRS	Porcine Respiratory and Reproductive Syndrome
PSE	Producer Support Estimate
R&D	Research and development
REAF	Reunión Especializada en Agricultura Familiar (Specialised Forum on Family Farming
RFS / RFS2	Renewable Fuels Standard in the United States, part of the Energy Policy Act
rse	Raw sugar equivalent
RTA	Regional Trade Agreements
r.t.c.	Ready to cook
r.w.e.	Retail weight equivalent

SDG	Sustainable Development Goals
SEA	South East Asia
SME	Small and medium enterprise
SMP	Skim milk powder
SPS	Sanitary and Phyto sanitary measures (WTO agreement)
SSA	Sub-Saharan Africa
t	Metric tonnes
t/ha	Metric tonnes/hectare
TFP	Total Factor Productivity
TPP	Trans-Pacific Partnership
tq	Tel quel basis (sugar)
TRQ	Tariff rate quota
UN	The United Nations
UNECLAC	UN Economic Commission for Latin America and the Caribbean
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
US	United States
USDA	United States Department of Agriculture
USMCA	United States—Canada—Mexico Agreement
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization
WMP	Whole milk powder
WTO	World Trade Organization

Currencies

ARS	Argentinean peso
AUD	Australian dollars
BRL	Brazilian real
CAD	Canadian dollar
CLP	Chilean peso
CNY	Chinese yuan renminbi
EGP	Egyptian pound
EUR	Euro (Europe)
GDP	British pound sterling
IDR	Indonesian rupiah
INR	Indian rupee
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
UAH	Ukrainian grivna
USD	US dollar
ZAR	South African rand

Summary table for country grouping in the Statistical Annex

North America	Developed	Canada, United States
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[1], 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, Republic of North Macedonia, Ukraine, United Kingdom
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, The People's Republic of China, 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, Saudi Arabia, Republic of Korea, 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[2]		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, The People's Republic of China, India, Russian Federation, South Africa

1. Refers to all current European Member states except the United Kingdom.
2. 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, The People's Republic of China, 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
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, Republic of North Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan
Western Europe	European Union[1], Norway, Switzerland, United Kingdom
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

1. Refers to all current European Member states except the United Kingdom. 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.

Executive Summary

The *Agricultural Outlook 2019-2028* 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 focus on Latin America and the Caribbean.

Several years of strong supplies have reduced the international prices of most agricultural commodities, with cereal, beef and sheepmeat prices showing short-term rebounds. For nearly all commodities covered in the *Outlook*, real prices are projected to remain at or below current levels over the coming decade, as productivity improvements continue to outpace demand growth.

A growing global population will continue to use increasing amounts of agricultural products as food, feed and for industrial purposes. Much of the additional food demand over the coming decade will originate in regions with high population growth, in particular Sub-Saharan Africa, India, and the Middle East and North Africa.

Per-capita consumption of staple foods is expected to be stagnant as demand is saturated for most of the world's population. Meat demand is expected to be relatively strong in the Americas, while low incomes continue to constrain meat consumption in Sub-Saharan Africa. Fresh dairy products will meet much of the demand for protein in Asia (notably India and Pakistan). More widely, per capita consumption of sugar and vegetable oils is expected to rise, driven by urbanisation and the shift to more processed and convenience foods.

A combination of excessive calorie consumption, unbalanced diets and declining activity levels imply a growing burden of overweight and obesity in various countries across the world. In many low and middle-income countries, these problems coexist with undernourishment and micronutrient deficiencies, implying a "triple burden" of malnutrition.

Robust demand for animal foods products provides incentives to expand production in the livestock sector through larger herds. Paired with assumed improvements in offtake rates, demand for animal feed will be stimulated, with feed crops such as maize and soybeans expected to increase their shares in the global crop mix. Hence, the growth in feed use of cereals is expected to exceed the expansion of food use over the coming decade.

Biofuels formed a major source of crop demand growth between 2000 and 2015, but the expansion will be lower over the coming decade, with additional demand coming mainly from Indonesia, using vegetable oil for biodiesel, and the People's Republic of China and Brazil, using cassava and sugarcane for ethanol.

Agricultural production is expected to grow by 15% over the coming decade, while global agricultural land use is expected to be broadly flat. The projected expansion in crop output can be attributed primarily to yield improvements and higher production intensity, driven by technological innovation. The foreseen growth in livestock production will be based on an expansion of herds, greater feed use and a more efficient use of feed. Because of the limitations in capture fisheries, nearly all projected growth in fish and seafood supply will be from aquaculture, pushing its share of total production to about 55% by 2028.

Agriculture continues to be a significant contributor to global greenhouse gas emissions. Direct emissions of agriculture, mostly from livestock, as well as rice and synthetic fertilisers, are expected to grow by 0.5% p.a. over the coming decade, compared with 0.7% p.a. over the past ten years. This is lower than the growth in agricultural production, indicating a declining carbon intensity as productivity increases.

International trade will remain essential for food security in a growing number food-importing countries. It also continues to be important to incomes and livelihoods in exporting regions such as Latin America and the Caribbean, which is expected to further increase its share of global agricultural exports. The Black Sea region will consolidate its position as a leading exporter of wheat and maize, with most exports going to the Middle East and North Africa.

World agricultural markets face a range of new uncertainties that add to the traditionally high risks facing agriculture. On the supply side, these include the spread of diseases such as African Swine Fever, growing resistance to antimicrobial substances, regulatory responses to new plant breeding techniques and responses to increasingly likely extreme climatic events. On the demand side, they include evolving diets, reflecting perceptions with respect to health and sustainability issues, and policy responses to alarming trends in obesity. A further factor is the heightened uncertainty with respect to future trading agreements between several important players on world agricultural markets. An escalation of ongoing trade tensions has the potential to reduce and redirect trade, with repercussions for international and domestic markets.

Latin America and the Caribbean

This year's special chapter focuses on Latin America and the Caribbean (LAC), a region abundant in land and water that accounts for 14% of global production and 23% of the world's exports of agricultural and fisheries commodities. Production growth is expected to slow over the coming decade; but, with 22% growth for crops and 16% for livestock products, be, respectively, seven and two percentage points faster than the global average. Increased exports from the LAC region will limit the slowdown in production, underscoring the importance to LAC countries of trade openness at the global level. By 2028, the region will account for more than 25% of global exports in agricultural and fisheries products, underscoring the importance of trade openness at the global level.

For the majority of countries in the region, support provided to farmers is low relative to the OECD or global average, so production decisions are determined primarily by market signals. However, due to the diverse state of rural infrastructure and R&D initiatives across the region, there are differing requirements for public spending on strategic investments in agriculture's enabling environment that could raise agricultural productivity sustainably. Several governments in the region also face the need to invest in improving the environmental performance of the sector and reduce soil erosion, deforestation and emissions from agricultural production.

Strong growth opportunities in high value fruit and vegetable crops provide opportunities for smallholders, but policies will need to be differentiated according to their resource endowments and market potential. The ongoing feminisation of agriculture in the region supports the needfor targeting female farmers to improve their access education, credit and extension services.

Food security continues to be a concern in the region, with many households unable to afford the food they need. As extreme poverty has risen since 2015, ensuring income growth among the poorest communities is paramount – a challenge where agricultural development has an important role to play. The LAC region is simultaneously experiencing a rapid development in the number of people who are overweight and obese, which represents a growing public health problem. Several initiatives have been introduced to counter these trends, from the provision of public information to regulations on industry and fiscal measures. Evaluating these policies is essential, so that successful initiatives can be scaled up and extended to other countries.

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 2019 to 2028. 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. International trade will remain essential for food security in food-importing countries. World agricultural markets face a range of new uncertainties that add to the traditionally high risks facing agriculture. These include the spread of diseases such as African Swine Fever and the heightened uncertainty with respect to future trading agreements between several important players on world agricultural markets.

1.1. Introduction

The *Agricultural Outlook* presents a consistent baseline scenario for the evolution of agricultural and fish commodity markets at national, regional and global levels over the coming decade (2019-2028). The *Outlook* thus focuses on the medium term, complementing both short-term market monitoring and outlook publications and long-term projections.[1]

The projections in the *Outlook* are developed by OECD and FAO in collaboration with experts from member countries and international commodity bodies. The use of the OECD-FAO Aglink-Cosimo model links the sectors covered in the *Outlook* and ensures a global equilibrium across all markets. It further allows follow-up analysis, including a consideration of market uncertainties. A detailed discussion of the methodology underlying the projections as well as documentation of the Aglink-Cosimo model is available online.[2] Projections by commodity are discussed in detail in the online commodity chapters.

The projections in this *Outlook* are influenced both by current market conditions (reviewed in Figure 1.1) and by assumptions on the macro-economic, demographic and policy environment (presented in Box 1.4 at the end of this chapter). Over the *Outlook* period, world population is expected to reach 8.4 billion people, with most growth concentrated in Sub-Saharan Africa (+300 million people) and South Asia, notably India (+189 million people). Economic growth will be unevenly spread around the world, with strong per capita income growth in India and the People's Republic of China (hereafter "China") and weaker growth in Sub-Saharan Africa in particular. Despite robust per capita income growth among emerging markets, the level of income attained by 2028 is expected to remain significantly below levels in OECD countries. These and other assumptions are discussed in more detail in Box 1.4.

The projections are also subject to a number of uncertainties, discussed in detail at the end of the chapter and in each of the online commodity chapters.

Figure 1.1. Market conditions for key commodities

Current market conditions

Cereals: World production of cereals declined for the second consecutive year in 2018, driven by smaller wheat and other coarse grains harvests. In contrast, the maize crop was larger. Rice output was also higher in 2018, overtaking the previous year's record production. Global cereal stocks fell for the first time in six years.

Oilseeds: The United States and Brazil recorded bumper crops for soybean in 2018. Demand for protein meals has tapered off given China's tariffs on US soybeans and moves to lower the share of protein meal in feed rations. Prices peaked in the first half of 2018, but have fallen since, in part due to high stocks and market uncertainties.

Sugar: Following a record production surplus in 2017-18, a smaller surplus is estimated for 2018-19 due to unfavourable weather conditions in India, Thailand and Europe. Growth in sugar intake remains strong in many developing countries. As a result of the continued production surplus, world sugar prices were relatively depressed for much of the 2017-18 season.

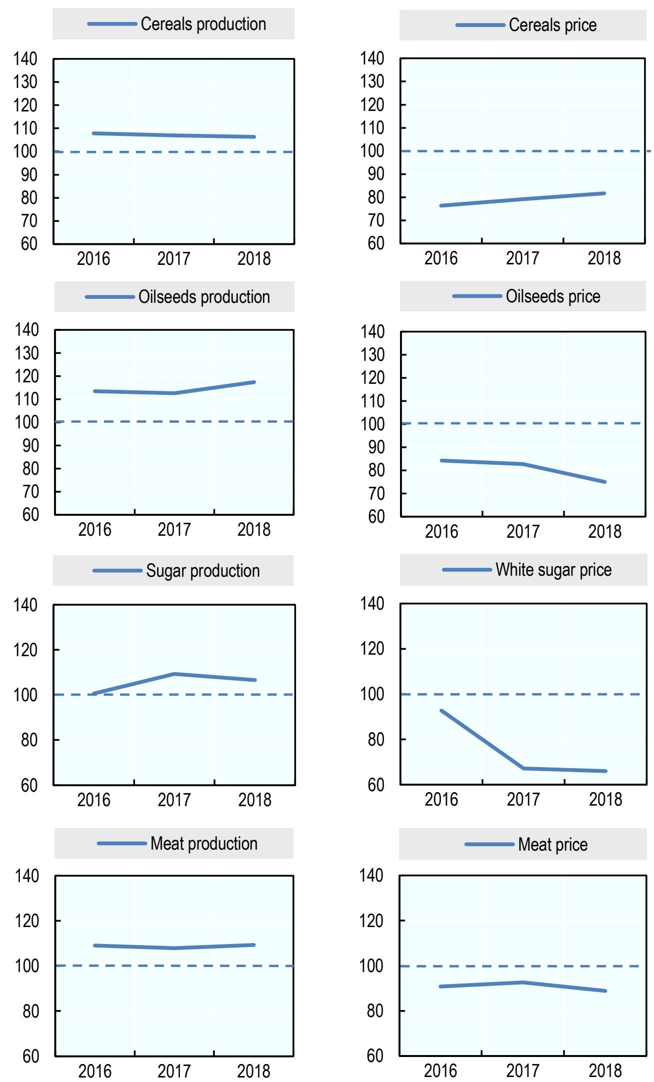
Meat: Production of bovine, pig and poultry meats increased in 2018, with much of the expansion originating in the EU, the Russian Federation and the United States. Output fell in the People's Republic of China (hereafter "China") due to the outbreak of African Swine Fever. Prices of pig and poultry meats declined while those of bovine meat remained stable.

Production Index

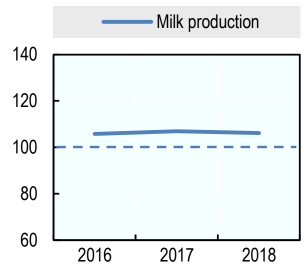
Average 2009-2018 = 100

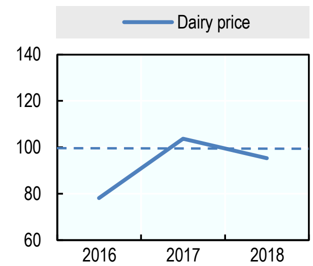
Nominal Price Index

Average 2009-2018 = 100

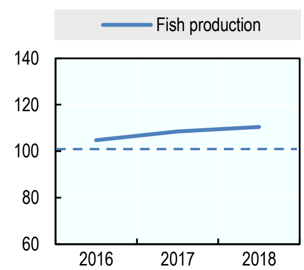


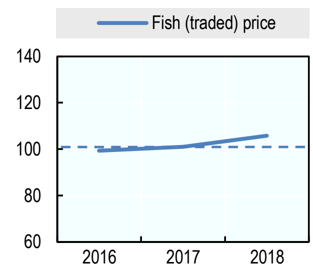
Dairy: World milk production experienced an increase by 1.6% in 2018, fuelled by a 3.0% increase in India and growing production in the three major dairy exporters (the European Union, New Zealand and the United States). Butter prices declined compared to the record levels of last year, while skim milk powder (SMP) prices recovered from low levels seen a year ago.



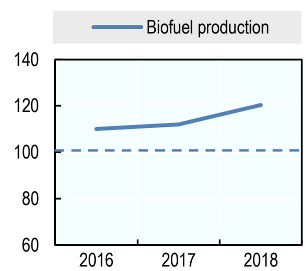


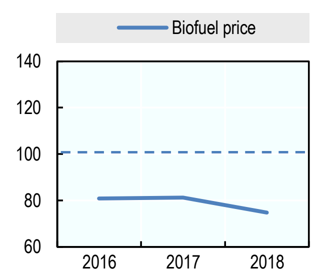
Fish: Production, trade and consumption all reached historical peaks in 2018. The growth in production was due to a slight increase in capture fisheries (mainly of anchoveta in South America) and the continued expansion of aquaculture production, at some 3-4% a year. Fish prices grew during the first part of 2018 and remain above 2017 levels for most species and products.



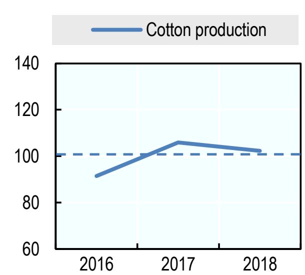


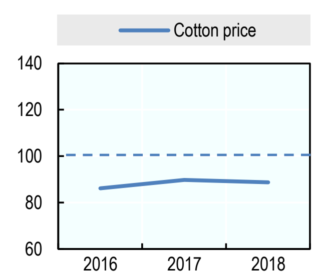
Biofuels: Global production increased in most major producing regions in 2018. Demand was sustained by obligatory blending and growing total fuel demand, although prices decreased due to ample supply. Decreasing price ratios of biofuels to conventional fuels resulted in additional non-mandated demand for biofuels, mainly in Brazil.





Cotton: Production fell by 3% in the 2018 marketing year as pest and weather problems plagued the major producers. Consumption grew strongly in Bangladesh, Turkey and Viet Nam. Global stocks declined to about 8 months of world consumption. Prices have been declining but continue to be high compared to polyester, the main substitute for cotton.





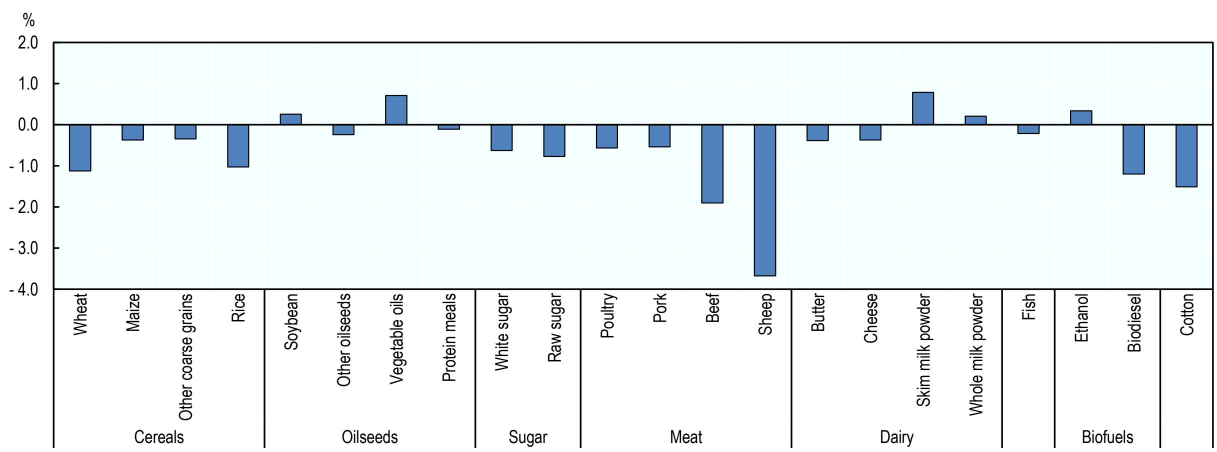
Note: All graphs expressed as an index where the average of the past decade (2009-2018) is set to 100. Production refers to global production volumes. Price indices are weighted by the average global production value of the past decade as measured at real international prices. More information on market conditions and evolutions by commodity can be found in the commodity snapshot tables in the Annex and the online commodity chapters.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957232

1.2. Prices

The *Outlook* uses prices at main markets (e.g. US Gulf ports, Bangkok) of each commodity as international reference 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. Shocks such as droughts or recessions create variability around these price paths, which are explored through a partial stochastic analysis later in the chapter.

Figure 1.2. Average annual real price change for agricultural commodities, 2019-28



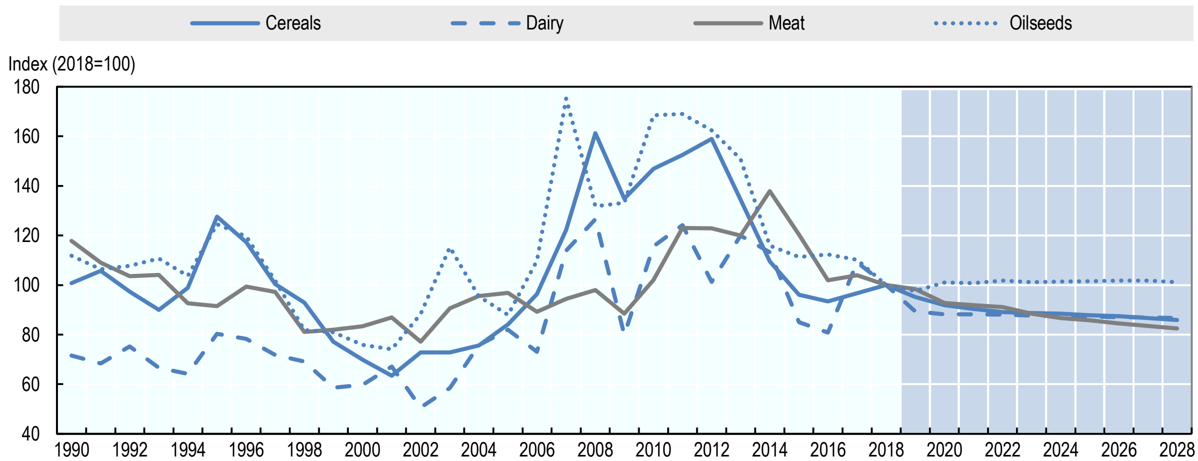
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957251

Most of the commodities covered in the *Outlook* are expected to see real price declines over the coming decade by around 1-2% per year (Figure 1.3), as productivity growth is expected to contribute to a gradual decline in real prices in the coming decade. Pronounced price declines are expected for beef and sheep. For beef, high prices in recent years have stimulated an expansion of the cattle inventory. Given the longer time needed to raise cattle, this will result in additional supply in the coming years, bringing prices back down. A similar process is at work for sheep prices, which increased by more than 20% in real terms between 2017 and 2018; this *Outlook* expects real prices for sheep meat to decline in the coming two years to their 2017 levels. For a few commodities (vegetable oil, skim and whole milk powder, ethanol) real prices are expected to be flat or increase slightly given their relatively low starting point.

Figure 1.3 puts these real price projections in the context of recent history. Prices for cereals, oilseeds, dairy and meat (among other agricultural commodities) saw strong increases between the early 2000s and 2007-14, with real prices in some cases doubling in a short period of time (Figure 1.4). Prices have fallen in recent years, however, and prices are projected to remain at or below current levels, as marginal production costs are assumed to decline further in real terms over the decade.

Figure 1.3. Medium-term evolution of commodity prices, in real terms



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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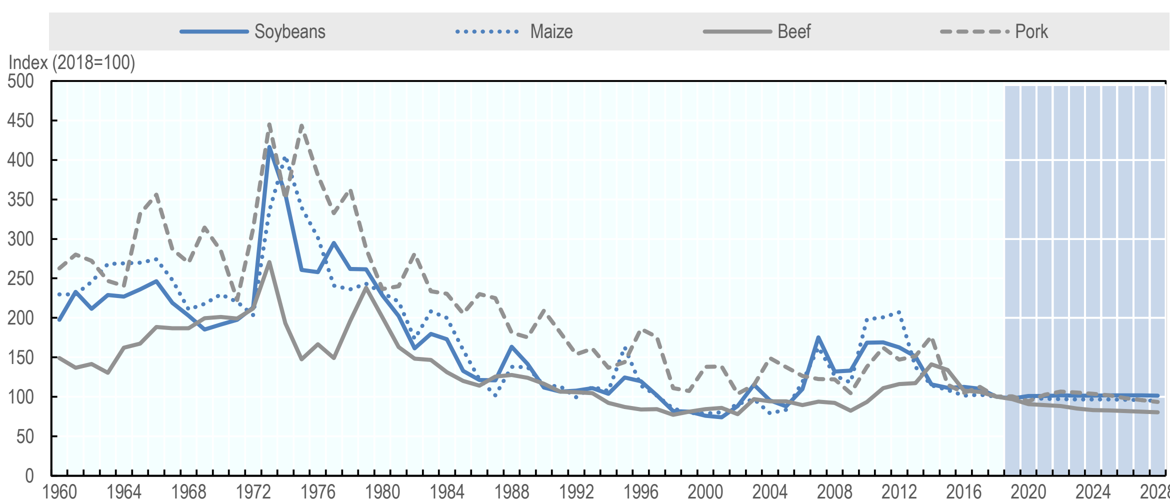
Figure 1.4. Long-term evolution of commodity prices, in real terms



Note: Historical data for soybeans, maize and beef from World Bank, "World Commodity Price Data" (1960-1989). Historical data for pork from USDA QuickStats (1960-1989).
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957289

The expected decline in real prices is consistent with a long-term downward trend (Figure 1.4). Historical data show that agricultural commodity prices tend to be highly correlated, and tend to follow a declining trend over the long run. However, the historical data also shows the possibility of periods of volatility and high prices interrupting the long-term trend. This was the case in the 1970s, as well as more recently. Price projections in this *Outlook* reflect structural trends over the coming decade, but unforeseen events (e.g. harvest failures, demand shocks) could create volatility around these trends.

Lower prices are a boon to millions of consumers worldwide, but also put pressure on the incomes of those producers who are not lowering their costs sufficiently through improved productivity. A low-price environment could thus lead to increasing demands for support to farmers, which could in turn affect the projections.

In addition to the evolution of international prices, domestic prices of agricultural commodities are influenced by several other factors such as transport costs, trade policy, taxation and exchange rates. Among these, changes in exchange rates are perhaps the main source of variation, as exchange rates can change significantly over a short period of time. While international prices provide information on global demand and supply conditions, commodities are typically quoted in US dollars, so that variations of exchange rates relative to the US dollar are an additional factor determining price evolutions. Assumptions on exchange rates are discussed in Box 1.4.

1.3. Consumption

The needs of a growing and more affluent global population for food and raw materials will drive the demand for agricultural commodities over the next ten years. Global utilisation is expected to be shaped in particular by the population-driven food demand in Sub Saharan Africa, income-driven demand for higher value and more processed foods in emerging economies and changing consumption patterns resulting from a steadily increasing health, environmental and sustainability awareness in advanced economies. Moreover, the economic growth assumptions are subject to an additional element of uncertainty, especially in view of the recent revisions pointing to an overall economic slowdown.

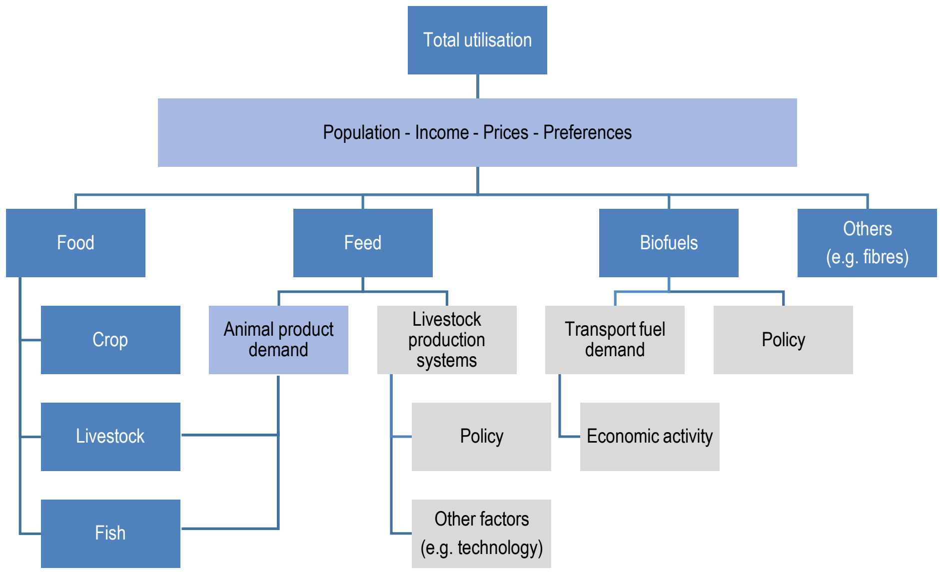
Drivers of agricultural commodity demand

Agricultural commodities are used as food, feed, fuel and raw materials for industrial applications. The demand is driven by a set of common factors, such as population dynamics, disposable income, prices and consumer preferences. Additionally, a number of specific drivers can be identified, as shown in Figure 1.5.

Population, income level, and preferences influence food demand directly, as they determine number of consumers, the desired food basket, and the ability to purchase these goods. Because of the considerable geographic differences in each of these factors, their relative influence on food use differs by country and region. In addition to these basic drivers, for non-food uses such as feed, fuel and other industrial applications, a number of specific factors can be identified. For example, feed demand is derived from a combination of the food demand for products of animal origin and the respective livestock production systems. They, in turn, depend on policies that set the context and on production technologies. Demand for agricultural products is also subject to broader policies that shape disposable incomes. Biofuels are a specific example of a policy driven demand. To project the actual use of biofuels and the derived demand for the various feedstocks several political and economic factors are assessed in the *Outlook* (for details see the biofuel chapter).

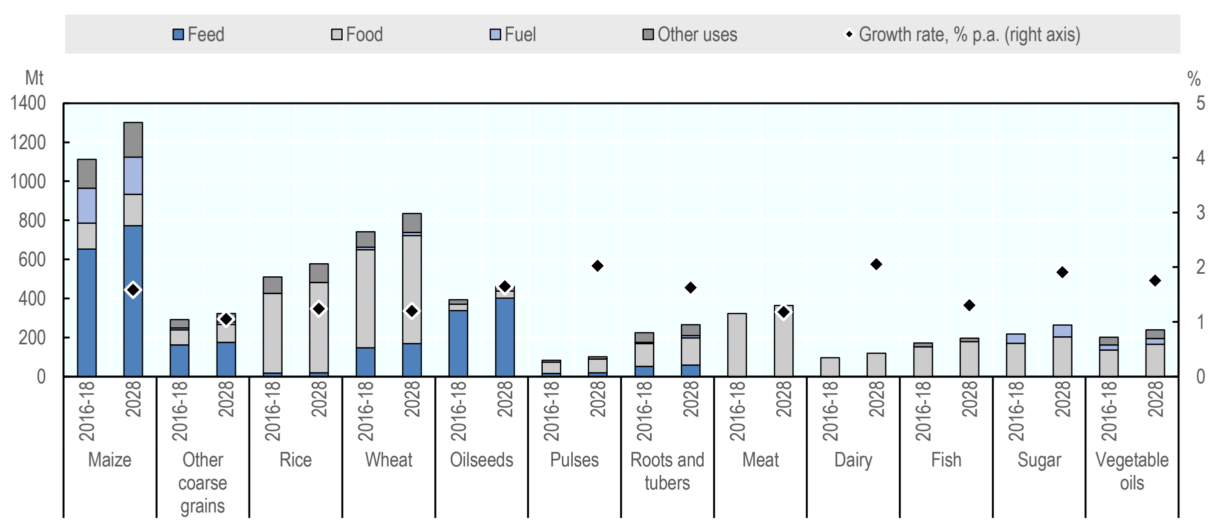
Food has been the primary use for most edible commodities, however feed and fuel uses have made significant gains in recent decades. In particular, the evolution of eating patterns towards a higher share of animal foods and the subsequent development of the livestock sector have increased the importance of feed. Growth in feed use of cereals is expected to exceed the expansion of food use over the coming decade, while biofuel feedstocks will maintain their strong position, without further gains (Figure 1.6).

Figure 1.5. Decomposition tree of main agricultural commodity uses and demand drivers



Note: Dark blue boxes represent the uses of agricultural commodities; light blue boxes represent the demand drivers; grey boxes represent production and policy factors.

Figure 1.6. Global use of major commodities



Note: Feed use of oilseeds refers to the oilseed equivalent of the protein meal component of crushed oilseeds; the oil obtained from crushing oilseeds is accounted for in "vegetable oils"; Dairy refers to all dairy products in milk solid equivalent units; Sugar biofuel use refers to sugarcane, converted into sugar equivalent units.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

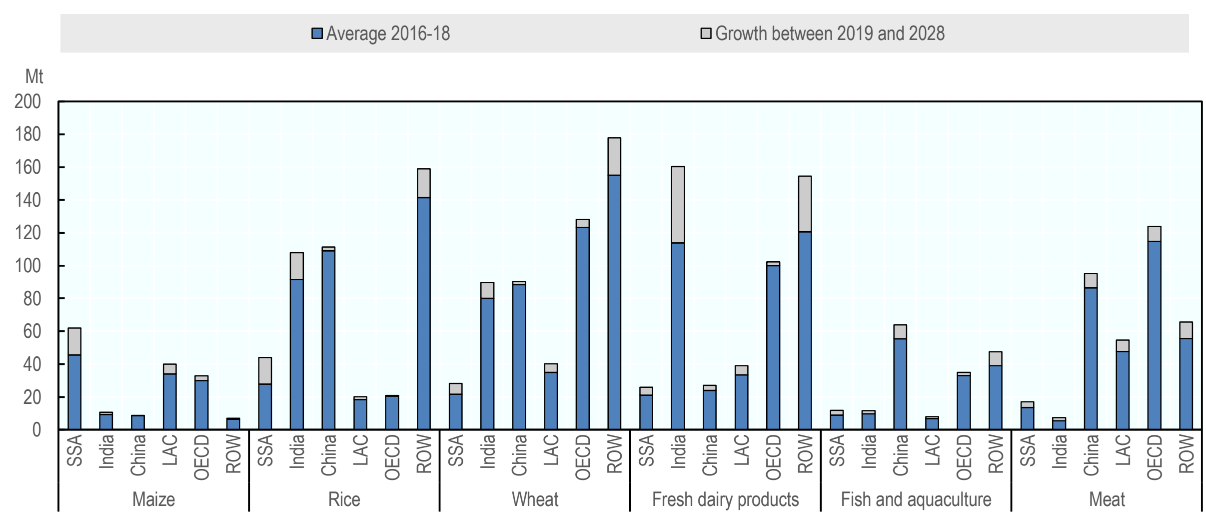
StatLink http://dx.doi.org/10.1787/888933957308

Global outlook for food use of agricultural commodities

Total food use of the commodities covered in this *Outlook* is expected to grow steadily over the next decade at rates of 1.2% p.a. for cereals, 1.7% for animal products, 1.8% for sugar and vegetable oils, and 1.9% p.a. for pulses and roots and tubers. In general, per-capita food consumption of staple products (cereals, roots & tubers, pulses) has levelled off globally and will be driven predominantly by population growth, while the evolution of higher value commodity (sugar, vegetable oils, meat, dairy products) demand will be based on a combination of per-capita use and population growth. As a result, demand for higher value products is projected to grow faster than for staples over the next decade.

Food use of cereals is projected to grow by 150 Mt over the outlook period, with rice and wheat accounting for the bulk of that expansion, each accounting for an additional 50 Mt by 2028. Consumption growth in animal products will come especially from continuously expanding consumption of dairy products, projected to expand by 20 Mt (milk solids equivalent) over the medium term. Meat consumption is expected to expand by 40 Mt and fish consumption by 25 Mt by 2028. The growth in sugar and vegetable oil consumption is estimated at about 30 Mt each. Regional differences in the level and growth rate of each commodity will persist, depending on the relative importance of the sub-sectors and drivers shown in Figure 1.7.

Figure 1.7. Regional contribution to food use of select commodities



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; ROW represents the rest of the world.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

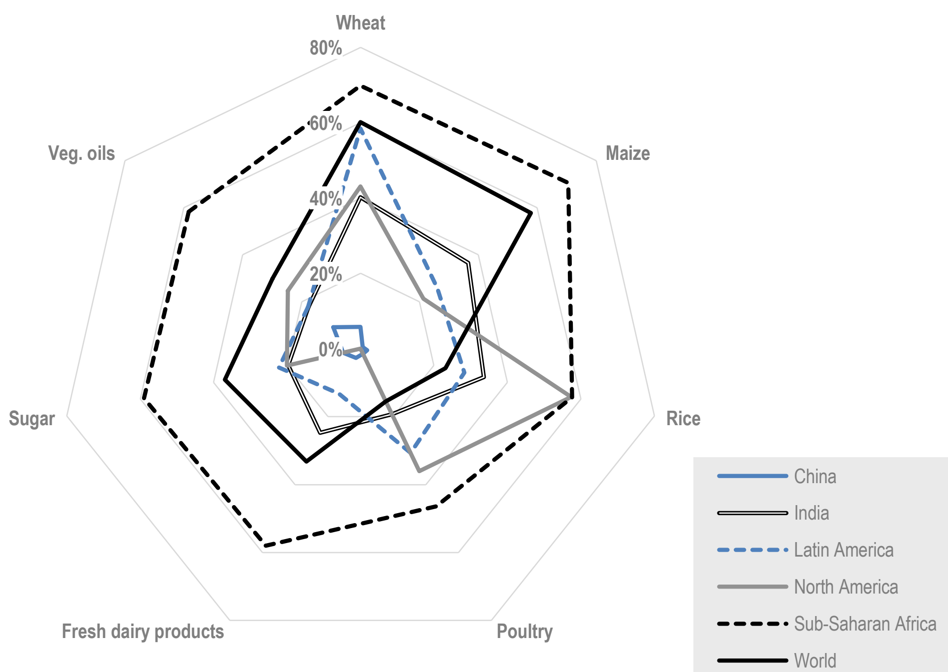
StatLink http://dx.doi.org/10.1787/888933957327

Population dynamics will shape the consumption of basic food commodities

Population represents the most significant factor behind the projected growth in food use of agricultural commodities, in particular for commodities that have high levels of per-capita consumption in regions with strong population growth. Global food use of cereals is expected increase by 147 Mt over the projection period, of which 42% (62 Mt) is projected come from Africa; about 90% of the expansion in African cereals consumption can be attributed to population growth.

The relative importance of the two main drivers of total demand for agricultural commodities, per-capita demand growth and population dynamics, varies widely across regions and commodities (Figure 1.8). For cereals, the importance of population as a driving factor tends to remain high across regions, as per-capita demand is stagnant or even decreasing in several high-income countries. For meat and dairy products, the impact of population dynamics is lower as income and individual preferences play a greater role. In Asia, population growth is responsible for about 60% of the additional consumption of meat. In some countries and regions, the projected growth in total food consumption is the net result of population growth and a partially offsetting decrease in per-capita demand. For example, meat consumption in Africa is expected to expand by only 25%, despite population growth rate of 30% over the coming decade. Similar effects are anticipated for staples consumption in many industrialised countries, however for very different reasons as highlighted in the following sections.

Figure 1.8. Contribution of population to growth in food use



Note: This chart shows for selected regions and commodities the share of the growth in food use accounted for by population growth.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

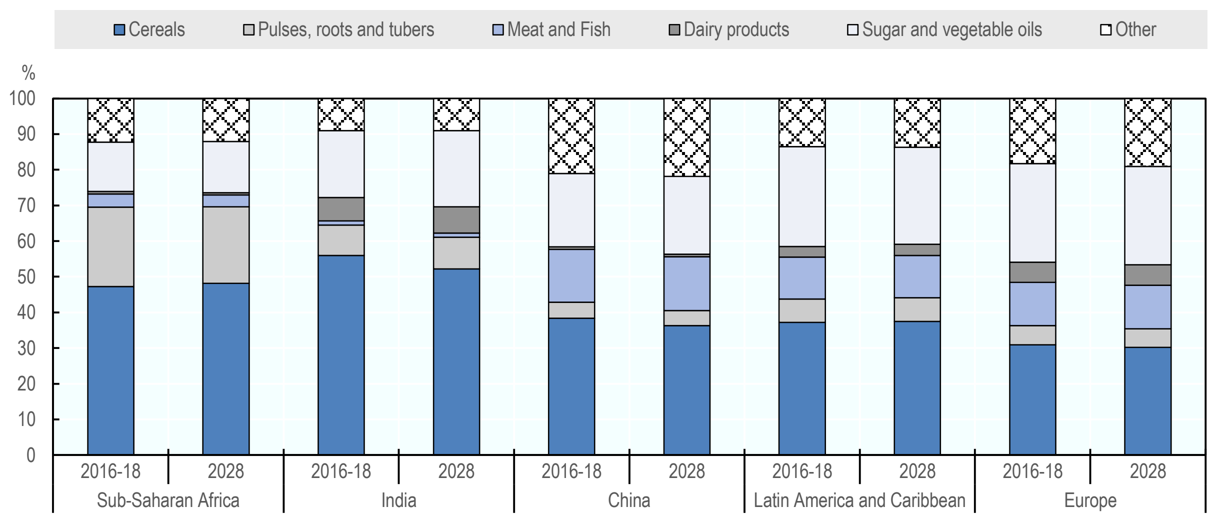
StatLink http://dx.doi.org/10.1787/888933957346

Per capita food consumption: Outlook and drivers

Demographic developments are an important driver of demand growth in many regions, but their effect depends on per capita food consumption patterns in each region. These patterns are determined by consumer preferences and available incomes. Over the outlook period, dietary patterns will be influenced by changes in income, lifestyles and other determinants such as health and environmental concerns. However, regional differences are expected to persist in part because preferences, which have been shaped by culture and tradition, are expected to evolve only gradually.

Figure 1.9 shows the composition of diets across regions over the *Outlook* period in terms of the daily availability of calories per capita by food groups. Important differences in dietary composition exist across regions: staples such as cereals, pulses, roots and tubers represent the biggest share of calorie intake in India and Sub-Saharan Africa, whereas they contribute a smaller share in China, Latin America and Europe.

Figure 1.9. Contribution of food groups to total daily per capita calorie availability



Note: Bars are subdivided into the share of total daily calories per capita attributable to each food group.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933395736

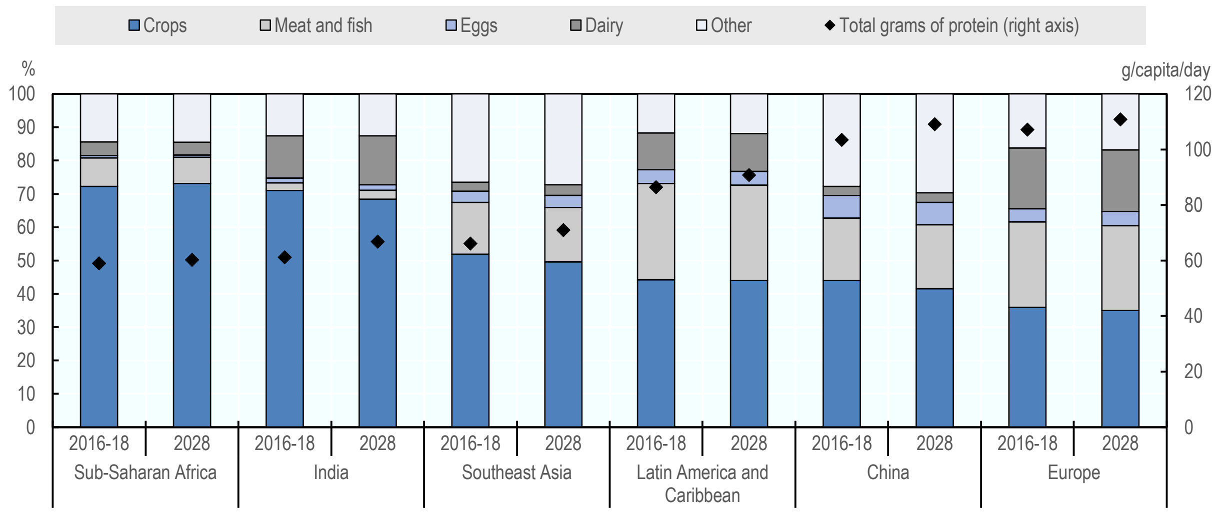
The relative importance of different sources of protein similarly varies around the world (Figure 1.10). Meat and fish account for a large share of protein intake in Latin America and the Caribbean, China, and Europe; but their share is much smaller in India and Sub-Saharan Africa.

Established food baskets across different geographic regions and income groups are expected to evolve only moderately over the medium term, preserving the broader consumption patterns. Consumers in low-income countries will continue to obtain roughly 70% of total calories and protein from staple foods, while only 20% of protein will come from animal sources. People in higher income countries will still consume around 40% of calories as staple foods and obtain over half of their protein from animal sources.

In medium and high-income countries, per capita food consumption of staples such as wheat, rice, roots and tubers has been levelling off or decreasing. The share of cereals in some Asian and Latin American diets is expected to stagnate or diminish, as their consumption is projected to grow at a slower rate than higher value products, such as meat, dairy, sugar or vegetable oil. However, as the mainstays of local diets in these countries, cereals will continue to be important over the medium term.

Despite the broad stability of dietary patterns, some important changes are taking place due to income growth, urbanisation, policies, and growing health and environmental concerns.

Figure 1.10. Contribution of protein sources to total daily per capita availability



Note: Bars refer to the share of the food group in total daily per capita protein intake (left axis); Dots represent the total quantity daily per capita protein intake (right axis); Crops include arable food crops (cereals, edible oilseeds, pulses, roots and tubers, sugar)

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957384

Implications of changing incomes on diets

Over the coming decade, economic growth is expected to raise average incomes around the world (see Box 1.4 for the overview of economic growth assumption). However, there is a growing concern that the income growth projections underlying the present Outlook are unlikely to be met, with recent data pointing to a more pronounced economic slowdown. The reduced prospects for the near term might translate into weaker growth over the medium term and curb the projected expansion in food consumption more than hereto presented. Furthermore, income growth and distribution will continue to remain uneven across and within regions and countries.

For example, the East and Southeast Asia region is expected to see per capita income grow by 60-100% by 2028. These higher incomes will result in greater demand for meat in the region, with meat consumption rising by 5 kg/capita in China and 4 kg/capita in Southeast Asia over the medium term. This expansion will be largely concentrated in greater poultry and pork consumption, the two meats most widely consumed in those regions. Beef consumption in China is also expected to rise in per capita terms by 0.5 kg/capita over the next decade, bringing average consumption to 4 kg/capita, slightly increasing the share of beef in total meat consumption.

In South Asia, by contrast, income growth will not generate a similar expansion of meat consumption. There, income growth is projected to be associated with greater consumption of dairy products, sugar and vegetable oil. Dairy products and pulses will remain the critical sources of protein. Pakistan is expected to lead global per capita fresh dairy consumption growth, adding 42 kg/capita by 2028 and bringing the country's average annual level to 274 kg/capita, representing nearly 30% of total daily per capita protein availability. Dairy consumption is projected to grow quickly in India as well, and will account for 15% of total per capita protein intake by 2028. Pulses represent the other main source of protein in India.

Food use is estimated to reach 17 kg/capita, accounting for 15% of total protein intake in 2028.

Overall, the role of meat as a source of protein varies across regions at different levels of incomes. These differences are likely to persist as meat is gaining further importance especially in regions that are already key consumers of meat, while elsewhere eating patterns are not expected to change significantly in favour of meat.

Among high-income countries, per capita meat consumption will grow more slowly than in lower income economies. But given relatively high consumption, this translates into a larger absolute increase. Although per capita meat consumption in the United States is expected to grow by only 2%, annual consumption is expected to rise by over 2 kg/capita, bringing the country's intake above 100 kg/capita in 2028, still the highest in the world. In total, United States meat consumption is projected to rise by 4 Mt, accounting for 10% of the global growth in food use. Substantive growth in meat consumption in many medium and high-income countries is expected to widen the gap in per capita meat consumption compared to many low income countries, especially in Sub-Saharan Africa.

Total per capita meat consumption in Sub-Saharan Africa is expected to decline by 0.6 kg, falling to 12.9 kg on average for the region by 2028. Income growth in the region will not develop sufficiently over the medium term to render meat products accessible to a wider population. The consumption decline is projected mostly for sheep, beef and veal, while modest growth is expected for poultry in only a few countries in the region.

At a global level, rising incomes are expected to contribute to significant consumption growth for sugar and vegetable oils. By 2028, global food use of sugar is expected to rise by nearly 2 kg/capita to reach 24 kg/capita. For vegetable oils, the expansion will be comparable, reaching nearly 20 kg/capita by the end of the outlook period. Since both of these changes will affect mostly middle and lower income countries, sugars and fats will contribute a greater share of calories to diets in those regions by 2028.

Urbanisation-led changes in lifestyles contribute to demand for higher-calorie foods

The projected increase in sugar and vegetable oil consumption can be attributed to rising income levels, as well as an ongoing urbanisation of lifestyle in many low and middle income countries. This phenomenon is marked by a structural change in the economy where population increasingly concentrates in urban centres. Migration to urban areas tends to open up new income opportunities, but does not necessarily imply an improvement in the standard of living.

Urbanisation results in longer, more complex, commercial food value chains. Rural to urban migration in the context of urbanisation shifts people away from direct contact with local production and may offer exposure to a wider array of food products, but also introduces the challenge of accessing nutritious food options, which in urban settings may be most easily accessible to higher income groups.[3] Paired with a change in lifestyle that is potentially more time constrained, less centred on the household and thus focused more on convenience, urbanisation is typically associated with greater consumption of convenience foods, processed or prepared outside the home, that tend to be higher in fat, salt and sugar.

With 55% of the global population currently residing in urban settings, a figure that is projected to rise to nearly 60% over the next decade, the relevance of prepared and processed foods will rise accordingly, in turn supporting growth in the consumption of sugar and vegetable oils.

Policies seek to curb the consumption of sugar and fats

The change in diets resulting from a combination of higher incomes and an urban, more time-constrained and convenience-oriented lifestyle has contributed to a rising prevalence of obesity and non-communicable diseases, such as diabetes. In Latin America and the Caribbean, a region that has experienced a significant increase in sugar and vegetable oil consumption, obesity currently affects around one quarter of the population, while about 60% of the population is overweight.

Rising obesity rates and concerns regarding the wider health effects of high sugar and fat consumption have led to policies seeking to curb the consumption of these products. Sugar taxes have been implemented or are being considered in numerous countries, such as Chile, France, Mexico, Norway, South Africa and the United Kingdom. In some cases, such as Chile, such taxes are being paired with new food product labelling requirements that indicate products high in salt, sugar and fat, as well as regulations limiting the youth-targeted advertising of such products. One effect of these measures has been the industry reformulating products to reduce their sugar or fat contents, which in turn may indirectly curb consumption.

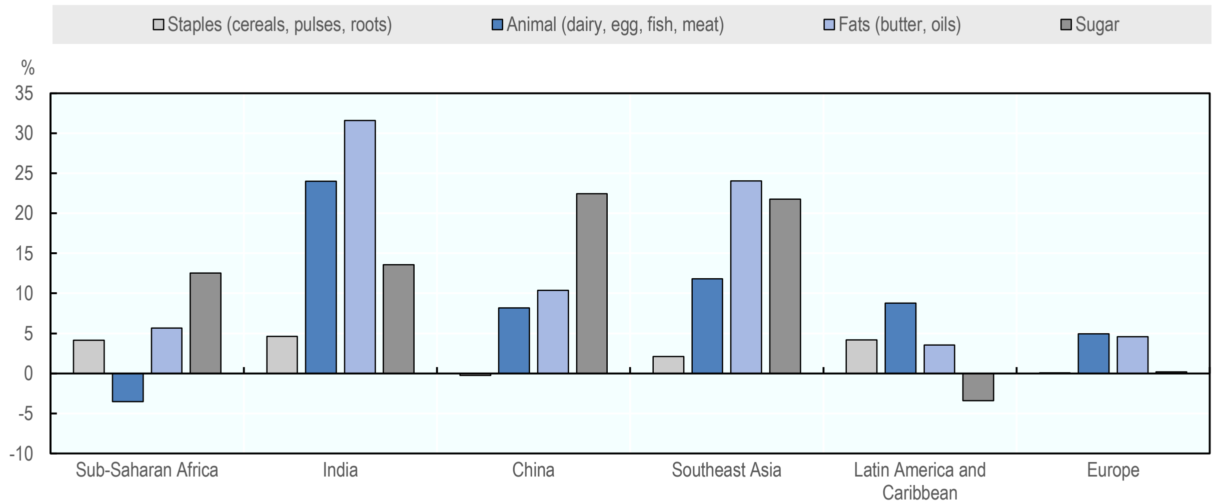
Social factors drive product substitution for healthier and more sustainable alternatives

In high-income countries, growing awareness of health and sustainability issues is increasingly shaping consumer decisions. This effect has contributed to the rising popularity of lean meats, such as poultry. Developed countries are expected to expand per capita poultry food use by nearly 2 kg/capita to reach 31 kg/capita by 2028. By contrast, consumption of beef and veal is projected to decline over the *Outlook* in countries such as Canada (-1.4 kg/capita) and New Zealand (-1 kg/capita). Health concerns will motivate corresponding increases in poultry consumption, with Canada increasing per capita food use of poultry by 1.2 kg/capita by 2028, and New Zealand adding 1.6 kg/capita over the same period. Similar substitutions across meat types are projected for the European Union, Norway, Switzerland and Australia.

Concerns about health and wellbeing are seen as fostering a continued substitution of cooking fats from vegetable oil to butter over the medium term. These considerations, together with environmental concerns regarding palm oil production will contribute to the decline in vegetable oil use by consumers in Canada, the European Union and Norway, where comparable increases in the use of butter are projected to take place. Canada is projected to increase butter consumption by nearly 1 kg/capita over the outlook period, while reducing food use of vegetable oil by nearly 4 kg/capita, despite the price advantage of oils.

Hence, even though large regional differences in dietary patterns will remain, changes in per capita food consumption will take place due to income growth, urbanisation, policies, and health and environmental concerns. Some of these changes are illustrated in Figure 1.11. The change in daily per capita calorie availability will differ across regions, with higher growth rates in India, China, and Southeast Asia relative to other regions; these reflect to a large degree the patterns of income growth. In general, daily per capita calorie intake will grow slowly for staples, but growth rates will be generally higher for animal products as well as for fats and sugar, reflecting the influence of urbanisation and the growing importance of convenience food. Finally, in some regions (e.g. Europe, Latin America and the Caribbean) growth rates for sugar are low or negative, in part due to growing health concerns.

Figure 1.11. Per cent change of food group in daily per capita calorie availability, 2016-18 to 2028



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Global outlook for feed demand

In 2016-18, approximately 1.7 billion tonnes of agricultural commodities were used as livestock feed (mainly maize and other cereals, and protein meals derived from oilseeds; the *Agricultural Outlook* only considers commercial feed and hence excludes, for example, pasture, hay and kitchen waste, discussed in Box 1.1). Over the medium term, total feed use is expected to expand by 1.5% p.a., faster than the projected output growth for meat of 1.2% p.a., indicating a further intensification in the livestock sector. The largest share of growth will be taken by cereals, where an additional 156 Mt is expected to be used as feed, compared to a 147 Mt expansion in global food use.

The demand for feed is mainly driven by two factors. First, the demand for products of animal origin (eggs, meat, dairy and fish), which determines the production level of the livestock and aquaculture sector. Second, the structure and efficiency of its production systems, which determine the amount of feed needed to produce the demanded output.

Box 1.1. Is there a trade-off between animal feed and food?

The production of animal products such as meat, dairy products or eggs requires the use of animal feed. Ruminants such as cows, sheep or goats can consume grasses and other plants found on grasslands and rangelands. Non-ruminants such as pigs and poultry, by contrast, cannot live off pastures but require other types of feed. In small-scale "backyard" production systems, this may include kitchen waste; in larger-scale systems, it may include grains and protein meals (derived from oilseeds such as soybeans). The latter can also be fed to ruminants, either to complement a grass-based diet or as main component of the diet (e.g. in feedlots).

Producing animal feed may come at the expense of producing food for humans. This is most obvious when cropland is used to grow feed for animals. But even pastures may to some extent occupy land which could be used for growing food crops.

To quantify such potential trade-offs between food and feed, research at FAO has investigated feed use around the world.[1] Globally, FAO estimates that livestock consumed some 6 billion tonnes of feed in 2010, expressed in dry matter. Of this, 86% was material not edible for humans, such as grass and leaves (46% of the total) or crop residues (19%). Around 13% of the total feed intake consisted of cereals, a figure which corresponded to almost one-third of global cereal production.

Not surprisingly, the data show important differences between ruminants and non-ruminants. Roughages (grass and leaves, crop residues, and silage) represent almost three-quarters of total feed intake, but these are fed almost exclusively to ruminants. By contrast, poultry and pigs together consume two-thirds of all other types of feed. There are also geographic differences. While OECD countries only account for 16% of global roughage consumption, their share of other feed intake is 32%.

The study also estimates that of the more than 3 billion hectares of global pasture, some 685 Mha could in principle be used as cropland, an area which corresponds to around half of current global arable land. In addition, around 560 Mha of global arable land are used to feed livestock through production of crops, principally cereals and oilseeds.

1 Mottet, A., C. de Haan, A. Falcucci, G. Tempio, C. Opio and P. Gerber (2017) "Livestock: On our plates or eating at our table? A new analysis of the feed/food debate", *Global Food Security*, Vol. 14.

Growth in feed demand will expand faster than meat production

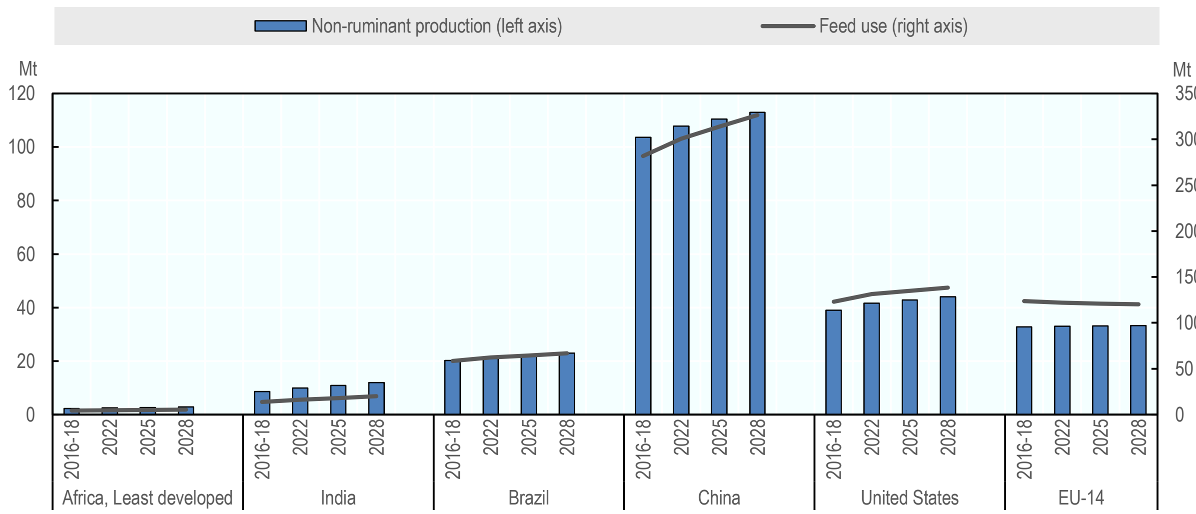
Use of high-energy concentrate feed in China is projected to expand by 61 Mt by 2028 (+1.5% p.a.), the largest volume of growth attributed to a single country over the *Outlook* period. However, other countries are projected to expand feed use at faster rates than China, such as Paraguay (4.0% p.a.); Peru (3.3% p.a.); Viet Nam (3.0% p.a.), Indonesia (2.9% p.a.) and the Philippines (2.7% p.a.). The feed demand growth in these countries relative to the output growth of livestock products indicates further intensification of production. Production of eggs, pork and poultry is projected to expand annually by 1.3% in Paraguay, 2.1% in Peru, and 1.9% in Viet Nam, 2.2% in Indonesia and 2.0% in the Philippines.

The changing structure of livestock production systems influences feed demand

As livestock sectors evolve from traditional or backyard production systems to commercialised production, feeding intensity rises and the overall demand for concentrate feed per unit of output initially grows. With the change in production systems, improvements in feeding efficiency kick in, reducing the per-unit demand for feed again. Paired with the respective growth of the livestock and aquaculture sector, these phases will determine the feed projections of a region in the outlook.

Figure 1.12 depicts the outlook for non-ruminant production and its respective feed use, illustrating the differences in production structures across regions. Growth in feed use for non-ruminant production in regions such as the least developed countries of Africa will expand at a faster rate than production of eggs, poultry and pork, indicating the underlying assumption of a continuing modernisation of production systems in the region. By contrast, in regions such as the United States and the EU-14, which have larger-scale, industrial production systems, feed use expands at roughly the same rate or even at a declining rate relative to non-ruminant animal production.

Figure 1.12. Non-ruminant feed use and meat production over the outlook period



Note: Non-ruminant production includes eggs, pork and poultry. EU-14 represents the pre-2004 members of the European Union excluding the United Kingdom.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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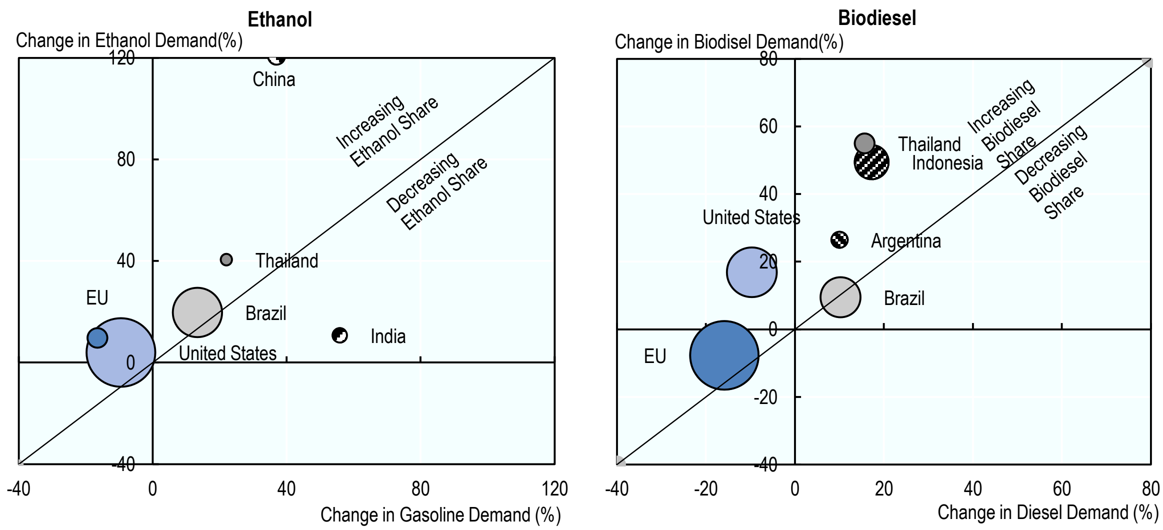
Drivers of biofuel demand: Policy changes and evolving fuel use

Agricultural commodities have become an important feedstock in the transportation fuel sector since the early 2000s when national policies began mandating the use of biofuels in Brazil, the European Union and the United States, where a significant share of maize, sugarcane and vegetable oil are now utilised for the production of renewable fuels. In the European Union and the United States, further expansions will be limited; yet biofuels will continue to expand, based on new or extended mandates in emerging and developing countries (Figure 1.13).

Biodiesel utilisation is expected to rise by 18% or 6.6 Mln L over the coming decade, largely supported by a new mandate in Indonesia that seeks to increase the biodiesel blending rate to 30%. Motivated by high domestic inventories and competitive international prices of vegetable oil, the mandate will be accompanied by a levy collected from palm oil exporters to support the domestic biodiesel sector. These measures seek also to hedge against the potential drop in palm oil imports from the European Union, its most important export destination. As the European Union increasingly directs support towards second generation biofuels and moves away from first generation technology, it is expected to reduce the use of vegetable oil for biodiesel. In parallel, the European Union is expected to experience a decline in total diesel use over the medium term, underpinning a projected 4% decline in biodiesel use.

Figure 1.13. Biofuel demand developments in major regions



Note: The size of each bubble relates to the consumption volume of the respective biofuel in 2018.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957441

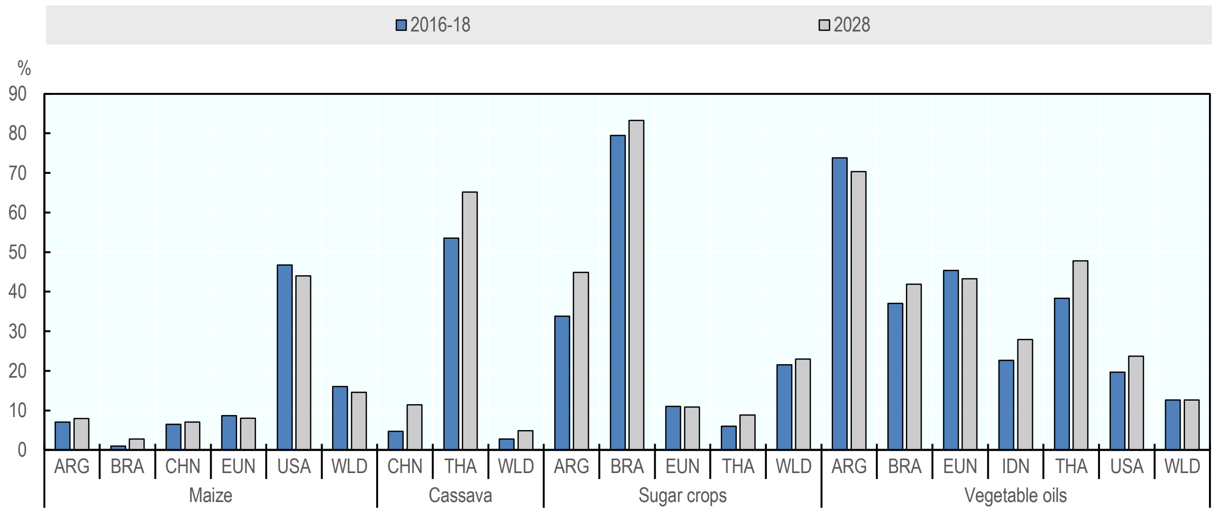
Global use of ethanol is expected to grow around 18% or an additional 21 bln L by 2028 with greater use expected mostly in China (+5.4 bln L). In 2017, the Chinese government announced the goal of a 10% ethanol blending share for 2020, which is expected to be filled through domestic production coming from domestic maize and imported cassava. While the full mandate is unlikely to be reached, strong growth is nonetheless expected.

Brazil, the world's second largest consumer of ethanol, is expected to also add 7.6 bln L as the country's RenovaBio law seeks a 10% reduction in emissions from transport fuel by 2028. This policy will incentivise the expansion of sugarcane for biofuel use over the medium term, motivated in part to counter a ten-year slump in global sugar prices.

Several other countries will continue to apply policies to foster the shift of sugar crops towards ethanol production, which aim to support the domestic sugar cane producers, achieve climate change commitments and to reduce dependency on imported fossil fuels.

Although the use of cassava for ethanol production is still not significant compared to maize or sugarcane, biofuel use is projected to contribute 17 % of total growth in utilisation of cassava, largely accounted for by China's imports of Thai and Vietnamese cassava.

Figure 1.14. Biofuels as a percentage of total use, by main feedstock crops



Note: ARG is Argentina; BRA is Brazil; CHN is China; EUN represents the 27 member states of the European Union (i.e. excluding the United Kingdom); IDN is Indonesia; THA is Thailand; USA is the United States; WLD is the world total. Sugar crops include sugarcane (ARG; BRA; THA; WLD) and sugar beet (EUN, WLD)
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957460

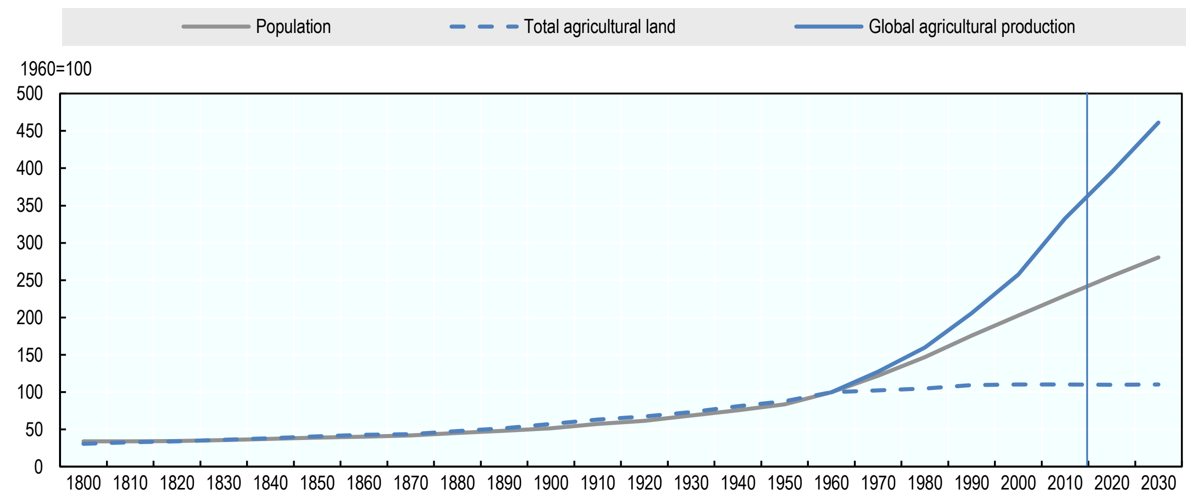
1.4. Production

The growing demand for agricultural commodities raises the question of how the agricultural sector will expand production to meet this demand, and importantly whether it can do so sustainably. Agriculture is a major user of land and water, and has a considerable environmental footprint. For instance, the conversion of natural landscapes to agriculture causes losses of biodiversity and an increase in greenhouse gas emissions, while the intensive use of inputs such as fertiliser and pesticides can affect ecosystems.

Prior to the "Green Revolution" of the mid-twentieth century, crop production grew mainly by bringing additional land into production. (Figure 1.15). Historical estimates suggest that agricultural land use grew proportionately to global population until the middle of the twentieth century. Since the 1960s, the growing application of fertiliser and pesticides, use of irrigation, and improved crop varieties led to drastic yield improvements in many parts of the world. Since then, the majority of incremental production came from higher productivity, i.e. higher yields and cropping intensities, with a much smaller contribution from an expansion of cropland.[4] Ongoing breeding progress, more intense use of high-energy and high-protein feed as well as ongoing improvements in disease control and general production management have at the same time increased productivity in the livestock sector.

Despite global population more than doubling since 1960 and global food production more than tripling, total agricultural land use (for crop production and grazing) is estimated to have increased only by about 10%. For the coming decade, the *Outlook* projects global agricultural production to increase by around 14%, while global agricultural land use is expected to be broadly flat. The *Outlook* thus expects a continuation of the growing intensification of production, resulting in more food per person (Figure 1.16).

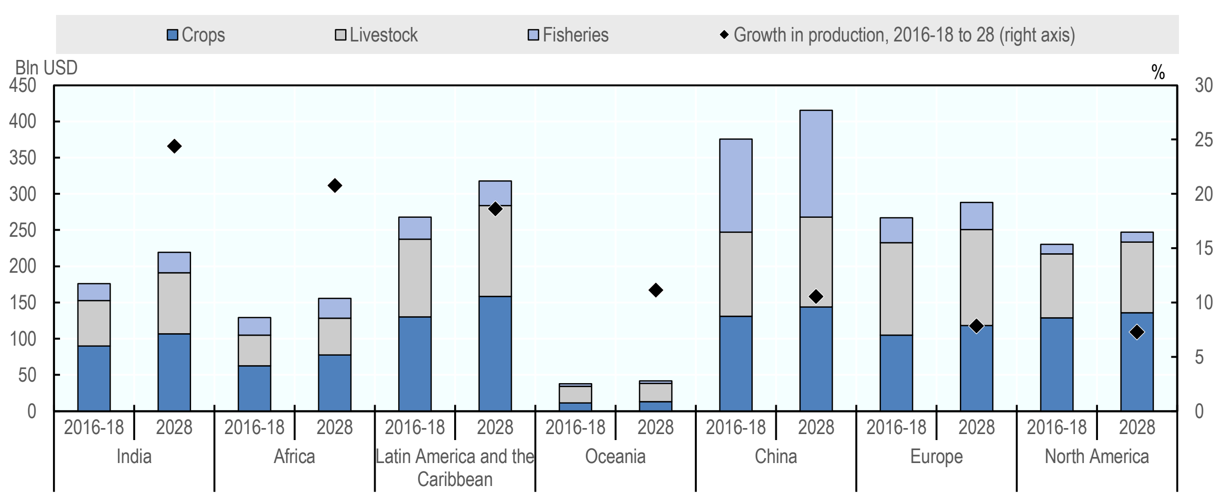
Figure 1.15. Population, agricultural production and agricultural land use in the long run



Note: Population data from Maddison's historical statistics for 1820-1940; UN Population Division for 1950-2030; 1800 and 1810 extrapolated from Maddison. Agricultural (crops and pasture) land data for 1800-2010 from the History Database of the Global Environment (HYDE 3.2), Klein Goldewijk et al. (2017); extended to 2030 using *Agricultural Outlook* projections. Global agricultural production data for 1960-2010 from FAOSTAT (Net Agricultural Production Index); extended to 2030 using *Agricultural Outlook* projections.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957479

Figure 1.16. Regional trends in agriculture and fisheries production



Note: Figure shows the estimated net value of production of agricultural and fisheries commodities covered in the *Outlook*, in billions of USD, measured at constant 2004-6 prices. Europe includes the Russian Federation.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957498

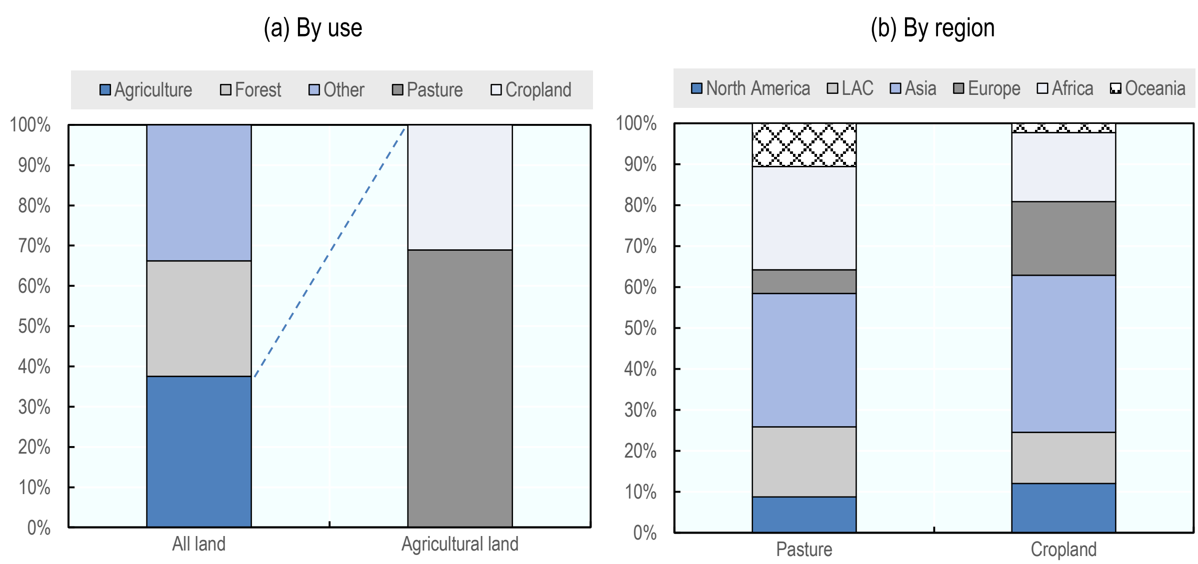
Over the coming decade, production growth will be predominantly located in emerging and developing countries, reflecting greater investment and technological catch-up, as well as resource availability (in Latin America) and, in part, stronger demand growth (in India and

Africa). Production growth is expected to be more muted in North America and Europe, where yields and productivity levels are typically already at high levels, and where environmental policies are limiting the scope for greater output growth.

Agricultural production growth will lead to only minor shifts in global land use

Agriculture currently uses nearly 40% of the world's land (Figure 1.17), of which some 70% are used as pasture. The suitability of agricultural land as pasture and cropland differs by region. Some regions such as Oceania or Africa are constrained to pasture use for large parts of their land, while others (e.g. Europe) are relatively more abundant in land usable for crop production. These differences are determined mainly by agro-ecological characteristics (e.g. rainfall, soil, slope), limiting the substitution between pasture and cropland. Some caution is needed in interpreting pasture area, however, as pasture can be difficult to define or measure precisely.[5]

Figure 1.17. Distribution of global agricultural land



Note: Europe includes the Russian Federation; LAC is Latin America and the Caribbean.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

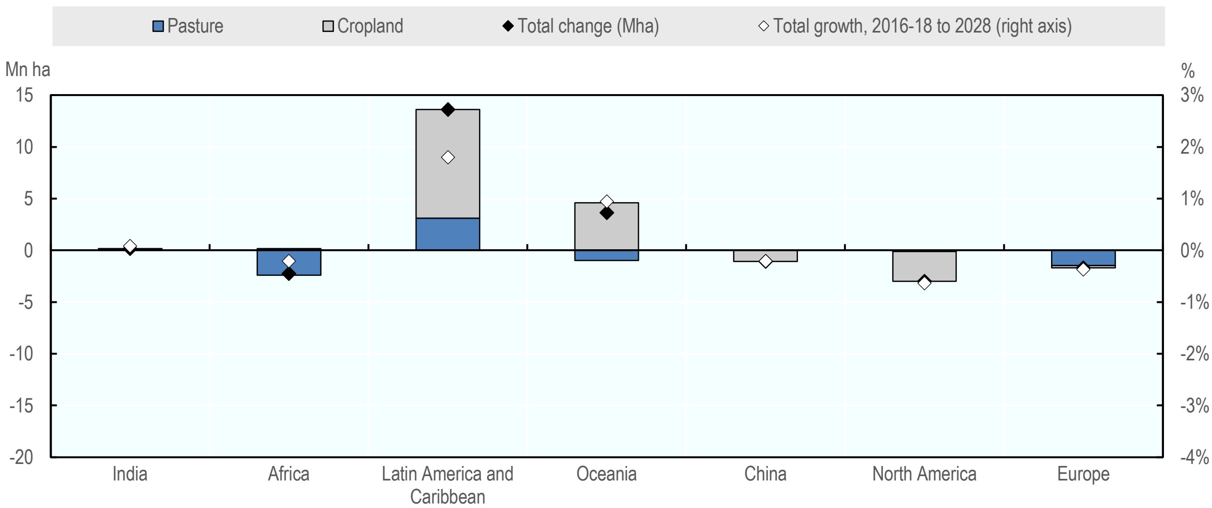
StatLink http://dx.doi.org/10.1787/888933957517

In line with trends observed over the past decade, global agricultural land use is expected to remain at current levels during the coming decade as an increase in cropland offsets a decrease in pasture. However, trends in land use, and their underlying determinants, differ around the world (Figure 1.18).

Both pasture and cropland use are projected to expand in Latin America and the Caribbean. Mostly low-cost, large-scale commercial farms in the region are expected to remain profitable and to invest into the clearing and cultivation of new land, despite the projected low-price market over the coming decade.

Total agricultural land use is not expected to expand significantly in Africa, despite substantial land availability in Sub-Saharan Africa. The farmland expansion will be mainly constrained by the prevailing smallholder structure, the presence of conflict in land-abundant countries, the loss of agricultural land to degradation and other uses such as mining and urban sprawl. Some pasture land is expected to be converted into cropland in the region, e.g. Tanzania, reflecting the development of agricultural area by commercial farms.

Figure 1.18. Change in agricultural land use, 2016-18 to 2028



Note: Europe includes the Russian Federation.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.
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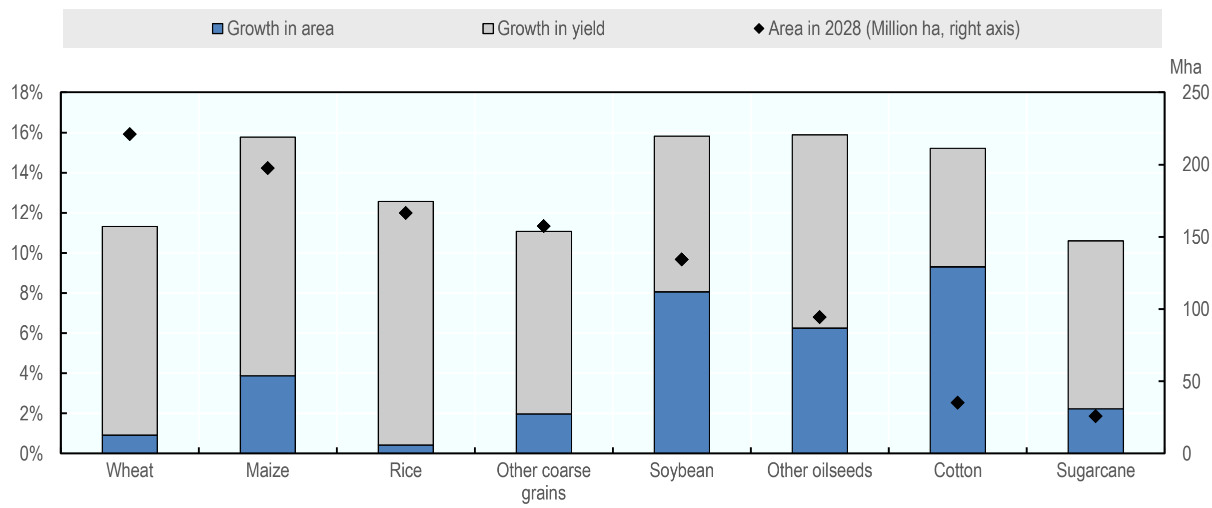
Higher crop production expected mostly through improved yields

Over the coming decade, global crop production is expected to expand by 384 Mt for cereals, 84 Mt for oilseeds, 41 Mt for roots and tubers, 19 Mt for pulses, and 3 Mt for cotton. The growth in crop production will be achieved mostly through investments into yield improvements in the case of cereals and palm oil, and through a combination of area expansion and yield growth for oilseeds, cotton and sugarcane.[6]

For wheat, production will expand in particular in the Black Sea region. In the Russian Federation, government-supported investments in infrastructure and agricultural technology such as improved seeds have increased productivity in recent years, a trend which is expected to continue. The focus on strengthening domestic agriculture seems in part related to the sanctions put in place since 2014, which have limited imports of basic commodities from the United States and the European Union. Paired with a weaker currency and an improved domestic capacity to supply inputs, the Russian Federation's exports of wheat have become competitive on global markets (see trade section for more detail).

Production of maize and soybeans is largely dominated by the Americas, and production growth will come both from changes in the land use as well as investments to improve yields. In Argentina and Brazil, the ongoing practice of double cropping of maize and soybean is expected to raise output through more intensive use of already cultivated land. By contrast, in North America, the expansion of harvested area for maize and soybeans happens almost exclusively through substitution with other crops. Growth rates of North American yields are expected to be driven mostly by breeding progress, as farms tend to operate at the production frontier. Figure 1.20 illustrates the projections for area expansion and yield improvements across different regions. Despite higher yield growth in lower-yielding regions, wide yield disparities will remain by 2028.

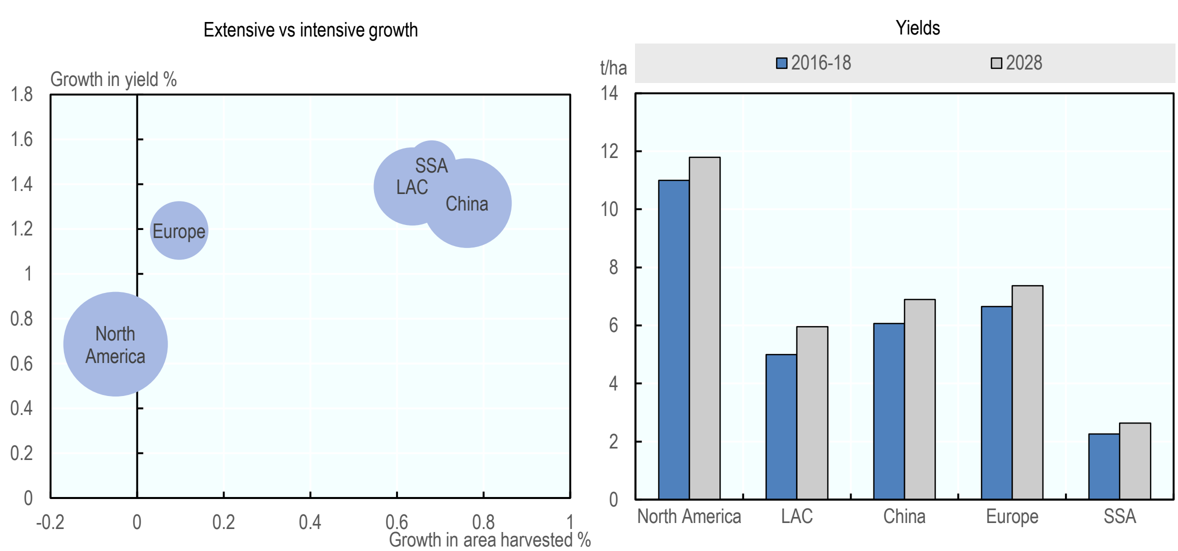
Figure 1.19. Growth in crop production



Note: Figure shows the decomposition of total production growth (2016-18 to 2028) into growth of global area harvested and growth in global average yields.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957555

Figure 1.20. Maize production



Note: In the left panel, the size of the bubbles is proportional to maize production in 2028. LAC is Latin America and the Caribbean; SSA is Sub-Saharan Africa.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957574

Yields for other crops will also continue to vary widely around the world. This is in part due to different agro-ecological conditions, but it also reflects yield gaps caused by lack of access to improved crop varieties, fertilisers and other inputs.[7] Since the beginning of the "Green Revolution" in the 1950s, the use of such inputs had grown strongly in much of Asia and Latin America, while technological change in Sub-Saharan Africa has historically been much slower. Fertiliser use per hectare of arable land in East Asia, South Asia, and Latin America is respectively 20, 10 and 9 times greater than that in Sub Saharan Africa.[8] In recent years, however, the use of fertiliser and other inputs (in particular herbicides) has been growing in several countries in the region.[9] Continued efforts to develop locally adapted improved crop varieties and to implement optimised management practices should further increase yields in Sub-Saharan Africa. In regions where the use of fertiliser and crop protection chemicals is already widespread, continued yield growth is expected to come mostly from improved varieties.[10]

Box 1.2. Innovations in plant breeding

Since the Green Revolution, plant breeding innovations such as semi-dwarf wheat and rice varieties and new genetic sources of pest and disease resistance have greatly improved the yield, quality and resilience of agricultural crops. New innovations in plant breeding have emerged in recent years and can help meet these continuing needs.

A first innovation is the extension of hybridisation to more species. When two inbred lines are crossed, the resulting seed has increased vigour, yield and yield stability, a phenomenon known as *heterosis*. In the past, hybridisation was only feasible for a few crops, notably maize. New techniques now enable the development of hybrid varieties for wheat and rice, among others. For instance, work is underway on wheat hybrids that are less vulnerable to changes in climatic conditions. Recent work on a Japonica rice hybrid also aims to deliver hybrid plants that produce cloned seeds, which could reduce seed production costs and encourage the uptake of new varieties by farmers.[1]

Traditional breeding requires vast numbers of plants over many years to select improved varieties. Recent 'genomic selection' techniques use computational models and molecular markers to predict and identify when certain genes are expressed, thereby improving the efficiency of selection. Genomics can also be used to explore the presence of beneficial genes in underexploited gene banks.[2]

Even newer techniques such as CRISPR can generate targeted mutations quickly and easily, and can therefore be used to speed up the development of useful agronomic traits.[3] Researchers recently used such techniques to create a wheat variety resistant to powdery mildew (a fungal pest). CRISPR is also being used to speed up the introduction of viral resistance in plants.

In several important crops such as soybeans, rice and wheat, the photosynthesis process is relatively inefficient, limiting plant growth. Researchers have recently used genetic engineering to change the photosynthesis process in tobacco (chosen as a model species as it is easy to modify). This resulted in 41% more biomass, which suggests that important yield gains could be possible in important food crops as well.[4]

But such developments in the lab are only the first step in a long journey to the farm. New characteristics need to be available in high performing varieties that are generally well adapted to the agro-ecological region where they will be grown. This requires breeding, multiplication and distribution infrastructure for finished varieties. This, in turn, requires the trusted provision of authentic, traceable, high-quality seed typically ensured through variety registration, seed certification and royalty collection schemes. The OECD Seed Schemes forms a key part of the international regulatory framework that ensures that high quality seed reaches farmers.[5] Expanding the access to breeding innovation for farmers also remains a challenge. Estimates indicate that the 13 leading global seed companies together reach no more than 10% of the world's 500 million small farms.[6] Hence, the innovations listed here may not immediately show up in farmers' fields; but they are of promising long-term potential nonetheless.

1. Khanday et al. (2019), "A male-expressed rice embryogenic trigger redirected for asexual propagation through seeds," *Nature* 565, 91-95.
2. Yu et al. (2016) "Genomic prediction contributing to a promising global strategy to turbocharge gene banks," *Nature Plants* 2, 1-7.
3. Schaart, J. et al. (2015), "Opportunities of New Plant Breeding Techniques," Wageningen University and Research, http://edepot.wur.nl/357723.
4. South et al. (2019) "Synthetic glycolate metabolism pathways stimulate crop growth and productivity in the field," *Science* 363, 6422.
5. See http://www.oecd.org/agriculture/seeds/
6. Access to *Seeds Index*, https://www.accesstoseeds.org/.

The outlook for palm oil, cotton and sugarcane is influenced to a larger degree by concerns related to land availability, investments and sustainability.

Global production of cotton is projected to grow by 10% by 2028. Global cotton yields have been flat since 2004, as several countries struggle with pest and water problems. Because of these continuing difficulties in raising yields, the expansion of cotton production will come in large part through greater land use.

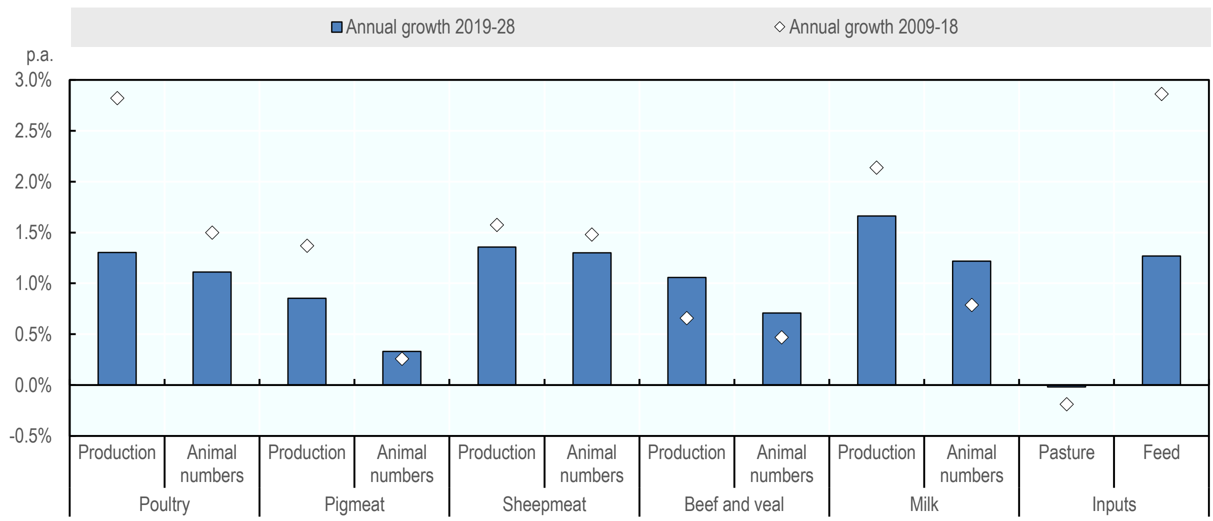
Expectations of declining real prices and ongoing sustainability concerns in some markets will limit further investments in the palm oil sector in major producing countries. Replanting of trees and cultivation of new plantations is expected to slow significantly, resulting in a production expansion of only 9 Mt by 2028, compared to growth of 27 Mt in the previous decade.

Despite continuously low sugar prices, the global production of sugarcane is expected to expand by about 13% over the outlook period, responding to ongoing growth in sugar and (especially) ethanol demand across the world. While the replanting of sugarcane will be slow in the main producer country, Brazil, sugarcane production will grow strongly in India (in part due to public support to the sector).

Growth in livestock production varies in intensity across regions

Over the outlook period, livestock production is projected to expand by nearly 15%, based on a range of growth factors. In most countries the larger output of meat, milk and other livestock products will be achieved by a combination of increasing the number of animals and improving the average output per animal per year. More intensive meat production will occur through higher slaughter weights per animal and shortening the time to finish an animal for slaughter. Both of these dimensions can be influenced by animal breeding, the use of higher-quality feed, and improved management practices.

Figure 1.21. Growth in global livestock production



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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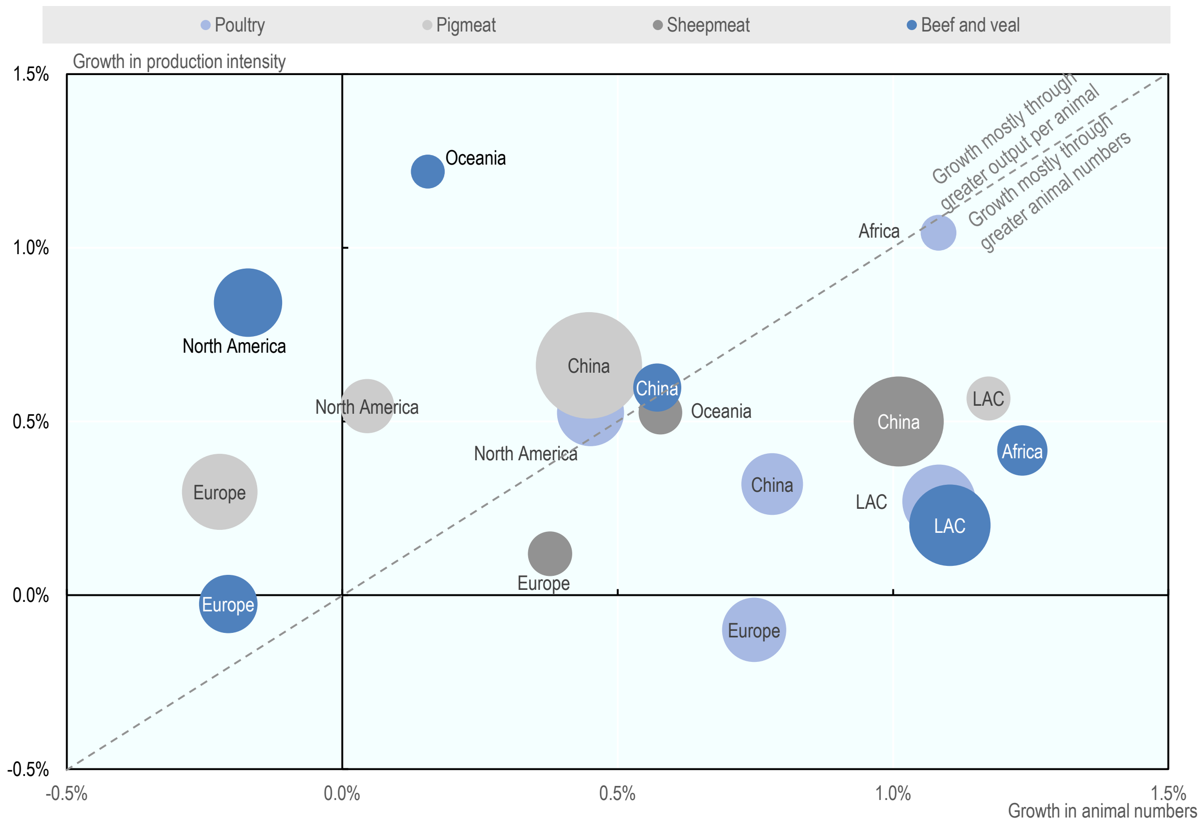
For poultry and sheep meat, global production will grow more or less in line with the growth in animal numbers, while output is expected to grow faster than animal numbers for pigmeat, beef and veal, and milk (Figure 1.21). At the global level, the growth in livestock production will be achieved with declining pasture land, but with robust growth in the use of animal feed. The relative role of greater animal numbers and higher production intensity (understood here as output per animal) will differ not only by livestock product but also by region; in general, animal numbers will grow faster in emerging and developing regions than in Europe or North America (Figure 1.22).

Poultry production is expected to increase by 20 Mt, accounting for roughly half of the total increase in meat production over the coming decade. Poultry production is expected to intensify, taking advantage of favourable feed prices, while simultaneously expanding the production base. Rising poultry production in China and Latin America is expected to account for nearly 40% of the global expansion of poultry meat and will be mostly related to growing animal numbers. In Europe, the growth in poultry meat production per animal has slowed down in recent years and production is expected to remain flat in the coming years.

Sheep meat production is much lower than the other meat types at the global level, but is projected to show strong growth of 14% (+2 Mt). Growing incomes in China and growing population in Africa will support demand growth, much of which will be sourced locally. Since sheep production is typically pasture based, growth comes mainly from breeding progress and expansion of flocks. In Africa (not depicted in Figure 1.22), sheep herds are expected to grow by nearly 2% p.a., while production per animal is expected to be flat as breeding progress has so far been limited in the region.

Figure 1.22. Sources of meat production growth, by region



Note: Production intensity is defined as total annual output divided by the number of animals at the end of the calendar year. The size of each bubble is proportional to the region's share of global production of each meat type in 2028. Regions accounting for less than 5% of the total are not shown. One outlier (sheepmeat in Africa) is not shown.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Beef and veal production is expected to expand by about 9 Mt by 2028. The world's largest producing regions, Latin America and the United States, will contribute more than half of global growth. The combination of relatively low feed prices and growing demand for beef and veal is expected to stimulate an intensification of production in North America and Oceania.

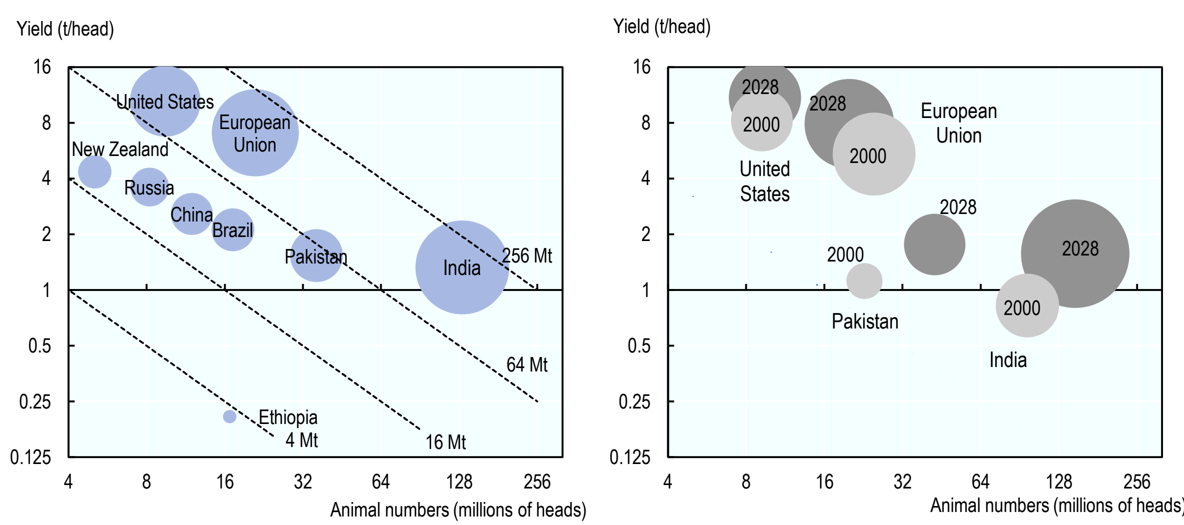
Pigmeat production is projected to grow by 11 Mt by 2028, an expansion that will be largely concentrated in China, which will account for 42% of global growth. In China, two-thirds of production growth is expected to come from increasing production intensity. Over the past decades, the country has moved away from backyard production to commercial operations. The recent outbreaks of African Swine Fever are expected to lead to a further shift in production towards larger, more productive operations (as discussed in more detail in the meat chapter), which should raise the average output per animal. Growing production intensity will thus be the dominant trend in the global pork industry. However, in Latin America, which historically played a much smaller role in pig meat than in poultry or beef, growing animal numbers are expected to be more important as the region seeks to respond to fast-growing demand in Asia.

Animal husbandry in Africa is expected to remain largely dependent on small-scale producers. Intensification is constrained by structural issues such as a lack of investment capital, the limited availability of feed, and environmental factors such as desertification in North Africa. These factors are particularly pronounced for ruminant (beef and sheep meat) production, where output per animal is expected to remain stagnant in the coming years. However, poultry is a notable exception. In some countries, such as South Africa and Tanzania, the modernisation of the poultry supply chain has resulted in intensified production, which is expected to lead to further growth in the next decade.

Dairy is expected to be the fastest growing livestock sector over the next decade. The sector is responding to strong demand, especially for fresh dairy products in Asian countries, but is also driven by ongoing favourable prices for processed dairy products, such as butter, cheese and milk powders. In most dairy-producing regions, production of butter and cheese will expand, utilising milk produced through intensified feeding of a steadily growing dairy herd.

Despite projected global improvements in yields, dairy productivity tends to vary strongly around the world (Figure 1.23). For instance, milk yields in India, the world's largest producer, are currently only one-eighth of the level achieved in North America, another major supplier of milk and dairy products. Strong growth of dairy production in India will partly come from an increase in milk yields (through better feeding practices and better genetics), but the yield gap between India and North America is expected to remain wide.

Figure 1.23. Dairy production, yield, and animal numbers



Note: Yield is milk production in tonnes per head, including non-cow milk. Animal numbers include non-cow herds. Both axes are shown on a logarithmic scale to allow the comparison of producers who vary considerably in scale. The size of the bubbles indicates total milk production (including non-cow milk). The downward-sloping lines connect all combinations of yields and inventories which result in the same level of production (in Mt). 'European Union' refers to EU-27 in all years.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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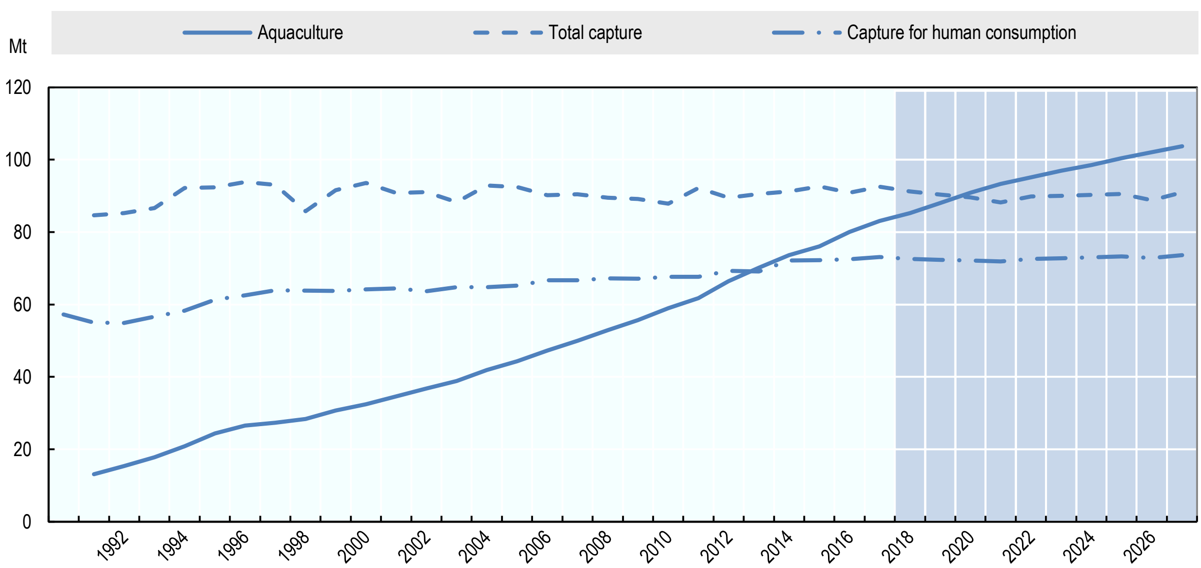
Aquaculture expected to overtake capture fisheries in coming years

Fish and seafood production today has two equally important sources – capture and aquaculture. Until the 1990s, almost all fish and seafood was obtained through capture fisheries, since then, the importance of aquaculture has grown steadily, notably in China. Currently, aquaculture accounts for 47% of total production and is expected to continue its rising trend, while capture fisheries production has remained relatively flat over the past 20 years any further expansion is expected to be relatively limited. As a result, over the course of the *Outlook* period aquaculture is expected to overtake capture fisheries as the most important source of fish and seafood worldwide.

Figure 1.24. Aquaculture and capture fisheries



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Greater efficiency in aquaculture production is anticipated over the *Outlook* period, especially by reducing the amount of fishmeal or fish oil needed to produce a given quantity of farmed fish, including by using substitutes such as protein meal, insects, or algae in fish feed rations. The relative share of feed derived from wild fish species (e.g. anchovies) is expected to continue falling over the next decade.

Impact of policies on outlook

Public policies exert a strong influence on agricultural markets. Agricultural support policies such as subsidies, guaranteed minimum prices or import tariffs can stimulate production, albeit in an inefficient way and, depending on the circumstances, potentially at the expense of trade partners. For this reason, the use of such support measures is governed by the World Trade Organization's Agreement on Agriculture, which has been in force since 1995. This agreement puts upper limits on the use of the most distortionary policies, but still leaves considerable room for such policies. Historically, support to farmers was mostly provided by high-income countries, but in recent years, such support has also become widespread in a number of emerging countries, in some cases to support an objective of domestic self-sufficiency in certain products.[11] This is the case in the Russian Federation, for instance, where the government sets production targets for several agricultural commodities (including cereals, meat, sugar, vegetable oil, and dairy) and provides various forms of financial support to farmers. Similarly, within the ASEAN group of Southeast Asian economies, almost all have some form of self-sufficiency targets, most commonly for rice.[12]

Given agriculture's considerable use of natural resources and its contribution to greenhouse gas emissions, the coming decade is likely to see more policies to improve environmental sustainability, possibly constraining output growth. For instance, China's 13th Five-Year Plan (2016-2020) aims to improve the efficiency and sustainability of its fisheries and aquaculture industry leading to a likely reduction in Chinese capture fisheries and a smaller increase in aquaculture than would have been the case otherwise. As China currently accounts for nearly 40% of global fish production, these stricter policies also imply lower growth in global production (as discussed in more detail in the Fish and Seafood chapter).

Agricultural support measures and sustainability policies have a visible and direct effect on output. However, other policies may have greater impacts but may act with a longer delay. This is particularly the case for measures to stimulate public and private investments in agricultural research and development (R&D), which are in the long-run the most important determinant of productivity growth in crop and livestock agriculture. This topic is discussed in more detail in the Risks and Uncertainties section.

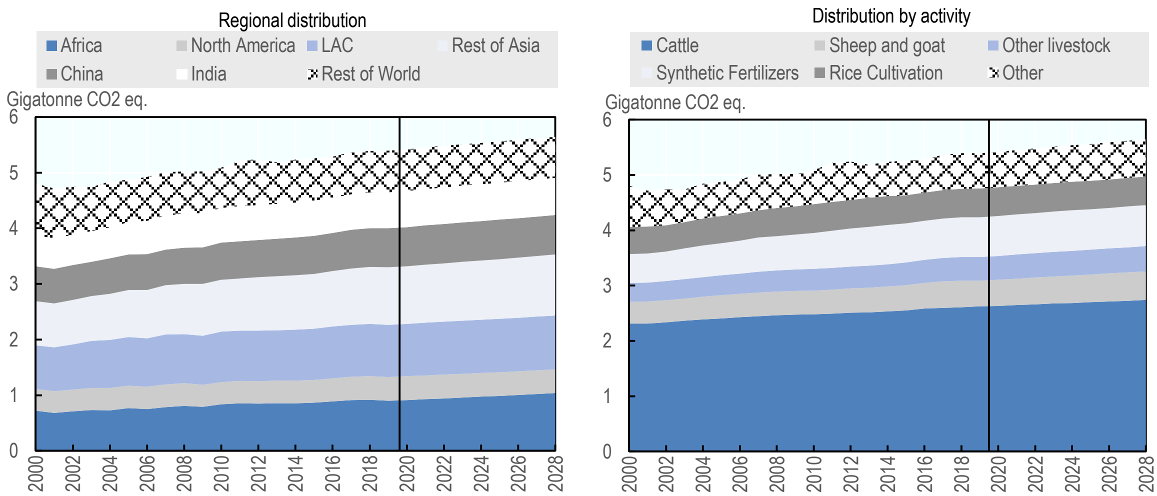
Implications for greenhouse gas emissions

Greenhouse gas emissions from Agriculture, Forestry and Other Land Use (AFOLU) are estimated at 24% of the global total. Direct emissions from agriculture account for 11% of global emissions, but agriculture also indirectly causes much of the emissions from land use change, for instance when expanding agricultural land use leads to deforestation or to the draining of peatland.[13] Livestock (and in particular ruminants such as cattle, sheep and goats) account for two-thirds of agriculture's direct emissions (e.g. through enteric fermentation and emissions from manure), with an additional important indirect effect on land use. Synthetic fertilisers and rice production are two other important contributors.[14]

Over the outlook period, and assuming no change in current policies and technologies, projections imply a growth in direct GHG emissions of 0.5% p.a. This is in line with the historical path of direct emissions, which similarly increased by 0.5% p.a. between 1990 and 2016, below the growth rate of agricultural production over the same period (at 2.7% p.a.). This differential implies a declining carbon intensity over time, although it has not been enough to achieve an absolute decoupling of emissions from production.

Almost half of the growth in direct emissions is expected to come from cattle, with another 15% coming from small ruminants (sheep and goats). Geographically, most of the increase in direct GHG emissions from agriculture is projected to come from the developing world, with Africa alone accounting for more than 40% of the increase, and Asia (including China and India) accounting for another 45%. The large contribution of the developing world is explained both by their higher growth rates of agricultural production and by the extensive, pastoral livestock systems, which lead to relatively high GHG emissions per unit of output.[15]

Figure 1.25. Direct GHG emissions from agriculture



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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Between 2000 and 2010, the direct emissions shown in Figure 1.25. made up slightly more than half of total agricultural GHG emissions, with the remainder coming through land use effects, mostly burning of biomass and deforestation. Over time, these indirect emissions have been declining, in particular thanks to a reduction in deforestation rates. The future evolution of these indirect emissions is not modelled in this *Outlook*.

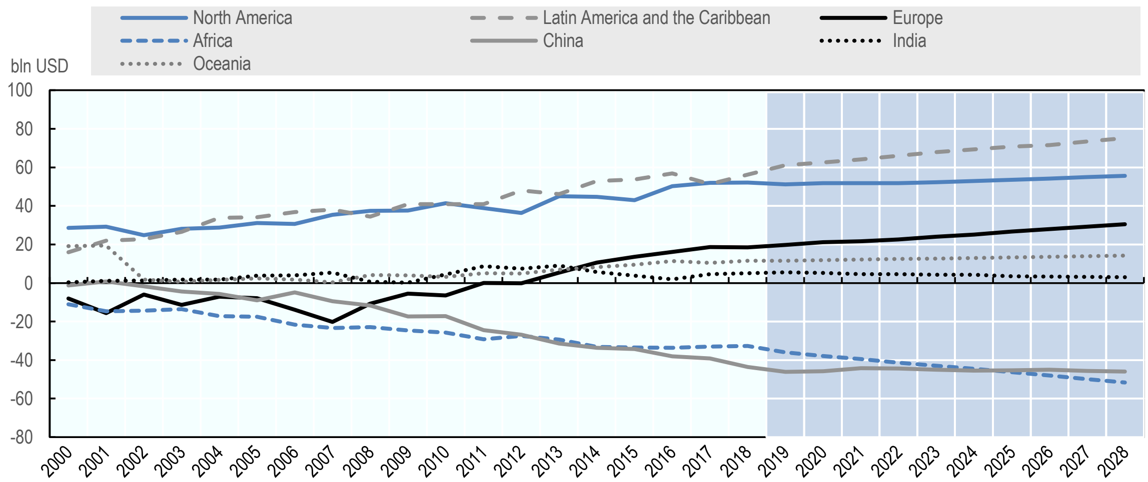
Several options exist to mitigate emissions from agriculture. These include carbon pricing, policies to reduce or prevent deforestation, technological options to reduce the emissions intensity of agricultural production practices, changes in diets away from products with a high emissions footprint, and initiatives to reduce food loss and waste.[16] These policy options need to be assessed carefully given the complex interactions between the environment, rural livelihoods, and food security and nutrition.[17]

1.5. Trade

The regions where agriculture is most productive are not always the places where population (and hence demand) are concentrated. Agricultural trade is therefore essential for food security in some regions, and an important source of income in others. Over time, agricultural trade has allowed an increasing differentiation between net exporting and net importing regions, with agricultural exports often originating from a relatively small number of countries while agricultural imports are typically more dispersed.

Since the early 2000s, growth in agricultural trade has been supported by a lowering of agro-food tariffs and trade-distorting producer support, and by strong economic growth in China.[18] Over the coming decade, agricultural trade will continue growing but at a slower pace, as global demand growth, and Chinese import growth in particular, slows. However, the broader trend of continuing differentiation between net exporting and net importing regions is expected to continue in the coming decade (Figure 1.26).

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



Note: Net trade (exports minus imports) of commodities covered in the *Agricultural Outlook*, measured at constant 2004-06 USD. Europe includes the Russian Federation.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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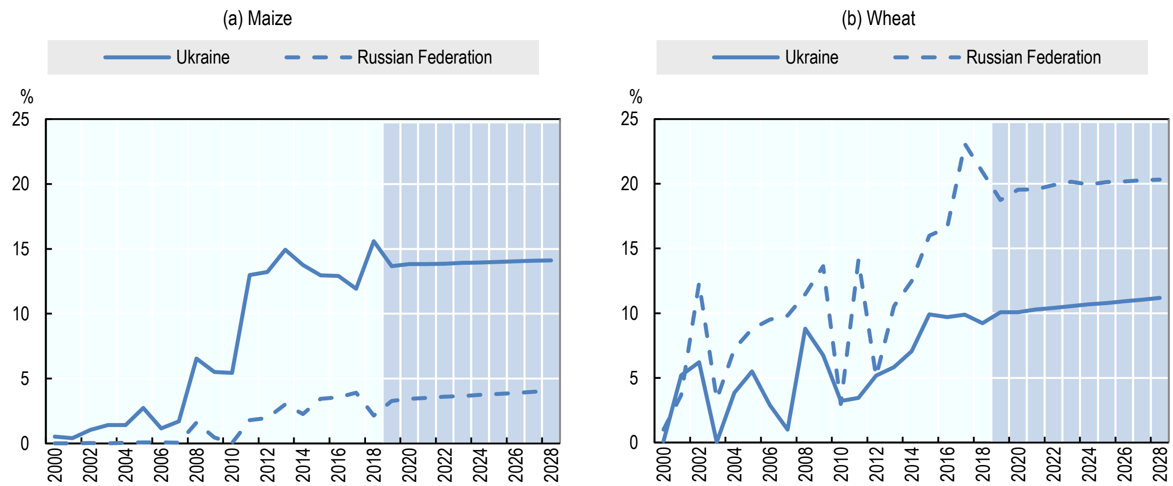
Throughout the 2000s, the Americas in particular have strengthened their position as global suppliers of agricultural commodities such as maize, soybean, and meat. Over the coming decade, Latin America and the Caribbean are expected to see increasing exports, while export growth in North America will be more muted, in line with the projected trends for agricultural production. Oceania has traditionally been a net exporter of agricultural commodities, but total exports (after adjusting for price changes) have been broadly flat over the past two decades, a trend which is not expected to change much.

Europe (which also includes the Russian Federation and Ukraine) has moved over time from being a net importer of agricultural commodities to a net exporter, in part due to a stagnating population and flat per capita consumption, which limits domestic demand. Production growth has also contributed to the improved export performance, in particular for Ukraine and the Russian Federation, which have grown in the span of a few years into competitive exporters of maize and wheat respectively, due to significant productivity improvements and favourable exchange rate movements (Figure 1.27).

Among the regions with a negative agricultural trade balance, net imports have grown in China and Africa, albeit for different reasons. In China, strong economic growth stimulated food demand, leading to a surge of imports in the 2000s. In the coming decade growth of Chinese imports will be more muted for these products. Since the early 2000s, China's share of world soybean imports grew from less than 30% to more than 60% today; while its share of world imports of whole milk powder grew from less than 10% in the early 2000s to around 20%. Both import shares are expected to remain flat in the coming decade.

Figure 1.27. Ukraine and the Russian Federation: Share of global exports



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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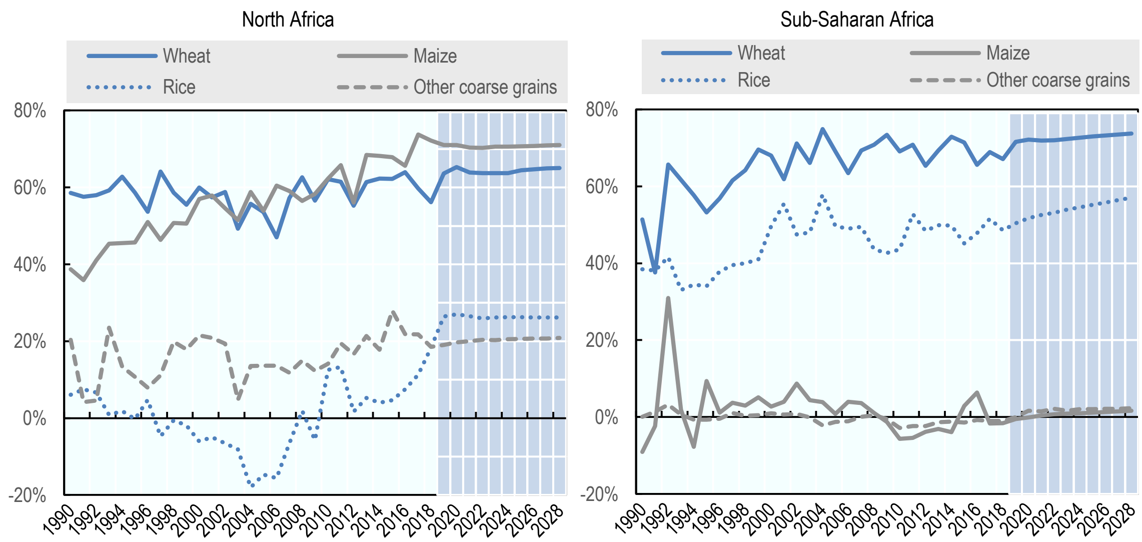
The growth of imports in Africa is linked to strong population growth and is expected to continue throughout the decade (although this *Outlook* does not cover tropical products, of which Africa is a net exporter). As Figure 1.28 indicates, both North and Sub-Saharan Africa are net importers of cereals, which support food security both directly and through use as animal feed. In North Africa, maize and other coarse grains are predominantly used as feed, while wheat and rice are used as food. The region is a net importer across these four categories, a situation which is expected to continue in the coming decade. Growing cereal imports in North Africa in turn support the growth of cereals exports in the Russian Federation and Ukraine, which benefit from their proximity to the region. In Sub-Saharan Africa, maize (especially white maize) and other coarse grains (including local grains such as teff) are mostly used as food, and the region is self-sufficient for these traditional cereals. As incomes grow, the demand for rice and wheat is increasing, leading to rising imports. The impact will be especially pronounced for rice, where Africa's share of world imports is expected to grow from 35% to 50% over the outlook period.

The agricultural trade balance of India is notable, as the country is currently neither a major importer nor a major exporter, despite its size. However, given the country's size, changes in its trade balance could have a big effect on markets. In the coming decade, domestic production is expected to keep up with growing population and higher incomes, with little change in its overall trade position. For instance, the strong growth in India's consumption and production of dairy are expected to have little effect on global markets. Notable exceptions are vegetable oil, for which India is a major importer, as well as rice and carabeef (buffalo meat), for which India is a leading exporter. The coming decade will further consolidate these positions.

Figure 1.28. Ratio of net imports to domestic utilisation



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Free trade agreements affect agricultural trade projections

On average, agriculture faces much higher trade barriers than manufacturing. While successive rounds of multilateral trade negotiations have succeeded in reducing import tariffs for manufacturing, progress in reducing agricultural protectionism has been more limited. The 1995 WTO Agreement on Agriculture was an important breakthrough, and led to increased market access and limits on trade-distorting support to producers. Despite this progress, agricultural products in recent years still face average import tariffs of around 16% compared to 4% for industrial goods.[19] Moreover, some agricultural commodities often face much higher tariffs in countries where these commodities are considered sensitive. Progress in multilateral negotiations has stalled, and hence most of these barriers to trade are expected to continue shaping trade flows throughout the next decade. However, countries have increasingly turned to bilateral and regional trade agreements, which can affect agricultural trade projections. Overall, the share of trade in total agricultural production is expected to remain constant throughout the next decade.

Since the last *Agricultural Outlook*, two large free trade agreements (FTAs) have been ratified: the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the EU-Japan Economic Partnership Agreement (EPA). Both agreements include, among other provisions, commitments to increase market access for agricultural products. (The trade agreement between Canada, the United States and Mexico to replace the North American Free Trade Agreement has not yet been ratified; this *Outlook* therefore assumes that NAFTA remains in effect).

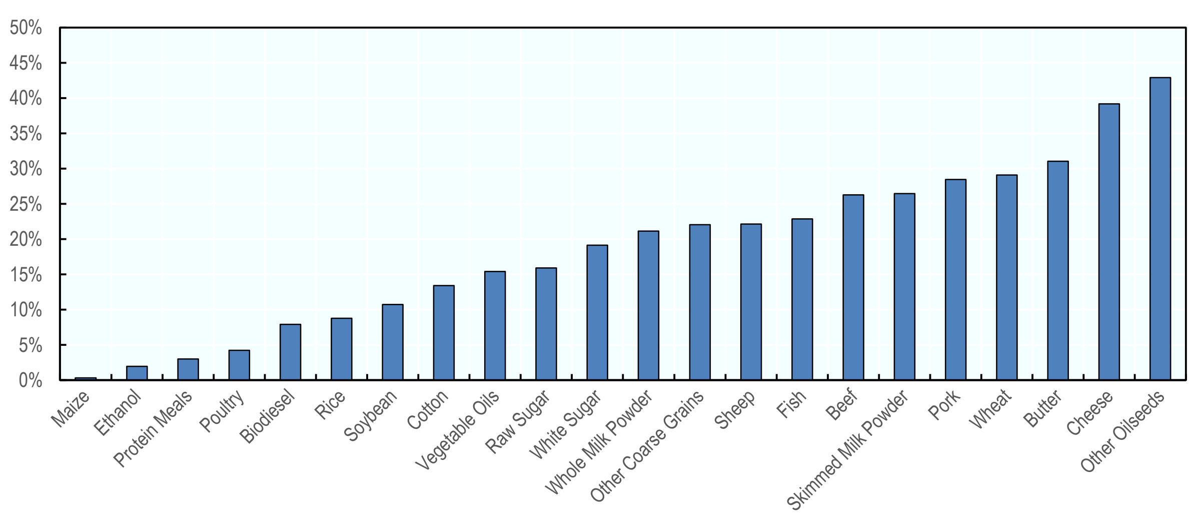
The CPTPP is a trade agreement between 11 countries: Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Viet Nam. Under the agreement, most tariff lines will become duty-free.[20] In 2016, these countries accounted for around 20% of global agricultural exports and imports. For several commodities such as butter, cheese, and other oilseeds, intra-CPTPP trade already accounts for an important share of total trade of these countries (Figure 1.29).

While detailed projections of the trade-promoting effect of the agreement cannot be provided in this *Outlook*, the largest impacts are expected on trade in meat, dairy products and to a lesser extent cereals. Import tariffs for these products can be relatively high. For example, beef imported into Japan faces duties of 38.5%, which will be lowered to 9% under the CPTPP. Import tariffs on dairy products in Canada and poultry in Mexico can reach up to 250% and 234%, respectively. These tariffs will come down under the CPTPP. Overall, Japan's imports are likely to be particularly affected, as it is the largest net importer of most of these products in value terms.

The EU-Japan Economic Partnership Agreement (EPA) entered into force on 1 February 2019 and liberalises most tariff lines between the European Union and Japan. For the European Union, the agreement is expected to bring considerable gains in the agricultural sector.[21] The European Union is already an important supplier of agricultural products to Japan for butter, white sugar, pork, and cheese (trade flows in the other direction are more limited). The EPA seems likely to increase agricultural trade flows from the European Union to Japan, in particular for pork, beef, poultry and dairy products. While the *Agricultural Outlook* does not model bilateral trade flows, these likely effects have been taken into account in preparing the projections for EU exports and Japanese imports.

International trade in agricultural products is currently facing several risks and uncertainties related to the ongoing US-China trade conflict and uncertainty around the terms of the departure of the United Kingdom from the European Union, among others. These are discussed in more detail in the next section.

Figure 1.29. Intra-regional trade shares for CPTPP in 2016



Note: Data shows the share of total trade of CPTPP countries accounted for by trade with other CPTPP countries.
Source: Global Trade Tracker (2019).

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1.6. Risks and uncertainties

Sensitivity analysis

The projections in the *Agricultural Outlook* are based on a set of assumptions about the likely development of demographic and macro-economic variables (detailed in Box 1.4) as well as an assumption of average weather conditions. The Aglink-Cosimo model underlying the *Outlook* can be used for scenario analyses to explore how different assumptions affect the projections. For instance, a recent study using the Aglink-Cosimo model relaxed the assumption of average weather conditions and modelled the implications of extreme climate events for agricultural markets, as described in Box 1.3.

Box 1.3. Potential effects of extreme climate events

Extreme climate events such as heat waves, droughts, and heavy rainfall will likely occur more frequently and last longer in many areas.[1] Such events often have a strong effect on crop production. Projections in the *Agricultural Outlook* typically assume average agro-climatic conditions during the growing season. Crop yields generally follow their historical trends and therefore do not capture the potential effect of rare and high biophysical stress.

In a recent study researchers of the European Commission's Joint Research Centre have extended the Aglink-Cosimo model underlying this *Outlook* to take into account yield deviations attributable to temperature and water-based anomalies using information on historical extreme events.[2] By experimentally simulating the recurrence of 58 cases of regional extreme events affecting wheat, maize, and soybean, from the period 1980-2010 into the marketing year 2019/20, the potential economic impacts on key domestic and international commodity markets were examined.

Depending on the attributes (e.g. duration and intensity) of the extreme events analysed, impacts on domestic production were estimated to range from -28% (Australia) to +41% (Kazakhstan) for wheat, from -49% to +68% (South Africa) for maize, and from -12% to +13% (United States) for soybean. These deviations led to significant differences in domestic and international crop prices compared to a situation with average conditions. Overall, domestic prices could range from -10% (Kazakhstan) to +125% (Pakistan) for wheat, from -21% to +310% (South Africa) for maize, and from -24% to +58% (India) for soybean. The transmission of prices to global markets was found to be pronounced in the case of large shocks in key exporters and importers. For instance, international reference prices of wheat could range from –6% to +10% due to extremes exclusively in the Russian Federation, while prices of maize (–13% to +35%) and soybean (–14% to +15%) would be notably affected by extreme events in the United States. Similarly, significant trade impacts were found in both directions. Damaging events, for instance, would ultimately dictate lower export competitiveness, higher import dependency, lower self-sufficiency, and occasionally temporary price volatility.

Overall, crop prices are more sensitive to damaging events than to beneficial ones. This implies that trade and stocks may not always be enough to "buffer" the damage from simultaneous and recurrent harvest failures, which could render future prices even more responsive. Formulating policy responses, such as multi-country emergency reserves, to extreme agro-climatic events will however require a deeper understanding of two factors:

the likelihood and magnitude of simultaneous and recurrent events across the globe, and the degree to which different regions can adapt through resistant crop varieties, early warning systems, and efficient water use. In the absence of such information, it would be difficult for governments in food-insecure regions not only to specify and agree on optimal stock quantities to be held but also to sustain supply- or price-stabilising buffer stock schemes in practice.

1. IPCC (2012), "Managing the risks of extreme events and disasters to advance climate change adaptation," Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change.
2. Chatzopoulos T., Pérez Domínguez I., Zampieri M., Toreti A. (2019), "Climate extremes and agricultural commodity markets: A global economic analysis of regionally simulated events", in Weather and Climate Extremes, https://doi.org/10.1016/j.wace.2019.100193.

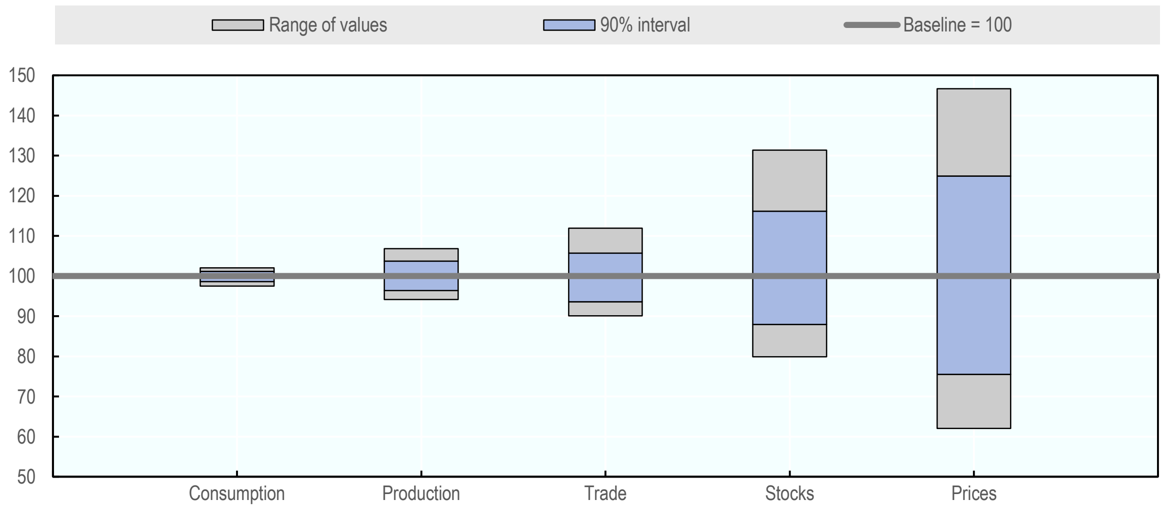
A partial stochastic analysis has been used to assess how "typical" variation in macro-economic variables affects the projections. In this analysis, 1 000 different simulations are run using random combinations of variations of variables such as the oil price, exchange rates, economic growth, and yield shocks. The variations are chosen according to the historical deviation of these variables from their long-run trend.

The analysis is partial, as not all sources of variability affecting agricultural markets can be captured. For example, animal diseases such as African Swine Fever can have important effects on markets but are not included here. Nevertheless, the results of these scenarios give an indication of the sensitivity of the projections to some of the most important sources of variability in agricultural markets.

A first finding of the stochastic analysis is that consumption projections tend to be less sensitive to shocks than production projections, which in turn are less sensitive than trade, stock levels or prices. This finding is illustrated in Figure 1.30 for maize, comparing the baseline projection for 2028 with the full range of values observed in the stochastic analysis as well as the 90% interval (i.e. the range which includes 90% of the simulated scenarios). Agricultural supply and demand tend to be relatively insensitive to price changes, which means that shocks can lead to large variation in prices. The stochastic analysis suggests these shocks could lead to prices up to 40% above or below those projected in the baseline.

The stochastic analysis also provides insight into the relative importance of different types of shocks. Figure 1.31 compares results for the maize price in 2028 using all shocks in the stochastic analysis or various subsets of shocks. Prices appear most sensitive to shocks in yields; in simulations where only yield shocks are included, the maize price in 2028 can end up 20% above or below the baseline projection. Exchange rates and oil prices are also an important source of variation. Interestingly, in both cases the simulations reveal an asymmetric response of prices. In the simulations, exchange rate shocks induce price increases of up to 10% but price decreases of up to 20%. Historical shocks to exchange rates (from which stochastics are drawn) have been asymmetrical in many countries, with large depreciations relative to the US dollar occurring more frequently than equally-large appreciations. As commodity prices are denoted in US dollars, such large depreciations tend to stimulate exports and discourage imports. Since agricultural exports are often concentrated among only a handful of countries, depreciations in major exporters can lead to important increases in global exports and hence relatively large declines in world prices. Shocks to oil prices, on the other hand, induce price increases of more than 10% but price decreases of up to 6% because historical shocks to oil prices have been asymmetrical, with large increases occurring more frequently than equally-large decreases. Finally, income shocks lead to prices which are up to 10% above or below the baseline projection, although most of the simulated outcomes are found in a more narrow range of a few percentage points around the baseline projection.

Figure 1.30. Range of outcomes for maize in 2028



Note: Chart shows the range of values obtained in the partial stochastic analysis, where the baseline value is normalised to 100.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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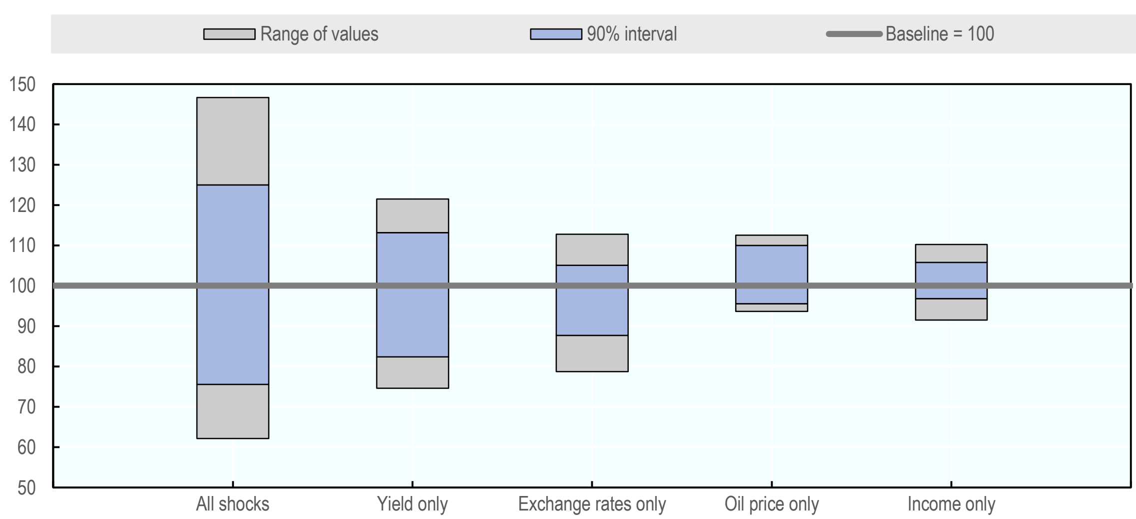
Figure 1.31. Range of outcomes for the world maize price in 2028, by type of shock



Note: Chart shows the range of values for the world maize price obtained in the partial stochastic analysis for different types of shocks. The baseline value is normalised to 100.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The stochastic analysis thus sheds some light on the sensitivity of the projections to a range of shocks. However, various other uncertainties are harder to quantify. The potential impact of several of these uncertainties is discussed below.

Uncertainties to the projections

Demand

The *Agricultural Outlook* incorporates the likely evolution of consumption preferences. Alternative assumptions about their development, such as a wider spread of vegetarian, vegan or "flexitarian" lifestyles, would alter the medium term projection trend. Short run shocks, like food health scares, which are not considered in the projections, would lead to fluctuations around the food consumption projections in the *Outlook*.

The *Outlook* holds policies fixed in the medium term and makes assessments about their future effectiveness. These conventions also constitutes a source of uncertainty. For instance, policy measures introduced to reduce overall calorie consumption or to shift consumers towards healthier diets could affect both the overall demand for food as well as the relative demand for different food products in ways that are unforeseen today. Similarly, policies to stimulate more sustainable diets could affect consumption patterns differently than the expert consensus underling the *Outlook* has suggested.

The assessment of the effectiveness of biofuel polices remains uncertain as well. For instance, the Chinese government has announced a nationwide 10% ethanol blending mandate by 2020. The *Outlook* assumes that a blending rate of only about 4% can be reached by 2028. If China were to reach the 10% blending target, it would require large amounts of additional maize, cassava and/or sugarcane as feedstock, altering the outlook for crops and livestock products.

Supply

The projections in this *Outlook* are sensitive to outbreaks of plant and animal diseases, which are impossible to predict but may have significant and long-lasting effects. One example of such a pest outbreak is the Fall Armyworm, an insect native to the Americas which spread to Sub-Saharan Africa in 2016. This pest predominantly attacks maize, but can also damage numerous other crops including rice, cotton and sugarcane. FAO estimates that the damage of Fall Armyworm in Africa currently ranges between USD 1 and USD 3 billion. The *Outlook* assumes the infestation can be largely controlled and no widespread devastation over the medium term will occur. In July 2018, the insect was detected in India and Yemen; by January 2019 it had spread to Sri Lanka, Bangladesh, Myanmar, Thailand, and China's Yunnan province. While data for Asia are not yet available, the projections assume the impact to be less severe than in Africa because of a better availability of crop protection products.[22] No other disease outbreaks are incorporated in the *Outlook*, but such occurrences would either result in short-term shocks around the projected trends, or, in severe cases, alter them permanently.

Animal diseases have in the past disrupted poultry, beef and other livestock markets, and have the potential to do so again during the coming decade. A current epidemic affecting livestock production is the African Swine Fever, which is fatal to pigs and wild boars although it does not affect humans. In August 2018, China reported an outbreak of African Swine Fever, the first reported case in the country. In the meantime, the disease has also been detected in other countries in Asia, and has re-emerged in Europe (where cases had previously been detected in 2007 and 2014). The medium-term impact of the disease on global pork production is uncertain. Measures to contain the outbreak are assumed to moderately depress global pork production in the short term. As their success is uncertain, the medium term impact of the epidemic may become more severe than currently anticipated.

The projected yield trends and trends in animal productivity in the *Outlook* assume continued improvements to the genetic potential of crops and farm animal and ongoing innovations in the production technology, which in turn depend on continued public and private investments into research and development (R&D). A large literature has demonstrated the substantial social benefits from public investments in agricultural R&D, which suggests that current rates of investment are too low.[23] Yet, in high-income countries, public investments appear to have fallen since the financial crisis of 2008-9.[24] As these countries accounted for half of global public spending on agricultural R&D in 2008, this trend could lead to lower productivity growth in the coming decades On the other hand, public R&D spending is growing among emerging economies, notably in China and India.[25] Moreover, global private-sector R&D investments have been growing faster than public R&D spending in recent years.[26] These trends support the assumptions of continued productivity growth in this *Outlook*, but any alternative scenario with respect to the assumed rate of progress would alter the projections.

In the coming decade, agricultural production will be shaped by a wide array of policy measures that aim to guide production practices. They pursue various objectives, such as combating climate change, protecting animal welfare and human health, increasing domestic self-sufficiency or meeting export targets. The *Outlook* has incorporated expectations on the impact of all known measures, however, their actual outcomes are uncertain and they are subject to change.

International trade

The ongoing trade tension between the United States and China continues to create uncertainty around the projections in the *Outlook*. In the summer of 2018, Chinese tariffs on US soybean led to a decline in US exports. Estimates by the US Department of Agriculture suggest US soybean exports to China fell by 22 Mt year over year.[27] Increased exports to other destinations increased by around 7 Mt, leading to a net reduction of around 13.5 Mt. The Chinese tariff created a gap between the US and Brazilian soybean export price over the summer of 2018, which disappeared near the end of the year as China pledged additional purchases of US soybeans and other crops. At the time of writing, negotiations were ongoing between the United States and China. As no specific end date was set for the Chinese tariffs, the *Outlook* assumes these remain in place throughout the projection period, in line with the *Outlook's* overall approach, which holds policy settings constant. Any negotiated resolution to this dispute is likely to impact Chinese imports and US exports of soybeans as well as global soybean prices and market shares of other countries, given the importance of China and the United States in the global soybean market.

On 29 March 2017, the UK government officially announced its intention to leave the European Union, a process commonly referred to as Brexit. During the preparation of the *Agricultural Outlook*, the terms of departure were still unclear. Hence, the *Outlook* assumes no disruption to trading relations between the United Kingdom and the European Union. The impact of Brexit could be substantial, as the United Kingdom has a strong trading relationship with the European Union. In 2018, more than 70% of the country's agricultural imports came from the European Union and 62% of the country's agricultural exports went to the European Union. Overall, the country is a net importer of agricultural products, and in 2018 it had an annual agri-food trade deficit of USD 27 billion with the rest of the European Union. While trade between EU Member States is tariff free, Brexit could result in higher trade barriers, which would affect agricultural prices and production in the UK and the European Union. In addition, the UK farming sector receives on average 60% of farm incomes from the EU Common Agricultural Policy (CAP) subsidies. Even though the government is committed to maintaining these subsidies until 2020, the subsequent withdrawal of support could affect domestic production and prices. Brexit may have a global impact on markets for cheese, butter, pork and sheep meat, commodities for which the United Kingdom is a large net importer. For instance, the United Kingdom is the world's largest net importer of cheese. For other markets, the main effect may be a reallocation of trade flows to other trade partners with less impact on overall numbers.

The USMCA is the preferential trade agreement between the United States, Mexico and Canada, which is set to replace the NAFTA. It was signed on 30 November 2018, but has not yet been ratified. Therefore, it has not been incorporated in the baseline projections. Compared to NAFTA, there are only modest market access increases in agriculture under the USCMA. Agricultural products that could be imported at a zero tariff rate under NAFTA will remain at zero tariffs under the USMCA. When compared to NAFTA, the USMCA maintains existing agriculture commitments between United States, Mexico and Canada, with relatively free market access across the countries. The major improvements will be the increased market access for Unites States dairy, poultry and eggs exports to Canada. The Canadian government secured new market access in the United States for certain dairy products and in the form of tariff rate quotas for refined sugar and sugar-containing products. For Mexico, the USMCA would not lead to any significant changes in market access in agriculture.

Data

The *Agricultural Outlook* is built on a comprehensive dataset of global agricultural production, consumption, trade, and prices, and incorporates data from national statistical sources, international organisations (notably FAO), international commodity bodies (such as the International Grains Council), and private data providers. While global and regional aggregates and data for developed countries are generally reliable, in some cases historical data are estimates with potential measurement error. The historical data are regularly updated when revisions become available, which normally has little impact for the global picture.

However, recent data revisions in China pose a particular uncertainty. Following China's 2017 census, its National Bureau of Statistics released revised estimates of agricultural production going back to 2007 and for fisheries and aquaculture back to 2009. These revisions imply that Chinese cereals production has been significantly higher over the past decade than previously assumed. For maize, the cumulative revision amounts to 266 Mt, or an increase of around 10%. Upward revisions were also published for other cereals. For dairy, by contrast, new estimates imply production is up to 15% lower than previously assumed.

The higher estimates of maize production raise the question where this additional production has ended up. It is not clear whether the additional maize has ended up as feed (which would either imply greater livestock production or more intensive use of feed than previously believed). On the other hand, assuming the additional production has ended up in stocks poses other issues, as it is not clear who would be holding these stocks and where they would be located.[28]

The revisions to Chinese statistics not only impact historical numbers, but also raise questions about the transparency of global agricultural markets. Having reliable stock data is essential to assess the resilience of global agricultural markets to shocks. The revision of Chinese production numbers thus points to a broader issue of uncertainty around stock estimates. These stocks (for China and for other countries) are often not known directly, but annual changes are estimated based on the difference between production and consumption, which makes stock estimates particularly vulnerable to measurement errors. Given the importance of reliable data on global food availability, more work is needed to improve global stock estimates, for instance through direct surveys.[29]

Box 1.4. Macroeconomic and policy assumptions

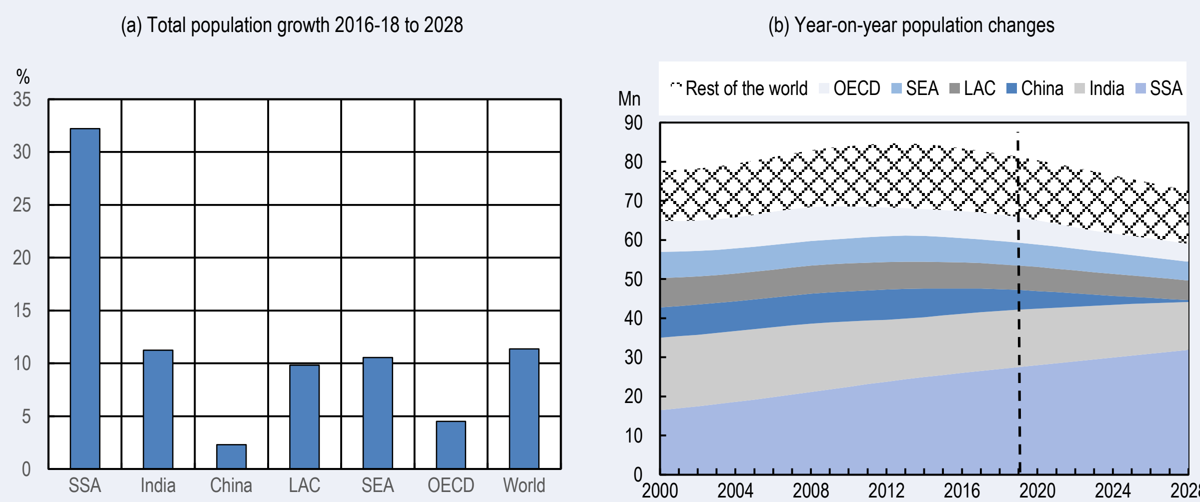
The main assumptions underlying the baseline projection

This *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. Detailed data are available in the Statistical Annex; the main assumptions are highlighted in this box.

Population growth

The *Agricultural Outlook* uses the UN Medium Variant set of estimates from the 2017 Revision of the United Nations Population Prospects database.

Figure 1.32. World population growth



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; SEA is Southeast Asia.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933957802

Over the projection period, world population is projected to grow from 7.5 billion people in 2016-18 to 8.4 billion people in 2028. This represents an annual growth rate of 1%, a slowdown compared to the 1.2% p.a. growth rate in the last decade. This growth is concentrated in developing regions, particularly Sub-Saharan Africa, which is expected to have the fastest growth rate at 2.4% p.a., and India, where the population is projected to grow by 0.9% p.a. With an additional 136 million people by 2028, India is expected to overtake China as the most populous country.

Per capita income growth

Estimates of per capita income growth are taken from the *OECD Economic Outlook* No. 104 (November 2018) and the *IMF World Economic Outlook* (October 2018). They are expressed in purchasing-power parity terms, in constant 2011 US dollars.

The demand for food depends on households' disposable incomes, which are approximated in this *Outlook* using the growth in per capita GDP. However, the effects of economic growth can be unevenly spread, which influences average consumption. In particular, the incomes of the poorest 40% have lagged average income growth in several Sub-Saharan African countries, as highlighted in the World Bank's Poverty and Shared Prosperity 2018 report. For this reason, demand projections in this *Outlook* sometimes deviate from what might be expected based on average growth.

Over the projection period, global income per capita is expected to grow by 2.5% p.a. in real terms. In India, strong economic growth is expected to double per capita incomes over the projection period (6.6% p.a.). Economic growth in China is expected to slow down in the coming decade, although per capita incomes are still expected to grow by 63% (4.1% p.a.) over the projection period. Other developing countries in Asia are projected to continue experiencing robust growth over the medium term. The growth of per capita incomes in Viet Nam, Indonesia, and the Philippines is anticipated to be in the 4-6% p.a. range, while that in Thailand is at around 3.3% p.a. In Pakistan, growth will be slower at 1.2% p.a. In Sub-Saharan Africa, per capita incomes are expected to grow by 14.2% over the projection period, in particular due to high economic growth expected in Ethiopia at 7.6% p.a. over the next ten years. In countries of the Latin America and Caribbean region, per capita growth varies considerably by country. While incomes in Brazil and Mexico will grow relatively slowly in the next decade (at around 2% p.a.), countries such as Peru, Paraguay and Colombia will see per capita incomes grow by 2.8% p.a.

In OECD countries, per capita income is expected to grow around 1.9% p.a. in the coming decade. Higher growth is expected for Turkey at 3.1% p.a. while per capita incomes are expected to grow slowest in Canada at 1.3% p.a.

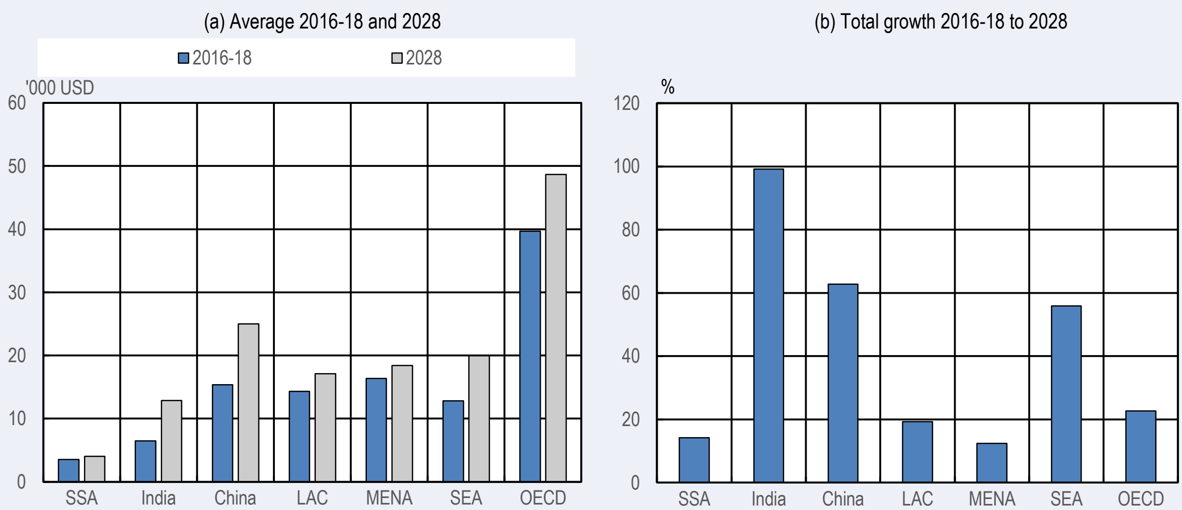
Global growth

GDP growth assumptions are based on the *OECD Economic Outlook* No. 104 (November 2018) and on the *IMF World Economic Outlook* (October 2018).

The global economy is expected to grow at a rate of 3.4% on average over the next ten years. Figure 1.34 shows growth rates of GDP for major regions and for selected countries of Latin America, the subject of this year's focus chapter. Globally, the highest growth will be registered in India (at 7.7% p.a.). In Latin America, the fastest total GDP growth will be seen by Paraguay at 4.0% p.a.

Figure 1.34 also decomposes the GDP growth assumptions into per capita GDP growth and population growth. Globally, economic growth will mostly correspond to per capita income growth; this is especially the case in OECD countries and in China. By contrast, high population growth in Sub-Saharan Africa means that the relatively high rate of economic growth in the region (at close to 4% p.a.) corresponds to only modest growth in per capita incomes (around 1.3% p.a.).

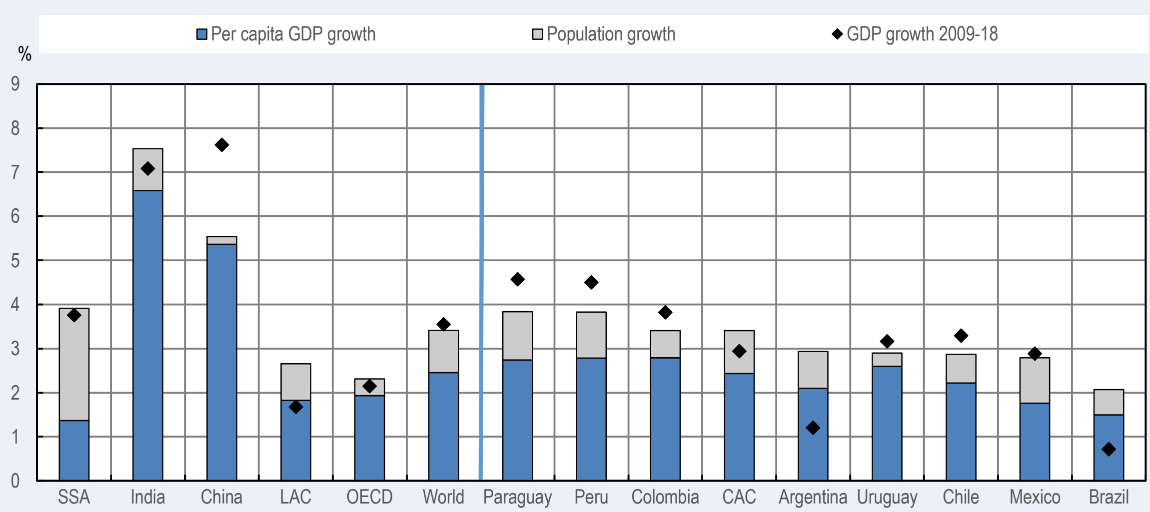
Figure 1.33. Per capita income growth



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; MENA is Middle East and North Africa; SEA is Southeast Asia. Panel (a) shows per capita GDP in purchasing-power parity (PPP) terms (constant 2011 US dollars).
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database).

StatLink http://dx.doi.org/10.1787/888933957821

Figure 1.34. Annual GDP growth rates 2019-2028



Note: SSA is Sub-Saharan Africa; LAC is Latin America and Caribbean; CAC is Central America and Caribbean.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database).

StatLink http://dx.doi.org/10.1787/888933957840

Exchange rates and inflation

Exchange rate assumptions are based on the *OECD Economic Outlook* No. 104 (November 2018) and on the *IMF World Economic Outlook* (October 2018). Real exchange rates for the period 2019-28 are assumed to be broadly stable, so that nominal exchange rates relative to the US dollar are mostly driven by differences in inflation compared to the United States. Some currencies are expected to appreciate in real terms compared to the US dollar; this is the case for Mexico, Paraguay and Uruguay. By contrast, a real depreciation is expected for Argentina, Brazil and Australia.

Inflation projections are based on the private consumption expenditure (PCE) deflator from the *OECD Economic Outlook* No. 104 (November 2018) and on the *IMF World Economic Outlook* (October 2018). Inflation is projected to increase over the next few years in both advanced and developing economies, reflecting the recovery in demand and the increase in real commodity prices. In the United States, inflation of 2.1% p.a.is expected over the next ten years, and in the Euro zone at 1.7% p.a. In other OECD countries, inflation is expected to average 3.5% p.a. Among the major emerging economies, consumer price inflation is projected to remain stable in China at around 2.9% p.a., and to ease slowly in Brazil at 4.6% p.a. Similarly, consumer price inflation in India should decrease from an annual growth rate of 6.8% to 4.1% p.a. over the next ten years.

Even though US inflation is slightly higher than inflation in the Euro zone, the Euro is expected to depreciate relative to the US dollar in both nominal and real terms. The currencies of China, Canada, Korea, New Zealand, Australia, the Russian Federation and Japan are expected to depreciate nominally. Relatively strong depreciations are projected for Argentina, Brazil, Turkey, Uruguay and India.

Input costs

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

Historical data for world oil prices to 2017 are based on Brent crude oil prices obtained from the short-term update of the *OECD Economic Outlook* N°104 (November 2018). For 2018, the annual average monthly spot price in 2018 was used, while the estimate for 2019 is based on the average of daily spot prices in December 2018. For the remainder of the projection period, oil prices are assumed to remain flat in real terms, which implies an increase in nominal terms from USD 58/barrel at the end of 2018 to USD 70/barrel in 2028.

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 reflected in the projections as the terms of that departure were not determined as this *Outlook* was being prepared. Nevertheless, the United Kingdom is reported separately from the rest of the European Union in this report.

In the case of bilateral trade agreements, only ratified or implemented agreements are incorporated. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which was signed in March 2018 and implemented, following ratification in most member countries, at the end of 2018, is included (see the Trade section of the Overview chapter for a discussion of its effects). As of February 2019, the Japan-European Union Economic Partnership Agreement entered into force. Also, the partly implemented but not yet ratified Comprehensive Economic and Trade Agreement (CETA) between Canada and the European Union is incorporated. On the other hand, the North American Free Trade Agreement (NAFTA) remains unchanged throughout the *Outlook* projection period as the new trade agreement to replace NAFTA, the United States—Canada—Mexico Agreement (USMCA) has not yet been ratified.

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 2019. The temporarily increased tariffs by the United States and China are maintained throughout the *Outlook* period as no formal end date is announced. The specific assumptions on biofuel policies are elaborated in the biofuel chapter.

Notes

[1] For short-term market monitoring and outlook, see in particular the Agricultural Market Information System (www.amis-outlook.org) and FAO's Global Information and Early Warning System (www.fao.org/giews/en/). For long-term projections to 2050, see e.g. FAO (2018) The Future of Food and Agriculture – Alternative pathways to 2050; Adenäuer, Brooks and Saunders (2019), "Analysis of Long-term Challenges for Agricultural Markets" *OECD Food, Agriculture and Fisheries Papers*, forthcoming; as well as other approaches reviewed by Hertel et al. (2016) "Predicting Long-Term Food Demand, Cropland Use, and Prices," Annual Review of Resource Economics 8, 417-441.

[2] See http://www.agri-outlook.org/about/

[3] See Reardon and Timmer (2012), "The Economics of the Food System Revolution," *Annual Review of Resource Economics* Vol. 4, pp. 225-264.

[4] For a decomposition of production growth in the developing world into area and yield expansion, and an examination of the different factors contributing to higher yields, see e.g. Evenson, R. and D. Gollin (2003) "Assessing the Impact of the Green Revolution, 1960 to 2000," *Science 300*(5620), pp. 758-762.

[5] See Phelps and Kaplan (2017) "Land use for animal production in global change studies : defining and characterizing a framework," *Global Change Biology*, 23(11), pp. 4457-4471. The *Agricultural Outlook* uses the FAOSTAT definition of pasture.

[6] The relative contribution of yield growth and area expansion is important for understanding the likely expansion of agricultural land and the resulting pressures on the natural environment.

However, higher yields are not always economically optimal, for instance when the economic cost of additional inputs would be higher than the value of additional output. In addition, increasing yields may itself result in environmental damage, for instance when higher fertiliser use leads to nitrogen pollution in waterways. While yields are an important indicator, a focus on yields thus only gives a partial picture of productivity growth and environmental impacts in crop production. See e.g. Beddow et al. (2015) « Rethinking Yield Gaps », University of Minnesota College of Food, Agricultural and Natural Resource Sciences – Staff Paper P15-04.

[7] See e.g. the data available in the Global Yield Gap Atlas (www.yieldgap.org) and the analysis in Fischer, Byerlee and Edmeades (2014) "Crop yields and global food security: Will yield increase continue to feed the world?", Australian Centre for International Agricultural Research and Grains Research & Development Corporation.

[8] Data for 2016 from the World Bank's World Development Indicators (AG.CON.FERT.ZS), http://wdi.worldbank.org.

[9] See, for example, Christiaensen (2017) "Agriculture in Africa – Telling myths from facts: A synthesis," *Food Policy* 67, 1-11; Haggblade et al. (2017) "The Herbicide Revolution in Developing Countries: Patterns, Causes, and Implications," *European Journal of Development Research* 29(3), 533-559; and International Fertilizer Association (2018) *Fertilizer Outlook 2018-2022*.

[10] A comparison of experiences in the first two decades of the Green Revolution (1961-1980) and in later years (1981-2000) shows that the contribution of improved varieties has increased both in relative and in absolute terms. As the use of other inputs spreads, further yield growth is likely to increasingly depend on improved varieties. See Evenson and Gollin (2003), "Assessing the impact of the Green Revolution, 1960-2000," Science 300(5620), 758-762.

[11] On agricultural policies in the BRIC economies, see e.g. Brink et al. (2017) "BRIC Agricultural policies through a WTO lens," in: A. Bouët and D. Laborde, *Agriculture, Development, and the Global Trading System: 2000-2015*, IFPRI, and OECD (2018) *Agricultural Policy Monitoring and Evaluation 2018*.

[12] On the Russian Federation, see United States Department of Agriculture – Foreign Agricultural Service (2018) "Russian Federation – Agricultural Economy and Policy Report," GAIN Report RS1819, https://gain.fas.usda.gov; for Southeast Asia, see OECD (2017), *Building Food Security and Managing Risk in Southeast Asia*, OECD Publishing, Paris (pp. 107-8).

[13] See Smith et al. (2015) "Agriculture, Forestry and Other Land Use," in IPCC's Fifth Assessment Report, https://www.ipcc.ch/report/ar5/wg3/.

[14] Figures for 2016 from FAOSTAT, http://www.fao.org/faostat/en/.

[15] See, for example, Herrero et al. (2013) "Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems", Proceedings of the National Academy of Sciences, December 2013, 110 (52), pp. 20888-20893.

[16] See, for example, Blandford and Hassapoyannes (2018) "The role of agriculture in global GHG mitigation," *OECD Food, Agriculture and Fisheries Papers* 112, OECD Publications, Paris; World Resources Institute (2018) *Creating a Sustainable Food Future*, https://www.wri.org/publication/creating-sustainable-food-future; Smith et al. (2015) "Agriculture, Forestry and Other Land Use," in IPCC's Fifth Assessment Report, https://www.ipcc.ch/report/ar5/wg3/.

[17] See OECD (2019), "Options for Climate Change Mitigation in the Agricultural Sector : A Partial Equilibrium Analysis," forthcoming.

[18] See OECD (2019) "The changing landscape of agricultural markets and trade", *OECD Food, Agriculture & Fisheries Papers* 118, OECD Publications, Paris.

[19] See Bouët and Laborde (2017), "Assessing the potential cost of a failed Doha Round", in: A. Bouët and D. Laborde, *Agriculture, Development and the Global Trading System: 2000-2015*, IFPRI, Washington D.C.

[20] The CPTPP entered into force between Australia, Canada, Japan, Mexico, New Zealand, and Singapore on 30 December 2018. It entered into force for Viet Nam on 14 January 2019. The CPTPP will enter into force in the four remaining countries (Brunei Darussalam, Chile, Malaysia, and Peru) 60 days after they complete their respective ratification processes. Most tariff lines (around 86%) will become duty-free when the CPTPP enters into force for each CPTPP country. Some tariffs will be eliminated gradually over "phase-out" periods, which vary by country and tariff line, while a small number of tariff lines will not become duty free. Overall, around 99% of the CPTPP countries' tariff lines will be duty free within 15 years.

[21] Under the agreement, the European Union has agreed to liberalise 99% of its tariff lines and 100% of its imports while Japan liberalises 97% of its tariff lines and 99% of its imports. Once the trade agreement is fully implemented, Japan will have liberalised approximately 84% of all agricultural tariff lines while the European Union will have liberalised almost all agricultural products, with the exception of rice (which is mutually excluded) and some processed agricultural products.

[22] FAO is working with governments in both regions to inform and train farmers on how to combat the infestation. See http://www.fao.org/asiapacific/news/detail-events/en/c/1186008/

[23] See, for example, Alston et al. (2000) "A meta-analysis of rates of return to agricultural R&D: Ex pede Herculem?", IFPRI Research Report; Hurley et al. (2014) "Re-examining the reported rates of return to food and agricultural research and development," American Journal of Agricultural Economics 96(5), 1492-1504; Nin-Pratt and Magalhaes (2018) "Revisiting rates of return to agricultural R&D investment," IFPRI Discussion Paper 01718.

[24] See Heisey and Fuglie (2018) *Agricultural Research Investment and Policy Reform in High-Income Countries*, United States Department of Agriculture – Economic Research Service, May 2018.

[25] See ASTI (2012) *ASTI Global Assessment of Agricultural R&D Spending*, Agricultural Science and Technology Indicators, https://www.asti.cgiar.org/globaloverview.

[26] See Fuglie et al. (2012) "The contribution of private industry to agricultural innovation," *Science* 338(6110), 1031-1032.

[27] R. Johannson (2019), "The Outlook for US Agriculture", speech delivered at the US Department of Agriculture's Agricultural Outlook Forum (21-22 February 2019).

[28] Ongoing work by the AMIS Secretariat is using estimates on the biological requirements of livestock to assess how much of the additional cereal production is likely to have ended up as animal feed. See *AMIS Market Monitor* No. 65 (February 2019), available at www.amis-outlook.org.

[29] For more information, see *AMIS Market Monitor* No. 64 (December 2018), available at www.amis-outlook.org.

Chapter 2. Latin American Agriculture: Prospects and Challenges

This chapter reviews the prospects and challenges facing the agricultural sector in Latin America and the Caribbean (LAC). The region accounts for about a quarter of global exports in agricultural and fisheries products, underscoring the importance of trade openness at the global level. Strong growth opportunities in high value fruit and vegetable crops provide opportunities for smallholders, but policies will need to be differentiated according to resource endowments and market potential. Food security continues to be a concern, with many households unable to afford the food they need. Given the simultaneous rise in the number of people who are overweight and obese, several initiatives seek to counter these trends. Raising agricultural productivity sustainably in LAC will rely on new strategic investments in agriculture's enabling environment. However, due to the region's diverse state of rural infrastructure, R&D initiatives and of environmental problems from agricultural production, mixed potential exists to further expand public spending and improve the environmental performance of the sector.

2.1. Introduction

The Latin America and Caribbean (LAC) region covers more than 2 billion ha and encompasses 34 countries with a total estimated population in 2018 of 657 million- a low average population density of 0.34 persons per ha. From the available area, 38% is used for agriculture (9.5% for crops and 28.5% for pasture) and the other 46% is covered with forests. The region's land represents 15% of the earth's surface, receives 30% of precipitation and generates 33% of the world's water, which makes the region a great world reserve of arable land and forests. Due to its enormous latitudinal range, varied topography and rich biodiversity, LAC has one of the most diverse and complex range of farming systems of any region in the world (Box 2.1).

Agriculture is an important sector for the economy across much of LAC, accounting for an average of 4.7% of GDP in 2015-17. This share is 1.4% lower than in 1996-98, in line with traditional economic development trends, and reflects declining shares in all LAC countries except Argentina. Some countries have seen agriculture's share in total GDP reduced drastically such as Ecuador (10% during the same period), Guatemala (13.6%) and Guyana (20.2%). Nevertheless, agriculture still accounts for around 10% or more of total GDP in these countries, as well as in Belize, Bolivia, Dominica, Ecuador, Haiti, and Paraguay.

Agriculture and fisheries in Latin America and the Caribbean have grown by an average of 2.7% per year (in constant 2010 US dollars, including forestry) over the past two decades, a slightly lower rate than overall economic growth, commensurate with the sector's declining share of GDP. This pace of growth is considerably faster than that of OECD countries (1.2% annual growth), but slower than that of the more dynamic regions of South Asia, and East Asia and the Pacific, which grew by 3.1% and 3.7% respectively, or Sub-Saharan Africa, which outperformed every region by growing at 4.6% per year (World Bank, 2019[1]).

Performance has been diverse across the region. In general, agriculture and fisheries in South American countries have performed relatively better than in Central American countries. The sector has contracted in several Caribbean economies, yet the second fastest rate of growth (4.3%) was recorded in the Dominican Republic.

The region has positioned itself as a leading exporter of agricultural products. Latin American countries are major exporters of soybeans, pork, maize, poultry, animal feed, sugar, coffee, and fruits and vegetables. Brazil is the largest agricultural and food exporter (USD 79.3 billion in 2017) in the region, followed by Argentina, (USD 35.0 billion), Mexico (USD 32.5 billion), Chile (USD 17 billion), Ecuador (USD 10.4 billion) and Peru (USD 8.8 billion). Some Latin American countries are significant importers of agri-food products as well, such as Mexico, which is among the major world importers of maize, soybeans, dairy, pork and poultry, and Brazil, one of the top world wheat importers. Overall, however, LAC's agricultural trade surplus has steadily increased over the past two decades, reaching USD 104.3 billion in 2017.

The sector is especially important to livelihoods. In 2018, 14.1% of total labour force in the LAC region was employed in agriculture. Countries such as Bolivia, Ecuador, Guatemala, Honduras, Haiti, Guatemala, Nicaragua and Peru employed more than a quarter of its labour force in the agricultural sector (World Bank, 2019). LAC countries managed to bring rural poverty rates down even during times of economic crises and sluggish economic growth. From 1990 to 2014, rural poverty in the region fell by almost 20 percentage points. Key to this successful performance was a switch in public policy from generalised consumer subsidies to targeted conditional cash transfer programmes, where Latin American countries have been pioneers. Moreover, during times of economic crises in the region, agriculture has served as a "buffer" during recessionary periods (Arias et al., 2017[2]).

The favourable poverty alleviation trend, however, has been reversed in recent years. Furthermore, there is still a high incidence of poverty and extreme poverty in rural areas (48.6% and 22.5%, respectively). Since 2015, the trend of closing the gap between the rural and urban poor has also reversed, and the poverty gap has widened when other dimensions of poverty (access to basic public services) are taken into consideration (CEPAL, 2018[3]; Food and Agriculture Organization of the UN (FAO), 2018[4]). In addition, the number of undernourished people increased for the third consecutive year in 2017, reaching 39.3 million in (Food and Agriculture Organization of the UN (FAO) et al., 2018[5]), a problem related to the affordability of food to poor consumers rather than the physical availability of food, given the agricultural and food surplus status of the region.

LAC's abundant natural resource endowment will allow the region to continue playing a major role in world agricultural production and trade. The challenges for the future lies in maintaining growth in a context of slower demand growth and lower international prices, while ensuring that future agricultural growth is more sustainable and more inclusive than it has been in the past.

Box 2.1. Agriculture in Latin America and the Caribbean – a vastly heterogeneous sector

Agriculture in Latin America and the Caribbean (LAC) is heterogeneous from nearly every angle. The region covers a great variety of different agro-ecological zones, varied topography and vastly different farm sizes and structures, operating at different levels of technology and sophistication. This makes agriculture in the region immensely diverse in terms of production systems, economic importance and its contribution to income, employment and trade.

The region's overall productive structure is highly diverse. A capital and technology-intensive corporate sector that has successfully managed to integrate itself into global agri-food markets alongside coexists alongside a broad socio-productive sector based on subsistence farming, non-farming rural activities and landless rural populations that have been unable to participate in dynamic economic circuits. Between these two extremes, there is an intermediate sector that is able to connect to markets, but that continues to be extremely vulnerable to economic and political shocks as well as to climatic risks.

The heterogeneity of agriculture in LAC is reflected in the diversity of the region's farm structures. While agriculture in the Southern Cone is dominated by large, commercial and export-oriented farms, particularly in Argentina and Brazil but increasingly in other countries such as Uruguay, much of the rest of the region is characterised by smallholder and family agriculture. It is estimated that there are 15 million smallholder and family farmers in the LAC region, who are responsible for a substantial share of the region's food production.

As regards trade, while the region as a whole is a major supplier of grains and oilseeds to global markets, as well as bananas, coffee and sugar, large differences exist across the sub-regions. For instance, the countries of the Southern Cone, in particular Argentina and Brazil, are among the world's largest exporters of wheat, maize, soybeans and sugar, whereas the Caribbean countries depend on world markets to meet their food requirements.

There are also large differences in the contribution of agriculture to overall economic output. On average, primary agriculture merely accounts for less than 5% of GDP in LAC, but the regional average masks considerable differences across countries. While agriculture accounts for even less than 4 % of GDP in Mexico and Chile, it exceeds 15% in Belize and Nicaragua and even 20% in Paraguay. Nevertheless, regardless of the individual country situation, the importance of agriculture rises when upstream and downstream activities are added to primary production. Applying this broader definition of agriculture, the sector accounts for a share of more than 20% of GDP in most of the LAC economies.

2.2. Agricultural development

Agricultural performance

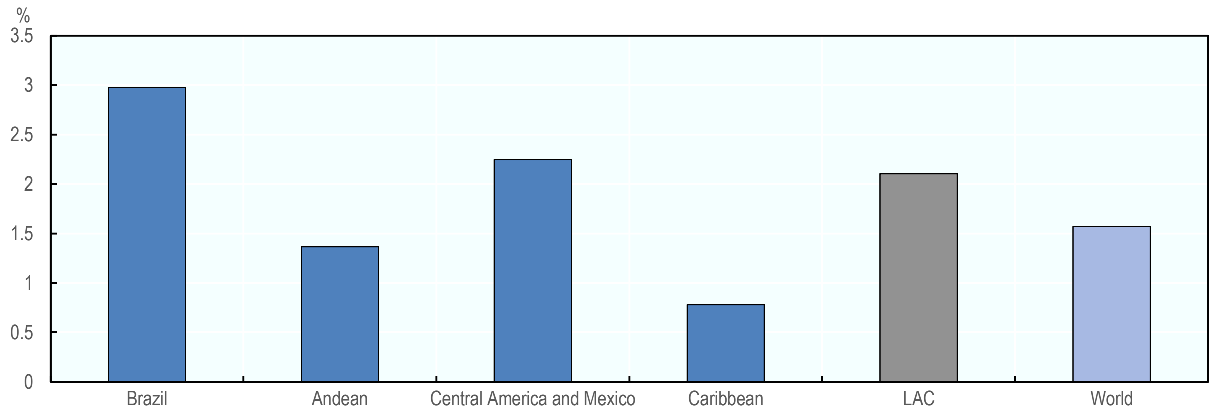
The Latin America and Caribbean region has experienced substantial agricultural output growth over the past two decades. Brazil was one of the agricultural growth leaders both in the region and worldwide, with an average growth rate of 4.1% between 1991 and 2015, while Southern Cone[1] and Andean countries' agriculture grew 2.8%, Central American agriculture grew 2.5%, and Caribbean countries reported a modest 1.0% average annual growth rate.

Most of this production growth has come from productivity improvements, rather than bringing more land into production. Agricultural Total Factor Productivity (TFP) in Latin America and the Caribbean grew at an annual average rate of 2.1% between 1991 and 2015, 0.5 percentage points above world average, but 1.3 percentage points below the fastest growing region in the world during that period, Northeast Asia. Agricultural TFP growth was uneven within the region: while Caribbean agricultural TFP growth was one of the lowest worldwide, Brazil's (3.0%) was only surpassed by Northeast Asia (3.4%), a region in which agricultural TFP used to grow at around half Brazil's rate during the 1970s and 1980s.

Productivity growth has been uneven between countries in the region; data from Brazil suggest that there are also important differences according to farm size, location, and degree of specialisation. In Brazil, large farms (500+ha) and small farms (0-5 ha) showed the fastest TFP growth during 1985 and 2006, whereas medium-large farms (100-500 ha) showed the slowest growth. Differences in TFP growth related to the farms' degree of specialisation were also found (Rada, Helfand and Magalhães, 2018[6]). The relationship between farm size and TFP growth varies by region; for example, the highest TFP growth in the Brazil's Northeast was recorded by the 5-20 ha farm size class, whereas in the Southeast the 500+ ha farms showed the highest TPF growth (Arias et al., 2017[2]).

Productivity growth across the region has been driven by R&D, accompanying investments in agriculture's enabling environment, and specific support to farmers. Public investment in agricultural research and development (R&D) has been key to increased productivity in Latin American agriculture. Although volatile during the 1980s and 1990s, government expenditure on agricultural R&D shows a long-term positive trend; by 2013, the region spent USD 5.1 billion (2011 PPP prices) on agricultural R&D, with Brazil accounting for a little more than 50% of total expenditure (Stads et al., 2016[7]).

Figure 2.1. Annual total factor productivity growth in agriculture, weighted averages, 1991-2015



Notes: Brazil includes French Guyana, Guyana and Surinam; LAC is Latin American and the Caribbean.
Source: USDA (2018).

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Government agricultural research institutions, sometimes working together with the private sector, have played a key role in operationalising government expenditure in R&D to increase productivity. For instance, Brazil's EMBRAPA, the largest agricultural research institution in the region, completely transformed agriculture in the *Cerrado* region (savannah area) in Midwest Brazil by introducing technologies from abroad (nitrogen fixation, no-tillage practices, for example) and livestock breeds, and adapting them to the local conditions to produce cotton, soybeans, maize and cattle (OECD/FAO, 2015[8]). Argentina's INTA, through its research on seed breeding, direct seeding, weed control, and working together with the private sector, was instrumental in soybean productivity growth (including the expansion of the double cropping soybean-wheat system) in the Pampa and extra-Pampa regions (Bisang, Anlló and Campi, 2015[9]). Research conducted by Chile's INIA has contributed to boosting Chilean agricultural exports; by introducing new nut varieties, farmers estimate that nut exports increased 1000% in the decade from 2001 to 2011. INIA also introduced blueberries in various regions of Chile and, from being practically an unknown fruit to farmers only two decades ago, today Chile is an important blueberry producer and exporter in the Southern hemisphere (Instituto de Investigaciones Agropecuarias (INIA), 2014[10]). In Mexico, an assessment of 30 new technologies developed by INIFAP over the 2000-2010 period (new bean, oat, garbanzo, and garlic varieties, forage management, more efficient water use, for example) concluded that these technologies reached 536 369 farmers and 1.8 Mha, and yielded internal rates of return ranging from 10.6% to 73% (González-Estrada, 2016[11]).

Parallel investments in agriculture's enabling environment can leverage the benefits of R&D. Complementary factors include policies that improve economic incentives for producers, stronger rural education and agricultural extension services, and rural infrastructure that improves access to markets. (Fuglie and Wang, 2012[12]).

Specific support has also been delivered to farmers. Mexico's *Alianza para el Campo*, for example, has offered support to farmers under a wide array of instruments, including on-farm investment subsidies (*Programa de Apoyo a la Inversión en Equipamiento e Infraestructura*), income support (*Procampo, Diesel Agropecuario, Fomento Productivo* *del Café,* for example), natural resource conservation programmes, risk management and marketing support. The Mexican government has also implemented special strategic programmes such as PROMAF, which supports the maize and bean value chains, being these two products traditional staple foods of the Mexican diet.

Brazil has similarly implemented comprehensive agricultural policies addressing specific target farmer populations, such as PRONAF (National Programme to Strengthen Family Farming). Mid-size farmers have had access to special lines of credit through PRONAMP (National Programme to Support Medium Agricultural Producers) and larger producers have benefitted from price support and subsidised credit and insurance programmes.

Chile's agricultural policy has focused both on developing efficient internal markets (improving market information, storage infrastructure, promoting contract agriculture, for example) and promoting agricultural exports through its *Fondo de Promoción de Exportaciones Agropecuarias*. The Chilean government subsidises small-scale irrigation projects through competitive tender processes. Through FONDOSAG, farmers receive government support to invest on phytosanitary, animal health and resource conservation matters. Smallholder farmers have traditionally been supported by INDAP, a Ministry of Agriculture Institute that provides a wide array of instruments for this type of farmers, including credit, training, on-farm investment subsidies, and marketing support.

Other Latin American and Caribbean countries have also supported farmers, by facilitating access to credit and new technologies, and providing other investments. However, their impact on agricultural productivity is difficult to assess, and there have been few formal impact evaluations.

Agricultural productivity also benefits from the building of human and social capital. Better management skills are complemented by the fast-paced growth in information technologies, which improve both technical and allocative efficiency. Better organisational skills also allow farmers to respond better to changing market conditions (Chang and Zepeda, 2001[13]). Over 33 000 agricultural cooperatives are active in the LAC region. In addition, several farmers' organisations at national, sub-regional and regional levels operate with various degrees of effectiveness.

Colombia's *Federación Nacional de Cafeteros*, for example, conducts marketing campaigns in several countries, directly trades coffee, and conducts research and technology transfer for its member farmers. The quinoa export boom would have probably not been possible without the existence of quinoa producer associations, such as Bolivia's ANAPQUI and APQUISA, or Peru's various quinoa cooperatives. At the regional level, the Latin American Poultry Producers Association, through its Technical and Scientific Committee, designs poultry disease prevention, control and eradication plans, as well as training programmes for poultry associations at the country level.

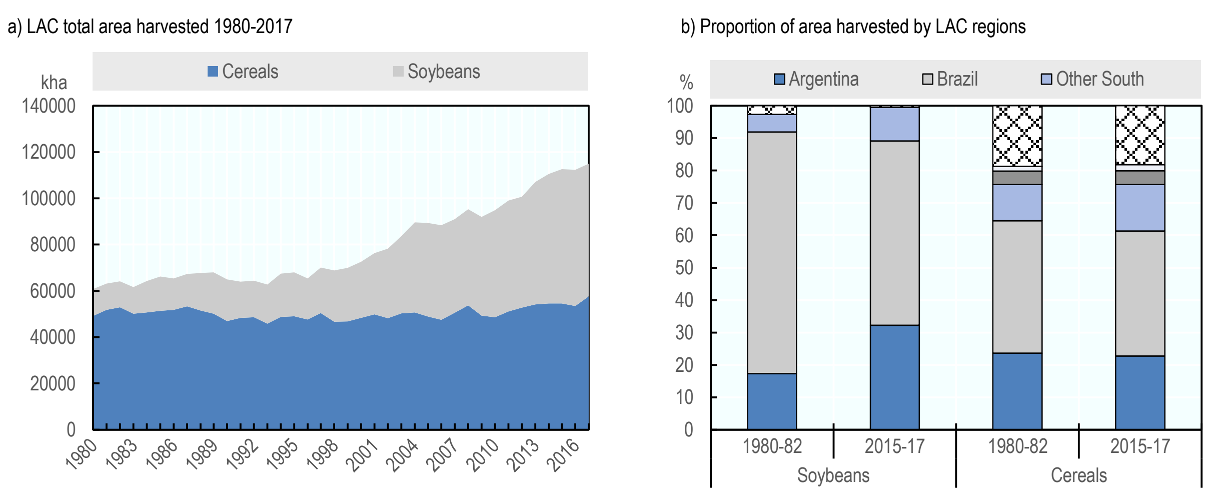
Changes in the structure of agricultural production

Since 2000, the pasture area in LAC has remained almost stable at 570 Mha, whereas crop land has increased by 1.2% p.a. to 188 Mha in 2018. Brazil alone increased agricultural harvested area by 55.7 Mha over the past three decades. Since 2000, nearly a third of the increase in area harvested of cereals, oilseeds and pulses in Argentina and Brazil has been due to double cropping. Oilseed (especially soybean) harvested area increased considerably in MERCOSUR countries, remained fairly constant in Andean countries, except for Bolivia, and declined steadily in Central America, Mexico and Chile. In contrast, fruits and vegetables gained considerable importance in Central America, Mexico and Chile.

Cattle ranching has shown different dynamics in Latin America: while the cattle herd has remained relatively constant in the Caribbean (the fall in Cuba and small island countries has been offset by the increase in the Dominican Republic), it has grown moderately in Central America, Mexico, Andean countries and Uruguay, and rapidly in Brazil and Paraguay. Cattle herd increased from 293 million head in 1980-82 to 414 million head in 2015-17, with 80% of this growth occurring in Brazil alone. In 2015-17, Brazil accounted for 53% of the total LAC herd (11 percentage points more than in 1980-82).

Aviculture has been particularly dynamic in the region, with growing domestic and foreign demand underpinned by favourable prices relative to other meats. Poultry stocks have trebled in MERCOSUR and Central American countries over the past three decades, and more than trebled in Andean countries and in the Caribbean. In contrast to cattle ranching, aviculture growth has been less concentrated regionally. In fact, even though poultry stocks trebled in Brazil between 1980-82 and 2015-17, Brazil's share of LAC's total poultry stocks fell 4 percentage points; nevertheless, the country still accounts for 40% of total LAC poultry stocks. Andean countries' share of total LAC poultry stocks increased 6 percentage points during this period, thanks mainly to Bolivia, whose expansion of soybean area made poultry feed more affordable for Bolivian producers.

Figure 2.2. Cereal and soybean harvested area in Latin America and the Caribbean



Note: Area harvested includes double cropping; LAC is Latin American and the Caribbean.
Source: FAOSTAT.

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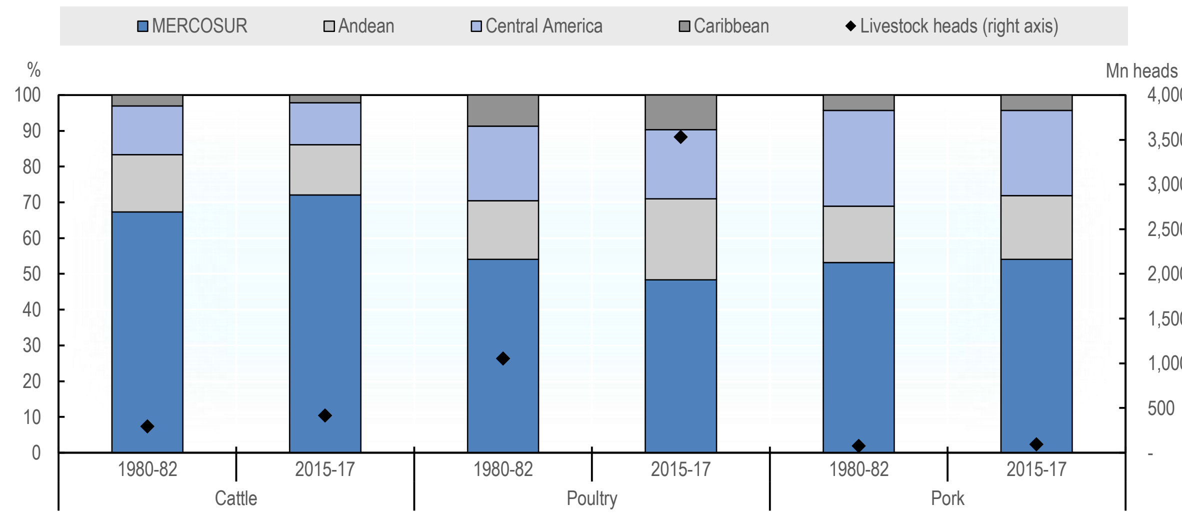
The structure of Latin American agriculture is heterogeneous and has evolved differently across countries. Large, export-oriented, capital-intensive farms coexist with small, labour-intensive, subsistence-oriented farms. Out of the estimated 20.4 million farms in the region, 81.3% are smallholder family farms, occupying only 23.4% of farm land. Conversely, 18.7% of all farms own 76.6% of total agricultural land (Leporati et al., 2014[14]).

Figure 2.3. Livestock stocks by Latin American and the Caribbean sub-region



Source: (Food and Agriculture Organization of the UN (FAO), 2018[15]).

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Over the past couple of decades, two contrasting phenomena have been observed regarding agricultural land structure in Latin America: land concentration has been recorded in countries such as Paraguay, Argentina, Uruguay, Chile and Venezuela, whereas land fragmentation has occurred in countries such as Brazil, Peru, Mexico, Costa Rica, Nicaragua and El Salvador. Economies of scale, inheritance, urbanisation, and the development of land markets are behind the observed phenomena, all of which may take place simultaneously at the country level. Average farm size has increased more than 20% in Argentina and Uruguay and almost 40% in Paraguay in less than two decades, whereas average farm size has declined around 30% in countries such as Nicaragua (from 2001 to 2011) and El Salvador (from 1971 to 2007-2008) (Sotomayor and Namdar-Irani, 2016[16]). Household survey data also suggest a land concentration process in the region. From 2002 to 2014, the number of agricultural households (wage and autonomous) fell by one fifth in twelve LAC countries and employment in agriculture fell 11 percentage points (UN Economic Commission for Latin America and the Caribbean (UNECLAC); Food and Agriculture Organization of the UN (FAO); Inter-American Institute for Cooperation on Agriculture (IICA), 2017[17]).

The above farm size averages do not consider land renting, a common practice in some countries such as Argentina, whose *seeding pools* may manage farms of several thousand hectares, or Mexico, with its long-established transnational agribusinesses that, through contract farming, implicitly control the whole production process of several thousand hectares. Furthermore, the above figures conceal concentration processes occurring under specific agricultural sectors. For example, even though Peru reported land fragmentation in the past couple of decades, one single economic group manages farms that range from 1 240 to 8 858 ha in the fruit and vegetable export sector. In Brazil, where land fragmentation was also reported, a single farmer was able to plant 223 000 ha of soybeans (Soto Baquero and Gómez, 2014).

Table 2.1. Average farm size change in selected Latin American countries, most recent census observations

	Average Farm Size (ha)				
	Previous census (A)		Most recent census (B)		Average farm size variation (B/A)
Country	Year of observation	Value	Year of observation	Value	
Paraguay	1991	77.5	2008	107.3	38.40%
Argentina	1988	423.6	2002	524.1	23.70%
Uruguay	2000	296.9	2011	361.5	21.70%
Chile	1997	111.2	2007	121	8.80%
Venezuela	1997-1998	60.01	2007-2008	63.8	6.30%
Brazil	1995-1996	72.8	2006	63.8	-12.40%
Peru	1994	20.1	2012	17.1	-14.50%
Mexico	1991	24.6	2007	20.2	-17.60%
Costa Rica	1984	31.7	2014	25.9	-18.50%
Nicaragua	2001	31.8	2011	22	-30.90%
El Salvador	1971	3.5	2007-2008	2.3	-35.40%
Country average		60.1		51.4	-14.50%
Average, countries with concentration		176.4		205	16.20%
Average, countries with fragmentation		44		35.9	-18.50%

Note: According to the latest agricultural census, undertaken in 2017, the average farm size in Brazil is 69.1 ha (preliminary data). IBGE (2017).
Source: (Sotomayor and Namdar-Irani, 2016[16]).

In addition to land concentration, a relatively recent phenomenon appears to be increased foreign investment in agricultural land. Foreign investors have not only come from outside the region but also from within the region. Brazilians and Argentinians are producing soybeans, livestock and forest products in Bolivia, for example. Brazilian investors have acquired land not only in Bolivia, but also in Paraguay, Colombia, and Uruguay. Mexican, Costa Rican and Guatemalan investors are engaged in forest, cattle, rice, sugarcane, citrus and oil palm fruit production in Nicaragua, to name a few examples (Soto Baquero and Gómez, 2014). Both land renting and increased foreign ownership of agricultural land make farm operations reach a size of thousands of hectares, changing the agricultural land structure and dynamics of the region, and pointing towards higher land concentration rates not captured by census data. In any case, both phenomena have posed contrasting challenges for policy makers.

Trends in rural population, rural poverty, and food security

The Latin American agricultural boom has not stopped migration from rural areas to cities nor to countries outside the region. During the late 1980s, the rural population in the region stopped growing and a few years later started to decline slightly. The number of people living in rural areas in 2017 (126 million) equalled that recorded in the mid-1970s. Latin America has thus become increasingly urban, with 80.4% of its 644 million inhabitants living in urban areas. More males than females have migrated from rural to urban areas; thus, agricultural households headed by females increased by 40% between 2002 and 2014 (UN Economic Commission for Latin America and the Caribbean (UNECLAC); Food and Agriculture Organization of the UN (FAO); Inter-American Institute for Cooperation on Agriculture (IICA), 2017[17]).

For 25 years, Latin America witnessed continuous improvement in rural poverty reduction (20 percentage points from 1990 to 2014). Some countries were able to reduce rural poverty significantly such as Brazil (42 percentage points from 1990 to 2014), Ecuador (39 percentage points from 2000 to 2014), Chile (32 percentage points from 1990 to 2013) and Peru (27 percentage points from 1997 to 2014). Economic growth, public investment in infrastructure and public services, and the implementation of social protection programmes, mainly conditional cash-transfer programmes which, by 2015, covered about a fifth of the Latin American population, largely explain these achievements (Food and Agriculture Organization of the UN (FAO), 2018[4]).

This positive poverty alleviation trend, including the narrowing of the rural/urban poverty gap, stagnated in 2014-2016 and reversed in some countries. Furthermore, significant gender inequalities prevailed in the region, indigenous and Afro-descendant peoples suffered from marginalisation, and social security, housing quality and educational-level inequalities were evident (Food and Agriculture Organization of the UN (FAO), 2018[4]). Paradoxically, being an agricultural and food surplus region, Latin America witnessed the number of food insecure population increase for the third consecutive year (Food and Agriculture Organization of the UN (FAO) et al., 2018[5]). Rather than the physical availability of food, the affordability of food to poor consumers has been behind the swing in food security trends in the region. In addition, overweight and obesity have increasingly become a public health problem in Latin American and Caribbean societies. One-fifth of LAC's population is considered obese, and obesity seems to remain on the rise, particularly affecting lower-income sectors of the population, women, indigenous peoples, Afro-descendants and, in some cases, children (Box 2.2).

Box 2.2. The obesity epidemic in Latin America and the Caribbean region

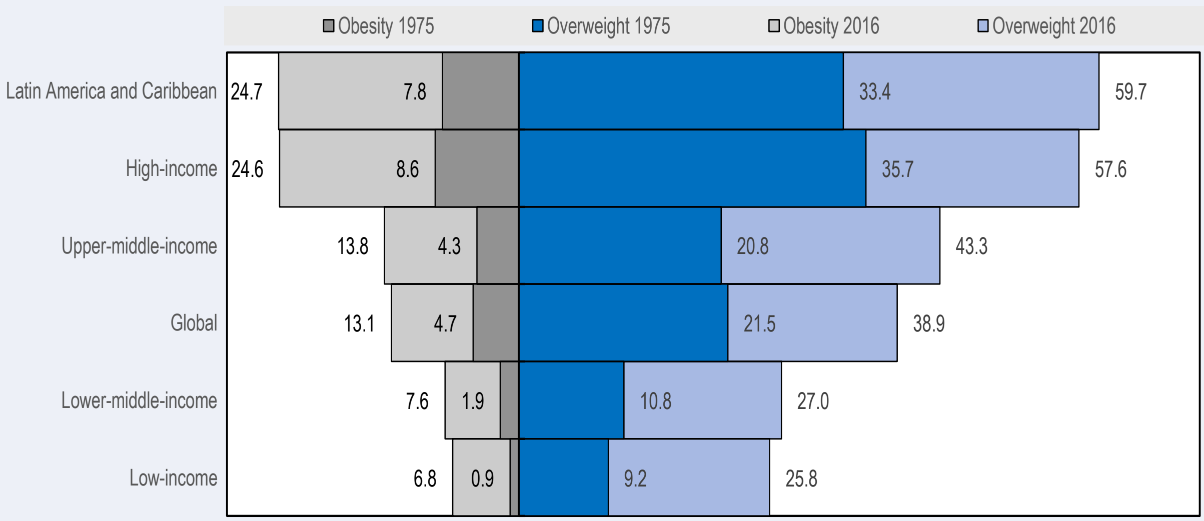
A regional look at diet composition and at policies that aim to halt an alarming trend

The Latin America and Caribbean (LAC) region has faced the challenge of malnutrition for a long time. Important progress in decreasing the prevalence of undernutrition has occurred over the last decades in part related to a strong political commitment by countries across the LAC region. A report by the World Food Programme (WFP) and the Economic Commission for Latin America and the Caribbean (ECLAC) (WFP-ECLAC, 2017[19]) states that over-nutrition is expected to become the main social and economic problem in the LAC region. Indeed, over-nutrition together with a lack of physical activity is a major driver towards people becoming overweight and obese (Graf and Cecchini (2017[20])). This is related to the energy imbalance between the calories consumed by an individual and the calories expended (WHO, 2019[21]). Over-nutrition leads to non-communicable diseases with consequences in terms of public health expenditures, rising prevalence of premature deaths and to productivity inefficiencies (Devaux and Sassi, 2015[22]).

The prevalence of individuals being overweight and obese in the LAC region has been well above average world levels for more than four decades and is comparable to the levels that prevail in high-income countries (Figure 2.4). In fact, LAC is the region with the second highest prevalence of individuals being overweight or obese in the world today, just behind North America.

According to WHO (2019[23]), the prevalence of people being overweight in the region has grown steadily from about 35% in 1975 to 60% in 2016 while the prevalence of people being obese has grown from 8% in 1975 to 25% in 2016. This rising trend has occurred in all countries across the region. Currently, the lowest prevalence of people being overweight is in Trinidad and Tobago (46%) and the highest in Mexico (65%).

Figure 2.4. Prevalence of adults being overweight or obese across the world



Note: The prevalence is presented in the percentage of the adults (age standardised) being overweight and obese, meaning they have BMI over 25 and 30, respectively. Prevalence for Latin American and the Caribbean was calculated by removing Canada and United States of America from WHO Americas aggregate using UN population data.
Source: (World Health Organization (WHO), 2019[24]), ((UN), 2017[25]).

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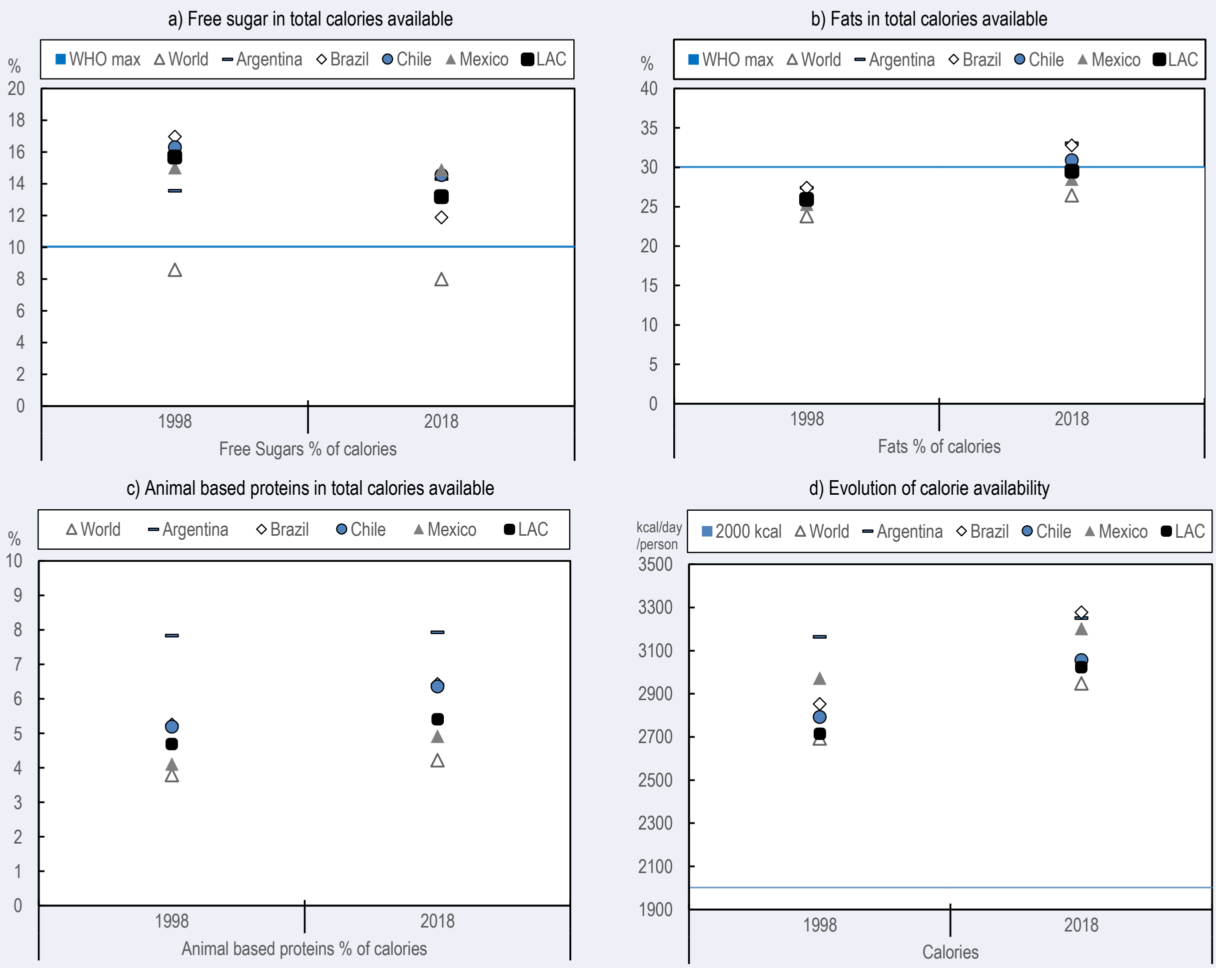
This box provides some insights on the evolution of diet composition in the LAC region based on historical data collected for the *Agricultural Outlook*. The *Outlook* assesses the current per capita calorie availability[1] in the LAC region at around 3 000 calories, up by about 11% compared to 1998 levels (Figure 2.6.d). Even allowing for food waste at the processing, retail and household levels, such a per capita calorie availability level implies higher average consumption than would be consistent with the 2 000 calorie reference diet for the average individual (WHO, 2019[26]).

WHO recommends that the shares of free sugars and of fats do not exceed, respectively, 10% and 30% of total calories consumed. It appears that food habits in the LAC region are not in accordance with these recommendations. In the LAC region, the share of free sugar availability is well above the recommended WHO threshold although it has decreased from around 16% of total available calories in 1998 to 13% in 2018 (Figure 2.5.a). Brazil witnessed the strongest reduction in free sugar availability, with the share decreasing from 17% of total calories in 1998 to around 12% in 2018. However, this downward trend did not occur in all LAC countries. Other countries experienced a slight increase, for example in Argentina the availability increased from 13.5% to 14% in 20 years, while in other countries such as Mexico the share of free sugar availability in diets did not change.

There is rising trend across the LAC region in the percentage of fat based available calories, rising from about 26% to 29.5% over the last two decades and almost reaching the 30% maximum threshold recommended by WHO. Some countries in the region such as Argentina, Brazil and Chile are already above this threshold.

With regard to proteins, two decades ago the protein-based share of available calories in the LAC region was similar to the world average at almost 11%. However, about 45% of those protein calories were animal-based compared to only one third at the world level. A shift away from a traditional diet rich in cereals, roots, tubers and pulses towards more animal-based proteins has occurred in the region (Figure 2.5.c).

Figure 2.5. Focus on the shares of fats, free sugar and proteins in the nutritional composition of diets in the Latin America and the Caribbean region



Note: Free sugar is the aggregate for sugar and high-fructose corn syrup. Animal protein are proteins from meat, fish, dairy and eggs; LAC is Latin American and the Caribbean.
Source: OECD/FAO (2019), "*OECD-FAO Agricultural Outlook*", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Given the alarming trends in the development of the prevalence of people being overweight and obese and the specificities of the diets in the LAC region, several countries in the region have introduced over the last five years policies to change consumers' behaviour in terms of food choices. Table 2.2 provides an overview of the policies that are currently in place in four major countries in the region: Brazil, Argentina, Mexico and Chile. The classification of the policies in the table reflects the policy approach to encourage healthier food choices proposed in *Towards Policies Encouraging Healthier Food*, published in the

OECD Food, Agriculture and Fisheries Paper series. Information was gathered concerning public interventions oriented towards the demand side, such as the provision of information to consumers, or at the supply-demand interface to modify the behaviour of food chain stakeholders.

Chile is particularly engaged with respect to nutrition policies. The Chilean government has implemented a policy package that covers advertisement control on processed foods and beverages marketed to children and the introduction of a mandatory warning front-of-pack labelling system that signals food products that are high in sugar, fats or sodium. Mexico was, in 2014, one of the first countries to develop a health-related tax on food. Brazil has developed the most comprehensive school meal law in order to reduce ultra-processed foods (Popkin and Reardon, 2018[24]). Ecuador was the first country in the region to have a mandatory traffic light labelling on food products (Pérez-Escamilla et al., 2017[25]). The private sector is also involved with voluntary commitments by food processors towards food reformulation.

This effectiveness of the public-private commitment to change the food environment and halt the obesity epidemic in the LAC region will need to be assessed in the future.

Table 2.2. Nutrition policies in Latin America

Country	Undernutrition	Over nutrition							Physical Activities
		Demand side public interventions		Interventions at the supply-demand interface					
		Provision of public information		Voluntary public-private collaboration	Firmer regulations				
		Dietary guidelines	Education programmes	Product reformulation	Warning labels	Rules on advertise-ments	Rules on unhealthy product compositions	Fiscal measures	
Argentina	●	●	●	●	●*	●*	●		●
Brazil	●	●	●	●	●*	●	●		●
Chile	●	●	●	●	●	●	●	●	●
Mexico	●	●	●	●	●	●		●	●

Note: * Policies in development or being updated.
Source: OECD based on a review on policies (Annex 2.A).

1. Per capita calorie availability refers to the calories associated with the total food use of agricultural products as evaluated in the *Outlook* (with the addition of fruits and vegetables consumption reported in FAOStat) divided by the population. Food use includes waste that might occur at different levels of the food chain and is different from food intake.

2.3. Medium-term outlook

The foregoing projections for agricultural markets in Latin America and the Caribbean reflect the structural determinants described previously. These projections could be affected by further actions to raise productivity, manage environmental resources sustainably and to make agricultural growth more inclusive. Strategic responses to these challenges and policy options are discussed, at the sectoral level, in Section 2.4.

Demand

The demand for Latin American agricultural and food products will be mainly determined by population and income growth in the region and in its major markets. With 656.6 million inhabitants, LAC accounts for 8.5% of the world's total population. South America is the most populous sub-region, with 65.6% of the total LAC population; Central America and Mexico account for 27.6% and the Caribbean for the remaining 6.7%. Population growth in the region has been declining over the past two decades, as the fertility rate in the region dropped from 3.06 births per woman in 1995 to 2.12 in recent years, and due to the net out-migration of the region. In 2005, for instance, emigration to developed countries peaked at 1.1 million people, and has stabilised at around 350 000 migrants per year in recent years. Annual average population growth in the region is expected to decline from 1.3% in the past two decades to 0.8% over the next decade. Population growth in the largest economy and most populous country of the region, Brazil (with a population of 212 million in 2019) is expected to halve in the next decade, to 0.6% per year, compared with other 1.1% over the past two decades. Mexico (with second largest population at 132 million) will also see a decline in population growth, going from 1.4% in 1995-2018 to 1.0% per year in 2019-2028.

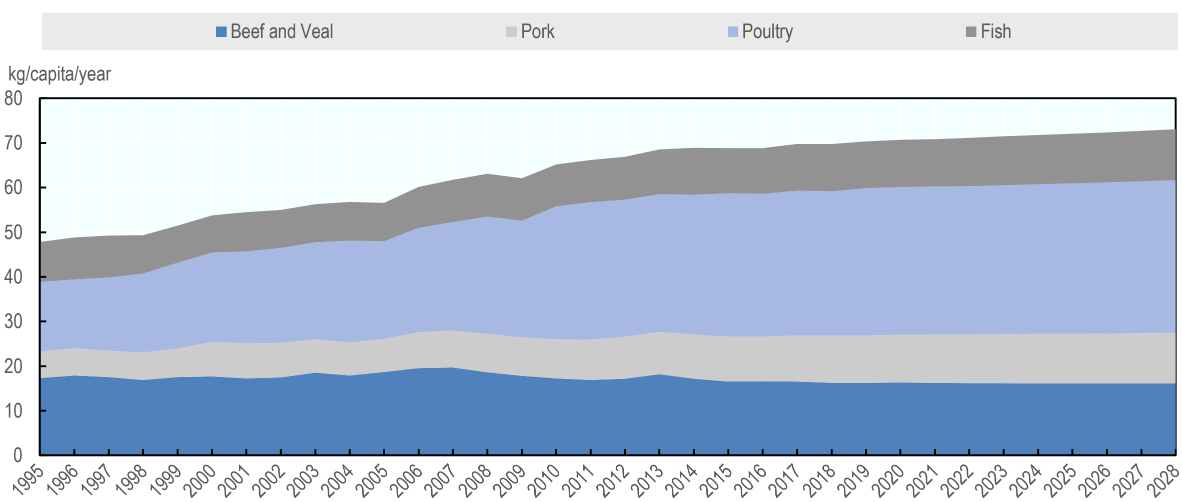
Real per capita GDP in the LAC region is expected to grow by an average of 1.9% per year in the next decade, 0.3 percentage points higher than in OECD economies. This will bring about changes in the composition of demand for LAC agricultural and food products. Increased demand for animal-based proteins, for example, could be expected. In addition, domestically, increased consumption of fruits, vegetables, meats, dairy, and fish could be expected relative to staples such as maize (whose per capita food consumption is expected to decline by 4.3% in the coming decade), wheat, rice and beans. Annual consumption of dairy products in the LAC region is projected to grow by 1.2% in the case of butter, 1.4% for fresh dairy products, 1.8% for whole milk powder, and 2.0% for cheese. Per capita beef, veal and pig meat consumption in LAC is expected to grow around 10% in the coming decade, fish by around 12%, and poultry by almost 15%. Thus, by 2028, poultry consumption, at 34.2 kg per capita per year, will account for 42.1% of total meat consumption. This is 14.8 percentage points higher than in the mid-90s, as LAC consumers, who are quite flexible regarding substitution between different types of meat, are expected to respond to favourable prices of poultry relative to other meats.

Biofuels (mainly ethanol and biodiesel) have been a significant contributor to increased demand for agricultural commodities in the past two decades, both in the region and worldwide. Ethanol production in Brazil, the second largest producer and exporter in the world after the United States, has been particularly dynamic, growing at an annual average rate of 5.3%. However, in the next decade, biofuels are expected to play a relatively smaller role in the demand growth for agricultural commodities.

Average annual growth in biodiesel and ethanol consumption in LAC is expected to drop from 10.8% and 7.2% in the previous decade to 1.6% and 1.3% in the coming decade, respectively. Developments in international biofuel policy will largely determine future biofuel performance. On the one hand, blending mandates, such those recently enacted in Argentina, Brazil, Colombia and Mexico, and programmes such as Brazil's RENOVABIO initiative, will stimulate the market for biofuels. On the other hand, the policy debate that has started in Europe on "food-based" biofuels as a sustainable energy source, which has countries such as Norway considering the removal of the 20% ethanol blend achieved in 2017, could negatively impact biofuels market development (Renewable Energy Policy Network for the 21st century (REN21), 2018[27]). This policy debate could reach Latin American countries at some point, especially those that are net cereal and oilseed importers.

While demand growth for Latin American agricultural and food products is expected to slow, countries with more diversified trade partners or who can better respond to export opportunities in countries where food demand will continue to be dynamic (Sub-Saharan Africa, India, the People's Republic of China – hereafter "China") will be less affected. Furthermore, possible appreciation of China's yuan and India's rupee could boost the demand for Latin American agricultural exports. The baseline Aglink-Cosimo model macroeconomic projections assume an 11.2% depreciation of the yuan and a 22.7% depreciation of the rupee by 2028.

Figure 2.6. Per capital meat consumption in Latin America and the Caribbean



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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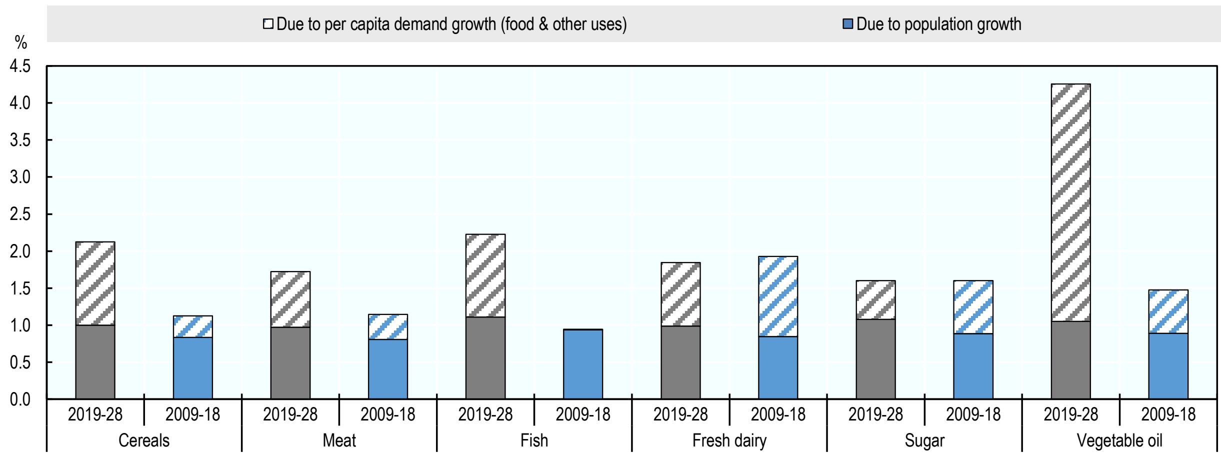
Figure 2.7. Annual growth in demand for key commodity groups in Latin America and the Caribbean



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.

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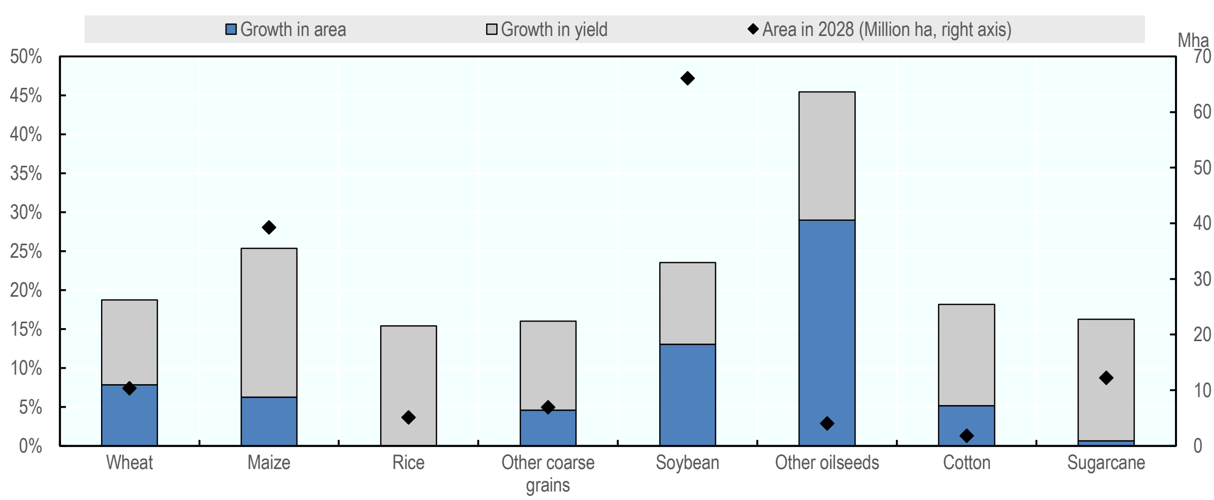
Production

Figure 2.8. Sources of growth in crop production in Latin America and the Caribbean



Note: Figure shows the decomposition of total production growth (2016-18 to 2028) into growth of LAC area harvested and growth in LAC average yields.
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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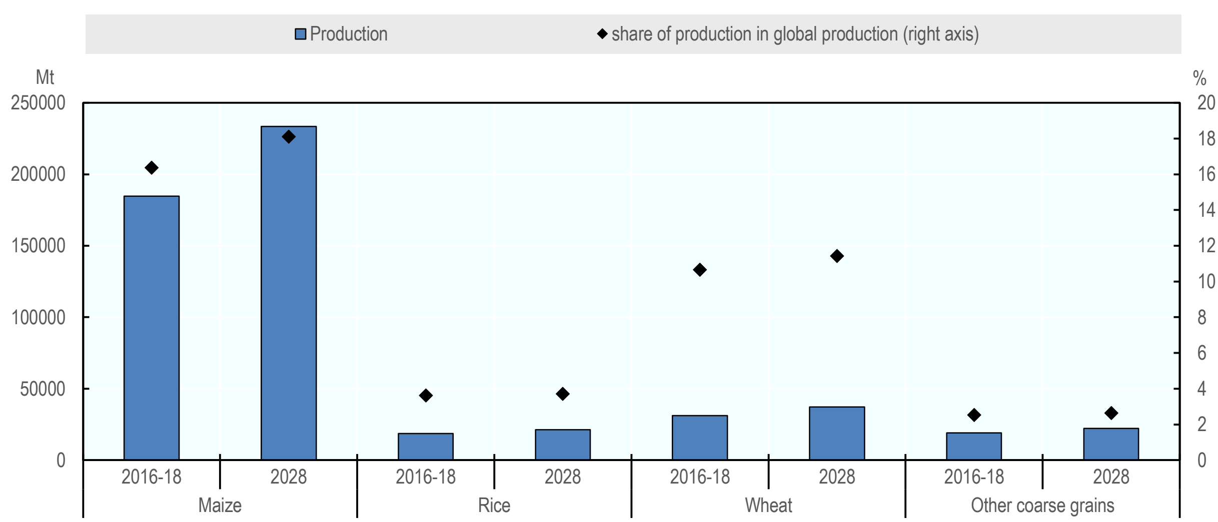
Cereals

Argentina and Brazil are the major cereal producers in the region. In 2016-18, these two countries accounted for around half of total LAC coarse grain and rice production, 75.1% of total maize production, and 77.8% of wheat production. Maize is the key staple in Mexican diets, but over the past two decades, Mexico's share of total LAC maize production dropped almost 10 percentage points to a current 15.2%. A similar situation was observed regarding Mexico's coarse grain (mainly sorghum) production, where the share in total LAC production fell by 11.7 percentage points from 42.9% to 31.2%. Though highly concentrated, wheat production shares have remained fairly constant over the past two decades.

Cereal production growth is expected to slow in the coming decade, with expected annual growth rates around half those observed in the past two decades for the major cereal producing countries. By 2028, the LAC region is expected to produce 233.5 Mt of maize (18% of world total), 22.1 Mt of coarse grains (3% of world total), 21.4 Mt of rice (4% of world total) and 37.3 Mt of wheat (11% of world total).

Figure 2.9. Cereal production in Latin America and the Caribbean



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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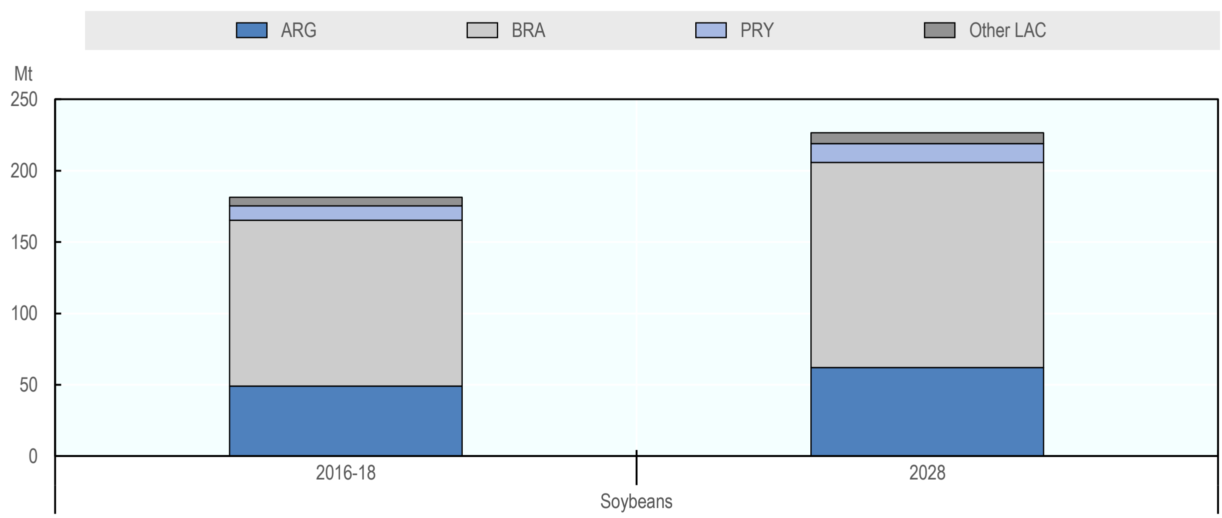
Oilseeds and vegetable oil

Soybean production has been particularly dynamic in South America, especially in Argentina, Brazil and Paraguay where yield improvement on the basis of technological innovation has been accompanied by land expansion. These countries brought into soybean cultivation an additional 12.7, 22.0 and 2.6 Mha, respectively, from 1995-97 to 2015-2017. From 1995-97 to 2016-18, soybean production increased by 300% in Argentina, Brazil, and Paraguay, combined. Most of this rapid expansion was due to additional harvested area which grew by 5.1% p.a. compared to a 1.3% p.a. grows in yields. These three countries currently account for 96.6% of total soybean production in the region.

Soybean production will continue to grow over the next decade, and further land use expansion for soybeans is projected at the expense of pasture, although a third of the increase in harvested area will come from double cropping. But the annual production growth rate for the region as a whole is expected to decline from 6.9% in the previous two decades to 2.8% for the coming decade. In the past two decades, growth in vegetable oil output has been relatively modest (137%) in the region as a whole but dynamic in Central America and the Caribbean (370%) due to rapidly expanding palm oil area. Vegetable oil output is slightly less concentrated in the LAC region: Argentina and Brazil account for shares of 34% each (most of it soybeans), Mexico and Colombia account for 7.2% and 7.0% respectively, while Central America and the Caribbean account for 7.5%. Vegetable oil production is expected to increase 26.8% by 2028.

Figure 2.10. Distribution of soybean production in Latin America and the Caribbean



Note: ARG is Argentina, BRA is Brazil, PRY is Paraguay, LAC is Latin American and the Caribbean.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Pulses

Pulses, mainly beans, are an important part of the diet in several LAC countries. Pulse production in the LAC region has grown modestly overall (30%) over the past two decades, but been relatively more dynamic in Central America and the Caribbean (162.6% growth from 1995-97 to 2016-18), underpinned by government programmes that were implemented in response to the 2007-8 world food crisis. Central American and Caribbean countries thus increased their share in LAC's total pulse production by 10 percentage points, going from 9.2% to 18.6%, over the past two decades. Brazil and Mexico account for 41.2% and 24.8%, respectively, of total pulse production. Over the next decade, production trends similar to those observed in the past are expected, with an estimated production average growth rate of 1.3% p.a. for the LAC region as a whole.

Cotton

Cotton production doubled in the region over the past two decades. Brazil leads cotton production in LAC, with 78.4% of total production in 2016-18, followed by Mexico, which managed to increase its share from 5.8% in 2000-02 to 11% in 2016-18, and Argentina, with a total production share of 8.8%. Brazil is the world´s fifth largest cotton producer with around 6% of global production; its cotton exports represent around 10% of the global total. In the coming decade, LAC cotton production is projected to grow 0.9% per year, underpinned by growing demand for the fibre and the recent favourable relative prices of cotton with respect to competing crops such as wheat, soybeans, rice, maize and sugarcane. This growth, however, will be 3.5 percentage points lower than that in the previous two decades. Brazil's export share in total world exports is projected to reach 14.7% by 2028.

Sugar

As in other developing countries, per capita sugar consumption will continue to grow in LAC countries. Because of socio-economic changes, increased demand for processed food will stimulate sugar production and thus contribute to the expected 2.6% average annual growth over the coming decade. Brazil will continue to be LAC's main sugar producer, with an expected 62.4% share in total production by 2028, followed by Central American and Caribbean countries (13.6% of total), and Mexico (9.5% of total). But, after 15 consecutive years as the world's main sugar producer, Brazil will be overtaken by India in 2019. As Brazil diverts more sugarcane toward ethanol production, Brazil's share in world exports is expected to fall from 38.7% in 2016-2018 to 37.6% in 2028.

Roots and tubers

Root and tuber production in the LAC region grew relatively slowly (13.8% over the past two decades), compared to other agricultural products. Brazil is the main root and tuber producer in the region, but the area harvested to those products declined by 15.6% over the past two decades as Brazil's share of the region's root and tuber production declined from 56.9% to 46.0%. In contrast, Central American and Caribbean countries and Peru increased their production share by 5 percentage points, accounting for 10.3% and 11.4% of total, respectively, in 2016-18. Root and tuber production is expected to grow at an average of 1.4% per year over the coming decade.

Coffee

Brazil is the world's leading coffee producer and exporter, while Colombia, Honduras, Peru and Mexico are also among the top ten coffee producers. Five LA countries are top-ten coffee exporters. Whereas coffee harvested area has remained relatively unchanged in Brazil over the past two decades, in Colombia and Mexico it has declined by 6.0% and 9.8%, respectively. In contrast, Honduras and Peru have more than doubled coffee harvested area. These production changes in the region have repositioned countries in export markets. Brazil increased its export market share from 23% to 29% over the past two decades while Colombia lost 8 percentage points, going from 17% to 9%. Mexico accounted for 5% of world coffee exports two decades ago, but now has lost its net exporter status. Guatemala remains among the major top coffee exporters with 3% market share (2 percentage points less than two decades ago); Costa Rica is no longer a major exporter, while Honduras and Peru have export market shares of 4% and 3%, respectively. Latin American countries will continue to play an important role in world coffee markets, despite the rising presence of Asian suppliers. The region's favourable production potential is underpinned by growing consumption in emerging markets such as China, the Russian Federation and Korea, and in current exporting countries such as India, Indonesia and Viet Nam. However, in order to maintain market share, LA coffee producers will have to deal with changing climate conditions which will make some regions unsuitable for coffee production and facilitate the spread of pest and diseases, such as the Coffee Leaf Rust (Sänger, 2018[28]).

Fruits and vegetables

Underpinned by Free Trade Agreements, LAC production and exports of fruits and vegetables have grown considerably with most bound for the United States and Canada. Mexico has traditionally been the main fruit and vegetable supplier to its northern neighbour, but Central American countries and Chile, taking advantage of their FTAs with the United States, have also played an increasingly important role in the US winter fruit and vegetable import market. In 2017, Mexico, Peru, Guatemala and Costa Rica accounted for 75.4% of US total fresh vegetable imports. In the case of fresh fruits, nine LA countries accounted for 92.3% of total US imports, with Mexico, Chile, Guatemala and Costa Rica the main suppliers. Over the past two decades, harvested area of fruits and vegetables in Mexico increased 26.2%, reaching 1.9 Mha in 2015-17; this compares with increases of 42.2% in Chile and 45.8% in Central America. The region's traditional fruit and vegetable production and exports (Mexican tomatoes and avocados, Chilean grapes and peaches, Central American bananas and pineapples, for example) have risen considerably and have expanded to include, for example, Chilean cherries and cranberries; Central American chillies and peppers, and eggplant; and Mexican blueberries and raspberries. Thanks to favourable climate conditions, and reflecting the labour-intensive nature of production, LAC countries may continue to enjoy a comparative advantage in fruit and vegetable production in the future which could be further strengthened by improving storage technology, infrastructure and production practices.

Box 2.3. Bananas and tropical fruits in Latin America and the Caribbean

Bananas and tropical fruits[1] constitute increasingly important commodities to both food security and rural sector growth of Latin America and the Caribbean (LAC). Predominantly cultivated within the tropical zones, these fruits first and foremost provide ready sources of vital calories and nutrients to the growing consumption needs of the region. Beyond domestic markets, international trade in bananas and tropical fruits has been gaining in importance as a source of export earnings for many producing countries in LAC. Rapidly growing demand in burgeoning import markets has bolstered high export prices for the majority of tropical fruits, making this group an attractive choice in export diversification away from lower-valued agricultural products.

Abundantly endowed with tropical land that features highly favourable agro-climatic conditions for the cultivation of tropical products, LAC ranks as the second leading production zone of bananas and tropical fruits globally, behind Asia. Between 2016 and 2018, LAC accounted for approximately 25% of total global production on average, which translates into roughly 54 Mt. In terms of individual fruits, bananas constitute the most important type for the region, displaying an annual production volume of approximately

30 Mt. At a per capita consumption of 55 kg of bananas and tropical fruits per annum, LAC also ranks as one of the major consumers of these fruits globally.

The importance of LAC to world fruit supply is further evident in the magnitude of the region's trade volumes of unprocessed, fresh or dried bananas and tropical fruits. Aided by the region's proximity to the United States of America, one of the largest importers of fruits globally, LAC has firmly established itself as the world's primary supplier of both bananas and tropical fruits in recent decades, accounting for approximately 80% of global shipments of bananas, pineapples, papayas and avocados, and for approximately 50% of global mango exports on average.

On account of briskly expanding global demand, the pace of growth in exports of bananas and tropical fruits from the region shows to have accelerated ahead of production over the past decade. Building on a large and longstanding indigenous sector – with many tropical fruits being native to the region – national and multinational enterprises have invested heavily to capitalize on rising export prospects. While the commercialisation of banana and pineapple is well established, opportunities for substantial expansion have recently arisen for the other tropical fruits, which have been subject to rapidly growing consumer interest.

Total shipments of all five fruit commodities combined are estimated to have reached approximately 20 Mt on average over the three year period from 2016 to 2018. Assessing net trade of bananas and tropical fruits by region, LAC firmly ranks as the principal supplier to developed markets. Approximately 86% of EU pineapple imports are sourced from Costa Rica, and some 70% of EU banana imports from Ecuador, Colombia and Costa Rica combined. Virtually all banana and avocado imports to the United States originate in LAC, with Guatemala and Mexico the key suppliers respectively.

Although tropical fruits play a comparatively small role in overall agricultural trade in volume terms, their high average export unit value of well above USD 1 000 per tonne places them as the most valuable fruit group in absolute terms, behind bananas. Estimates point to a total export value of around USD 15.5 billion for bananas and tropical fruits from LAC combined in 2016-18, of which bananas and avocados accounted for some USD 6 billion and USD 3.5 billion, respectively.[2] In some of the key producing countries, export earnings from bananas and tropical fruits weigh significantly in agricultural GDP. For example, Costa Rica's exports of tropical fruits account for approximately one-third of its entire agricultural export earnings.

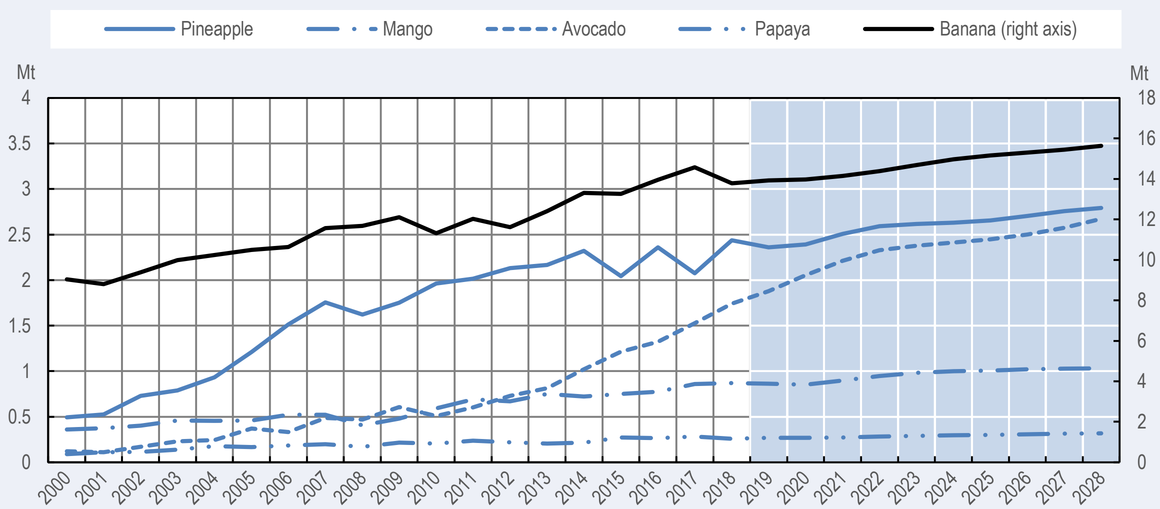
Beyond contributing to export earnings, trade in tropical fruits generates substantial income to smallholder producers in the region, contingent on fair and inclusive trade conditions. An estimated 80% of avocado cultivation in Mexico is carried out by smallholder farmers who are endowed with land of 5 ha or less. In many producing zones of the LAC region, tropical fruits furthermore continue to be cultivated mainly at the subsistence rather than commercial level, thereby contributing vitally to food security.

Outlook[3]

Underpinned by global population growth, improvements in per capita incomes in many consuming regions and associated shifts in diets, banana and tropical fruit production in Latin America and the Caribbean is projected to grow by 1.4% p.a. in the next decade. Total combined production is expected to rise by 9 Mt to reach 63 Mt by 2028, with bananas accounting for 50% of total supply. Encouraged by growing demand, incentives for higher production of tropical fruits are anticipated to be driven by strong profit margins and trend growth in crop yields as the sectors become more commercialized. Within the region, the largest suppliers of bananas and tropical fruits are Brazil, Colombia, Costa Rica, Ecuador, Guatemala and Mexico.

Preference changes towards higher consumption of tropical fruits in developed regions, particularly in the case of avocado, should meanwhile stimulate a further expansion in trade. Overall, banana and tropical fruit exports from LAC are projected to grow at 1.7% p.a. between 2019 and 2028, to reach 23 Mt by 2028. By and large, LAC will continue to be the main source of global supplies in bananas and tropical fruits, with its share in global trade projected to remain close to 80% by 2028. However, with regard to overall import volumes, the share by developed countries is projected to decline slightly over the medium term as imports by China are expected to rise more quickly, on the back of per capita income growth and related changing consumer tastes towards more premium tropical fruits, in particular avocados.

Figure 2.11. Latin America and the Caribbean net exports of bananas and tropical fruit



Source: FAO (2019).

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Expansion in banana and tropical fruit production will be largely demand driven. With the exception of bananas, where demand shows to be moving toward saturation in many countries, per capita demand is growing most in countries where it has started from a low base. Besides population growth, the principal determinant of fruit demand growth will be shifting consumer preferences on account of higher per capita incomes, both in the region and in key import markets. A higher awareness of the nutritional benefits of tropical fruits, particularly in the case of avocados and mangoes, which are oftentimes labelled as nutritional super fruits, will be central to this. In higher income countries, a growing preference for tropical fruits will be supported not only by a more widespread availability of these fruits but also by changing perceptions of the health implications of consuming refined sugar, with fruits, including tropical fruits, increasingly seen and promoted as a healthier alternative.

The projections affirm the view that bananas and tropical fruits will be among the fastest growing sectors in agriculture, and as such deserve attention from policymakers looking for sources of economic growth, nutrition and poverty alleviation in rural sectors. This will be particularly true for countries in LAC, which are supplying a large part of the global excess demand for these commodities. However, the threat of climate change and associated erratic and extreme weather events looms heavily over the sector, given that many production zones in the LAC region, particularly those located in the Caribbean, have acute vulnerability to the phenomenon. Detrimental environmental repercussions arising from issues such as land clearing, deforestation and irrigation as well as perils from pests and diseases, *inter alia*, add further stress to production and trade, threatening not only food security in the region but also the commercial viability of the sector. Trade tensions, phytosanitary restrictions, volatile freight costs and mounting price pressure in import markets additionally complicate a sustainable development of the sector in Latin America and the Caribbean.

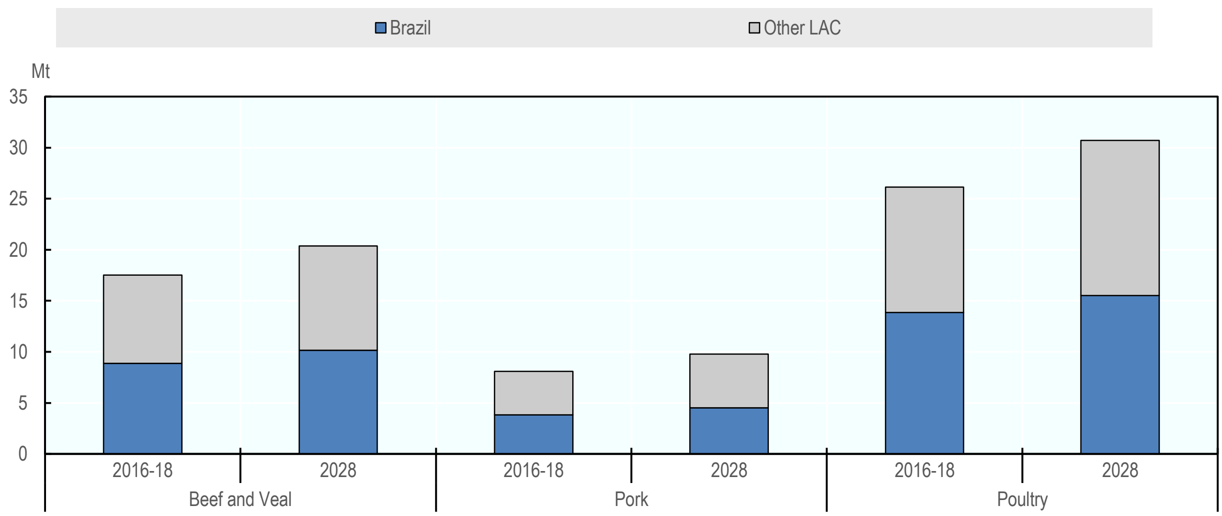
1. Tropical fruits included in this analysis are pineapples, mangoes, avocados and papayas.
2. As indicated by reported export values from the region.
3. The projections are dependent on critically important assumptions concerning the growth of key driving factors such as incomes, population, and input costs, as well as the specific conditions surrounding tropical fruit production in the rural sector; these include opportunity costs for land, which are affected in turn by the prices of other agricultural commodities, rural activities and ownership structures. The agricultural conditions that are also likely to affect the sector were drawn from the *OECD-FAO Agricultural Outlook 2019-28.*

Livestock

Livestock production has also grown substantially in LAC: during the past two decades, beef production increased by 33%, pork by 111% and poultry by 302%. This growth has been driven by an expansion of the aviculture, swine and cattle ranching sectors and by technological innovation in all livestock sectors.

Average annual growth in beef and veal production will slow slightly in the coming decade to 1.2% compared to 1.4% in the previous two decades. This slowdown is less severe than that of domestic demand, as a rising share of LAC production will be destined for export. As in other regions, per capita demand growth is expected to slow as income rise. Brazil will continue to be the main beef producer in the region; with a projected two additional Mt, the country will account for 56.9% of total LAC beef production by 2028. Pork and poultry production will continue to be more dynamic than beef, growing at 2.2% per year in the coming decade. Brazil's share in total pork and poultry production is expected to remain at around 50% in the coming decade.

Figure 2.12. Livestock production in Latin America and the Caribbean



Note: LAC is Latin American and the Caribbean.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Dairy

Fresh dairy production is expected to pick up in the next decade, growing at 1.4% per year, 0.6 percentage points higher than in the previous two decades as a result of strong domestic demand. Fresh dairy production growth will mainly originate in Southern Cone countries and in Brazil, but remain flat in the rest of the region. Butter output will also remain flat in the coming decade while cheese production will grow at 1.2% per year. Whole milk powder production in MERCOSUR countries is expected to display the same drive it has shown in the past by growing at around 3% per year over the coming decade. The region as a whole, however, will continue to be a net importer of dairy products, except for whole milk powder.

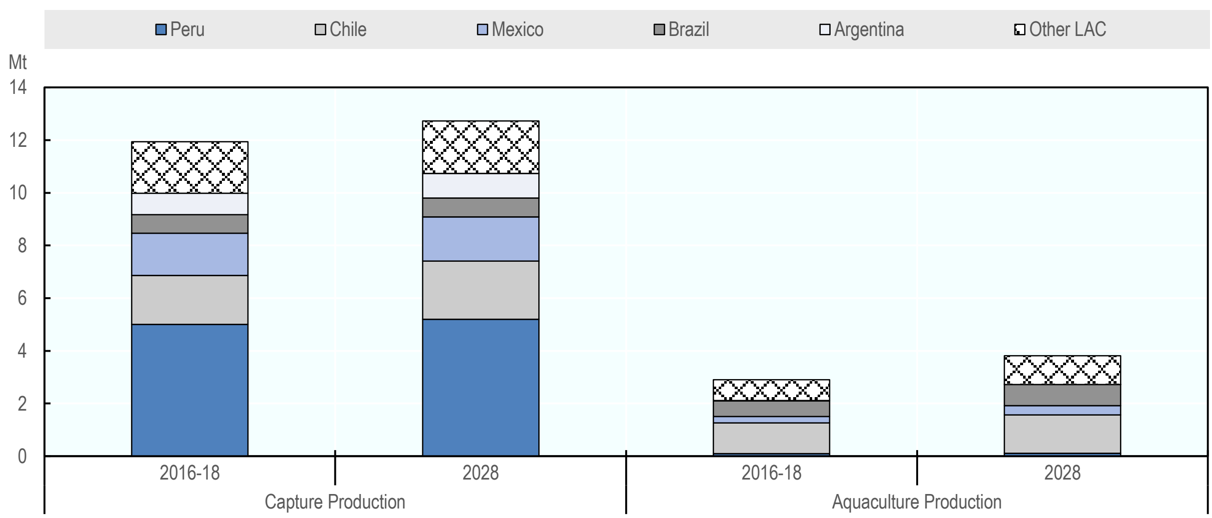
Fisheries and aquaculture

Fisheries and aquaculture play an important role in the region as they provide an important source of proteins, livelihood for millions of households, and of earning from exports. Peru, Chile, Mexico, Brazil, and Argentina are the main fish producers in the region. While world marine catch has remained fairly constant over the past decade, that of Latin American and the Caribbean declined substantially, although there was some recovery in 2017 and 2018 ((FAO), 2019[29]). This decreasing trend is particularly evident in Peru and Chile, the major fish producers in Latin America, and is due primarily to the implementation of stricter management plans, as well as reflecting climate variability (including *El Niño*). In some cases, increasing overexploitation is also a cause (Food and Agriculture Organization of the UN (FAO) Barange.M et al. (Eds.), 2018B[30]). *El Niño* has been responsible for the fall in anchoveta catches by Peru and Chile; in the case of Peru, anchoveta account for more than 75% of total marine catch. Aquaculture, in contrast to marine catch production, has been growing steadily over the past decade both worldwide and in the region. However, Latin America and the Caribbean account for only 3.4% of world aquaculture production

(Chile alone accounts for 38.3% of aquaculture production in the region) (Food and Agriculture Organization of the UN (FAO), 2018[31]).

Fish production is projected to grow by 12% over the coming decade in LAC. Paraguay, Chile, and Brazil will witness the highest fish production growth (30%, 21% and 17%, respectively). Peru is projected to experience the lowest growth rate, at +4.0%, over the next decade. Aquaculture, which today accounts for less than 20% of total fish production in the region (compared to 46.8% globally), will become increasingly important in total fish production due to its high potential for expansion as compared to marine capture. Overall, the region will continue to be a net exporters of fishery and aquaculture products, with Peru and Chile among the major world exporters of fishmeal and fish oil and Chile of salmon.

Figure 2.13. Capture and aquaculture production in Latin America and the Caribbean



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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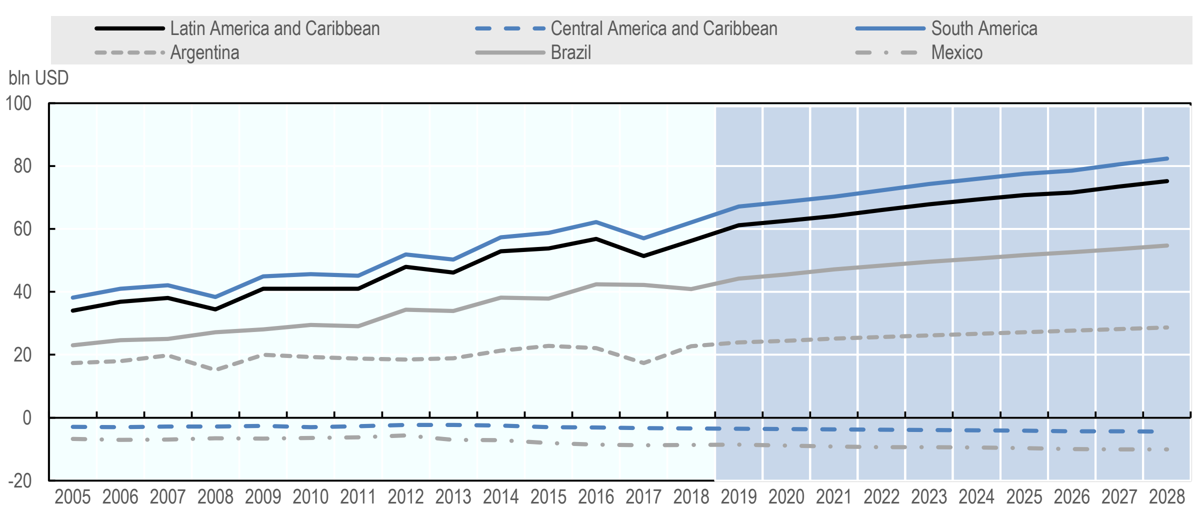
Trade

Despite the slowdown of growth in global agricultural trade volumes over the past two decades, the Latin America and Caribbean region has steadily increased agricultural exports, outperforming other regions of the world. LAC's agricultural trade surplus has increased from USD 12 billion in 1996-98 to USD 54 billion in 2016-18; this compares with the agricultural trade deficits recorded by Sub-Saharan Africa (USD 17.3 billion in 2016-18) and South East Asia (USD 71.6 billion in 2016-18). Brazil and Argentina have kept leading roles as world exporters of soybeans, maize, vegetable oils, sugar, poultry and beef. The share of exports in domestic production is particularly high for oilseeds (46%), wheat (48%) and sugar (56%) (Figure 2.14). Brazil has positioned itself as the world's third largest exporter of agricultural products, with exports reaching USD 79.3 billion in 2017. Argentina ranked tenth, with an agricultural export value of USD 35 billion. Although with much lower export values compared to Argentina or Brazil, Chile's agricultural exports have grown three-fold in the past two decades, with products such as berries, apples, peaches, plums, poultry and salmon increasingly reaching diverse world markets. Central American and Mexican fruit (including avocado), vegetable, and coffee exports have also shown high dynamism. In 2016 Mexico, after almost four decades of continuous agri-food trade deficits (except during the Mexican crisis of 1985-87), became a net exporter of agri-food products and the main supplier of agri-food products to the United States outplacing Canada and the European Union. Over the next decade, LAC sugar exports are expected to grow by 6.9%, wheat and rice exports will increase by 23.1% and 24.0%, respectively, and vegetable oil exports will grow by 40.5%.

The LAC region has also emerged as a major world supplier of animal products. Livestock production and meat exports have grown quite rapidly: LAC beef exports increased from 1.2 Mt to 3.2 Mt from 1995-97 to 2016-18, poultry exports increased 639% over the same period, reaching 4.7 Mt in 2016-18, and pigmeat exports, which in the mid-1990s were modest, increased almost twelve-fold, reaching close to 1 Mt in 2016-18. Brazil dominates LAC meat exports, with a 45% share of total LAC exports of beef, 65% of pork, and 91.6% of poultry. Argentina, Chile and Mexico follow Brazil, albeit at a distance, as the main LAC meat exporters. In the next decade, meat export growth will slow from double-digit annual growth rates in the cases of pork and poultry to average annual growth rates of around 2% for beef and poultry and 2.5% for pork. Thus, by year-end 2028, LAC beef exports are expected to grow 57%, pork exports 33% and those of poultry 27%.

In recent years, LAC fruit and vegetable exports have shown great dynamism, reaching almost USD 30 billion in 2015-17. Central American fruit and vegetable exports trebled from 2002-04 to 2015-17; during the same period, Mexico's exports of such produce grew 244.5%, South American exports rose by 281.2%, and those of the Caribbean increased 15-fold.

Figure 2.14. Agricultural trade balances by Latin American and the Caribbean regions, in constant value



Note: Net trade (exports minus imports) of commodities covered in the Agricultural Outlook, measured at constant 2004-06 USD.
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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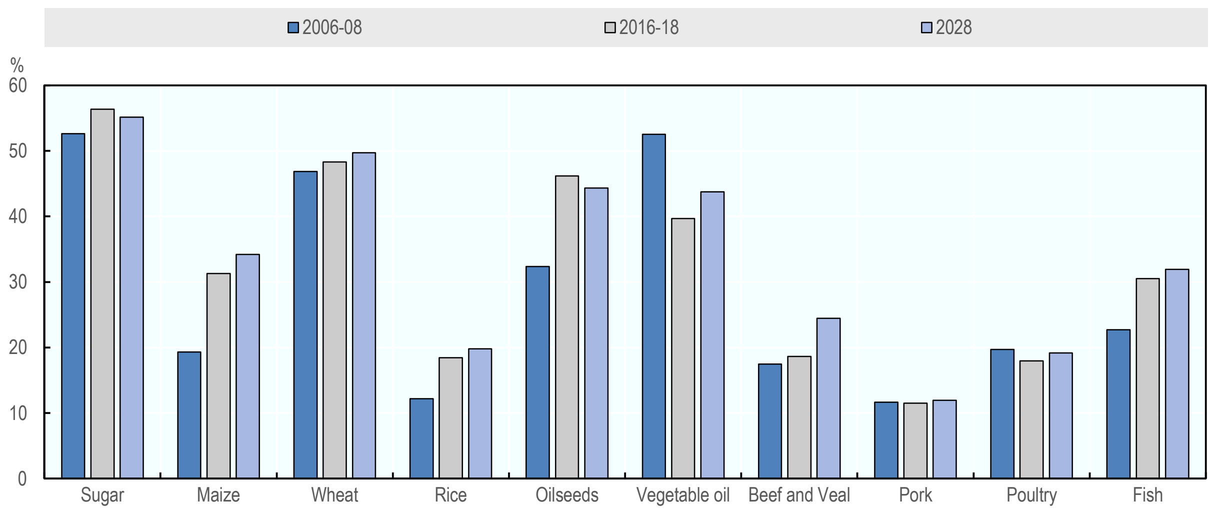
Figure 2.15. Share of exports in domestic production in Latin America and the Caribbean



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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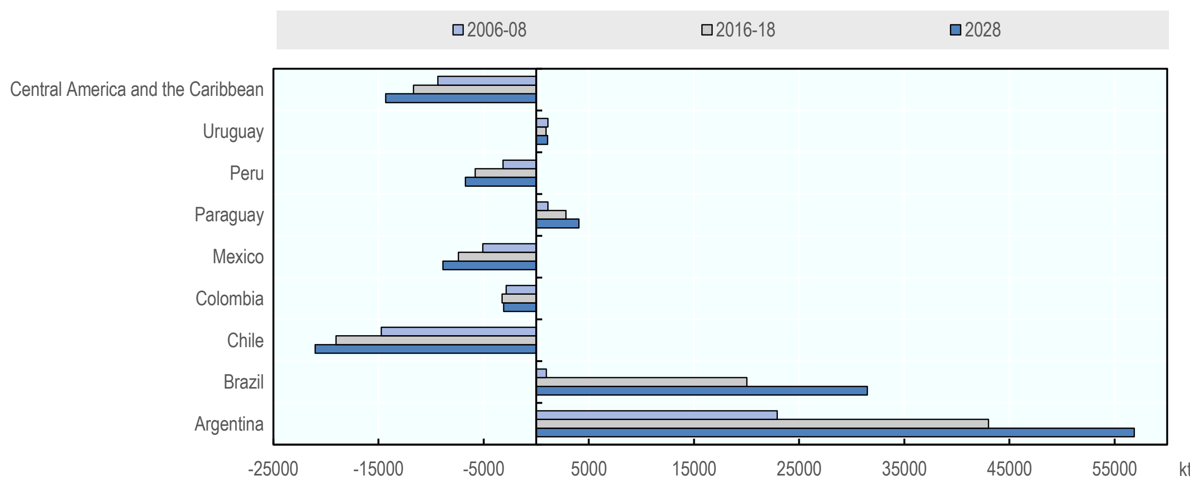
Some countries in the region play important roles as world importers of specific agricultural commodities, such as Mexico (soybeans, dairy, maize, pork and poultry) and Brazil (wheat). In fact, with the exception of MERCOSUR countries, all other LAC countries are net importers of cereals, often sourced from within LAC. Agricultural and food imports in these countries will continue to grow in the next decade. LAC wheat imports, for instance, are projected to increase by 3.5 Mt by 2028, and maize imports will increase by almost 7 Mt, reaching 40.3 Mt in 2028. Mexico is projected to account for 41% of total maize imports in the region, Colombia for 15% and Peru for 10%. In the case of wheat, Brazil will lead LAC's imports, with 6.6 Mt in 2028, accounting for 25.1% of total LAC wheat imports, followed by Mexico (20.2%) and Peru (9.8%).

Important trade flow changes have occurred over the past two decades in the LAC region. Asian countries, especially China, have become increasingly important destination markets for LAC agricultural exports. Andean agricultural and fishery exports to East Asia and the Pacific increased four-fold in the past two decades, while MERCOSUR's exports to that region increased eleven-fold. During 2015-17, East Asia and the Pacific became the main export destination of MERCOSUR´s agricultural and fishery exports with a 35.7% total export share, outplacing Europe and Central Asia. In fact, the relatively modest growth of LAC agricultural and fishery exports to Europe and Central Asia compared to that to other regions of the world made Europe and Central Asia lose share in the export destination from all LAC sub-regions.

North America (United States and Canada) has been a growing agricultural and fishery export market for all LAC sub-regions in absolute terms and, because of its proximity and preferential access, it has been particularly important for the Caribbean in relative terms, increasing its share of total Caribbean exports by 10 percentage points at the expense of Europe and Central Asia. Mexico's agricultural and fishery exports to North America increased 352.3% over the past two decades, but this region's share of Mexico's total exports has remained fairly stable at around 80%.

Intra-regional trade has also become more relevant. Andean countries increased agricultural and fishery trade among themselves by 2.7 percentage points over the past two decades; Caribbean countries did so by 3.5 percentage points, and Central American countries increased intra-regional trade by 11.6 percentage points. In fact, by 2015-17, 20.5% of total Central American agricultural and fishery exports was bound to countries in the same sub-region, and 9.8% of total exports was bound to other LAC countries (Figure 2.16).

Figure 2.16. Cereal trade balance in Latin America and the Caribbean



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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No trend has been observed so far in terms of the share of processed agricultural exports with respect to total agricultural exports. Latin America continues to specialise in the exporting of bulk products. Unlike Southeast Asian countries, which show strong agro-food global value chain linkages both within the region and with other regions, LA countries show low integration in global agro-food value chains due, in part, to the high prevalence of non-tariff measures. In fact, Latin America (together with North American countries) ranks last in terms of average total global value chain participation, with Asia in the lead, followed by Europe, Africa and the Middle East. Trade and investment policies, agricultural capabilities (e.g. education, agricultural R&D), and structural characteristics are found to be influencing factors on global value chain participation (Greenville, Kawasaki and Beaujeu, 2017[33]).

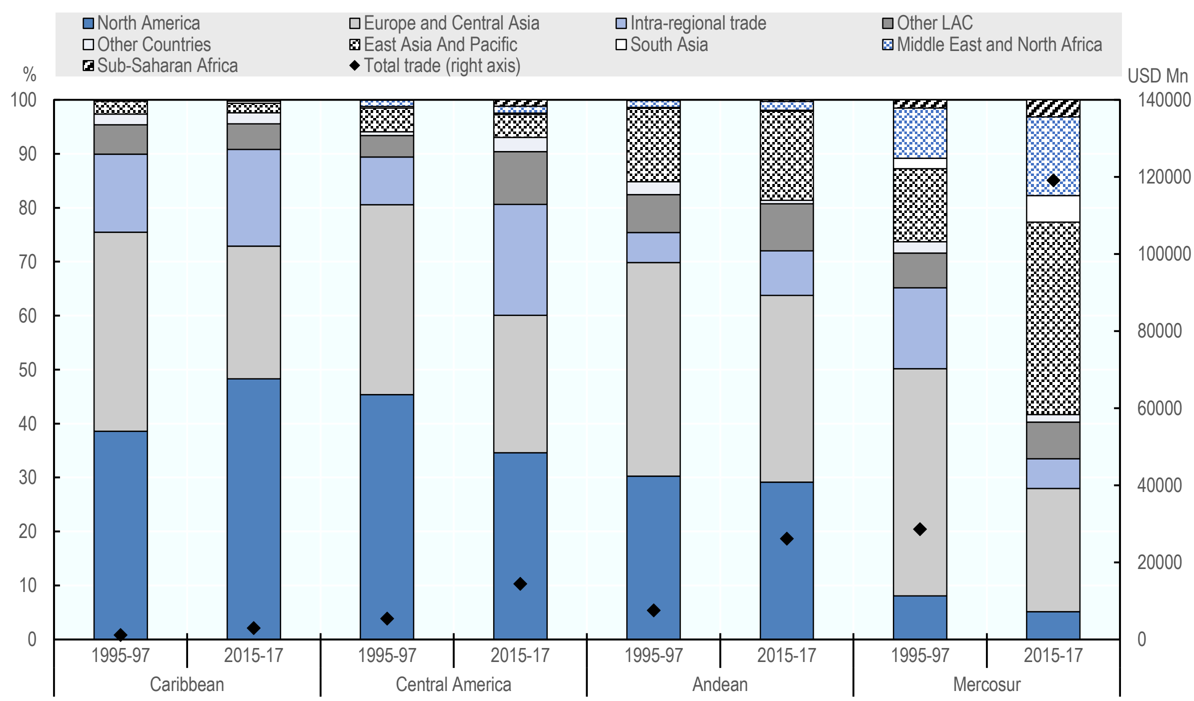
The dynamism in agricultural trade observed in the region is explained, in part, by the active participation of LAC countries in Free Trade Agreements (FTAs). In addition to the sub-regional economic integration efforts made by Caribbean, Andean, MERCOSUR, and Central American Countries, which have faced several challenges, LAC countries have established over 70 intra- and extra-regional FTAs. Chile and Mexico, for instance, hold FTAs with most of the countries in the region, the United States and Canada, the European Union, and several Asian countries, including (in the case of Chile) China and Japan.

Population growth elsewhere in the world will also drive the demand for LAC agricultural and food products, especially in China, whose populations is expected to reach 1 441 by

2028. Global food demand growth, including that for China, is projected to slow in the coming decade.

In the next decade, favourable export prospects are expected for LAC agricultural exports, but export growth will slow down, and the risk of protectionist policies could make the slowdown in agricultural trade more severe. Furthermore, the recently signed (March, 2018) Comprehensive and Progressive Agreement for Trans Pacific Partnership (CPTPP) could change the level and direction of agricultural trade flows for LAC countries. The CPTPP Agreement, which entered into force on 30 December 2018, opens up export opportunities to countries such as Japan, Viet Nam, Malaysia, Australia, and New Zealand. The only LAC countries participating in the CPTPP are Mexico, Peru and Chile. If the United States joins the Agreement, having withdrawn from the earlier TPP, that could reduce the Latin American market share in Asian countries in products such as soybeans, meat, sugar, dairy products and vegetables. A similar diversion could occur if the European Union and the United States were to lower their agricultural and food import tariffs under an eventual Transatlantic Trade and Investment Partnership. LAC countries will need to identify trade policies and strategies in order to take advantage of their agricultural comparative advantage under the dynamic FTA environment.

Figure 2.17. Destination of Latin America and the Caribbean agricultural and fishery exports by USD value



Note: Regions are according to World Bank definitions, i.e. North America is composed of the United Sates, Canada, and Bermuda. Intra-regional trade refers to trade within the region defined in the x-axis. "Other LAC" is the Latin American and the Caribbean region less the region defined in the x-axis. Product coverage: HS Chapters 1 to 24 including fish and fish products, HS headings: 33.01, 35.01-33.05, 41.01-41.03, 43.01, 50.01-50.03, 51.01-51.03, 52.01-52.03, 53.01, 53.01 HS code 2905.43, 2905.44, 3809.10, 3823.60.
Source: (UN Statistics Division (UNSD), 2019[32]).

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2.4. Strategic challenges and policy options

LAC governments have pursued a number of agricultural policy objectives according to their own visions and changing socioeconomic and political contexts. Objectives have included improved productivity and competitiveness, food security, environmental protection, access of smallholder farmers to markets and increased foreign exchange earnings. Governments have used an array of policy instruments to address their policy objectives. This section examines the policy mix across the LAC region, and the extent to which it supports sustainable productivity growth, as well as greater inclusiveness.

Policy responses

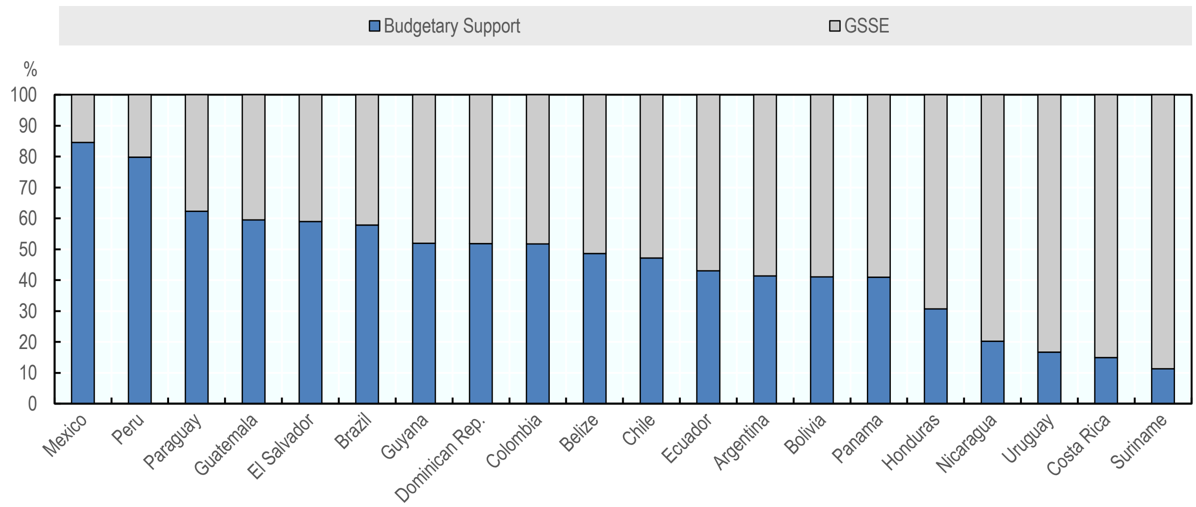
The extent to which farmers depend on government support varies widely across the region. For most countries, the %PSE (i.e. the Producer Support Estimate expressed as a percentage of gross farm receipts) is lower than the OECD average of 18%, exceptions being Panama, Peru, the Dominican Republic and El Salvador. Producer support is low (with a %PSE less than 5%) in several countries, including Guatemala, Uruguay, Paraguay, Chile and Brazil. Argentina stands out an exception in the region, with a negative %PSE, implying that the country's farmers are on balanced taxed by government policies. The low average rate of producer support reflects the competitiveness of agriculture in most countries, and associated net-export position.

Across the LAC region, these is a tendency to rely on market support and other potentially trade distorting instruments (such as input subsidies) as opposed to direct payments to farmers that are decoupled from production. Mexico is an exception, with a similar rate of support to the United States and more than half that support provided via less distorting direct payments to farmers. Direct payments also dominate in Paraguay, Chile and Brazil, although the overall rate of support to producers is low in these countries.

Reflecting the importance of price interventions in the policy mix, budgetary support to agriculture tends to be relatively low. Moreover, of total budgetary payments to the sector, between 40% and 60% is paid to producers (i.e. is included in the PSE), with the remainder comprising payments to the sector as a whole (the General Services Support Estimate, or GSSE). The latter category includes important/ areas of investment, including agricultural R&D, extension services, technical assistance, innovation systems and agricultural infrastructure. Spending in this latter category is just 15% in Mexico, but 85% in Costa Rica. In general, the LAC region would appear to be under-spending on public goods with the potential to accelerate agricultural development.

The allocation of investments to agriculture requires proper diagnostics and evaluation. Evaluation is probably the link in the policy cycle that suffers the most. Sometimes multi-million dollar programmes are inadequately evaluated or not evaluated at all. Thus, policy makers often do not know if their policies and programmes are achieving their expected results, or are unable to interpret the results they are observing. Making policy evaluation an institutional process becomes thus essential, especially when governments need to deal with tight budgets. Instilling an "evaluation culture" is a long-term process, but some countries such as Mexico and Chile have already made important progress in this regard with potential lessons for other countries in the region.

Figure 2.18. Budget support and GSSE relative to Total Budgetary Allocations to the sector, 2015-17 or latest year



Source: Argentina, Chile, Brazil, Costa Rica, Mexico, Canada, United States, Colombia, European Union: OECD (2018b), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en. Guatemala (2012-14), Uruguay (2011-13), Paraguay (2011-13), Ecuador (2014-16), Belize (2012-14), Nicaragua (2009-10), Suriname (2012-14), Honduras (2011-12), Bolivia (2007-09), Guyana (2009-11), Pananama (2013-15), Peru (2011-13), Dominican Rep (2015-17), El Salvador (2010-12): IDB DATABASE (2019), https://mydata.iadb.org/Agriculture-and-Rural-Development/IDB-Agrimonitor-PSE-Agricultural-Policy-Monitoring/2dqw-u35p.

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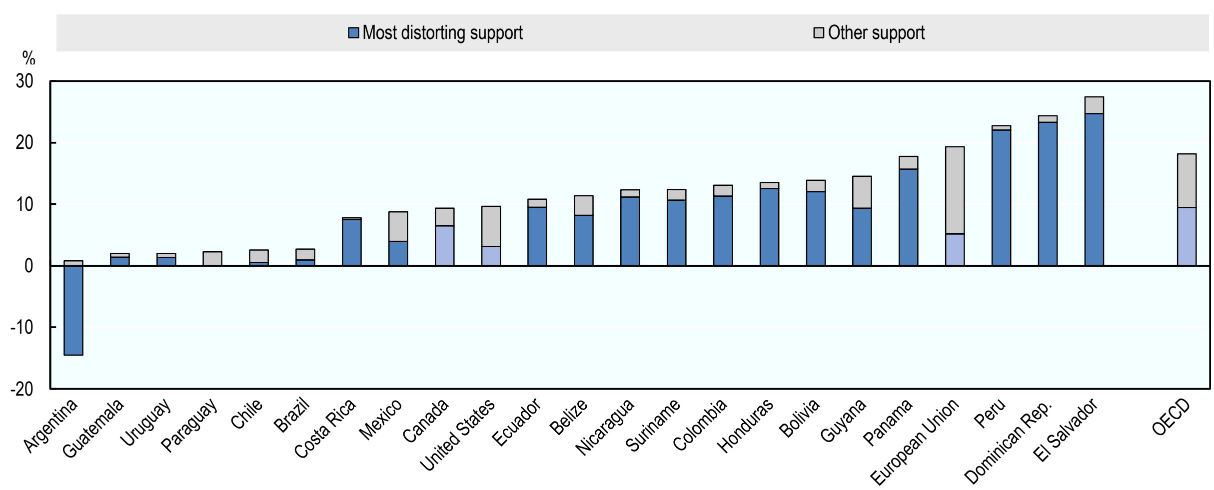
Figure 2.19. Composition of the Producer Support Estimate by country, 2015-17 or latest year



Note: Percentage of gross farm receipts. (1) Support based on output (including market price support and output payments) and on the unconstrained use of variable inputs. *EU28.
Source: Argentina, Chile, Brazil, Costa Rica, Mexico, Canada, United States, Colombia, European Union: OECD (2018b), "Producer and Consumer Support Estimates", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-pcse-data-en. Guatemala (2012-14), Uruguay (2011-13), Paraguay (2011-13), Ecuador (2014-16), Belize (2012-14), Nicaragua (2009-10), Suriname (2012-14), Honduras (2011-12), Bolivia (2007-09), Guyana (2009-11), Panama (2013-15), Peru (2011-13), Dominican Rep (2015-17), El Salvador (2010-12): IDB DATABASE (2019), https://mydata.iadb.org/Agriculture-and-Rural-Development/IDB-Agrimonitor-PSE-Agricultural-Policy-Monitoring/2dqw-u35p.

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Raising productivity and the necessary enabling policy environment

For Latin America to remain competitive in world markets, agricultural productivity needs to grow further, in a sustainable manner. This will require an appropriate channelling of resources into agricultural research, complementary investments in the sector, well-functioning credit and insurance markets, and improved coordination across policies.

Agricultural research

Agricultural research spending in Latin American countries has grown steadily over the past decades. The region was able to achieve the minimum UN target of investment at least 1% of agricultural GDP in agricultural R&D. However, there are considerable differences across countries: while Brazil, Uruguay, Argentina and Chile spend well above 1% of their agricultural GDP on agricultural R&D, Nicaragua, Peru, Venezuela, Dominican Republic, Paraguay, Ecuador, Honduras and Guatemala spend 0.4% or less (Stads et al., 2016[7]).

Increasing investment in agricultural R&D is a prerequisite but may still be insufficient to increase productivity while facing future climate and food security challenges. It may be necessary to look at how current available resources for agricultural R&D are being invested. Are LA countries investing in the "right" type of research? To what extent do climate smart agriculture (CSA) technologies comprise part of their agricultural research agenda? Is combatting antimicrobial resistance (AMR) sufficiently high in the crop and livestock research agenda? In order to tackle AMR, research is needed on the economic costs of transitioning to lower levels of antibiotic use in farming, the potential of alternative products, and ways of improving the hygiene of animal husbandry (O'Neill, 2016[34]).

Three additional challenges also need to be confronted. First, countries will need to identify succession strategies for their ageing scientists, as 40% of the region's agricultural researches were in their 50s and 60s in 2012/13 (Stads et al., 2016[7]). Second, effective ways of coordinating and strengthening synergies will need to be identified in order to overcome the complex institutional arrangements in which agricultural research is conducted (federal government agencies, local government institutions, universities, private sector, farmers organisations, NGOs). Third, financing mechanisms need to be assured. Regarding the latter, competitive government funds, and taxes on production/exports, already used in some LA countries, are financing options that governments could explore building on country experiences in Latin America and elsewhere.

Investment in agriculture

Productivity growth and competitiveness in world markets will demand, in addition to increased and better targeted investment in agricultural research, continued investments in infrastructure, extension services, and smallholder targeted initiatives, while ensuring an enabling environment to foster private investment.

Public investment in infrastructure is not only subject to economic cycles but also depend on priorities set by governments. In general terms, investment in infrastructure tends to be a low priority in total public expenditure. In the case of the agricultural sector, over the past two decades investment in infrastructure (including maintenance) increased modestly in Chile (7.2% annual average growth), Colombia (8.5%) and Mexico (7.0%), and substantially in Argentina (14.0%) and Costa Rica (10.9%). In Brazil, agriculture related infrastructure investment has been quite erratic and suffered greatly the effects of the country's recent economic crisis. When adding up the resources invested in infrastructure for all these six countries, there is a significant net decline between 1997-99 and 2015-2017. This is explained by the large sums Brazil invested in the 1990s, which represented 82.6% of total investment in infrastructure in 1997-99 in these six countries. In 2015-17, Brazil's share had fallen to 11.9%.

Poor irrigation, rural road, logistics and port facility infrastructure represent, in several cases, key bottlenecks to agricultural development. Poor roads, for instance, reduce the competitiveness of the lowest-cost producing region in Brazil, Mato Grosso, and make logistic costs account for 32% of total soybean export costs. Soybean transport costs in Brazil are estimated to be seven times larger than those in the United States (Arias et al., 2017[2]). Nevertheless, Brazil increased exports of soybeans much faster than the United States over the past decade.

The World Economic Forum's Competitiveness Report captures competitiveness issues related to infrastructure. According to the 2017-18 issue, out of a total of 137 countries, most Latin American countries fell below the mean score for infrastructure, except for Chile and Uruguay, which ranked 41 and 45, respectively. Brazil for instance ranked 73, Argentina, 81, Colombia, 87, and Honduras, 104.

The public sector is far from being the largest investment source in the agricultural sector. It is farmers that invest the most, exceeding government investment in a proportion of 4 to 1 (FAO, 2012). However, public investment has a catalytic role, not only through infrastructure development, but also when supporting smallholder family farmer initiatives. The low adoption rate of CSA practices mentioned above, for instance, may be explained by weak extension services directed to smallholder farmers and lack of appropriate approaches for this type of farmers such as Farmers Field Schools.

Governments have also the responsibility of assuring an enabling environment to encourage private investment in agriculture. Infrastructure certainly plays a key role, but so do property rights, contract enforcement, improving regulation and taxation, well-functioning labour markets, and financial market institutions (Food and Agriculture Organization of the UN (FAO), 2012[35]). A policy framework for investment in agriculture was developed by OECD (2014[36]), which could serve as an important reference for countries in Latin America.

Agricultural credit and insurance

Competitive credit and insurance schemes need to be available for the various types of farmers for the private sector to invest in agriculture. Latin American rural financial markets have undergone important structural changes as governments have greatly reduced their participation as direct providers of credit services or through the elimination of interest rate subsidies and commercial bank operating cost subsidies. Smallholders' access to financial services has suffered particularly because of their perceived higher risk, lack of insurance schemes, relatively higher operating costs for banks (client dispersion, poor communication systems, inadequate legal systems, etc.), and lack of information regarding the productive sector in which they operate. However, both long-term and short-term credit and insurance schemes become essential if Latin American agricultural productivity is to grow in a sustainable way.

The macroeconomic and financial environment has evolved positively in the region, laying the foundation for the development of competitive rural financial markets. Large or export-oriented farmers' access to financial services seem to be assured. In some cases, because of high rates of return in the production of some specific agricultural products, it is actually investment funds that seek out farmers to offer financial resources. Yet, despite the existence of government-supported credit programs in various Latin American countries, there is broad consensus that credit and insurance needs are not being met for more than 80% of total landholdings in the region.

There is a rich history of rural micro-finance institutions in the region (International Finance Cooperation (IFC), 2014[37]), as well as innovative insurance schemes for smallholders (Celaya et al., 2014[38]) where lessons can be drawn from to improve risk assessment, lower transaction costs and improve delivery channels. But, for those schemes to be effective governments need to assure that the legal and regulatory framework is in place. Governments also need to invest in financial, physical and communication infrastructure, and design programmes for rural financial institutional strengthening. To encourage private sector participation in rural micro-finance, governments need to consider incentives such as credit guarantees, risk sharing facilities, and joint credit product design for the small and medium landholder. Collection and dissemination of data is another key area for government intervention, as it will facilitate financial institutions' understanding of the sector or value chain in which the farmer participate and will allow for more realistic risk assessments. Special attention should be paid when intervening in financial markets to avoid market distortions.

Policy coherence and coordination

A set of sectoral policies of different origin and scope converge in agriculture and the rural sector. Different line ministries (agriculture, environment, social development, economy, etc.) design and implement policies and programmes that interact with regional/state and municipal programmes at the local level. In addition, NGOs and multilateral agencies operate programmes that can be of considerable importance in some countries.

Some countries have undertaken important initiatives to coordinate policies and programmes at the various government levels, with varying degrees of success. Facilitating such coordination is regarded as a key challenge given the decentralisation of government that has taken place in various Latin American countries in the past two decades, and because of the potential synergies that could be created by having an effective coordination of policies and programmes.

Farmers organisations have also been influential in agricultural policy making in the region. Mexico's Consejo Nacional Agropecuario, for instance, played a key role during the agricultural policy reform process undertaken by the country in the 1990s, when price support instruments were replaced by income support mechanisms. The Confederation of Family Farmers Organizations of MERCOSUR (COPROFAM) stands out as an example of how policy dialogue forums can be created and sustained in time. With the creation of the *Reunión Especializada en Agricultura Familiar*, REAF (Specialised Forum on Family Farming), family farmers organisations have been able to sit together with government under MERCOSUR's framework to discuss family farming policy issues. REAF has played an important role in the creation of national registries of family farmers in MERCOSUR countries, which have been the basis for targeted family farming policies (Food and Agriculture Organization of the UN (FAO) and Reunión Especializada en Agricultura Familiar (REF)/MERCOSUR, 2016[39]).

Environmental and resource challenges

Land

Latin America is one of the few regions in the world with substantial land resources, relatively low population density, and the potential to bring unexploited land into cultivation, especially in South America. Brazil's and Argentina's land endowments are well known, but there are other countries that could further expand agricultural land, such as Colombia, which could release in the near future an additional 3 to 4 Mha under-utilised because of the armed conflict.

Over 90% of LA's cultivated land is considered as good and prime land, highly suitable for agriculture, a figure above the world average (80%). However, the region has also experienced land degradation issues such as the loss of natural soil nutrients, salinisation, erosion and desertification (Food and Agriculture Organization of the UN (FAO), 2011[40]).

Close to 20% of LA's soils are at risk of erosion. In Argentina, erosion affects 25 Mha, and humid plains farmers often incur huge economic losses because of soil salinisation. Erosion also represents a major challenge for 19% of Mexico's territory, 43% of Cuba's, 30% of Uruguay's, 50% of Ecuador's, and 75% of El Salvador's. Because of its large share of agricultural land located on hillsides, Central America has been particularly vulnerable to erosion. Desertification affects 17% of Colombia's territory, 28% of Ecuador's, 62% of Chile's, and poses significant challenges to some vulnerable regions, such as Brazil's Northeast (Vargas et al., 2015[41]). Natural factors (rainfall, wind) explain part of the land degradation problem, but so does human action such as land use changes (mainly deforestation), overgrazing, and mismanagement of the arable land.

In order to deal with land degradation, several farmers have adopted Conservation Agriculture (CA), an approach that follows three main principles: a) no or minimum tillage, b) soil cover (e.g. retaining crop biomass, root stocks), and c) crop diversification / crop rotation. Conservation Agriculture has been growing exponentially worldwide, but the uptake of this approach has been particularly significant in South America (it is worth noting that the third principle on crop diversification / rotation may not be followed in full). It is estimated that 70% of the total cropland of MERCOSUR countries (Argentina, Brazil, Paraguay and Uruguay) is farmed under Conservation Agriculture (Kassam, Friedrich and Derpsch, 2019[42]).

Conservation Agriculture, however, has posed additional challenges to farmers and governments. For farmers, this approach, being capital intensive, demands having access to sufficient financial resources. Also, CA is heavily dependent on herbicides, especially on the use of glyphosate, and some governments are now considering the possibility of banning the use of this herbicide. This could have adverse short-term impacts on farmers' profitability, soil erosion and GHG emissions.

Aware of the possibility of a ban on glyphosate, but also because some weed species have become resistant to it, farmers in Australia, the United States, and the United Kingdom have been trying alternative weed control methods, something likely to be replicated in Latin America. Whatever alternative weed control method is adopted, it will demand additional capital investments for Latin American farmers currently engaged in Conservation Agriculture.

Conservation Agriculture is not limited to large commercial farmers. Several weed control mechanisms (mechanical, biological and integrated weed management strategies) have been identified for small farmers interested in the adoption of the CA approach (Sims et al., 2018[43]). However, in contrast to the rapid expansion of CA in Latin America's large, capital intensive landholdings, smallholder CA seems to have lagged behind, compared to other regions of the world (Asia and Africa), which presents an opportunity for agricultural policy.

Water

Latin America is relatively well-endowed with water resources and more than 90% of agriculture is rain-fed. However, population growth and urbanisation have been putting considerable pressure on water available for irrigation, and climate change could pose additional pressure on water resources as precipitation is expected to decrease across the region.

Agriculture accounts for 68% of fresh water withdrawals in Latin America and the Caribbean and, through its internationally traded products (mainly agricultural), LAC is a net virtual water exporter to other regions of the world (United Nations Environment Programme (UNEP), 2016[44]). Irrigated land accounts for 8% of total cultivated land in South America and 7% in Central America, compared to 17% in the world (Food and Agriculture Organization of the UN (FAO), 2011[40]). Irrigation subsidies have been greatly reduced as irrigation management units were decentralised to its users in Latin American countries. Investment in irrigation has declined steadily over the years, and large irrigation projects that were undertaken in past decades are rarely seen nowadays. Current irrigation infrastructure is sometimes poorly managed, resulting in water loss. Water management, water policy, and investments in small irrigation systems (an area largely overlooked by government policy) seem to be the relevant issues to improve efficiency and equity of irrigation in the region (Salcedo et al., 2011[18]).

Forests and deforestation

Latin America has lost considerable forested area during the past three decades. From 1990 to 2015 deforestation affected 9% of the tree-covered land, that is, 90.3 Mha. Almost 60% of this loss occurred in Brazil. Although not as large in absolute terms, Central America lost 25% of its forests during this period; South America lost 9.5%, whereas the Caribbean increased its forested area by 43.4% (Food and Agriculture Organization of the UN (FAO), 2015[45]).

The rate of deforestation has declined over the years, and policies have been introduced to reduce it further. Nevertheless, Brazil showed a net loss in forested area of almost one million hectares between 2010 and 2015, while Paraguay, Argentina and Bolivia lost around 300 000 hectares each. Forest area as a percentage of total land area in the region thus decreased from 51.3% in 1990 to 46.4% in 2015 (Food and Agriculture Organization of the UN (FAO), 2018[46]).

Agricultural growth has contributed, either directly or indirectly, to deforestation. Agricultural and environmental policy and regulations, legislation, and lack of adequate surveillance and enforcement capacity have also played a role in deforestation. Thus, any relaxation of environmental regulations could pose a deforestation risk.

Besides their contribution to the environment, policy makers may not always perceive forests' economic benefits. Thus, raising awareness about forests' contribution to economic development and their potential in integrated agro-forestry systems is key as it will contribute to fighting deforestation. FAO considers as critical policy principles (a) creating an enabling environment for private sector participation, with the right mix of regulatory approaches and incentives; (b) investing in the transformation of the informal sector to make it formal; and (c) integrating forest policies with the broader sustainable development agenda. Such an approach will require information, data and analysis on local conditions for proper decision making (Food and Agriculture Organization of the UN (FAO), 2018[46]).

The UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD programme) and UN-REDD+ represent key mechanisms to combat deforestation (in addition to their other expected benefits). These programmes are already present in 23 LAC countries, working with indigenous peoples and other forest-dependent communities.

Climate change

Prolonged droughts, more intense rains and floods, changing weather patterns, and changes in the type, distribution and intensity of pests and diseases are all foreseen effects of climate change. Climate change may thus reduce agricultural yields and livestock productivity, putting food security at risk for the expected 9.7 billion population in 2050. Actions are thus urgently needed to make agriculture more resilient to Climate Change.

Table 2.3. Contribution of agriculture to GHG emissions, selected countries

	Contribution of agriculture to country Total GHG Emissions (%)	Share from cropland (% of agriculture's total)	Share from livestock (% of agriculture's total)
Argentina	44.3	52.9	47.1
Colombia	38	58	49.2
Costa Rica	37	59.4	40.6
El Salvador	22	49.5	50.5
Grenada	0.02	75	25
Mexico	12.3	50.2	49.8
Nicaragua	11.9	53.1	46.9
Peru	19	49.6	50.4
Uruguay	75	44	56

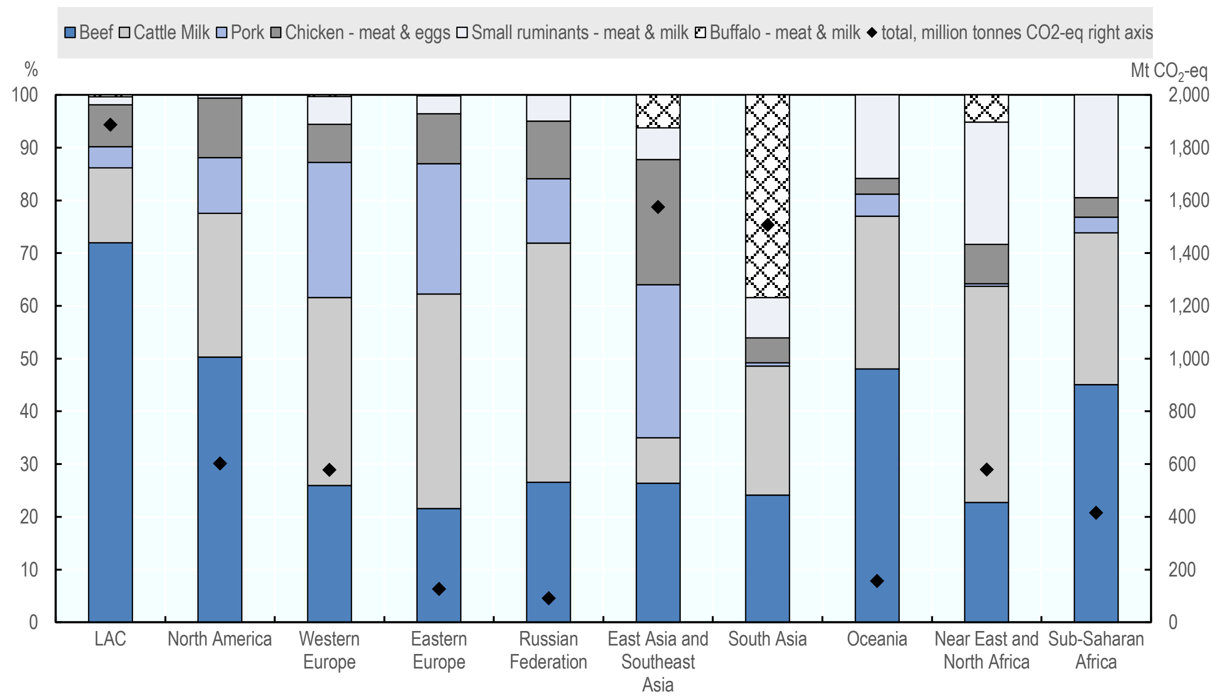
Source: World Bank/CIAT (2015).

But agriculture itself is a contributor to climate change. Indeed, globally, agriculture, forestry and land-use (AFOLU) change are accountable for almost a quarter (24%) of total greenhouse gas (GHG) emissions. Electricity and heat production are the only sectors that, together, have a higher share (25%) of emissions. Over the past decades, AFOLU emissions have shown an upward trend in developing countries (agriculture's direct emissions increased 54% from 1970 to 2000) due to the expansion in the number of ruminants, the growth in the use of synthetic fertilisers, and deforestation (Blandford and Hassapoyannes, 2018[47]).

In the case of Latin American countries, agriculture's contribution to total greenhouse gas emissions can be as high as 75% (Uruguay) (World Bank, Centro Agronomico Tropical de Investigacion Ensenanza and International Center for Tropical Agriculture, 2014[48]), a particularly delicate situation as GHG concentrate on key sectors to the economy.

Within agriculture, livestock production plays the major role in GHG emissions. Across regions, Latin America and the Caribbean report the highest levels of GHG emissions (Figure 2.19), owing to a large extent to the region's specialisation in the production of beef. Regardless of their level of contribution to total GHG emissions, actions are urgently needed to reduce GHG emissions from agriculture.

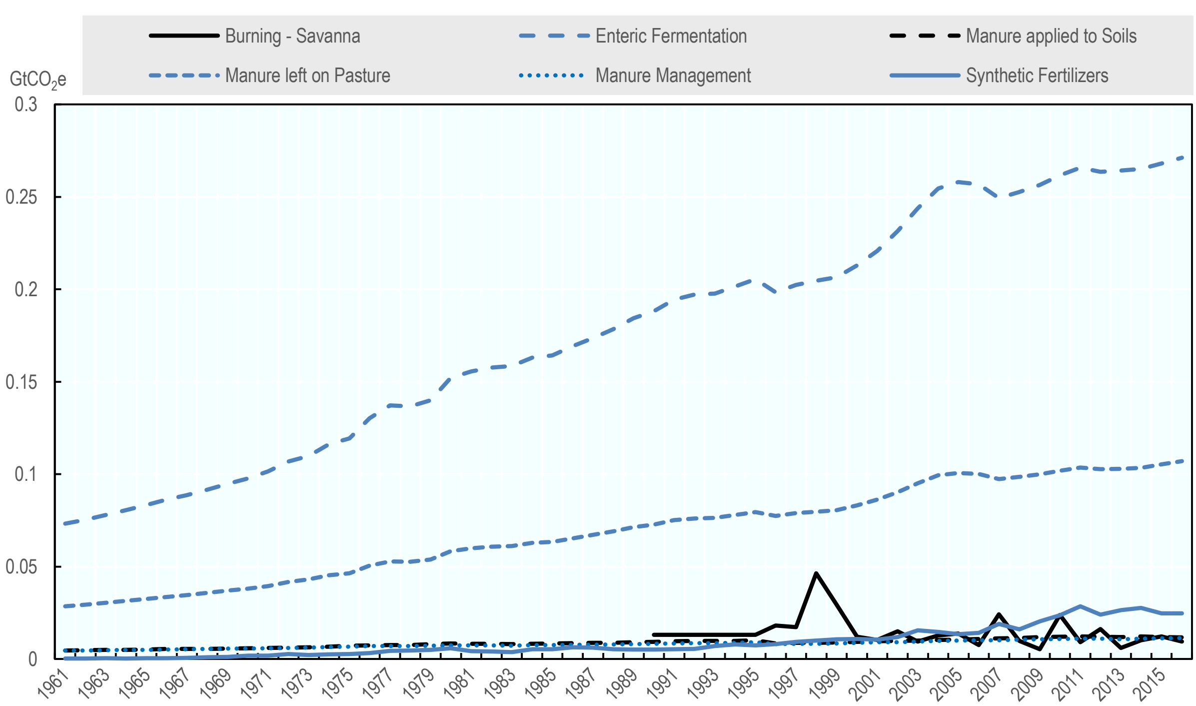
Figure 2.20. Livestock GHG emissions by region in 2017



Note: Small ruminants refers to sheep and goats; LAC is Latin American and the Caribbean.
Source: (Food and Agriculture Organization of the UN (FAO), 2017[49]).

StatLink http://dx.doi.org/10.1787/888933958220

Figure 2.21. Brazil: Sources of direct agricultural emissions



Source: (Food and Agriculture Organization of the UN (FAO), 2018[15]).
StatLink http://dx.doi.org/10.1787/888933958239

Significant increases in agricultural GHG emissions have been recorded in the region's largest agricultural powerhouse, Brazil, due mainly to the country's substantial beef herd expansion, which has increased methane emissions from enteric fermentation, and nitrous oxide emissions through increased manure left on pasture. Other sources of GHG emissions have played a relative minor role (Figure 2.20). Despite increased direct emissions from agriculture, overall emissions from Agriculture, Forestry and Other Land Use (AFOLU) have declined due to a slowing in the rate of deforestation.

Attaining sustainable agricultural growth while meeting climate change mitigation objectives

In the past, Latin American countries have prioritised agricultural production targets over reduced pollution or lower GHG emissions. However, not all countries have followed the exact same path. Argentina, Belize, Bolivia, Brazil, Costa Rica, and Mexico have been able to attain a more environmentally-friendly agriculture while maintaining productivity growth (Moreno-Moreno, Velasco Morente and Sanz Diaz, 2018[50]).

There are several examples of how agricultural productivity can grow in a sustainable manner, following Climate-Smart Agriculture (CSA) practices. Climate Smart Agriculture rests on three pillars: a) sustainably increasing productivity and incomes, b) adapting and building resilience to climate change, and c) reducing and/or removing greenhouse gas emissions, where possible (Food and Agriculture Organization of the UN (FAO), 2013[51]). According to this definition, it is estimated that hundreds of CSA practices already exist and are being used to some degree.

Some CSA practices have been studied in detail, assessing their "smartness" with respect to six key categories: water use efficiency, impact on carbon stocks, nitrogen use efficiency, energy use from fossil fuels, weather-related risk reduction, and local knowledge promotion. The adoption of these CSA practices has been assessed in relevant production systems and, in some cases, by type of farmer (size of landholding). The work undertaken by the World Bank, CIAT and several national institutions in ten countries in Latin America and the Caribbean identified and ranked, according to their "smartness", 304 CSA practices for 68 relevant agricultural production systems. Water management, crop tolerance to stress, and intercropping were among the CSA practices most frequently identified in the region. Thirty three percent of CSA practices in LAC were identified in cash crops, 28% in grain crops, 21% in livestock, 15% in mixed systems, and 3% in tubers (Sova et al., 2018[52]).

In the case of Brazil, CSA practices that have proved effective in reducing GHG emissions have also been identified under the "Low Carbon Agriculture Plan (ABC Plan). The Plan consists of seven policies, such as reforestation of degraded pastures, crop-livestock-forestry integrated systems, planting over straw, biological nitrogen fixation, planted forests, treatment of animal waste and other measures to adapt to climate change. In the case of the Brazilian livestock sector, this approach entails "shifting to more intensive pasture management and meat production systems, adopting improved crop varieties, and improving forage for cattle [which] will reduce methane emissions from digestive processes without reducing total meat production" (Arias et al., 2017[2]).

Overall, however, CSA practice availability does not assure proper access and adoption by farmers. Highly ranked CSAs in the ten LAC countries studied by World Bank/CIAT (2014[48]), for instance, had low to moderate rates of adoption in the majority of cases. Small family farmers are less likely to adopt these kinds of technologies and regional differences are also observed within countries.

Governments need to ensure access to CSA technologies, especially for smallholder farmers, and design the right incentives for larger farmers to adopt these types of practices. The starting point seems to be strong political commitment to addressing climate change, which LAC governments have shown in multilateral forums and expressed through their national legislation and institutional arrangements.

Fully mainstreaming climate change in agricultural policy and designing CSA strategies and programmes is no easy task technically, institutionally or financially (for a comprehensive approach to climate change mitigation in agriculture, see (Blandford and Hassapoyannes, 2018[47])). Available CSAs may need to be adapted to specific local conditions. Traditional institutions dealing with productivity concerns may find it difficult to integrate environmental issues and vice-versa. Moreover, governments may face budget constraints when trying to implement CSA programmes.

The Green Climate Fund has opened up important opportunities for financing CSA initiatives. The Fund has already started to finance CSA projects in Latin America, with projects approved in Mexico, Guatemala, the Dominican Republic and Paraguay. Other international financial sources need to be explored and approached, while governments may also need to reallocate resources internally in order for agriculture to play an effective role in climate change mitigation.

Making agricultural growth more inclusive

Foreseen Latin American economic and agricultural growth, per se, will not necessarily assure that smallholder family farmers benefit from such growth. Inclusive growth will depend on the extent to which smallholders currently participate in dynamic and export oriented agricultural sectors. In general, smallholder participation is low in the production of soybeans, wheat, beef, pork, poultry and dairy, and high in the production of coffee, cocoa and some tropical fruit production. In addition, several barriers, including some structural, still impede effective inclusion of small family farmers in dynamic agricultural markets, a challenge Governments will need to address by improving small farmers' access to public and private services, and to input and product markets.

Governments may need to follow different strategies for effective inclusive agricultural growth, ranging from the continuation of social protection programmes, to smallholder family farmer specific programmes, in addition to strengthening links to global value chains, reducing the inequalities between male and female farmers, and raising opportunities for the rural youth.

Social protection programmes, particularly conditional cash-transfer programmes, have proven to be very successful in reducing rural poverty, and governments will very likely continue to have them in place in the future. However, these programmes need to be accompanied with differentiated policies and strategies according to the socioeconomic characteristics of each agricultural sector and its degree of integration into global value chains. In this regard, four broad agricultural sector categories can be envisaged: (A) dynamic, export oriented, capital intensive, with low smallholder participation (e.g. soybeans, wheat, meat); (B) dynamic, export oriented, labour intensive (e.g. some fruits and vegetables), with low smallholder participation; (C) dynamic, export oriented, labour intensive, with high smallholder participation (e.g. coffee, cocoa, some tropical fruits); and, (D) relatively less dynamic, domestic market oriented, with high smallholder participation (e.g. cereals, pulses, tubers, fruits, vegetables, meat, dairy).

Regarding category A “dynamic, export oriented, capital intensive, with low smallholder participation”, the strengthening of emerging agri-food global value chains, with a “clusters” approach, may be an option for inclusive agricultural growth. Engagement of the rural population through this approach will require specialised and targeted training, according to current value chain needs, as well as supporting entrepreneurial initiatives for the establishment of small and medium rural enterprises that will provide competitive services to the export-oriented agricultural sectors and agri-food value chains. The World Bank has funded several small and medium enterprise (SME) programmes in the region and worldwide, and has conducted impact evaluations and drawn several lessons on SME programme effectiveness. Also, one of IFAD’s Agribusiness Capital Fund objectives is to finance SME’s and young rural entrepreneurs. Under the strategy for category A, innovation, where local universities should play a key role, and investments in infrastructure will also be important components in order to increase productivity of export-oriented sectors and to transform them into competitive global value chains.

For category B “dynamic, export oriented, labour intensive with low smallholder participation”, inclusive agricultural growth may mean fostering decent rural employment. LAC rural laborers, especially the youth, have traditionally held precarious and poorly remunerated jobs, often lack formal contracts, and do not have social security. Fostering decent rural employment (Goal 8 of the SDGs refers specifically to decent work) should help reduce the current urban-rural wage gap and improve in general the quality of existing jobs in rural areas. In addition, for the smallholder farmers participating under this category, the strengthening of social capital and farmers organisations will be relevant to assure increased inclusion.

The strengthening of farmer organisations also becomes crucial under category C “dynamic, export oriented, labour intensive, with high smallholder participation”. In addition, strategies focusing on this category will need to consider the possible impact of climate change as some regions will no longer be suitable for production in the future, as well as finding ways in which to better deal with new pests and diseases. In addition to improving agricultural productivity, marketing, product differentiation (organic, fair trade, geographic denomination), and vertical integration will be key areas for these strategies.

Most smallholder farmers, however, fall under category D “relatively less dynamic, domestic market oriented”, covering a wide range of agricultural products. Inclusive agricultural growth in this case will not necessarily mean having smallholders switch from their current category to the dynamic export-oriented ones. Instead, inclusive growth will require that small family-farming sector specific programmes are put in place to raise productivity in a sustainable manner and to improve access to input, service and product markets. In many cases, this will mean reducing the high transaction costs traditionally faced by smallholders and implementing sustainable credit and insurance mechanisms for this type of farmers. Multiple successful experiences have been documented on how Latin American small family farmers have been able to increase production in a sustainable manner, increase access to local and national markets, and even engage in ventures with large agribusinesses (Food and Agriculture Organization of the UN (FAO), 2014[53]). These successful initiatives, however, have had a relatively limited scope as there has not been, in most cases, solid nor long-lasting institutional arrangements supporting their scaling up.

Institutional arrangements focusing on small family farmers need to be designed and put in place. Two examples stand out in the region on this regard. Brazil implemented comprehensive family farming programmes (e.g. credit, insurance, marketing support), legislation (for example, a certain proportion of food government purchases for school feeding programs had to come from family farmers), and set up institutions at the highest levels (up until 2018, Brazil had a Ministry specifically devoted to smallholder farmers and agrarian reform). The successful performance of Brazil's family farming sector over the past two decades could not be explained without these institutional arrangements. Chile's INDAP, under the Ministry of Agriculture, has been supporting small farmers for almost six decades with a variety of instruments (e.g. credit, technical assistance, investment subsidies, improving access to markets, training, irrigation infrastructure), which have evolved over time to adjust to changing contexts.

Specific institutional arrangements should follow each country's own characteristics; however, agricultural growth in the next decade is not likely to be inclusive without institutional arrangements specifically oriented to small family farmers, and which follow an integrated approach but with a strong focus on the areas of agricultural research (Climate Smart Agriculture), extension (making use of local knowledge and Farmers Field Schools), and credit and insurance.

The strengthening of social capital is also regarded as a necessary means not only to be able to participate in dynamic agricultural sectors, but to assure more favourable patterns of inclusiveness. Inclusion of small family farmers in agricultural value-chains can take on different forms. Stronger small farmers organisations will be more likely to influence technology transfer (avoiding top-down approaches), adopt better crop management practices, and have better benefits in general than weaker organisations (Ramirez et al., 2018[54]). Thus, building/strengthening social capital, an area that was a component of large rural development programmes in the past but with time became increasingly neglected except for multilateral organisation projects, acquires more relevance for government intervention.

Feminisation of agriculture is likely to continue in the future, as males continue to migrate to larger cities or abroad. Government will need to implement actions to close the gender gap as it has significant impact on productivity. Compared to male farmers, female farmers have less education and less access to extension services and agricultural information; female farmers use less inputs and credit than males. Should the gender gap be closed, agricultural yields could be increased by as much as 20-30% (Food and Agriculture Organization of the UN (FAO), 2011[40]). Making agricultural growth more inclusive would thus require closing the gender gap in agriculture by mainstreaming gender in agricultural policy, fighting discrimination against women, and designing gender specific interventions to raise education of women farmers and increase their access to agricultural input, service and product markets.

Because of the ageing farm population in Latin America, youth is another particularly vulnerable segment of the rural population requiring special government attention. Out of the 30.9 million rural youth population (15 to 29 years of age), 11.9 million do not have a job. But even those with a job often find themselves poorly remunerated, lacking social security and other benefits enjoyed by the urban employed youth (Dirven, 2016). Several successful initiatives have been documented on how the rural youth can increase access to land (Mexico has a relevant experience through its "Young Rural Entrepreneur and Land Fund Programme), knowledge, information, education, financial services, and markets (Food and Agriculture Organization of and the United Nations (FAO), 2014[55]); currently, IFAD and FAO conduct projects focusing on rural youth in the region. Furthermore, there are some innovative initiatives such as the Chilean programme "I, Rural and Young", supported by INDAP and implemented through Facebook, which is building a virtual community that brings together rural young farmers, engineers, entrepreneur, professors, etc., to share experiences, ask questions, share information, innovate and develop new ventures.

Building the bridge between projects or initiatives with a limited scope to nation-wide comprehensive strategies seems to be the missing link to appropriately address the rural youth challenge. And even though there have been regional and national initiatives trying to bring the rural youth into the political agenda, their impact has been quite limited. Political commitment then seems to be the key starting point. Finally, because of the huge regional disparities within a country, making agricultural growth more inclusive may require governments to follow a territorial approach to rural development.

2.5. Conclusion

Agriculture is a major sector for the LAC region, in terms of its contribution to output and employment, and as a source of foreign exchange earnings. In most LAC countries, the sector has grown rapidly over the past two decades, but slowing demand from both domestic sources and foreign markets is expected to contribute to slower production growth over the next decade.

Trade will temper the slowdown in production. While global trade in agricultural products is expected to slow, the LAC region's comparative advantage in many of these products means it stands to capture a greater share of global markets. For several commodities, such as maize, rice and beef, stronger demand growth overseas than domestically means that a greater share of production will be destined for export. For most exported commodities, the majority of exports are destined for markets outside the LAC region, underscoring the importance to LAC countries of trade openness at the global level.

Agricultural growth can be supported by policies that support sustainable productivity growth. However, less than half of all budgetary support provided to the sector comes in the form of strategic investments that could raise agricultural productivity sustainably, such as R&D, rural infrastructure and other investments in agriculture's enabling environment. Several governments are under-spending on such public goods.

At the same time, agricultural growth needs to be made more environmentally sustainable. The LAC region is abundant in land and water, but environmental problems persist, in particular soil erosion, while deforestation continues to be a major challenge. A range of policies have been adopted to improve the environmental performance of LAC agriculture, such as conservation agriculture. These work alongside policies to mitigate climate change, such as climate smart agriculture. A stronger emphasis on programme evaluation would help guide these initiatives over the longer term.

The benefits of agricultural growth can also be spread more widely. Strong growth opportunities in high value fruit and vegetable crops provide opportunities for smaller farmers, but policies toward smallholders will need to be differentiated according to their resource endowments and market potential. Similarly differentiated policies are needed to address the "feminisation" of agriculture, as males leave the sector. Women typically have less access to services that would increase their productivity, such as education, credit and extension services.

Food security continues to be a concern in the region, with many households unable to afford the food they need. This is primarily a question of ensuring income growth among the poorest communities – a challenge where agricultural development has an important role to play. The LAC region is simultaneously experiencing a particularly rapid development in the number of people who are overweight and obese, which represents a growing public health problem. Several initiatives have been introduced to counter these trends, and there is a pressing need to evaluate these policies so that successful initiatives can be scaled up within countries and extended to other countries.

Note

[1] In this chapter, the Andean region includes Bolivia, Colombia, Ecuador and Peru; the Central American Region includes Costa Rica, El Salvador Guatemala, Honduras, Nicaragua, and Panama; MERCOSUR includes Argentina, Brazil, Paraguay and Uruguay; the Caribbean region includes Belize, Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Jamaica, Grenada, Haiti, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago. The Southern Cone region includes Argentina, Chile, Paraguay and Uruguay. South America includes Brazil, Venezuela, Southern Cone and Andean countries.

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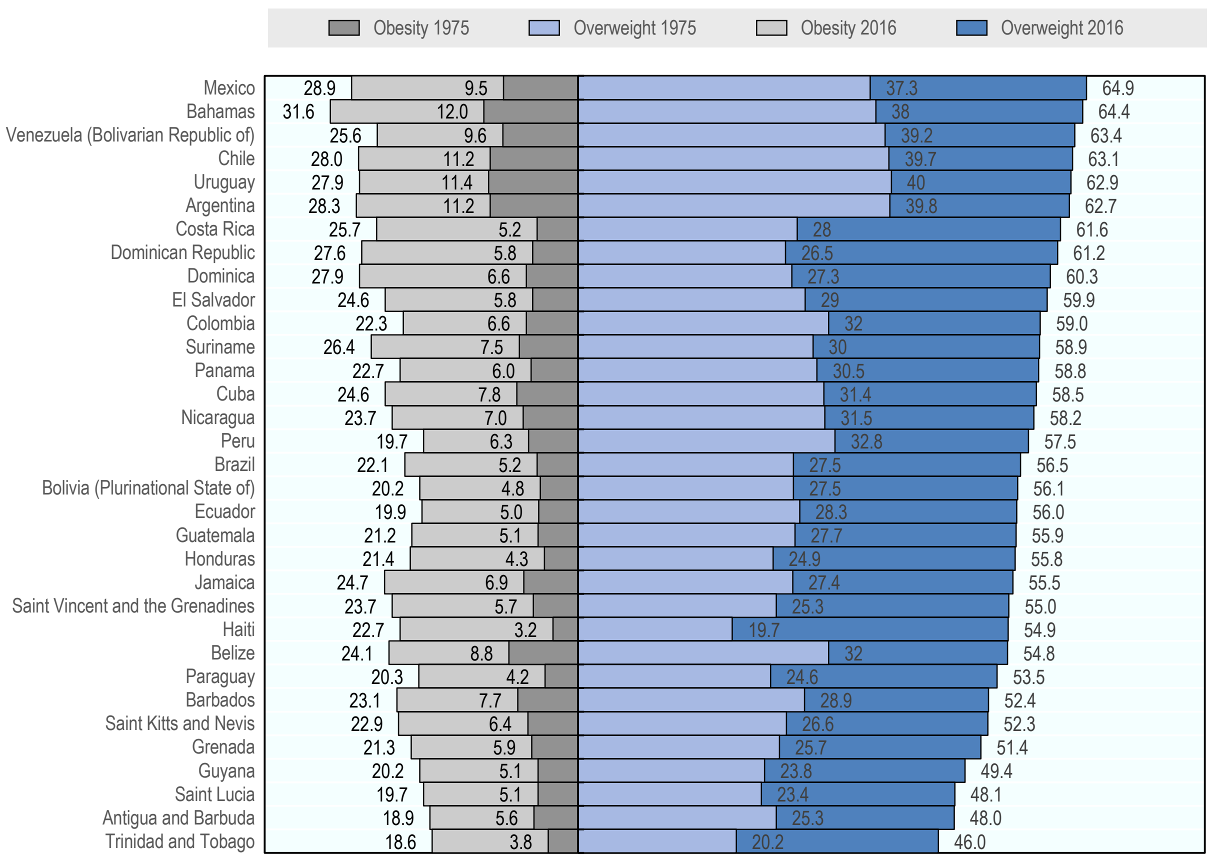
Annex 2.A. The prevalence of obesity in Latin America and the Caribbean

Annex Figure 2.A.1. Overweight and obesity prevalence (%) in LAC countries, 2016 compared to 1975



Source: WHO (2019).

StatLink http://dx.doi.org/10.1787/888933958258

Annex Table 2.A.1. Nutritional policies in Latin America

Country	Policy	Source
		Undernutrition
Argentina	Promoting breastfeeding	Ministerio de Salud (2019), *Políticas de Salud*, Ministerio de Salud – Argentina, http://www.msal.gob.ar/images/stories/bes/graficos/0000001030cnt-modulo_5_politicas-salud.pdf (accessed on 4 April 2019)
	Provision of fortified milk	Ministerio de Salud (2019), *Políticas de Salud*, Ministerio de Salud – Argentina, http://www.msal.gob.ar/images/stories/bes/graficos/0000001030cnt-modulo_5_politicas-salud.pdf (accessed on 4 April 2019)
Brazil	National Food and Nutrition Security System	Ministério do Desenvolvimento Social e Combate à Fome (2014), *Estratégia Intersetorial de Prevenção e Controle da Obesidade: Recomendações para Estados e Municípios*, Ministério do Desenvolvimento Social e Combate à Fome – Brasil, http://www.mds.gov.br/webarquivos/publicacao/seguranca_alimentar/estrategia_prevencao_obesidade.pdf (accessed on 4 April 2019)
	Food distribution program	Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica - Desnutrição*, http://dab.saude.gov.br/portaldab/ape_pcan.php?conteudo='desnutricao' (accessed on 4 April 2019) Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica – Fortificação da alimentação infantil com micronutrientes em pó (NutriSUS)*, http://dab.saude.gov.br/portaldab/ape_pcan.php?conteudo=nutrisus (accessed on 4 April 2019)
	Monitoring the nutritional status of children under five years	Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica - Desnutrição*, http://dab.saude.gov.br/portaldab/ape_pcan.php?conteudo=desnutricao (accessed on 4 April 2019)
	Prevention of specific nutritional deficiencies and supplementation	Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica - Desnutrição*, http://dab.saude.gov.br/portaldab/ape_pcan.php?conteudo=desnutricao (accessed on 4 April 2019)
	Promoting breastfeeding	Ministry of Health of Brazil (2013), *PNAN – National Food and Nutrition Policy*, Ministry of Health of Brazil – Brasília-DF, http://189.28.128.100/dab/docs/portaldab/publicacoes/national_food_nutrition_policy.pdf (accessed on 4 April 2019)
Chile	National Complementary Food Program (PNAC and PACAM)	Ministerio de Salud (2019), *Políticas Públicas en Alimentación y Nutrición*, https://www.minsal.cl/politicas-publicas-en-alimentacion-y-nutricion/ (accessed on 4 April 2019)
Mexico	Food distribution program	Gobierno de México – *Programa de Inclusión Social PROSPERA (2019), Día mundial de la alimentación*, https://www.gob.mx/prospera/articulos/dia-mundial-de-la-alimentacion-178687?idiom=es (accessed on 4 April 2019) Gobierno de México – *Programa de Abasto Social de Leche (2019)*, https://www.gob.mx/liconsa/acciones-y-programas/programa-de-abasto-social-de-leche (accessed on 4 April 2019)
	Promoting breastfeeding	Secretaría de Salud (2013), *Estrategia Nacional para La Prevención y el Control del Sobrepeso, la Obesidad y la Diabetes*, Secretaría de Salud – México, https://www.gob.mx/cms/uploads/attachment/file/276108/estrategia_sobrepeso_diabetes_obesidad.pdf (accessed on 4 April 2019)

	Overnutrition: Dietary guidelines	
Argentina	Dietary guidelines	Ministerio de Salud (2019), *Mensajes y gráfica de las Guías Alimentarias para la Población Argentina*, http://www.msal.gob.ar/ent/index.php/component/content/article/9-informacion-ciudadanos/482-mensajes-y-grafica-de-las-guias-alimentarias-para-la-poblacion-argentina (accessed on 4 April 2019)
Brazil	Food guides	Ministério da Saúde (2019), *Guia alimentar para a população brasileira*, http://dab.saude.gov.br/portaldab/biblioteca.php?conteudo=publicacoes/guia_alimentar2014 (accessed on 4 April 2019) Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica – Programa Saúde na Escola*, http://dab.saude.gov.br/portaldab/pse.php (accessed on 4 April 2019)
Chile	Dietary guidelines	Ministerio de Salud (2015), *Guía de Alimentación del Niño(a) Menor de 2 años*, http://www.crececontigo.gob.cl/wp-content/uploads/2016/01/Guia-alimentacion-menor-de-2.pdf (accessed on 4 April 2019) Ministerio de Salud (2013), *Estudio para Revisión y Actualización de las Guías Alimentarias para la Población Chilena*, https://www.minsal.cl/portal/url/item/dde0bc471a56a001e040010165012224.pdf (accessed on 4 April 2019)
México	Dietary guidelines	Secretaría de Educación Pública (2019) – *Lineamientos generales para el expendio y distribución de alimentos y bebidas preparados y procesados en las escuelas del Sistema Educativo Nacional*, http://alimentosescolares.insp.mx/alimentacion/ (accessed on 4 April 2019)
	Overnutrition: Education programmes	
Argentina	Education on healthy eating	Ministerio de Salud (2019), *Programa Nacional de Alimentación Saludable y Prevención de la Obesidad*, Ministerio de Salud – Argentina, http://www.msal.gob.ar/ent/images/stories/programas/pdf/2016-09_resolucion-732-programa-nacional-alimentacion-saludable.pdf (accessed on 4 April 2019)
Brazil	Planting vegetable gardens in school yards	Ministério da Educação (2019), *Programa Nacional de Alimentação Escolar (PNAE)* – Educação Alimentar e Nutricional (EAN), http://www.fnde.gov.br/programas/pnae/pnae-eixos-de-atuacao/pnae-educacao-alimentar-nutricional (accessed on 4 April 2019)
Chile	"Healthy Life Program"	Ministerio de Salud (2019), *Intervención en factores de riesgo de enfermedades no transmisibles*, http://ssms.cl/como-me-cuido/programas-de-salud/vida-sana/ (accessed on 4 April 2019)
Mexico	Improving nutritional information	Secretaría de Salud (2013), *Estrategia Nacional para La Prevención y el Control del Sobrepeso, la Obesidad y la Diabetes*, Secretaría de Salud – México, https://www.gob.mx/cms/uploads/attachment/file/276108/estrategia_sobrepeso_diabetes_obesidad.pdf (accessed on 4 April 2019)
	Planting vegetable gardens in schoolyards	Secretaría de Agricultura y Desarrollo Rural (2018) – *Huertos Escolares, Enseñanza y Alimentación*, https://www.gob.mx/sader/es/articulos/huertos-escolares-ensenanza-y-alimentacion (accessed on 4 April 2019)
	Overnutrition: Product reformulation	
Argentina	Agreements with Food Industries to reduce sodium on processed food and sugar and fat	Ministerio de Salud (2019), *Menos Sal + Vida*, http://www.msal.gob.ar/ent/index.php/informacion-para-ciudadanos/menos-sal--vida (accessed on 4 April 2019)
	Training in healthy food preparation for restaurants, shops, etc	Ministerio de Salud (2019), *Programa Nacional de Alimentación Saludable y Prevención de la Obesidad*, Ministerio de Salud – Argentina, http://www.msal.gob.ar/ent/images/stories/programas/pdf/2016-09_resolucion-732-programa-nacional-alimentacion-saludable.pdf (accessed on 4 April 2019)
Brazil	Volunteer agreements with food industries to reduce trans-fat, sugar and sodium in processed food	Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica – Redução de Sódio, Açúcar e Gordura Trans*, http://dab.saude.gov.br/portaldab/ape_promocao_da_saude.php?conteudo=reducao (accessed on 4 April 2019)

Chile	Voluntary agreements with Associations of Supermarkets of Chile (ASACH) and the Chilean Federation of Bakers Industries (FECHIPAN) to reduce sodium on bread	Ministerio de Salud (2019), *Políticas Públicas en Alimentación y Nutrición*, https://www.minsal.cl/politicas-publicas-en-alimentacion-y-nutricion/ (accessed on 4 April 2019)
Mexico	Volunteer agreements with food industries	Secretaría de Salud (2013), *Estrategia Nacional para la Prevención y el Control del Sobrepeso, la Obesidad y la Diabetes*, Secretaría de Salud – México, https://www.gob.mx/cms/uploads/attachment/file/276108/estrategia_sobrepeso_diabetes_obesidad.pdf (accessed on 4 April 2019)
	Overnutrition: Warning labels	
Argentina	Current regulation on food labelling	https://www.argentina.gob.ar/sites/default/files/anmat_capitulo_v_rotulacion_14-01-2019.pdf
Brazil	Public consultations on changes in regulation of food labelling	Agência Nacional de Vigilância Sanitária – ANVISA (2019), *Relatório Preliminar de Análise de Impacto Regulatório sobre Rotulagem Nutricional*, http://portal.anvisa.gov.br/documents/33880/4712786/Resultado+preliminar+da+TPS/7d4e17d2-804d-401c-a3a3-a19de2c8219a (accessed on 4 April 2019) http://portal.anvisa.gov.br/documents/219201/219401/An%C3%A1lise+de+Impacto+Regulat%C3%B3rio+sobre+Rotulagem+Nutricional.pdf/c63f2471-4343-481d-80cb-00f4b2f72118 (accessed on 7 June 2019)
	Current regulation on food labelling	Agência Nacional de Vigilância Sanitária – ANVISA (2019, *Resolução da Diretoria Colegiada - RDC nº 54 de 12/11/2012*, http://portal.anvisa.gov.br/documents/10181/4825974/%281%29RDC_54_2012_.pdf/921d3c25-cef9-40d8-9b3f-7861eb7b8235 (accessed on 7 June 2019)
Chile	High level labels: sugar, saturated fat, sodium and calories)	Ministerio de Salud (2019), *Ley de Alimentos – Nuevo Etiquetado de Alimentos*, https://www.minsal.cl/ley-de-alimentos-nuevo-etiquetado-de-alimentos/ (accessed on 4 April 2019)
Mexico	Regulation of food labelling	Secretaría de Salud (2013), *Estrategia Nacional para la Prevención y el Control del Sobrepeso, la Obesidad y la Diabetes*, Secretaría de Salud – México, https://www.gob.mx/cms/uploads/attachment/file/276108/estrategia_sobrepeso_diabetes_obesidad.pdf (accessed on 4 April 2019)
	Overnutrition:-Rules on advertisements	
Argentina	Regulation of food advertising	Ministerio de Salud (2019), *Publicidad de Productos para la Salud*, Ministerio de Salud – Argentina, http://www.anmat.gov.ar/comunicados/comunicado-publicidad-consumidores.pdf (accessed on 4 April 2019)
Brazil	Regulation of food advertising	Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica – Publicidade de Alimentos*, http://dab.saude.gov.br/portaldab/ape_promocao_da_saude.php?conteudo=publicidade (accessed on 4 April 2019) Ministry of Health (2019), *Public Health and Regulation of Food Publicity*, Ministry of Health – Brazil, http://189.28.128.100/dab/docs/portaldab/documentos/regulamentaPublicidadeAlimentosEnglish.pdf (accessed on 4 April 2019)
Chile	Regulations on food advertising	Ministerio de Salud (2019), *Ley de Alimentos – medidas respecto a la publicidade de alimentos*, https://www.minsal.cl/ley-de-alimentos-medidas-respecto-a-la-publicidad-de-alimentos/ (accessed on 4 April 2019)
	Restricting advertising of unhealthy foods to children	Ministerio de Salud (2019), *Ley de Alimentos – medidas respecto a la publicidade de alimentos*, https://www.minsal.cl/ley-de-alimentos-medidas-respecto-a-la-publicidad-de-alimentos/ (accessed on 4 April 2019)
Mexico	Regulations on food advertising	Secretaría de Salud (2013), *Estrategia Nacional para la Prevención y el Control del Sobrepeso, la Obesidad y la Diabetes, Secretaría de Salud* – México, https://www.gob.mx/cms/uploads/attachment/file/276108/estrategia_sobrepeso_diabetes_obesidad.pdf (accessed on 4 April 2019)
	Regulating food and drinks in schools	Secretaría de Salud (2013), *Estrategia Nacional para la Prevención y el Control del Sobrepeso, la Obesidad y la Diabetes, Secretaría de Salud* – México, https://www.gob.mx/cms/uploads/attachment/file/276108/estrategia_sobrepeso_diabetes_obesidad.pdf (accessed on 4 April 2019)

	Overnutrition: Rules on unhealthy product compositions	
Argentina	Reform of the food code limiting trans fat (AGT) in food	Ministerio de Salud (2017), Alimentación Saludable, Sobrepeso y Obesidade en Argentina, Ministerio de Salud – Argentina, http://www.msal.gob.ar/images/stories/ryc/graficos/0000001137cnt-2017-09_cuadernillo-obesidad.pdf (accessed on 4 April 2019)
	Law for the Reduction of Salt Consumption	Ministerio de Salud (2018), *Nueva reducción de sódio en alimentos procesados*, https://www.argentina.gob.ar/noticias/nueva-reduccion-de-sodio-en-alimentos-procesados (accessed on 4 April 2019)
Brazil	Monitoring and regulation of sodium, sugars and fats in foods	Ministério da Saúde (2019), *Portal do Departamento de Atenção Básica – Redução de Sódio, Açúcar e Gordura Trans*, http://dab.saude.gov.br/portaldab/ape_promocao_da_saude.php?conteudo=reducao (accessed on 4 April 2019) Ministério da Saúde (2019), *Nota Técnica: Ações do Governo Brasileiro sobre as Gorduras Trans,* Ministério da Saúde – Brasil, http://189.28.128.100/dab/docs/portaldab/documentos/nota_imprensa_gorduras_trans.pdf (accessed on 4 April 2019)
Chile	Food surveillance and control programs	Ministerio de Salud (2019), *Políticas Públicas en Alimentación y Nutrición*, https://www.minsal.cl/politicas-publicas-en-alimentacion-y-nutricion/ (accessed on 4 April 2019)
	Overnutrition: Fiscal measures	
Chile	Tax on sugary beverages	Biblioteca de Congreso Nacional de Chile – BCN (2014), *Ley 20780 - Reforma Tributaria que Modifica el Sistema de Tributación de la Renta e Introduce Diversos Ajustes en el Sistema Tributario*, https://www.leychile.cl/Navegar?idNorma=1067194&idParte=0&idVersion= (accessed on 4 April 2019)
Mexico	Tax on unhealthy food	Gobierno de México (2019), *Lo que todo Contribuyente debe saber*, Procuradoria de la Defensa del Contribuyente – Mexico, https://www.gob.mx/cms/uploads/attachment/file/64513/Lo_que_Todo_Contribuyente_debe_de_saber.pdf (accessed on 4 April 2019)
	Overnutrition: Physical activities	
Argentina	"More Active, More Healthy" plans	Ministerio de Salud (2019), *Argentina presentó la implementación del plan "Más Activos, Más Saludables"*, http://www.msal.gob.ar/ent/index.php?option=com_content&view=article&id=602:argentina-presento-la-implementacion-del-plan-mas-activos-mas-saludables-en-un-encuentro-internacional-de-politicas-publicas-de-cultura-fisica-en-ecuador&catid=6:destacados-slide602 (accessed on 4 April 2019)
Brazil	Health gym program in public spaces	Ministério da Saúde (2019), *Programa Academia da Saúde*, http://dab.saude.gov.br/portaldab/ape_academia_saude.php?conteudo=sobre_academia (accessed on 4 April 2019)
Chile	"Healthy Life Program"	Ministerio de Salud (2019), *Intervención en factores de riesgo de enfermedades no transmisibles*, http://ssms.cl/como-me-cuido/programas-de-salud/vida-sana/ (accessed on 4 April 2019)
Mexico	Promoting health activities in schools	Secretaría de Gobernación (2014), *Programa Nacional de Cultura Física y Deporte 2014-2018*, http://www.dof.gob.mx/nota_detalle.php?codigo=5342830&fecha=30/04/2014 (accessed on 4 April 2019) Comisión Nacional de Cultura Física y Deporte (2017), *Estrategia Nacional de Activación Física*, https://www.gob.mx/conade/acciones-y-programas/muevete-en-30-30m (accessed on 4 April 2019)

Note: Supplementary information to Table 2.2.
Source: OECD-FAO Secretariats.

Chapter 3. Cereals

This chapter describes the market situation and highlights the medium-term projections for world cereal markets for the period 2019-28. Price, production, consumption and trade developments for maize, rice, wheat and other coarse grains are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world cereal markets during the coming ten years.

3.1. Market situation

Global supplies of major cereals have exceeded total consumption in recent years, leading to a significant build-up of inventories and much lower prices in international markets as compared to the previous decade. However, world production of cereals is expected to decrease for the second consecutive year in the 2018 marketing year, due to smaller harvests of wheat and other coarse grains. Wheat and barley output decreased largely due to bad weather conditions in the European Union, the Russian Federation, and Australia. In contrast, the maize harvest is expected to be larger given the favourable growing conditions in Ukraine, Brazil, and Argentina. Rice output is also expected to be higher in 2018 owing to continued growth in Asia and a production recovery in the United States. Due to a decrease in the level of production and sustained growth in demand, short-term global cereal stocks are expected to fall for the first time in six years, resulting in modest gains in prices. Overall, trade in cereals is expected to increase as higher shipments of maize will likely offset lower shipments of wheat, rice and other coarse grains from some major exporting countries.

3.2. Projection highlights

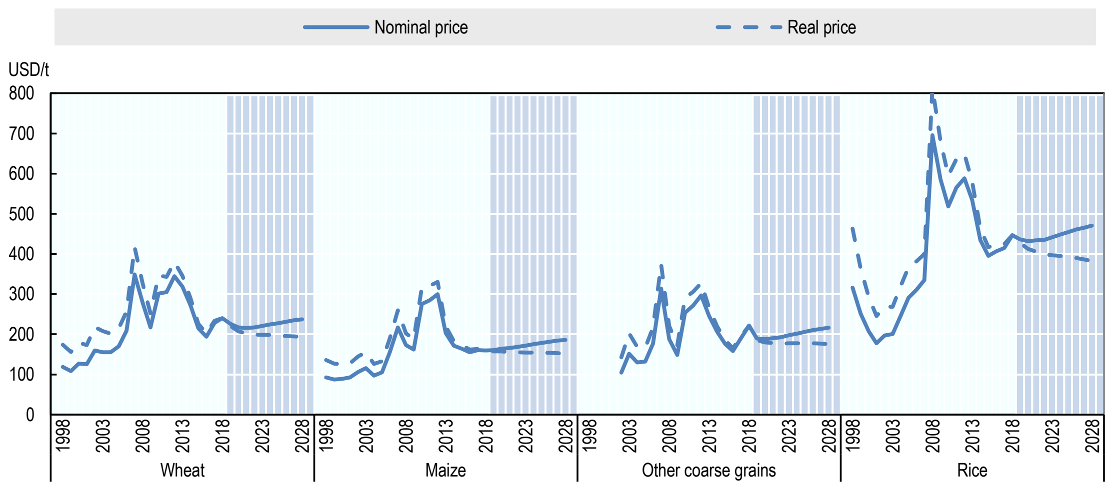
Following several years in which growth in production outpaced that of consumption, resulting in large stocks, international cereal prices in the near term are expected to remain low (Figure 3.1). Over the outlook period, prices are projected to fall in real terms (but increase nominally) as large stocks and slower growth in demand compared to the previous decade will continue to exert downward pressure on cereal markets. The anticipated lower prices may affect producer revenues, influencing planting decisions and supply responses.

Global cereal production is projected to increase by 367 Mt to reach 3 053 Mt in 2028, mainly due to gains in yields. Maize production is projected to increase the most (+181 Mt), followed by wheat (+86 Mt), rice (+66 Mt), and other coarse grains (+35 Mt). Improved seed varieties will continue to drive increases in yield and the increasing number of commercial farms, particularly in Africa and the Black Sea region, will facilitate access to new technologies, including machinery and extension services. Large farms could also improve productivity, particularly through more efficient use of inputs such as fertilisers and farm chemicals. Accordingly, the global average of cereal yields is projected to grow at 1.1% per year over the outlook period, below the 1.9% of the previous decade. A modest in the total area planted is projected, mostly due to new agricultural land (Africa, the Russian Federation, and Latin America), multi-cropping (Latin America), and conversion of pasture to cropland (India). These changes are partly the result of national food self-sufficiency policies.

Global cereal use is projected to grow by 382 Mt between the base period and 2028, reaching 3 036.0 Mt in 2028. Over the medium term, growth in overall cereal demand should be more subdued than the previous decade as feed demand within the People's Republic of China (hereafter "China") is expected to slow down. An increase in the industrial use of cereals, most notably that of starch and biofuels, is likely to be more modest. On the food side, per capita consumption of most cereals has reached saturation levels around the world; nevertheless, food demand is expected to be strong, driven by rapid population growth in Africa and Asia, where cereal staples remain the main diet components. Wheat consumption is projected to increase by 93 Mt compared to the base period, and will continue to be largely consumed by humans. The use of maize is projected to increase by 189 Mt, driven by an expanding livestock sector in China, the Americas, and

Southeast Asia. Maize for human consumption is projected to increase by 27 Mt, especially in Sub-Saharan Africa where white maize is an important food staple and the population is growing rapidly. The use of other coarse grains is projected to increase by 32 Mt, with higher food use expected in Africa. Global consumption of rice is projected to increase by 67 Mt by 2028, with Asia and Africa accounting for most of the projected increase, and direct human consumption remaining the main end-use of this commodity.

Figure 3.1. World cereal prices



Note: Wheat: US wheat, No.2 Hard Red Winter, fob Gulf; maize: US Maize, No.2 Yellow, fob Gulf, other coarse grains: France, feed barley, fob Rouen, rice: Thailand, 2nd grade milled 100%, fob Bangkok.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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World trade in cereals is projected to increase by 76 Mt to reach 503 Mt by 2028. The Russian Federation has evolved as a major player in international wheat markets over the past few years, surpassing the European Union in 2016 to become the top exporter. It is expected to maintain this lead throughout the projection period, with 20.3% of global exports in 2028. For maize, the United States will remain the lead exporter; however, its market share will decrease as Brazil, Argentina, Ukraine, and the Russian Federation gain significance in the global maize markets. The European Union, Australia and the Americas are expected to continue to be the main exporters of other coarse grains (mainly barley and sorghum), although growth in these exports will be restrained by trade protection and increased competition from maize in feed markets. India, Thailand, Viet Nam, and Pakistan will continue as the top global suppliers of rice, with Cambodia and Myanmar playing a more important role.

Due to China's efforts in particular to reduce its stockpile of maize, world cereal inventories are projected to contract over the outlook period. This would result in world cereal stocks-to-use ratio shrinking from 33% in the base period to 27 % in 2028. While this decline may point to prospects for higher prices, global cereal stocks will generally still be high over the outlook horizon, even increasing for wheat and other coarse grains. China's demands for feed, as well as its overall level of domestic supplies and associated changes in stocks are among the main uncertainties during the projection period.

3.3. Prices

The world wheat price, as measured by the benchmark US wheat No. 2 Hard Red Winter fob Gulf, is expected to increase to USD 241/t in 2018, the second consecutive yearly increase following a downward trend that had begun in 2013. With assumed low (and flat) real oil prices, average harvest expectations, and moderate growth in exports, the world wheat price is projected to decline in real terms over the outlook period, but to slightly increase relative to the base period, reaching USD 238/t in 2028 (Figure 3.1).

The world maize price, as measured by the benchmark US maize No. 2 Yellow fob Gulf, is projected to average USD 160/t in 2018, thus unchanged from 2017. Although global maize stocks are declining, de-stocking efforts in China, assumed lower energy and input prices, and projected slower growth in export demand compared to the previous decade will limit real gains in the international maize price. Accordingly, while the nominal price is projected to increase to USD 186/t by 2028, this growth will lag behind inflation and as a result the real price will fall.

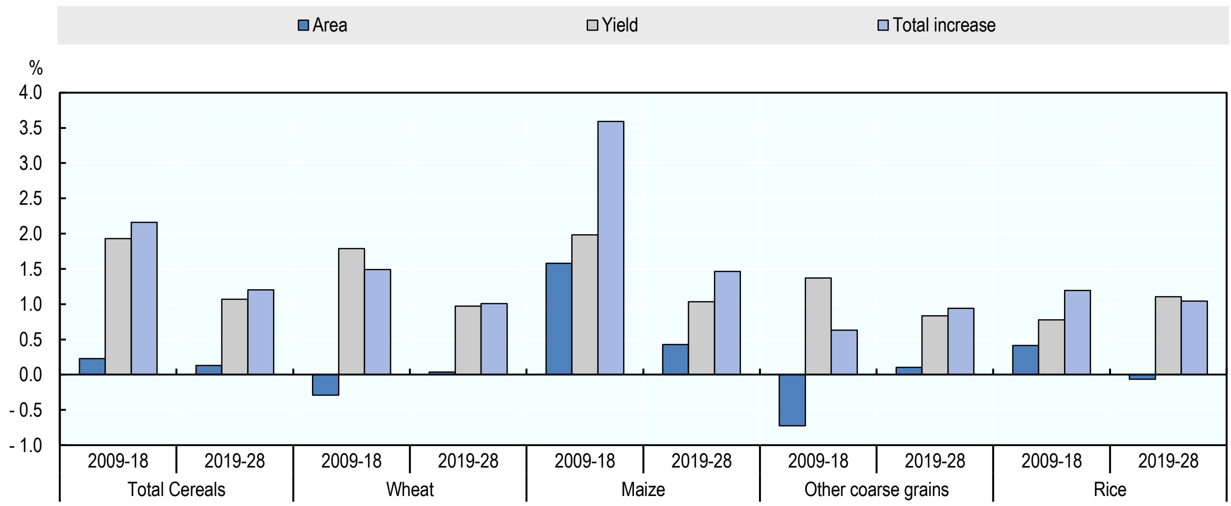
The world market price for other coarse grains, as measured by the price for feed barley (France, fob Rouen), is projected to increase to USD 221/t in 2018, the second successive yearly increase following the downward trend that began in 2013. Over the medium term, the world market price for other coarse grains is projected to decrease in real terms, reaching USD 216/t in 2028, as trade protection measures and increased competition from maize impede import demand growth in China.

The world price for rice (Thailand grade B milled 100%, fob Bangkok) increased to USD 447/t in 2018, the highest level since 2014. Over the outlook period, rice import demand in Sub-Saharan Africa (where population is increasing rapidly) is expected to be strong; however, large policy-driven production gains in major importing countries in Asia are expected to limit global rice import growth to less than half the rate seen in the previous decade. Consequently, growth of the nominal price will lag behind inflation, reaching to USD 470/t by 2028.

3.4. Production

Global cereal production is projected to grow by 1.2% p.a. between the base period and 2028, reaching 3 053 Mt in 2028; with much of the growth due to gains in yields (Figure 3.2). Over the outlook period, the global average of cereal yields is projected to increase by 1.1% per year (slower than the 1.9% seen in the previous decade), driven by advances in biotechnology, structural changes towards larger farms, and improved cultivation practices. Total area is projected to increase only marginally, principally due to additional new agricultural land (Africa, Eastern Europe and Latin America), multi-cropping (Latin America), and conversion of pasture to cropland (India). In the developed world, growth in cereal area will be limited by constraints on converting forest or pasture into arable land, ongoing urbanisation, and low cereal prices relative to other crops. Most of the increase in global cereal production is projected to occur in Asia, Latin America, Africa and Eastern Europe (Figure 3.3), where national food self-sufficiency policies will drive not only area expansion but also research in seed varieties to increase yields at a faster rate. In the past, such policies – which also included input subsidies, support prices, direct payments, agricultural loans, insurance at preferential rates, access to improved seed varieties, and extension services – did have a certain impact in increasing production. However, their success were largely dependent on the timing and implementation of the policy itself.

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



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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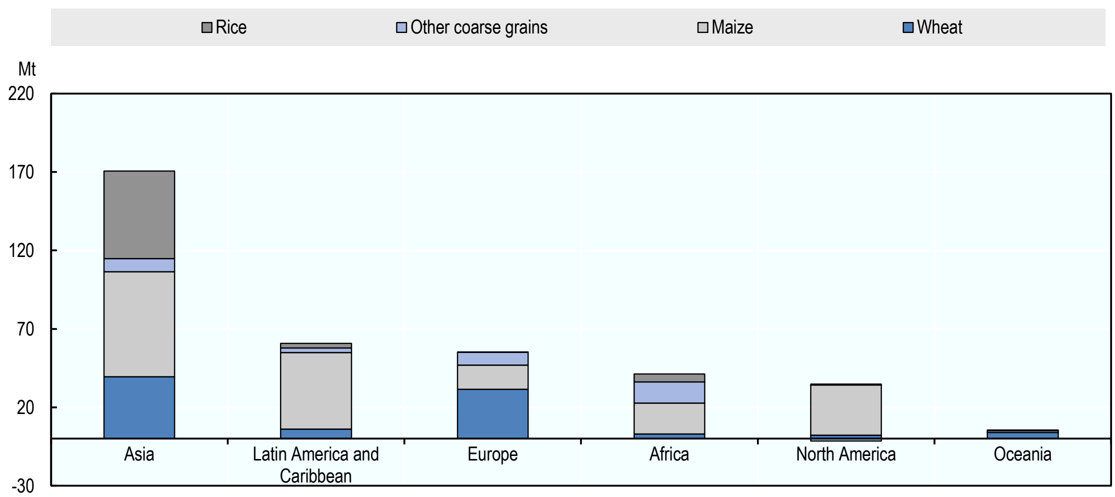
Global wheat production is projected to increase by 86 Mt to 838 Mt by 2028, a more moderate pace compared to the last decade. Among the developed countries, increases in wheat production is expected to be the highest in the European Union in view of its high yields, competitive prices, and grain quality. While developed countries are projected to increase production by 41 Mt by 2028, developing countries are projected to add 45 Mt to global output, a marginal increase of their share of global production. India, the world's third largest wheat producer, is projected to increase its wheat production by 15.5 Mt by 2028. This increase is largely sustained by its minimum support price policy that guarantees farmers a stable income through the country's public procurement programme. This *Outlook* assumes that irrigated land will continue to comprise more than 95% of the production area. In addition to India, other countries are also projected to have significant production increases: European Union (+13 Mt), the Russian Federation (+9 Mt), China (+8 Mt), and Ukraine (+6 Mt). Production increases in the Russian Federation and Ukraine are due to their domestically-produced hybrid seeds and fertilisers, low energy costs, and large commercial farms.

Global maize production is projected to grow by 183 Mt to 1311 Mt over the next decade, with the biggest increases in China (+47 Mt), the United States (+31 Mt), Brazil (+25 Mt), Argentina (+17 Mt), and Ukraine (+6 Mt). Maize production in China is projected to grow more slowly (2.1% p.a.) than over the previous decade (4.5% p.a.) as policy changes in 2016 eliminated maize price support and the concurrent stockpiling programme; these were replaced with direct farm subsidies and market-oriented purchasing. As a result, in the near term, area in China will shift away from maize to other commodities, such as soybeans and wheat, but may shift back into maize in few years as stocks decline to more sustainable levels. In the United States, maize planted area will remain stable and production increases due mainly to higher yields. Increased production in Brazil and Argentina will be sustained by both larger planted area (new agricultural land and multi-cropping) and productivity increases, motivated by favourable domestic policies (e.g. loans at preferential rates) and the depreciation of national currencies. Ukraine's production will be largely sustained by high yield domestic varieties grown in rain-fed systems.

Figure 3.3. Regional contribution of growth in cereals production, 2016-18 to 2028



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Global production of other coarse grains, such as sorghum and barley, is projected to reach 325 Mt by 2028, up 34 Mt from the base period. Ethiopia is projected to account for 16% of the increase in global production; its other coarse grain production will increase by 5 Mt to reach 19 Mt by 2028, with teff and sorghum accounting for most of this increase. A similar increase is expected to occur in the European Union (+5 Mt), followed by India Turkey, and China (+1.9 Mt each). Production of other coarse grains in the United States (particularly sorghum) will continue to decline over the outlook period, influenced by trade protection measures and the elimination of maize price supports in China, which decreased the price competitiveness of feed substitutes relative to maize. Overall, the contribution of the developed world to the global increase in production will be limited (+9 Mt), due in part to slower growth in feed demand and increased competition from maize in the feed markets. In contrast, production gains will be robust in developing countries (+25 Mt), especially in Africa where higher food demand due to its growing population and feed sector.

Global rice production is projected to grow by 65 Mt to reach 578 Mt in 2028. While production in developed countries is projected to increase marginally (+1 Mt), production in developing countries is projected to be relatively robust, increasing 64 Mt. Asia is projected to contribute the majority of the additional global production, accounting for 56 Mt of the increase during the outlook period. The highest growth is expected in the world's second largest rice producer India (+21 Mt), followed by Least Developed Asian countries (+11 Mt), Indonesia (+7.6 Mt), China and Viet Nam (+4 Mt each), and Thailand (+3 Mt).

India's rice production gains are expected to be sustained through yield improvements. The government actively promotes the implementation of new seed varieties and the expansion of irrigation facilities. This *Outlook* assumes this trend will continue, thus helping to reduce India's yield gap relative to other major producers. The maintenance of the minimum support price over the outlook period should support planting. In China, the world's top producer of rice, production is projected to grow at a slower pace than the previous decade as area planted to rice is anticipated to decrease, in line with government efforts to address oversupply problems.

Production gains in Thailand and Viet Nam, two leading global suppliers of rice, will depend on yields improvements, assuming government efforts to promote a shift towards alternative crops are effective. Nonetheless, as with other rice producers, further to infrastructural and input-related aspects, much will depend on the varietal structure of plantings and the adoption of improved seed strains. Efforts to promote production of higher quality but lower yielding varieties could have implications on the future rate of productivity improvements in both countries.

In developed markets, production will stagnate or fall below the base period's level in Korea, Japan, and the European Union, but expand in the United States and Australia, although not exceed the 2010 peak for the United States nor the 2001 peak for Australia. Least Developed Asia – comprised of Myanmar, Cambodia, the Lao People's Democratic Republic, and Bangladesh – are expected to continue to increase their productivity levels as they adopt higher-yield varieties and implement better agricultural practices. While production is expected to increase in many African countries, its full potential will be restrained as the outlook assumes they will continue to rely on rain-fed systems, limited use of inputs, and inadequate farm infrastructure.

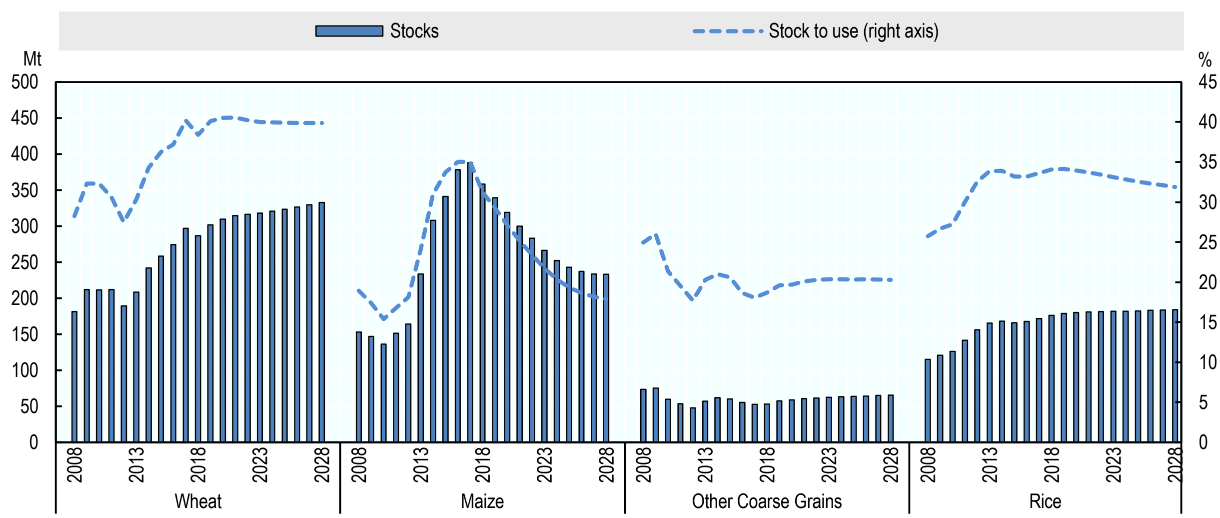
3.5. Consumption

Global consumption of cereals is projected to grow at 1.2% p.a. over the outlook period. This growth is more less than the 2.1% p.a. seen in the previous decade as demand in China, which was responsible for 32% of the growth in the last decade, is expected to be slower and to account for only 22% of the projected increase. In the base period, food consumption accounts for the largest share of global cereals use (42%), followed by feed (37%) and industrial use (21%). Over the outlook period, absolute growth in cereal feed consumption (+156 Mt) is projected to exceed growth in food use (+147 Mt), increasing the share of feed in total consumption slightly by 2028. The bulk of additional food demand is expected to come from Africa and India, where cereal staples remain the main components of national diets and where populations are growing rapidly. In addition, while the average per capita consumption of cereals has reached a saturation level globally, it is increasing robustly in Africa, particularly in Ethiopia with per capita intake gains of about 20 kg per capita and LDC Sub-Saharan Africa with 10 kg per capita. Parts of Asia, particularly India and Indonesia, are projected to add more than 5 kg of cereals to per capita annual consumption by 2028. In Latin America, gains are projected to be more modest at about 6 kg over the projection period.

On the feed side, China is stll expected to account for a considerable share (25%) of the additional demand; however, the Americas, a leading producer and exporter of meat, is expected to increase its feed uptake considerably and to contribute 17% of the additional demand. Southeast Asia, the Middle East, North Africa, and Eastern Europe will see higher feed consumption, driven by expanding livestock and dairy sectors. Finally, growth in the industrial use of cereals, notably in the production of starch and biofuels, will be modest as existing policies will not likely support further expansion.

Wheat consumption is projected to increase by 94 Mt compared to the base period, and to be largely used for human consumption. It is projected that China (+21 Mt), India (+12 Mt), continental Africa (+17 Mt) and the Middle East (+9 Mt), will account for over two-thirds of the increase in total consumption, reflecting their wheat-based diets and growing population. Food use, which will remain stable at about two-thirds of total consumption, will represent 55% of the total demand increase, with the slower increase attributed to the slight decrease in global per capita consumption and moderate pace of population growth. Feed use is also projected to grow more slowly, increasing by 21 Mt compared to the base period as global livestock production slows and maize feed becomes more competitive. Global production of wheat-based ethanol is projected to increase by 3 Mt, supported by efforts in China to boost ethanol production. In the European Union (a major user of wheat in ethanol processing in the past decade), biofuel policies are assumed to no longer support further growth of first generation biofuels. With global wheat production consistently higher than consumption throughout the projection period, the global stocks-to-use ratio is expected to reach 40% in 2028, up 1 percentage point from the base period.

Figure 3.4. World cereal stocks and stocks-to-use ratios



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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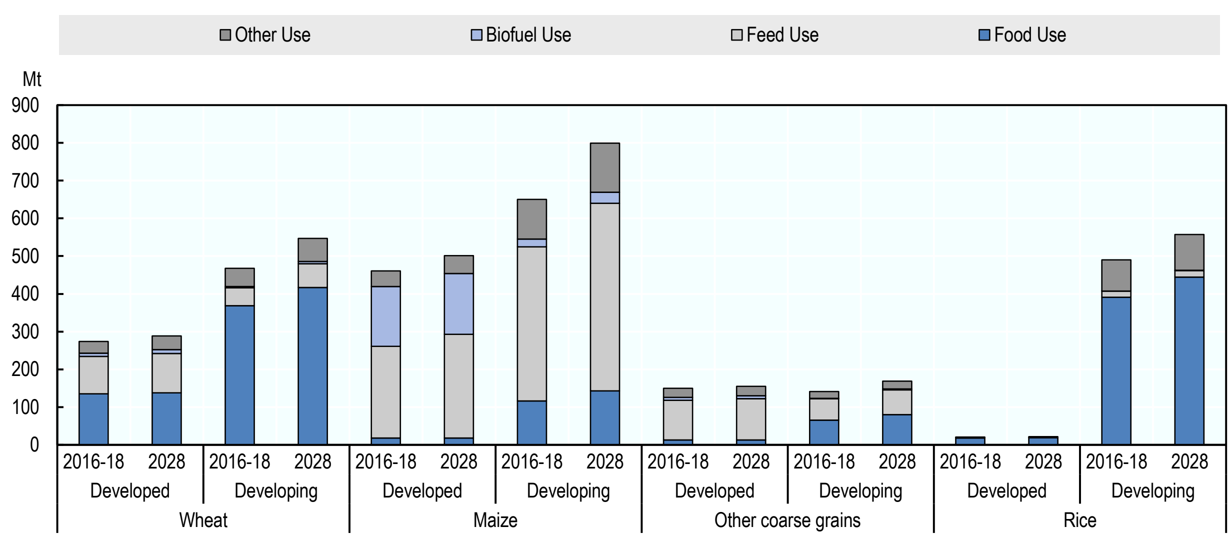
Global maize consumption is projected to increase by 189 Mt over the projection period, a smaller increase compared to the 265 Mt of the previous decade. As maize is principally a feed crop (59% share in the base period), this slower growth is linked to developments in feed demand, which during the outlook period is characterised by gains in feed-use efficiency and slower growth in livestock production. In addition, growth of maize for biofuel production, which more than doubled over the last decade, is expected to be limited, as current biofuel policies will not likely support further expansion in major producers. Of the projected increase, feed use accounts for the largest share (63%), owing to the expanding livestock sectors in China, the Americas, and Southeast Asia. Maize for human consumption is projected to increase by 27 Mt, driven by both population growth and increasing global per capita consumption. Sub-Saharan Africa, where white maize is an important staple and populations are growing rapidly, is projected to have the strongest food consumption growth (+13 Mt).

In 2016, China changed its maize policy, eliminating the market price support system that was in place since 2008. The reasons for the policy change included the need to reduce the extremely large (and deteriorating) maize stocks, unsustainable farming practices, and environmental concerns. As an alternative, China adopted a direct maize subsidy policy and replaced its stockpiling programme with market-oriented purchasing. This *Outlook* assumes this policy change will result in the release of China's accumulated stocks over the projection period, with stocks reaching a more sustainable stocks-to-use ratio of 17% by 2028. Given this assumption, the global stocks-to-use ratios are expected to decline from 34% in the base period to 18% in 2028 (Figure 3.4).

World utilisation of other coarse grains is projected to increase by 32 Mt or 1% p.a. over the outlook period, a faster pace than the 0.5% p.a. seen over the past decade. Similar increases are projected for food and feed use (+14 Mt each). As utilisation in developed countries is expected to remain stable due to slower growth in feed demand, developing countries, particularly those in Africa, are expected to account for a large share of the additional use (Figure 3.5). The main source of growth in African countries is increasing food demand, underpinned by gains in per capita consumption and rapid population growth. On the feed side, countries in the Middle East (particularly Iran and Turkey) and Latin America are expected to contribute substantial shares to the additional use, driven by expanding livestock and poultry sectors. Given that food demand growth is expected to exceed that of feed demand, the food share of global consumption is projected to increase from around 27% in the base period to 29% in 2028. In addition, with utilisation lagging behind production, the global stocks-to-use ratio is projected to increase from 18% in the base period to 20% by 2028.

Figure 3.5. Cereal use in developed and developing countries



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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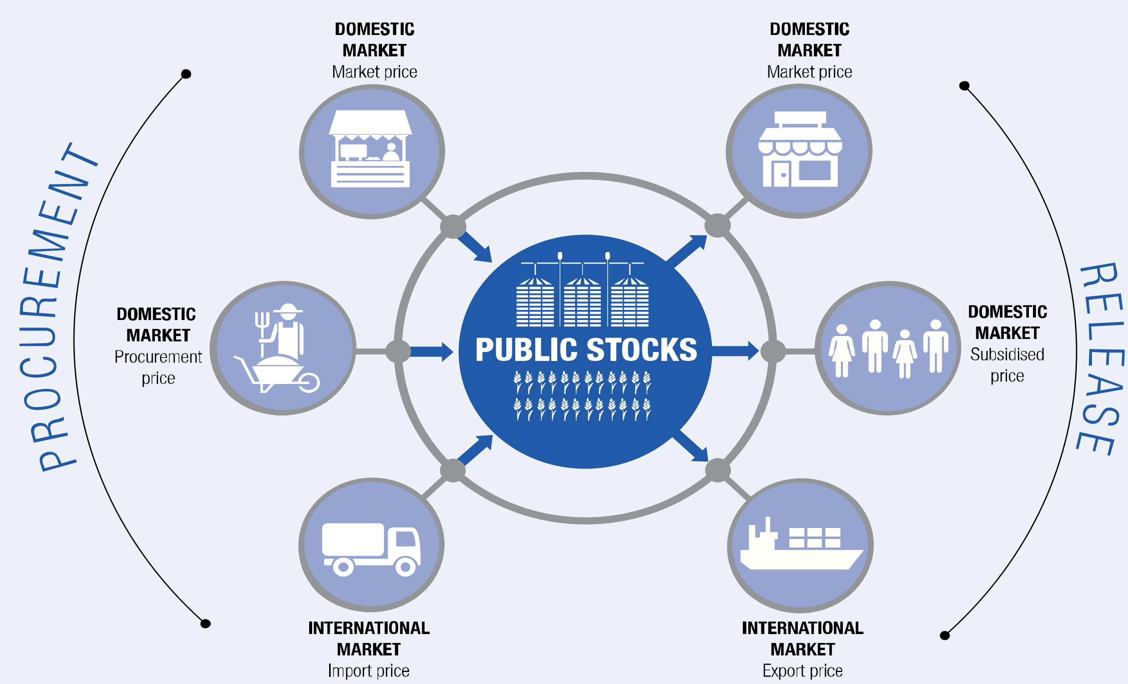
Box 3.1. Economic effects of public stockholding policies for rice in Asia

Over the course of the last decade, a number of countries across the globe have increased their use of public stockholding programmes, whereby the government purchases, stockpiles and distributes staple foods. The objectives of these programmes range from stabilising prices to supporting regular food distribution programmes and providing assistance during transitory food crises. However, not all public stockholding programs are able to achieve these objectives. Most "buffer stock" programmes (public stocks which aim to stabilise prices) have not been successful in reducing price volatility and some have even been found to increase volatility, implying that allocating public funds to these programmes comes at the expense of more effective policies (Deuss, 2015; World Bank, 2012).

In addition to having varying successes in achieving their goals, public stockholding programmes may also have additional and unforeseen impacts on domestic and international markets alike. Effects on prices, production, consumption and trade can, moreover, be compounded by impacts on both public budgets and private sector activity. The extent of these impacts depend not only on the size, but also on the functioning of these programmes; i.e. the channels through which public stocks are procured and released (Figure 3.6).

Figure 3.6. The general functioning of public stockholding programmes



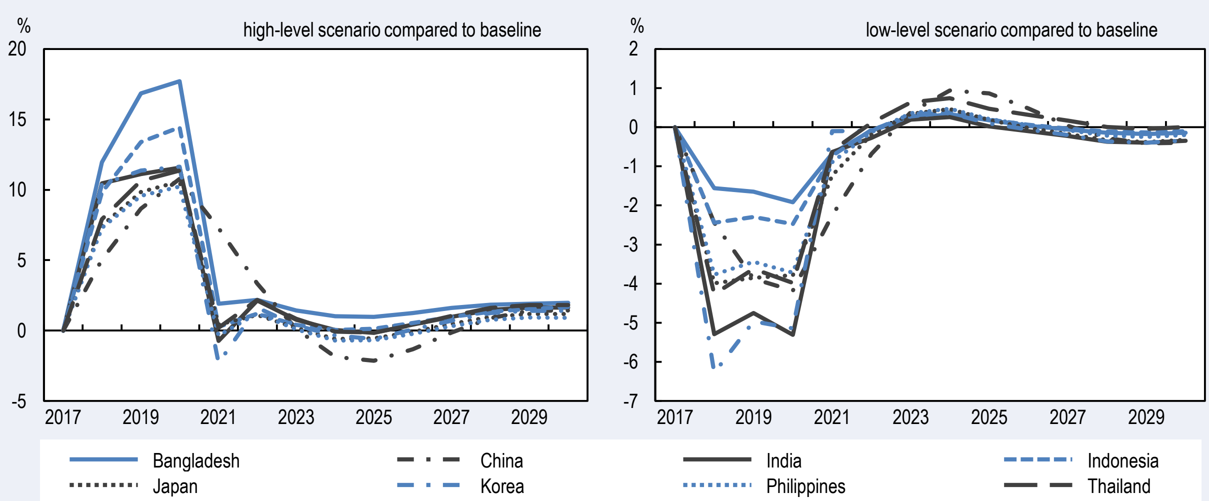
Source: OECD (2018).

The report *The Economic Effects of Public Stockholding Policies for Rice in Asia* (OECD, 2018) compares the functioning of public stockholding programmes for rice in eight Asian countries – Bangladesh, China, India, Indonesia, Japan, Korea, the Philippines, and

Thailand – and examines their economic effects. The analysis simulates, against a baseline of unchanged existing policies, the impacts of a future collective change to a high public stock level ("high-level" scenario) or a low public stock level ("low-level" scenario) in the medium term (2018-2030). The level of public stock norms under the high-level scenario is set at three months of national domestic rice consumption, and at two weeks under the low-level scenario.

The findings reveal that such changes can have extensive impacts on domestic and international markets: under the high-level scenario, the availability of rice on markets would be reduced, leading to higher domestic (Figure 3.7) and international rice prices compared to the baseline, while the reverse would occur under the low-level scenario. These impacts are projected to be most pronounced during the three-year transition period in which changes to the programmes are implemented; nevertheless, there will also be structural impacts that will persist – albeit at a lower intensity – over the medium term. These would not only include shifts in procurement levels (e.g. maintaining higher levels of stocks requires a continued higher procurement) and impacts on domestic and international prices and availability, but also on public expenditure and private stock levels. Under the high-level scenario, for example, private stocks would be lower in the medium term compared to the baseline, as the private sector is crowded out from stockholding activities. The reverse would apply under the low-level scenario.

Figure 3.7. Percentage change in producer prices



Source: OECD simulations using the OECD-FAO Aglink-Cosimo model.

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A final key finding relates to the capacity of public stocks to shield markets from supply shocks. The analysis reveals that whereas maintaining higher levels of public stocks might initially lessen the impact on price and availability from a global production shock, maintaining low levels of public stocks facilitates faster recovery towards the no-shock situation. Furthermore, keeping low levels of public stocks significantly reduces the public expenditure bill, which frees up funds that can be used for other mitigation strategies to deal with (emergency) food shortages.

What should governments do?

When considering changing levels of public stocks, governments should carefully evaluate not only the potential short-term market impacts but also the persisting medium-term impacts on domestic and international markets. Governments should also recognise that increasing public stock levels raises fiscal costs and can discourage private sector engagement in stockholding activities.

Deuss, A. (2015), "Review of the performance and impacts of recent stockholding policies", in *Issues in Agricultural Trade Policy*, OECD Publishing, Paris, https://doi.org/10.1787/9789264233911-5-en.
OECD (2018), *The Economic Effects of Public Stockholding Policies for Rice in Asia*, OECD Publishing, Paris, https://doi.org/10.1787/9789264305366-en.
World Bank (2012), "Using Public Food Grain Stocks to Enhance Food Security", Report No. 71280- GLB, September 2012.

World rice consumption is expected to increase by 67 Mt by 2028. With direct human consumption remaining the main end-use, rice continues to be a major food staple in Asia, Africa, Latin America and the Caribbean. Largely due to population growth over the next decade, total utilisation of rice is projected to expand by about 1.1% p.a. compared with 1.4% p.a. in the last decade. The expected additional consumption is almost entirely attributable to increasing food demand in developing countries (Figure 3.5), particularly in Asia (+35 Mt) and Africa (+17 Mt). Owing to diversification of diets due to higher incomes, per capita rice consumption in most Asian countries, where the majority of production is consumed domestically, is expected to stagnate or rise marginally. The exception is India, where 4 kg are added to the annual per capita consumption over the next ten years, partly driven by the government's social policy to improve food security of vulnerable households through the public distribution of food grains. In Africa, where rice is gaining importance as a major food staple, per capita rice consumption is projected to grow faster, increasing by about 5 kg over the outlook period (Table 3.1). Globally, the average food per capita consumption of rice is projected to increase by 1 kg to reach 55 kg per year. With rice utilisation projected to grow at a slightly faster pace than world supply, the global stocks-to-use ratio is expected decrease marginally, from a high of 34% in the base period to 32% by 2028.

Table 3.1. Rice per capita consumption

KG/person/year

	2016-18	2028	Growth rate (% p.a.)
Africa	26.1	30.7	1.26
Asia and Pacific	77.8	78.7	0.11
North America	12.8	12.9	0.23
Latin America and Caribbean	28.6	28.4	-0.03
Europe	5.8	6.1	0.42

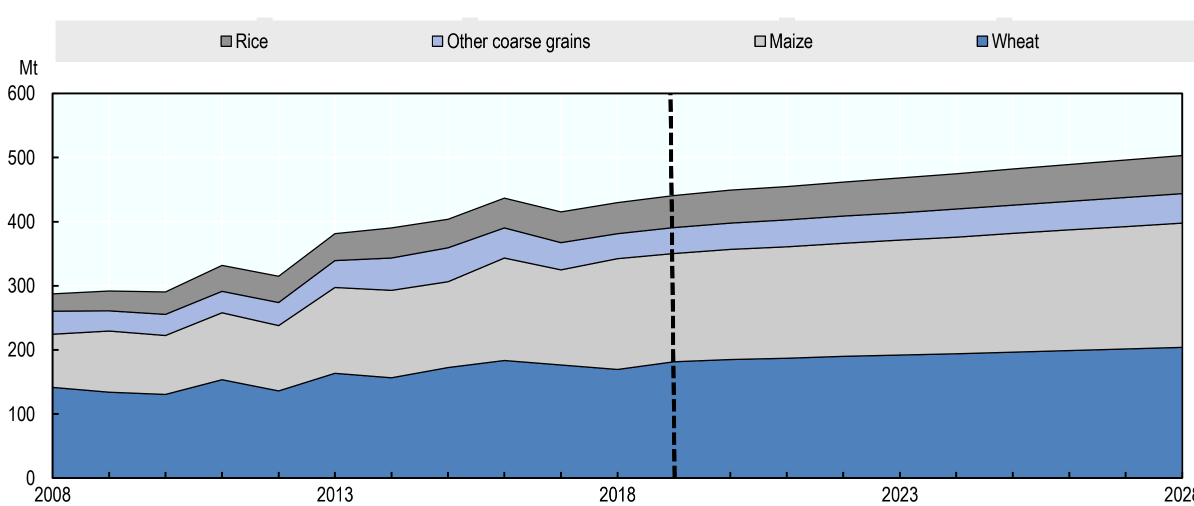
Source: OECD/FAO (2018), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-data-en.

3.6. Trade

World trade in cereals is projected to expand by 76 Mt. over the outlook period to reach 503 Mt by 2028 (Figure 3.8). Consistent with the projected slower growth of demand, cereal trade volumes will grow at 1.5%, a slower pace than the 5.0% p.a. seen over the previous decade keeping the share of trade in global consumption at about 16% throughout the projection period. Generally, the Americas, the Black Sea Region, and Australia will supply cereals to countries within and outside their geographical regions where growing food and feed demands cannot be met domesticallly. This situation is expected to continue over the next decade as the combined export share of the top five cereals exporters is expected to remain stable.

Wheat exports are projected to grow by 27 Mt to 203 Mt by 2028. The Russian Federation surpassed the European Union as the top exporter in 2016, driven by competitive prices and geographical proximity to major importing countries in the Middle East and North Africa. Egypt, the largest wheat importer in the world, recently reduced the protein content requirement of imported wheat, signalling its preference for Black Sea wheat. In the past decade, supply in the major wheat-producing countries of the Black Sea region – the Russian Federation, Kazakhstan, and Ukraine – has been volatile mainly due to yield fluctuations. Nonetheless, production growth has been outpacing consumption growth due to the adoption of improved seed varieties. As a result further increases in production are expected from these countries, increasing their share of global wheat exports (Figure 3.9). The Russian Federation is projected to remain the lead wheat exporter, accounting for about 20% of global wheat exports by 2028, followed by the European Union (15%), the United States (13%), Canada (12%), and Ukraine (11%). The export share of the European Union is expected increase slightly, given its competitive prices, grain quality, and proximity to major export markets in Africa and Asia. Wheat imports are expected to be spread more widely among many importing countries, with the top five – Egypt, Indonesia, Algeria, Brazil, and the Philippines – accounting for a combined share of about 25-27% over the outlook period.

Figure 3.8. Global cereals trade volumes by commodity



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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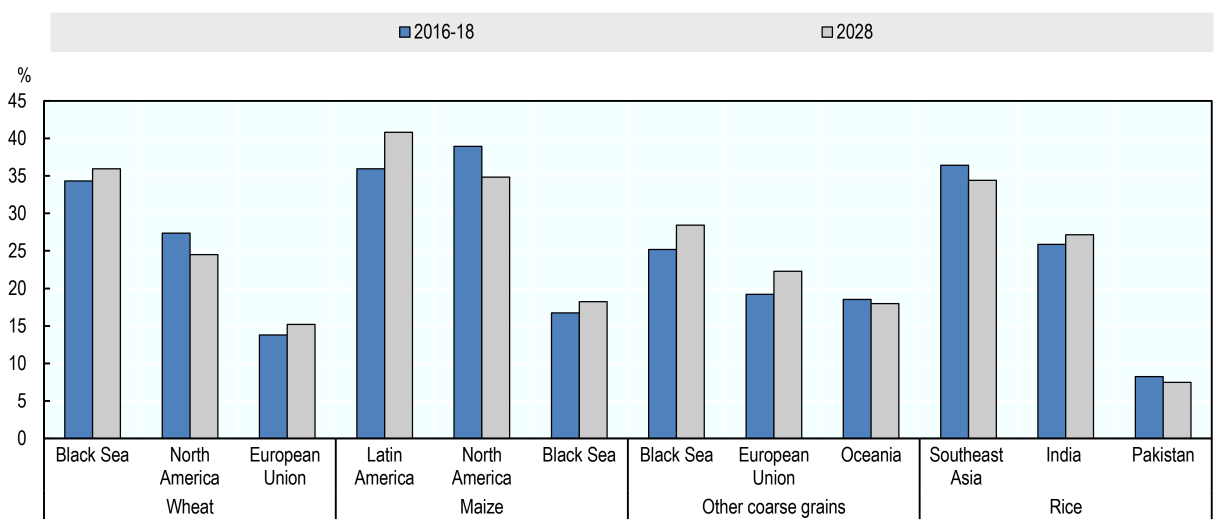
Maize exports are projected to grow by 33 Mt to 193 Mt in 2028. The export share of the top five exporters – the United States, Brazil, Ukraine, Argentina, and the Russian Federation –account for 89% during the base period and will increase to 91% in 2028 due to expected higher exportable supplies in Brazil, Argentina, and the Ukraine. The United States is projected to remain the top maize exporter, with exports increasing by 5 Mt to 66 Mt by 2028, but the US export share will decline (from 38% to 34%) as traders in Southeast Asia signal preferences for South American corn due to perceptions over moisture levels and kernel hardness. As a region, Latin America is projected to increase its export market share from 36% in the base period to 41% in 2028 (Figure 3.9) owing to production gains supported by favourable domestic policies (e.g. loans at preferential rates) and the depreciation of local currencies. It is also expected that the Ukraine and the Russian Federation will be rising maize exporters, given that their domestic supplies are expected to increase faster than domestic consumption, leading to surpluses entering the global market.

Figure 3.9. World export shares of major exporting regions



Note: The Black Sea region comprises of the Russian Federation, Ukraine and Kazakhstan.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The top five destinations for maize during the base period – Mexico, the European Union, Japan, Korea and Egypt – account for 43% of world imports. Viet Nam, which has experienced a surge in maize imports since 2012, is expected to replace Korea to become the fourth largest maize importer, driven by expanding livestock and poultry sectors. Malaysia is expected to further expand imports as it sustains growth in its livestock sectors. In China, given the policy change in 2016 that eliminated the price support system and associated stockpiling programme, growth in maize production is projected to slow down. As stocks decline to more sustainable levels, a tightening of supply is projected to support import growth to a level close to the tariff rate quota of 7.2 Mt in 2028.

Constrained by trade protection measures (particularly in China) and increased competition from maize in feed markets, the international trade volume of other coarse grains, such as barley and sorghum, is projected to increase by only 3 Mt over the outlook period, compared to almost 10 Mt observed in the previous decade. Between 2012 and 2014, China's imports of other coarse grains grew from 2.9 Mt to 20.2 Mt, supported by high domestic maize prices (under the price support system) and limited border restrictions. Since then, the elimination of maize support price and the subsequent release of existing maize stock reserves, together with border tariffs, have reduced imports of other coarse grains into China. In the base period, the top five exporters – the European Union, Australia, Ukraine, Canada, and the United States – account for an export share of 72% of global trade; this share is projected to shrink to 71% as United States sorghum exports are curbed by Chinese import tariffs. Consequently, the Russian Federation is expected to replace the United States as the fifth largest other coarse grains exporter as Russian exports are sustained by preferential access to Iran and countries in Central Asia. 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, the Islamic Republic of Iran, Japan, and the United States – absorb 66% of global trade, with China alone projected to account for 29% in 2028.

Global rice trade growth is projected to be 2.3% p.a. over the outlook period, with the volume exchanged increasing by 12 Mt to 164 Mt in 2028. The export share of the top five rice exporters – India, Thailand, Viet Nam, Pakistan, and the United States – is expected to decrease over the projection period from 77% to 75%. India is expected to remain the world's largest rice exporter of rice, with demand from its traditional African and Near Eastern markets expected to drive export gains. Thailand, whose shipments have traditionally been largely composed of higher quality rice, is projected to remain the second largest rice exporter, while in Viet Nam, expected growth is partly linked to ongoing efforts to diversify the varietal make-up of the country's rice shipments, which could underpin an increase in its deliveries to the Middle East, Africa and East Asia. All three countries could, however, face heightened competition for markets as Chinese rice exports to Africa are projected to expand, and the rise of Cambodia and Myanmar as important rice suppliers are projected to continue over the projection period. Given their competitive prices and the expectation of large exportable supplies, total base period exports of about 4 Mt from these countries is projected to increase to 7 Mt in 2028.

The largest import growth will be in African countries where demand, driven by per capita gains and rapid population growth, is expected to outpace production. Total imports in this region is projected to increase from 17 Mt in the base period to 29 Mt in 2028. This would increase Africa's share of world rice imports from 35% to 49%, and the region would become the prime destination of global rice flows. Nigeria, in particular, is projected to more than double its rice imports by 2028, almost reaching the same import quantities projected for China, the world's largest rice importer. LDC Sub-Saharan Africa is projected to see a steep growth in imports, from 8 Mt in the base period to 14 Mt in 2028. With its large stockpiles and significant efforts to control rice smuggling through its southern border, China's rice imports are expected to decrease slightly; it will remain, however, a large rice outlet during the outlook period. In addition to China and Nigeria, the group of five major importers includes the Philippines, the European Union, and Iran, which together account for about 26% of global rice imports in the base period.

The outlook for the Philippines does not account for the recent replacement of quantitative restrictions on rice imports with import tariffs, following the February 2019 passage of the Republic Act No. 11203. This is so given that implementation aspects of the law are still forthcoming, including those related to public rice stockholding and distribution, as well as those concerning the 10 bln PHP Rice Competitiveness Enhancement Fund it established, and through which assistance to local rice producers will be channelled for six years.

Indica varieties account for the bulk of global rice trade. The Japonica variety, which is cultivated in more temperate climates, represents about 13% of global rice output and roughly 7% of trade. Japan, Korea, Egypt, and Turkey almost exclusively produce and consume the Japonica variety and hence projections for these countries constitute the medium-term outlook for Japonica rice. The largest exporters include the United States, Australia, the European Union and China, where Japonica represents about 21%, 80%, 77% and 35% of rice production respectively. On the import side, northeast Asia (Japan, Korea, and Chinese Taipei) remains the top destination for japonica rice, followed by the Middle East and North Africa region, where import demand is growing. Rice trade is increasingly involving LDC, specifically Asia as an exporter and Africa as an importer. It is a unique case where a group of LDC are expected to contribute to improve the food security of other LDC´s outside their geographical proximity.

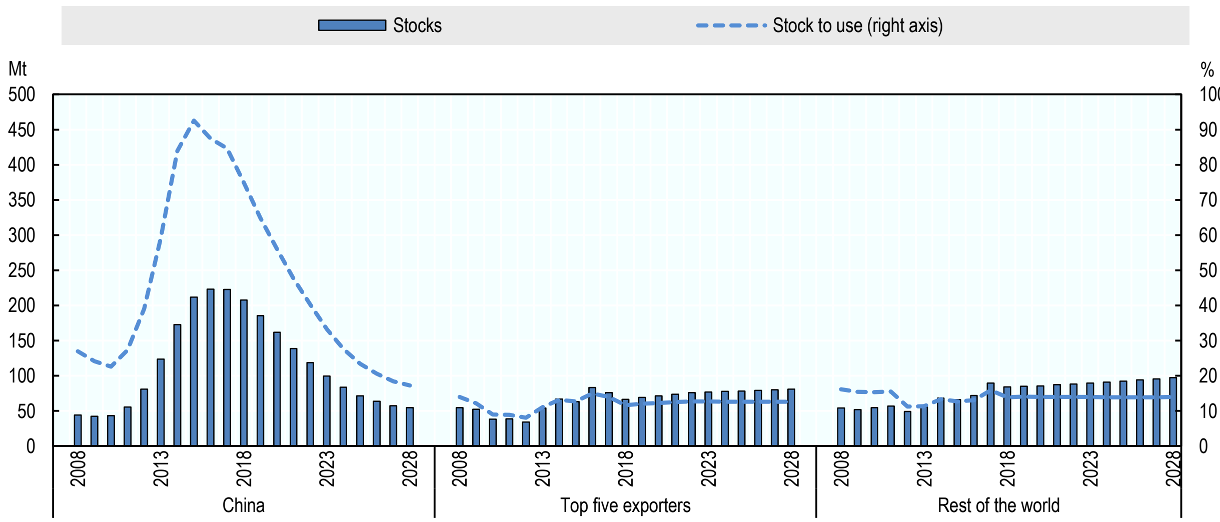
3.7. Main issues and uncertainties

While normal assumptions for weather lead to positive production prospects for the main grain-producing regions, pests, plant diseases and adverse weather events that are accentuated by climate change may cause higher volatility in crop yields, thereby affecting global supplies and prices. Historically, deviations of crop yields from trends have been more pronounced in Australia, Kazakhstan, the Russian Federation, and Ukraine. Crop yields in South American countries, such as Argentina, Brazil, Paraguay and Uruguay, also show high variability. Over the last few years, the increasing participation of the Black Sea region in global cereal markets has decrease some of the risks associated with crop shortages in major exporting countries. Its continued increase in export participation over the next decade may mitigate the risks of volatile yields in certain regions. In addition, the impact of plagues such as the fall army worm, in large producing and exporting countries could be severe for world markets.

The future development of global maize and wheat markets is uncertain since major exporting countries in South America face significant price increases given their assumed exchange rate depreciations. In these countries, international prices could fall in dollar terms, and farmers and export companies could experience rising prices due to their weakening domestic currency, which could stimulate production. Uncertainty in exchange rates in this region could affect production response and exportable supplies.

China's feed demand and its overall level of domestic supplies and associated changes in stocks are among the major uncertainties. At present, a complete and official market balance for China is missing. In 2018, based on its third National Agricultural Census, the Chinese authorities revised crop production estimates, with significant changes reported for maize (+266.0 Mt) in the last ten years. Feed and stocks figures, however, were not provided. In the current baseline, USDA estimates are used, where additional output was distributed between previous estimates of stocks and feed use. Nonetheless, even with this revision, maize production in China has been decreasing over the last three years owing to the 2016 policy change, which replaced the market price support system with a direct maize subsidy programme. It is assumed this policy change will result in the release of China's accumulated stocks over the projection period (Figure 3.10). However, if the actual level of stocks are considerably below the current estimates, there is a possibility that China could become a major maize importer and thereby greatly influence future developments in the global cereal markets. Furthermore, recent changes on the policy implementation to support rice farmers could affect planting decisions that would lead to the release of rice stocks. The magnitude of such a release is uncertain and could divert from the trend assumed in this *Outlook*.

Figure 3.10. Global maize stocks and stocks-to-use ratios



Note: Top five exporters (2016-2018): the United States, Brazil, Argentina, Ukraine and the Russian Federation.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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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, and the United States) may also impact the demand for cereals.

The international trade environment for cereals also faces increasing uncertainty which may influence trade flows. Further trade protection, the resolution of existing trade tensions (e.g. United States-China trade tension), and the emergence of new regional trade agreements may have important implications for future developments in cereal markets.

Chapter 4. Oilseeds and oilseed products

This chapter describes the market situation and highlights the medium-term projections for world oilseed markets for the period 2019-28. Price, production, consumption and trade developments for soybean, other oilseeds, protein meal and vegetable oil are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world oilseed markets during the coming ten years.

4.1. Market situation

The downward trend in vegetable oil prices continued in 2018, with average prices reaching a ten-year low. For oil meals and seeds, however, prices peaked in the first half of 2018, but have since experienced a similar, although less dramatic, decline. The high levels of stocks among major exporters, coupled with market uncertainties related to trade talks between the United States and People's Republic of China (hereafter "China"), have influenced these price trends.

Global soybean production increased in 2018, with the United States and Brazil recording bumper crops, contributing to inventory build-ups. Demand for protein meals has tapered off given China's imposition of additional tariffs on US soybean exports and subsequent moves to lower the share of protein meal in feed rations. African swine fever continued to affect China's livestock sector, curbing feed demand. The government recently also supported to decrease the minimum share of protein in feed rations, which was first proposed by a major industry association.

The vegetable oil sector was characterised by a slowdown in global trade, largely reflecting a decrease in edible oil imports by India in 2018. This resulted from an expansion in domestic oilseeds production, combined with increased import tariffs. Several countries also expanded their crushing capacity, thus increasing their seed imports at the expense of oil and meal purchases. Accordingly, exports by the main suppliers of vegetable oil, such as Indonesia and Malaysia, expanded less than average, leading to rising stocks and lower prices. The combination of these factors led to the introduction of higher biodiesel mandates in Indonesia, which drove domestic take up of palm oil for biodiesel production from 3.5 million litres in 2017 to 5.1 million litres in 2018.

4.2. Projection highlights

During the outlook period, global soybean production is projected to continue to expand at 1.6% p.a., with the expansion of area harvested accounting for 53% of global output growth. With its domestic output reaching 144 Mt by 2028, Brazil will become the world's largest producer, overtaking the United States, for which output is projected to be 121 Mt by 2028. Production of other oilseeds will increase by 1.4% p.a. over the next decade, reflecting slower growth relative to the last ten years, due in part to curbed demand for rapeseed oil as a feedstock in European biodiesel production. Crushing of soybeans and other oilseeds into meal (cake) and oil will continue to dominate usage and increase faster than other uses, such as direct food/feed consumption of soybeans, groundnuts and sunflower seeds. Overall, 91% of world soybean output and 87% of world production of other oilseeds are projected to be crushed in 2028.

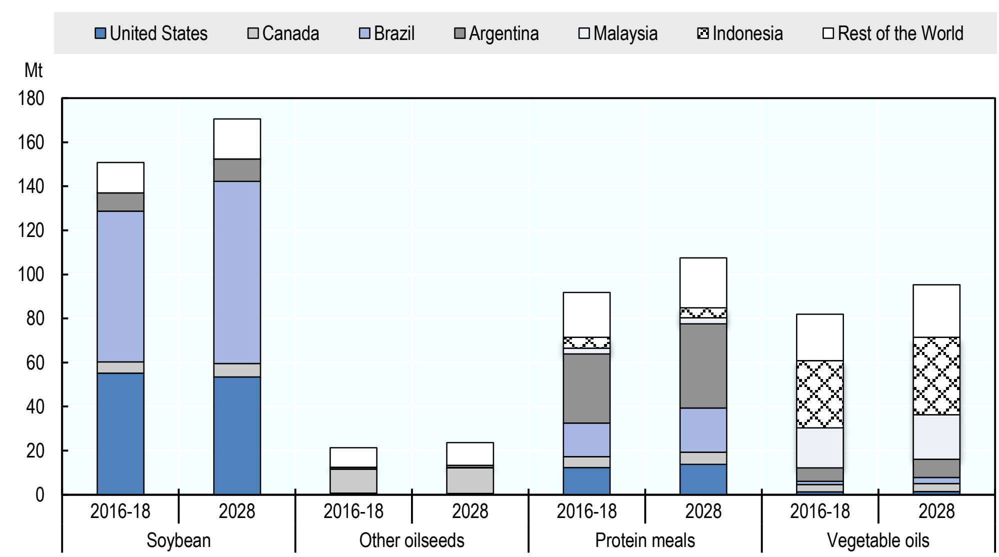
Vegetable oil includes oil obtained from the crushing of soybeans and other oilseeds (about 55% of world vegetable oil production), palm oil (35%), as well as palm kernel, coconut and cottonseed oils. Despite a slowdown in the expansion of the mature oil palm area, significant production growth is projected in Indonesia (4.6 Mt) and Malaysia (2.3 Mt). However, the rise in Indonesia's domestic biodiesel requirement will place pressure on vegetable oil supplies in the medium term. Global demand for vegetable oil will expand by +28 Mt by 2028, which is likely to draw down high inventories and support vegetable oil prices over the outlook period.

Soybean meal dominates protein meal production and consumption. Compared to the past decade, the expansion of protein meal utilisation (1.5% p.a. vs. 4.1% p.a.) will be constrained by slower growth in global production of pork and poultry, and by efforts in China to adopt a lower protein meal share in livestock feed rations. As a result, Chinese protein meal use is projected to grow slightly slower than animal production.

Vegetable oil has one of the highest trade shares (40%) of production of all agricultural commodities. Indonesia and Malaysia, the world's two main suppliers of palm oil – the greatest single component of vegetable oil – will continue to dominate vegetable oil trade (Figure 4.1), exporting over 70% of their combined production and jointly accounting for nearly 60% of global exports.

Growth in world trade of soybeans, dominated by the Americas, is expected to slow considerably in the next decade, a development directly linked to the projected slower growth in the crushing of imported soybeans in China. In parallel, Brazil will consolidate its position as the world's largest exporter of soybean.

Figure 4.1. Exports of oilseeds and oilseed products by region



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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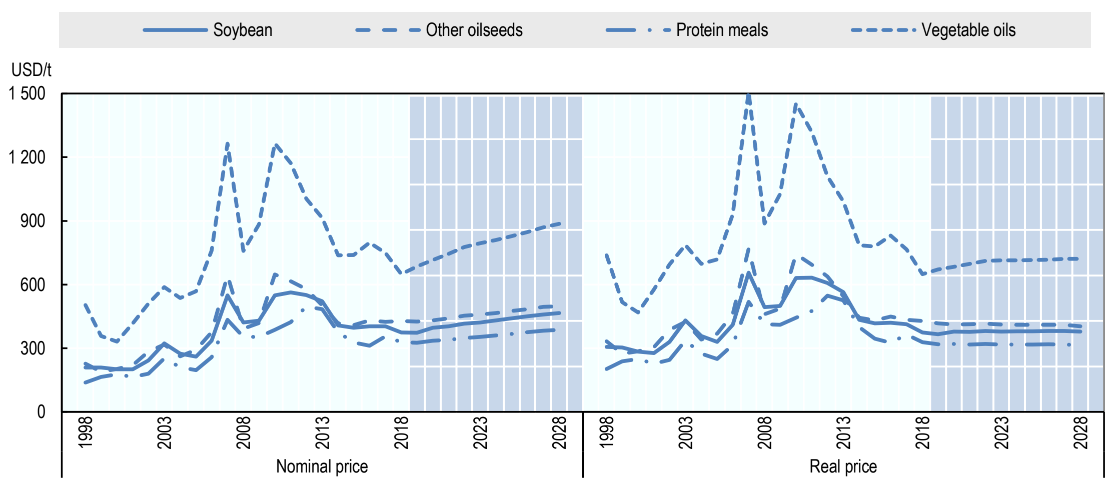
The expansion of soybean production and exports by the United States and Brazil will be subject to the outcome of the ongoing trade negotiations between China and the United States. The scope to increase palm oil output in Indonesia and Malaysia will increasingly depend on replanting activities and accompanying yield improvements (as opposed to area expansion), which in recent years have been sluggish given the low profitability of the sector, the limited scale of public replanting programmes in Indonesia, and rising labour costs in Malaysia. Sustainability concerns also influence the expansion of palm oil output as demand in developed countries favours oils not associated with deforestation and seeks sustainability certifications for vegetable oil used as biodiesel feedstock and, increasingly, for vegetable oils entering the food chain.

4.3. Prices

Vegetable oil prices, which stand at a thirteen-year low in real terms, are expected to begin an upward trend. Prices are set to recover as the ongoing global expansion of food and oleo-chemical demand for vegetable oil coupled with new domestic demand for vegetable oil as a biodiesel feedstock in selected countries, notably Indonesia will bring down its stocks, which currently stand at a ten-year high level. At the same time, production constraints in major palm oil-producing countries will hamper any major expansion of supplies over the next decade, thus consolidating the upward trend of real vegetable oil prices.

Real prices for soybean, other oilseed and protein meals will decline slightly as demand growth is expected to expand slightly slower than global supplies. Real prices will nonetheless remain above historical troughs (Figure 4.2). In nominal terms, prices of oilseeds and oilseed products are expected to rise over the medium term, although they are not expected to attain previous highs.

Figure 4.2. Evolution of world oilseed prices



Note: Soybeans, United States, 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 (2018=1).
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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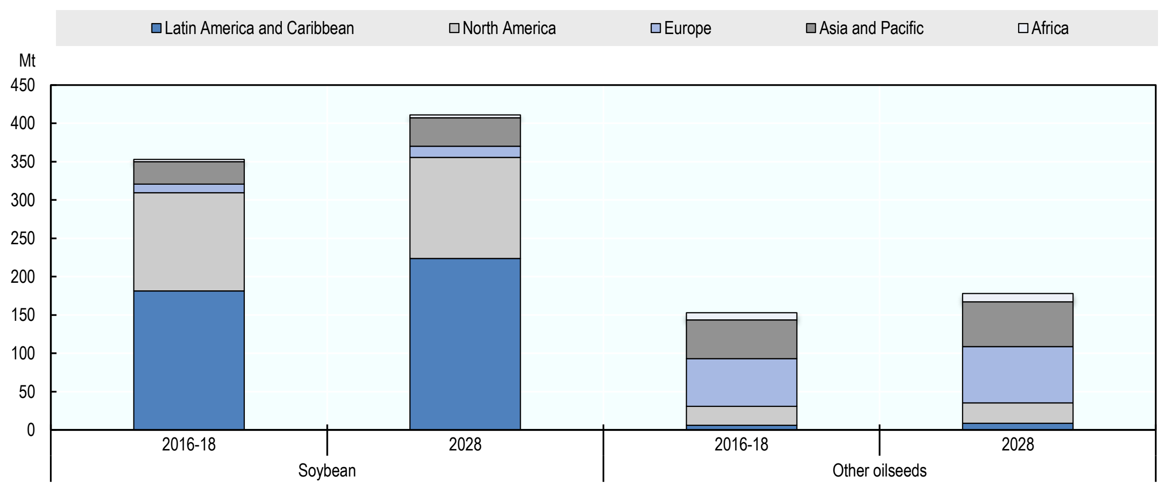
4.4. Oilseed production

The production of soybeans is projected to grow by 1.6% p.a., compared to 4.4% p.a. over the last decade. The production of other oilseeds (rapeseed, sunflower seed, and groundnuts) will grow slower than the production of soybeans, at 1.4% 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 64% of production growth, compared to 46% of overall production growth derived from yields in the case of soybeans.

Brazil and the United States are currently producing similar amounts of soybeans (around 120 Mt in 2016-18), but over the next decade, the projected growth in Brazil (1.8% p.a.)

should be stronger than in the United States (1.2% p.a.), mainly due to the possibility to expand area planted, mainly through crop intensification by double cropping soybean with maize. In addition, assuming that the additional tariffs China recently introduced on United States soybeans remain in place, Brazilian soybeans will enjoy a competitive advantage in the world's largest import market. Overall, the production of soybeans will continue to grow strongly in Latin America, with Argentina and Paraguay producing 62 Mt and 13 Mt by 2028 (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 India, the Russian Federation, Ukraine, and Canada.

Figure 4.3. Oilseed production by region



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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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 2028. However, limited growth in output is projected for both regions (China 1.0% p.a. and European Union 0.6% p.a.) as competitive prices for cereals will generate strong competition for constant to declining arable land. Canada, another major producer and the largest exporter of rapeseed, is projected to increase its production by 1.2% p.a. By contrast, faster growth in other oilseed production is projected for Ukraine and the Russian Federation, in line with the ongoing expansion of the agricultural sector in the Black Sea region. In India, other oilseeds production will expand faster over the next ten years as the government continues to support production in order to respond to domestic demand for vegetable oils and protein meal.

Soybean stocks are expected to remain unchanged, which implies that the world stock-to-use ratio would decline from 12.3% in 2016-18 to 10.7% in 2028. 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.

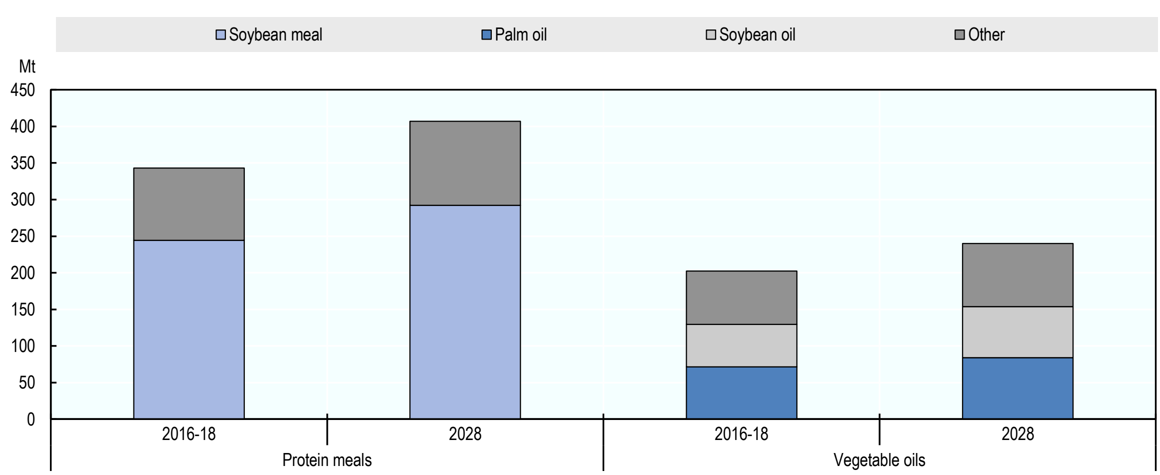
4.5. Oilseed crush and production of vegetable oils and protein meal

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 2028. 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).

In absolute terms, soybean crush expands by 61 Mt over the outlook period, well below the 111 Mt expansion of the previous decade. Chinese soybean crush is expected to increase by 19 Mt, accounting for about 31% of the world's additional soybean crush, the bulk of which will utilise imported soybeans. The growth in China although large is projected to be considerably lower than in the previous decade. Crush of other oilseeds is expected to grow in line with production and its location closer to production compared to soybeans. This implies a much lower trade share for other oilseeds than for soybeans.

Global vegetable oil production depends on both the crush of oilseeds and 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 is expected to weaken slightly over the projection period (Figure 4.4). Production of palm oil is concentrated in Indonesia and Malaysia, which together account for more than one third of world vegetable oil production.

Figure 4.4. Protein meal and vegetable oil production by type



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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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 sustainable agricultural norms (e.g. in the context of the 2030 Agenda for Sustainable Development) are expected to slow the expansion of the oil palm area in Malaysia and Indonesia. This implies that growth in production will be increasingly sourced from productivity improvements, including an acceleration in replanting activities. Palm oil production in other countries is expected to expand more rapidly from a low base, mainly for domestic and regional markets. For example, Thailand is projected to produce 2.9 Mt by 2028, Colombia 2.0 Mt, and Nigeria 1.2 Mt. In certain countries of Central America, niche palm oil production is developing from the outset with global sustainability certifications in place, positioning the region for eventually reaching broader export markets. At the global level, palm oil supplies are projected to expand at an annual rate of 1.8%.

In addition to palm oil and oil extracted from the crush of oilseeds analysed above, 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. Palm kernel oil and coconut oil have important industrial uses, and dominance has shifted towards palm kernel oil along the growing production of palm oil. Cottonseed oil is a by-product of cotton, with global production concentrated largely in India, the United States, Pakistan, and China. Overall, vegetable oil production is expected to increase globally by 1.7% p.a., a higher rate than most agricultural commodities covered in this *Outlook*.

Global protein meal output is projected to expand by 1.6% p.a., reaching 400 Mt by 2028. World production of protein meals is dominated by soybean meal which accounts for more than two-thirds of world protein meal production (Figure 4.4). Production is concentrated in a small group of countries. Argentina, Brazil, China, the European Union, India, and the United States are projected to account for 75% of global production by 2028. In China and the European Union, most protein meal production comes from crushing of imported oilseeds, primarily soybeans from Brazil and the United States.

4.6. Vegetable oil consumption

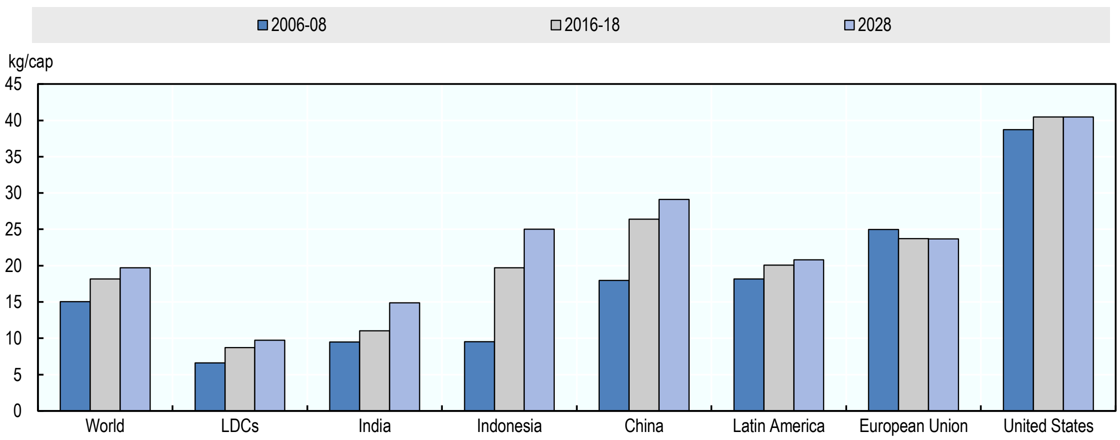
Per capita consumption of vegetable oil for food is projected to grow by 0.9% p.a., which is considerably less than the 2.0% p.a. increase observed during 2009-18. In China (30 kg per capita) and Brazil (24 kg per capita), the per capita level of vegetable oil food availability is set to reach levels comparable to those of developed countries, for which growth in vegetable oil food consumption will level off at 27 kg per capita, growing at 0.4% p.a. (Figure 4.5).

India, the second largest consumer and number one importer of vegetable oil in the world, is projected to maintain a high per capita consumption growth of 3.1% p.a. and to reach 15 kg per capita in 2028. This substantial growth will be the result of both expansion of its domestic production, sourced in the intensification of oilseed cultivation, and a further increase in imports of mainly palm oil from Indonesia and Malaysia. For LDCs, the per capita availability of vegetable oil is projected to increase by 1.2% p.a. to reach 10 kg per capita in 2028.

The uptake of vegetable oil as feedstock for biodiesel will remain unchanged over the next ten years, 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. In addition, used oils, tallow, and other feedstocks are increasing their share in the production of biodiesel largely due to specific policies (see Chapter 9 for more details on biofuels). Argentina is expected to maintain an export-oriented biodiesel industry (more than half of produced biodiesel is exported). Vegetable oil uptake by Argentina's biodiesel industry is projected to be 3.2 Mt by 2028, 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 this is expected to taper off in the coming decade but expected to exceed overall food demand growth for vegetable oil, in part underpinned by support measures to stimulate domestic biodiesel consumption.

Figure 4.5. Per capita food availability of vegetable oil in selected countries



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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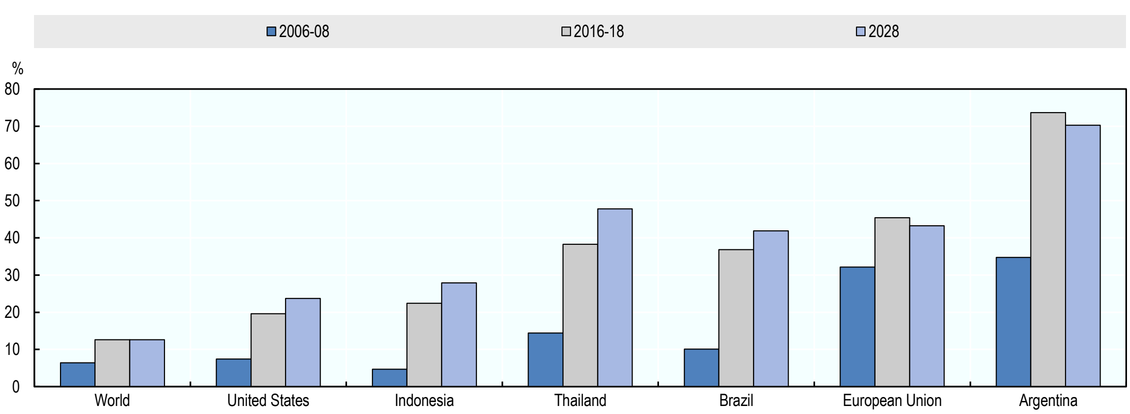
Figure 4.6. Share of vegetable oil used for biodiesel production



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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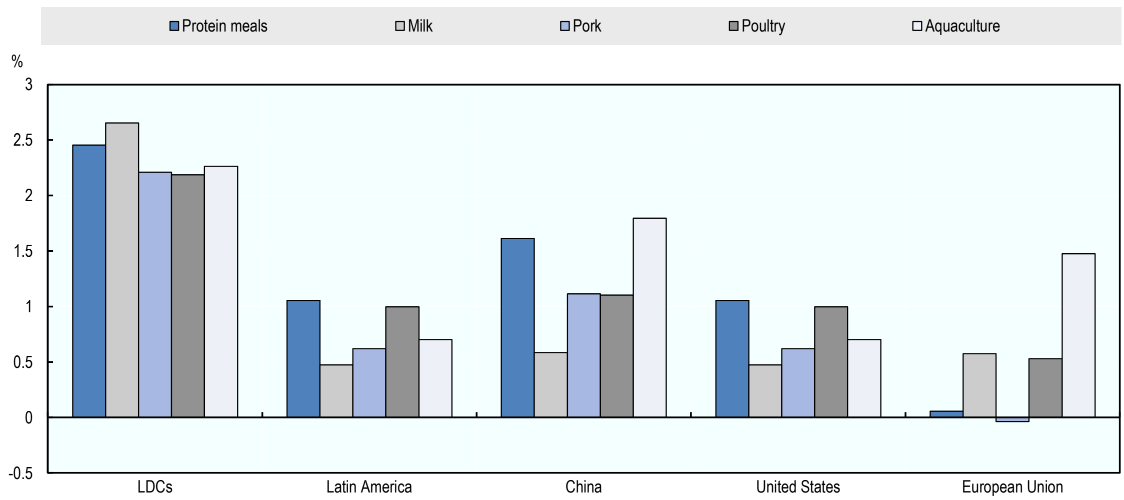
4.7. Protein meal consumption

Protein meal consumption is expected to continue to grow at 1.6% p.a., considerably below the 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, with backyard production characterising lower income producers and industrial production the norm in higher income economies (Figure 4.7).

Figure 4.7. Average annual growth in protein meal consumption and animal production (2019-28)



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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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 very low, intensification in livestock production with more widespread use of commercial feed is expected to continue. The use of protein meal per unit of livestock production should increase considerably leading to fast growth in total demand in these countries. In countries such as the United States and in the European Union, where most animal production is compound feed-based, protein meal consumption are expected to grow at similar rates as for animal production.

Protein meal consumption growth in China is projected to decline from 6.3% p.a. in the last decade to 1.6% p.a. 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 protein meal content in China's compound feed surged in the last decade and considerably exceeds at present the levels found in the United States and European Union. To address this issue, the government of China recently supported a downward revision to the recommended protein content in feed rations which was originally proposed by a major industry association.

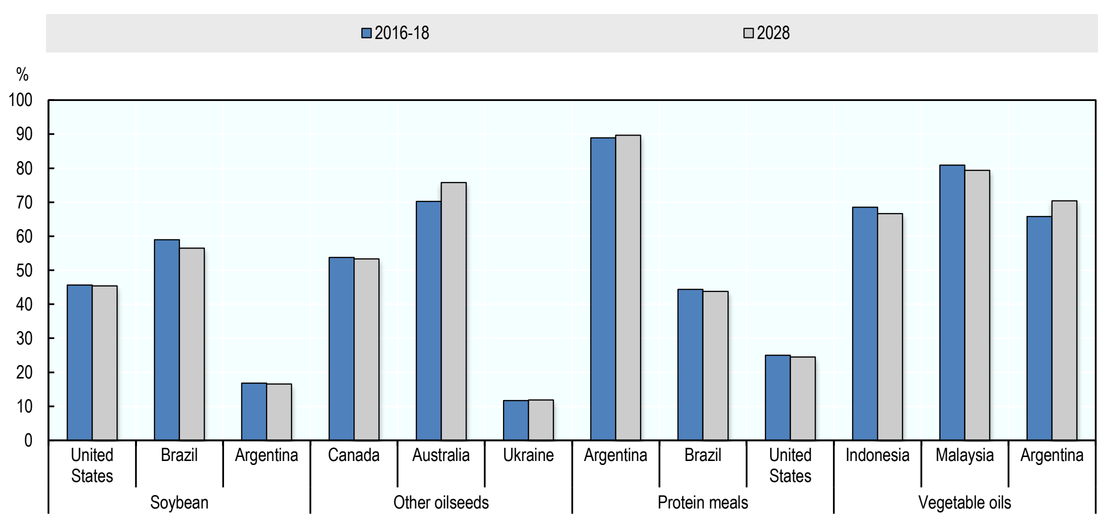
4.8. Trade

Over 40% of world soybean production is traded internationally, a high share compared to other agricultural commodities. 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 1.5% p.a. to about 113 Mt in 2028, accounting for about two-thirds of world soybean imports. Exports of soybeans originate predominately from the Americas; the United States, Brazil and Argentina are projected to account for 87% of world soybean exports in 2028. 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 2028, it is projected that Brazil will account for 42% of total global exports of soybean. This development is favoured by the additional 25% tariffs applied by China on soybean imported from the United States. It is assumed these tariffs will remain in place throughout the outlook period.

For other oilseeds, its share of global production trade is much lower than that for soybeans, at about 14% of world production. Important exporters are Canada, Australia, and Ukraine, which together are projected to account for more than 75% of world exports by 2028. In Canada and Australia, more than half of the other oilseed (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 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 (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933958581

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 outlook period. Argentina is projected to become the third largest exporter (mainly of soybean oil), reaching about 7.9% of the world vegetable oil exports in 2028. In all three countries, it is expected that exports will 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 demand for food, oleochemical and especially biodiesel uses is expected to grow more than exports. India is expected to continue its strong growth in imports at 3.7% p.a., reaching 22 Mt in 2028, or about a quarter of world vegetable oil imports.

The expected growth in world trade of protein meal is around 1.5% p.a. over the outlook period, down from 3.6% p.a. during the last decade, and will be characterised by a declining share of trade in global production. This shift is projected as the global expansion of meat production will be concentrated in the main oilseed-processing countries, where the use of locally-produced protein meal will increase, and thus trade will expand only slightly.

Argentina will remain the largest meal exporter because it is the only major protein meal producer with a clear export orientation. The largest importer is the European Union, with imports projected to remain almost unchanged at 28.1 Mt in 2028. More than half of the 18 Mt global import growth in protein meal will occur in Asia, especially in Viet Nam, Pakistan, and Thailand. Domestic crushing capacity in these countries are not expected to keep pace with protein meal demand, and expansion of the livestock sector will therefore require imported feed to meet production requirements.

4.9. Main issues and uncertainties

The uncertainties common to most commodities (e.g. macroeconomic environment, crude oil prices, and weather conditions) apply to oilseeds and products. 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 expansion of soybean production in the United States and Brazil will be subject to the outcomes of the ongoing trade negotiations between China and the United States, which could result in an expansion of soybean cultivation in Brazil to respond to Chinese demand and the parallel conversion of soybean area to maize in the United States. The evolution of such negotiations could also influence demand for other oilseeds from other origins, replacement effects, and the volume of China’s imports of meals and oils.

Consumer concerns regarding soybeans stem from the high share of soybean production derived from genetically modified seeds. In the European Union in particular, certification schemes of animal products based on feed free of genetically modified products are gaining momentum and may shift feed demand to other protein sources. Environmental concerns are also on the rise, especially with respect to a potential link between deforestation and increasing soybean production in Brazil and Argentina. These concerns have motivated the private sector to incentivise the use of land already cleared for further area expansions. If successful, these voluntary initiatives should discourage further clearing of land by soybean producers.

The scope for increasing palm oil output in Indonesia and Malaysia will increasingly depend on replanting activities and accompanying yield improvements (as opposed to area expansion), which in recent years have been sluggish given the low profitability of the sector, the limited scale of public replanting programmes in Indonesia, and rising labour costs in Malaysia. Sustainability concerns also influence the expansion of palm oil output as demand in developed countries favours deforestation-free oils and seeks sustainability certifications for vegetable oil used as biodiesel feedstock and, increasingly, for vegetable oils entering the food chain.

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 export for Malaysia and Indonesia.

The demand for vegetable oil as feedstock for biodiesel is levelling off after its rapid growth beginning in 2000 when domestic biofuel policies were first implemented in several countries. In the United States, the European Union, and Indonesia these policies remain a source of major uncertainty in the vegetable oil sector given that about 12% of global vegetable oil supplies go to biodiesel production. In the European Union, policy reforms and the emergence of second-generation biofuel technologies will likely prompt a shift away from crop-based feedstocks. In Indonesia, the attainability of the recently proposed 30% biodiesel mandate remains to be seen, in view of the fact that it may impose medium term supply constraints. The development of mineral oil prices, which affects the profitability of biodiesel production, also remains a major source of uncertainty in the vegetable oil sector.

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

This chapter describes the market situation and highlights the medium-term projections for world sugar markets for the period 2019-28. Price, production, consumption and trade developments for sugar beet, sugar cane, sugar, molasses and high-fructose corn syrup are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world sugar markets during the coming ten years.

5.1. Market situation

Following a record production in the 2017 season year (October 2017-September 2018), a smaller surplus is estimated for 2018. The contraction in output is mostly due to unfavourable weather conditions, which negatively affected yields in major producing countries such as India, Thailand, and Europe. For the last two years, India has surpassed Brazil as the world's largest sugar producer. Despite increases in domestic production, the People's Republic of China (hereafter "China") continues to be a major sugar importer.

Although demand growth has slowed in recent years due to a decrease in world population growth rates and increasing concerns over the potential health effects of excessive sugar consumption, growth in sugar intake continues to remain strong in many developing countries, where per capita consumption is relatively low. Sugar inventories are building up in India, following bumper crops, while destocking is taking place in the European Union and the United States, resulting in a relatively stable global stock-to-use ratio.

World nominal sugar prices were relatively depressed for much of the 2017 season, dropping to levels of about ten years ago, underpinned by a supply glut. Prices would have dropped even lower if Brazil had not diverted sugarcane from sugar to ethanol production. However, several sugar exporters such as India, Mexico and Australia experienced an increase of their export prices for much of 2018 due to the appreciation of the US dollar.

5.2. Projection highlights

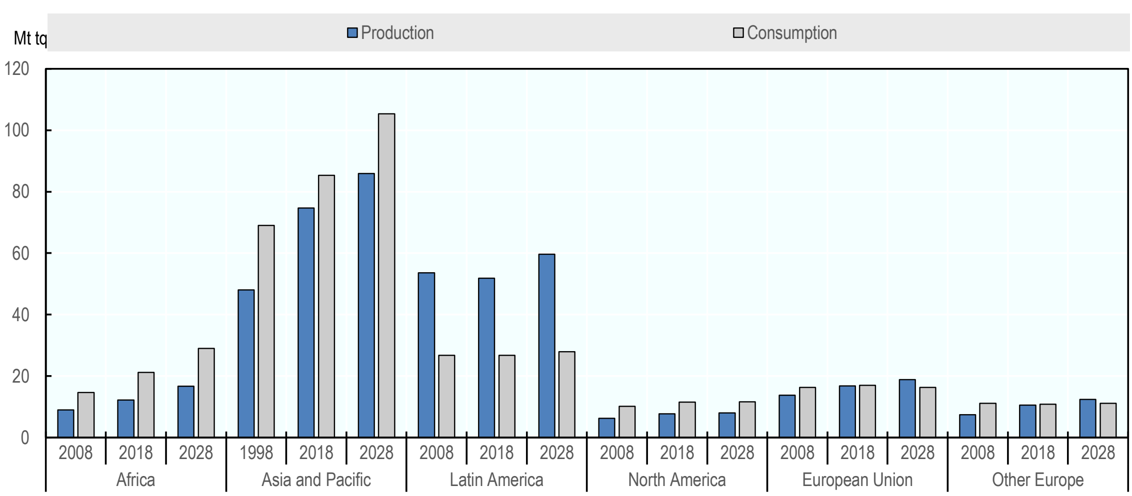
Starting at relatively low levels, raw and white sugar prices in real USD terms are projected to rebound over the next four years and then follow a slight downtrend to return to USD 285/Mt in 2028. Under the assumption of a constant oil price, the profitability of the highly mechanised sugar sub-sector is expected to decrease over time. In nominal USD terms, prices are projected to pursue a moderate upward trend (+1.3% p.a. on average). A relatively tight white sugar premium (difference between white and raw sugar prices) in the 2018 season (USD 70/Mt nominal terms) is expected to widen slightly up to USD 88/Mt over the projection period, but will stay lower than the average of the last decade (USD 93/Mt).

Assuming normal weather conditions, both sugarcane and sugar beet production are foreseen to continue to expand, driven by remunerative returns in comparison to alternative crops and by policies that support sugar or sugar crop-based ethanol production. Sugarcane, cultivated predominantly in tropical and sub-tropical countries in Africa, Asia and Latin America and the Caribbean, will remain the dominant sugar crop (about 86%). Compared to sugar beet, a higher growth in sugarcane yields is foreseen, while areas are expected to expand at the same rate for both crops.

Over the next ten years, global sugar production is projected to expand by 14%, from 178 Mt in the base period (September 2016 to October 2019) to 207 Mt in 2028, with 85% of the projected increase originating in developing countries. The economic assumptions underlying the projections imply that Brazil's sugar export prices remain attractive enough to create productivity gains throughout the sugar value chain. The sugar sub-sector is expected to face increasing competition from the use of sugarcane for ethanol production, despite relatively low oil prices, since Brazil's Renovabio programme (adopted in December 2017) will support ethanol production over the next decade. Brazil is expected to recapture India's recent position as the world's largest sugar producer for two seasons, stabilising for just over a sixth of the world's sugar output (compared to a fourth a decade ago). In absolute terms, and when compared to the base period, major changes in global production are projected in India (+5.7 Mt), Thailand (+3.0 Mt), China (+2.9Mt) and Brazil (+2.5 Mt). Globally, the average annual growth rate of sugar production is foreseen to be slightly lower over the next decade compared to the previous one, especially in OECD countries and the main Asian producers.

Global demand for sugar is expected to rise to 203 Mt in 2028, which is 32 Mt more than in the base period, mainly driven by rising sugar consumption in Asia, Middle East and North Africa. In per capita terms, however, a slowdown is foreseen in those regions and a decline is expected in high consuming countries. Consumption of the main alternative caloric sweetener, high fructose corn syrup (HFCS), is projected to increase by 1.6 Mt to reach 15 Mt in 2028. Sugar and HFCS will continue to represent respectively 80% and 10% of the sweetener market. In several developed countries, and certain developing countries (e.g. Brazil, Egypt, Mexico, Paraguay, South Africa, Turkey), high levels of sugar consumption have raised health concerns (obesity, diabetes, and other associated health issues) to the point of triggering policy actions such as the introduction of taxes on high caloric sweeteners (sugar and HFCS). The effect of such taxes could be more effective if they are part of a broader public health strategy framework, which includes policies to promote balanced diets and physical activity; governments nevertheless gain from higher tax revenues and have started to introduce these taxes over the past few years, including in Asia.

Figure 5.1. Supply and demand of sugar by region



Note: data are expressed on a tel quel basis (tq)
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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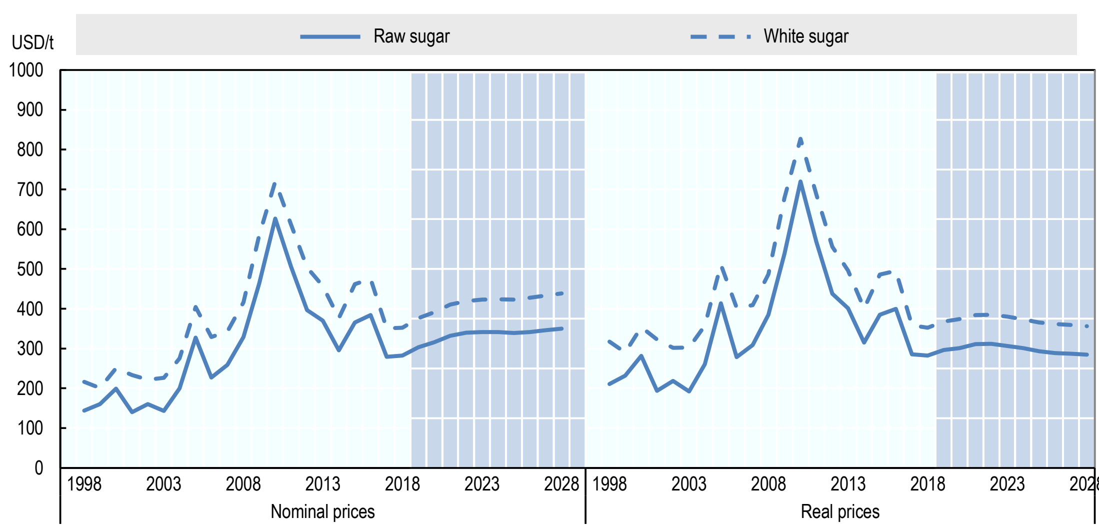
Global policy changes and government-to-government free trade agreements are expected to create new world trade dynamics. Brazil is expected to continue to dominate world trade in sugar; its share of the market, which has declined in recent years, is foreseen to rebound in the early 2020s, but Thailand is expected to remain a major competitor to fill the gap with supplies into expanding markets in Africa, the Middle East, and Asia. Trade tensions between large exporters will continue to dominate the market, with complaints to the WTO over subsidies and other forms of supports likely to persist.

5.3. Prices

Real sugar prices are low at the start of the outlook period and close to the historically low levels that occurred during the bumper crop seasons in 2006, 2014 and 2017. Prices are foreseen to slightly rebound for about four years, sustained by a production that resumes slowly from its current level. For the remainder of the project period, prices are expected to follow a downward trend reaching levels in 2028 that are similar to the current level. This downward trend is driven by an expected slowdown in demand growth over the next decade, even in countries where per capita consumption is low compared to the world average, and abundant sugar supplies. The stocks are not anticipated to increase much and the stock-to-use ratio is expected to return smoothly to below its long-term average of 48%.

Average sugar prices in real terms over the next decade are expected to be lower than the average of the last 20 years, but higher when expressed in nominal terms. By 2028, the nominal world price is projected to be USD 350/t (USD 15.9cts/lb) for raw sugar and USD 438/t (USD 19.9cts/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 increase slowly to USD 88/t in nominal terms at the end of 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.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The phasing out of trade-distorting sugar support policies in some key sugar markets is expected to contribute to a dampening of year-to-year sugar price variations. 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. The renegotiated sugar trade deal between the United States and Mexico, finalised in June 2017, has brought a certain stability to the market. Nonetheless, support programmes that encourage the export of sugar (e.g. India, Pakistan) can have significant negative effects on prices. Reforms on the demand side seem to have less price impact as changes in consumer behaviour are rarely immediate. In general, these reforms refer to sugar taxes on caloric sugar-sweetened beverages that aim to fight obesity and other health-related issues that are already in place in several countries.

5.4. Production

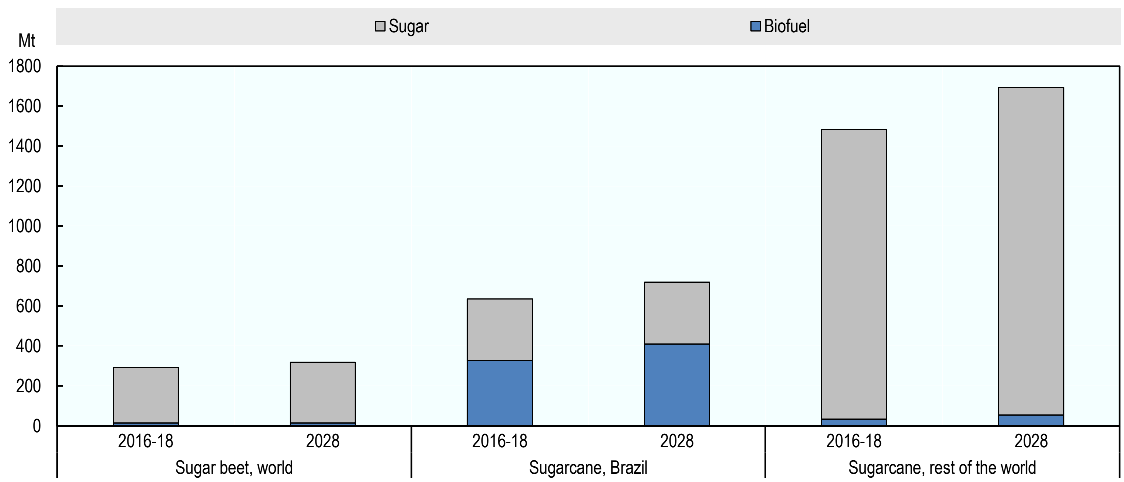
Sugar crop farming is foreseen to expand in many parts of the world, given its specific advantage that allows sugar mills to shift between sugar and ethanol production, depending on their respective remunerative prices. Sugarcane accounts for around 86% of the sugar crops and sugar beet makes up the remainder. Sugarcane is a perennial crop which grows mainly in the tropical and sub-tropical regions. The same plants can be harvested for several years, although at declining yields which makes them less substitutable than annual crops. In addition to sugar and ethanol, sugarcane can also generate derivatives such as electricity (through bagasse surplus) and bioplastics. However it remains a water-intensive crop. Conversely, sugar beet is an annual crop, cultivated mostly in temperate zones. All parts of the crop are used to produce a wide range of products, from food (sugar), feed, bio-based products for the industry (pharmaceuticals, plastics, textiles and chemicals), and ethanol.

Over the outlook period, increases in production for both sugar crops are foreseen to come from higher yields rather than area expansion. Production of sugarcane, the main sugar crop, is projected to grow by 1.3% p.a., slightly lower than during the last decade, with Brazil anticipated to contribute to 44% of the change in global output volume. Prospects are relatively less robust for sugar beet with an anticipated lower production growth (+1% p.a.) compared to the last decade (+2.4% p.a.) (Figure 5.3); some expansion is expected in Egypt, Turkey, the European Union, China, the Russian Federation, and Ukraine. However, in the European Union, the ban on the use of some neonicotinoids that came into effect on 1 January 2019 will contribute to lowering beet yields for a couple of years until acceptable practices are put in place and more pesticide-resistant seeds are used. In the highly supported US sugar sector, where both sugar crops are cultivated, increasing input costs will dampen production growth of sugar beet, while some growth in sugarcane production is expected since this crop is more stable given its perennial nature.

Relative to the base period, the share of sugarcane allocated to sugar production is expected to decline by 4% while it will remain more or less flat in the case of sugar beet. This means that the share of world sugar crops used for world ethanol production is expected to increase from 18% in the base period to 21% in 2028. Brazil will continue to be the main producer of sugar and sugarcane-based ethanol, producing 37% of the world's sugarcane by 2028, which will be used for 18% of global sugar production and 88% of global sugarcane-based ethanol production (versus 19% and 91%, 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 1.7% 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 2028 (compared to 75% during the base period). The leading regions are Asia and Latin America. Asia is projected to expand its share in global production from 39% during the base period to 42% in 2028. Latin America, on the other hand, is expected to play a smaller role in global production, with their share decreasing from 31% during the base period to 29% in 2028. This drop is mostly due to a lower contribution from Brazil, the biggest supplier to the global output. The country has been dealing with persistent indebtedness for the last ten years and this will weigh on the pace of growth of investment in productivity and cane renewal for the coming years. Its sugar sub-sector will also continue to be challenged since more than half of its sugarcane will be used for ethanol production. Brazil's dominance as the world's top producer and exporter will be maintained over the outlook period. At the end of the projection period, sugar production in Brazil is projected to reach 36 Mt (+2.5 Mt compared to the base period, about 3.3 Mt less than the increase foreseen in India).

Figure 5.3. World sugar crops production



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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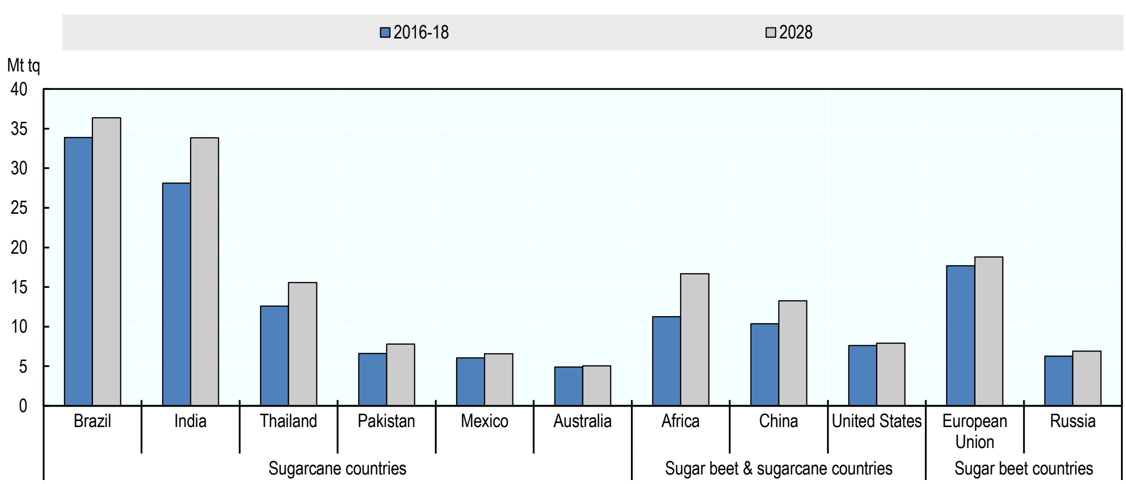
The world's second largest sugar producer is India, where production is expected to expand more steadily, partly driven by renewed public support to the sub-sector. On the back of robust domestic demand for sugar, production is expected to increase by 5.7 Mt over the next decade, reaching 34 Mt in 2028. 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 the fact that sugarcane expansion occurs in areas less suitable for production. Thailand is projected to produce as much as 15.6 Mt by 2028. 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, but production costs are expected to remain high when compared to neighbouring countries. To limit competitive imports, the government increased the out-of-quota duty for some specific countries from 50% to 95% in May 2017, and extended it to all origins as of 1 August 2018. By 2028, sugar production in China is projected to reach 13.3 Mt. In Pakistan, with a government still strongly supporting sugar through guaranteed prices to farmers, production is foreseen to increase but at a much lower growth rate per annum, 2% compared to 6.5% during the last decade to reach 7.8 Mt in 2028.

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 48% to reach 16.7 Mt by the end of 2028 compared to the base period 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 (8% in 2028).

Developed countries accounted for nearly a third of the increase of global sugar output during the last decade. This share, however, is projected to decrease to 15% over the forecast period (Figure 5.4). Whereas production growth in the developing world is projected to be 1.7% p.a., it will be only 1.0% p.a. in the developed world. Relative to the base period, the main increases in developed countries are projected to occur in South Africa and the European Union (each +1.1Mt), the Russian Federation (+0.6Mt), Ukraine (+0.4 Mt), and the United States (+0.3 Mt). The European Union will maintain its position as the world's third largest producer, although production is projected to slow down during the first years of the outlook period due to lower beet yields. Sugar in South Africa is projected to expand, shielded by higher import duties (from USD 566/t to USD 680/t in August 2018); increasing inputs costs and frequent tensions between mills and workers hamper further growth. In the Russian Federation, efforts were made to modernise the industry, increase yields, and daily processing capacities; some consolidation is still expected in the coming years, but the country will remain dependent on weather conditions. Not much change is expected in the United States as the sugar sub-sector remains heavily influenced by government policies that support domestic production. These policies include the Sugar Loan Program that support prices paid to farmers, the Sugar Marketing Allotments to force or to encourage producers to fulfil 85% of domestic consumption, the Feedstock Flexibility Program to divert any sugar surplus to ethanol production rather than sugar loan forfeitures to the USDA's Commodity Credit Corporation, and trade barriers that limit imports (through tariff rate quotas, regional agreements, and Export Limits for Mexico).

Figure 5.4. Sugar production classified by crop



Note: Data are expressed on a tel quel basis (tq)
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World sugar stock levels are relatively high at the beginning of the projection period, due mainly to ample supplies in India, even if the European Union and the United States released some stocks on the market in 2018. Global stocks are expected to increase moderately over the next decade. The global stock-to-use ratio is projected to decline to 43.6% in 2028, from 47.3% in the base period.

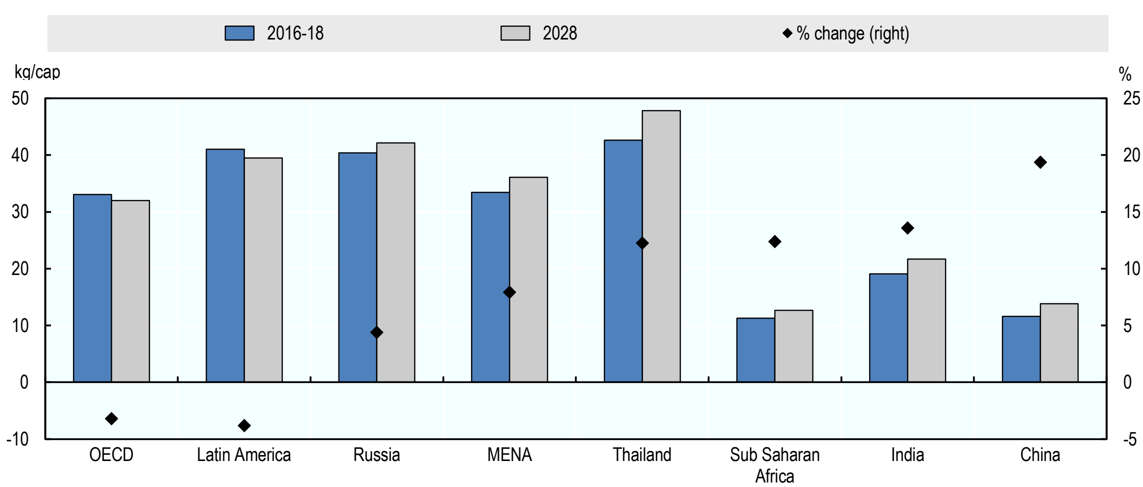
5.5. Consumption

Global sugar consumption is projected to continue growing at around 1.6% p.a., reaching 203 Mt in 2028. It will be influenced by the slight slowdown in population growth, sluggish global economic growth, and rising concerns over the potential effects of excessive sugar consumption. Over the outlook period, the average world level of per capita consumption is expected to increase from 22.7 kg/cap to 24.2 kg/cap, although considerable variations between regions and countries will occur (Figure 5.5).

Increases in global sugar consumption over the next ten years are expected to come mainly from the developing countries, which will account for 98% of the additional demand. The largest contributions to additional demand will occur in Asia (69%) and Africa (27%), 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 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 10 kg per year during the base period, but the annual growth rate in those countries will not change much compared to the last decade as individuals do not favour sweet products and eating habits change slowly. In Africa, the highest increases in total consumption are projected for Egypt and several Sub-Saharan countries, but per capita consumption will remain below 11 kg per year in LDC Sub-Saharan countries and Nigeria.

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



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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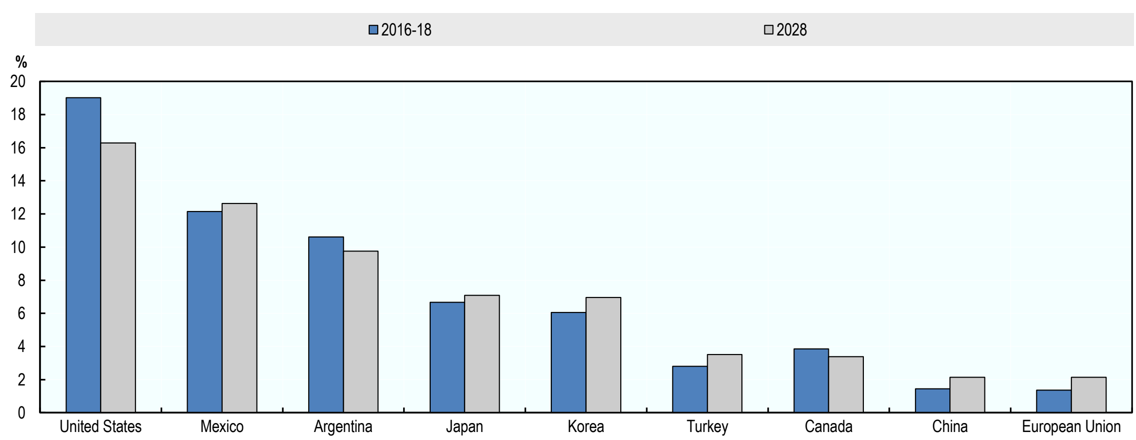
In contrast, the level of sugar intake per person in many developed countries is expected to continue to decline due to increased consciousness of the negative health effects of sugar overconsumption: unhealthy weight gains that raise the risk of diabetes, heart disease and tooth decay. Several countries have implemented taxes on caloric sugary products in an attempt to reduce sugar consumption; Mexico was the first country to do so in 2014. To counteract the effects of these taxes, some multinationals have managed to reduce portion sizes, decrease the amount of caloric sweeteners, or replace the amounts of sugar by the equivalent amount of artificial sweetener, the latter having a sweeter taste but fewer calories than sugar. The decline in sugar consumption of developed countries is foreseen to be strongest in the European Union as its sugar markets will also face competition with isoglucose (HFCS), the starch-based sweetener whose production was limited before September 2017. The reverse is expected to occur in the United States where the share of sugar in per capita caloric sweetener consumption is projected to increase, from 62% during the base period to 64% in 2028, even if sweetener consumption itself is expected to remain stable. The idea that HFCS is potentially more harmful to health than sugar continues to be debated in the country. In the Russian Federation, conversely, sugar demand is anticipated to continue growing based on good prospects for alcoholic drinks (rum and vodka), even if regulations are locally implemented to reduce heavy drinking, and soft and hot drinks. The debate on a possible taxation of sugar is still in progress.

Figure 5.6. Share of per capita HFCS in sweetener consumption for major consuming countries



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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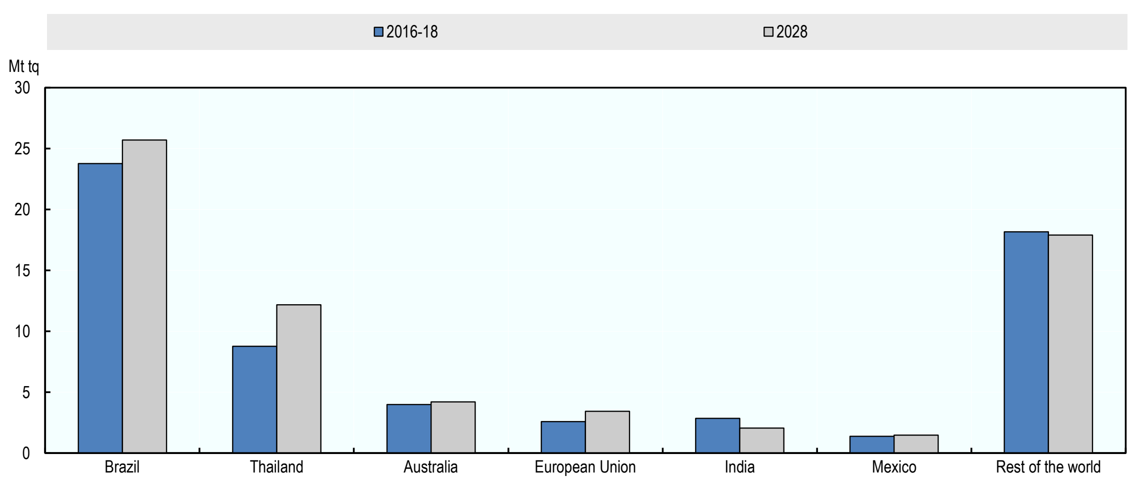
Owing to its competitiveness in sugary soft drinks, HFCS consumption (dry weight) is projected to grow by 12% or 1.6 Mt by 2028. Global consumption will remain limited to a few countries. Like sugar, per capita consumption is assumed to decline in countries where total caloric sugar consumption is high, with China expected to be the main driver of this increase. As the biggest world producer of starch, it is anticipated that China will increase its HFCS supply to fulfil a growing domestic demand. In the European Union, an increase in isoglucose availability was planned following the abolition of the HFCS quota in 2017 in the sugar deficit countries of the region; it is assumed to be less pronounced than predicted due to its relatively higher price compared to sugar. Consumption growth is also expected – to a lesser degree – in Mexico. In the latter, the share of HFCS in the demand for sweeteners is expected to slightly increase over the outlook period due to the fact that companies tend to replace sugar by "less sugar" in their soft drinks, and both HFCS and sugar prices are competing. Conversely, in the United States, the leading HFCS producer, demand for HFCS as a share of global consumption of the product is projected to continue to decline from 48% during the base period to 38% in 2028. This reduced demand is a direct result of the contraction of the market for carbonated soft drinks in the United States due to the desire of some consumers to avoid this sweetener.

5.6. 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 (38% 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 sugar market will be challenged by strong ethanol production. As a result, Brazilian sugar exports are projected to expand by only 2 Mt compared to the base period. In Thailand, the world's second largest sugar exporter, very little ethanol is produced directly from sugarcane (less than 3%); molasses or cassava are used instead. This established Asian competitor will benefit from steady growth in production and is foreseen to continue to gain market share, accounting for 18% of world sugar exports in 2028 versus 14% (9 Mt) during the base period to reach 12 Mt of sugar exports in 2028. In Australia, investments in irrigation, sugarcane area expansion, and increased milling capacity will lead to higher production, which in turn will boost export sales over the medium term.

Figure 5.7. Sugar exports for major countries and regions



Note: Data are expressed on a tel quel basis (tq)
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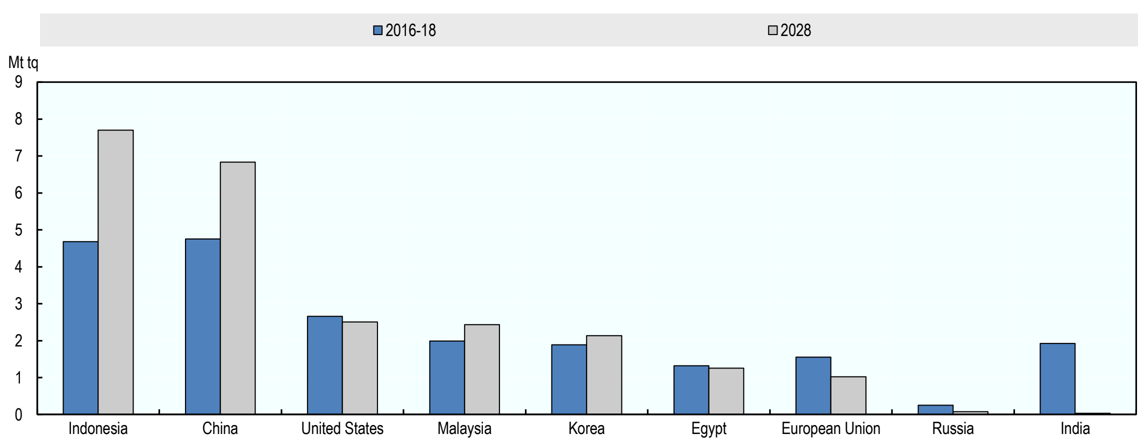
In 1968 the European Union introduced sugar and isoglucose production quotas to guarantee production and prices. These quotas were abolished in 2017, which led to a decrease in domestic prices and freed exports from their WTO subsidised export limit. Over the projection period, an increase of 33% in high quality white sugar exports is projected compared to the base period, even if sold at a premium price. These exports will mainly reach sugar-deficit countries in the MENA and Far East regions, but will face competition from traditional sugarcane refineries in the MENA region.

World sugar imports are more dispersed than exports (Figure 5.7). Based on the outlook projections, Asia and Africa will see the strongest growth in sugar demand and this will influence the growth in imports for these regions. During the base period, China and

Indonesia were the leading importers followed by the United States, Malaysia, India, and Korea. Production increases in India and China will affect the repartition over the next decade, during which Indonesia is expected to become the leading sugar importer, followed by China, the United States, Malaysia and Korea (respectively 7.7 Mt, 6.8 Mt, 2.5 Mt, 2.4 Mt, and 2.1 Mt in 2028). Due to the abolition of the sugar quotas, the European Union has become less attractive for countries that are allowed to ship their sugar despite some regional trade agreements; sugar imports are projected to decrease by 61% over the next ten years to average at 1.0 Mt, versus 2.6 Mt the last decade. The EU HFCS trade will not change much as the production increase occurring 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 environment will lead to a continuation of restricted imports, characterised by tariff rate quota (TRQ) allocations under WTO or free trade agreements (FTAs) as well as limited imports from Mexico due to the US Export Limit (set by the US Department of Commerce). Given the relatively higher sugar prices in the United States, Mexico will continue to export its sugar primarily to the United States. In return, Mexico is expected to resort to US HFCS (+9% or 93 kt by 2028) to fill its demand for sweeteners.

Figure 5.8. Sugar imports for major countries and regions



Note: Data are expressed on a tel quel basis (tq)
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5.7. 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. Domestic sugar markets are also protected with domestic policies that foster production even in a context of relatively low prices. A shock to any of these variables could create significant variability in the market because production is concentrated within a small number of countries.

The projections for Brazil carry some uncertainty due to the ongoing financial consolidation. These projections are also based on the Brazilian real, the appreciation of which could reduce the returns paid to farmers from sales denominated in US dollars. The evolution of biofuel policies and prices in the country could also indirectly affect the sugar markets. In addition, the increased planting of genetically modified sugarcane plants, whose commercial use was approved two years ago, could impact sugarcane yields from 2020 onwards and therefore change the level of production of the sub-products.

The outlook for Thailand is rather positive as the country has benefited from strong investments in the sugar sector during the recent years. However, Thailand is assumed to allocate only a small share of its raw sugar to ethanol production. If this share were to increase, depending on the profitability of both products, this could create some instability on world markets, given the country's large contribution to world sugar exports.

Trade distortions in international sugar markets will persist, which creates additional sources 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 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 continue to use trade policy instruments: high out-of-quota tariffs (China introduced a three-year long safeguard measure in May 2017 on sugar imports from top growers, and which was extended to all origins in August 2018; South Africa increased its import duty in August 2018 to USD 680/t from USD 560/t); adjustments to WTO TRQ and Export Limit for Mexico (United States); transportation subsidies to stimulate exports of sugar and support domestic sugar prices (Pakistan, India); high import tariffs (European Union, Russian Federation, United States); regional trade agreements (NAFTA agreements, European Economic Partnership Agreements and Everything but Arms).

Brexit brings an additional uncertainty for the United Kingdom’s sugar market. If the country manages to negotiate new free trade deals, British refiners (which are the main ones in Europe) could gain when importing their raw sugar product which is exempt from tariffs. Beet farmers, however, would face prohibitive tariffs when exporting to the European Union. Nevertheless, the impact on the global market is expected to remain weak.

Prospects for demand are also uncertain. In view of growing evidence of the detrimental effect of excessive sugar consumption on human health, consumption levels could go down in the future. To fight obesity and other health problems, some governments have already imposed taxes on caloric sweeteners to encourage lower consumption. This could be reinforced over the next decade, although pro-active actions taken by the food industry, such as product reformulation, use of alternative sweeteners, and decreasing portion sizes, could temper the effects on the projections.

Chapter 6. Meat

This chapter describes the market situation and highlights the medium-term projections for world meat markets for the period 2019-28. Price, production, consumption and trade developments for beef and veal, pigmeat, poultry and sheepmeat are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world meat markets during the coming ten years.

6.1. Market situation

World meat production increased by 1.0% to 327 Mt in 2018, reflecting increases in the production of bovine (hereafter "beef"), pig and poultry meats, with very modest gains in sheepmeat. Much of the world meat production increase occurred in Australia, the European Union, the Russian Federation, and the United States, and to a certain extent in Argentina, India, and Mexico. Meat output, however, declined marginally in the People's Republic of China (hereafter "China") and Brazil, two of the largest meat producers in the world, slowing the pace of the overall global increase. Meat output increase is largely attributable to productivity improvements, but in several cases, in particular Australia and the European Union, the higher rate of drought-induced slaughter was a factor. In the case of China, the slower growth in meat output was mainly the result of a decline in pigmeat output due to the outbreak of African Swine Fever (ASF), and the output decline in Brazil was largely caused by a loss of export markets, especially that of the Russian Federation, due to an import embargo triggered by food safety concerns.

Measured by the FAO Meat Price Index, average prices in 2018 were 2.2% lower than in 2017, reflecting the decline in annual average prices of pig and poultry meats, while those of beef remained stable. Sheepmeat prices increased, but due to their smaller volumes, its impact on the Index was limited. The spread of ASF and the consequent import restrictions weighed on international pigmeat price quotations, while generally sluggish import demand caused poultry prices to decline. The international market for beef was characterised by abundant export availability and robust demand, both of which contributed to price stability. Strong import demand, along with limited supplies from Oceania, was behind the strength of sheepmeat prices.

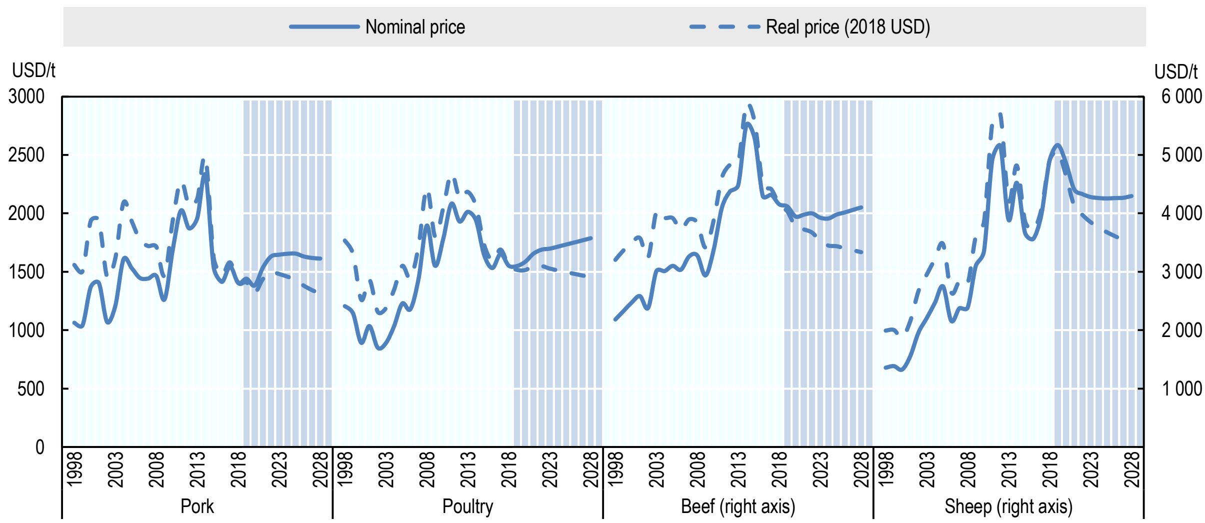
World total meat exports increased to 34 Mt in 2018, up 1.5% from 2017. In 2018, export expansion was mainly driven by increased shipments from Australia, Argentina, Thailand, and the United States, but offset by declines in Brazil and India. On imports, China, the world's largest meat importer, increased its purchases significantly as consumer demand for meat continued to rise amid a contraction in domestic pig meat output.

6.2. Projection highlights

This year's *Outlook* projects that, relative to the base period (average 2016 to 2018), meat prices will decline in real terms over the medium term. This decline is a result of slower growth in meat consumption combined with expanding supply, which will be supported by low feed grain prices relative to the past decade. Although feed costs are projected to rise slowly, meat-to-feed price margins will generally remain within historical levels.

The real price (at 2018 prices) for beef and sheepmeat are projected to decrease the most by 2028 to USD 3336/t and 3493/t carcass weight equivalent (c.w.e.) respectively, while real pigmeat and poultry prices are projected to decline to USD 1 311/t c.w.e. and USD 1 453/t product weight (p.w.), respectively. In nominal terms, all meat prices will increase modestly by 2028, with the exception of sheepmeat as current prices are high relative to historic levels (Figure 6.1). Sheepmeat prices are projected to remain high during the early outlook period as a result of supply constraints in Oceania arising from a combination of drought-induced flock reductions in Australia combined with a strong import demand from China. A projected increase of Australia sheep inventory once the present drought is over will lower sheepmeat prices in the second part of the projection period.

Figure 6.1. World meat prices



Note: US Choice steers, 1 100-1 300 lb c.w.e., Nebraska. New Zealand lamb price c.w.e., all grade average. US Barrows and gilts, National base 51-52% lean c.w.e., Brazil: Export unit value for chicken (f.o.b.) product weight.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933958752

At the global level, growth in demand for animal protein in the next decade is projected to slow down. In light of continued income growth, global meat consumption per capita is projected to increase to 35.1 kg retail weight equivalent (r.w.e.) by 2028, an increase of 0.4 kg r.w.e.or 1.2% compared to the base period.

Historically, lower product prices have contributed to making poultry the meat of choice, particularly for consumers in developing countries. With income growing over the projection period, this will remain true as poultry will constitute the largest share of additional per capita consumption at the global level. At the same time, many consumers are expected to diversify their meat consumption, adding more expensive meat protein such as beef and sheepmeat, thereby supporting gains in per capita consumption of these meat types globally by 2028. Pigmeat consumption per capita, however, is projected to decline over the outlook period, as it is not a significant element in the national diets of several developing countries.

This year's *Outlook* projects continued expansion in meat supply over the next decade. Global meat production is projected to be 13% higher in 2028 relative to the base period, with developing countries projected to account for the vast majority of the total increase. Greater use of a grain-intensive feeding systems in the production process will result in shorter time required to reach heavier carcass weights.

The global cattle inventory has increased over the past few years. This expansion, particularly in the main exporting countries of the Americas such as Argentina, Brazil and the United States, as well as in India in spite of uncertainty regarding cattle slaughter policies, will contribute to an additional supply entering the market in the early years of the projection period. In Australia, beef supply remains tight in the short term as a result of ongoing drought conditions.

Numerous outbreaks of ASF around the world in 2018 are expected to reduce global pigmeat output for 2019. China, the largest producer, was severely affected. This *Outlook* assumes a return to a steady global increase in production from 2021 onwards. Moreover, as the effects of the Avian Influenza (AI) outbreak in China abate in the early years of the projection period, world poultry output growth will return to historic trends. Poultry meat will continue to be the primary driver of meat growth, increasing its share of total meat production over the projection period, but at a slower rate than in the past decade

Production of sheepmeat is also expected to increase at a slower rate when compared to the last decade. Production increases will mostly originate in Asia, led by China, but important production increases are also projected to occur in Africa. In Oceania, a major exporter, production growth is expected to increase slightly, in particular in New Zealand, because of ongoing competition from beef and dairy sector.

Globally, the share of meat output traded is expected to increase marginally over the projection period. It is expected that meat production growth in developing countries will remain insufficient to satisfy demand growth, particularly in Africa. As a result, import demand is expected to remain strong throughout the outlook period.

Globally, animal disease outbreaks (e.g. ASF), sanitary restrictions, and trade policies will remain the main factors that drive the evolution and dynamics in world meat markets. Uncertainties related to existing or future trade agreements over the outlook period (e.g. the United Kingdom's exit from the European Union) could impact and diversify meat trade patterns. Other factors that could influence the meat outlook include consumer preferences and attitudes towards meat consumption with respect to its impacts on health, the environment, and global GHG emissions.

6.3. Prices

Meat prices have declined from recent peaks, in both nominal and real terms (Figure 6.1). Over the outlook period, real meat prices will continue to trend downwards due to slower growth in meat consumption, combined with an expanding supply supported by relative low feed grain prices. The actual path over time will differ by meat type.

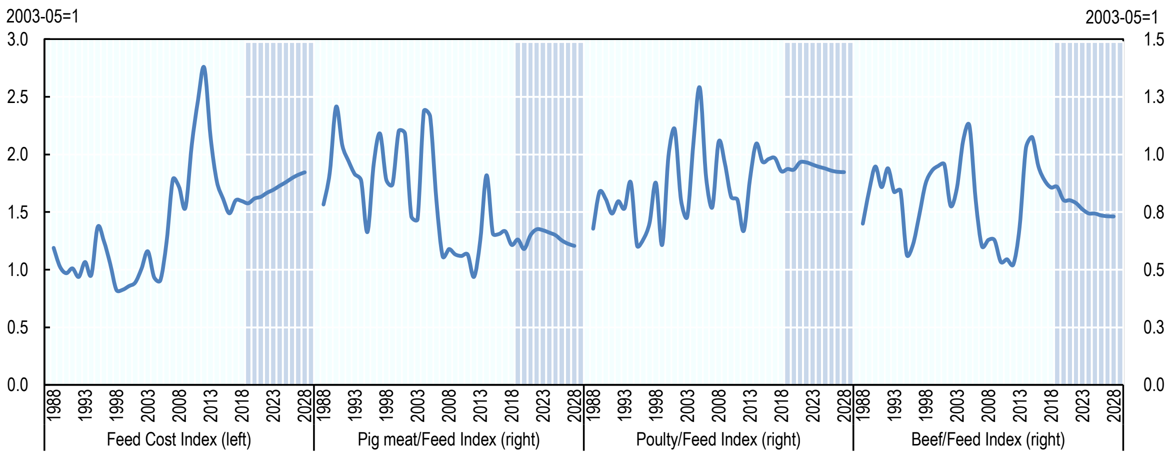
In the short term, real beef prices will decline faster due to the ample beef supply from major producing countries such as Argentina, Brazil, and the United States following a rapid increase in herd inventory. However, as beef cow herds decline and the rate of production growth slows, nominal prices are projected to slowly start to increase.

Pigmeat prices are projected to decrease in real terms but expected to oscillate in a typical cycle for the projection period. Notable features of the global sector that shape this trend are increased supply from Brazil and the United States and higher imports, in particular from China where production has been affected by ASF.

The 2017 spread of AI in China seems to be contained; however, low breeding stock availability will restrict chicken production in the first year of the outlook period. At the global level, a slow increase in poultry flock is projected combined with rising feed costs (Figure 6.2), resulting in a moderate increase in poultry price early in the projection period.

Sheepmeat prices in real terms are expected to remain high until 2020 as contractions in flock will reduce supply and restrict trade of the two leading exporters, Australia and New Zealand. This will keep pressure on global prices in the early years of the projection period. Strong import demand growth from China is expected to subside in the early part of the projection period as the spread of ASF in 2018 resulted in sustained imports of meat protein, including that of sheepmeat.

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



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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6.4. Production

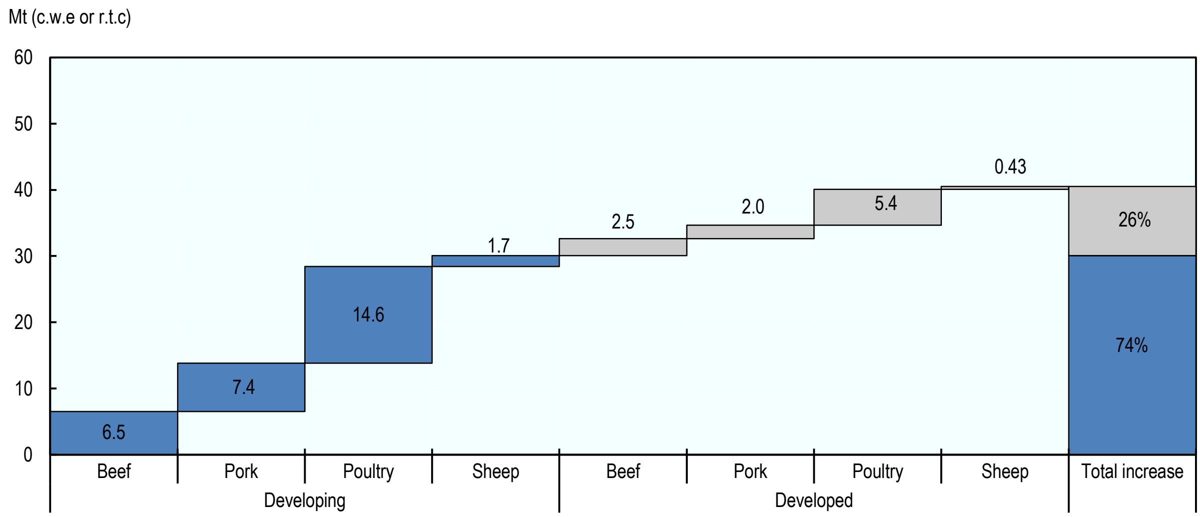
Over the medium term, production will benefit from favourable feed price (Figure 6.2). Inherent differences in the production system imply that favourable meat to feed ratios are more beneficial to certain types of meat than others. For instance, poultry and pigmeat production make the most intensive use of feed in the production system, whereas beef producers have more flexibility to move between intensive and extensive systems. Sheepmeat production is mostly pasture-based and producers benefit less from lower meat to feed price ratios.

Over the course of the outlook period, a combination of herd and flock expansion in the Americas and increased productivity in the region will support a supply-driven market. Poultry meat remains the primary driver of 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.

Total meat production is projected to expand by more than 40 Mt by 2028, reaching nearly 364 Mt. Overall, the bulk of meat production growth is attributed to developing region, which will account for 74% of the additional output, but the increase in production will vary according to the region (Figure 6.3). In the short term, the supply response of the various meat types remain influenced by disease outbreaks in China (poultry and pigmeat), as well as weather-induced sheep flock reductions in Australia. Post-2021, these factors will stabilise, providing a constant yearly increase in the different meat types produced.

Figure 6.3. Growth of meat production by region and meat type

2028 vs 2016-18



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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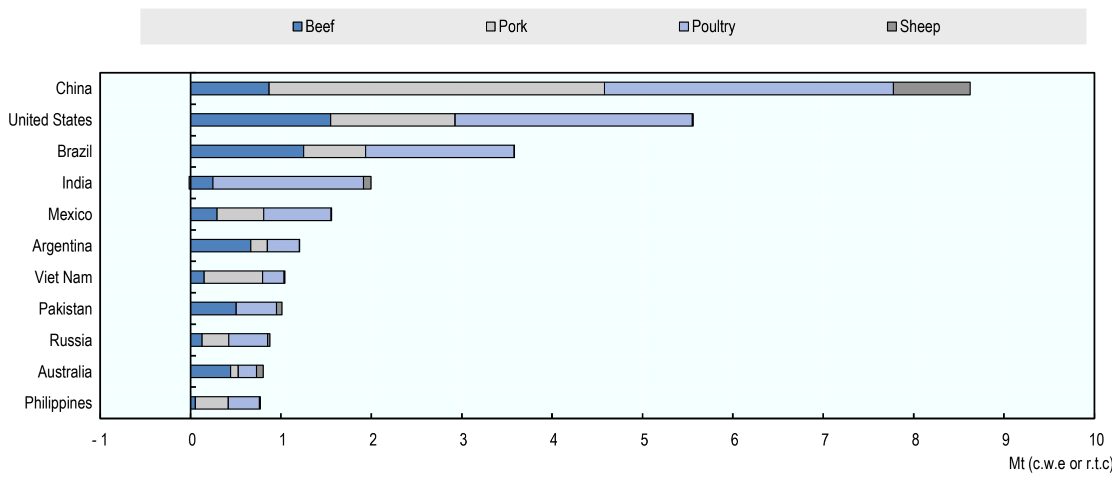
In some developing countries, production growth is supported by increasing productivity in the form of higher carcass weight per livestock unit and improving feed use efficiency. However, productivity in the least developed countries (LDCs) is not projected to improve at the same rate as smallholder structures and lack of investment in the livestock sector will continue to limit technological improvements and commercialisation.

Meat production continues to be dominated by Brazil, China, the European Union, and the United States. Production growth in Brazil will continue to benefit from an abundant supply of natural resources, feed, grassland availability, productivity gains, and to some extent the devaluation of the Real. Production in China will benefit increasingly from growing economies of scale as small production units grow into larger commercial enterprises. The introduction of new environmental regulations has resulted in the disappearance of many smaller farms, with large integrated producers expanding and increasing their market share. The ASF outbreak could accelerate this process as smaller producers could suffer more from an outbreak as they generally have weaker biosecurity measures. Production in the United States will benefit from strong domestic demand and higher slaughter weight, while overall meat production in the European Union will remain relatively stable. However, the European Union share of the different meats will depend on consumer preferences, export potential, and profitability. In the case of beef, changes in the dairy sector will also play an important role.

Other countries with noteworthy potential contributions to additional meat production include: Argentina – stimulated by export opportunities to China and increased domestic poultry consumption; Australia – with seasonal conditions improving for pasture; India – with small poultry producers organised under "contract farming" conditions; Mexico – with the modernisation of its infrastructure, as well as vertical integration and improved genetic and biosecurity; Pakistan – in response to growing export opportunities in the region; the Philippines and Viet Nam – due to rapidly increasing domestic demand (Figure 6.4).

Finally, the meat import ban imposed by the Russian Federation until the end of 2019 combined with the depreciation of its currency have resulted in increased domestic prices. This will continue to stimulate the country's domestic meat production.

Figure 6.4. 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 (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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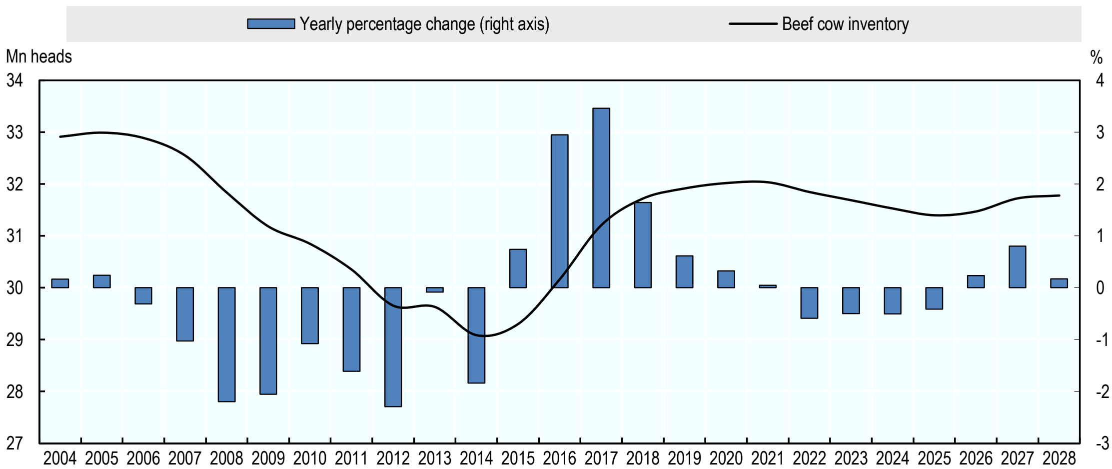
Beef production will continue to grow across the main producing countries over the outlook period (Figure 6.5). In developing countries, it is projected that it will be 17% higher in 2028, relative to the base period. Developing countries are projected to account for 72% of the additional beef produced. The majority of this expansion should occur in Argentina, Brazil, China, Mexico, Pakistan and South Africa. While in developed countries, production is projected to be 8% higher by 2028 compared to the base period, virtually all of this increase will be due to high growth, e.g. in the United States. In the short term, beef production will be supported by both higher carcass weights resulting from low feed costs and improved genetics, as well as increased slaughter numbers as multiple years of herd rebuilding in several producing regions lead to higher livestock numbers. In the United States, the total number of beef cows is projected to increase and reach its peak in 2021. 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-2021.

Whilst the expansion cycle leading to higher cattle inventory in the United States is nearing its end, the herd expansion cycle in other countries, such as Argentina, Brazil, India and Mexico, is still strong and expected to slow down at a later time. Moreover, in spite of the introduction of a temporary export tax on beef in Argentina, higher cattle inventory is expected to increase beef production back to historical levels over the medium term. Production growth is expected in India relative to the past decade amid continued uncertainty regarding cattle slaughter policies. However, beef production in the European Union[1] is expected to enter a downward trend as dairy breeds, which make up approximately two-thirds of the beef supply, will decrease somewhat following productivity gains in the milk sector. There are other factors that will limit the beef sector's growth potential in the European Union, including low profitability, increased competition in the export market, and declining domestic demand which is expected to shift to processed meat and ready-to-eat meals. In the United Kingdom, beef production is also expected to trend down over the outlook period as the price competitiveness of imports is anticipated to put pressure on domestic production.

Figure 6.5. US beef cow inventory



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The increase in global pork production will decelerate over the next decade, largely due to pigmeat not being an important element of national diets in many developing regions. The global increase in pigmeat production will continue to be driven by the Asian region, with China's production growth expected to provide half of the additional global output. Strong production growth rates, aimed mostly at the domestic market, are also expected in Brazil, the United States, and Viet Nam over the outlook period. The European Union's pigmeat production, however, is expected to decline marginally as environmental and public concerns on manure management is expected to limit the expansion of production.

China first emerged as a significant importer of pork during 2007-2008 when the Porcine Respiratory and Reproductive Syndrome (PRRS) epidemic reduced domestic supply. The ASF outbreak in 2018 had a similar impact on China's production growth and leaves an uncertain outlook over the projection period. This *Outlook* assumes that that production will be negatively affected in 2019 (by -5%). For 2020, production and consumption is projected to return to the 2018 level and resume its trend in growth for the remainder of the outlook period. As a result, China will face a supply shortage and its imports are projected to increase to nearly 2 Mt in 2019. With increased tariffs imposed on US exports of pigmeat, Brazil, Canada and the European Union are projected to benefit from China's increased import demand.

Poultry will continue to strengthen its dominant position within the meat complex, accounting for virtually half 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 that produce surplus feed grains, such as Brazil, and from the sustained productivity gains and investment made in the European Union, in particular in Hungary, Poland, Romania, and the United States. Rapid expansion is also foreseen in Asia after 2019, led by China – where the effects of the previous AI outbreak will continue to abate and breeding stock availability is expected to increase - and India, Indonesia, Thailand and Turkey.

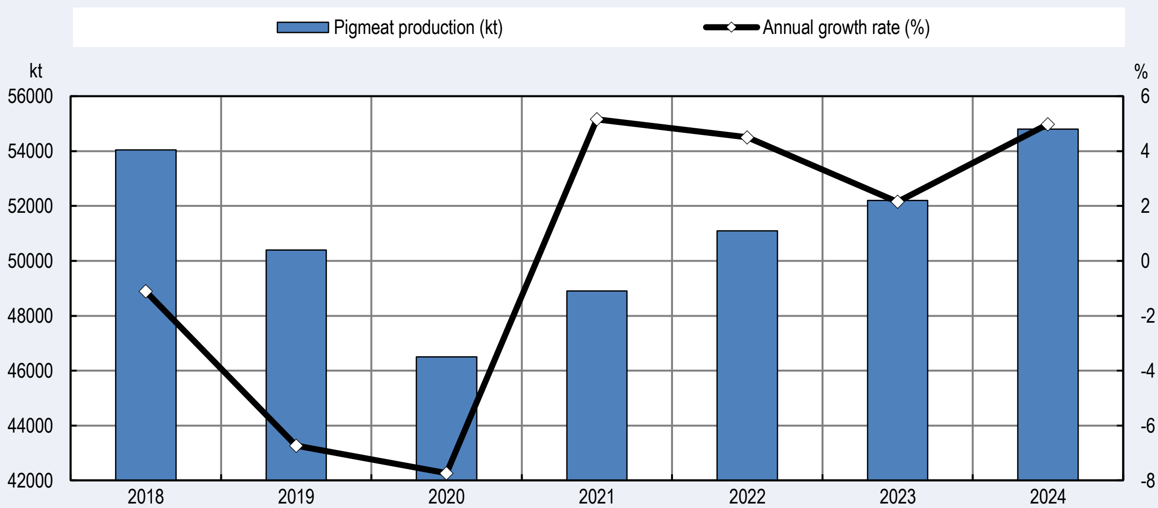
Supply remains constrained in the global sheepmeat market, mainly as a result of flock reductions in Australia, and stagnant production in the United Kingdom. This situation is expected to persist at least through 2019 and while global sheep meat production is expected to recover around 2020, this *Outlook* does not project large flock expansion, with the possible exception of Australia. Chinese producers are projected to increase supply in response to current high prices and will contribute more than 40% of additional production as domestic demand continues to grow. Production in the European Union is projected to increase slightly from the current level, with increased profitability for sheep farms and implementation of voluntary coupled support in the main sheep-producing Member States. The share of Africa in global sheepmeat production will slowly increase despite limitations linked to urbanisation, desertification, and the availability of feed in some countries.

Box 6.1. China's assumptions for African Swine Fever

The Chinese Ministry of Agriculture and Rural Affairs (MARA) released its *China Agricultural Outlook* (2019 – 2028) on 20 April 2019. This report provides projections for agricultural markets that incorporate the effects of the ASF outbreak and the Environment Protection Act, which aims to improve the sustainability of production, on the country's pigmeat market. It is expected that production capacity will decline substantially in the first two years of the outlook period. Import volumes are projected to to reach 2.1 Mt by 2020, an increase of more than 75 % over 2018, in order to make up for the shortfall. This would increase China's share of world imports from 17% in 2018 to about 23% in 2020. Most of the additional pigmeat imports are expected to originate from Brazil, Canada, and the European Union. Production volumes, however, are assumed to recover from 2021 and by 2024 reach the same production quantities as in 2018.

ASF will lead Chinese consumers to turn towards alternative sources of animal protein and, in particular, poultry meat, for which increased production is projected to supply the additional domestic demand. The growth in overall feedstock demand, however, is projected to slow down in the early years of the outlook period despite the increase in poultry production and, in the case of corn, decline in the first two years of the projection period, when Chinese pigmeat production is expected to be declining. This is principally because of the greater amount of feed required to produce a given volume of pigmeat than of poultry. Towards 2028, both the *OECD FAO Agricultural Outlook* and the China *Agricultural Outlook* project that pigmeat production will reach similar levels.

Figure 6.6. China pigmeat production



Note: As reported in the China Agricultural Outlook (2019 - 2028)
Source: Ministry of Agriculture and Rural Affairs (2019), "China Agricultural Outlook (2019 - 2028)".

StatLink http://dx.doi.org/10.1787/888933958847

Note to Box 6.1: For additional information, please see FAO (May, 2019), "African Swine Fever: Challenges for some, opportunities for others?", in *Food Outlook*, FAO publications, Rome.

6.5. Consumption

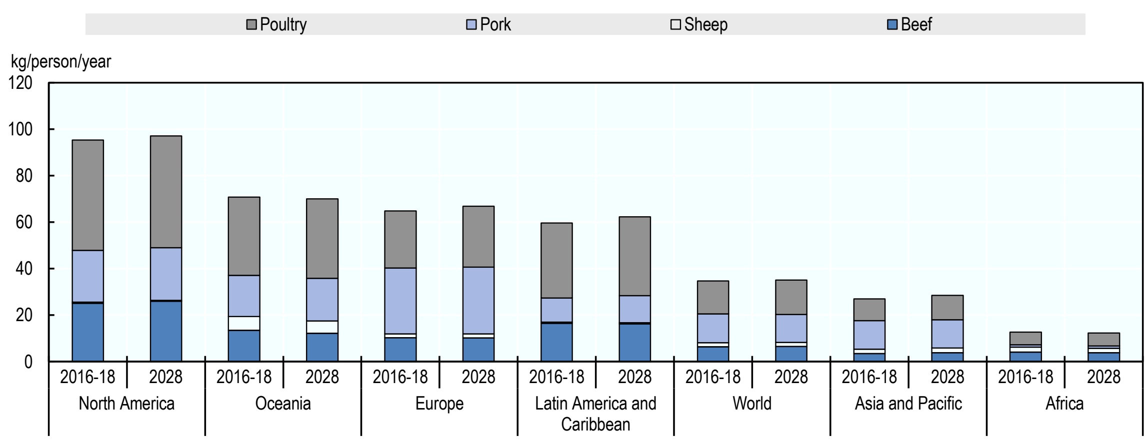
Growth in meat consumption is expected to increase, particularly in Asia, over the outlook period, although growth rates are generally expected to be lower than over the past decade. Over the projection period, global meat consumption per capita is projected to increase 0.4 kg r.w.e. compared to the base period. Growth will stem from a combination of income and population growth, especially in Asian and Latin American countries with large middle classes.

Generally speaking, consumption levels in the developed regions are already high, but meat demand continues to increase as meat become more affordable in some countries. This is particularly visible in the United States, where per capita consumption and meat prices will return to levels similar to those of a decade ago. However, a declining trend in meat consumption can be observed for some countries and growth rates in developed countries are generally expected to be lower than those in the developing countries (Figure 6.7).

Because both the level and growth of population in developing regions is higher, the overall growth in the volume of meat consumption is expected to be approximately four times that of developed countries. However, gains in per capita consumption are expected to remain small, particularly in regions where income growth occurs from a small base. This is evident in Africa, where total consumption growth is faster than any other region despite limited gains in per capita terms. Import demand is also expected to increase at the fastest rate in Africa, while in volume terms half of the global additional increase in meat imports is driven by Asia, where strong consumption growth stems from a combination of population growth and increased consumption per capita due to rising incomes.

Historically, lower product prices have contributed to making poultry and pigmeat the favourite choice for consumers in developing countries, but rising income levels are allowing those same consumers to gradually diversify their meat consumption to more expensive meat varieties such as beef and lamb. In addition to income levels and relative prices, other factors are influencing meat consumption trends, including religious beliefs, cultural norms, urbanisation, environmental, ethical, and health concerns.

Figure 6.7. Per capita meat consumption by region



Note: Per capita is expressed in retail weight.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Beef and buffalo meat consumption will increase gradually over the next ten years. In per capita terms, beef consumption in the developing world is expected to remain low relative to developed countries, at about one-third in volume terms. In Asia, the main driver of growth in beef consumption includes a westernisation of consumer diet, together with a positive perception among Chinese consumers. Increased beef consumption levels are also expected in Kazakhstan, Korea, Turkey, and Viet Nam.

Global pigmeat consumption on a per capita basis is expected to decline slightly 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 fuelled by favourable relative prices that have positioned pork as one of the favoured meats, along with poultry, as the industry is continuously investing in expansion and vertical integration in an effort to meet rising demand from the middle class.. Several Asian countries with favourable economic conditions which traditionally consume pork, such as China, Japan, Korea, and Viet Nam, are increasing consumption on a per capita basis. The European Union consumption of pigmeat, however, is projected to decline as changes in the population structure influences diet in favour of poultry meat.

Consumption of poultry meat is expected to increase globally, independent of income level. Growth rates, however, are expected to remain higher in developing regions with the exception of Saudi Arabia, where the decline is attributed to a number of factors, including weaker income growth since oil prices have decreased, the departure of large numbers of expatriate family members, and the imposition of a ban on electric immobilisation in poultry production which substantially increased retail prices. In China, consumption has recovered from the AI outbreaks and this *Outlook* assumes that growth in consumption will resume in 2019 and return to its historical trend. Among all the additional meat consumed over the projection period, poultry is expected to account for half.

Global sheepmeat consumption encompasses a broad mix of product types and cuisines but generally remains a niche, premium component of many diets. As a result, sheepmeat consumption worldwide on a per capita basis is expected to marginally increase over the projection period. Sheepmeat consumption per capita in Africa, North and Latin America, and Oceania is expected to decline slightly, but is expected to continue to expand in several Asian countries, such as China, where consumers associate sheepmeat with quality and nutritional benefits. With disease outbreaks in both poultry and pigmeat sectors, China's demand for sheepmeat has increased notably the past two years as an alternative animal protein. The projection expects China to represent 40% of all the additional sheepmeat consumed by 2028. In many Middle East countries, however, where sheepmeat is traditionally consumed, per capita consumption is projected to decline slightly. 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.

6.6. Trade

Meat exports at the global level (excluding live animals and processed products) are projected to be 18% higher in 2028 than in the base period. This represents a slowing down of meat trade growth to an annual average rate of 1.4%, compared to 3% during the previous decade. However, the share of total meat output traded on the global market will slightly increase.

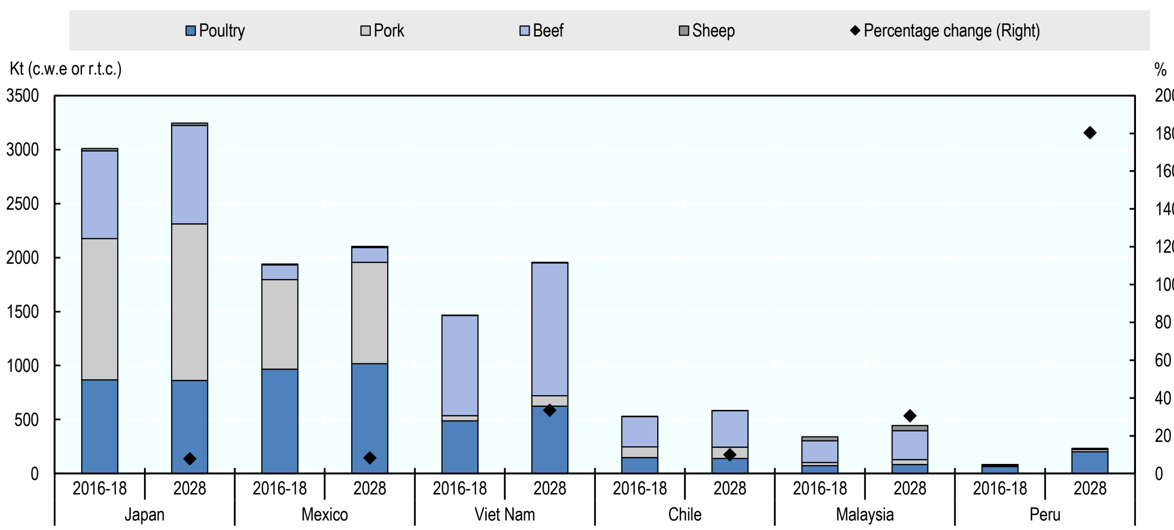
By 2028, developed countries are expected to account for slightly more than half of global meat exports, but their share will decrease steadily relative to the base period owing to faster growth in exports from developing countries. Meat exports are concentrated; the combined share of the two largest meat exporting countries, Brazil and the United States, is expected to increase to around 43%, contributing more than half of the expected increase in global meat exports over the projection period. 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 Latin America, traditional exporting countries are expected to retain a high share of the global meat trade. Argentina, Brazil are expected to increase their share of world meat exports somewhat, benefiting from the depreciation of their currencies.

The Asian region will continue to dominate in the area of meat imports, accounting for 56% of global trade. The greatest increases will originate from the Philippines, along with CPTPP[2] members such as Japan, Malaysia and Viet Nam, where consumption and import growth, supported by favourable economic growth, will outpace domestic production expansion (Figure 6.8). While China imports are not expected to increase substantially over the projection period, they will remain at the high level of the base period. Outside of Asia, Africa is another fast-growing importing region. In the Russian Federation, the long-term effects of the 2014 import ban on meat, which this *Outlook* expects will be removed at the end of 2019, has stimulated domestic production and meat import level are expected to remain lower than before the embargo.

Rising imports over the next decade will be comprised mainly of poultry and beef, with poultry the largest contributor. Together, these two meat types are expected to account for the most of additional meat imports into Asia and African.

Globally, pigmeat imports are projected to account for 16% of the increase in meat imports. Rapid growth in imports from Latin America, where lower income consumers consider pork, along with poultry, as a lower cost alternative to beef, is projected to contribute 33% of the additional import demand of pigmeat by 2028. Developed countries will supply the bulk of additional exports in pigmeat.

Figure 6.8. Meat imports in selected CPTPP countries



Note: c.w.e. is carcass weight equivalent, r.t.c. is ready to cook equivalent.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Sheepmeat exports from Australia and New Zealand have benefitted from broad-based strong demand as it remains a niche, premium component of many diets. Shipments to its three largest markets – the United States, China and the Middle East – broke all records in 2018. Sheepmeat supply has been unable to keep pace with the strong demand from China, which historically was a mutton market but is at present a major destination for lamb. As a result, Australia is expected to continue to increase its lamb production at the expense of mutton. In New Zealand, export growth is projected to be marginal as land use has shifted from sheep farming to dairy.

6.7. Main issues and uncertainties

Trade policies remain a major factor affecting the dynamics of world meat markets. As a result, the implementation of various trade agreements over the outlook period could diversify or consolidate meat trade considerably. Multilateral trade agreements, such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), and their impacts on the meat market is proving difficult to quantify as several other existing bilateral trade agreements have to be considered.

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 2019 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 steep decline in meat imports, higher producer price volatility, and higher consumer prices. Domestic policies also influence the competitiveness of meat producers. For example, Argentina introduced a temporary export tax in 2018 that is applied to meat and other products that are exported. This is expected to negatively impact Argentina's competitiveness on the world meat market and hinder, in the short term, new opportunities for exports. Ongoing negotiation about the exit of the United Kingdom, a major meat producer, from the European Union will also impact the various meat markets according to their current importance in the European Union[3] and the world meat market.

Animal diseases have in the past disrupted poultry, beef and other livestock markets, and have the potential to do so again during the coming decade. A current epidemic affecting livestock production is the African Swine Fever, which is fatal to pigs and wild boars although it does not affect humans. In August 2018, China reported an outbreak of African Swine Fever, the first reported case in the country. In the meantime, the disease has also been detected in other countries in Asia and Europe. The medium-term impact of the disease on global pork production is uncertain. Measures to contain the outbreak are assumed to moderately depress global pork production in the short term. As their success is uncertain, the medium term impact of the epidemic may become more severe than currently anticipated.

Changing consumer preferences – such as the rise in vegetarian or vegan lifestyles, societal concerns such as the negative impact of meat production on the environment, and other various socio-cultural aspects such as those dictated by religion or cultural norms – will also have an impact. The increasing attention of consumers to animal treatment and how meat is produced (with a growing preference for free-range meat and antibiotic-free meat products) are relatively new factors that are difficult to assess. If adopted by an increasing share of the population, they could affect global meat markets, but the extent to which consumers are willing and able to pay a premium for such goods remains unclear.

Notes

[1] (2017) European Commission. "Box 4.1Insights on development in EU member states", *EU Agricultural Outlook for markets and income 2017-2030*.

[2] The rate of import growth is generally expected to be higher than what had been assumed in the past because of the ratification of the CPTPP. This trade agreement, in turn, is expected to have an impact on both the growth rates of domestic production and consumption.

[3] (2018) European Commission "What about the UK?", *EU Agricultural Outlook*, p.69, for markets and income 2018-2030.

Chapter 7. Dairy and dairy products

This chapter describes the market situation and highlights the medium-term projections for world dairy markets for the period 2019-28. Price, production, consumption and trade developments for milk, fresh dairy products, butter, cheese, skimmed milk powder and whole milk powder are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world dairy markets during the coming ten years.

7.1. Market situation

World milk production (81% cow milk, 15% buffalo milk, and a total of 4% for goat, sheep and camel milk combined) grew by 1.6% in 2018 to about 838 Mt. In India, the largest milk producer in the world, production increased by 3.0% to 174 Mt, although this had little impact on the world dairy market as India trades only marginal quantities of milk and dairy products.

The three major dairy product exporters achieved production increases during 2018, the European Union (0.8%), New Zealand (3.2%) and United States (1.1%), that were almost entirely driven by higher milk yields per cow; in New Zealand, favourable grass conditions also played a role. As a result, the availability of fresh dairy products1 and processed products for export increased. In the People's Republic of China (hereafter "China"), the world's largest importer of dairy products, milk production increased for the first time in four years by 1.1% in 2018. Official milk production data for China was revised downward in late 2018 by up to 15% for the last ten years.

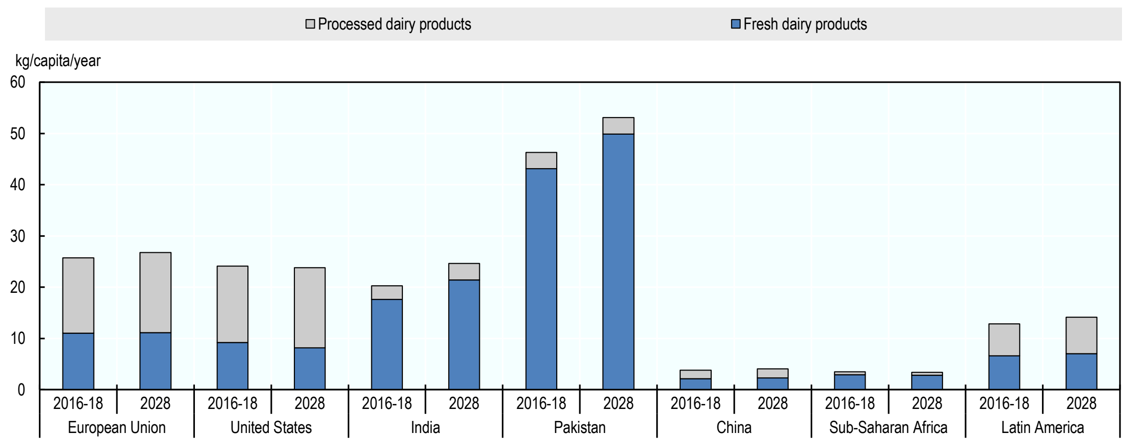
International dairy prices refer to dairy products, as unprocessed milk is practically not traded. Butter is the reference for milk fat and skim milk powder (SMP) for other milk solids. Milk fat and other milk solids together account for about 13% of the weight of milk, with the remainder being water. In 2018, butter prices declined compared to its record 2017 levels but showed a significant increase around the middle of the year. The strength of milk fat prices (butter) in contrast to the prices of other milk solids (SMP) continued in 2018, supported by strong demand in North America and Europe for cream, butter and other full-fat milk products. SMP prices started to recover from low levels towards the end of 2018 as the European Union considerably reduced its intervention stocks, purchased mainly in 2016 when European Union prices fell below the set threshold of EUR 1 698 per tonne.

7.2. Projection highlights

World milk production is expected to grow at 1.7% p.a. (to 981 Mt by 2028) over the next decade, faster than most other main agricultural commodities. In contrast to the previous decade, the projected growth of cowherds (1.2% p.a.) is higher than the projected average yield growth (0.4%) as cow herds are projected to grow faster in countries with low yields. It is expected that India and Pakistan, important milk producers, will contribute more than half of the growth in world milk production over the next ten years, and to account for more than 30% of world production in 2028. Production in the second largest milk producer, the European Union, is projected to grow more slowly than the world average as only a small share of production is exported and domestic demand is growing only slightly.

Milk is a highly perishable product and requires to be processed shortly after collection. It cannot be stored for more than a few days. Nevertheless, most of dairy production is consumed in the form of fresh dairy products, which are not or only slightly processed. The share of fresh dairy products in world consumption is expected to increase over the coming decade due to strong demand growth in developing countries, driven by income and population growth. World per capita consumption of fresh dairy products is projected to increase by 1.0% p.a. over the coming decade, slightly faster than over the past ten years, driven by higher per-capita income growth, especially in India. In Europe and North America, overall per capita demand for fresh dairy products is declining, but the composition of demand has been shifting for several years towards dairy fat. The majority of cheese consumption, the second most important dairy product in terms of milk solids, occurs in Europe and North America, where per capita consumption is expected to continue to increase.

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 dairy products include butter cheese, skim milk powder and whole milk powder.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Milk is internationally traded mainly in the form of processed dairy products. China consumes small amounts of dairy per person but is the most important importer of dairy products, especially of whole milk powder (WMP). Japan, the Russian Federation, Mexico, and the Middle East and North Africa are other important net importers of dairy products. International trade agreements (e.g. CPTPP, CETA, and the preferential trade agreement between Japan and the European Union) have specific arrangements for dairy products (e.g. tariff rate quotas) which create opportunities for further trade growth.

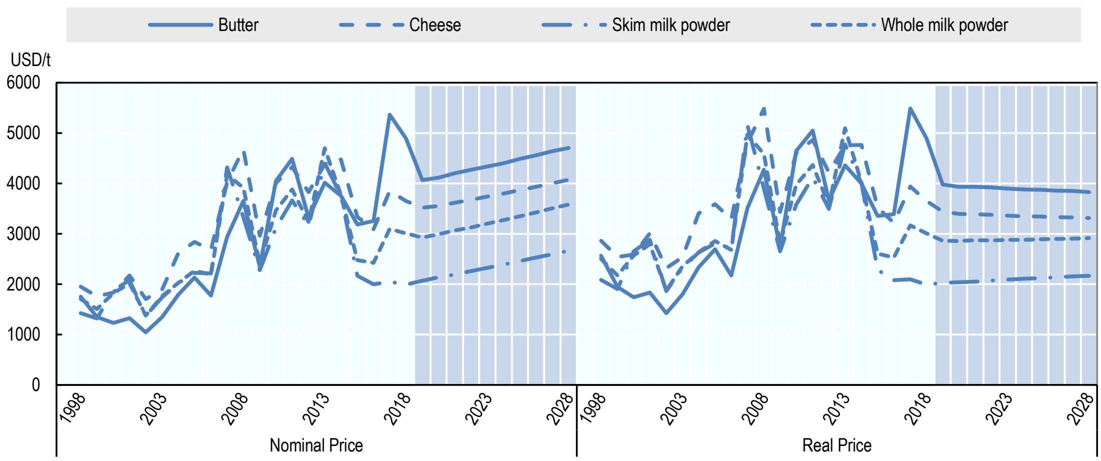
Since 2015, the price of butter is considerably higher than SMP prices. This development is attributed to stronger demand for milk fat compared to other milk solids on the international market and is assumed to be a structural feature over the coming decade.

Dairy trade flows could be substantially altered by changes in the trade environment. For example, large amounts of cheese and other dairy products are traded between the European Union and the United Kingdom, and this could be affected by Brexit, while the USMCA is expected to influence dairy trade flows in North America. So far the big dairy consuming countries, India and Pakistan, are not integrated in the international market. Greater engagement in trade by these countries could have a substantial effect on world markets.

7.3. Prices

International reference prices for dairy refer to processed products of the main exporters in Oceania and Europe. The two main reference prices for dairy are for butter and SMP. Since 2015, the prices of butter have increased considerably more than SMP prices due largely to stronger demand for milk fat compared to other milk solids on the international market. This is expected to continue over the coming decade (Figure 7.2).

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 (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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SMP prices are currently at a relatively low level and are projected to increase in real terms over the projection period. High intervention stocks in the European Union stalled this price increase, but these were almost entirely released in the second half of 2018 and the beginning of 2019. Annual butter prices peaked historically in 2017 and have been on the decline since. Butter prices are projected to decline slightly in real terms in line with most other agricultural commodities over the projection period. World prices for whole milk powder (WMP) and cheese are expected as functions of butter and SMP price developments, in line with the respective content of fat and non-fat solids.

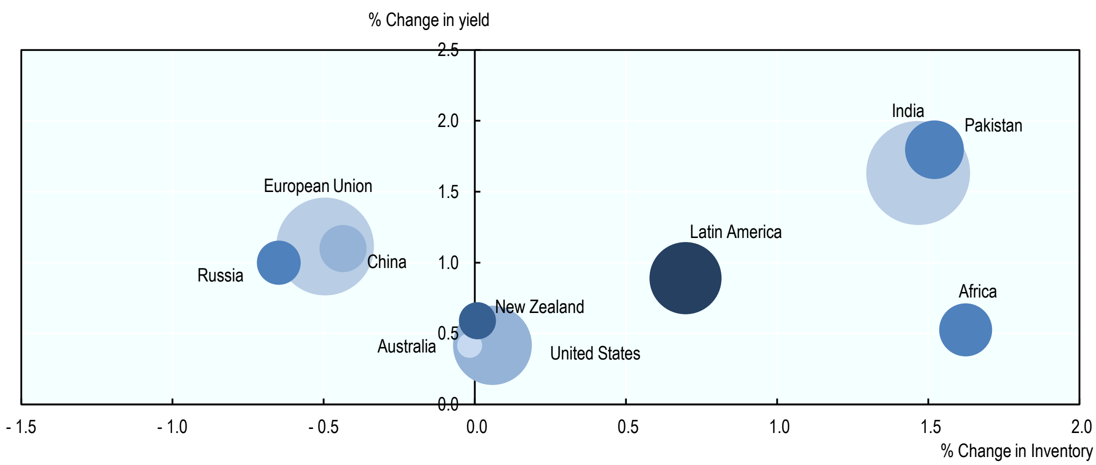
The strong volatility of international dairy prices stems from its small trade share (approximately 8% of world milk production), the dominance of a few exporters and importers, and a restrictive trade policy environment. Most domestic markets are only loosely connected to those prices as fresh dairy products dominate consumption and only a small share of milk is further processed.

7.4. Production

World milk production is expected to grow at 1.7% p.a. (to 981 Mt by 2028) over the next decade, faster than most other main agricultural commodities. In almost all regions of the world, yield growth is expected to contribute more to production increases than herd growth (Figure 7.3). The contradicting world average observation of a larger growth of herds (1.2% p.a.) than average yield growth (0.4%) is due to herds growing faster in countries with relatively low yields.

India and Pakistan are especially important for milk production, and are expected to contribute to more than half of the growth in world milk production over the next ten years. They are also expected to account for more than 30% of world production in 2028. Production will occur mostly in small herds of a few cows or buffaloes. It is expected that yields will continue to grow fast and contribute more to production growth. In both countries, the vast majority of production will be consumed domestically as few fresh products and dairy products are traded internationally.

Figure 7.3. Annual changes in inventories of dairy herd and yields between 2019 and 2028



Note: The size of the bubbles refer to the total milk production in the base period 2016-18.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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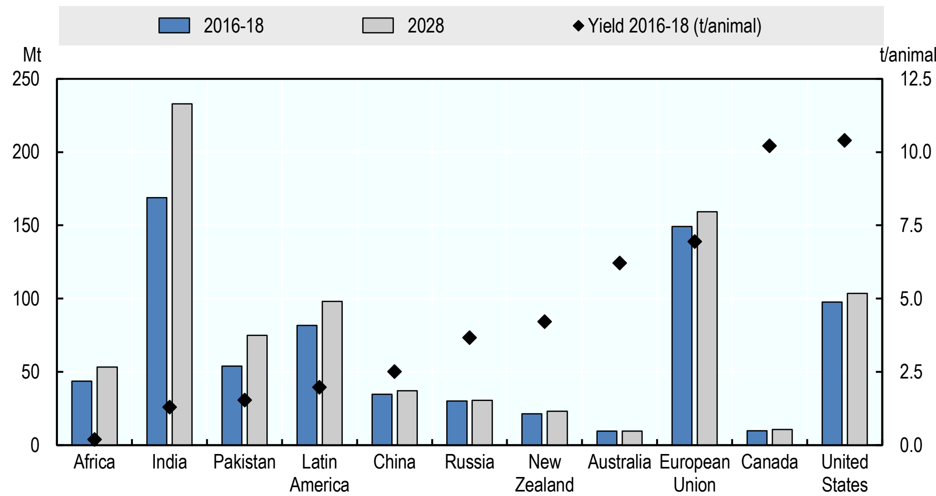
Production in the European Union, the second largest producer, is projected to grow more slowly than the world average. The European Union's medium term growth is due to a small increase in domestic demand (cheese, butter, cream, and other products) as well as an increase in global demand for dairy products. Growth in EU milk production will stem from an increase in milk yields, which are projected to grow at 1.1% p.a. over the next decade. Dairy herds are expected to go on a declining trend again (-0.5% p.a.) following an increase in the early years of the projection period in response to the abolition of milk quotas. The European Union production originates from a mix of grass-based and feed-based production systems. In addition, a growing share of milk produced is expected to be organic; more than 10% of dairy cows today are in organic systems in Austria, Sweden, Latvia, Greece, and Denmark. About 3% of European Union milk production at present comes from organic farms with relatively low yields, but a considerable price premium for milk.

The highest average yield per cow is expected to occur in North America as the share of grass-based production is low and feeding is focused on high yields (Figure 7.4). Cow herds in the United States and Canada are expected to remain largely unchanged and production growth to originate from further increases of what are already high yields. As domestic markets are saturated and the milk fat demand continues to increase, US exports will mostly be in the form of SMP.

Figure 7.4. Milk production and yield in selected countries and regions



Note: The yield is calculated per milking animal (mainly cows but also buffaloes, camels, sheep and goats)
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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New Zealand is the most export-orientated producer and has seen substantial recent growth in milk production. Milk production is mainly grass-based and yields are considerably lower than in North America and Europe. The efficiency of grass management and the year-round grazing, however, allows New Zealand to be competitive. The main constraining factors for growth are land availability and increasing environmental restrictions. A change to a more feed-based production is nevertheless not expected.

Strong production growth is expected in Africa, mostly due to larger herds. These will usually have low yields, but a considerable share of milk production will come from goats and sheep. Most cows, goats and sheep graze and are used for other purposes, such as meat production, traction, and savings. Over the projection period, about a third of the world-wide herd population is expected to be located in Africa, and account for about 5% of world milk production.

It is expected that less than 30% of milk will be further processed into products such as butter, cheese, SMP, WMP, or whey powder. Butter and cheese have considerable direct food demand, especially cheese, and they presently account for a large share of consumption of milk solids in Europe and North America. SMP and WMP are highly traded and are largely produced for trade only. Both are used in the food processing sector, notably in confectionary, infant formula, and bakery products.

Only the production of butter is projected to grow at 1.9% p.a., a faster rate than for world milk production. SMP is expected to grow at 1.3% p.a.; whereas cheese and WMP are both projected to grow at 1.2% p.a. The slower growth of cheese is due to the high importance of slow growing food markets in Europe and North America.

7.5. Consumption

Most of dairy production is consumed in the form of fresh dairy products. The share of fresh dairy products in world of global consumption is expected to increase over the coming decade due to stronger demand growth in India and Pakistan in particular, which in turn is driven by income and population growth. World per capita consumption of fresh dairy products is expected to increase by 1.0% p.a. over the coming decade, slightly faster than over the past ten years, driven by higher per-capita income growth.

The level of milk consumption in terms of milk solids per capita will vary largely across the world (Figure 7.1). One reason is tied to income per capita but the impact of regional preferences will also be an important factor. For example, the per capita intake in India and Pakistan is expected to be high, but low in China. In all countries, the share of processed dairy products in the overall consumption of milk solids is expected to be closely related to income.

In Europe and North America, overall per capita demand for fresh dairy products is declining, but the composition of demand has been shifting over the last several years towards dairy fat, e.g. full-fat drinking milk and cream. This is to some extent due to recent studies that have shed a more positive light on the health benefits of dairy fat consumption, as well as to growing consumer preference for taste and less processed foods.

Cheese consumption, the second most important dairy product in terms of milk solids, occurs primarily in Europe, North America and Oceania, and per capita consumption is expected to continue to increase. The dominant use of SMP and WMP will continue to be in the manufacturing sector, notably in confectionary, infant formula, and bakery products.

While some regions are self-sufficient, e.g. India and Pakistan, in other parts of the world such as Africa, South East Asian countries and the Middle East, consumption is expected to grow faster than production, leading to an increase in dairy imports. As liquid milk is more expensive to trade, this additional demand growth is expected to be met with milk powders, where water is added for final consumption or further processing.

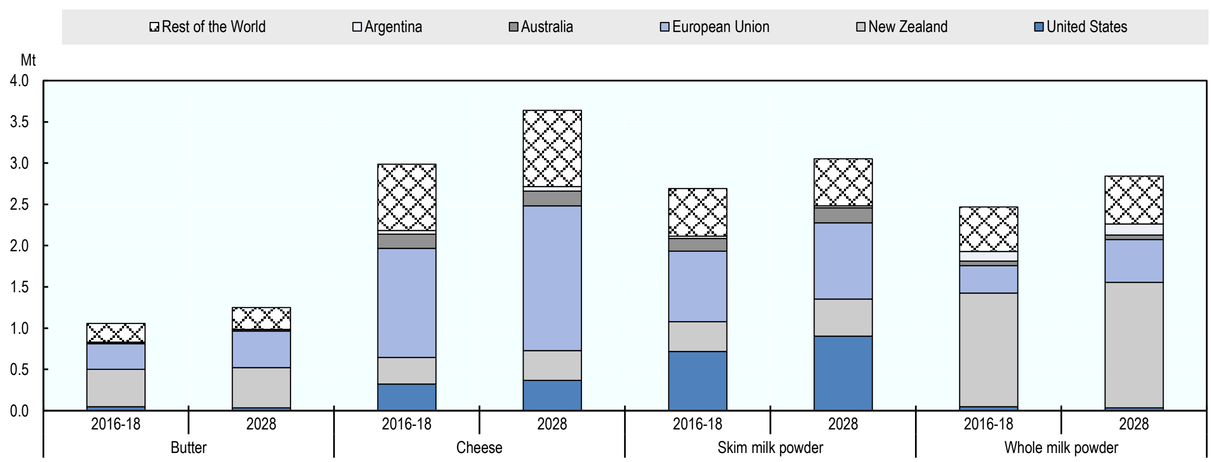
7.6. Trade

Approximately 8% of world milk production is traded internationally. This is primarily due to the perishability of milk and its high water content (more than 85%). Nevertheless, in recent years, imports of liquid milk by China from the European Union and New Zealand have increased considerably. The trade share of WMP and SMP is high at more than 40% of world production, but these products are often only produced to store and trade milk over a longer period.

The four major exporters of dairy products in the base period are New Zealand, the European Union, the United States, and Australia. These four counties are expected to jointly account for around 75% of cheese, 78% of WMP, 79% of butter, and 81% of SMP exports in 2028 (Figure 7.5). In the case of WMP, Argentina is also a main exporter, and is expected to account for 5% of world exports in 2028. In recent years, Belarus became an important exporter, orientating its exports primarily to the Russian market.

New Zealand remains the primary source for butter and WMP on the international market, and its market shares are expected to be around 39% and 53%, respectively, by 2028. Given that China, a major importer of WMP, has drastically decreased its purchases, it is projected that New Zealand will have a lower production growth rate of 0.3% p.a. over the next decade compared to 6.9% p.a. over the last decade. It is also projected that New Zealand will diversify and slightly increase its production of cheese over the outlook period.

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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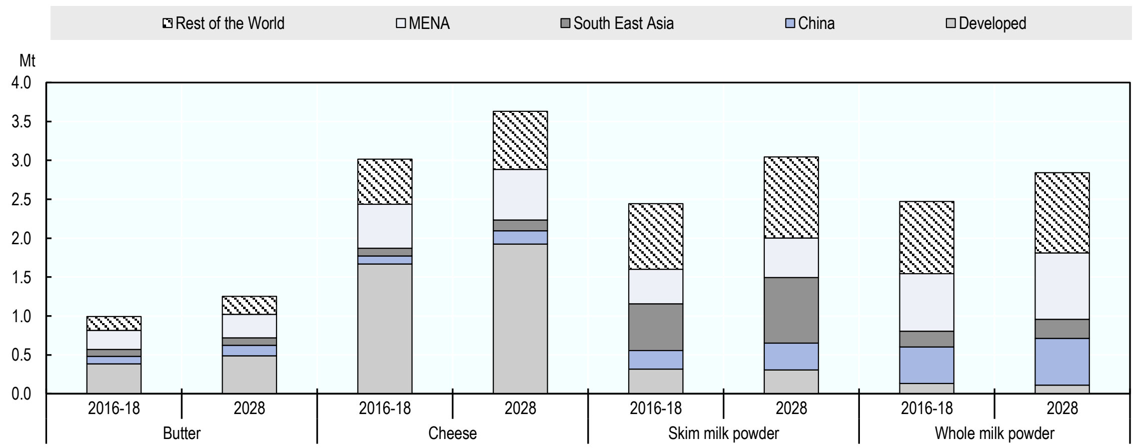
The European Union will continue to be the main world cheese exporter, followed by the United States and New Zealand. It is projected that the European Union's share in world cheese production will be around 48% in 2028, and sustained by increased cheese exports to Canada via the CETA agreement and to Japan following the ratification of the bilateral trade agreement in 2019.

Imports are spread more widely across countries and the dominant destinations for all dairy products are the Middle East and North Africa (MENA), developed countries, South East Asia, and China (Figure 7.6). Imports by the Middle East and North Africa are expected to originate primarily from the European Union, while United States and Oceania are expected to be the main suppliers of milk powders to South East Asia.

China is expected to continue to be the world's major dairy importer, particularly for WMP. Most of its dairy imports come from Oceania, although in recent years, the European Union has increased its exports of butter and SMP to China. China is also a major importer of fresh dairy products. Net imports over the base period were about 0.7 Mt, and it is expected this will increase over the projection period by 2.7% p.a.

Developed countries import a high level of cheese and butter, around 55% and 39% of world imports in 2016-18, respectively. These percentages are expected to be similar in 2028. The United Kingdom, the Russian Federation, Japan, the European Union, and China are projected to be the top five cheese importers in 2028. There will be some changes in the order, but most of the main cheese importers are developed countries. These countries often also export cheese and international trade is expected to increase the choice of cheeses for consumers.

Figure 7.6. Imports of dairy products by region



Note: MENA refers to Middle East and North Africa; South East Asia contains Indonesia, Malaysia, Philippines, Thailand and 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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7.7. Main issues and uncertainties

World production may be constrained because of unforeseen weather events, which affect grazing based milk production, the dominant production method worldwide. 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).

The seasonality of milk production in the case of grass-based systems resulted in seasonal variation of international prices with peaks around the mid of the calendar year, especially for butter. This development was more visible during the period of high butter prices in recent years.

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 (for example New Zealand, Ireland). Any changes in related policies could affect dairy production. The increase trends toward sustainable pratices such as water access and manure management are additional areas where policy changes could have an impact.

Specialisation and restructuring of milk production in the European Union were given impetus by the removal of milk quotas in April 2015. In several countries – the Netherlands, Germany, Denmark, France, and Italy – concerns about environmental issues may limit future milk production increases. Constraints for dairy production can come from farm-level nutrient balancing in the European Union, especially for specialised feed-based production.

Animal diseases can have a big impact on milk production. Mastitis is the most common infectious disease in dairy cattle worldwide and across all types of farm sizes. It is also the most damaging from an economic point of view, with a significant impact on milk yield and milk quality. Future developments in awareness, identification and treatment of this disease could lead to significant increases in milk production through smaller losses.

In order to control many diseases including mastitis, treatments based on antimicrobials are commonly used. This has raised concerns on the overuse of antimicrobials and the development of antimicrobial resistance, which would reduce the effectiveness of existing treatments and require the development of new ones. The evolution of this process remains an uncertainty for the next decade.

The relatively high price for milk fat may lead to the substitution of milk fat with vegetable fats (e.g. fat-filled powders and other dairy products) for certain uses and destinations. This adds to the uncertainty on the long- term relative valuation of milk fat and non-fat milk solids.

In recent years, the role of plant-based dairy substitutes (e.g. soya, almond, rice and oat drinks) in the fluid milk sector has increased in many regions, e.g. North America, Europe and East Asia. Causes include lactose intolerance but also discussions on the health and environmental impact of dairy. Growth rates are strong from a low base, but conflicting views exist regarding the environmental impact and relative health benefits of plant-based dairy substitutes. As a result, there is again uncertainty on the long-term impact this will have on dairy demand.

Changes in domestic polices also remain an uncertainty. In Canada, the SMP export projections are uncertain due to changes in its domestic dairy industry in reaction to the World Trade Organization Nairobi Decision, which eliminates the use of export subsidies in agriculture beyond 2020. In the European Union, intervention buying of SMP and butter at fixed prices remains possible and this has had considerable market impact in recent years for SMP.

Dairy trade flows could be substantially altered by changes in the trade environment. To date, the big dairy consuming countries, India and Pakistan, are not integrated into the international dairy market as domestic production is projected to expand fast to respond to demand.

Changes or creation of trade agreements would affect dairy demand and trade flows. For example, large amounts of cheese and other dairy products are traded between the European Union and the United Kingdom, and this could be affected by Brexit, while the USMCA is expected to influence dairy trade flows in North America. The Russian Federation's embargo on several dairy products from major exporting countries is expected to end in 2019 and imports are expected to increase slightly, although they do not seem likely to return to the pre-ban levels.

Note

[1] Fresh dairy products contain all dairy products and milk which are not included in 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 medium-term projections for world fish and seafood markets for the period 2019-28. Price, production, consumption and trade developments for fish and seafood from catch and aquaculture are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world fish and seafood markets during the coming ten years.

8.1. Market situation

Overall, 2018 has been a year of further expansion for the fisheries and aquaculture sectors, with production, trade and consumption all reaching historical peaks. The growth in production was due to an increase in capture fisheries (mainly of anchoveta in South America) and the continued expansion of aquaculture production, at some 3-4% a year.

Fish[1] prices grew during the first part of 2018, driven by demand growing faster than supply for a number of key species, and weakened over the rest of the year due to increased supply and softening consumer demand in the United States and some European markets. The aggregate FAO Fish Price Index[2] reached a record high in March 2018 (165 from a base of 100 in 2002-04), and then started to slightly decline. However, fish prices remained above 2017 levels for most species and products. These high prices, combined with sustained trade volumes, resulted in the value of total trade in fish and fish products peaking at USD 166 billion in 2018, more than a 7% increase compared with the previous year.

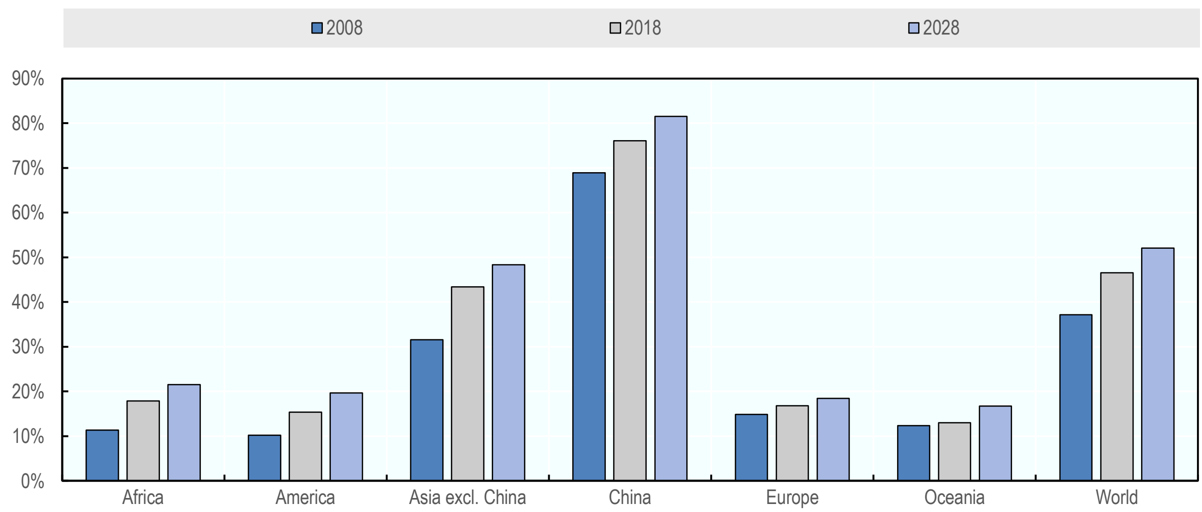
8.2. Projection highlights

Fish prices will all remain relatively flat in real terms over the duration of the outlook period, as production constraints prevent prices falling to the same extent as expected in potential meat substitutes, such as poultry. Growth rates are projected to be within +/-1% p.a. in all cases; slightly negative for capture species, the world price for traded fish, and fishmeal; and slightly positive for aquaculture species and fish oil. When compared to the previous decade (2009-18), annual rates of price growth are all projected to be either lower or remain negative. In the wake of the higher price plateau observed for many agricultural products over the previous decade, prices of fishmeal and fish oil in particular have been historically high, a situation that is expected to continue into the foreseeable future. Growth in the weighted average real price of aquaculture species outpaces that of the price of low protein feeds such as maize. This is potentially a positive sign for profitability as low protein feeds represent a major input in the production of many aquaculture species. In nominal terms, fish prices are expected to gradually increase in all cases.

The quantity of fish produced at the global level is projected to continue growing (1.1% p.a.), but at a slower rate than observed over the previous decade (2.4% p.a.). Among the major contributors to the slowdown, there are the impacts of the China's 13th five-year plan (2016-2020)[3], affecting both capture and aquaculture production, and the downwardly revised Chinese production data since 2009.[4] The relative and growing importance of aquaculture should continue (Figure 8.1) and the average growth in this sector (2.0% p.a.) is expected to be the principle driver of growth in total fish production at the global level in this *Outlook*. By 2028, aquaculture is projected to produce substantially more fish than the capture sector (8.0 Mt). While inadequate governance and stock depletion of some fisheries will continue to be a concern at the global level, the quantity of fish produced by capture fisheries is projected to increase slightly over the outlook period (0.2% p.a.), partly supported by expectations that improved management conditions in several regions will continue to pay dividends.

It is projected that fish production will predominantly continue to be consumed as food (178 Mt in 2028), with only 9.4% utilised for non-food uses (mainly as fishmeal and fish oil). The share of fish for human consumption originating from aquaculture is projected to increase from 52% (average 2016-18) to 58% in 2028. The slowdown in world fish production growth means global food fish consumption is projected to increase by only 1.3% p.a., a substantial decline when compared to the 2.7% p.a. growth rate witnessed over the previous decade. World per capita apparent[5] fish food consumption is projected to reach 21.3 kg per capita in 2028, up from 20.3 kg per capita in 2016-18. While Sub-Saharan Africa is expected to decline slightly in per capita terms, or remain static in the case of Africa overall, Latin America and Europe should show the highest growth rates.

Figure 8.1. Contribution of aquaculture to regional fish and seafood 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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Fish and fish products (fish for human consumption and fishmeal) are amongst the most traded food items in the world. By 2028, export volumes of fish and fish products are projected to account for about 36% of total production (31% excluding intra-EU trade). World trade of fish for human consumption is projected to continue growing over the coming decade (+1.1 p.a.) but at a slower rate than in the past decade (+1.9% p.a.), reflecting the slowdown in production growth. The long-term trend, which has seen Asian countries steadily increasing their proportion of world trade in fish for human consumption, is projected to continue with 52% of world exports by 2028, compared with 49% in 2016-18. After experiencing a downward trend over the previous decade, world fishmeal trade is expected to grow over the outlook period, boosted by higher fishmeal production as greater quantities are recovered from fish waste and capture production increases slightly.

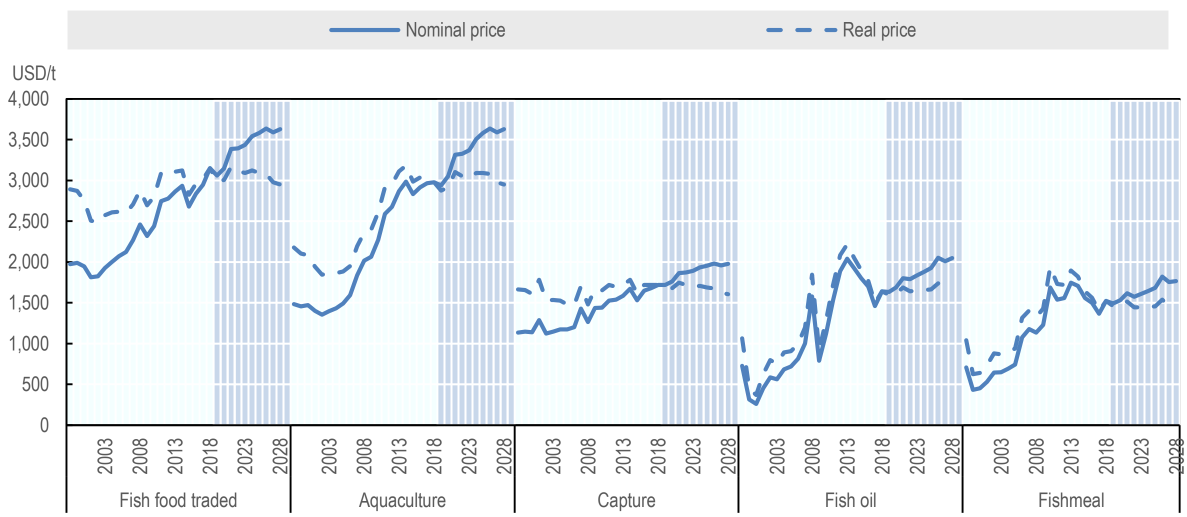
These outlook projections are a conditional scenario of what are considered the most likely developments, based on specific economic and policy assumptions. Future prospects for the fisheries and aquaculture sectors are subject to multiple uncertainties arising from changes in environmental conditions, governance in the fisheries sector, and trade policies and market access. Consequently, the implications of these uncertainties depend upon both the extent to which they differ from the assumption and the sector's capacity to deal with them.

8.3. Prices

Fish prices are expected to remain relatively stable over the outlook period in real terms, with small reductions expected in most cases by 2028 when compared to the base period. The greatest decrease is projected for capture production (-6.5%) followed by fishmeal

(-4.0%), traded fish products (-3.0%), and then aquaculture (-2.2%), while the price of fish oil is projected to increase slightly (+1.8%) (Figure 8.2).

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: N.W. Europe. Real price: US GDP deflator and base year = 2018.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The most likely outcomes of China's 13th five-year plan (2016-2020) are once again the key underlying assumptions for fish and seafood in this *Outlook*, as it was in the 2018 report. In combination with a census driven downward revision of production data for China from 2009, this has resulted in a substantial reduction in fisheries and aquaculture production. This reduction caused an increase in Chinese prices, which was further exacerbated by the ongoing swine flu outbreak reducing pork production and increasing demand for fish. China produces 59% of global aquaculture (average 2016-18), so its relative importance in combination with strong global demand for fish driven by a growing population and incomes, has helped to reduce the extent to which fish prices will fall at the world level.

While the fishmeal price is expected to fall slightly in real terms, it is coming from what are historically high levels and by 2028 prices will still be 53% higher than those seen in 2005, the year prior to the period when major increases started. This situation is even more pronounced for fish oil, where the real price in 2028 is projected to be 83% higher than that observed in 2005. Considered together, and all else remaining equal, this suggests that converting capture fish and fish waste to fishmeal and fish oil will remain a lucrative activity over the period projected.

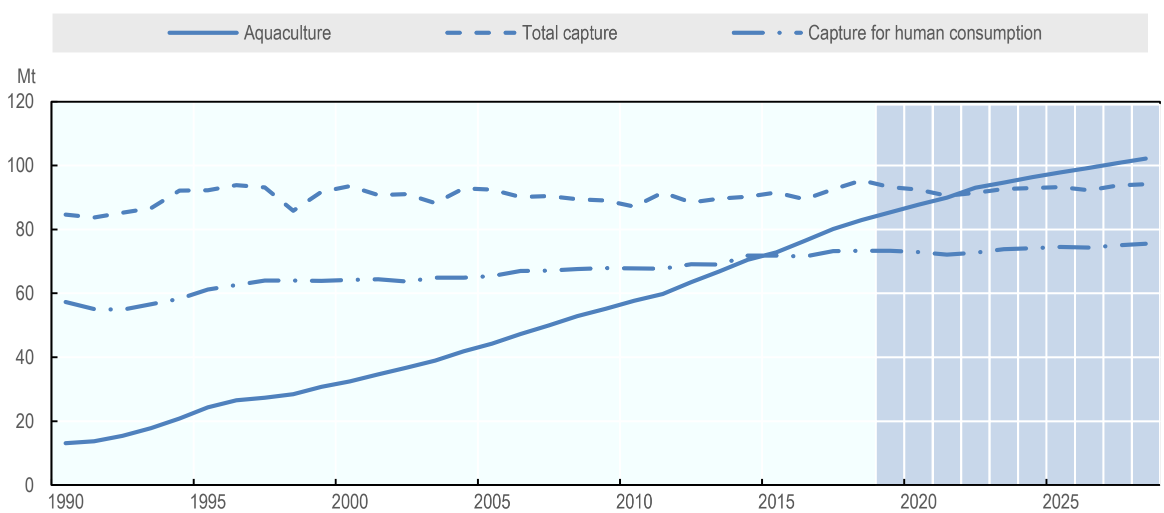
Over the long term, world prices of fishmeal and fish oil are expected to continue to broadly follow the price of oilseed products due to their strong substitution possibilities. However, fishmeal prices are expected to slowly increase relative to oilseed meals due to limited growth of supply, with reductions in El Niño[6] years; and continuous demand due to its nutritional characteristics, from both expanding aquaculture production and other sources such as livestock breeding (mainly pigs and poultry). For fish oil, the ratio with oilseed oil will remain high since the structural change in the relationship that occurred in 2012 is assumed to be maintained. The change came about largely as a consequence of increased demand for omega 3 fatty acids, of which fish oil is particularly rich, in the human diet.

Feed is the major expense for most intensive aquaculture producers and the increasing importance of plant-based ingredients in feed rations make the ratio between aquaculture and maize prices a good indicator of potential profitability in aquaculture. This ratio is expected to remain high over the current outlook period, suggesting a profitable aquaculture sector in most years.

8.4. Production

The total quantity of fish produced at the world level is projected to be 196.3 Mt by 2028, an increase of 14% relative to the base period (average of 2016-18) and an additional 24.1 Mt of fish and seafood in absolute terms (Figure 8.3). While the total quantity being produced continues to increase, both the rate and absolute level of growth continue to fall. In absolute terms, growth in total fish and seafood production over this outlook period is projected to be 51% of that observed over the previous decade, when annual world production was 32.2 Mt higher by the final year.

Figure 8.3. World aquaculture and capture fisheries



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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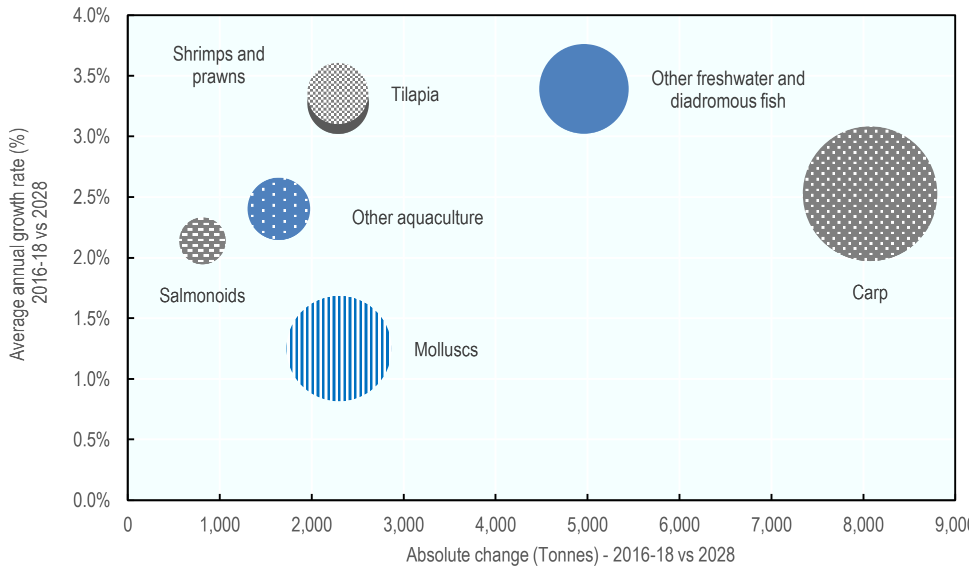
The majority of growth in world fish and seafood production will continue to come from the aquaculture sector, where output is projected to increase by an average of 2 Mt per year to 102.2 Mt in 2028, an increase of 28% over the outlook period. While breaking the 100 Mt threshold for the first time in 2027 will be a milestone event for the aquaculture sector, the annual rate of aquaculture growth is expected to continue to slow over the next decade, projected at less than half that observed in the previous one (2.0% vs 4.6%). This is largely a consequence of how China's current five-year plan is expected to constrain output growth of its aquaculture industry. China's aquaculture production is expected to grow by 24% in the next decade, halving from the 54% increase in the previous decade. China accounted for 59% of global aquaculture production in the base period (average of 2016-18) and this is projected to fall to 57% by 2028, despite aquaculture's contribution to total Chinese fish and seafood production increasing from 75% to 82% (Figure 8.3) in the same period, as levels of capture fisheries production fall (-14%). At the world level, the anticipated lower productivity gains in aquaculture, as a consequence of environmental regulations and a reduction in the availability of optimal production locations, will also contribute to lower production growth.

In contrast to the relative plateau of recent years, some growth in capture fisheries production is projected, resulting in world capture production at the end of the outlook period being 94.2 Mt, about 1.7 Mt larger than the average of 2016-18 and an increase of 1.9% compared to the base period. This increase is despite the anticipated reduction in capture fisheries production from China and is driven by expectations associated with better management in some regions (e.g. North and Latin America, Europe) and the relatively high price of fish driving demand. At a country level, the greatest absolute increases in capture production are expected to occur in the Russian Federation and Indonesia. As a consequence of the overall increase in capture production, aquaculture is now not expected to surpass total capture production (including that utilised for non-food uses) until 2022, an event previously anticipated to occur in 2021. Assumed *El Niño* events in 2021 and 2026 result in world capture production falling in both years, as these periodic environmental events have a substantial impact on the pelagic fisheries of South American countries.

At the species group level, all forms of aquaculture production will continue to increase, but rates of growth will be uneven across groups and the importance of different species, in terms of quantities produced at the world level, will change as a consequence. By 2028, carp and molluscs, are projected to remain the most significant aquaculture groups and will together account for 55% of total production by 2028, 35.8% and 19.2% respectively. The dominance of these groups continues to diminish though, especially for molluscs, having slowly fallen from a combined peak of 77% in the mid-1990s, as production growth in other species has outpaced them. This pattern will continue over the next decade, with tilapia followed by catfish and pangas (part of other freshwater and diadromous fish) projected to experience the highest rate of growth, at 3.4% p.a. (Figure 8.4).

After a decade of little growth in fish oil production and falling levels of fishmeal production, both are expected to increase over the outlook period by 3.9% in 2028 compared to the base period in the case of fish oil and 10.6% in the case of fishmeal. This is despite the share of capture production that is reduced into fishmeal and fish oil not being expected to move much from its current level of around 16%. Growth is instead expected to be a consequence of: the ongoing increase in the proportion of fishmeal and fish oil being sourced from fish waste, their relative higher prices; and the expected small increase in capture fisheries production. The proportion of fishmeal being produced from waste is projected to increase from 25% in 2018 to 31% by 2028, while for fish oil it is projected to increase from 35% to 40%.

Figure 8.4. Growth in world aquaculture production by species



Note: The size of the bubble represents the average world total production (tonnes) in 2016-2018.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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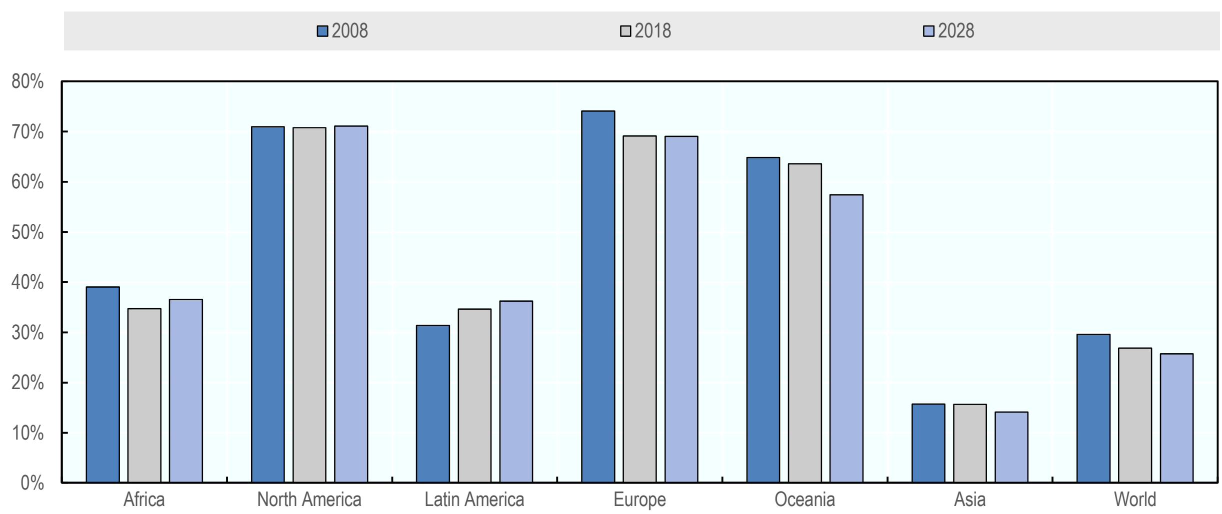
8.5. Consumption

Fish is a versatile and heterogeneous commodity covering a wide variety of species. It can be prepared and consumed in many different ways and forms for either food or non-food uses. Marked differences also exist in how fish is utilised, processed and consumed within and between continents, regions and countries. The bulk of the utilisation of fish production is in the form of products for human consumption and this share is projected to grow from 89% in the base period (2016-18) to 91% by 2028. Overall, the amount of fish for human consumption is projected to increase by 25 Mt by 2028, reaching 178 Mt. This represents an overall increase of 16% compared to the average for 2016-18, a slower pace when compared to the 32% growth experienced in the previous decade. This slowdown mainly reflects the reduced amount of additional production available, a deceleration in population growth and saturated demand in some countries, particularly developed ones, where food fish consumption is projected to show little growth (+0.6% p.a. by 2028).

Growth in demand will stem mostly from developing countries (in particular in Asia), which are expected to account for 93% of the increase in consumption and to consume 81% of the fish available for human consumption in 2028 (vs 79% in 2016-18). Overall, Asia is projected to consume 71% (or 126 Mt), of the total food fish, while the lowest quantities will be consumed in Oceania and Latin America. Asia will also continue to dominate growth in consumption, accounting for 71% of the additional fish consumed by 2028. This growth, in particular in eastern (minus Japan) and south-eastern Asia, will be driven by a combination of further increases in domestic production, in particular from aquaculture, rising income and increased commercialisation and a large, growing and increasingly urban population, which will push the intake of animal proteins, including fish, at the expense of foods of vegetal origin. Being the largest fish producer, China will remain by far the world's largest fish consuming country, projected to consume about 36% of the global total in 2028, with per capita consumption reaching about 44.3 kg compared with 39.3 kg in the base period.

Overall, growth in demand is also expected to be fuelled by ongoing changes in dietary trends, which should continue towards a greater variety in food choice along with increased health, nutrition and diet concerns. Fish, being a concentrated source of protein and of many other essential fatty acids and micronutrients, plays a particular role in this regard by providing a valuable and nutritious contribution to a diversified and healthy diet. Trade is expected to continue playing a major role as expanding the commercialisation of fish which will further help to reduce the impact of geographical location and limited domestic production, broadening the markets for many species and offering wider choices to consumer. Imports are projected to represent up to 69% of the food fish consumption in Europe and up to71% in North America (Figure 8.5).

Figure 8.5. Share of imports in food fish 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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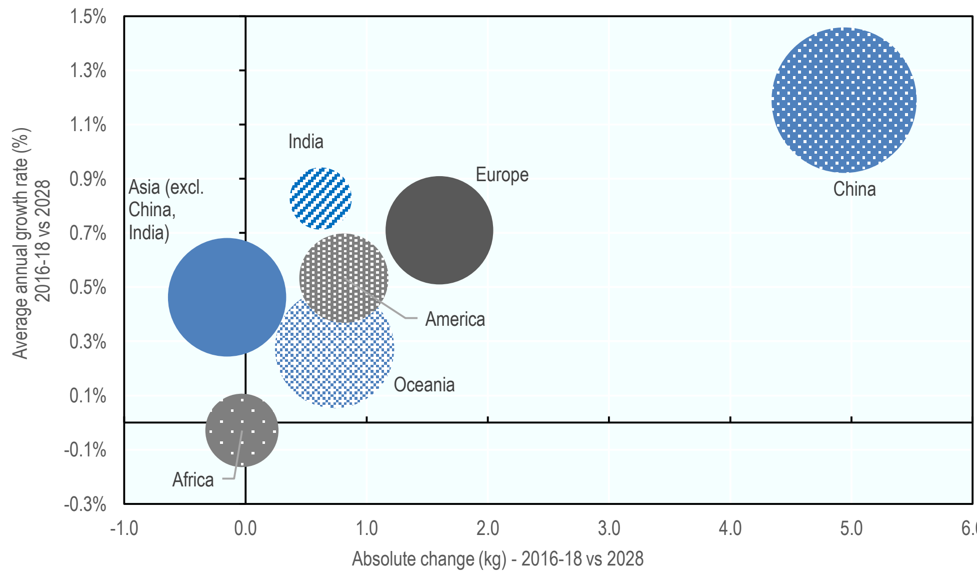
Per capita fish consumption (Figure 8.6) should increase in all continents, except Africa where consumption is expected to remain static. A small decline is expected to occur in Sub-Saharan Africa. Despite an expected overall increase in total food fish supply (+30% for Africa and +31% for Sub-Saharan Africa compared to the base period), obtained through increased production and imports, it will not be sufficient to outstrip similar growth rates of the African population, with a consequent static or declining per capita fish consumption. This stagnation of per capita fish consumption for Africa as a whole and the decline for the Sub-Saharan region, raises an alarm in terms of food security, considering that the highest prevalence of undernourishment in the world is in Africa and that the food security situation has recently worsened, especially in parts of sub-Saharan Africa.[7] Even if current per capita fish consumption in Africa is lower than the world average, fish plays a major role in the region, providing valuable micronutrients and proteins, at higher levels than the world average in the case of proteins.

Figure 8.6. Growth in per capita fish consumption by region



Note: The size of the bubble represents the average world total production (tonnes) in 2016-2018.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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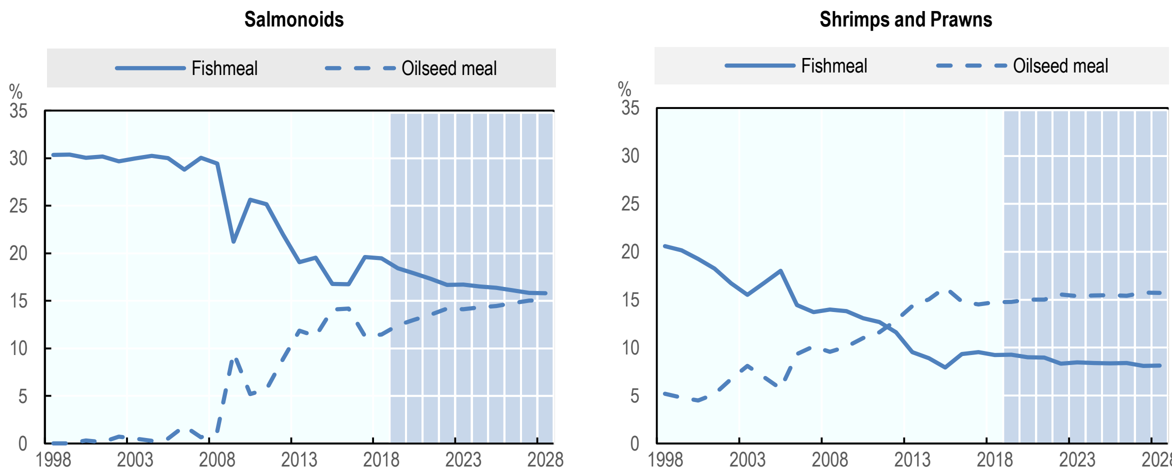
Just under 10% of fish production is projected to be utilised for non-food uses. The greatest amount will be used to produce fishmeal and fish oil, and about 2% for ornamental fish, culturing, fingerlings and fry, bait, pharmaceutical inputs, or as direct feed for aquaculture, livestock and other animals. Fishmeal and fish oil can be processed from whole fish, fish trimmings or other fish by-products resulting from processing. Both fishmeal and fish oil are mainly used as animal feed in aquaculture and livestock breeding (in particular pigs), and as dietary supplements for human consumption and ingredients in the food industry. Currently about 70% of fishmeal is used as feed in aquaculture and this share increases to 75% in the case of fish oil. Furthermore, about 7% of fish oil is utilised as dietary supplement.[8] No major significant changes are expected in the next decade, except for a potential increase in the share of fish oil being utilised as dietary supplement, that usually obtain higher prices.

Due to limited increase in production volumes, together with high prices and innovation efforts, fishmeal and fish oil will be more frequently used as strategic ingredients to enhance growth at specific stages of fish or livestock production, as they are considered the most nutritious and most digestible ingredients for fish and livestock breeding. Their inclusion rates in compound feeds for aquaculture have shown a clear downward trend, as they are used more selectively and are substituted by lower priced oilseed meal (Figure 8.7). By 2028, the oilseed meal used in aquaculture is projected to reach almost 9 Mt in 2028, compared to 4.4 Mt for fishmeal. Being by far the main aquaculture producer, China will continue to be the main consumer of fishmeal, accounting for about 38% of total consumption, while Norway will remain the main consumer of fish oil due to its salmon industry.

Figure 8.7. Share of fishmeal and oilseed meal in feed ratio



Note: World weighted average.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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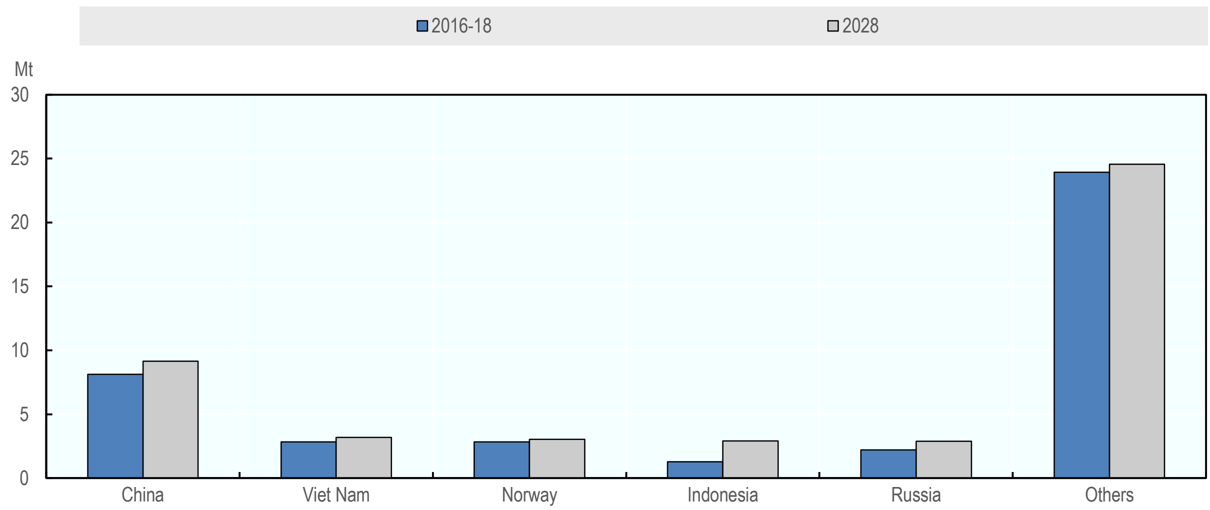
8.6. Trade

The expansion of trade in fish and fish products (fish for human consumption and fishmeal) will continue over the outlook period, but at a slower pace than in the previous decade, reflecting the slowdown in production growth and the trade tension between the United States and China. Trade will continue to play an important role in the fisheries and aquaculture sectors, notably in terms of food supply and food security. Globally, the contribution of fish to the total animal protein intake is trending upwards, partly due to the development of trade in fish and fish products.

World trade of fish for human consumption is projected to total 45.8 Mt live weight by 2028 (excluding intra-EU trade), up 11% on the 2016-18 base period. Exports of fish for human consumption are expected to concentrate in fewer exporting countries over the outlook period (Figure 8.8). The share of the top five largest exporters (China, Viet Nam, Norway, European Union (overtaken by Indonesia by 2028), and the Russian Federation) in total export volumes is expected to rise from 45% on average in 2016-18 to 46% by 2028. Among these countries, Norway is expected to experience the slowest growth rate, where the export trend mirrors the production trend. Alternatively, the fastest growth rate is forecasted for Indonesia. The country, in view of the expansion of its production, is expected to become the fourth largest exporter of fish for human consumption by 2028, ahead of the European Union and the Russian Federation, up from the tenth rank in the base period. Among the other large exporters, strong growth rates are projected in Chile and Thailand. However, the United States are projected to see a decline in their export volumes due to the on-going effects of the trade tension between the United States and China, which is assumed to last until 2028.

Figure 8.8. Exports of fish for human consumption by major exporters in 2016-18 and 2028



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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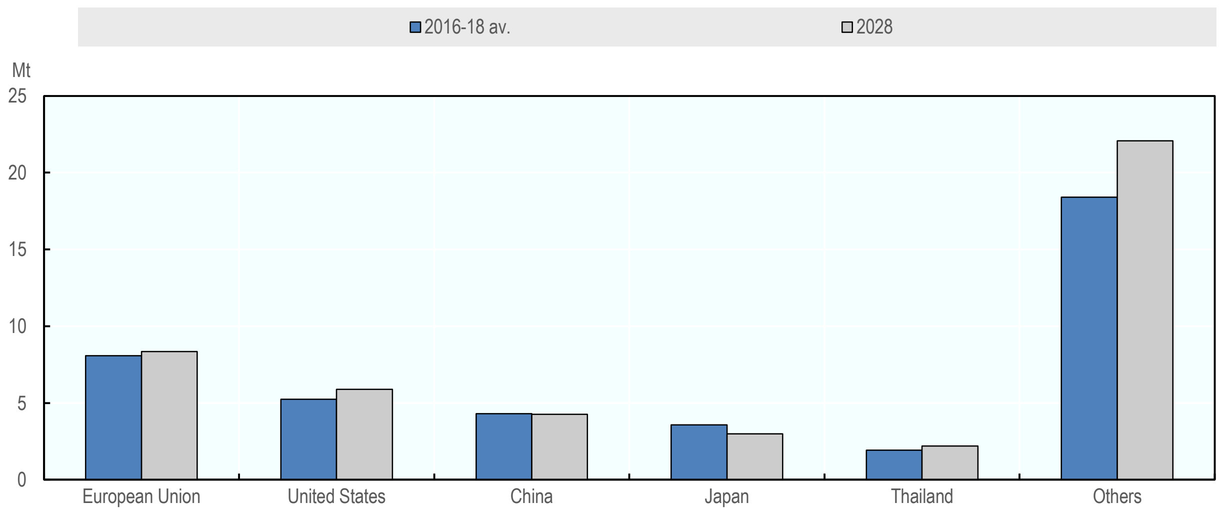
Imports, on the contrary, will become less concentrated over the outlook period. The European Union, United States, China, Japan, and Thailand will remain the top five importers of fish for human consumption (Figure 8.9). However, their share is projected to decline from 56% of global import volumes in 2016-18 to 52% in 2028, reflecting a decline in Japanese and Chinese imports. Fish consumption in Japan, which is partly sourced from imports, will continue its downward trend, as younger generations favour meat over fish. Chinese imports are expected to slightly decrease as the aquaculture sector better adapts to domestic consumers preferences in terms of species. In particular, imports of marine species are expected to decline over the outlook period. Overall, the share of Asia in world imports of fish for human consumption is projected to slightly decline from 40% in the base period to 39% by 2028.

Trade of fishmeal is projected to rise by 9.8% over the next decade, totalling 3.1 Mt product weight in 2028, reflecting higher production volumes except in 2026 an assumed severe *El Niño* year. This represents an upward change compared to the period 2013 to 2016 characterised by severe fishing quota in Peru and the occurrence of *El Niño*. Peru is expected to remain, by far, the main export of fishmeal, followed by the European Union and Chile. China will remain the main fishmeal importer, accounting for nearly half of total imports by 2028. It reflects the importance of its aquaculture production as fishmeal is used in feed manufacturing. Trade of fish oil is projected to reach 0.9 Mt product weight by 2028, up compared to the same dismal years for the same reasons. Fish oil is mainly imported by the European Union and Norway, where it is used as a food supplement and in the salmon industry.

The failure of the Doha round market access negotiation led to a proliferation of bilateral and regional trade agreements (RTAs). In this *Outlook*, the following seven trade agreements were explicitly taken into account: United States-Korea (KORUS), European Union-Korea, Canada-Korea (CKFTA), China-Korea, Canada-European Union (CETA), European Union-Japan economic partnership agreement (EPA), and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).[9] These agreements led to a first tariff reduction on fish and fish products, respectively in 2012, 2013, 2015, 2017, 2018, 2019 and 2019.

Figure 8.9. Imports of fish for human consumption by major importers in 2016-18 and 2028



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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8.7. Main issues and uncertainties

The projections presented in this *Outlook* rely on a number of economic, policy, and environmental assumptions. A shock to any of these variables would result in different fish projections. Many uncertainties and potential issues may arise over the projection period. Several of these were analysed in previous editions of the *Outlook* (e.g. stock status, pollution, sector specific issues) and remain relevant. This section discusses some specific uncertainties.

For the period 2009-2016, capture and aquaculture production data for China have been revised following the new census results. The downward revision was taken into account in the *Outlook* as well as the most likely changes in the implementation of the Chinese 13th five-year plan (2016-2020), leading to significantly lower Chinese fish production than anticipated previously. However, uncertainties remain regarding the exact effects of the five-year plan. With China being the main fisheries and aquaculture producer and exporter, any changes from the baseline scenario could have significant consequences on the overall production, trade and consumption volumes of fish and fish products. For example, if the plan is fully implemented, overall production for China will be between 4 to 5 Mt less than the amount reported in this *Outlook*.

Climate change,[10] weather variability and changes in the frequency and extent of extreme weather events are anticipated to have a major impact on the availability and trade of fish and fish products mainly through habitat destruction, changes in fish migration patterns and natural productivity of fish stocks. However, for complexity reasons, climate change was not explicitly included in the modelling exercise of this *Outlook*, except the influence of El Niño events, which are explicitly accounted for in the modelling process (in 2021 and

2026) based on previous behaviour. International fishing rights are likely to be further complicated as stocks move into new economic zones. There will be a higher potential for conflicts to arise when species enter new territorial waters and for temporary gaps in fishery managements policies as countries adapt to new migration routes. Already, with mackerel stocks shifting towards Iceland and the Faeroe Islands, a disagreement exists about mackerel management. Iceland and Greenland did not approve the proposal on quota shares agreed by the European Union, the Faeroe Islands, and Norway.

No impact from Brexit is taken into account in this *Outlook*. The current lack of agreement, ongoing uncertainty, and many possible outcomes mean it is not possible to account for this situation in the baseline. Potential outcomes of Brexit include reduced access to United Kingdom waters for European Union Member State vessels and higher tariffs for United Kingdom producers that export fish to the European Union. The European Union is the United Kingdom's most important export market for seafood so the impact of tariff, or customs-related delays when dealing with live or highly perishable fresh products have the potential to be costly to producers and may result in trade patterns changing.

The global level of fish production, accounting for both aquaculture and capture fisheries, is strongly influenced by management policy and enforcement. Governments are increasingly aware of the need for improved fisheries management frameworks. 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. In this respect it is important that countries have set objectives as part of the UN SDGs to restore fisheries' sustainability and eliminate harmful support policies.

Future progress on eliminating harmful fisheries support policies is a further source of uncertainty for capture fisheries. Support policies can have unintended negative side-effects, such as increasing fishing effort beyond desired levels or causing excess capacity of fishing fleets, as well as making illegal unreported and unregulated (IUU) fishing more attractive for fishers. All of this taken together reduces the profits and income of fishers, leads to less fish for consumers, and risks the health of the ocean environment. New work by the OECD[11] has shown it is possible to support the fishing sector and deliver benefits to fishers without unduly provoking overfishing or overcapacity; for example, moving existing support away from gear, fuel, vessels or other inputs towards helping fishers to better operate their business could improve fishers' income by as much as USD 2 billion per year, reduce pressure on stocks, and increase harvest by almost half a Mt per year. Such changes, however, are dependent on progress at the WTO level and revisions to national fisheries policies.

The trade tension between China and the United States, resulting in a 25% rise in Chinese tariffs on all fishery products coming from the United States from mid-2018, was factored into the baseline. In the absence of signs of de-escalation of the trade tension, the higher tariffs were kept over the entire outlook period. The overall impact of the trade tension is estimated to be limited, as China should be able to source imports from alternative trading partners. Similarly, the United States should be able to partly divert exports to other destinations. However, it remains unclear whether these higher tariffs will be kept over the entire outlook period. Depending on how long these tariffs remain active, they could lead to a potential reduction of traded volumes and to changes in trade patterns.

Notes

[1] In this chapter and publication the term "fish" indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, crocodiles, caimans, alligators and aquatic plants. All quantities are expressed in live weight equivalent, except those of fishmeal and fish oil.

[2] Calculated in nominal terms and covering fish and seafood products.

[3] As in the 2018 projections, this *Outlook* assumes only the most likely outcomes of China's plan.

[4] This revision occurred in light of new information from the census and affected both capture and aquaculture data in China.

[5] The term *apparent* refers to the amount of food available for consumption, which is not equal to the edible average food intake. The amount is calculated as production + imports – exports - non-food uses, +/- stocks variations, all expressed in live-weight equivalent.

[6] 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. The impact is set in 2021 and 2026.

[7] FAO, IFAD, UNICEF, WFP and WHO. 2018. The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO.

[8] Source: The Marine Ingredients Organisation (IFFO).

[9] Bilateral trade of the six countries (Canada, China, European Union with the United Kingdom, Japan, Korea, and the United States) could be included in the model thanks to the information kindly provided by the Department of Fishery and Ocean in Canada (DFO) coming from their seafood Market Simulation Model (SEASIM).

[10] 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 http://www.fao.org/3/I9705EN/i9705en.pdf.

[11] Martini, R. and J. Innes (2018), "Relative Effects of Fisheries Support Policies", *OECD Food, Agriculture and Fisheries Papers*, No. 115, OECD Publishing, Paris http://dx.doi.org/10.1787/bd9b0dc3-en.

Chapter 9. Biofuels

This chapter describes the market situation and highlights the medium-term projections for world biofuel markets for the period 2019-28. Price, production, consumption and trade developments for ethanol and biodiesel are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world biofuel markets during the coming ten years.

9.1. Market situation

In 2018, global biofuel production increased in all major producing regions with the exception of Argentina, where biodiesel production decreased to its lowest level in four years mainly because of less favourable export opportunities. While crude oil prices in 2018 increased, ethanol and biodiesel prices decreased due to ample supply. Biofuel feedstock prices remained at levels similar to those in 2017, with the exception of vegetable oil prices, which dropped to historically low levels. The biofuel-to-feedstock price ratios increased in 2018 for biodiesel, thus increasing its profitability, while profits decreased marginally for ethanol producers.

Demand for biofuels was sustained by obligatory blending and by growing global total fuel demand due to continued low energy prices. Decreasing price ratios of biofuels to conventional fuels resulted in additional demand for non-mandated use of biofuels, mainly in Brazil. In some countries, policy decisions were favourable to biofuels in 2018, with developments such as mandate increases and differential taxation systems or subsidies enacted or announced.

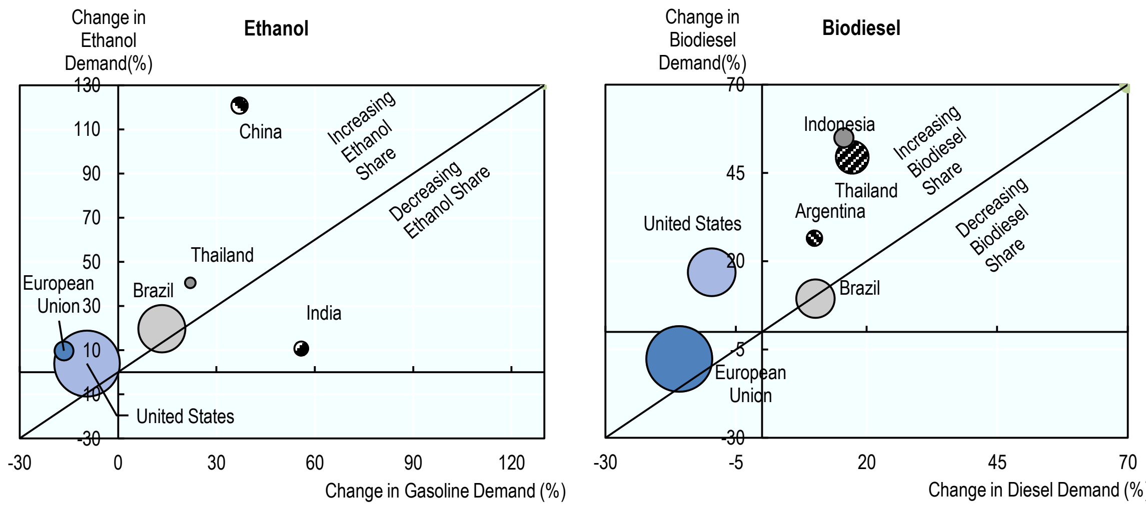
9.2. Projection highlights

World prices for biofuels are closely linked to developments in feedstock prices (which are mostly decreasing in real terms) and crude oil prices (constant in real terms). Consequently, international biofuel prices are projected to increase over the outlook period in nominal terms, while they continue to decrease in real terms.

Future developments of biofuel markets will continue to be largely driven by national support policies. Two major producing regions, the European Union and the United States, are increasingly directing their support to advanced biofuels that are not based on traditional agricultural commodities as feedstock (first generation technologies). The IEA *World Energy Outlook* (on which this *Outlook* bases its own projections) foresees decreasing total fuel demand in both regions, suggesting limited growth in biofuel consumption (Figure 9.1). Biodiesel consumption in the European Union is even expected to fall below current levels, driven by an expected decrease in total diesel consumption. In contrast, the United States is expected to experience sustained growth in biodiesel consumption, as biodiesel produced from vegetable oil can qualify as an advanced biofuel in the Renewable Fuel Standard (RFS) rules and both the advanced and biodiesel mandates are increasing in 2019 and 2020.

In Brazil, total fuel consumption is expected to increase, in contrast to the United States and the European Union. Sustained by this development and by the RenovaBio law which aims to reduce fuel emissions by 10% by 2028, both ethanol and biodiesel consumption are projected to increase in the coming years. Biodiesel consumption is expected to keep pace with total diesel consumption, while the share of ethanol in gasoline consumption will increase slightly. Ethanol consumption in Brazil is projected to reach 37 bln L in 2028, almost a third higher than today. Only in the People's Republic of China (hereafter "China") is the relative increase expected to be higher. In September 2017, the Chinese government announced that a new nationwide ethanol E10 mandate would be implemented by 2020 and large ethanol production capacities are currently under construction. It is unlikely that the full mandate will be reached by 2020 and this *Outlook* assumes that a blending rate of only about 4% will be reached by this date. Nevertheless, Chinese ethanol consumption will more than double over the coming decade if this is indeed the case.

Figure 9.1. Biofuel demand developments in major regions



Note: Shares calculated on demand quantities expressed in volume and compare 2028 to 2018. The size of each bubble relates to the consumption volume of the respective biofuel in 2018.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933959189

In Argentina biodiesel use is assumed to reach the 10% blending mandate. In Indonesia, both total diesel use and biodiesel consumption shares are expected to increase over the outlook period, although it is unlikely that demand will meet the envisaged B20 or B30 targets. This *Outlook* assumes that the biodiesel blending rate will reach about 18% by 2028. In Thailand, the government decided to reduce the ethanol and biodiesel targets from 4.1 bln L to 2.6 bln L based on the assumption that feedstock supply to the domestic biofuel industry would not meet production targets. Ethanol consumption growth in India is not expected to keep pace with total fuel consumption growth (which almost doubles over the coming ten years) because even though ethanol fuel use is projected to increase, ethanol blending is projected to decrease over the projection period.

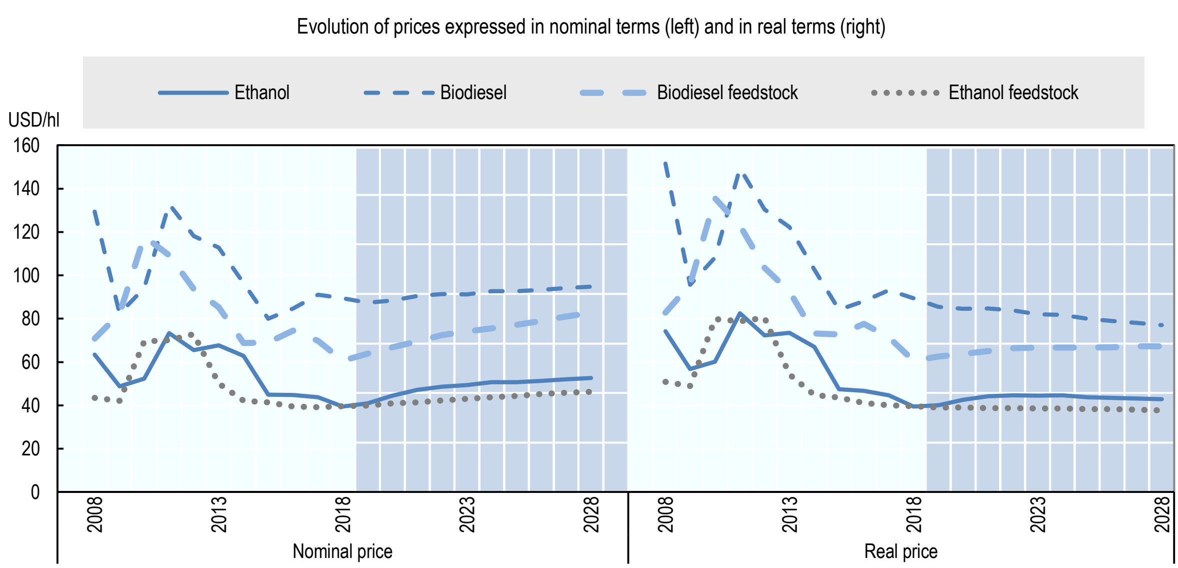
As biofuel policies in many countries tend to support national markets, international trade volumes are relatively low. Global trade for biodiesel and ethanol as a share of total production (44 bln L biodiesel and 143 bln L ethanol by 2028) has rarely exceeded 10% over the last decade and is dominated by a few countries. World biodiesel trade is projected to decrease from current levels due to faster supply than demand growth in the United States and the European Union, while ethanol trade should remain stable. On the export side, Argentine biodiesel exports are expected to increase and Indonesian ones to decrease.

The major risks and uncertainties for the future developments of the biofuel sector are related to the policy environment. This *Outlook* still expects that most of the biofuels produced will be based on agricultural feedstock. Recent policy announcements, however, appear to be favourable to biofuels with a focus on the potential contribution of renewable fuels to greenhouse gas mitigation in the transportation sector (e.g. in the European Union, Brazil or Canada). 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. However, no substantial increase in advanced biofuels can be expected before the middle of the outlook period, considering the required investments in production plants.

9.3. Prices

Influenced by developments on the vegetable oil markets, nominal biodiesel prices are projected to increase at a slower pace (0.8% p.a.) than ethanol prices (2.4%). Expressed in real terms, biodiesel prices are expected to decrease over the projection period, and ethanol prices return to a decreasing trend after 2023. The main reason for nominal ethanol prices performing more strongly than biodiesel is due to the fact that ethanol prices are currently at historical lows from which a recovery in the first years of the projection period is expected to occur. It should be borne in mind, however, that international and domestic biofuel prices are often disconnected, mainly by policies that include fiscal benefits or supported prices.

Figure 9.2. The evolution of biofuel and biofuel feedstock prices



Note: Ethanol: wholesale price, United States, Omaha; Biodiesel: Producer price, Germany, net of biodiesel tariff and energy tax. Real prices are calculated based on the GDP deflator in the United States. As proxy for the biodiesel feedstock price, the world vegetable oil price is used and for Ethanol a weighted average between raw sugar and maize is applied.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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9.4. Production and use

A major driver for global biofuel production and use are developments in the global transportation sector. External projections taken from the *IEA World Energy Outlook* anticipate global gasoline demand to remain at about 1 120 bln L over the projection period, while diesel demand is expected to decrease about 8%, from 762 bln L to 703 bln L. This despite that many countries are expected to continue to face increasing total fuel demand (Figure 9.1).

Box 9.1. Biofuels at a glance

Biofuels (bioethanol and biodiesel[1]) are fuels produced from biomass. Today about 60% of ethanol is produced from maize, 25% from sugar cane, 7% from molasses, 4% from wheat, and the remainder from other grains, cassava or sugar beets. About 77% of biodiesel is based on vegetable oils (30% soybean oil, 25% pal oil, 18% rapeseed oil) or waste cooking oils (22%). More advanced technologies based on cellulosic feedstocks (e.g. crop residues, wood, or dedicated energy crops) do not account for large shares of total biofuel production. Nevertheless, they are often seen as relevant technologies for the future as they are supposed to cause less competition with food products and emit safer levels of greenhouse gas emissions.[2] The international biofuel sectors are strongly influenced by national policies with three major goals: farmer support, reduced greenhouse gas emissions, and/or reduced energy independency.

Table 9.1. Biofuel production ranking and key feedstocks

	Production ranking (base period)		Major feedstocks	
	Ethanol	Biodiesel	Ethanol	Biodiesel
United States	1 (50%)	2 (19%)	Maize	Soybean oil / diverse other oils
European Union	4 (5%)	1 (36%)	Maize / wheat / sugar beet	Rapeseed oil / waste oils
Brazil	2 (24%)	3 (12%)	Sugar cane	Soybean oil
China	3 (8%)	8 (3%)	Maize	Waste oils
India	5 (2%)	15 (0.5%)	Molasses	Palm oil
Canada	6 (1.6%)	10 (1.4%)	Maize	Waste oils
Indonesia	23 (0.2%)	4 (10%)	Molasses	Palm oil
Argentina	9 (1%)	5 (7%)	Maize / sugar cane	Soybean oil
Thailand	7 (1.5%)	6 (4%)	Molasses / cassava	Palm oil
Colombia	13 (0.4%)	9 (1.5%)	Sugar cane	Palm oil
Paraguay	15 (0.3%)	19 (0.03%)	Maize / sugar cane	Soybean oils

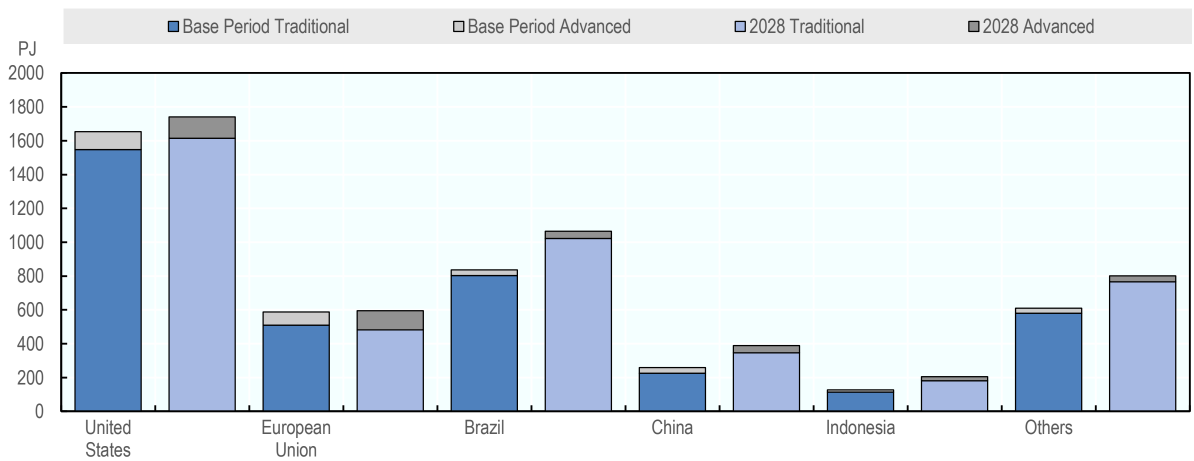
Note: Percentage numbers refer to the production share of countries in the base period.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

1. Biodiesel includes renewable diesel (also known as Hydrotreated Vegetable Oil or HVO) in the accounting of this *Outlook* although both are different products.
2. An analysis of the potential contribution of biofuels to climate change mitigation in the transport sector (COM/TAD/CA/ENV/EPOC(2018)19/FINAL) that uses the Aglink-Cosimo model finds, however, that a substantially increased role for biofuels in decarbonisation of the transport sector would require a different set of policy incentives that would also need to be cost-effective and take into account effects on food security and the sustainability of resource use.

Globally, the *Outlook* projects increases in biofuel production at a much slower pace when compared to previous decades. The primary reason is that policies of the United States and the European Union are injecting less additional support into the biofuel sector. Demand for biofuels is expected to grow in major developing countries given expected developments in the transportation fleet and domestic policies that favour demand at the consumer level and higher blends.

Global ethanol production is projected to increase from about 122 bln L during the base period to 143 bln L by 2028, while global biodiesel is projected to reach almost 44 bln L, driven principally by the mandate increase in the United States over the initial projection years. Global biofuel production will continue to be dominated by traditional feedstocks, despite the fact that increasing sensibility to the sustainability dimension of biofuel production is observed in many countries (Figure 9.3). Coarse grains, especially maize, and sugarcane will continue to dominate ethanol feedstock. Ethanol production is projected to use 14% and 24% of global maize and sugarcane production respectively by 2028. Vegetable oil is expected to continue 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, Canada, and the United States.

Figure 9.3. World biofuel production from traditional and advanced feedstocks



Note: Traditional feedstocks are here defined as food and feed crop based biofuels. Values in Petajoule = 1015 Joule.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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The share of energy that enters the transport sector through biofuels exceeds 10% in only a single country, Brazil. However, a goal of many biofuel policies, especially in developing countries, is to reduce energy dependency from fossil sources. A goal that is far from being achievedd in many countries.

United States

In the United States, the 2007 Energy Independence and Security Act (EISA) defined the Renewable Fuel Standard programme (RFS2). It established four quantitative annual mandates up to 2022: the total and advanced mandates that require fuels to reduce GHG by at least 20% and 50% respectively, and the biodiesel and cellulosic mandates nested within the advanced mandate. The Environmental Protection Agency (EPA) establishes annual minimum quantities for each of the four classes of biofuels required.[2]

In 2018, the EPA decided to increase the advanced biofuel mandate in 2019 (+2.3 bln L) and the biodiesel sub-mandate in 2020 (+1.3 bln L). Similar to previous rulings, an important part of the initial final levels proposed in the EISA were waived for the total advanced and cellulosic mandates on the basis that the production capacity for cellulosic ethanol was not developed; the conventional gap,[3] often referred to as an implied maize mandate, was maintained at 56.8 bln L.

This *Outlook* assumes that all mandates will remain at recently announced levels in volume terms despite the projected decrease in the use of transportation fuel. The exception is the cellulosic mandate, which is assumed to more than double over the projection period, even though it is projected to attain only 4.6% of the level specified in EISA for 2028. 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[4] is projected to increase only moderately to 11.2% by 2028, as current discussions about developing E15 pumps nationwide have not been taken into account.

Due to the aforementioned mandate increases, the production of biodiesel, which is eligible for both mandates, is projected to increase to 8.7 bln L (Figure 9.5). Growth in ethanol production is projected to be limited to 0.1% annually, almost entirely driven by the assumed increase in the cellulosic mandate; this *Outlook* does not project a large biofuel export potential for the United States. Although it is projected to maintain its position as the world's largest ethanol producer, US global production shares are projected to decrease from 50% to 43%.

The European Union

Since 2010, EU legislation related to biofuel support is based on the 2009 Renewable Energy Directive (RED), which requires from EU Member States that at least 10% of transport energy use be based on renewables by 2020. In June 2018, agreement was reached to increase the biofuel target to 14% by 2030, with national caps to food and feed crop-based biofuels at 1 percentage point above 2020 levels but not exceeding 7%. The new framework was adopted under Directive 2018/2001 on 11 December 2018 and will be fully implemented by 2030[5]. The major metrics of this framework, on which the *Outlook* projections are based, are illustrated in Table 9.2.

Table 9.2. EU policy framework for biofuels

	2010-2020 Framework	2020-2030 Framework
	RED / ILUC	ILUC RED II agreement
Renewables in transport	10%	14%
Cap on crop-based biofuels	7%	2020 Member States level +1 p.p., max 7 %
Target for advanced	No target, with double-counting	3.5 %, with double-counting
Contribution of waste oils and fats		Max 1.7 % with double-counting

Source: EU agricultural outlook for markets and income, 2018-2030. European Commission, DG Agriculture and Rural Development, Brussels.

According to the IEA baseline used for this *Outlook*, total energy use in the transport sector is projected to decrease for diesel and gasoline. The decrease for diesel-type fuels is that strong that, although the RED II proposal promotes some growth in biofuel consumption shares, only ethanol consumption is projected to increase (+0.8 bln L), while biodiesel consumption is projected to decrease in absolute terms (-0.4 bln L). Palm oil-based biodiesel constitutes a large share of this decrease in view of the EU sustainability concerns associated with palm oil production. Biodiesel produced from other vegetable oils is expected to decrease as well, but less significantly, while production from waste oils is projected to remain stable. Given these projected demands for the biodiesel sector, the European Union is expected to continue being the world's largest biodiesel-producing region in 2028, but global production shares are expected to decrease from 36% to 30%.

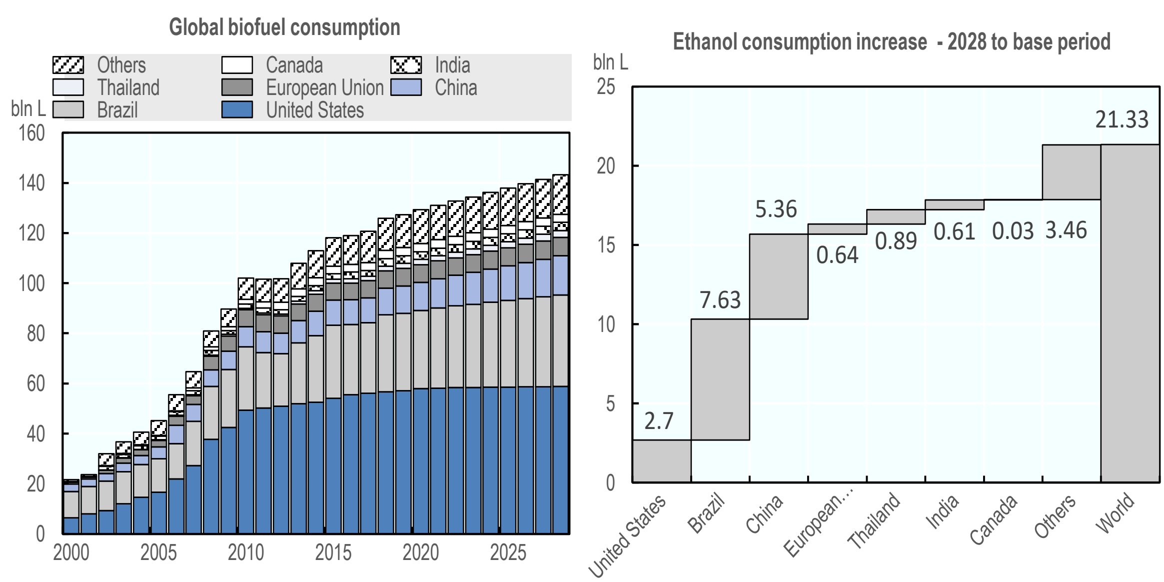
Total biofuel consumption in 2028 in terms of energy is projected to increase slightly (+14 PJ), but the share of advanced biofuel sources is projected to increase from 15% today to 22% in 2028 (Figure 9.3).

Brazil

Brazil is one of the few countries with a large fleet of flex-fuel vehicles that can run on either gasohol (a mix of gasoline and anhydrous ethanol) or on E100 (hydrous ethanol). For gasohol, the mandatory blending requirement for ethanol is legislated at 27%. There is also a differentiated taxation system that favours hydrous ethanol over blended gasohol in key Brazilian states. For biodiesel, a 10% mandate exists.

The largest share of ethanol consumption and production increases in this *Outlook* is expected to come from Brazil (Figure 9.4), due mainly to the RenovaBio programme[6] which will come into effect over the next two years. The RenovaBio programme was officially signed in January 2018; it defines a minimum blending target for anhydrous fuel ethanol that should reach 40% by 2030, as expressed in volume terms. It is intended to reduce the emissions intensity of the Brazilian transport sector in line with the country's commitments under COP 21. To create the necessary incentive structure, RenovaBio will introduce a system of tradeable carbon savings credits similar to those in California's Low Carbon Intensity Program. It might take a few years until this programme changes current production trends, but strong increases in production should be expected once this is the case. Brazil is assumed to contribute 37 bln L to global production and use growth (+8 bln L). In 2028, more than half of the total Brazilian ethanol production is projected to be consumed by high blend flex-fuel vehicles, implying an increase of this fleet.

Figure 9.4. Development of the world ethanol market



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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In contrast to the United States and the European Union, total fuel consumption of diesel and gasoline in Brazil is projected to increase over the coming decade (Figure 9.1), underpinning the potential for growth of these two renewable fuel types. As a consequence, this *Outlook* projects that not only ethanol market volumes in Brazil will increase, but also biodiesel consumption. This increase is projected to occur at the same pace as that of total diesel consumption because the 10% biodiesel blending mandate was reached in 2018 and no further change to this mandate is assumed.

China

The second largest contribution to the global increase in ethanol production is expected to come from China. In September 2017, the Chinese government announced a new nationwide ethanol E10 mandate to be implemented by 2020. Mechanisms for its implementation and enforcement had not been announced as of March 2019. Although this *Outlook* assumes that the ambitious E10 mandate will not be reached by 2028, it does assume that gasoline-type fuels will be blended with 4% of ethanol. This corresponds to a production increase of 5 bln L as the *Outlook* assumes most of the ethanol demand will be produced from domestic feedstocks. Biodiesel production in China will continue to be used more for cooking oil, which has limited growth potential.

India

The National Policy on Biofuels came into effect in May 2018. The main objectives are to achieve 20% ethanol and 5% biodiesel blending, substantially above the current 1.4% and 0.1% blending levels. A new characteristic is that it opens the possibility to use grains as feedstocks if these are not suitable for human consumption. Ethanol would continue to be produced primarily from molasses. This new policy includes the use of non-edible crops, restrictions on imports, price regulations, fiscal incentives, and research and development, especially in second generation biofuels.

Although India is the world’s fifth largest ethanol producer, most of it is used for industrial and food purposes, whereas biofuels represents about 44% of total demand. Biodiesel production in India is marginal given that it is a net importer of vegetable oils. While this *Outlook* assumes ethanol and biodiesel fuel use to reach 1.6 bln L and 0.24 bln L by 2028, blending is expected to decrease marginally from current levels as demand for conventional fuels expands faster.

The main limitation to biofuel production growth assumed over the outlook period is the availability of feedstocks. Projected molasses production in India would not be sufficient to meet the increasing demand from the biofuels industry. While sugarcane would be an alternative, the current use of sugar cane in ethanol is marginal. There is no clear indication on how the new policy would support increases in processing capacity for sugar cane; this *Outlook* assumes no relevant growth. Although non-edible grains would be eligible for producing ethanol, projected decreases in stocks to use ratio of feed grains (maize and other coarse grains) indicate tight markets and no increase of grain-based ethanol is expected.

Canada

The federal Renewable Fuels Regulations mandates 5% renewable content in gasoline (some provinces have their own provincial mandate which is higher) and 2% in diesel fuel. This regulation is supposed to be replaced by the Canadian Clean Fuels Standard (CFS) to be implemented in 2022 for the liquid fuel stream.[7] The Clean Fuel Standard (CFS) policy, currently under negotiation, aims to reduce greenhouse gas emissions from the fuels consumed by introducing Carbon Savings Credits. The current Renewable Fuel Regulations (biofuel mandates) at the federal level (5% renewable content in gasoline and

2% renewable content in diesel) will most likely not be suppressed, but could act as a backstop to the CFS by providing minimum blending rates. The expectation is, however, that the CFS will add value to biofuels through compliance credits and that it would create further incentives to increase blending and use in Canada. This *Outlook* does not include the effects that the CFS might have on biofuel markets, thus biodiesel and ethanol blending rates are expected to stay at current levels.

Indonesia

The implementation of B30 aims to reduces the country's dependency on imported fossil fuels. In recent years, biodiesel production was increased due to the Biodiesel Program, which provides support to biodiesel producers and is financed by the crude palm oil (CPO) fund. In the years 2016-2017, based on media reports, it is estimated that the CPO fund was about USD 1.9 bln, of which 1.5 bln were used for the Biodiesel Program. Sustaining the growth of biodiesel production relies entirely on palm oil exports and competitive prices.

Sustained by the collection of export levies through the CPO fund over the last three years, biodiesel production in Indonesia reached an historical peak of 5 bln L in 2018. This *Outlook* assumes an additional increase in production in 2019, reaching 5.5 bln L. Thereafter, and given the projected increases in palm oil exports, the CPO fund would need to be replenished to allow production to continue to expand. As a result, this *Outlook* assumes a two-year transition period during which biodiesel production is expected to decrease, although not below 5 bln L, to then resume an upward trend, reaching 6 bln L by 2028. The policy to support biodiesel producers relies on international prices, specifically the price wedge between domestic and international palm oil prices that defines the amount of the levy to be collected. Although Indonesia aims to fulfil a B30 target, the blending rate is expected to increase from 8% in the base period to 13% by 2028 (5.8 bln L). Nonetheless, the projected biodiesel production increase is the highest among all countries in this *Outlook* (Figure 9.5).

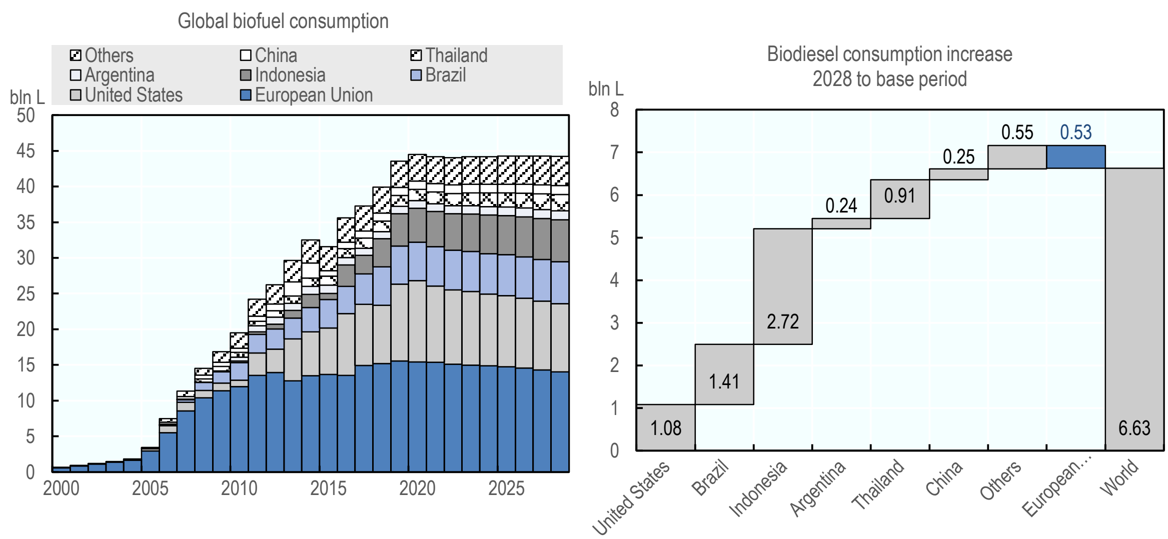
Argentina

Argentina has blending mandates of 10% biodiesel and 12% ethanol. Increases to the biodiesel mandates are under discussion especially given that the two major export markets, the United States and the European Union, have filed anti-dumping import duties on Argentina. Argentina's mandates are expected to be filled by 2021. Tax exemptions should continue to boost the development of the Argentinean biodiesel industry, which exports more than half of the production. However, trade barriers set by the United States on Argentinean biodiesel will likely limit export demand for this country's biodiesel. Thus, although production is expected to recover from current low levels, Argentina is not expected to reach the production peaks of 2014 or 2017 again.

Thailand

Thailand is seeking to reduce CO2 emissions and its dependency on imported fossil fuels. To achieve these goals, it has set an ambitious target of producing 4.1 bln L of ethanol and biodiesel; this target, however, was revised downwards to 2.6 bln L due to problems of feedstock availability – domestic production constraints of molasses, cassava, and palm oil. While the projected domestic cassava production would be sufficient to meet the initial target, cassava production is heavily focussed on export markets because international prices are higher than those offered by the local biofuels industry. As a result, domestic supply to the biofuels industry will remain limited over the outlook period. While sugarcane would be an alternative, investment in sugarcane mills that can process ethanol is limited and no policy changes to allow for this are envisaged.

Figure 9.5. Development of the world biodiesel market



Note: Blue shaded number means reduction
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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Columbia

The government has announced its intentions to implement the E10 at the national level. The existing Biodiesel B10 mandate has proved difficult to be fulfilled, as it would require palm oil production to increase significantly. Other policies include tax exemptions to promote blending and regulated prices for domestic producers.

This *Outlook* assumes that the E10 mandate will be reached by 2028, leading to a fuel demand of 1.5 bln L. The main feedstock is currently sugarcane and projections assume this will continue over the outlook period. In line with historical developments, ethanol is projected to increase in importance as an alternative source of income for the sugarcane industry. By 2028, it is projected that about 38% of the sugarcane production will be used for ethanol production. Such an ambitious target can only be met by doubling production capacity over the projection period. Biodiesel demand is projected to increase marginally 1.1 p.a. over the projection period, to reach 0.7 bln L in 2028, with the blending rate constant at about 6%. Although biodiesel will benefit from tax exemptions, blending obligations and mandate prices, production is assumed to remain limited. As of 2018, Colombia began importing a small amount of biodiesel; this raised concerns amongst producers about the sustainability of the domestic industry if more imports were allowed.

Paraguay

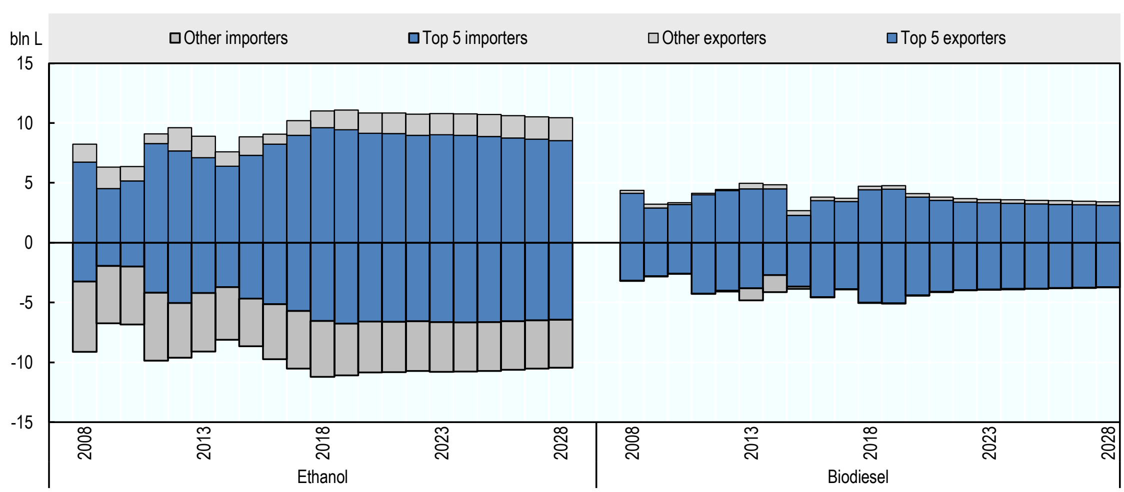
The average blending rate in Paraguay is about E18. Based on past growth and on automobile fleets largely made up of flex cars, the national blending rate could increase in the future. Ethanol production is projected to remain largely based on sugar; however, maize would increase its share as the sugarcane industry is not expected to be able to meet the demand for both food and biofuels, even with declining sugar per-capita intake. The production of both biofuels is projected to more than double over the outlook period.

9.5. Trade

Global ethanol trade is projected to remain as a low share of global production, decreasing from 9% over the base period to 8% by 2028. 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 trade is subject to uncertainties concerning the future of current trade tensions. In this *Outlook*, biodiesel trade is projected to decrease over the next ten years as most countries with biodiesel mandates or targets will fill these domestically, and import demand from developed countries, in particular the United States and the European Union, should decrease.

Figure 9.6. Biofuel trade dominated by a few global players



Note: Top five ethanol exporters in 2028: United States, Brazil, Pakistan, European Union, United Kingdom. Top five ethanol importers in 2028: Brazil, United States, Japan, Canada, China. Top five biodiesel exporters in 2028: Argentina, European Union, Canada, United States, Indonesia. Top five biodiesel importers in 2028: European Union, United States, United Kingdom, Peru, Canada.
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933959284

Argentina should remain the lead biodiesel net exporter, followed by the European Union (mainly exports to the United Kingdom) and Canada. Argentinian exports are expected to increase from current lows over the projection period. Exports from Indonesia and

Malaysia are expected to decline due primarily to diminishing export markets, notably the European Union.

9.6. Main issues and uncertainties

The major risks and uncertainties for future development of the biofuel sector are related to the policy environment. This includes uncertainties about mandate level changes, mandate enforcement mechanisms, investments in non-traditional biofuel feedstocks, and changes to tax exemptions for biofuels.

This *Outlook* makes many assumptions on the expected fill rates of mandates and in many cases these are considerably lower than 100%. Stronger investments in biofuel production capacities or stronger support to the sector would increase the potential of biofuels.

Another uncertainty is related to the capacity of the agricultural sector to produce feedstock for the increasing demand for biofuels in many countries if mandates were to be fulfilled. Biodiesel production is constrained by the limited supply of vegetable oil as it competes directly with food demand. Ethanol production is subject to disruptions in the sugarcane sector inherent to the cyclical production nature of this crop. While such challenges could be addressed by diversifying feedstocks, increasing processing capacity remains uncertain.

Sustainability criteria, agreed upon in early 2019 require European Union Member States to reduce "high ILUC risk" biofuels as of 2024, reaching zero by 2030. "High ILUC-risk" biofuels are produced from food and feed crops that require significant global expansion into land with high carbon stock such as forests, wetlands and peatlands. It remains uncertain how this criteria will affect the biofuel market, especially the use of palm oil as "low ILUC risk" biodiesel feedstock requires certification.

A major determinant in the use of biofuels would be related to the development of national transport fleets. The automobile industry is currently investing in electric cars and, depending on the uptake of this technology (which might depend on the policies enacted), total fuel demand projections could be lower than assumed in this *Outlook*, thereby decreasing the potential of biofuel.

Notes

[1] Biodiesel includes renewable diesel (also known as Hydrotreated Vegetable Oil or HVO) in the accounting of this *Outlook* although both are different products.

[2] https://www.epa.gov/renewable-fuel-standard-program/final-renewable-fuel-standards-2019-and-biomass-based-diesel-volume.

[3] The conventional gap is the difference between the total and advanced mandates as defined by the Renewable Fuel Standard (RFS2).

[4] The blend wall in this context is the maximal achievable national average blending rate, given that most pumps in the United States offer only E10. This assumes that several E15 pumps will be developed over the coming years.

[5] https://ec.europa.eu/jrc/en/jec/renewable-energy-recast-2030-red-ii

[6] http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2017/lei/L13576.htm.

[7] https://www.canada.ca/en/environment-climate-change/services/managing-pollution/energy-production/fuel-regulations/clean-fuel-standard/regulatory-design.html.

Chapter 10. Cotton

This chapter describes the market situation and highlights the medium-term projections for world cotton markets for the period 2019-28. Price, production, consumption and trade developments for cotton are discussed. The chapter concludes with a discussion of important risks and uncertainties affecting world cotton markets during the coming ten years.

10.1. Market situation

Global cotton production fell by 3% to 25.8 Mt in the 2018 marketing year.[1] Declines were seen in India, the People's Republic of China (hereafter "China"), and the United States. Limited water availability, pest problems, and bad weather contributed to these output declines. Among the top producers, only Brazil expanded its output, notably in Mato Grosso where the cotton area has grown from less than 600 000 ha to an estimated 1 Mha over the last four seasons.

Global cotton consumption increased by 2% to 27.3 Mt during 2018. China remained the largest raw cotton consumer, accounting for around one-third of total spinning mill use (see below), followed by India. In recent years, strong growth of the spinning and textile industries has spurred the processing of raw cotton in Bangladesh, Turkey and Viet Nam, a trend which continued in 2018.[2]

Estimated global raw cotton ending stocks declined by 7% to 17.8 Mt, about eight months of world consumption. Changes in stocks are mostly determined by China, which currently holds 40% of global stocks but has been destocking since 2014.

Global cotton exports grew 7% to 9.5 Mt, or 37% of global production. Export growth was registered for the United States (the world's main exporter), as well as for Brazil, which is increasingly supplying cotton to South and East Asia. On the demand side, imports increased in China as well as in Viet Nam and Bangladesh; as neither of the latter two have much domestic cotton production, their growing cotton consumption is mirrored by growing imports.

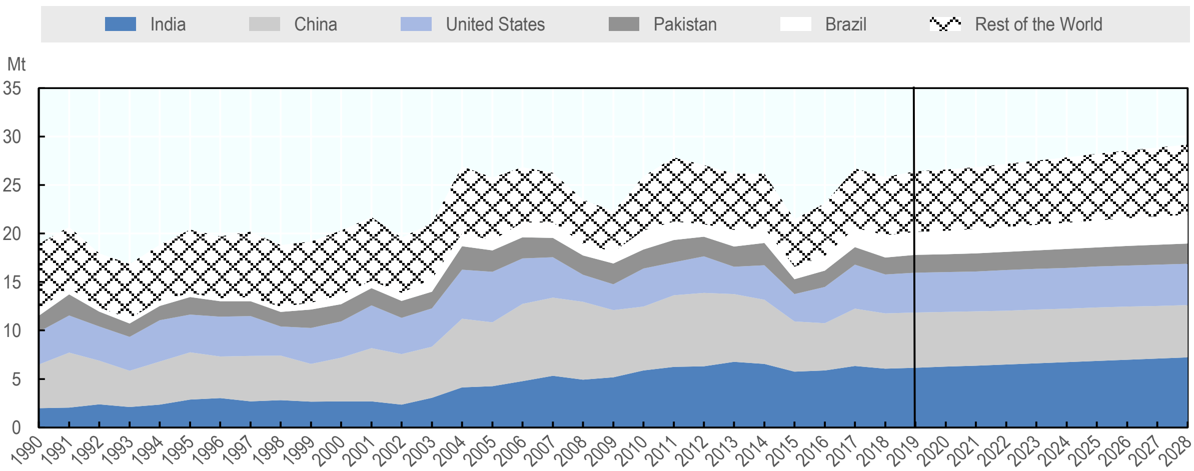
The Cotlook A index, the main reference for international cotton prices, grew from USD 1 750/t in August 2017 to almost USD 2 200/t in August 2018, but has been declining in recent months and is expected to average USD 1960/t in 2018.[3] Cotton prices continue to be historically high compared to prices of polyester, the main substitute for cotton. In 2018, polyester staple fibre prices fluctuated between USD 1 200 and USD 1 700/t.

10.2. Projection highlights

While cotton seeds are used as oilseeds, cotton is mainly grown for its fibres (also known as cotton lint), which are spun into yarn in spinning mills. These spinning mills can typically also process synthetic fibres. The yarn is subsequently woven or knitted into fabric, which is then processed into garments and other textile products. Global consumption of cotton textiles is expected to grow more slowly than world population in the coming decade, as population growth is concentrated in regions with lower per capita use of cotton textiles while per capita use itself is expected to continue to stagnate in most regions.

Consumption data in this *Outlook* refer to spinning mill use, i.e. the processing of raw cotton into yarn. The distribution of consumption across the globe thus depends on the location of spinning mills, usually in proximity to a textile industry. Over the past decades, there has been a marked shift, with spinning mill activity moving from the developed world and the former Soviet Union towards Asia, especially China. However, Chinese consumption peaked in 2007 and has been declining as stricter environmental regulations and rising labour costs have stimulated a move of the industry to other Asian countries, notably Viet Nam and Bangladesh. These trends are expected to continue over the outlook period. In India, another major cotton consumer, government policies promote a domestic textile industry which is expected to also stimulate growth in spinning mill use.

Figure 10.1. World cotton production



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

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World production is projected to increase by +16% and reach 29.2 Mt in 2028. Growth will come mostly from an expansion of the cotton area (by 9%) while average global yields are projected to grow by 6%. Average yields have been flat since 2004, as several countries struggle with pest and water problems. Better agronomic practices (e.g. high-density planting, the use of short-duration varieties, and better canopy management) as well as better genetics and new pest management techniques could bring improvement over the coming decade, but yield growth may remain a challenge in several countries. India will remain the world's largest cotton producer, accounting for more than 65% of the expected area increase but, given its low yields, for only one-third of the increase in global production.

Global exports of raw cotton are projected to reach 12 Mt in 2028. The United States remains the world's largest exporter, accounting for 31% of global exports. In part thanks to efficient double-cropping of cotton with soybeans, Brazil is expected to emerge as a major exporter over the coming decade. Given their expected consumption growth, imports into Bangladesh and Viet Nam (the two leading importers) will continue to grow. Chinese imports are expected to be stable in the early years before falling in later years as consumption resumes its longer-term decline.

Cotton prices will remain below the average of the base period in both real and nominal terms, as competition from synthetic fibres exerts downward pressure. This Outlook assumes a decline in the real cotton price by about 23% over the first three years, bringing cotton prices closer in line with polyester.

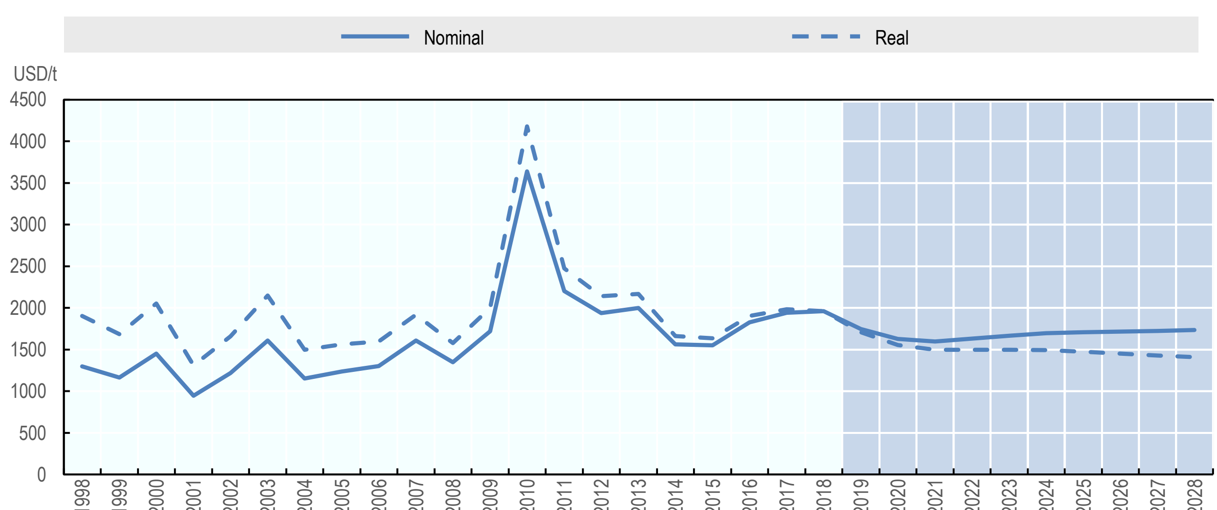
Several uncertainties affect the outlook period under study. It is unclear how per capita consumption of cotton textiles in developing and emerging economies will evolve as incomes grow and urbanisation continues, especially given competition from polyester. This *Outlook* assumes stagnating per capita cotton consumption in these economies, in line with trends observed over the past decade, but relatively small deviations from this trend could have important repercussions for global projections. On the production side, projections are sensitive to pests and weather conditions. Climate change, with its impact on the occurrence and magnitude of events such as droughts and storms, constitutes an additional factor for uncertainty in the future. Projected yield trends are also uncertain. While yield growth has been disappointing in many producing regions in the past decade, it is possible that better agronomic practices, improved genetics, and better pest management techniques will lead to stronger yield growth. Sustainability considerations will continue to influence the future demand and supply of cotton.

Policies are also a factor of uncertainty, in particular China's policy with respect to its large reserve stocks and producing countries' position on genetically modified Bt cotton as the debate on its effectiveness and impact has re-emerged in India and Burkina Faso.

10.3. Prices

International cotton prices are expected to decrease in real terms throughout the projection period, as world cotton demand remains under pressure from synthetic fibres, notably polyester (Figure 10.2). Since the early 1970s, when polyester became price-competitive with cotton, cotton prices have tended to follow polyester prices; on average, cotton prices were only 5% above polyester staple fibre prices between 1972 and 2009. Since 2009, however, cotton prices have been on average almost 40% above the polyester price. This may partly reflect changing preferences, but it seems likely to be in large part due to temporary factors, including low production in 2015-16 and Chinese stockpiling. This *Outlook* expects a partial correction, bringing cotton prices closer in line with the historical pattern. A decline of 23% in real cotton prices is expected in the first three years of the outlook period, followed by a gradual decline of 1.1% per year in real terms. (Polyester prices themselves are not part of the outlook projections, but are expected to track oil prices, which are assumed to be flat in real terms).

Figure 10.2. World cotton prices



Note: The reference cotton price is the Cotlook price A index, Middling 1 1/8", c.f.r. far Eastern ports. Data shown represent the marketing year average (August/July).

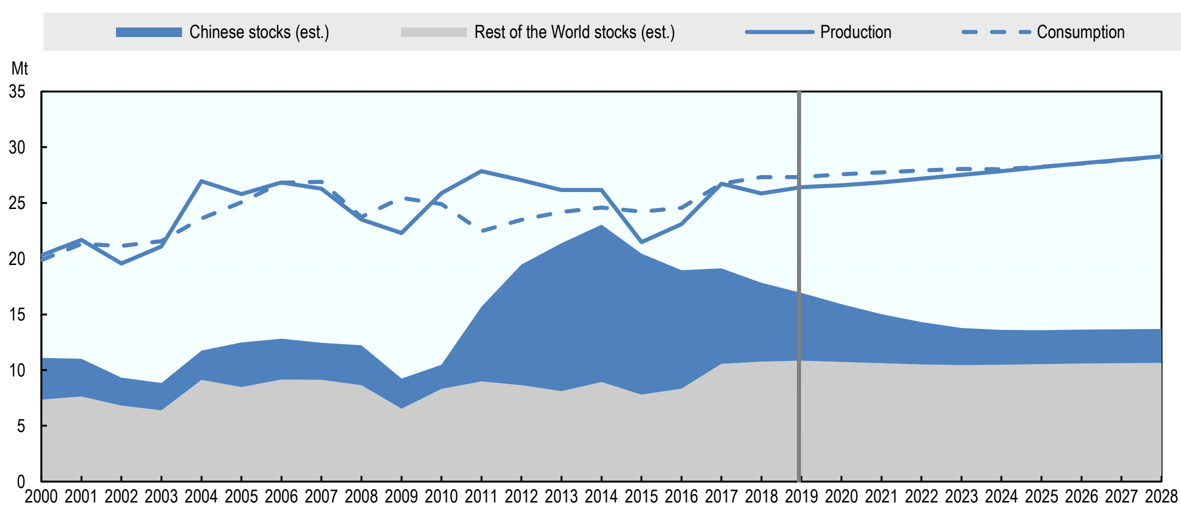
Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933959322

Cotton prices have historically been sensitive to demand and supply shocks, which can lead to large swings. In 2009 and 2010, cotton prices more than doubled due to a mix of low global stock levels, unexpectedly high demand, and floods in Pakistan. The subsequent correction in the cotton price was partly offset by large purchases by the Chinese National Cotton Reserve, with Chinese stocks growing to half or more of the global total in recent years (Figure 10.3).

The potential for demand or supply shocks to create volatility still exists, but a repeat of the 2009-10 price peak seems unlikely given higher global stocks outside China. However, decisions on destocking in China can affect the projections. This *Outlook* assumes that Chinese public stocks will gradually return to pre-2011 levels, in line with recent trends. The future path of cotton prices is clearly sensitive to this assumption.

Figure 10.3. World cotton production, consumption, and stocks



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

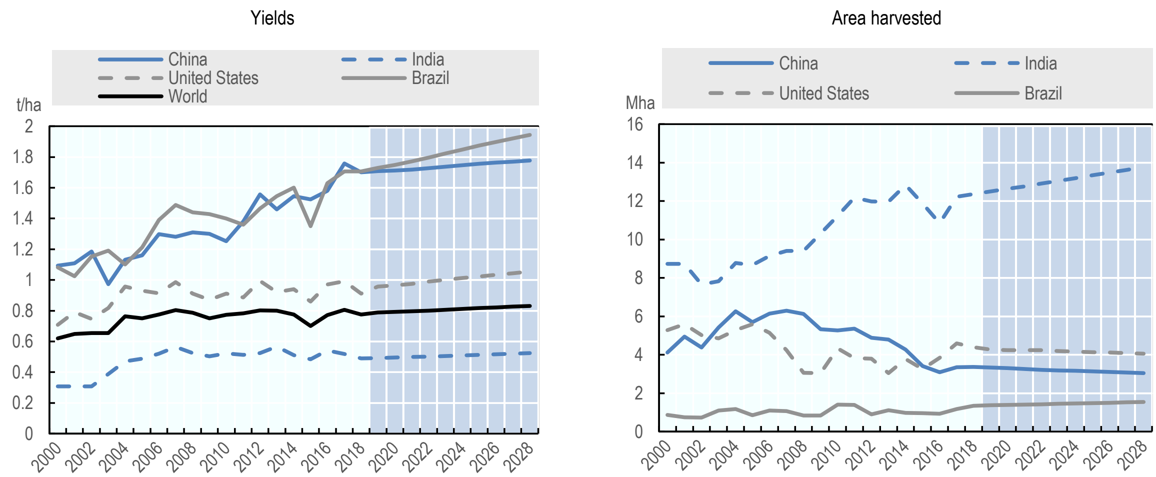
StatLink http://dx.doi.org/10.1787/888933959341

10.4. Production

Cotton is grown in subtropical and seasonally dry tropical areas in both the northern and southern hemispheres, although most of the world's production takes place north of the equator. The main producing countries are India, China, United States, Brazil, and Pakistan. Together, these countries account for more than three-quarter of global production (Figure 10.1).

Most of the production growth in the coming decade is expected to come from these countries, with India accounting for more than a quarter of the increase. At a global level, the cotton area is projected to grow by 9% while yields are only projected to increase by 6%. In the last decade, global yields were stagnant because of stagnant yields in some major producers (the United States, Pakistan, India) and because the cotton area declined in the United States and China (where yields are above-average) while it expanded in India (where yields are below-average). These two factors are expected to continue to affect global yield trends in the coming decade, despite growth in both yields and cotton area in Brazil.

Figure 10.4. Cotton yields and area harvested in major producing countries



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933959360

Production in India is projected to grow by around 1.8% p.a. over the coming decade due in large part to a growing demand for cotton to supply the domestic apparel industry. After a rapid increase in yields between 2000 and 2007 (linked to an increase in irrigation, fertiliser use, and the adoption of genetically modified Bt cotton), yield growth has disappointed in recent years as producers have struggled with adverse weather and pests such as the pink bollworm, which has become resistant to Bt cotton. While it is possible that new technologies will provide relief, the development and roll-out of solutions may take several years. In addition, India's cotton yields are influenced by the monsoon pattern in rain-fed regions and are hence vulnerable to climate change. This *Outlook* therefore assumes broadly flat yields for Indian cotton, and the growing demand for cotton in India is likely to be met by an increase in the cotton area, as has been the case in the past.

Chinese cotton producers currently achieve yields per hectare which are twice the world average and, even though yields are still below potential levels, further improvement may become more difficult. The cotton area in China has been declining over the past decade mostly due to changing government policies. However, in the last two years, this decline seems to have halted. This *Outlook* expects a slowly decreasing cotton area in China.

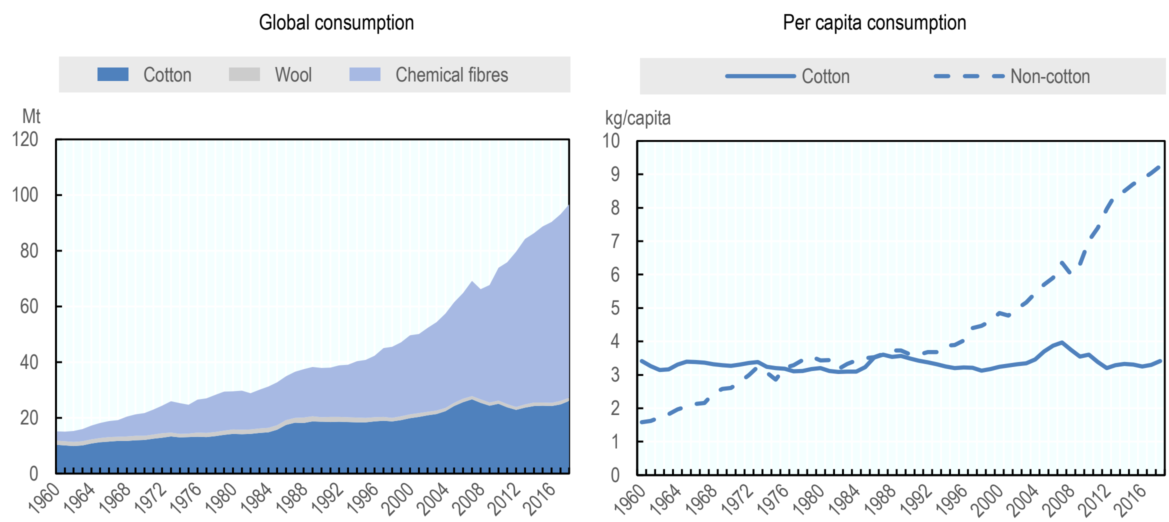
In Brazil, cotton is grown in part as a second crop in rotation with soybeans or maize, and output has recently grown strongly in Mato Grosso. Given favourable growing conditions and a high rate of adoption of modern technologies, it seems likely that yields and area harvested will continue their upward trend of the past years.

Cotton production is expected to grow at a slower pace than consumption during the first few years of the outlook period, resulting from the expected release of stocks, especially in China.

10.5. Consumption

Cotton consumption statistics in this *Outlook* refer to the use of cotton fibres by spinning mills for the production of yarn. This mill use depends on the global demand for textiles as well as on competition of substitutes such as polyester and other synthetic fibres. Over the past decades, global demand for textile fibres has grown strongly, but most of this demand has been met by chemical fibres (Figure 10.5). Per capita consumption of non-cotton fibres overtook that of cotton in the early 1990s, and has continued to grow strongly. By contrast, global per capita consumption of cotton fibres has not increased much over time and has even decreased in recent years. As a result, global cotton consumption peaked in 2007 at 27 Mt, but decreased to around 26 Mt in 2016-18.

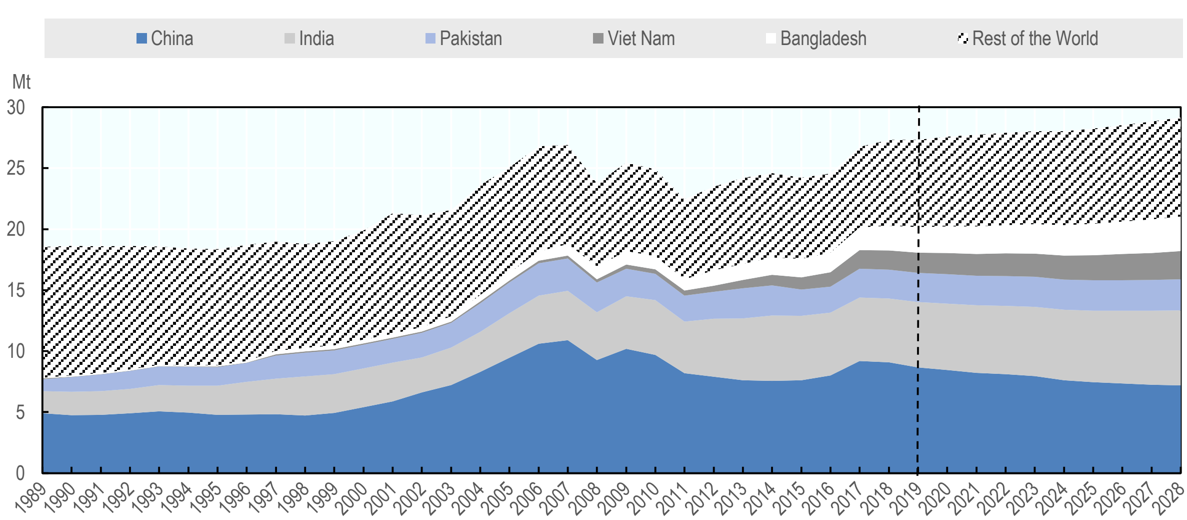
Figure 10.5. Trends in consumption of textile fibres



Source: ICAC World Textile Demand estimates, 2018.

StatLink http://dx.doi.org/10.1787/888933959379

Figure 10.6. Cotton consumption by region



Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en; historical data from ICAC.

StatLink http://dx.doi.org/10.1787/888933959398

The prospects for global cotton depend to an important degree on how per capita consumption of cotton textiles will evolve in developing and emerging economies. Data collected by the International Cotton Advisory Committee suggests that for the developing world as a whole, per capita demand for such cotton products decreased between 2007 and 2012 and has been flat since then. It seems likely that the effects of income growth (which could lead to a higher demand for cotton products) are partly offset by strong population growth in regions where per capita demand for cotton products is below average. Because of these developments, this *Outlook* expects that global consumption of cotton products will grow more slowly than global population in the coming decade. Correspondingly, global mill use is projected to grow by around 0.7% p.a. over the outlook period.

The distribution of demand for cotton fibres depends on the location of spinning mills, where cotton and synthetic fibres are spun into yarn. These mills are mostly located in Asian countries, in part due to cheaper labour costs; China has been the world's largest consumer of cotton since the 1960s. Major shifts are taking place, however, as yarn production gradually moves from China to other Asian countries.

Consumption in China peaked in 2007, and since has fallen by 20%. This decline was partly due to a decrease in government purchases of cotton, which had provided higher prices to farmers but also induced a shift from cotton to synthetic fibres on the demand side. This decline also reflects a more structural change as higher labour costs and more stringent regulations stimulated a move of the industry to other Asian countries, notably Viet Nam and Bangladesh. In the last three years, mill consumption has regained some lost ground, in part because cotton has become more attractive compared to polyester as government interventions to prop up cotton prices have been reduced. Polyester also appears to have suffered a setback due to government measures to combat industrial pollution. Despite these factors, the strong growth of the apparel and spinning industry in lower-cost Asian countries suggests that Chinese spinning mill use will resume its declining trend over the outlook period.

By contrast, spinning mill use is expected to grow in India as the government favours the development of the domestic textile industry. Textiles form an important component of Indian industrial production and are considered an engine of employment generation. Policies are expected to continue supporting its development, e.g. through support for the adoption of faster looms.

The phase-out in 2005 of the Multi Fibre Arrangement (which had fixed bilateral quotas for developing country imports into Europe and the United States) was expected to favour Chinese textile producers to the detriment of smaller Asian countries. Instead, countries such as Bangladesh, Viet Nam and Indonesia have experienced surprisingly strong growth in their textile industry. In the case of Viet Nam, this is due in part to foreign direct investment by Chinese entrepreneurs and its accession to the World Trade Organization in 2007. The rapid growth in these countries is expected to continue over the next decade, with all three countries expanding their mill use by more than 50%. Further growth is also expected in Turkey, where the textile industry is expanding in part thanks to growing exports to the European Union and the Russian Federation.

10.6. Trade

Cotton has historically been traded in bales of raw cotton fibres, although recently trade in cotton yarn has been growing. The global trade in raw cotton (the focus in this *Outlook*) is expected to reach 12 Mt in 2028, about 30% higher than during the base period. Trade is therefore expected to grow faster than overall consumption and production given demand growth in countries without much domestic cotton production, such as Bangladesh and Viet Nam, and declining domestic mill use in Brazil.

Bangladesh and Viet Nam are projected to be the leading importers over the next decade due to a strong growth in import volumes. By 2028, both countries are expected to increase their imports by more than 50%. Together, they will account for over 40% of global imports.

The United States will remain the world's largest exporter throughout the outlook period, accounting for almost a third of global exports in 2028. Brazilian exports are expected to grow strongly over the next decade, as Brazil emerges as the second-largest exporter by 2028.

Cotton is an important export crop for Sub-Saharan Africa, which currently accounts for 15% of global exports (with West Africa accounting for almost 75% of the region's production and shipments). Burkina Faso, Benin, Mali, and Côte d'Ivoire, the leading producing countries, have seen their volumes expanding during recent seasons due to area expansion and government support. Spinning mill consumption remains limited throughout Sub-Saharan Africa and many countries export virtually all of their production. Sub-Saharan African exports are projected to continue growing at around 2.6% p.a. in the coming decade, increasing the region's market share to 17%, with Asia and Southeast Asia being the major destinations for shipments.

10.7. Main issues and uncertainties

As discussed earlier, it is unclear how economic growth and urbanisation will affect the per capita demand for cotton textiles in developing and emerging economies. Even a relatively small deviation from the per capita demand trend for the developing world assumed in this *Outlook* could lead to important changes in global consumption, production and trade projections. In the short run, demand for textiles depends on economic conditions; a global recession could therefore lead to a drop in cotton demand.

Other demand trends could also affect the projections. For instance, recycling by the textile industry is creating a steady secondary market, which competes to provide raw material to producers of lower-quality textiles and non-textile products. This trend could further reduce the demand for cotton and other fibres. On the other hand, in high-income countries there appears to be an increasing consumer preference for natural fibres which could favour cotton over polyester.

Policy measures can also affect consumption trends; for instance, several East African countries are moving towards discouraging second-hand clothing imports, which could give a push to cotton consumption and encourage value addition in Africa.

Cotton production is sensitive to pests and to weather conditions. Given cotton's dependence on water, projections are sensitive to climate change, which could lead to droughts and other adverse weather conditions. As noted above, yield growth has been slow in several countries in the past decade. Improved genetics (facilitated in part by a better understanding of the cotton genome) and better pest management have the potential to lead to stronger yield growth than what is expected in this *Outlook*. However, such innovations take time to develop and deploy and, in the case of genetically modified cotton, are sometimes controversial. In India, pink bollworm appears to have become resistant to Bt cotton, resulting in major crop losses in Maharashtra. The causes of this problem are currently under debate, although it seems that India's long-duration hybrid cotton varieties may contribute to the problem. In Burkina Faso, the introduction of Bt cotton in 2008 was effective in combatting bollworms, but resulted in a shorter staple length (and hence lower quality premiums), prompting the government to phase out Bt cotton in 2015.

Policies play an important role in global cotton markets. This is notably the case for Chinese stockholding policies, as discussed earlier. Other policy initiatives (e.g. support for domestic textile industries, input subsidies) may also affect projections.

Sustainability considerations will continue to influence the future demand and supply of cotton. Globally, an estimated 19% of cotton was produced under the sustainability standards of the Better Cotton Initiative in 2017-18, and further growth is expected. Related segments such as organic cotton are also expected to grow. One consequence of these trends is an increased need for transparency and traceability along the supply chain.

Notes

[1] In line with the convention used by the International Cotton Advisory Committee, the marketing year for cotton is defined as running from 1 August to 31 July. Data for 2018 thus refer to the period from 1 August 2018 to 31 July 2019, and are forecasts based on available data.

[2] The *Agricultural Outlook* reports data for least-developed countries in Asia as a single aggregate, which in addition to Bangladesh includes Afghanistan, Bhutan, Cambodia, East Timor, Laos, Myanmar, and Nepal. For cotton, Bangladesh accounts for nearly all the activity in this aggregate. For simplicity, this chapter therefore describes the data as referring to Bangladesh only.

[3] The Cotlook A index is expressed in US cents per pound while prices in the *Outlook* are in USD per (metric) tonne (2 204,6 pounds). Dividing prices reported here by a factor of 22 gives the price in US cents per pound.

Annex A. Glossary

Aquaculture	The farming of aquatic organisms including fish, molluscs, crustaceans, 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. (for more information on this topic: http://www.oie.int/doc/ged/d13953.pdf)
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. See also Pacific beef/pigmeat market.
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 (for more information on this topic, see http://www.oie.int/doc/ged/D13947.PDF)
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 feedstock 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.
Common Agricultural Policy (CAP)	The European Union's agricultural policy, first defined in Article 39 of the Treaty of Rome signed in 1957

Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)	CPTPP is a trade agreement between Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Viet Nam. It was signed in March 2018 and came into force for the first six countries in December 2018.
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 run on either 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.
G20	The G20 is an international forum made up of 19 countries and the European Union, representing the world's major developed and emerging economies. Together, the G20 members represent 85 % of global GDP, 75% of international trade, and two-thirds of the world's population. Originally bringing together finance ministers and central bank governors, the G20 has evolved into a forum to address broader global challenges.
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, for example, the marketing year 2018, this is short for 2018/19 for the above commodities. For all other commodities, the marketing year is equal to the calendar year.
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. In 2018, a new agreement between the United States, Mexico and Canada (USMCA) was signed. It should replace NAFTA following ratification.
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. See also Atlantic beef/pigmeat market.
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 (see http://www.oecd.org/agriculture/topics/agricultural-policy-monitoring-and-evaluation/).
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.
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.
Tel quel basis	Weight of sugar, regardless of its sucrose content (measured by polarisation).
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.

Annex B. 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. 104 (November 2018). For other economies, historical macroeconomic data were obtained from the IMF, *World Economic Outlook* (October 2018). Assumptions for 2019 2028 are based on the recent medium term macroeconomic projections of the OECD Economics Department, projections of the *OECD Economic Outlook* No. 104 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 2017 is taken from the short term update of the *OECD Economic Outlook* No. 104 (November 2018). For 2018, the annual average monthly spot price is used, while the average daily spot price for December 2018 is used as the oil price value for the year 2019. Brent crude oil prices from 2019 are assumed to remain flat in real terms.

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, as well as biodiesel and bioethanol. Other 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 agricultural markets. In particular, country specific macroeconomic variables, the crude oil price, and 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 all countries: the consumer price index (CPI), the gross domestic product index (GDPI), the gross domestic product deflator (GDPD) and the US-Dollar exchange rate (XR). The yield variables considered contain crop and milk yields in all model regions.

In 2019, the previous methodology to determine the stochastic draws (explained in Araujo-Enciso, Pieralli and Pérez-Domínguez, 2017[2]) was abandoned. The approach applied is based on a simpler process which is easier to understand and still captures the historical variance of each single variable. The three main steps of the partial stochastic process are briefly explained below.

(i) The quantification of the past variability around the trend for each macroeconomic and yield variable separately

The first step is to define the historical trend of stochastic variables. Often a linear trend does not represent adequately observed dynamics. Consequently, a non-linear trend is estimated by applying a Hodrick-Prescott filter, which seeks to separate short-term fluctuations from long-term movements.[3] The filter is applied to the yield time series directly and to year-on-year changes for macro variables.

(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. For each year of the 2019-2028 projection period, one year of the historical period 1995-2018 is drawn. The relative deviation between the actual variable value of that year and the respective trend value estimated in step 1 is then applied to the value of the variable in the actual projection year. All variables thereby receive the value of the same historical year. The process, however, handles macro variables separated from yields, as both are not strongly correlated.

(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 2. When both macroeconomic and yield uncertainty were included, this procedure yielded 989 successful simulations. The model did not solve the remaining eleven cases. 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] 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.

[3] The filter was popularized in the field of economics in the 1990s in Robert Hodrick and Edward C. Prescott (1997), "Postwar U.S. Business Cycles: An Empirical Investigation", *Journal of Money, Credit, and Banking*, Vol. 29 (1), pp. 1–16. JSTOR 2953682.

Annex C. Statistical Annex

Table C.1. World cereal projections

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WHEAT												
World												
Production	Mt	752.2	766.4	772.9	781.0	788.8	796.5	804.8	812.8	821.6	829.8	838.0
Area	Mha	219.0	220.5	220.2	220.2	220.2	220.2	220.4	220.5	220.8	220.9	221.0
Yield	t/ha	3.43	3.48	3.51	3.55	3.58	3.62	3.65	3.69	3.72	3.76	3.79
Consumption	Mt	741.1	751.6	764.7	776.0	787.1	795.1	802.1	810.1	818.4	826.7	834.8
Feed use	Mt	146.3	147.8	150.9	153.1	155.4	157.5	159.4	161.4	163.5	165.5	167.7
Food use	Mt	503.4	512.5	518.4	525.5	531.5	535.1	538.0	542.3	546.5	550.8	554.5
Biofuel use	Mt	12.3	12.6	12.8	13.1	13.4	13.7	14.0	14.5	14.9	15.3	15.7
Other use	Mt	79.1	78.7	82.6	84.3	86.8	88.8	90.7	92.0	93.5	95.1	96.9
Exports	Mt	176.6	181.4	185.2	187.3	189.9	191.9	193.9	196.7	199.2	201.7	204.0
Closing stocks	Mt	286.0	301.6	309.8	314.8	316.6	317.9	320.6	323.3	326.5	329.6	332.8
Price[1]	USD/t	221.1	225.9	217.1	216.0	217.4	221.0	224.9	227.9	231.4	234.7	237.5
Developed countries												
Production	Mt	394.3	402.9	405.6	409.4	412.7	415.8	419.6	423.3	427.6	431.3	434.8
Consumption	Mt	273.6	271.3	273.3	275.3	277.7	279.6	281.0	282.7	284.6	286.3	288.1
Net trade	Mt	122.2	126.8	130.4	132.6	135.1	136.9	138.3	140.8	142.7	144.8	146.5
Closing stocks	Mt	79.8	77.1	79.1	80.6	80.4	79.7	80.0	79.9	80.2	80.4	80.6
Developing countries												
Production	Mt	357.9	363.6	367.3	371.5	376.2	380.7	385.1	389.5	394.0	398.5	403.2
Consumption	Mt	467.5	480.2	491.4	500.7	509.3	515.5	521.1	527.4	533.8	540.3	546.8
Net trade	Mt	-120.5	-126.8	-130.4	-132.6	-135.1	-136.9	-138.3	-140.8	-142.7	-144.8	-146.5
Closing stocks	Mt	206.2	224.5	230.7	234.2	236.2	238.2	240.6	243.4	246.2	249.2	252.2
OECD[2]												
Production	Mt	282.3	291.6	292.8	294.8	296.3	297.8	299.9	301.8	304.4	306.4	308.3
Consumption	Mt	225.4	225.6	227.1	228.8	230.7	232.2	233.2	234.4	235.8	237.1	238.4
Net trade	Mt	57.9	63.7	64.0	64.7	65.6	65.9	66.8	67.7	68.4	69.2	69.7
Closing stocks	Mt	65.1	62.0	63.8	65.0	65.0	64.7	64.7	64.5	64.7	64.8	64.9
MAIZE												
World												
Production	Mt	1 128.2	1 151.5	1 168.2	1 184.8	1 201.5	1 219.5	1 237.1	1 256.9	1 275.3	1 293.6	1 311.2
Area	Mha	190.2	190.2	191.1	191.7	192.6	193.5	194.2	195.2	196.1	196.9	197.5
Yield	t/ha	5.93	6.05	6.11	6.18	6.24	6.30	6.37	6.44	6.50	6.57	6.64
Consumption	Mt	1 111.5	1 159.2	1 177.6	1 192.8	1 207.4	1 225.1	1 240.1	1 255.5	1 270.0	1 286.0	1 300.7
Feed use	Mt	651.9	678.6	690.7	700.4	708.9	721.3	731.1	741.3	751.0	762.2	772.0
Food use	Mt	133.9	138.7	141.0	143.5	146.0	148.5	151.0	153.5	156.1	158.7	161.3
Biofuel use	Mt	178.5	181.6	183.0	184.0	185.3	186.3	187.4	188.0	188.7	189.2	189.7
Other use	Mt	100.0	112.4	114.5	116.1	117.8	119.2	120.3	121.7	122.8	124.1	125.3
Exports	Mt	160.1	169.1	171.7	173.8	176.5	179.2	182.1	185.0	187.9	190.8	193.6
Closing stocks	Mt	374.9	339.5	319.1	300.0	283.1	266.4	252.3	242.7	237.0	233.5	233.0
Price[3]	USD/t	158.5	160.6	164.5	165.8	169.0	171.9	175.3	178.3	181.6	184.2	186.0
Developed countries												
Production	Mt	520.5	528.9	536.3	541.4	545.6	549.9	554.0	558.5	563.0	567.0	570.8
Consumption	Mt	461.1	468.4	475.2	478.9	482.0	486.5	489.4	492.6	495.8	498.7	501.3
Net trade	Mt	57.9	58.3	59.3	60.5	61.8	62.8	64.3	65.4	66.7	67.8	69.0
Closing stocks	Mt	84.7	78.9	80.7	82.6	84.4	85.1	85.4	85.9	86.4	87.0	87.5
Developing countries												
Production	Mt	607.6	622.6	631.8	643.4	655.9	669.6	683.1	698.4	712.4	726.6	740.4
Consumption	Mt	650.4	690.7	702.3	713.9	725.4	738.6	750.7	762.9	774.2	787.4	799.5
Net trade	Mt	-46.8	-47.3	-48.3	-49.5	-50.7	-51.7	-53.2	-54.4	-55.6	-56.8	-58.0
Closing stocks	Mt	290.3	260.6	238.4	217.4	198.6	181.3	166.9	156.8	150.6	146.5	145.5
OECD[2]												
Production	Mt	487.4	494.1	500.2	504.4	507.5	510.9	513.9	517.3	520.7	523.7	526.3
Consumption	Mt	485.3	494.1	501.7	505.6	508.7	513.4	516.4	519.7	523.1	526.1	528.8
Net trade	Mt	0.6	-2.8	-3.6	-3.2	-2.9	-3.0	-2.8	-2.9	-2.9	-2.9	-2.9
Closing stocks	Mt	83.9	77.8	79.9	81.9	83.6	84.2	84.5	84.9	85.4	85.9	86.3

Table C.1. World cereal projections *(cont.)*

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
OTHER COARSE GRAINS												
World												
Production	Mt	292.1	299.1	301.0	304.1	306.8	309.3	312.5	315.5	318.7	321.9	325.0
Area	Mha	154.2	156.1	155.6	155.9	155.9	156.0	156.3	156.6	156.8	157.1	157.3
Yield	t/ha	1.89	1.92	1.93	1.95	1.97	1.98	2.00	2.01	2.03	2.05	2.07
Consumption	Mt	290.8	293.0	298.2	300.8	304.0	306.9	310.2	313.4	316.4	319.7	322.9
Feed use	Mt	161.7	162.4	164.8	165.9	167.2	168.7	170.1	171.6	172.8	174.3	175.6
Food use	Mt	77.7	79.1	80.7	81.9	83.5	84.6	86.2	87.6	89.0	90.5	92.1
Biofuel use	Mt	9.4	9.5	9.6	9.6	9.8	9.9	10.0	10.1	10.2	10.2	10.3
Other use	Mt	42.1	42.1	43.2	43.3	43.5	43.8	44.0	44.2	44.4	44.6	44.9
Exports	Mt	43.1	40.5	41.1	41.6	42.3	42.8	43.6	44.2	44.8	45.4	46.1
Closing stocks	Mt	53.7	57.5	58.7	60.4	61.7	62.5	63.2	63.7	64.4	65.0	65.5
Price[4]	USD/t	189.9	189.2	188.3	190.3	192.5	197.6	201.3	205.6	210.1	213.7	216.1
Developed countries												
Production	Mt	180.0	182.1	182.7	183.8	184.7	185.1	186.0	186.8	187.7	188.6	189.4
Consumption	Mt	150.1	149.4	151.7	151.7	152.3	152.7	153.2	153.6	153.8	154.2	154.6
Net trade	Mt	31.6	29.0	30.1	30.7	31.6	31.9	32.6	33.1	33.6	34.2	34.8
Closing stocks	Mt	28.7	31.0	31.9	33.3	34.1	34.6	34.9	35.0	35.3	35.5	35.5
Developing countries												
Production	Mt	112.0	117.0	118.2	120.4	122.2	124.2	126.4	128.6	130.9	133.3	135.6
Consumption	Mt	140.7	143.6	146.5	149.1	151.7	154.2	157.0	159.7	162.6	165.4	168.3
Net trade	Mt	-27.9	-27.4	-28.5	-29.2	-30.0	-30.3	-31.0	-31.5	-32.0	-32.6	-33.2
Closing stocks	Mt	25.0	26.5	26.7	27.2	27.6	27.9	28.3	28.6	29.1	29.5	30.0
OECD[2]												
Production	Mt	145.9	149.7	150.0	150.6	151.0	151.1	151.5	151.9	152.3	152.8	153.2
Consumption	Mt	128.8	128.1	129.9	130.3	130.5	130.7	130.9	131.3	131.4	131.7	132.0
Net trade	Mt	20.2	18.9	19.4	19.5	20.0	19.9	20.3	20.5	20.8	21.1	21.4
Closing stocks	Mt	20.3	20.9	21.6	22.4	23.0	23.5	23.8	23.9	24.0	24.0	23.9
RICE												
World												
Production	Mt	513.4	526.9	532.1	537.9	543.8	549.1	554.8	560.7	566.6	572.4	578.2
Area	Mha	165.8	167.5	167.3	167.1	167.1	166.9	166.8	166.8	166.7	166.6	166.5
Yield	t/ha	3.10	3.15	3.18	3.22	3.26	3.29	3.33	3.36	3.40	3.44	3.47
Consumption	Mt	510.5	524.1	530.8	537.0	543.3	548.9	554.6	560.3	566.1	571.8	577.6
Feed use	Mt	17.8	17.0	17.5	17.7	17.9	18.0	18.1	18.3	18.5	18.7	18.9
Food use	Mt	408.7	419.6	424.7	429.5	434.7	439.5	444.2	448.9	453.7	458.4	463.1
Exports	Mt	47.3	49.9	51.4	52.2	53.1	54.1	55.1	56.2	57.3	58.4	59.6
Closing stocks	Mt	171.7	178.9	180.2	181.0	181.6	181.7	182.0	182.5	183.0	183.6	184.1
Price[5]	USD/t	422.7	436.4	431.5	433.7	434.8	441.3	448.5	454.5	460.5	465.7	470.3
Developed countries												
Production	Mt	17.9	18.1	18.1	18.2	18.4	18.4	18.5	18.6	18.7	18.8	18.9
Consumption	Mt	20.0	20.2	20.3	20.3	20.3	20.4	20.4	20.5	20.6	20.6	20.6
Net trade	Mt	-1.8	-1.8	-1.8	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Closing stocks	Mt	4.6	4.1	3.7	3.5	3.4	3.3	3.2	3.3	3.3	3.4	3.6
Developing countries												
Production	Mt	495.6	508.8	514.0	519.7	525.4	530.6	536.3	542.1	547.9	553.6	559.2
Consumption	Mt	490.5	504.0	510.5	516.8	523.0	528.5	534.1	539.8	545.5	551.2	557.0
Net trade	Mt	1.3	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Closing stocks	Mt	167.1	174.9	176.5	177.6	178.2	178.5	178.8	179.2	179.7	180.1	180.5
OECD[2]												
Production	Mt	21.4	21.6	21.6	21.7	21.8	21.8	21.9	21.9	21.9	22.0	22.0
Consumption	Mt	23.8	23.7	23.9	23.9	23.9	23.9	23.9	23.9	24.0	23.9	24.0
Net trade	Mt	-2.0	-1.8	-1.9	-2.0	-2.0	-2.0	-2.0	-2.1	-2.1	-2.1	-2.1
Closing stocks	Mt	5.7	5.1	4.7	4.5	4.4	4.3	4.3	4.3	4.3	4.5	4.6

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

1. No.2 hard red winter wheat, ordinary protein, United States FOB Gulf Ports (June/May).
2. Excludes Iceland but includes all EU 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.2. World oilseed projections

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
SOYBEAN												
World												
Production	Mt	352.8	357.1	362.1	368.5	374.6	381.8	387.5	393.2	398.9	404.8	411.0
Area	Mha	124.3	126.3	127.2	128.1	129.0	130.1	131.0	131.8	132.6	133.4	134.3
Yield	t/ha	2.84	2.83	2.85	2.88	2.90	2.93	2.96	2.98	3.01	3.03	3.06
Consumption	Mt	347.0	358.8	365.5	370.8	376.1	381.8	387.5	393.1	398.9	404.8	410.9
Crush	Mt	311.8	322.5	329.2	334.3	339.3	344.7	350.1	355.5	361.1	366.8	372.4
Closing stocks	Mt	42.6	50.9	47.5	45.2	43.7	43.6	43.7	43.8	43.7	43.8	43.9
Price[1]	USD/t	393.8	373.5	395.9	403.0	415.4	421.2	431.0	440.3	450.3	459.5	465.8
Developed countries												
Production	Mt	140.9	129.6	131.0	133.3	135.4	138.2	140.3	142.3	144.4	146.6	148.8
Consumption	Mt	91.2	94.0	95.2	96.1	97.0	98.0	99.0	100.0	101.0	102.1	103.3
Crush	Mt	82.2	84.5	85.7	86.6	87.4	88.3	89.2	90.1	91.1	92.1	93.1
Closing stocks	Mt	19.4	27.2	23.8	21.5	19.9	19.5	19.4	19.3	19.1	19.0	18.9
Developing countries												
Production	Mt	211.9	227.4	231.1	235.2	239.2	243.6	247.3	250.8	254.5	258.3	262.2
Consumption	Mt	255.8	264.8	270.3	274.7	279.1	283.8	288.5	293.1	297.9	302.8	307.7
Crush	Mt	229.6	238.0	243.4	247.7	251.9	256.5	260.9	265.4	270.0	274.7	279.4
Closing stocks	Mt	23.3	23.7	23.7	23.8	23.8	24.1	24.3	24.5	24.6	24.8	25.0
OECD[2]												
Production	Mt	131.8	119.7	121.0	123.0	124.9	127.4	129.3	131.1	133.0	134.9	136.9
Consumption	Mt	91.3	93.8	95.0	96.0	97.0	98.0	99.1	100.1	101.2	102.2	103.4
Crush	Mt	82.3	84.3	85.6	86.5	87.4	88.4	89.4	90.3	91.3	92.3	93.2
Closing stocks	Mt	19.5	27.0	23.7	21.4	19.8	19.5	19.3	19.2	19.0	18.9	18.7
OTHER OILSEEDS												
World												
Production	Mt	152.8	157.2	158.9	161.7	164.1	166.5	168.9	171.2	173.4	175.6	178.0
Area	Mha	88.7	90.3	90.4	91.1	91.6	92.1	92.6	93.0	93.4	93.8	94.3
Yield	t/ha	1.72	1.74	1.76	1.77	1.79	1.81	1.82	1.84	1.86	1.87	1.89
Consumption	Mt	151.9	156.8	159.3	161.5	163.9	166.3	168.7	171.0	173.3	175.5	178.0
Crush	Mt	130.8	135.6	137.9	139.8	142.1	144.2	146.3	148.4	150.5	152.4	154.7
Closing stocks	Mt	8.5	8.4	8.0	8.2	8.4	8.7	8.9	9.1	9.2	9.4	9.4
Price[3]	USD/t	428.0	426.3	431.5	441.5	453.3	458.2	466.0	475.5	484.3	494.5	497.1
Developed countries												
Production	Mt	92.5	95.5	96.2	98.0	99.4	100.7	102.0	103.2	104.4	105.5	106.8
Consumption	Mt	82.7	85.6	86.8	87.6	88.7	89.6	90.6	91.4	92.3	93.1	94.1
Crush	Mt	75.0	78.0	79.0	79.8	80.8	81.7	82.6	83.3	84.2	85.0	85.9
Closing stocks	Mt	6.2	6.4	6.0	6.2	6.3	6.6	6.8	6.9	7.0	7.1	7.1
Developing countries												
Production	Mt	60.3	61.6	62.7	63.7	64.7	65.8	66.9	68.0	69.1	70.1	71.2
Consumption	Mt	69.3	71.2	72.6	73.9	75.2	76.7	78.1	79.6	81.0	82.3	83.8
Crush	Mt	55.8	57.7	58.9	60.1	61.3	62.5	63.8	65.1	66.3	67.5	68.8
Closing stocks	Mt	2.3	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.3
OECD[2]												
Production	Mt	61.0	61.1	61.2	62.3	63.0	63.6	64.2	64.7	65.1	65.5	66.0
Consumption	Mt	56.2	56.9	57.5	57.8	58.3	58.7	59.1	59.4	59.7	59.9	60.3
Crush	Mt	50.3	50.9	51.5	51.7	52.2	52.5	52.9	53.1	53.4	53.7	54.0
Closing stocks	Mt	5.3	5.5	5.1	5.3	5.5	5.7	5.9	6.1	6.2	6.3	6.3
PROTEIN MEALS												
World												
Production	Mt	343.0	354.5	361.3	366.6	372.2	377.9	383.7	389.4	395.3	401.1	407.2
Consumption	Mt	342.0	354.6	361.3	366.5	372.1	377.8	383.6	389.3	395.2	401.0	407.1
Closing stocks	Mt	15.3	13.8	13.8	13.9	13.9	14.0	14.1	14.2	14.2	14.3	14.4
Price[4]	USD/t	332.5	325.2	335.7	339.6	348.3	353.4	360.8	367.9	376.1	382.7	387.2
Developed countries												
Production	Mt	108.7	111.4	112.9	114.0	115.2	116.3	117.5	118.6	119.8	121.0	122.2
Consumption	Mt	124.4	127.2	128.4	129.2	130.0	130.8	131.6	132.3	133.1	133.9	134.7
Closing stocks	Mt	1.9	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9
Developing countries												
Production	Mt	234.2	243.1	248.3	252.6	257.0	261.6	266.2	270.8	275.5	280.2	285.0
Consumption	Mt	217.6	227.3	232.8	237.3	242.1	247.0	252.0	257.0	262.1	267.2	272.4
Closing stocks	Mt	13.5	12.0	12.0	12.1	12.1	12.2	12.2	12.3	12.4	12.5	12.6
OECD[2]												
Production	Mt	99.1	100.6	102.1	103.0	104.0	105.1	106.1	107.0	108.1	109.0	110.1
Consumption	Mt	128.0	130.6	132.2	133.3	134.3	135.4	136.5	137.5	138.6	139.6	140.7
Closing stocks	Mt	1.6	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6

Table C.2. World oilseed projections *(cont.)*

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
VEGETABLE OILS												
World												
Production	Mt	202.6	210.6	214.0	216.9	220.1	223.4	226.7	229.9	233.2	236.4	239.8
of which palm oil	Mt	71.3	74.7	75.6	76.5	77.6	78.7	79.8	80.8	81.8	82.9	83.9
Consumption	Mt	201.2	210.9	214.2	217.1	220.2	223.3	226.6	229.8	233.1	236.4	239.7
Food	Mt	136.3	140.8	143.2	145.7	148.2	150.8	153.6	156.3	159.2	162.0	164.8
Biofuel	Mt	25.4	29.8	30.5	30.5	30.4	30.5	30.4	30.4	30.3	30.3	30.2
Exports	Mt	81.9	84.6	85.8	87.0	88.2	89.2	90.4	91.6	92.8	94.1	95.4
Closing stocks	Mt	22.3	21.1	20.9	20.7	20.6	20.7	20.9	21.0	21.0	21.0	21.1
Price[5]	USD/t	731.6	685.2	715.4	744.8	776.0	794.6	810.3	827.8	846.9	868.9	886.5
Developed countries												
Production	Mt	50.0	51.6	52.3	52.8	53.4	54.0	54.6	55.1	55.7	56.2	56.8
Consumption	Mt	53.9	56.1	56.4	56.7	57.1	57.2	57.2	57.2	57.2	57.2	57.1
Closing stocks	Mt	3.7	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Developing countries												
Production	Mt	152.6	159.0	161.7	164.1	166.7	169.5	172.1	174.8	177.5	180.2	183.0
Consumption	Mt	147.3	154.8	157.8	160.4	163.1	166.2	169.4	172.6	175.9	179.2	182.6
Closing stocks	Mt	18.6	17.6	17.4	17.2	17.2	17.2	17.4	17.4	17.5	17.5	17.6
OECD[2]												
Production	Mt	39.6	40.2	40.7	41.0	41.4	41.8	42.2	42.5	42.8	43.1	43.5
Consumption	Mt	53.2	55.1	55.4	55.8	56.1	56.2	56.2	56.2	56.3	56.3	56.1
Closing stocks	Mt	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1

Note: Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

1. Soybean, U.S., CIF Rotterdam (October/September).
2. Excludes Iceland but includes all EU 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 (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.3. World sugar projections

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WORLD												
SUGARBEET												
Production	Mt	291.4	290.8	293.5	295.1	297.6	300.1	303.2	307.0	310.3	313.8	317.4
Area	Mha	4.7	4.7	4.7	4.7	4.8	4.8	4.8	4.8	4.8	4.9	4.9
Yield	t/ha	61.91	61.59	61.88	62.35	62.56	62.80	63.24	63.81	64.23	64.69	65.15
Biofuel use	Mt	13.8	14.0	14.0	14.0	14.1	14.1	14.1	14.1	14.1	14.1	14.1
SUGARCANE												
Production	Mt	1 758.2	1 731.1	1 771.0	1 800.3	1 825.5	1 849.1	1 870.8	1 892.6	1 908.8	1 926.7	1 947.7
Area	Mha	25.3	24.9	25.3	25.5	25.6	25.7	25.8	25.8	25.8	25.9	25.9
Yield	t/ha	69.36	69.40	69.90	70.56	71.26	71.95	72.59	73.25	73.87	74.51	75.16
Biofuel use	Mt	360.6	376.6	389.5	403.9	412.5	421.4	429.6	437.7	446.1	455.1	464.1
SUGAR												
Production	Mt tq	177.6	179.7	183.0	186.5	189.6	192.2	194.9	197.7	200.2	203.2	206.8
Consumption	Mt tq	170.8	176.6	179.4	181.7	184.4	187.4	190.5	193.7	196.8	199.7	202.5
Closing stocks	Mt tq	80.8	83.5	83.4	84.5	86.0	87.2	87.9	88.1	87.9	87.7	88.3
Price, raw sugar[1]	USD/t	314.9	303.0	315.4	331.9	339.4	341.1	341.4	339.0	341.1	346.0	350.0
Price, white sugar[2]	USD/t	392.6	376.1	391.3	410.2	419.1	422.7	423.8	422.9	427.2	433.0	438.4
Price, HFCS[3]	USD/t	908.9	691.7	693.7	704.0	709.9	715.1	720.2	723.9	731.8	740.3	746.0
DEVELOPED COUNTRIES												
SUGARBEET												
Production	Mt	236.9	233.5	234.6	234.6	235.3	236.1	237.6	239.6	241.1	242.6	244.2
SUGARCANE												
Production	Mt	78.7	78.5	78.7	79.0	79.5	80.1	80.5	80.7	80.8	80.9	81.1
SUGAR												
Production	Mt tq	44.1	44.2	44.6	45.0	45.5	46.0	46.6	47.1	47.5	47.9	48.4
Consumption	Mt tq	46.9	47.2	47.3	47.3	47.4	47.4	47.5	47.5	47.5	47.6	47.6
Closing stocks	Mt tq	13.5	12.7	12.4	12.4	12.6	12.9	13.1	13.2	13.3	13.4	13.5
HFCS												
Production	Mt dw	9.1	9.0	9.0	9.0	9.1	9.1	9.1	9.1	9.1	9.1	9.1
Consumption	Mt dw	7.9	7.8	7.8	7.9	7.9	7.9	7.8	7.8	7.8	7.8	7.8
DEVELOPING COUNTRIES												
SUGARBEET												
Production	Mt	54.4	57.3	58.9	60.5	62.2	64.0	65.7	67.4	69.2	71.1	73.1
SUGARCANE												
Production	Mt	1 679.5	1 652.7	1 692.3	1 721.3	1 746.0	1 769.0	1 790.3	1 811.9	1 828.0	1 845.8	1 866.6
SUGAR												
Production	Mt tq	133.5	135.5	138.3	141.5	144.0	146.2	148.3	150.6	152.7	155.3	158.4
Consumption	Mt tq	123.8	129.4	132.1	134.4	137.0	139.9	143.0	146.2	149.2	152.1	155.0
Closing stocks	Mt tq	67.3	70.8	71.0	72.1	73.4	74.3	74.8	74.9	74.5	74.3	74.7
HFCS												
Production	Mt dw	4.5	4.9	5.0	5.1	5.3	5.4	5.5	5.6	5.7	5.8	5.9
Consumption	Mt dw	5.5	6.1	6.2	6.3	6.5	6.6	6.7	6.8	6.9	7.0	7.2
OECD[4]												
SUGARBEET												
Production	Mt	184.0	183.1	183.8	183.4	183.8	184.3	185.5	187.1	188.2	189.5	190.7
SUGARCANE												
Production	Mt	117.5	118.6	119.1	119.5	120.6	121.5	122.3	122.8	123.3	123.8	124.3
SUGAR												
Production	Mt tq	41.4	41.3	41.6	41.8	42.3	42.6	43.0	43.4	43.6	43.9	44.2
Consumption	Mt tq	43.9	44.1	44.3	44.3	44.3	44.3	44.4	44.4	44.4	44.4	44.4
Closing stocks	Mt tq	12.2	11.3	11.4	11.5	11.8	12.0	12.2	12.3	12.4	12.5	12.6
HFCS												
Production	Mt dw	10.3	10.2	10.3	10.3	10.3	10.4	10.4	10.4	10.5	10.5	10.5
Consumption	Mt dw	10.0	10.0	10.0	10.0	10.1	10.1	10.1	10.2	10.2	10.2	10.2

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.HFCS: High fructose corn syrup. Prices are in nominal terms.

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 EU member countries

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.4. World meat projections

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WORLD												
BEEF AND VEAL												
Production	kt cwe	68 441	70 379	71 413	72 122	72 812	73 689	74 474	75 171	75 965	76 750	77 476
Consumption	kt cwe	68 567	70 480	71 522	72 221	72 911	73 782	74 566	75 267	76 058	76 843	77 570
PIGMEAT												
Production	kt cwe	119 440	117 842	121 663	122 688	123 554	124 448	125 307	126 205	127 106	127 954	128 819
Consumption	kt cwe	119 435	117 809	121 592	122 661	123 527	124 408	125 264	126 163	127 064	127 914	128 779
POULTRY MEAT												
Production	kt rtc	121 083	125 637	127 068	128 788	130 437	132 142	133 886	135 667	137 424	139 218	141 091
Consumption	kt rtc	120 487	124 637	126 086	127 834	129 475	131 197	132 961	134 762	136 536	138 356	140 253
SHEEP MEAT												
Production	kt cwe	14 912	15 036	15 283	15 505	15 730	15 937	16 149	16 363	16 574	16 784	16 997
Consumption	kt cwe	14 911	15 048	15 302	15 524	15 747	15 959	16 170	16 382	16 592	16 799	17 009
TOTAL MEAT												
Per capita consumption[1]	kg rwt	34.7	34.4	34.7	34.8	34.8	34.8	34.9	34.9	35.0	35.0	35.1
DEVELOPED COUNTRIES												
BEEF AND VEAL												
Production	kt cwe	30 189	31 093	31 369	31 481	31 609	31 910	32 118	32 231	32 412	32 582	32 719
Consumption	kt cwe	28 994	29 649	29 896	30 023	30 142	30 394	30 592	30 694	30 849	30 996	31 110
PIGMEAT												
Production	kt cwe	44 823	45 630	46 233	46 108	46 100	46 216	46 323	46 459	46 602	46 728	46 857
Consumption	kt cwe	41 160	41 387	42 203	42 337	42 349	42 423	42 485	42 580	42 664	42 728	42 801
POULTRY MEAT												
Production	kt rtc	50 025	51 371	51 626	52 053	52 564	53 041	53 514	53 997	54 469	54 952	55 455
Consumption	kt rtc	47 622	48 779	48 797	49 206	49 628	49 977	50 370	50 775	51 149	51 549	51 966
SHEEP MEAT												
Production	kt cwe	3 517	3 558	3 608	3 661	3 706	3 740	3 778	3 819	3 860	3 902	3 946
Consumption	kt cwe	2 798	2 812	2 848	2 877	2 910	2 940	2 971	3 005	3 036	3 068	3 101
TOTAL MEAT												
Per capita consumption[1]	kg rwt	68.5	69.2	69.5	69.7	69.8	70.0	70.2	70.4	70.6	70.8	71.0
DEVELOPING COUNTRIES												
BEEF AND VEAL												
Production	kt cwe	38 252	39 287	40 044	40 641	41 202	41 779	42 356	42 940	43 553	44 169	44 757
Consumption	kt cwe	39 572	40 831	41 626	42 198	42 770	43 389	43 974	44 572	45 209	45 847	46 460
PIGMEAT												
Production	kt cwe	74 616	72 212	75 429	76 580	77 455	78 232	78 984	79 746	80 504	81 225	81 961
Consumption	kt cwe	78 275	76 422	79 389	80 324	81 178	81 985	82 779	83 583	84 400	85 186	85 977
POULTRY MEAT												
Production	kt rtc	71 058	74 266	75 442	76 735	77 873	79 101	80 372	81 669	82 955	84 266	85 636
Consumption	kt rtc	72 865	75 858	77 290	78 628	79 847	81 220	82 591	83 987	85 387	86 807	88 287
SHEEP MEAT												
Production	kt cwe	11 395	11 478	11 674	11 844	12 024	12 197	12 371	12 543	12 714	12 881	13 050
Consumption	kt cwe	12 114	12 236	12 454	12 647	12 837	13 019	13 198	13 378	13 556	13 732	13 908
TOTAL MEAT												
Per capita consumption[1]	kg rwt	26.8	26.5	26.9	27.0	27.0	27.1	27.1	27.2	27.3	27.4	27.5
OECD[2]												
BEEF AND VEAL												
Production	kt cwe	28 072	28 891	29 155	29 238	29 330	29 597	29 794	29 888	30 052	30 198	30 315
Consumption	kt cwe	27 196	28 011	28 270	28 378	28 456	28 678	28 873	28 962	29 108	29 242	29 347
PIGMEAT												
Production	kt cwe	42 624	43 505	44 106	44 036	44 059	44 220	44 369	44 537	44 713	44 871	45 032
Consumption	kt cwe	39 899	40 325	41 045	41 197	41 268	41 389	41 505	41 653	41 789	41 906	42 032
POULTRY MEAT												
Production	kt rtc	48 323	49 889	50 166	50 594	51 100	51 584	52 066	52 568	53 063	53 575	54 097
Consumption	kt rtc	45 634	46 854	46 943	47 380	47 829	48 190	48 583	48 995	49 381	49 792	50 215
SHEEP MEAT												
Production	kt cwe	2 729	2 701	2 728	2 765	2 788	2 802	2 817	2 834	2 850	2 869	2 889
Consumption	kt cwe	2 064	2 044	2 056	2 069	2 082	2 094	2 106	2 119	2 130	2 140	2 152
TOTAL MEAT												
Per capita consumption[1]	kg rwt	69.4	70.2	70.5	70.6	70.7	70.8	71.0	71.2	71.3	71.5	71.6

Note: Calendar Year; except year ending 30 September for New Zealand in aggregates. Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

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 EU member countries

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.5. World dairy projections: Milk, butter and cheese

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
MILK												
World												
Production	kt pw	826 106	848 978	859 795	874 273	888 433	902 445	922 292	937 673	951 779	965 154	981 218
Inventory	000 hd	681 852	697 501	700 570	708 580	716 540	724 700	738 873	748 031	756 078	763 306	773 185
Yield	t/head	1.21	1.22	1.23	1.23	1.24	1.25	1.25	1.25	1.26	1.26	1.27
Developed countries												
Production	kt pw	395 573	399 974	402 688	405 585	408 524	410 991	413 559	416 287	418 849	421 449	424 049
Inventory	000 hd	80 873	80 941	80 911	80 988	81 055	81 089	81 126	81 187	81 244	81 292	81 336
Yield	t/head	4.89	4.94	4.98	5.01	5.04	5.07	5.10	5.13	5.16	5.18	5.21
Developing countries												
Production	kt pw	430 534	449 005	457 107	468 688	479 909	491 454	508 733	521 386	532 929	543 705	557 169
Inventory	000 hd	600 979	616 559	619 659	627 592	635 484	643 611	657 747	666 844	674 833	682 014	691 849
Yield	t/head	0.72	0.73	0.74	0.75	0.76	0.76	0.77	0.78	0.79	0.80	0.81
OECD												
Production	kt pw	354 050	359 736	362 268	364 810	367 418	369 623	371 939	374 392	376 694	379 045	381 394
Inventory	000 hd	72 949	74 405	74 642	74 702	74 780	74 927	75 112	75 311	75 510	75 710	75 910
Yield	t/head	4.85	4.83	4.85	4.88	4.91	4.93	4.95	4.97	4.99	5.01	5.02
FRESH DAIRY PRODUCTS												
World												
Consumption	kt pw	412 909	428 638	433 576	442 380	450 518	458 906	473 047	482 519	491 689	499 081	509 144
Developed countries												
Consumption	kt pw	133 114	134 026	134 098	134 554	134 950	135 353	135 783	136 221	136 661	137 087	137 530
Developing countries												
Consumption	kt pw	279 795	294 612	299 479	307 826	315 568	323 553	337 264	346 298	355 027	361 994	371 614
OECD												
Consumption	kt pw	99 975	100 706	100 586	100 639	100 769	100 968	101 198	101 456	101 719	101 984	102 282
BUTTER												
World												
Production	kt pw	10 906	11 006	11 219	11 438	11 664	11 882	12 101	12 330	12 562	12 800	13 035
Consumption	kt pw	10 847	10 999	11 214	11 436	11 662	11 880	12 099	12 329	12 562	12 800	13 035
Stock changes	kt pw	-23	6	5	3	2	2	2	1	1	0	0
Price[1]	USD/t	4 504	4 066	4 113	4 199	4 271	4 334	4 400	4 484	4 554	4 637	4 704
Developed countries												
Production	kt pw	4 522	4 560	4 599	4 648	4 694	4 731	4 766	4 805	4 845	4 885	4 921
Consumption	kt pw	3 930	3 980	4 006	4 043	4 079	4 105	4 129	4 157	4 180	4 204	4 223
Developing countries												
Production	kt pw	6 384	6 446	6 620	6 790	6 970	7 151	7 335	7 524	7 717	7 915	8 115
Consumption	kt pw	6 917	7 019	7 207	7 393	7 582	7 774	7 970	8 172	8 382	8 596	8 812
OECD[2]												
Production	kt pw	4 349	4 405	4 447	4 497	4 543	4 582	4 620	4 660	4 701	4 742	4 778
Consumption	kt pw	3 780	3 830	3 863	3 906	3 946	3 977	4 007	4 040	4 068	4 099	4 125
Stock changes	kt pw	-19	3	2	-1	-1	-1	-1	-1	-1	-1	-1
CHEESE												
World												
Production	kt pw	23 343	23 986	24 240	24 541	24 867	25 149	25 466	25 780	26 092	26 409	26 743
Consumption	kt pw	23 287	23 990	24 214	24 543	24 865	25 147	25 465	25 779	26 090	26 408	26 742
Stock changes	kt pw	-14	-4	26	-2	1	2	1	1	1	1	1
Price[3]	USD/t	3 530	3 516	3 549	3 615	3 676	3 735	3 796	3 866	3 931	4 003	4 071
Developed countries												
Production	kt pw	18 746	19 358	19 568	19 785	20 030	20 233	20 472	20 712	20 947	21 188	21 443
Consumption	kt pw	17 790	18 379	18 502	18 721	18 934	19 103	19 308	19 510	19 710	19 920	20 145
Developing countries												
Production	kt pw	4 597	4 628	4 672	4 756	4 836	4 916	4 994	5 068	5 145	5 222	5 300
Consumption	kt pw	5 498	5 611	5 712	5 822	5 932	6 044	6 157	6 269	6 380	6 488	6 597
OECD[2]												
Production	kt pw	18 203	18 839	19 036	19 247	19 479	19 668	19 895	20 119	20 342	20 572	20 813
Consumption	kt pw	17 398	17 960	18 062	18 261	18 468	18 630	18 827	19 024	19 218	19 418	19 633
Stock changes	kt pw	-14	-4	26	-2	1	2	1	1	1	1	1

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand in aggregates. Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

1. FOB export price, butter, 82% butterfat, Oceania.
2. Excludes Iceland but includes all EU member countries
3. FOB export price, cheddar cheese, 39% moisture, Oceania.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.6. World dairy projections: Powders and casein

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
SKIM MILK POWDER												
World												
Production	kt pw	4 411	4 394	4 571	4 654	4 719	4 777	4 824	4 873	4 924	4 973	5 024
Consumption	kt pw	4 361	4 538	4 589	4 672	4 733	4 781	4 828	4 876	4 927	4 976	5 026
Stock changes	kt pw	11	-144	-18	-18	-13	-4	-4	-3	-3	-3	-3
Price[1]	USD/t	2 011	2 066	2 134	2 185	2 257	2 323	2 390	2 455	2 525	2 593	2 663
Developed countries												
Production	kt pw	3 844	3 836	3 988	4 055	4 104	4 150	4 187	4 225	4 263	4 300	4 339
Consumption	kt pw	1 927	1 980	1 970	1 983	1 984	1 973	1 962	1 949	1 937	1 923	1 911
Developing countries												
Production	kt pw	567	558	583	600	616	628	637	648	661	673	684
Consumption	kt pw	2 434	2 558	2 619	2 689	2 748	2 808	2 866	2 927	2 990	3 053	3 115
OECD[2]												
Production	kt pw	3 601	3 604	3 755	3 825	3 870	3 914	3 948	3 984	4 020	4 055	4 093
Consumption	kt pw	1 976	1 988	1 989	2 014	2 023	2 019	2 016	2 011	2 008	2 003	2 000
Stock changes	kt pw	11	-144	-18	-18	-13	-4	-4	-3	-3	-3	-3
WHOLE MILK POWDER												
World												
Production	kt pw	5 317	5 478	5 558	5 640	5 709	5 776	5 843	5 910	5 975	6 041	6 107
Consumption	kt pw	5 315	5 470	5 550	5 633	5 702	5 768	5 831	5 897	5 963	6 029	6 095
Stock changes	kt pw	17	8	8	8	8	8	13	13	13	13	13
Price[3]	USD/t	2 841	2 926	2 987	3 065	3 126	3 198	3 267	3 344	3 420	3 501	3 580
Developed countries												
Production	kt pw	2 383	2 499	2 530	2 553	2 583	2 603	2 624	2 645	2 668	2 692	2 718
Consumption	kt pw	610	612	617	621	625	628	627	630	633	636	639
Developing countries												
Production	kt pw	2 934	2 978	3 027	3 088	3 126	3 173	3 220	3 264	3 307	3 349	3 389
Consumption	kt pw	4 705	4 858	4 934	5 012	5 077	5 140	5 204	5 267	5 329	5 392	5 455
OECD[2]												
Production	kt pw	2 562	2 674	2 708	2 733	2 764	2 783	2 803	2 825	2 846	2 870	2 895
Consumption	kt pw	818	828	836	845	854	861	863	870	877	883	890
Stock changes	kt pw	23	-5	-5	-5	-5	-5	0	0	0	0	0
WHEY POWDER												
Price[4]	USD/t	903	955	1 007	1 029	1 052	1 089	1 121	1 153	1 188	1 221	1 252
CASEIN												
Price[5]	USD/t	5 958	5 936	6 075	6 230	6 389	6 563	6 729	6 913	7 095	7 284	7 472

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand in aggregates. Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

1. FOB export price, non-fat dry milk, 1.25% butterfat, Oceania.
2. Excludes Iceland but includes all EU 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.7. World fish and seafood projections

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
FISH[1]												
World												
Production	kt	172 268	178 537	180 246	180 582	184 508	187 299	189 342	191 143	191 488	194 478	196 324
of which aquaculture	kt	79 833	85 329	87 769	90 000	93 044	94 682	96 371	97 854	99 264	100 736	102 156
Consumption	kt	172 525	178 432	180 221	180 722	184 533	187 114	189 107	190 793	191 753	194 503	196 449
of which for food	kt	152 784	158 502	160 667	162 250	165 752	168 306	170 306	171 992	173 830	175 812	177 777
of which for reduction	kt	15 226	15 529	15 275	14 315	14 747	14 896	14 975	15 063	14 271	15 126	15 194
Price												
Aquaculture[2]	USD/t	2 952.2	2 936.7	3 050.7	3 315.1	3 325.7	3 368.7	3 507.1	3 580.5	3 635.8	3 588.0	3 626.2
Capture[3]	USD/t	1 683.4	1 719.0	1 760.2	1 864.7	1 873.2	1 891.3	1 935.7	1 952.8	1 979.6	1 959.9	1 976.5
Product traded[4]	USD/t	2 977.5	3 059.1	3 145.1	3 382.7	3 393.6	3 437.4	3 542.6	3 580.5	3 635.8	3 588.0	3 626.2
Developed countries												
Production	kt	29 603	30 102	30 240	30 099	30 196	30 540	30 625	30 726	30 765	30 844	30 921
of which aquaculture	kt	4 579	4 744	4 882	4 983	5 061	5 136	5 208	5 293	5 308	5 372	5 431
Consumption	kt	37 357	37 352	37 365	37 446	37 846	38 057	38 291	38 223	38 420	38 450	38 630
of which for food	kt	32 111	32 256	32 328	32 466	32 905	33 124	33 386	33 341	33 549	33 612	33 819
of which for reduction	kt	4 379	4 321	4 267	4 215	4 181	4 178	4 150	4 127	4 116	4 083	4 056
Developing countries												
Production	kt	142 666	148 435	150 006	150 482	154 313	156 759	158 717	160 418	160 723	163 634	165 403
of which aquaculture	kt	75 254	80 585	82 887	85 017	87 982	89 546	91 163	92 561	93 956	95 364	96 725
Consumption	kt	135 168	141 080	142 856	143 276	146 688	149 058	150 816	152 571	153 333	156 053	157 819
of which for food	kt	120 673	126 246	128 339	129 784	132 847	135 182	136 920	138 651	140 281	142 200	143 958
of which for reduction	kt	10 848	11 208	11 009	10 100	10 566	10 717	10 826	10 936	10 155	11 043	11 138
OECD												
Production	kt	28 824	29 637	29 753	29 305	29 513	29 890	30 000	30 120	29 821	30 166	30 378
of which aquaculture	kt	6 373	6 673	6 824	6 960	7 058	7 166	7 262	7 366	7 415	7 517	7 617
Consumption	kt	38 532	38 728	38 806	38 699	39 202	39 423	39 678	39 623	39 650	39 843	40 067
of which for food	kt	33 050	33 223	33 366	33 517	33 994	34 241	34 524	34 493	34 716	34 799	35 035
of which for reduction	kt	4 460	4 564	4 514	4 271	4 312	4 301	4 288	4 279	4 098	4 223	4 226
FISHMEAL[5]												
World												
Production	kt	4 865.7	5 033.3	5 022.3	4 822.3	4 974.4	5 066.2	5 132.5	5 203.6	5 049.8	5 316.4	5 380.6
from whole fish	kt	3 526.6	3 708.3	3 659.3	3 437.5	3 552.5	3 597.6	3 626.9	3 659.8	3 474.6	3 699.4	3 727.5
Consumption	kt	4 785.5	5 115.7	5 110.7	5 142.3	4 930.4	5 082.2	5 161.5	5 234.1	5 292.9	5 225.4	5 302.5
Variation in stocks	kt	80.2	-57.4	-63.4	-295.1	69.0	9.0	-4.0	-5.6	-243.1	90.9	78.0
Price[6]	USD/t	1 463.3	1 490.2	1 532.0	1 618.7	1 572.7	1 608.4	1 645.0	1 684.0	1 818.9	1 753.7	1 765.8
Developed countries												
Production	kt	1 523.2	1 561.8	1 563.6	1 561.7	1 570.6	1 595.9	1 607.6	1 621.6	1 637.5	1 648.4	1 660.1
from whole fish	kt	1 523.2	1 561.8	1 563.6	1 561.7	1 570.6	1 595.9	1 607.6	1 621.6	1 637.5	1 648.4	1 660.1
Consumption	kt	1 546.1	1 625.3	1 603.8	1 556.8	1 481.6	1 477.5	1 464.2	1 457.7	1 427.5	1 405.5	1 405.6
Variation in stocks	kt	4.5	-33.4	-3.4	-64.1	32.0	2.0	-3.0	-3.6	-57.1	33.9	11.0
Developing countries												
Production	kt	3 342.6	3 471.5	3 458.8	3 260.5	3 403.9	3 470.4	3 524.9	3 581.9	3 412.4	3 668.0	3 720.4
from whole fish	kt	3 342.6	3 471.5	3 458.8	3 260.5	3 403.9	3 470.4	3 524.9	3 581.9	3 412.4	3 668.0	3 720.4
Consumption	kt	3 423.1	3 640.4	3 631.9	3 685.6	3 523.8	3 654.7	3 722.2	3 776.4	3 865.4	3 820.0	3 897.0
Variation in stocks	kt	75.7	-24.0	-60.0	-231.0	37.0	7.0	-1.0	-2.0	-186.0	57.0	67.0
OECD												
Production	kt	1 517.6	1 575.2	1 573.6	1 524.0	1 545.3	1 563.3	1 573.9	1 586.3	1 558.4	1 601.4	1 614.9
from whole fish	kt	1 517.6	1 575.2	1 573.6	1 524.0	1 545.3	1 563.3	1 573.9	1 586.3	1 558.4	1 601.4	1 614.9
Consumption	kt	1 696.2	1 815.8	1 797.7	1 752.0	1 659.6	1 662.1	1 652.2	1 648.2	1 623.1	1 600.0	1 607.9
Variation in stocks	kt	7.8	-34.4	-18.4	-74.1	27.0	7.0	-1.0	-0.6	-62.1	33.9	31.0

Table C.7. World fish and seafood projections *(cont.)*

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
FISH OIL[5]												
World												
Production	kt	1 086.2	1 028.7	1 037.3	1 012.4	1 043.0	1 063.0	1 078.4	1 094.0	1 070.6	1 116.4	1 128.5
from whole fish	kt	614.5	645.2	645.4	614.1	636.8	646.9	654.5	662.4	631.2	669.4	673.9
Consumption	kt	1 095.9	1 057.9	1 067.8	1 077.4	1 036.0	1 075.6	1 079.9	1 091.7	1 111.4	1 086.0	1 128.8
Variation in stocks	kt	-19.8	0.8	-5.6	-45.0	22.0	-2.6	3.5	2.3	-40.8	30.4	-0.3
Price[7]	USD/t	1 601.0	1 633.4	1 688.1	1 803.0	1 787.7	1 837.4	1 880.9	1 925.5	2 053.9	2 009.2	2 048.1
Developed countries												
Production	kt	435.9	429.4	432.5	433.8	437.8	445.2	449.2	453.5	458.4	462.3	466.4
from whole fish	kt	435.9	429.4	432.5	433.8	437.8	445.2	449.2	453.5	458.4	462.3	466.4
Consumption	kt	571.5	602.7	600.2	610.5	583.8	610.8	616.1	628.3	645.6	620.3	644.2
Variation in stocks	kt	-8.5	-2.2	-2.6	-21.0	15.0	1.4	-1.5	-1.7	-19.8	16.4	2.7
Developing countries												
Production	kt	651.3	599.3	604.7	578.6	605.2	617.8	629.2	640.5	612.2	654.1	662.2
from whole fish	kt	651.3	599.3	604.7	578.6	605.2	617.8	629.2	640.5	612.2	654.1	662.2
Consumption	kt	479.9	425.2	442.7	446.9	437.2	454.8	458.8	463.4	465.8	465.7	484.7
Variation in stocks	kt	-11.3	3.0	-3.0	-24.0	7.0	-4.0	5.0	4.0	-21.0	14.0	-3.0
OECD												
Production	kt	508.5	523.6	526.0	516.7	523.3	529.0	532.5	536.2	531.1	541.5	545.6
from whole fish	kt	508.5	523.6	526.0	516.7	523.3	529.0	532.5	536.2	531.1	541.5	545.6
Consumption	kt	714.4	754.9	762.7	767.5	736.0	766.0	768.5	778.7	788.2	766.6	797.1
Variation in stocks	kt	-1.7	-1.2	-4.6	-19.0	10.0	-2.6	5.5	-0.7	-18.8	11.4	-2.3

Note: The term “fish” indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, crocodiles, caimans, alligators and aquatic plants. Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

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 (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.8. World biofuel projections

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
ETHANOL												
World												
Production	mln L	122.5	126.3	128.5	130.6	132.4	134.2	136.0	137.7	139.5	141.3	143.1
Consumption	mln L	121.9	127.3	129.3	131.0	132.7	134.4	136.2	137.9	139.7	141.4	143.2
Exports	mln L	10.5	11.1	10.8	10.8	10.7	10.8	10.8	10.7	10.6	10.5	10.4
Price[1]	USD/hl	42.6	40.9	44.5	47.1	48.7	49.4	50.7	50.7	51.3	52.0	52.6
Developed countries												
Production	mln L	72.3	73.3	73.6	73.6	73.9	74.0	74.1	74.3	74.4	74.5	74.6
Consumption	mln L	70.1	71.7	72.5	72.6	72.9	72.9	73.3	73.4	73.5	73.6	73.7
Net trade	mln L	2.1	2.1	1.7	1.5	1.3	1.3	1.1	1.1	1.0	1.0	1.0
Developing countries												
Production	mln L	50.1	53.0	54.9	57.0	58.6	60.2	61.8	63.4	65.1	66.8	68.5
Consumption	mln L	51.7	55.6	56.8	58.5	59.8	61.5	62.9	64.5	66.1	67.8	69.5
Net trade	mln L	-1.7	-2.1	-1.7	-1.5	-1.3	-1.3	-1.1	-1.1	-1.0	-1.0	-1.0
OECD[2]												
Production	mln L	71.4	72.4	72.6	72.7	72.9	73.1	73.2	73.3	73.4	73.5	73.6
Consumption	mln L	70.2	71.7	72.5	72.6	72.9	73.0	73.3	73.4	73.6	73.6	73.7
Net trade	mln L	1.1	1.2	0.7	0.5	0.3	0.3	0.1	0.1	0.1	0.0	0.0
BIODIESEL												
World												
Production	mln L	36.8	43.1	44.2	43.9	43.7	43.9	43.9	44.0	44.0	44.0	43.9
Consumption	mln L	37.6	43.6	44.5	44.2	44.0	44.2	44.2	44.3	44.3	44.3	44.2
Exports	mln L	4.1	4.8	4.1	3.8	3.7	3.6	3.6	3.5	3.5	3.5	3.4
Price[3]	USD/hl	88.4	87.3	88.4	90.4	91.3	91.2	92.7	92.6	93.2	94.1	94.7
Developed countries												
Production	mln L	21.3	24.6	25.7	25.3	24.9	24.6	24.3	24.0	23.7	23.3	22.9
Consumption	mln L	24.2	27.5	28.0	27.3	26.8	26.5	26.2	25.9	25.6	25.2	24.8
Net trade	mln L	-2.6	-2.8	-2.3	-2.0	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-2.0
Developing countries												
Production	mln L	15.5	18.5	18.5	18.6	18.9	19.3	19.6	19.9	20.3	20.7	21.0
Consumption	mln L	13.4	16.1	16.5	16.9	17.3	17.7	18.0	18.3	18.7	19.0	19.4
Net trade	mln L	2.2	2.4	2.0	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6
OECD[2]												
Production	mln L	22.0	25.3	26.4	25.9	25.5	25.3	24.9	24.7	24.4	24.0	23.6
Consumption	mln L	24.9	28.2	28.7	27.9	27.4	27.2	26.8	26.6	26.3	25.9	25.5
Net trade	mln L	-2.5	-2.7	-2.3	-2.0	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9

Note: Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

1. Wholesale price, United States, Omaha.
2. Excludes Iceland but includes all EU member countries
3. Producer price Germany net of biodiesel tariff and energy tax.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.9. World cotton projections

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
WORLD												
Production	Mt	25.2	26.4	26.6	26.8	27.2	27.5	27.9	28.2	28.6	28.9	29.2
Area	Mha	32.1	33.5	33.6	33.7	33.9	34.1	34.3	34.5	34.8	34.9	35.1
Yield	t/ha	0.78	0.79	0.79	0.80	0.80	0.81	0.81	0.82	0.82	0.83	0.83
Consumption[1]	Mt	26.2	27.3	27.6	27.7	27.9	28.0	28.0	28.2	28.5	28.8	29.2
Exports	Mt	8.8	9.9	10.2	10.3	10.5	10.7	10.8	11.0	11.2	11.4	11.6
Closing stocks	Mt	18.6	16.9	15.9	15.0	14.3	13.8	13.6	13.6	13.6	13.7	13.7
Price[2]	USD/t	1 908.9	1 745.4	1 627.4	1 597.2	1 631.3	1 666.5	1 696.5	1 707.1	1 713.8	1 722.2	1 734.7
DEVELOPED COUNTRIES												
Production	Mt	6.6	6.6	6.6	6.6	6.7	6.8	6.9	6.9	7.0	7.0	7.1
Consumption	Mt	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.9	1.9
Exports	Mt	5.1	5.0	5.2	5.2	5.3	5.3	5.4	5.4	5.4	5.5	5.5
Imports	Mt	0.3	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	2.4	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5
DEVELOPING COUNTRIES												
Production	Mt	18.6	19.8	20.0	20.2	20.4	20.7	21.0	21.3	21.6	21.9	22.1
Consumption	Mt	24.6	25.6	25.9	26.0	26.1	26.3	26.2	26.4	26.7	27.0	27.3
Exports	Mt	3.7	4.9	4.9	5.1	5.2	5.4	5.5	5.6	5.8	5.9	6.1
Imports	Mt	8.6	9.6	9.8	10.0	10.2	10.4	10.5	10.7	10.9	11.1	11.3
Closing stocks	Mt	16.6	14.6	13.6	12.7	12.0	11.4	11.2	11.2	11.2	11.2	11.2
OECD[3]												
Production	Mt	6.3	6.4	6.5	6.6	6.7	6.7	6.8	6.9	7.0	7.0	7.1
Consumption	Mt	3.2	3.3	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.7	3.7
Exports	Mt	4.6	4.4	4.6	4.6	4.7	4.8	4.8	4.8	4.9	4.9	5.0
Imports	Mt	1.5	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Closing stocks	Mt	2.5	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.8

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated. Prices are in nominal terms.

1. Consumption for cotton means mill consumption and not final consumer demand.
2. Cotlook A index, Middling 1 1/8", c.f.r. far Eastern ports (August/July).
3. Excludes Iceland but includes all EU member countries.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.10. Economic assumptions

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
REAL GDP[1]												
Australia	%	2.6	2.9	2.6	3.4	3.4	3.3	3.3	3.2	3.2	3.1	3.1
Canada	%	2.2	2.2	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Chile	%	2.2	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
European Union	%	2.1	1.7	1.6	1.5	1.5	1.5	1.4	1.5	1.4	1.4	1.4
Japan	%	1.2	1.0	0.7	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.3
Korea	%	2.9	2.8	2.9	3.0	2.9	2.8	2.7	2.6	2.5	2.5	2.4
Mexico	%	2.4	2.5	2.8	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.1
New Zealand	%	3.3	2.8	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.5
Norway	%	1.6	1.9	2.3	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.9
Switzerland	%	2.1	1.6	1.6	2.2	2.2	2.1	2.1	2.1	2.0	2.0	2.0
Turkey	%	4.7	0.4	2.6	2.1	2.2	2.6	2.6	2.6	2.6	2.6	2.6
United Kingdom	%	1.6	1.4	1.1	2.9	2.9	2.8	2.7	2.7	2.6	2.6	2.5
United States	%	2.2	2.7	2.1	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4
Brazil	%	-0.4	2.1	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.7
China	%	6.7	6.3	6.0	4.9	4.6	4.4	4.2	4.0	3.9	3.7	3.6
Egypt	%	4.6	5.5	5.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
India	%	7.0	7.4	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Indonesia	%	5.1	5.1	5.2	5.3	5.3	5.4	5.4	5.4	5.4	5.4	5.4
Iran	%	4.9	-3.6	1.1	1.6	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Malaysia	%	4.9	4.6	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Pakistan	%	5.2	4.0	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Russia	%	1.0	1.5	1.8	2.9	2.9	2.8	2.8	2.8	2.8	2.7	2.7
Saudi Arabia	%	1.0	2.4	1.9	2.1	2.2	2.3	2.3	2.3	2.3	2.3	2.3
South Africa	%	0.9	1.4	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Ukraine	%	2.8	2.7	3.0	3.2	3.3	3.4	3.4	3.4	3.4	3.4	3.4
OECD[2,3]	%	2.2	2.1	1.9	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1
PCE DEFLATOR[1]												
Australia	%	1.2	1.6	2.0	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Canada	%	1.4	2.0	1.9	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Chile	%	2.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
European Union	%	0.6	1.7	1.8	1.6	1.8	1.8	1.7	1.7	1.7	1.7	1.7
Japan	%	0.0	0.9	1.6	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0
Korea	%	1.3	1.8	1.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Mexico	%	4.8	4.4	3.7	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
New Zealand	%	1.1	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Norway	%	2.4	2.1	1.9	2.9	2.9	2.9	2.9	2.9	2.8	2.8	2.8
Switzerland	%	0.3	0.9	1.1	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0
Turkey	%	11.3	16.7	14.2	13.4	13.0	13.0	12.1	11.3	10.6	9.9	9.2
United Kingdom	%	1.9	2.2	2.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
United States	%	1.6	2.1	2.4	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Brazil	%	5.1	4.9	4.7	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
China	%	1.9	2.4	2.6	2.8	2.9	3.0	3.0	3.0	3.0	3.0	3.0
Egypt	%	18.2	14.0	10.9	7.8	7.2	7.0	7.0	7.0	7.0	7.0	7.0
India	%	4.3	4.9	4.6	4.3	4.1	4.0	4.0	4.0	4.0	4.0	4.0
Indonesia	%	3.6	3.8	3.8	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Iran	%	16.1	34.1	24.2	17.5	13.5	12.0	12.0	12.0	12.0	12.0	12.0
Malaysia	%	2.3	2.3	2.6	2.5	2.4	2.3	2.3	2.3	2.3	2.3	2.3
Pakistan	%	3.6	7.5	6.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Russia	%	4.5	5.1	4.8	4.8	4.8	4.6	4.6	4.6	4.6	4.6	4.6
Saudi Arabia	%	1.3	2.0	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1
South Africa	%	5.5	5.3	5.4	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ukraine	%	13.1	7.3	6.0	5.8	5.3	5.2	5.2	5.2	5.2	5.2	5.2
OECD[2,3]	%	1.9	3.0	3.1	3.1	3.2	3.3	3.3	3.2	3.2	3.2	3.2

Table C.10. Economic assumptions *(cont.)*

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
GDP DEFLATOR[1]												
Australia	%	2.1	1.1	1.4	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Canada	%	1.6	2.0	2.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Chile	%	3.5	2.1	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
European Union	%	0.0	1.7	1.8	1.6	1.8	1.8	1.7	1.7	1.7	1.7	1.7
Japan	%	0.0	0.3	1.6	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.0
Korea	%	1.6	2.0	2.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Mexico	%	5.7	5.6	4.6	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
New Zealand	%	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Norway	%	2.9	3.3	2.2	2.9	2.9	2.9	2.9	2.9	2.8	2.8	2.8
Switzerland	%	-0.1	1.2	1.2	2.1	2.1	2.1	2.1	2.1	2.1	2.0	2.0
Turkey	%	10.9	15.3	12.0	12.1	12.5	12.8	12.0	11.1	10.4	9.7	9.0
United Kingdom	%	2.0	1.7	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
United States	%	1.7	2.2	2.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Brazil	%	5.0	4.4	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
China	%	2.7	3.0	3.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Egypt	%	16.9	13.8	10.7	7.7	7.2	7.0	7.0	7.0	7.0	7.0	7.0
India	%	3.7	4.3	4.1	3.8	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Indonesia	%	3.4	3.6	3.8	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Iran	%	1.7	2.2	2.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Malaysia	%	2.1	2.6	3.0	2.8	2.7	2.4	2.4	2.4	2.4	2.4	2.4
Pakistan	%	2.5	6.8	5.3	4.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Russia	%	6.0	5.3	3.4	3.9	3.9	4.0	4.0	4.0	4.0	4.0	4.0
Saudi Arabia	%	4.7	0.9	0.6	0.3	0.8	1.1	1.1	1.1	1.1	1.1	1.1
South Africa	%	5.7	5.3	5.4	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ukraine	%	16.6	8.4	8.1	8.0	7.3	6.8	6.8	6.8	6.8	6.8	6.8
OECD[3]	%	1.8	2.9	2.9	2.9	3.0	3.1	3.1	3.1	3.1	3.1	3.1
WORLD INPUT PRICES												
Brent crude oil[4]	USD/barrel	56.7	58.1	59.5	60.7	62.0	63.2	64.5	65.8	67.2	68.5	69.9
Fertiliser[5]	USD/t	247.8	249.2	251.2	254.4	257.2	260.1	262.6	266.2	270.2	274.5	278.8
EXCHANGE RATES												
Australia	AUD/USD	1.33	1.41	1.41	1.45	1.49	1.53	1.56	1.60	1.63	1.66	1.69
Canada	CAD/USD	1.31	1.31	1.31	1.33	1.35	1.36	1.37	1.38	1.39	1.40	1.41
Chile	CLP/USD	652.29	653.60	658.46	663.23	667.98	672.89	677.83	682.82	687.84	692.89	697.99
European Union	EUR/USD	0.88	0.88	0.88	0.89	0.90	0.90	0.91	0.91	0.92	0.92	0.93
Japan	JPY/USD	110.48	112.80	112.80	113.60	114.31	114.94	115.50	116.01	116.46	116.86	117.23
Korea	KRW/USD	1 131.32	1 140.60	1 140.60	1 144.61	1 149.28	1 154.60	1 160.54	1 167.06	1 174.11	1 181.66	1 189.67
Mexico	MXN/USD	18.88	19.95	19.95	20.01	20.08	20.17	20.26	20.36	20.47	20.59	20.72
New Zealand	NZD/USD	1.43	1.52	1.52	1.56	1.60	1.63	1.65	1.68	1.70	1.72	1.74
Brazil	BRL/USD	3.44	3.70	3.70	3.89	4.08	4.27	4.45	4.63	4.82	5.00	5.18
China	CNY/USD	6.68	6.97	6.97	7.02	7.08	7.14	7.20	7.26	7.31	7.37	7.43
Egypt	EGP/USD	13.53	17.86	18.39	19.84	21.29	22.12	22.99	23.88	24.81	25.78	26.78
India	INR/USD	67.14	71.24	72.54	73.73	74.90	76.10	77.31	78.54	79.79	81.07	82.36
Indonesia	'000 IDR/USD	13.80	15.09	14.96	15.19	15.38	15.56	15.75	15.94	16.13	16.33	16.52
Malaysia	MYR/USD	4.19	4.10	4.11	4.12	4.12	4.12	4.12	4.12	4.12	4.12	4.12
Pakistan	PKR/USD	103.10	108.22	111.21	114.16	117.53	120.90	124.38	127.95	131.62	135.40	139.28
Russia	RUB/USD	62.65	65.59	65.59	65.51	65.57	65.76	66.06	66.46	66.95	67.53	68.19
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	13.69	13.60	13.94	14.38	14.80	15.26	15.74	16.24	16.75	17.28	17.82
Ukraine	UAH/USD	26.41	28.66	29.92	31.17	32.22	33.23	34.27	35.34	36.45	37.59	38.76
United Kingdom	GBP/USD	0.76	0.79	0.79	0.80	0.81	0.82	0.83	0.83	0.84	0.85	0.85

Table C.10. Economic assumptions *(cont.)*

Calendar year

		2018est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
POPULATION[1]												
Australia	%	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0
Canada	%	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7
Chile	%	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
European Union	%	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Japan	%	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4
Korea	%	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
Mexico	%	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9
New Zealand	%	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7
Norway	%	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Switzerland	%	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6
Turkey	%	1.5	1.3	1.1	0.8	0.6	0.5	0.4	0.4	0.5	0.5	0.5
United Kingdom	%	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
United States	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Argentina	%	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8
Brazil	%	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.5
China	%	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0
Egypt	%	1.9	1.8	1.8	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4
India	%	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.8
Indonesia	%	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7
Iran	%	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5
Malaysia	%	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0
Pakistan	%	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5
Russia	%	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3
Saudi Arabia	%	1.9	1.7	1.7	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.1
South Africa	%	1.2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.8
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	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
World	%	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
REAL GDP PER CAPITA[1]												
Australia	%	1.3	1.6	1.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1
Canada	%	1.3	1.3	1.0	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3
Chile	%	1.4	2.6	2.4	2.3	2.3	2.3	2.4	2.4	2.4	2.4	2.5
European Union	%	1.9	1.7	1.6	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3
Japan	%	1.4	1.2	1.0	1.3	1.4	1.5	1.6	1.6	1.7	1.7	1.8
Korea	%	2.5	2.4	2.5	2.7	2.6	2.6	2.5	2.4	2.3	2.2	2.2
Mexico	%	1.1	1.3	1.6	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.2
New Zealand	%	2.3	1.9	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Norway	%	0.6	1.0	1.4	1.5	1.3	1.2	1.2	1.1	1.1	1.1	1.0
Switzerland	%	1.2	0.8	0.9	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4
Turkey	%	3.1	-0.9	1.5	1.3	1.6	2.2	3.0	3.7	4.4	5.0	5.6
United Kingdom	%	1.0	0.8	0.6	2.4	2.3	2.3	2.2	2.2	2.1	2.1	2.1
United States	%	1.5	2.0	1.4	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.7
Brazil	%	-1.2	1.4	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.2	2.2
China	%	6.3	5.9	5.7	4.6	4.4	4.2	4.0	3.9	3.8	3.7	3.6
Egypt	%	2.6	3.6	4.1	4.2	4.3	4.3	4.4	4.4	4.4	4.5	4.5
India	%	5.8	6.3	6.6	6.6	6.7	6.7	6.7	6.8	6.8	6.8	6.9
Indonesia	%	3.9	4.1	4.1	4.3	4.3	4.4	4.4	4.5	4.5	4.5	4.6
Iran	%	2.0	-6.6	-2.3	-1.3	-0.5	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2
Malaysia	%	3.5	3.3	3.5	3.5	3.5	3.5	3.6	3.6	3.7	3.7	3.8
Pakistan	%	3.2	2.1	1.6	1.6	1.2	1.3	1.3	1.4	1.4	1.4	1.5
Russia	%	1.0	1.5	1.8	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Saudi Arabia	%	-1.0	0.7	0.2	0.5	0.7	0.8	0.9	1.0	1.0	1.1	1.1
South Africa	%	-0.4	0.2	0.6	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.0
Ukraine	%	3.3	3.2	3.5	3.8	3.8	4.0	4.0	4.0	4.0	4.0	4.0
OECD[3]	%	1.6	1.7	1.4	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.7

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. 104, November 2018. For other economies, historical macroeconomic data were obtained from the IMF, World Economic Outlook, October 2018. Assumptions for the projection period draw on the recent medium 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 2016-18est and 2018est: Data for 2018 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 but includes all EU member countries
4. Short-term update for crude oil price from the OECD Economic Outlook N°104 (November 2018). For 2018, the annual average monthly spot price is used, while the average daily spot price for December 2018 is used as the oil price value for the year 2019 and oil prices during the projection period are expected to remain flat in real terms.
5. World Bank. Data for 2018 are estimated, projections by OECD and FAO Secretariats.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.11. World prices

Nominal price

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
CEREALS												
Wheat[1]	USD/t	221.1	225.9	217.1	216.0	217.4	221.0	224.9	227.9	231.4	234.7	237.5
Maize[2]	USD/t	158.5	160.6	164.5	165.8	169.0	171.9	175.3	178.3	181.6	184.2	186.0
Other coarse grains[3]	USD/t	189.9	189.2	188.3	190.3	192.5	197.6	201.3	205.6	210.1	213.7	216.1
Rice[4]	USD/t	422.7	436.4	431.5	433.7	434.8	441.3	448.5	454.5	460.5	465.7	470.3
Distiller's dry grains[5]	USD/t	126.5	134.5	138.0	139.2	141.9	144.2	147.2	150.0	153.2	155.8	157.6
OILSEEDS												
Soybean[6]	USD/t	393.8	373.5	395.9	403.0	415.4	421.2	431.0	440.3	450.3	459.5	465.8
Other oilseeds[7]	USD/t	428.0	426.3	431.5	441.5	453.3	458.2	466.0	475.5	484.3	494.5	497.1
Protein meals[8]	USD/t	332.5	325.2	335.7	339.6	348.3	353.4	360.8	367.9	376.1	382.7	387.2
Vegetable oils[9]	USD/t	731.6	685.2	715.4	744.8	776.0	794.6	810.3	827.8	846.9	868.9	886.5
SWEETENERS												
Raw sugar[10]	USD/t	314.9	303.0	315.4	331.9	339.4	341.1	341.4	339.0	341.1	346.0	350.0
Refined sugar[11]	USD/t	392.6	376.1	391.3	410.2	419.1	422.7	423.8	422.9	427.2	433.0	438.4
HFCS[12]	USD/t dw	908.9	691.7	693.7	704.0	709.9	715.1	720.2	723.9	731.8	740.3	746.0
Molasses[13]	USD/t	139.9	145.7	158.6	163.3	162.0	160.1	157.9	157.8	159.7	161.5	162.3
MEAT												
Beef and veal												
Price, EU[14]	USD/t dwt	4 290.1	4 357.8	4 183.7	4 123.4	4 043.6	3 931.4	3 907.8	3 934.2	3 938.3	3 948.1	3 914.5
Price, United States[15]	USD/t dwt	4 258.6	4 119.2	3 947.8	3 979.9	4 001.8	3 928.2	3 913.9	3 981.0	4 017.6	4 061.9	4 103.8
Price, Brazil[16]	USD/t dwt	3 959.3	4 006.5	3 872.4	3 899.8	3 871.0	3 841.0	3 875.6	3 934.1	3 982.2	4 036.2	4 093.6
Pigmeat												
Price, EU[17]	USD/t dwt	1 709.0	1 882.7	1 731.4	1 878.1	1 982.7	2 001.9	2 015.7	2 020.5	1 992.4	1 978.5	1 972.1
Price, United States[18]	USD/t dwt	1 454.4	1 440.5	1 382.4	1 535.8	1 631.2	1 646.5	1 654.4	1 655.7	1 631.3	1 618.6	1 613.2
Price, Brazil[19]	USD/t dwt	2 196.7	2 194.8	2 126.5	2 339.4	2 458.2	2 485.6	2 510.2	2 520.3	2 496.9	2 486.3	2 488.2
Poultry meat												
Price, EU[20]	USD/t rtc	2 091.7	2 094.5	2 138.5	2 166.6	2 116.3	2 076.6	2 074.5	2 073.3	2 063.7	2 050.9	2 042.5
Price, United States[21]	USD/t rtc	1 136.9	1 078.8	1 097.6	1 144.0	1 166.1	1 167.8	1 176.9	1 186.6	1 195.5	1 204.9	1 214.6
Price, Brazil[22]	USD/t rtc	1 579.0	1 549.7	1 585.5	1 654.8	1 689.4	1 698.3	1 715.7	1 733.8	1 751.4	1 769.5	1 787.9
Sheep meat												
Price, New Zealand[23]	USD/t dwt	4 148.5	5 171.6	4 866.0	4 414.0	4 332.4	4 281.7	4 263.9	4 257.5	4 263.9	4 268.3	4 298.0
FISH AND SEAFOOD												
Product traded[24]	USD/t	2 977.5	3 059.1	3 145.1	3 382.7	3 393.6	3 437.4	3 542.6	3 580.5	3 635.8	3 588.0	3 626.2
Aquaculture[25]	USD/t	2 952.2	2 936.7	3 050.7	3 315.1	3 325.7	3 368.7	3 507.1	3 580.5	3 635.8	3 588.0	3 626.2
Capture[26]	USD/t	1 683.4	1 719.0	1 760.2	1 864.7	1 873.2	1 891.3	1 935.7	1 952.8	1 979.6	1 959.9	1 976.5
Meal[27]	USD/t	1 463.3	1 490.2	1 532.0	1 618.7	1 572.7	1 608.4	1 645.0	1 684.0	1 818.9	1 753.7	1 765.8
Oil[28]	USD/t	1 601.0	1 633.4	1 688.1	1 803.0	1 787.7	1 837.4	1 880.9	1 925.5	2 053.9	2 009.2	2 048.1
DAIRY PRODUCTS												
Butter[29]	USD/t	4 504.2	4 066.1	4 112.6	4 199.1	4 270.7	4 334.2	4 400.3	4 484.1	4 554.3	4 636.5	4 704.0
Cheese[30]	USD/t	3 530.0	3 515.7	3 548.6	3 615.2	3 676.0	3 734.9	3 796.2	3 866.4	3 931.3	4 002.7	4 071.0
Skim milk powder[31]	USD/t	2 010.7	2 066.2	2 134.0	2 185.2	2 256.8	2 322.7	2 389.6	2 455.3	2 524.6	2 592.7	2 663.5
Whole milk powder[32]	USD/t	2 841.3	2 925.8	2 987.0	3 065.1	3 126.4	3 197.7	3 267.3	3 344.1	3 420.2	3 501.0	3 580.2
Whey powder[33]	USD/t	902.7	955.2	1 007.4	1 029.4	1 052.2	1 088.7	1 121.2	1 152.8	1 188.4	1 221.4	1 252.3
Casein[34]	USD/t	5 958.4	5 936.1	6 075.2	6 230.2	6 389.5	6 562.6	6 729.2	6 912.6	7 095.1	7 283.7	7 471.6
BIOFUEL												
Ethanol[35]	USD/hl	42.6	40.9	44.5	47.1	48.7	49.4	50.7	50.7	51.3	52.0	52.6
Biodiesel[36]	USD/hl	88.4	87.3	88.4	90.4	91.3	91.2	92.7	92.6	93.2	94.1	94.7
COTTON												
Cotton[37]	USD/t	1 908.9	1 745.4	1 627.4	1 597.2	1 631.3	1 666.5	1 696.5	1 707.1	1 713.8	1 722.2	1 734.7
ROOTS AND TUBERS												
Roots and tubers[38]	USD/t	397.3	483.4	502.7	506.3	520.2	525.6	538.3	546.0	557.4	565.0	572.3
USA GDP Deflator (2018=1)	**Index**	**0.979**	**1.022**	**1.047**	**1.068**	**1.090**	**1.112**	**1.135**	**1.158**	**1.181**	**1.206**	**1.230**

Table C.11. World prices *(cont.)*

Real price

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
CEREALS												
Wheat[1]	USD/t	225.5	221.0	207.4	202.2	199.5	198.7	198.2	196.9	195.9	194.7	193.1
Maize[2]	USD/t	161.8	157.2	157.2	155.3	155.1	154.5	154.5	154.0	153.7	152.8	151.2
Other coarse grains[3]	USD/t	193.6	185.2	179.8	178.2	176.6	177.7	177.4	177.6	177.8	177.2	175.7
Rice[4]	USD/t	431.5	427.1	412.2	406.0	398.9	396.8	395.3	392.5	389.8	386.3	382.3
Distiller's dry grains[5]	USD/t	129.1	131.6	131.8	130.3	130.2	129.7	129.7	129.5	129.6	129.2	128.1
OILSEEDS												
Soybean[6]	USD/t	402.4	365.5	378.1	377.3	381.1	378.8	379.8	380.3	381.1	381.2	378.7
Other oilseeds[7]	USD/t	437.2	417.1	412.1	413.3	415.9	412.0	410.6	410.7	409.9	410.2	404.1
Protein meals[8]	USD/t	339.5	318.2	320.7	317.9	319.6	317.8	317.9	317.7	318.3	317.5	314.8
Vegetable oils[9]	USD/t	748.3	670.5	683.3	697.2	712.0	714.5	714.1	714.9	716.8	720.8	720.6
SWEETENERS												
Raw sugar[10]	USD/t	322.4	296.5	301.2	310.7	311.4	306.7	300.8	292.8	288.7	287.0	284.6
Refined sugar[11]	USD/t	401.8	368.1	373.7	384.0	384.5	380.1	373.4	365.2	361.6	359.1	356.4
HFCS[12]	USD/t dw	929.6	676.9	662.6	659.1	651.3	643.0	634.7	625.2	619.4	614.1	606.4
Molasses[13]	USD/t	142.9	142.5	151.5	152.9	148.6	143.9	139.2	136.3	135.2	134.0	131.9
MEAT												
Beef and veal												
Price, EU[14]	USD/t dwt	3 813.0	3 713.5	3 479.7	3 361.4	3 230.7	3 078.4	2 998.8	2 958.7	2 902.7	2 851.8	2 771.0
Price, United States[15]	USD/t dwt	4 351.0	4 031.1	3 770.8	3 725.9	3 671.7	3 532.3	3 449.2	3 438.3	3 400.6	3 369.3	3 336.0
Price, Brazil[16]	USD/t dwt	4 043.2	3 920.8	3 698.8	3 650.9	3 551.7	3 453.9	3 415.4	3 397.7	3 370.6	3 348.0	3 327.8
Pigmeat												
Price, EU[17]	USD/t dwt	1 520.0	1 604.3	1 440.0	1 531.0	1 584.1	1 567.5	1 546.9	1 519.5	1 468.5	1 429.1	1 396.0
Price, United States[18]	USD/t dwt	1 485.7	1 409.7	1 320.4	1 437.8	1 496.6	1 480.6	1 458.0	1 430.0	1 380.8	1 342.6	1 311.4
Price, Brazil[19]	USD/t dwt	2 245.2	2 147.8	2 031.2	2 190.1	2 255.4	2 235.1	2 212.2	2 176.7	2 113.4	2 062.4	2 022.7
Poultry meat												
Price, EU[20]	USD/t rtc	1 858.7	1 784.8	1 778.7	1 766.2	1 690.9	1 626.0	1 591.9	1 559.2	1 521.0	1 481.4	1 445.8
Price, United States[21]	USD/t rtc	1 011.7	919.3	912.9	932.6	931.7	914.4	903.1	892.4	881.1	870.3	859.8
Price, Brazil[22]	USD/t rtc	1 612.8	1 516.5	1 514.5	1 549.2	1 550.0	1 527.1	1 512.0	1 497.4	1 482.4	1 467.8	1 453.4
Sheep meat												
Price, New Zealand[23]	USD/t dwt	4 228.1	5 060.9	4 647.9	4 132.3	3 975.1	3 850.2	3 757.6	3 677.1	3 609.1	3 540.5	3 494.0
FISH AND SEAFOOD												
Product traded[24]	USD/t	3 039.2	2 993.6	3 004.1	3 166.8	3 113.7	3 091.0	3 121.9	3 092.4	3 077.4	2 976.2	2 947.8
Aquaculture[25]	USD/t	3 015.1	2 873.9	2 913.9	3 103.5	3 051.4	3 029.2	3 090.7	3 092.4	3 077.4	2 976.2	2 947.8
Capture[26]	USD/t	1 719.0	1 682.2	1 681.3	1 745.7	1 718.7	1 700.7	1 705.9	1 686.6	1 675.6	1 625.7	1 606.8
Meal[27]	USD/t	1 494.5	1 458.3	1 463.3	1 515.4	1 443.0	1 446.3	1 449.7	1 454.4	1 539.5	1 454.7	1 435.5
Oil[28]	USD/t	1 635.7	1 598.4	1 612.4	1 687.9	1 640.3	1 652.2	1 657.6	1 663.0	1 738.4	1 666.6	1 665.0
DAIRY PRODUCTS												
Butter[29]	USD/t	4 589.7	3 979.1	3 928.2	3 931.1	3 918.5	3 897.4	3 877.8	3 872.7	3 854.8	3 846.0	3 824.0
Cheese[30]	USD/t	3 601.9	3 440.5	3 389.6	3 384.5	3 372.8	3 358.5	3 345.4	3 339.3	3 327.5	3 320.3	3 309.4
Skim milk powder[31]	USD/t	2 053.9	2 022.0	2 038.3	2 045.7	2 070.7	2 088.6	2 105.8	2 120.5	2 136.9	2 150.6	2 165.2
Whole milk powder[32]	USD/t	2 898.3	2 863.2	2 853.1	2 869.4	2 868.5	2 875.4	2 879.4	2 888.1	2 894.9	2 904.1	2 910.4
Whey powder[33]	USD/t	801.9	813.9	837.9	839.2	840.6	852.5	860.4	867.0	875.9	882.2	886.5
Casein[34]	USD/t	6 085.4	5 809.1	5 802.9	5 832.6	5 862.5	5 901.2	5 930.2	5 970.2	6 005.4	6 041.9	6 073.8
BIOFUEL												
Ethanol[35]	USD/hl	43.6	40.1	42.5	44.1	44.6	44.4	44.6	43.8	43.4	43.1	42.8
Biodiesel[36]	USD/hl	90.2	85.4	84.5	84.6	83.8	82.0	81.7	80.0	78.9	78.1	77.0
COTTON												
Cotton[37]	USD/t	1 948.9	1 708.1	1 554.4	1 495.3	1 496.8	1 498.5	1 495.0	1 474.4	1 450.6	1 428.5	1 410.2
ROOTS AND TUBERS												
Roots and tubers[38]	USD/t	404.8	473.1	480.2	474.0	477.3	472.7	474.4	471.6	471.8	468.6	465.3

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 2016-18est: Data for 2018 are estimated. Real prices are deflated using USA GDP base year 2018=1.

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 average prior 2013. National composite wholesale, broiler.
22. Brazil: export unit value for chicken (FOB), product weight.
23. New Zealand lamb price carcass weight, 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 1/8", c.f.r. far Eastern ports (August/July).
38. Thailand, Bangkok, Cassava (flour), wholesale.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.12.1. World trade projections, imports

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Wheat												
World Trade	kt	174 948	181 381	185 151	187 266	189 867	191 928	193 893	196 743	199 157	201 686	203 974
OECD[1]	kt	37 226	36 583	36 808	36 695	36 433	36 559	36 720	36 804	36 893	36 941	37 060
Developing countries	kt	144 164	150 121	153 941	156 413	159 127	161 135	163 036	165 828	168 182	170 679	172 912
Least Developed Countries	kt	17 328	19 235	19 816	20 075	20 477	20 964	21 469	22 002	22 498	22 995	23 492
Maize												
World Trade	kt	149 077	158 065	160 627	162 705	165 412	168 192	171 072	173 904	176 875	179 724	182 557
OECD[1]	kt	66 613	70 437	71 744	71 616	72 000	72 663	72 883	73 459	74 026	74 584	75 091
Developing countries	kt	110 365	117 644	119 531	122 067	124 617	127 038	130 106	132 771	135 591	138 277	140 981
Least Developed Countries	kt	3 414	4 536	4 585	4 693	4 750	4 778	4 799	4 863	4 914	4 987	5 081
Other coarse grains												
World Trade	kt	39 336	38 867	39 548	40 045	40 753	41 170	42 038	42 580	43 209	43 837	44 516
OECD[1]	kt	7 336	6 881	6 862	6 821	6 750	6 778	6 865	6 828	6 815	6 773	6 749
Developing countries	kt	32 471	31 973	32 798	33 479	34 259	34 613	35 367	35 903	36 512	37 155	37 835
Least Developed Countries	kt	580	728	935	943	1 311	1 171	1 419	1 483	1 591	1 700	1 894
Rice												
World Trade	kt	47 801	49 915	51 364	52 245	53 096	54 062	55 123	56 172	57 277	58 405	59 580
OECD[1]	kt	6 169	6 310	6 373	6 437	6 498	6 557	6 629	6 697	6 766	6 825	6 884
Developing countries	kt	41 670	43 515	44 941	45 765	46 567	47 479	48 483	49 480	50 530	51 611	52 742
Least Developed Countries	kt	10 877	11 244	11 622	12 122	12 607	13 115	13 641	14 192	14 771	15 391	16 039
Soybean												
World Trade	kt	150 824	152 601	154 445	156 365	158 120	160 221	162 124	164 104	166 113	168 179	170 225
OECD	kt	27 247	26 988	27 410	27 628	27 768	27 983	28 154	28 371	28 565	28 759	28 924
Developing countries	kt	129 146	131 504	133 113	134 969	136 694	138 742	140 561	142 418	144 310	146 247	148 194
Least Developed Countries	kt	1 498	1 827	1 900	1 954	1 998	2 039	2 073	2 107	2 141	2 176	2 212
Other oilseeds												
World Trade	kt	20 507	21 021	21 391	21 782	21 994	22 228	22 472	22 685	22 933	23 204	23 589
OECD	kt	10 653	10 683	10 788	10 938	10 922	10 878	10 817	10 772	10 755	10 766	10 822
Developing countries	kt	11 868	12 522	12 819	13 095	13 370	13 699	14 058	14 365	14 679	14 986	15 368
Least Developed Countries	kt	178	193	213	228	246	265	287	306	326	346	370
Protein Meals												
World Trade	kt	90 567	95 882	97 036	97 835	98 847	100 188	101 563	102 960	104 422	105 887	107 472
OECD	kt	48 648	50 431	50 916	50 843	50 827	51 099	51 373	51 628	51 896	52 125	52 414
Developing countries	kt	48 393	52 160	53 211	54 243	55 434	56 704	58 030	59 415	60 852	62 333	63 878
Least Developed Countries	kt	937	984	989	1 010	1 051	1 099	1 154	1 210	1 270	1 330	1 393
Vegetable Oils												
World Trade	kt	80 243	84 558	85 812	87 042	88 173	89 229	90 369	91 560	92 815	94 084	95 417
OECD	kt	21 252	22 267	22 298	22 342	22 338	22 109	21 873	21 631	21 427	21 204	20 912
Developing countries	kt	60 244	63 471	64 714	65 894	67 018	68 281	69 641	71 063	72 507	73 987	75 603
Least Developed Countries	kt	7 417	7 757	7 952	8 154	8 368	8 612	8 877	9 145	9 421	9 699	9 996
Sugar												
World Trade	kt	56 381	53 468	53 882	55 345	56 618	57 789	58 807	59 894	60 888	61 999	63 245
OECD	kt	11 263	11 541	11 345	11 402	11 355	11 358	11 236	11 137	11 109	11 035	10 937
Developing countries	kt	44 501	41 705	42 390	43 735	45 047	46 259	47 440	48 693	49 772	50 988	52 361
Least Developed Countries	kt	8 944	7 782	7 879	8 266	8 725	9 165	9 614	10 108	10 540	11 007	11 528
Beef[2,3]												
World Trade	kt	9 971	10 541	10 679	10 872	11 064	11 257	11 425	11 589	11 779	11 974	12 161
OECD	kt	4 204	4 326	4 348	4 421	4 463	4 492	4 527	4 551	4 588	4 627	4 665
Developing countries	kt	5 952	6 528	6 689	6 818	6 973	7 146	7 290	7 438	7 601	7 768	7 930
Least Developed Countries	kt	165	173	198	214	234	256	273	294	321	349	377
Pigmeat[2,3]												
World Trade	kt	8 806	9 310	9 322	9 251	9 318	9 383	9 450	9 536	9 622	9 709	9 798
OECD	kt	4 990	5 129	5 166	5 195	5 276	5 300	5 321	5 368	5 397	5 422	5 458
Developing countries	kt	4 943	5 431	5 306	5 177	5 193	5 242	5 301	5 360	5 432	5 512	5 584
Least Developed Countries	kt	147	147	174	201	215	233	251	269	289	311	333
Poultry meat												
World Trade	kt	13 121	13 423	13 709	13 976	14 232	14 527	14 826	15 130	15 426	15 733	16 045
OECD	kt	3 900	4 020	4 057	4 096	4 127	4 150	4 166	4 177	4 185	4 192	4 198
Developing countries	kt	8 898	9 047	9 327	9 559	9 804	10 077	10 352	10 635	10 914	11 200	11 493
Least Developed Countries	kt	860	873	940	993	1 051	1 117	1 182	1 250	1 321	1 393	1 467
Sheep meat[2,3]												
World Trade	kt	1 130	1 164	1 172	1 189	1 204	1 216	1 225	1 233	1 242	1 250	1 258
OECD	kt	493	467	467	467	473	476	478	479	481	481	483
Developing countries	kt	653	716	724	741	750	759	767	773	781	788	795
Least Developed Countries	kt	4	4	4	4	4	4	4	4	4	4	5

Table C.12.1. World trade projections, imports *(cont.)*

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Butter												
World Trade	**kt**	**994**	**1 067**	**1 107**	**1 130**	**1 147**	**1 159**	**1 175**	**1 191**	**1 212**	**1 232**	**1 252**
OECD	kt	312	332	358	369	376	375	377	381	382	387	389
Developing countries	kt	608	645	660	674	682	693	704	716	733	749	766
Least Developed Countries	kt	15	17	18	19	19	20	20	20	20	20	20
Cheese												
World Trade	**kt**	**3 016**	**3 093**	**3 170**	**3 240**	**3 298**	**3 353**	**3 410**	**3 468**	**3 525**	**3 579**	**3 631**
OECD	kt	1 620	1 667	1 685	1 712	1 743	1 766	1 786	1 807	1 828	1 844	1 859
Developing countries	kt	1 347	1 339	1 398	1 436	1 470	1 507	1 548	1 590	1 632	1 669	1 706
Least Developed Countries	kt	24	16	17	17	17	18	18	19	19	19	20
Whole milk powder												
World Trade	**kt**	**2 472**	**2 575**	**2 606**	**2 631**	**2 661**	**2 685**	**2 714**	**2 745**	**2 776**	**2 808**	**2 841**
OECD	kt	137	125	125	125	126	127	128	129	129	130	130
Developing countries	kt	2 339	2 460	2 492	2 518	2 548	2 573	2 602	2 633	2 665	2 697	2 730
Least Developed Countries	kt	207	219	224	229	234	240	246	251	258	264	270
Skim milk powder												
World Trade	**kt**	**2 444**	**2 633**	**2 659**	**2 711**	**2 752**	**2 799**	**2 846**	**2 895**	**2 945**	**2 995**	**3 046**
OECD	kt	558	594	591	599	603	610	616	624	631	639	647
Developing countries	kt	2 125	2 311	2 347	2 398	2 442	2 489	2 537	2 587	2 636	2 687	2 738
Least Developed Countries	kt	122	119	123	127	132	136	141	146	150	155	160
Fish												
World Trade	**kt**	**41 524**	**41 646**	**41 954**	**42 501**	**43 404**	**43 606**	**44 191**	**44 361**	**44 827**	**45 321**	**45 759**
OECD	kt	22 525	22 040	22 072	22 408	22 780	22 766	23 011	22 961	23 202	23 244	23 357
Developing countries	kt	19 556	19 893	20 233	20 535	21 121	21 310	21 677	21 904	22 219	22 690	22 975
Least Developed Countries	kt	1 308	1 431	1 486	1 520	1 608	1 680	1 751	1 817	1 897	2 001	2 098
Fishmeal[4]												
World Trade	**kt**	**3 051**	**3 245**	**3 277**	**3 140**	**3 102**	**3 134**	**3 153**	**3 159**	**3 053**	**3 126**	**3 149**
OECD	kt	1 033	1 066	1 072	981	977	949	934	930	852	902	891
Developing countries	kt	2 198	2 375	2 402	2 356	2 305	2 369	2 406	2 419	2 396	2 415	2 454
Least Developed Countries	kt	19	21	20	20	19	20	20	20	20	21	21
Fish oil[4]												
World Trade	**kt**	**801**	**845**	**857**	**849**	**842**	**864**	**866**	**877**	**877**	**882**	**907**
OECD	kt	654	691	697	690	685	704	705	715	714	717	737
Developing countries	kt	258	272	284	279	272	277	277	276	273	276	286
Least Developed Countries	kt	3	3	3	3	3	3	3	3	3	3	3
Ethanol												
World Trade	**kt**	**10 090**	**11 073**	**10 833**	**10 824**	**10 726**	**10 795**	**10 772**	**10 714**	**10 608**	**10 523**	**10 436**
OECD	kt	5 711	5 937	5 953	6 017	6 009	6 052	6 072	6 008	5 948	5 903	5 859
Developing countries	kt	4 981	5 698	5 458	5 388	5 297	5 325	5 282	5 291	5 247	5 210	5 169
Least Developed Countries	kt	13	3	3	3	3	3	3	3	3	3	3
Biodiesel												
World Trade	**kt**	**4 505**	**5 084**	**4 417**	**4 137**	**3 992**	**3 936**	**3 899**	**3 859**	**3 819**	**3 780**	**3 738**
OECD	kt	4 214	4 841	4 174	3 894	3 748	3 691	3 654	3 614	3 574	3 535	3 493
Developing countries	kt	290	244	243	243	244	245	245	245	245	245	245
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Cotton												
World Trade	**kt**	**8 946**	**9 894**	**10 156**	**10 330**	**10 526**	**10 705**	**10 836**	**11 018**	**11 207**	**11 398**	**11 590**
OECD	kt	1 504	1 441	1 539	1 595	1 581	1 581	1 584	1 591	1 603	1 614	1 625
Developing countries	kt	8 599	9 566	9 821	9 997	10 195	10 378	10 509	10 691	10 879	11 069	11 261
Least Developed Countries	kt	1 678	1 923	2 000	2 070	2 138	2 208	2 282	2 366	2 455	2 546	2 639
Roots and tubers												
World Trade	**kt**	**16 440**	**17 304**	**17 398**	**17 486**	**17 603**	**17 710**	**17 839**	**17 974**	**18 106**	**18 243**	**18 371**
OECD	kt	2 875	2 992	3 020	3 007	3 034	3 020	3 037	3 035	3 049	3 048	3 057
Developing countries	kt	14 148	14 881	14 962	15 077	15 185	15 306	15 425	15 566	15 690	15 834	15 959
Least Developed Countries	kt	216	202	216	220	219	227	229	235	239	245	252

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 2016-18est: Data for 2018 are estimated.

1. Excludes Iceland but includes all EU member countries
2. Excludes trade of live animals.
3. Excludes trade of live animals.
4. Data are in product weight.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.12.2. World trade projections, exports

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Wheat												
OECD[1]	kt	95 095	100 252	100 808	101 432	102 001	102 457	103 471	104 459	105 285	106 147	106 795
Developing countries	kt	23 641	23 318	23 586	23 799	23 979	24 237	24 706	25 071	25 474	25 888	26 377
Least Developed Countries	kt	121	110	108	106	105	103	101	99	97	95	94
Maize												
OECD[1]	kt	67 230	67 606	68 104	68 381	69 057	69 650	70 080	70 603	71 156	71 644	72 143
Developing countries	kt	63 538	70 390	71 235	72 595	73 893	75 312	76 895	78 404	79 985	81 514	83 004
Least Developed Countries	kt	3 216	2 748	2 637	2 590	2 558	2 536	2 518	2 485	2 458	2 425	2 382
Other coarse grains												
OECD[1]	kt	27 502	25 785	26 297	26 272	26 768	26 675	27 191	27 370	27 611	27 842	28 120
Developing countries	kt	4 564	4 540	4 306	4 317	4 264	4 315	4 373	4 406	4 471	4 558	4 650
Least Developed Countries	kt	857	476	236	210	161	175	157	157	156	156	154
Rice												
OECD[1]	kt	4 212	4 516	4 473	4 466	4 526	4 561	4 610	4 640	4 673	4 708	4 745
Developing countries	kt	42 990	45 285	46 755	47 639	48 424	49 343	50 347	51 355	52 415	53 494	54 620
Least Developed Countries	kt	4 704	4 806	5 384	5 463	5 636	5 844	6 066	6 308	6 571	6 850	7 162
Soybean												
OECD	kt	60 897	56 050	56 704	56 984	57 244	57 679	58 474	59 485	60 570	61 622	62 589
Developing countries	kt	86 446	92 902	93 917	95 388	96 719	98 215	99 150	99 955	100 728	101 589	102 512
Least Developed Countries	kt	64	76	76	76	74	73	72	71	69	68	66
Other oilseeds												
OECD	kt	15 324	14 606	14 900	15 224	15 380	15 591	15 799	15 919	16 080	16 219	16 499
Developing countries	kt	2 854	2 898	2 904	2 901	2 872	2 812	2 763	2 735	2 708	2 696	2 678
Least Developed Countries	kt	105	112	91	99	94	97	95	99	98	100	98
Protein Meals												
OECD	kt	19 738	20 540	20 699	20 533	20 532	20 716	20 911	21 102	21 332	21 538	21 767
Developing countries	kt	65 405	67 858	68 674	69 450	70 235	71 189	72 165	73 176	74 191	75 237	76 360
Least Developed Countries	kt	359	407	396	400	399	403	403	406	405	408	410
Vegetable Oils												
OECD	kt	7 775	7 435	7 581	7 616	7 651	7 692	7 828	7 901	8 006	8 100	8 293
Developing countries	kt	65 521	67 913	68 827	69 811	70 690	71 475	72 254	73 158	74 074	75 010	75 905
Least Developed Countries	kt	453	468	457	448	438	427	415	404	392	382	371
Sugar												
OECD	kt	8 792	8 974	8 651	8 779	9 062	9 405	9 727	9 977	10 235	10 455	10 624
Developing countries	kt	52 366	48 226	48 421	49 680	50 737	51 628	52 240	52 981	53 594	54 374	55 356
Least Developed Countries	kt	2 466	954	637	449	399	384	374	384	388	369	348
Beef[2]												
OECD	kt	4 831	5 041	5 083	5 115	5 165	5 227	5 259	5 287	5 335	5 381	5 429
Developing countries	kt	4 767	5 098	5 213	5 353	5 490	5 618	5 744	5 864	5 999	6 140	6 271
Least Developed Countries	kt	2	2	2	2	2	1	1	1	1	1	1
Pigmeat[2]												
OECD	kt	7 681	8 291	8 178	8 025	8 062	8 113	8 163	8 231	8 300	8 369	8 438
Developing countries	kt	1 140	1 179	1 236	1 264	1 285	1 300	1 313	1 324	1 335	1 345	1 356
Least Developed Countries	kt	1	1	1	1	1	1	1	1	1	1	1
Poultry meat												
OECD	kt	6 811	7 061	7 270	7 323	7 394	7 547	7 663	7 770	7 890	8 008	8 121
Developing countries	kt	7 093	7 454	7 479	7 668	7 828	7 955	8 130	8 316	8 480	8 656	8 840
Least Developed Countries	kt	19	20	19	19	19	18	18	17	17	17	16
Sheep meat[2]												
OECD	kt	1 092	1 056	1 076	1 101	1 115	1 126	1 132	1 139	1 147	1 156	1 164
Developing countries	kt	87	106	99	98	98	98	99	100	101	103	104
Least Developed Countries	kt	6	6	6	5	6	6	6	6	6	6	6
Butter												
OECD	kt	900	904	940	961	974	981	992	1 002	1 016	1 030	1 043
Developing countries	kt	79	68	69	68	67	66	66	66	67	67	67
Least Developed Countries	kt	4	4	4	4	4	4	4	4	4	4	4
Cheese												
OECD	kt	2 440	2 550	2 633	2 701	2 754	2 802	2 852	2 902	2 950	2 996	3 038
Developing countries	kt	447	356	358	370	375	380	385	389	396	403	410
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Whole milk powder												
OECD	kt	1 858	1 976	2 001	2 018	2 041	2 053	2 068	2 083	2 099	2 117	2 136
Developing countries	kt	576	567	573	580	585	594	605	618	630	641	651
Least Developed Countries	kt	9	9	9	8	8	8	8	8	8	8	8
Skim milk powder												
OECD	kt	2 170	2 354	2 376	2 428	2 465	2 508	2 553	2 600	2 646	2 694	2 742
Developing countries	kt	262	311	311	309	310	309	309	308	308	307	307
Least Developed Countries	kt	5	8	7	7	7	7	7	7	6	6	6

Table C.12.2. World trade projections, exports *(cont.)*

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Fish[3]												
OECD	kt	12 793	12 914	13 044	13 038	13 116	13 243	13 344	13 458	13 373	13 567	13 668
Developing countries	kt	27 013	27 203	27 358	27 881	28 772	28 827	29 343	29 411	29 884	30 306	30 693
Least Developed Countries	kt	1 594	1 516	1 478	1 453	1 394	1 365	1 325	1 293	1 250	1 202	1 158
Fishmeal[4]												
OECD	kt	847	860	866	827	836	843	857	868	849	870	867
Developing countries	kt	2 042	2 230	2 289	2 162	2 148	2 178	2 210	2 226	2 129	2 206	2 210
Least Developed Countries	kt	156	150	155	160	163	165	167	168	171	173	174
Fish oil[4]												
OECD	kt	449	461	465	459	462	470	463	474	476	480	488
Developing countries	kt	430	443	449	435	433	444	442	449	441	451	467
Least Developed Countries	kt	30	32	33	33	34	35	35	36	36	37	37
Ethanol												
OECD	kt	6 793	7 105	6 662	6 554	6 316	6 327	6 173	6 126	5 998	5 920	5 812
Developing countries	kt	3 295	3 563	3 764	3 863	4 002	4 059	4 189	4 176	4 197	4 192	4 212
Least Developed Countries	kt	1	0	0	0	0	0	0	0	0	0	0
Biodiesel												
OECD	kt	1 681	2 106	1 882	1 872	1 852	1 811	1 763	1 710	1 660	1 611	1 559
Developing countries	kt	2 445	2 686	2 243	1 973	1 846	1 830	1 841	1 854	1 863	1 873	1 884
Least Developed Countries	kt	0	0	0	0	0	0	0	0	0	0	0
Cotton												
OECD	kt	4 565	4 382	4 591	4 625	4 717	4 754	4 789	4 837	4 889	4 939	4 985
Developing countries	kt	3 707	4 868	4 947	5 105	5 220	5 370	5 475	5 620	5 770	5 926	6 085
Least Developed Countries	kt	1 056	1 237	1 265	1 300	1 339	1 380	1 422	1 465	1 507	1 550	1 595
Roots and tubers												
OECD	kt	1 718	1 749	1 733	1 780	1 763	1 812	1 812	1 850	1 858	1 893	1 909
Developing countries	kt	11 063	11 697	11 815	11 851	11 983	12 047	12 182	12 285	12 412	12 521	12 636
Least Developed Countries	kt	130	154	141	141	141	136	135	132	131	128	125

Note: Average 2016-18est: Data for 2018 are estimated.

1. Excludes Iceland but includes all EU 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.13.1. Wheat projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**752 209**	**838 032**	**1.49**	**1.01**	**174 948**	**203 974**	**3.56**	**1.27**	**176 580**	**203 974**	**3.59**	**1.27**
NORTH AMERICA	85 122	87 232	-0.24	0.13	3 859	3 641	2.85	-0.40	48 352	50 016	0.36	-0.01
Canada	31 298	32 805	2.61	0.21	94	93	1.36	0.02	21 572	23 618	3.07	0.37
United States	53 824	54 427	-1.64	0.09	3 765	3 548	2.89	-0.41	26 781	26 398	-1.49	-0.32
LATIN AMERICA	31 124	37 152	2.12	1.36	24 141	26 107	2.83	0.76	15 048	18 333	5.11	1.56
Argentina	18 794	22 286	6.53	1.30	3	3	0.00	0.00	13 009	15 835	11.61	1.55
Brazil	5 540	6 697	-0.56	1.72	6 569	6 548	0.99	0.03	517	517	-10.67	0.00
Chile	1 421	1 679	0.08	1.21	1 350	971	8.04	-1.54	0	0	..	..
Colombia	12	6	-15.97	2.09	1 962	2 391	4.28	1.42	7	6	17.09	-1.40
Mexico	3 436	4 221	-1.55	1.14	4 961	5 273	5.44	1.49	767	1 108	-3.58	2.60
Paraguay	857	1 020	-7.10	1.11	2	1	0.49	0.68	425	483	-10.68	1.13
Peru	181	216	-2.73	1.49	2 032	2 550	3.42	1.46	9	9	1.56	-1.25
EUROPE	256 197	287 615	2.59	1.00	10 601	10 012	0.78	-0.43	80 218	98 878	9.24	1.88
European Union[1]	130 950	144 241	0.97	0.68	6 387	6 045	-0.55	-0.71	24 332	30 980	2.46	1.30
United Kingdom	15 068	16 718	1.10	0.50	1 596	1 537	3.40	1.07	1 639	1 215	-8.26	-1.12
Russia	76 437	85 028	5.74	1.35	311	351	35.99	1.04	35 578	41 449	18.79	2.00
Ukraine	25 603	32 057	4.31	1.76	49	55	2.00	0.31	16 959	22 868	15.48	2.55
AFRICA	26 430	29 434	1.63	0.90	46 955	62 526	2.54	2.11	1 004	791	-5.04	-1.64
Egypt	8 867	10 082	1.40	1.06	12 067	15 218	2.69	1.32	0	0	..	..
Ethiopia	4 594	5 299	6.39	1.45	1 350	2 637	0.43	4.86	0	0	-75.14	..
Nigeria	69	72	-5.92	0.12	4 567	5 920	1.95	2.44	600	466	3.39	-2.38
South Africa	1 761	2 077	-0.77	1.53	1 438	1 656	0.17	0.30	93	56	-13.63	6.03
ASIA	329 583	369 011	1.36	1.18	88 528	100 692	4.80	1.16	16 584	17 051	1.37	1.16
China[2]	133 012	141 030	1.84	0.81	3 813	3 675	12.72	1.29	127	205	-16.80	3.41
India	96 833	112 285	2.05	1.44	2 525	145	52.80	-5.96	516	633	18.68	1.06
Indonesia	0	0	..	..	10 521	13 536	7.61	2.24	127	98	24.63	-2.19
Iran	12 333	15 360	2.01	1.39	584	656	-20.86	-6.78	187	30	11.15	-1.89
Japan	863	939	4.05	0.49	5 736	5 561	-0.04	-0.27	0	0	..	..
Kazakhstan	14 929	16 124	0.42	1.00	67	60	188.85	-0.15	8 123	8 993	1.25	1.17
Korea	35	37	1.37	2.24	4 545	5 315	-0.72	1.62	50	54	0.00	0.67
Malaysia	0	0	..	..	1 514	1 731	2.47	0.44	125	139	9.99	-0.44
Pakistan	25 932	29 879	1.11	1.45	7	6	-38.58	-1.40	815	625	5.74	8.47
Philippines	0	0	..	..	5 790	7 382	8.22	1.91	44	33	496.82	-1.88
Saudi Arabia	10	16	-49.94	5.27	3 519	4 215	7.85	1.12	0	0	..	..
Thailand	1	1	2.15	0.75	3 428	4 218	9.70	2.13	17	11	8.05	-2.09
Turkey	20 700	24 651	0.17	1.37	5 335	4 866	6.32	-1.43	4 575	4 516	5.37	1.46
Viet Nam	0	0	..	..	5 157	6 446	12.58	2.57	51	40	202.19	-2.51
OCEANIA	23 753	27 589	-2.31	1.42	865	996	4.76	1.15	15 373	18 905	-4.09	1.75
Australia	23 339	27 104	-2.33	1.40	26	20	8.94	0.00	15 373	18 905	-4.09	1.75
New Zealand	414	484	-1.13	2.53	521	574	8.11	1.04	0	0	-36.38	..
DEVELOPED COUNTRIES	**394 277**	**434 820**	**1.41**	**0.86**	**30 784**	**31 062**	**1.40**	**-0.04**	**152 938**	**177 597**	**3.71**	**1.25**
DEVELOPING COUNTRIES	**357 932**	**403 212**	**1.59**	**1.17**	**144 164**	**172 912**	**4.08**	**1.52**	**23 641**	**26 377**	**3.02**	**1.38**
LEAST DEVELOPED COUNTRIES (LDC)	8 343	9 521	0.62	1.43	17 328	23 492	5.49	2.24	121	94	-4.37	-1.77
OECD[3]	**282 260**	**308 333**	**0.26**	**0.63**	**37 226**	**37 060**	**2.01**	**0.12**	**95 095**	**106 795**	**0.14**	**0.73**
BRICS	**313 583**	**347 116**	**2.64**	**1.16**	**14 655**	**12 375**	**5.32**	**0.35**	**36 831**	**42 861**	**14.53**	**1.97**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.13.2. Wheat projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**741 113**	**834 844**	**1.50**	**1.13**	**503 381**	**554 470**	**1.28**	**0.85**	**67.0**	**66.3**	**0.11**	**-0.11**
NORTH AMERICA	39 979	40 739	-0.11	0.27	28 900	30 310	0.46	0.36	80.0	77.7	-0.28	-0.35
Canada	9 479	9 224	2.00	0.10	2 745	2 798	-0.13	-0.06	75.0	69.8	-1.12	-0.85
United States	30 500	31 514	-0.68	0.32	26 155	27 512	0.53	0.40	80.6	78.6	-0.19	-0.29
LATIN AMERICA	39 470	44 829	1.76	1.03	35 011	40 139	1.64	1.01	54.4	56.8	0.53	0.19
Argentina	5 838	6 457	1.47	0.95	5 205	5 848	1.17	1.04	117.6	120.3	0.14	0.20
Brazil	11 123	12 677	0.84	0.88	10 837	12 362	0.88	0.89	51.8	55.3	0.00	0.32
Chile	2 519	2 641	2.37	0.38	1 959	1 975	1.10	-0.03	108.5	101.6	0.23	-0.67
Colombia	1 873	2 374	3.97	1.58	1 709	2 170	3.42	1.55	34.8	41.2	2.45	0.93
Mexico	7 596	8 398	2.30	1.23	6 299	7 320	3.64	1.34	48.8	50.5	2.22	0.30
Paraguay	482	533	0.16	1.47	356	404	1.72	1.12	52.3	52.4	0.38	0.03
Peru	2 219	2 751	3.13	1.53	2 085	2 580	3.40	1.51	64.8	71.4	2.07	0.46
EUROPE	188 856	198 750	0.19	0.68	80 995	80 683	0.28	-0.04	109.0	108.8	0.18	-0.01
European Union[1]	113 937	119 285	0.17	0.61	49 962	50 204	0.32	0.04	112.8	113.4	0.24	0.06
United Kingdom	15 682	17 059	1.83	0.66	6 907	7 203	1.47	0.49	104.4	102.9	0.82	0.00
Russia	41 232	43 958	0.55	1.02	14 670	14 133	0.22	-0.40	101.9	99.9	0.14	-0.21
Ukraine	9 471	9 239	-4.08	0.12	4 681	4 358	-1.48	-0.64	105.9	104.5	-0.99	-0.10
AFRICA	73 786	90 761	2.86	1.93	62 626	77 853	2.59	2.00	50.4	48.3	-0.01	-0.36
Egypt	21 283	25 225	2.68	1.56	18 150	21 464	2.26	1.52	186.1	184.4	0.13	-0.05
Ethiopia	5 994	7 910	5.65	2.52	4 827	6 322	4.74	2.46	46.0	47.1	2.09	0.23
Nigeria	4 043	5 517	1.58	2.99	3 838	5 283	3.02	3.00	20.1	21.0	0.33	0.46
South Africa	3 282	3 674	0.72	0.90	3 203	3 556	0.98	0.91	56.5	56.1	-0.37	-0.08
ASIA	389 923	450 086	2.03	1.28	293 101	322 460	1.33	0.84	65.5	66.3	0.30	0.12
China[2]	122 365	143 518	0.93	1.11	88 367	90 302	0.31	0.16	62.7	62.6	-0.20	-0.01
India	98 843	110 836	2.78	1.32	80 095	89 780	1.52	1.05	59.8	60.3	0.31	0.10
Indonesia	10 444	13 411	8.12	2.32	6 777	8 732	3.48	2.39	25.7	30.0	2.24	1.51
Iran	14 650	15 956	0.75	0.85	13 500	14 679	1.23	0.70	166.4	166.6	0.01	0.01
Japan	6 577	6 500	0.13	-0.16	5 185	5 081	0.01	-0.30	40.7	41.4	0.13	0.07
Kazakhstan	6 754	7 165	-1.12	1.05	2 587	2 645	1.04	0.06	142.2	132.0	-0.44	-0.77
Korea	4 430	5 297	-0.33	1.62	2 437	2 513	0.59	0.29	47.8	47.8	0.19	0.03
Malaysia	1 455	1 590	4.12	0.65	1 015	1 063	2.41	0.20	32.1	29.4	0.71	-0.99
Pakistan	25 858	29 224	1.62	1.34	24 499	28 230	2.04	1.31	124.3	118.9	-0.03	-0.35
Philippines	5 613	7 319	7.95	2.04	2 450	2 899	1.93	1.50	23.3	23.7	0.30	0.11
Saudi Arabia	3 607	4 174	1.97	1.48	3 250	3 830	2.74	1.50	98.7	99.1	0.10	0.12
Thailand	3 280	4 151	11.21	2.33	1 115	1 305	2.35	1.50	16.2	18.7	1.96	1.44
Turkey	22 122	24 965	1.45	0.84	16 930	18 439	1.55	0.59	209.7	210.9	-0.02	0.04
Viet Nam	4 830	6 366	14.72	2.74	1 624	2 330	4.67	2.99	17.0	22.2	3.54	2.14
OCEANIA	9 098	9 679	4.68	0.85	2 748	3 026	2.91	1.13	69.0	66.2	1.36	-0.10
Australia	7 844	8 225	4.89	0.70	2 041	2 215	3.59	1.10	83.4	80.0	2.11	0.00
New Zealand	929	1 059	4.54	1.69	399	434	0.82	0.75	84.8	84.3	-0.24	-0.04
DEVELOPED COUNTRIES	**273 571**	**288 068**	**0.27**	**0.66**	**134 782**	**137 420**	**0.49**	**0.15**	**95.4**	**94.2**	**0.09**	**-0.12**
DEVELOPING COUNTRIES	**467 542**	**546 776**	**2.28**	**1.38**	**368 598**	**417 050**	**1.58**	**1.09**	**60.5**	**60.4**	**0.22**	**-0.02**
LEAST DEVELOPED COUNTRIES (LDC)	26 062	32 751	4.42	2.10	21 494	27 412	3.79	2.19	25.4	25.4	1.37	-0.05
OECD[3]	**225 380**	**238 443**	**0.59**	**0.61**	**123 199**	**128 156**	**0.80**	**0.32**	**92.8**	**92.4**	**0.25**	**-0.06**
BRICS	**276 846**	**314 663**	**1.48**	**1.16**	**197 172**	**210 133**	**0.82**	**0.55**	**62.4**	**62.5**	**0.00**	**0.01**

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.14.1. Maize projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**1 128 161**	**1 311 242**	**3.59**	**1.47**	**149 077**	**182 557**	**6.82**	**1.63**	**160 127**	**193 607**	**7.28**	**1.53**
NORTH AMERICA	387 975	420 131	2.32	0.64	2 525	2 619	2.55	-0.22	62 351	67 438	5.42	0.76
Canada	13 956	15 301	3.19	0.60	1 399	1 607	2.04	-0.34	1 539	1 723	21.75	0.74
United States	374 019	404 830	2.29	0.64	1 126	1 012	10.78	-0.01	60 812	65 715	5.41	0.76
LATIN AMERICA	184 693	233 553	5.63	2.03	35 506	42 274	7.10	1.46	57 550	79 040	9.79	2.18
Argentina	49 157	66 532	10.86	1.98	4	4	0.00	0.00	26 760	36 696	9.78	1.59
Brazil	90 094	114 582	4.80	2.34	1 070	695	8.96	-3.21	27 745	38 834	11.14	2.96
Chile	1 116	1 251	-2.76	1.69	1 689	1 985	13.33	1.91	21	20	-14.33	-0.63
Colombia	1 631	1 947	0.18	2.02	4 912	6 170	5.70	1.92	2	1	3.54	-0.15
Mexico	27 717	30 635	4.10	1.10	15 751	18 557	9.77	1.22	1 166	1 268	18.85	2.42
Paraguay	5 169	6 773	10.28	1.65	11	10	-3.81	0.12	1 836	2 201	4.60	-0.67
Peru	1 517	2 009	-0.15	2.30	3 406	3 767	10.09	2.14	10	10	2.69	-0.27
EUROPE	116 236	131 621	3.54	1.29	17 936	21 123	15.64	0.49	32 298	40 776	15.81	2.05
European Union[1]	63 635	66 041	0.31	0.63	15 198	17 924	18.69	0.56	3 417	3 200	3.29	-0.16
United Kingdom	28	32	224.28	0.00	1 861	2 322	8.38	0.78	128	69	22.01	-5.53
Russia	13 149	18 004	18.13	3.24	80	101	5.34	0.12	5 057	7 884	47.87	3.87
Ukraine	29 314	35 297	11.01	1.50	55	60	4.26	-0.39	21 733	27 343	17.28	1.82
AFRICA	80 544	100 192	3.12	2.12	22 737	27 209	6.71	2.33	4 247	3 843	-1.95	0.33
Egypt	7 467	8 823	0.15	1.52	9 500	11 145	7.49	1.37	0	0	..	..
Ethiopia	8 198	9 968	7.96	1.85	0	0	-83.06	..	700	615	14.04	-2.63
Nigeria	11 454	13 104	5.48	1.27	443	1 025	19.31	18.84	150	105	-10.02	-5.60
South Africa	13 097	15 227	0.45	1.81	745	0	-39.52	..	1 839	2 209	-2.55	2.94
ASIA	358 077	425 035	4.30	1.93	70 291	89 241	5.59	1.85	3 614	2 430	-5.19	-2.44
China[2]	260 005	307 180	4.49	2.09	3 588	6 312	11.46	2.72	34	14	-27.91	15.77
India	27 707	33 320	4.75	1.67	52	55	24.20	2.46	709	33	-20.00	-21.22
Indonesia	23 462	29 056	3.80	1.31	752	2 222	-3.35	12.40	99	208	2.14	-2.72
Iran	899	1 080	-7.57	1.78	7 446	10 344	10.37	2.79	0	0	..	..
Japan	0	0	..	..	15 500	15 628	-0.23	-0.11	0	0	..	..
Kazakhstan	799	969	7.87	1.39	5	4	178.18	-0.04	30	89	21.20	0.61
Korea	74	76	-0.33	0.14	9 809	11 034	2.89	0.59	0	0	..	..
Malaysia	68	81	4.80	1.66	3 910	4 780	3.78	1.85	31	25	20.78	-1.82
Pakistan	5 910	7 123	6.62	1.93	12	114	5.63	14.04	42	2	353.43	-20.05
Philippines	7 711	9 124	1.80	1.57	667	1 269	36.82	5.27	0	0	..	..
Saudi Arabia	86	132	-3.82	5.55	4 133	5 923	11.79	2.86	0	0	..	..
Thailand	4 831	5 731	0.07	1.64	126	168	-9.23	2.11	443	82	-2.67	-8.01
Turkey	6 000	7 227	4.93	1.49	2 263	2 758	20.41	1.84	80	69	6.86	-0.40
Viet Nam	5 095	5 160	1.46	0.55	9 045	14 311	33.71	4.11	105	86	40.68	-1.49
OCEANIA	635	709	1.17	0.39	82	92	56.00	1.22	67	80	14.32	1.46
Australia	407	449	0.99	0.64	2	0	69.99	..	63	77	18.01	1.52
New Zealand	218	239	1.47	0.14	79	92	85.01	1.22	3	3	-3.96	0.00
DEVELOPED COUNTRIES	**520 524**	**570 810**	**2.53**	**0.82**	**38 712**	**41 577**	**5.55**	**0.25**	**96 589**	**110 603**	**7.33**	**1.26**
DEVELOPING COUNTRIES	**607 637**	**740 432**	**4.62**	**1.99**	**110 365**	**140 981**	**7.32**	**2.07**	**63 538**	**83 004**	**7.62**	**1.90**
LEAST DEVELOPED COUNTRIES (LDC)	41 292	53 982	4.51	2.58	3 414	5 081	12.80	1.17	3 216	2 382	5.75	-1.34
OECD[3]	**487 399**	**526 313**	**2.13**	**0.68**	**66 613**	**75 091**	**6.21**	**0.65**	**67 230**	**72 143**	**5.30**	**0.74**
BRICS	**404 050**	**488 313**	**4.72**	**2.15**	**5 536**	**7 164**	**12.65**	**1.93**	**35 384**	**48 974**	**9.00**	**3.03**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.14.2. Maize projections: Consumption, feed, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		FEED (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**1 111 485**	**1 300 749**	**3.44**	**1.28**	**651 943**	**771 953**	**3.78**	**1.43**	**17.8**	**19.3**	**0.70**	**0.72**
NORTH AMERICA	328 797	355 030	1.68	0.68	145 459	167 502	1.69	1.39	16.8	15.8	-1.50	-0.56
Canada	13 897	15 189	2.18	0.48	8 770	10 115	3.21	0.95	22.6	14.9	-8.61	-4.11
United States	314 900	339 841	1.66	0.69	136 688	157 387	1.60	1.42	16.1	15.9	-0.02	-0.10
LATIN AMERICA	158 450	195 728	4.49	1.84	101 486	125 785	4.87	1.87	52.9	56.6	0.56	0.49
Argentina	22 311	29 735	12.61	2.49	16 500	22 291	14.91	2.61	35.7	36.6	1.79	0.19
Brazil	61 753	76 114	2.97	1.97	43 277	53 184	2.09	1.88	23.3	25.6	-0.07	0.48
Chile	2 614	3 166	2.14	1.57	1 962	2 458	1.98	1.80	21.3	21.8	0.84	0.20
Colombia	6 475	8 088	4.22	1.92	3 999	5 145	4.18	2.60	49.3	54.7	3.15	0.22
Mexico	41 513	47 850	5.19	1.11	23 181	26 587	9.17	0.98	130.9	133.9	-0.16	0.23
Paraguay	2 428	4 437	14.36	3.08	774	1 562	19.90	2.45	54.4	59.1	0.87	0.73
Peru	4 037	5 590	4.15	2.09	2 764	4 039	2.90	2.48	20.6	22.1	1.15	0.56
EUROPE	100 075	111 819	2.08	0.88	76 675	84 023	2.23	0.51	8.2	8.5	0.27	0.25
European Union[1]	73 936	80 762	1.67	0.64	56 547	59 498	1.97	0.07	9.8	10.1	-0.46	0.24
United Kingdom	1 766	2 287	8.15	1.03	702	1 153	7.66	1.10	8.4	9.0	7.85	0.15
Russia	8 005	10 172	14.07	2.89	6 171	7 962	15.00	3.30	1.4	1.5	4.10	0.78
Ukraine	7 975	7 987	1.92	0.36	5 973	5 954	2.27	0.25	10.8	11.4	-0.29	0.50
AFRICA	96 987	122 843	4.10	2.19	33 901	40 491	5.20	1.85	40.4	41.6	0.38	0.37
Egypt	16 867	19 916	3.71	1.55	12 200	14 795	4.56	1.79	41.7	38.8	-0.56	-0.54
Ethiopia	7 414	9 325	7.51	2.21	1 333	1 322	17.13	1.99	45.4	47.8	1.96	0.28
Nigeria	11 477	13 964	5.92	2.03	2 067	2 365	14.12	1.81	37.0	36.2	1.80	0.20
South Africa	11 536	12 954	1.55	1.37	5 275	6 453	1.20	2.33	89.2	85.2	-0.03	-0.49
ASIA	426 524	514 611	4.81	1.38	293 956	353 628	4.89	1.48	8.3	8.5	0.38	0.23
China[2]	264 962	316 499	4.79	1.18	189 000	219 374	4.44	1.18	6.1	6.1	-0.40	-0.01
India	27 033	33 331	7.39	1.75	11 331	15 590	12.16	2.52	7.0	7.2	-0.01	0.23
Indonesia	24 115	31 060	3.48	1.85	10 333	15 009	8.39	2.37	28.7	29.4	0.31	0.25
Iran	8 011	11 386	6.12	2.62	7 786	11 112	6.28	2.64	0.9	0.8	-1.20	-0.96
Japan	15 592	15 648	-0.26	-0.10	11 704	11 638	-0.16	-0.27	0.8	0.9	0.28	0.37
Kazakhstan	780	881	7.67	1.57	677	777	7.19	1.64	0.5	0.6	-1.46	0.15
Korea	10 166	11 110	3.20	0.83	7 867	8 808	3.73	1.06	2.0	1.9	0.82	-0.03
Malaysia	3 898	4 830	3.54	1.87	3 637	4 509	3.35	1.93	1.8	1.9	1.22	0.25
Pakistan	6 213	7 223	7.97	2.00	3 133	3 931	10.81	2.55	8.2	8.4	1.43	0.32
Philippines	8 218	10 357	2.31	1.95	5 476	7 061	1.55	2.15	18.5	19.0	1.24	0.18
Saudi Arabia	4 203	6 046	11.14	2.88	3 997	5 824	10.57	2.97	0.2	0.2	-2.57	-0.99
Thailand	4 597	5 801	0.52	1.85	4 258	5 470	0.77	1.97	1.2	1.1	-0.39	-0.65
Turkey	8 184	9 877	7.71	1.69	6 283	7 724	9.48	1.89	16.1	16.4	0.47	0.15
Viet Nam	14 296	19 360	13.59	3.06	10 842	15 318	11.99	3.51	7.2	8.7	3.47	1.65
OCEANIA	652	719	2.48	0.54	467	524	3.47	0.64	2.3	2.2	-1.11	-0.66
Australia	347	372	-0.04	0.46	186	196	-0.53	0.67	3.2	3.0	-0.92	-0.58
New Zealand	294	328	5.99	0.43	278	317	6.27	0.42	1.5	1.5	-1.05	-0.03
DEVELOPED COUNTRIES	**461 133**	**501 278**	**1.72**	**0.72**	**243 546**	**274 699**	**1.80**	**1.06**	**12.5**	**12.6**	**-0.18**	**0.00**
DEVELOPING COUNTRIES	**650 352**	**799 472**	**4.83**	**1.64**	**408 397**	**497 255**	**5.14**	**1.64**	**19.1**	**20.7**	**0.79**	**0.77**
LEAST DEVELOPED COUNTRIES (LDC)	40 974	56 356	5.24	2.61	10 141	13 104	9.43	1.85	26.8	30.3	0.79	1.19
OECD[3]	**485 340**	**528 825**	**2.01**	**0.72**	**256 189**	**288 158**	**2.41**	**1.00**	**22.5**	**23.7**	**0.14**	**0.46**
BRICS	**373 290**	**449 070**	**4.66**	**1.39**	**255 054**	**302 563**	**4.32**	**1.44**	**8.9**	**9.2**	**0.01**	**0.20**

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.
1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.15.1. Other coarse grain projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**292 081**	**325 009**	**0.63**	**0.94**	**39 336**	**44 516**	**5.29**	**1.51**	**43 078**	**46 104**	**4.25**	**1.46**
NORTH AMERICA	26 984	25 485	1.12	-0.18	1 652	1 770	-0.27	0.62	9 820	8 101	3.50	-0.55
Canada	12 348	12 878	0.48	0.16	81	94	10.01	-0.66	5 084	5 438	2.15	0.58
United States	14 636	12 607	1.67	-0.51	1 571	1 676	-0.65	0.70	4 737	2 663	4.78	-2.54
LATIN AMERICA	18 975	21 983	0.18	0.85	1 954	1 996	-11.46	0.24	3 026	3 532	-0.90	0.57
Argentina	6 805	7 809	2.69	0.38	1	1	0.00	0.00	2 825	3 217	-0.96	0.03
Brazil	2 954	4 036	3.14	1.33	579	796	8.50	3.29	2	2	-7.03	-1.25
Chile	870	933	3.17	1.36	109	112	-21.71	-2.72	36	71	-5.79	2.36
Colombia	22	26	-18.93	2.31	343	358	-6.40	0.69	0	0	..	..
Mexico	5 937	6 226	-2.68	0.62	647	554	-19.61	-0.73	0	0	-2.77	..
Paraguay	108	134	5.05	2.09	0	0	..	..	2	0	-0.31	-30.42
Peru	260	322	0.35	1.83	162	150	4.26	-1.11	36	41	295.47	1.12
EUROPE	132 781	141 066	0.34	0.42	2 459	1 910	0.29	-1.51	19 289	23 115	7.10	2.14
European Union[1]	82 141	87 316	-0.07	0.08	1 581	1 079	1.00	-1.36	8 283	10 275	7.02	1.19
United Kingdom	7 740	7 979	2.57	0.23	204	256	1.76	1.73	1 373	1 370	6.16	-0.02
Russia	26 582	27 077	3.09	0.86	212	178	-4.25	0.76	4 516	5 371	16.99	4.28
Ukraine	10 053	11 466	-2.22	1.82	50	52	4.35	0.15	4 925	5 829	3.69	2.35
AFRICA	54 026	67 544	1.59	2.29	3 872	5 601	7.91	3.84	1 427	1 033	1.45	0.69
Egypt	949	1 115	-0.60	1.38	36	53	-11.65	-2.19	0	0	..	..
Ethiopia	13 337	18 557	5.45	3.21	0	0	-75.39	..	432	737	6.13	3.43
Nigeria	8 310	9 982	-2.15	2.36	20	19	0.00	-20.40	100	97	-1.21	27.73
South Africa	516	665	0.54	1.97	202	248	9.60	-1.51	18	27	-7.36	1.11
ASIA	46 149	54 587	0.59	1.27	29 294	33 116	8.43	1.50	1 539	2 031	6.40	1.08
China[2]	7 540	9 436	3.87	2.00	12 671	12 878	28.65	1.49	32	21	-8.48	3.08
India	17 370	19 307	-1.39	0.64	207	209	73.33	1.61	76	71	-15.47	-0.87
Indonesia	0	0	..	..	107	132	4.54	1.77	0	0	..	..
Iran	2 953	3 563	1.36	1.50	2 151	4 041	14.10	3.91	0	0	..	..
Japan	225	219	1.54	-0.37	1 998	1 708	-7.07	-1.63	0	0	..	..
Kazakhstan	4 090	5 044	8.68	1.57	7	5	-12.01	-0.27	1 407	1 919	22.19	1.16
Korea	96	115	-1.24	0.55	114	121	4.44	0.61	0	0	..	..
Malaysia	0	0	..	..	15	16	339.46	1.85	0	0	..	..
Pakistan	512	606	-0.52	1.42	134	131	37.45	1.04	0	0	..	..
Philippines	1	1	9.98	1.42	37	52	-0.68	2.25	0	0	..	..
Saudi Arabia	202	271	2.99	2.35	8 059	9 242	1.74	0.89	0	0	..	..
Thailand	170	191	0.41	1.15	24	42	0.00	0.63	2	2	-0.17	-0.12
Turkey	7 635	9 531	-0.52	1.62	394	411	18.94	8.36	12	10	-27.60	-0.74
Viet Nam	3	3	8.42	1.43	123	119	5.59	1.36	0	0	..	..
OCEANIA	13 166	14 343	0.64	1.16	104	123	7.30	0.85	7 977	8 293	2.26	2.41
Australia	12 773	13 871	0.65	1.17	0	0	..	..	7 976	8 292	2.26	2.41
New Zealand	389	467	-0.02	0.71	19	26	69.15	-0.78	0	0	..	..
DEVELOPED COUNTRIES	**180 043**	**189 396**	**0.69**	**0.44**	**6 865**	**6 681**	**-2.52**	**-0.09**	**38 514**	**41 454**	**5.44**	**1.56**
DEVELOPING COUNTRIES	**112 039**	**135 613**	**0.65**	**1.69**	**32 471**	**37 835**	**7.75**	**1.82**	**4 564**	**4 650**	**-2.29**	**0.55**
LEAST DEVELOPED COUNTRIES (LDC)	26 144	31 139	2.67	1.93	580	1 894	-0.08	10.16	857	154	-0.11	-8.53
OECD[3]	**145 857**	**153 193**	**0.21**	**0.25**	**7 336**	**6 749**	**-5.58**	**-0.14**	**27 502**	**28 120**	**3.91**	**0.92**
BRICS	**54 962**	**60 522**	**1.33**	**1.00**	**13 871**	**14 311**	**25.01**	**1.51**	**4 645**	**5 492**	**13.82**	**4.17**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.15.2. Other coarse grain projections: Consumption, feed, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		FEED (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**290 801**	**322 938**	**0.48**	**1.05**	**161 679**	**175 625**	**0.13**	**0.85**	**10.3**	**11.0**	**0.15**	**0.72**
NORTH AMERICA	18 992	19 152	-1.10	-0.01	11 644	11 733	-2.31	-0.10	4.1	4.0	-0.17	-0.46
Canada	7 594	7 535	-1.41	-0.08	7 011	6 996	-1.44	-0.07	6.7	5.7	-1.31	-2.27
United States	11 398	11 617	-0.94	0.05	4 633	4 737	-3.90	-0.13	3.8	3.8	0.02	-0.12
LATIN AMERICA	17 968	20 389	-1.21	1.01	12 211	13 629	-3.39	0.73	3.8	3.9	1.01	0.24
Argentina	4 162	4 592	6.96	0.72	2 506	2 821	5.60	0.05	18.2	17.9	3.09	-0.20
Brazil	3 557	4 831	4.14	1.62	2 121	2 920	3.17	1.11	1.8	2.2	2.74	1.95
Chile	835	948	-6.06	1.67	534	594	-10.32	2.09	3.9	4.5	2.69	1.00
Colombia	366	384	-7.96	0.80	45	44	-27.81	2.58	0.8	0.4	-7.71	-1.05
Mexico	6 584	6 777	-5.79	0.50	5 876	5 994	-6.48	0.46	5.5	5.4	0.68	-0.22
Paraguay	106	134	5.34	2.28	96	111	5.35	1.63	0.0	0.0	-1.57	-1.16
Peru	390	431	0.65	0.79	23	33	-0.65	2.70	6.4	6.1	0.82	-0.46
EUROPE	117 706	119 917	-0.90	0.29	84 068	86 568	-0.87	0.30	13.7	13.3	-0.60	-0.10
European Union[1]	78 212	78 336	-0.62	0.17	57 462	57 870	-0.90	0.08	9.5	9.6	-0.10	0.14
United Kingdom	6 789	6 868	1.97	0.33	3 780	3 806	1.86	0.14	35.6	35.3	0.72	0.24
Russia	21 201	21 839	-0.61	0.12	14 658	15 410	0.60	0.30	14.4	12.2	-2.43	-1.26
Ukraine	5 180	5 649	-6.02	1.57	3 436	3 830	-5.90	2.42	17.0	15.9	-2.86	-0.74
AFRICA	56 064	71 762	1.64	2.41	8 160	9 637	-1.91	2.13	32.2	32.9	0.10	0.34
Egypt	985	1 164	-1.03	1.40	630	797	-1.74	1.98	3.0	2.5	-1.65	-1.54
Ethiopia	12 426	17 612	4.93	3.20	600	650	5.19	0.72	93.8	108.2	1.70	1.39
Nigeria	8 220	9 864	-3.84	2.07	272	331	-24.84	3.13	39.5	35.4	-1.26	-0.63
South Africa	708	885	3.21	0.89	107	151	-1.96	2.27	2.7	2.6	-1.19	0.05
ASIA	74 805	85 547	3.12	1.41	42 024	49 610	5.79	1.99	5.2	5.0	-0.99	-0.12
China[2]	20 153	22 356	14.15	1.68	10 940	11 904	50.32	2.98	2.4	2.2	2.44	-0.64
India	18 084	19 451	-0.94	0.67	796	712	8.78	-2.40	12.4	11.9	-1.86	-0.21
Indonesia	107	132	4.54	1.77	0	0	..	..	0.4	0.5	3.31	0.89
Iran	5 137	7 601	4.98	2.71	4 959	7 425	5.19	2.79	0.3	0.3	-1.20	-0.97
Japan	2 226	1 939	-6.02	-1.43	1 592	1 362	-7.92	-1.56	3.8	4.0	1.32	0.40
Kazakhstan	2 610	3 121	4.29	1.94	1 717	2 102	3.30	2.42	2.5	2.3	-1.46	-1.04
Korea	210	235	1.17	0.58	59	59	0.41	-0.19	3.0	3.4	1.10	0.59
Malaysia	14	16	275.93	1.93	13	15	333.97	1.95	0.0	0.0	125.78	0.93
Pakistan	646	738	2.65	1.35	196	202	0.13	0.09	2.1	2.1	2.22	0.32
Philippines	37	53	-0.57	2.23	26	38	-2.56	2.30	0.0	0.1	-0.90	1.14
Saudi Arabia	8 728	9 446	2.37	0.92	8 532	9 247	2.43	0.93	2.7	2.4	-2.57	-0.99
Thailand	192	231	0.37	1.11	56	87	0.85	2.27	1.4	1.4	-0.48	0.15
Turkey	8 046	9 888	0.59	1.80	6 993	8 817	0.71	2.05	3.6	3.3	-1.46	-0.57
Viet Nam	126	123	5.66	1.36	0	0	..	..	0.0	0.0	6.04	1.66
OCEANIA	5 265	6 171	-0.76	0.13	3 571	4 448	-1.20	0.13	6.7	6.6	-3.58	-0.19
Australia	4 770	5 579	-0.96	0.06	3 202	3 996	-1.46	0.07	7.8	7.6	-5.32	-0.36
New Zealand	408	493	0.64	0.62	350	435	0.74	0.71	1.7	1.6	-1.05	-0.80
DEVELOPED COUNTRIES	**150 060**	**154 611**	**-0.84**	**0.32**	**104 936**	**109 458**	**-1.03**	**0.35**	**8.9**	**8.5**	**-0.76**	**-0.32**
DEVELOPING COUNTRIES	**140 741**	**168 327**	**2.05**	**1.76**	**56 743**	**66 167**	**2.58**	**1.73**	**10.7**	**11.5**	**0.31**	**0.86**
LEAST DEVELOPED COUNTRIES (LDC)	25 783	32 792	2.79	2.29	1 775	2 095	6.15	1.85	23.0	24.1	0.32	0.42
OECD[3]	**128 757**	**131 976**	**-1.00**	**0.26**	**92 903**	**96 147**	**-1.56**	**0.24**	**7.7**	**7.6**	**-0.03**	**-0.02**
BRICS	**63 702**	**69 362**	**2.75**	**0.87**	**28 622**	**31 098**	**7.90**	**1.26**	**7.1**	**6.9**	**-1.12**	**-0.11**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.16.1. Rice projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**513 426**	**578 182**	**1.19**	**1.04**	**47 801**	**59 580**	**5.09**	**1.92**	**47 302**	**59 580**	**4.47**	**1.92**
NORTH AMERICA	6 593	7 031	-0.59	0.71	1 212	1 481	3.31	1.58	3 176	3 466	-0.99	0.51
Canada	0	0	..	..	381	454	0.49	1.72	0	0	..	..
United States	6 593	7 031	-0.59	0.71	831	1 027	4.84	1.51	3 176	3 466	-0.99	0.51
LATIN AMERICA	18 528	21 336	0.38	1.23	4 428	4 318	3.66	-0.21	3 419	4 174	2.40	1.80
Argentina	929	1 154	-0.27	2.32	9	10	3.05	0.00	439	532	-5.07	3.25
Brazil	7 932	8 533	-0.61	0.52	743	656	0.13	-1.20	734	969	1.46	0.96
Chile	111	151	4.70	1.46	150	165	3.15	-0.01	3	4	38.32	0.00
Colombia	1 774	1 988	2.22	1.31	185	82	3.69	-2.24	1	1	..	0.17
Mexico	266	238	3.05	-1.35	782	917	3.75	2.27	69	4	18.61	0.00
Paraguay	648	814	17.93	1.40	2	1	7.44	-0.23	581	695	20.72	1.45
Peru	2 192	2 720	1.72	1.82	331	161	14.70	-5.81	66	102	30.61	3.70
EUROPE	2 486	2 535	-0.93	0.53	2 538	2 726	2.16	0.54	710	711	2.27	1.49
European Union[1]	1 756	1 715	-0.89	0.04	1 332	1 483	3.40	0.93	493	484	2.81	0.56
United Kingdom	0	0	..	..	671	687	0.46	0.25	46	27	2.92	-5.00
Russia	674	753	0.22	1.66	231	239	1.68	-0.24	162	192	1.51	6.33
Ukraine	44	52	-12.08	1.42	76	68	3.48	-1.65	2	2	-16.72	1.21
AFRICA	20 834	25 920	3.26	2.22	16 900	29 212	5.97	4.47	462	253	-1.52	-2.58
Egypt	4 043	4 051	1.33	1.41	190	705	21.35	-0.52	125	14	-14.30	-0.48
Ethiopia	104	124	7.23	1.31	497	916	33.25	5.05	0	0	..	..
Nigeria	4 144	4 860	7.47	0.87	2 577	5 275	1.13	6.23	0	0	..	..
South Africa	2	2	0.00	1.70	892	1 050	2.65	1.08	0	0	..	..
ASIA	464 445	520 362	1.19	0.99	22 196	21 279	5.33	-0.21	39 286	50 399	5.54	2.07
China[2]	148 376	152 613	0.93	0.32	5 606	5 328	27.90	-0.13	1 239	1 991	10.91	1.99
India	112 650	133 388	2.23	1.44	2	1	22.30	0.80	12 239	16 167	17.99	1.02
Indonesia	46 202	54 346	1.65	1.26	1 257	541	4.40	-10.07	4	9	17.88	1.48
Iran	1 933	2 287	4.11	1.54	1 313	1 396	0.69	0.72	1	1	12.31	-0.05
Japan	7 592	7 573	-0.32	0.11	820	824	0.34	0.00	87	89	-9.53	0.22
Kazakhstan	322	403	5.22	1.67	9	6	-13.77	-1.56	90	117	10.37	1.58
Korea	4 012	3 633	-1.51	-0.87	425	517	2.59	1.55	36	43	20.89	0.00
Malaysia	1 814	2 174	1.66	1.49	904	1 084	-1.12	1.13	21	15	57.05	-0.22
Pakistan	7 130	8 249	2.76	1.45	7	7	-17.89	-0.02	3 886	4 441	0.56	1.47
Philippines	12 443	14 932	1.99	1.55	1 598	1 548	1.81	-0.14	0	1	-4.54	0.01
Saudi Arabia	0	0	..	..	1 187	1 478	0.02	1.38	0	0	..	..
Thailand	22 186	25 262	-1.12	1.02	257	241	-6.24	2.22	10 704	12 038	3.16	2.47
Turkey	552	668	1.53	1.26	289	270	0.23	-0.86	52	51	0.09	0.87
Viet Nam	28 289	32 053	1.15	1.11	600	543	-1.11	-0.72	6 494	8 444	-0.15	2.33
OCEANIA	540	999	-4.75	1.58	526	564	2.72	0.72	249	577	-5.64	2.44
Australia	531	988	-4.84	1.58	175	169	1.52	-0.05	248	576	-5.64	2.45
New Zealand	0	0	..	..	48	56	2.48	1.57	0	0	..	..
DEVELOPED COUNTRIES	**17 852**	**18 946**	**-0.52**	**0.53**	**6 131**	**6 838**	**2.20**	**0.77**	**4 312**	**4 960**	**-1.08**	**0.87**
DEVELOPING COUNTRIES	**495 574**	**559 236**	**1.26**	**1.06**	**41 670**	**52 742**	**5.60**	**2.08**	**42 990**	**54 620**	**5.17**	**2.02**
LEAST DEVELOPED COUNTRIES (LDC)	76 444	91 003	0.99	1.54	10 877	16 039	8.90	4.05	4 704	7 162	12.12	4.06
OECD[3]	**21 414**	**21 997**	**-0.70**	**0.21**	**6 169**	**6 884**	**2.25**	**0.98**	**4 212**	**4 745**	**-0.98**	**0.68**
BRICS	**269 634**	**295 291**	**1.40**	**0.82**	**7 474**	**7 274**	**15.36**	**-0.07**	**14 374**	**19 320**	**14.91**	**1.15**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.16.2. Rice projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**510 499**	**577 622**	**1.44**	**1.07**	**54.4**	**55.4**	**0.00**	**0.14**
NORTH AMERICA	4 622	5 041	0.43	0.94	12.8	12.9	-0.32	0.23
Canada	381	454	0.49	1.72	10.4	11.3	-0.51	0.91
United States	4 241	4 588	0.43	0.86	13.1	13.1	-0.29	0.16
LATIN AMERICA	19 616	21 456	0.73	0.80	28.6	28.4	-0.44	-0.03
Argentina	555	630	4.67	1.56	10.5	11.9	3.83	1.00
Brazil	8 027	8 222	-0.37	0.35	38.4	36.8	-1.24	-0.22
Chile	251	311	3.16	0.77	11.7	13.5	2.38	0.10
Colombia	1 847	2 070	1.64	0.70	34.3	35.6	0.29	0.01
Mexico	930	1 151	1.78	1.31	7.2	7.9	0.39	0.28
Paraguay	122	120	14.35	1.12	6.8	6.8	3.28	0.02
Peru	2 417	2 771	2.33	1.13	65.8	65.8	0.68	0.10
EUROPE	4 331	4 548	0.52	0.39	5.8	6.1	0.43	0.42
European Union[1]	2 584	2 715	0.54	0.36	5.8	6.1	0.47	0.38
United Kingdom	624	661	0.43	0.53	9.4	9.4	-0.21	0.04
Russia	767	798	1.04	0.43	5.3	5.6	0.96	0.62
Ukraine	117	118	-3.64	-0.44	2.6	2.8	-2.91	0.06
AFRICA	37 008	54 791	4.56	3.45	26.1	30.7	2.17	1.26
Egypt	4 128	4 734	1.99	1.30	38.6	37.9	0.07	-0.17
Ethiopia	585	1 028	23.95	4.57	5.0	7.1	20.71	2.59
Nigeria	6 721	10 128	4.91	3.33	29.8	34.4	1.87	0.76
South Africa	917	1 051	3.14	1.08	15.8	16.2	1.86	0.10
ASIA	444 099	490 802	1.26	0.86	77.8	78.7	-0.10	0.11
China[2]	149 309	156 547	1.49	0.32	77.3	77.2	0.10	0.01
India	98 712	116 822	1.21	1.54	68.3	72.4	-0.10	0.56
Indonesia	47 321	54 718	1.88	1.17	133.8	136.0	-0.06	0.06
Iran	3 165	3 671	1.89	1.29	34.8	36.7	0.45	0.41
Japan	8 633	8 134	0.38	-0.55	53.8	51.6	-1.09	-0.36
Kazakhstan	236	289	1.96	1.76	11.5	12.8	0.15	0.99
Korea	4 612	4 107	-0.83	-0.60	62.1	54.7	-2.22	-1.13
Malaysia	2 784	3 238	1.03	1.40	80.8	82.5	-0.08	0.22
Pakistan	3 145	3 800	2.87	1.50	12.8	13.1	0.30	-0.05
Philippines	14 035	16 473	1.76	1.28	115.8	116.8	-0.03	0.02
Saudi Arabia	1 320	1 476	1.36	1.39	39.5	37.7	-1.17	0.02
Thailand	13 546	13 456	0.75	0.03	98.7	90.2	-0.14	-0.92
Turkey	791	885	1.74	0.72	9.2	9.5	0.08	0.15
Viet Nam	22 271	24 130	1.41	0.69	153.1	150.2	-0.87	-0.21
OCEANIA	822	985	2.93	1.25	20.4	21.3	1.32	0.03
Australia	467	580	2.80	1.37	19.1	21.0	1.33	0.26
New Zealand	48	56	2.48	1.57	10.2	10.9	1.41	0.77
DEVELOPED COUNTRIES	**20 027**	**20 642**	**0.70**	**0.25**	**12.9**	**12.9**	**-0.32**	**-0.01**
DEVELOPING COUNTRIES	**490 471**	**556 981**	**1.47**	**1.10**	**64.1**	**64.4**	**-0.13**	**0.03**
LEAST DEVELOPED COUNTRIES (LDC)	82 002	99 659	1.35	1.79	76.4	75.2	-0.03	-0.15
OECD[3]	**23 834**	**23 956**	**0.34**	**0.09**	**15.5**	**15.0**	**-0.86**	**-0.29**
BRICS	**257 732**	**283 439**	**1.32**	**0.81**	**66.5**	**68.2**	**-0.02**	**0.26**

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.
1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.17. Main policy assumptions for cereal markets

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
ARGENTINA												
Crops export tax[1]	%	4.0	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rice export tax[1]	%	4.0	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CANADA												
Tariff-quotas[2]												
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[3]												
Voluntary coupled support												
Wheat[4]	mln EUR	89.9	89.3	89.7	89.7	89.7	89.7	89.7	89.7	89.7	89.7	89.7
Rice[5]	mln EUR	56.1	55.7	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6	55.6
Cereal reference price[6]	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[7]	bln EUR	41.5	41.6	42.2	42.3	42.3	42.3	42.3	42.3	42.3	42.3	42.3
Rice reference price[8]	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[2]	kt	4 482.8	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	4 523.2
Coarse grain tariff-quota[2]	kt	4 296.9	4 439.5	4 460.8	4 461.8	4 462.8	4 463.8	4 464.8	4 465.8	4 466.8	4 467.8	4 468.8
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[9]	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[10]	%	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	%	5.0	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 C.17. Main policy assumptions for cereal markets *(cont.)*

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
INDIA												
Minimum support price												
Rice	INR/t	15 743	16 880	17 401	17 887	18 354	18 827	19 317	19 814	20 326	20 851	21 389
Wheat	INR/t	16 268	16 638	17 019	17 455	17 953	18 468	18 953	19 321	19 711	20 116	20 525
Wheat tariff	%	61.7	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Rice tariff	%	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2	70.2
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	%	10.0	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	%	0.0	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	0.0	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	%	0.0	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 2016-18est: Data for 2018 are estimated.The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. In Argentina, a temporary export tax is applied on all goods from September 4th 2018 until December 31st 2020.
2. Year beginning 1 July.
3. 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%).
4. Mainly for durum wheat. Implemented in 6 Member States.
5. Implemented in 6 Member States.
6. 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.
7. 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.
8. Intervention is set at zero tonnes per marketing year. However, the Commission may initiate intervention if market requires.
9. Milled rice basis.
10. Applied by Brazil only.

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.18.1. Soybean projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**352 838**	**411 002**	**4.35**	**1.59**	**150 824**	**170 225**	**7.20**	**1.22**	**150 794**	**170 225**	**6.47**	**1.22**
NORTH AMERICA	127 995	132 032	4.75	1.50	1 168	1 292	5.55	1.09	60 192	62 101	5.18	1.23
Canada	7 274	8 668	8.40	2.07	457	521	5.70	3.00	5 054	6 071	10.43	1.78
United States	120 721	123 364	4.56	1.46	711	771	6.02	-0.03	55 137	56 030	4.78	1.17
LATIN AMERICA	181 455	223 704	4.49	1.58	9 636	7 911	7.88	0.97	85 442	101 700	6.99	1.12
Argentina	48 985	61 914	-0.18	1.34	2 574	0	243.23	..	8 231	10 260	-10.09	0.76
Brazil	116 234	140 989	7.01	1.60	410	410	21.91	0.00	68 568	79 699	12.01	0.97
Chile	0	0	..	..	250	462	3.48	2.10	2	1	0.00	-2.06
Colombia	70	90	0.31	2.61	840	939	7.72	0.64	33	19	76.21	-0.64
Mexico	459	545	15.78	1.87	4 160	4 749	2.44	1.46	0	0	..	..
Paraguay	10 083	13 231	5.90	2.13	5	5	-8.06	0.09	5 833	8 332	2.72	2.80
Peru	5	6	0.00	2.26	400	461	21.32	0.88	0	0	..	..
EUROPE	11 171	14 386	14.62	2.34	16 398	16 817	2.52	0.50	4 126	5 545	25.08	3.45
European Union[1]	2 799	3 662	15.01	2.81	13 245	14 076	1.97	0.75	578	364	18.09	0.29
United Kingdom	0	0	..	..	747	758	-1.59	0.00	11	11	18.64	0.00
Russia	3 843	5 199	17.67	1.93	1 910	1 445	10.39	-1.58	755	1 574	122.68	4.68
Ukraine	4 063	4 978	14.99	2.53	4	5	19.37	-0.18	2 775	3 585	22.99	3.31
AFRICA	2 801	3 646	6.37	1.78	4 720	5 673	7.57	0.83	212	218	1.16	-0.37
Egypt	35	42	1.60	1.61	2 727	3 632	6.03	1.28	50	43	15.22	-1.26
Ethiopia	106	124	30.97	1.42	2	2	0.00	-1.10	67	75	410.28	1.11
Nigeria	703	884	1.37	1.93	20	15	-2.17	-1.62	10	11	-0.79	0.71
South Africa	1 203	1 689	11.33	1.67	100	1	26.83	-6.07	4	6	-40.30	0.67
ASIA	29 366	37 136	-0.26	1.69	118 900	138 531	7.95	1.35	816	640	8.22	-0.17
China[2]	14 948	19 496	-0.14	1.65	93 032	108 482	8.11	1.48	233	100	-4.67	0.00
India	12 198	14 905	-0.24	1.75	100	50	91.77	-0.18	281	250	27.49	-0.78
Indonesia	598	742	-5.05	1.78	2 456	3 056	4.87	1.24	2	2	-35.47	-0.12
Iran	202	242	2.01	1.82	2 360	2 682	21.52	0.52	107	112	82.96	-0.52
Japan	246	274	1.36	1.02	3 203	3 011	0.16	-0.26	0	0	..	..
Kazakhstan	248	330	11.27	2.43	10	6	-22.69	-5.38	20	40	0.00	8.34
Korea	88	105	-4.36	0.54	1 267	1 270	0.88	0.32	0	0	..	..
Malaysia	0	0	..	..	813	941	5.51	0.97	23	9	3.03	-0.96
Pakistan	4	5	-9.30	1.73	2 257	3 148	33.32	1.53	0	0	..	..
Philippines	1	1	0.00	1.58	180	353	14.16	1.84	0	0	..	..
Saudi Arabia	0	0	..	..	583	852	23.85	1.39	0	0	..	..
Thailand	44	47	-14.89	1.56	2 825	3 102	6.23	0.83	6	4	-7.25	-0.82
Turkey	148	184	10.93	1.99	2 054	2 002	5.57	0.37	108	90	437.24	-0.37
Viet Nam	117	136	-10.21	1.72	1 558	1 935	24.88	1.57	1	1	-4.89	-0.23
OCEANIA	50	99	0.23	5.04	2	2	-1.42	0.22	6	21	7.13	10.35
Australia	50	99	0.23	5.04	1	1	-2.69	0.45	6	21	7.13	10.35
New Zealand	0	0	..	..	1	1	0.00	0.00	0	0	..	..
DEVELOPED COUNTRIES	**140 918**	**148 815**	**5.35**	**1.58**	**21 678**	**22 031**	**2.24**	**0.44**	**64 348**	**67 713**	**5.79**	**1.40**
DEVELOPING COUNTRIES	**211 920**	**262 186**	**3.72**	**1.59**	**129 146**	**148 194**	**8.27**	**1.35**	**86 446**	**102 512**	**7.01**	**1.11**
LEAST DEVELOPED COUNTRIES (LDC)	810	975	1.96	1.90	1 498	2 212	35.90	2.02	64	66	7.80	-1.56
OECD[3]	**131 791**	**136 907**	**4.91**	**1.54**	**27 247**	**28 924**	**1.99**	**0.73**	**60 897**	**62 589**	**5.29**	**1.23**
BRICS	**148 425**	**182 278**	**5.57**	**1.63**	**95 552**	**110 388**	**8.20**	**1.43**	**69 841**	**81 629**	**12.06**	**1.02**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.18.2. Soybean projections: Consumption, domestic crush

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		DOMESTIC CRUSH (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**346 981**	**410 923**	**4.53**	**1.50**	**311 794**	**372 450**	**4.59**	**1.58**
NORTH AMERICA	62 088	71 329	2.83	1.15	56 641	65 711	2.55	1.17
Canada	2 669	3 108	4.86	2.79	1 900	2 480	4.81	3.00
United States	59 419	68 221	2.75	1.08	54 740	63 231	2.48	1.10
LATIN AMERICA	105 715	129 878	3.24	1.91	98 862	121 671	3.32	1.93
Argentina	43 495	51 648	3.36	1.46	42 573	50 581	3.45	1.48
Brazil	48 076	61 696	2.40	2.47	42 879	55 411	2.39	2.56
Chile	247	461	3.64	2.18	247	461	3.64	2.18
Colombia	875	1 010	8.08	0.82	872	1 005	8.06	0.83
Mexico	4 562	5 294	3.08	1.50	4 326	5 045	3.25	1.55
Paraguay	4 188	4 883	10.84	1.06	4 036	4 697	11.06	1.03
Peru	418	467	22.48	0.89	417	465	22.49	0.89
EUROPE	23 454	25 697	4.65	0.83	20 935	22 175	4.33	0.84
European Union[1]	15 555	17 413	3.23	1.07	13 542	14 442	2.50	1.12
United Kingdom	736	747	-1.70	0.00	673	655	-1.31	-0.31
Russia	4 904	5 073	12.68	0.15	4 815	4 995	12.47	0.16
Ukraine	1 308	1 397	8.13	0.74	1 182	1 264	8.87	0.78
AFRICA	7 027	9 080	6.93	1.28	6 358	8 215	7.77	1.07
Egypt	2 652	3 626	5.54	1.39	2 652	3 626	5.57	1.39
Ethiopia	40	51	13.92	1.76	21	29	12.61	2.33
Nigeria	713	888	1.26	1.88	500	670	5.65	1.12
South Africa	1 111	1 670	14.64	1.78	1 010	1 518	14.75	1.77
ASIA	148 654	174 859	6.28	1.45	128 961	154 604	6.69	1.63
China[2]	108 980	127 742	7.15	1.55	93 486	112 084	7.52	1.82
India	11 962	14 697	0.03	1.79	10 062	12 493	-0.58	1.76
Indonesia	3 085	3 794	2.45	1.35	2 519	3 147	4.54	1.25
Iran	2 443	2 810	17.56	0.65	2 434	2 796	17.90	0.64
Japan	3 438	3 284	-0.13	-0.44	2 692	2 527	0.99	-0.49
Kazakhstan	238	296	7.30	1.61	124	151	2.68	1.45
Korea	1 347	1 375	0.57	0.34	905	952	0.51	0.56
Malaysia	790	931	5.46	1.01	790	931	5.46	1.01
Pakistan	2 227	3 149	32.69	1.53	2 227	3 149	32.74	1.53
Philippines	180	354	13.50	1.88	180	354	13.87	1.88
Saudi Arabia	582	852	23.80	1.40	582	852	23.80	1.40
Thailand	2 872	3 144	5.41	0.84	2 839	3 144	5.74	0.84
Turkey	2 139	2 092	5.29	0.58	2 096	2 067	5.58	0.57
Viet Nam	1 703	2 066	15.37	1.57	1 616	1 951	19.93	1.55
OCEANIA	43	80	-1.91	3.84	37	74	-2.25	4.23
Australia	42	79	-1.96	3.90	37	74	-2.25	4.23
New Zealand	1	1	0.00	0.00	0	0	..	..
DEVELOPED COUNTRIES	**91 170**	**103 263**	**3.25**	**1.03**	**82 233**	**93 062**	**3.02**	**1.05**
DEVELOPING COUNTRIES	**255 812**	**307 661**	**5.04**	**1.66**	**229 561**	**279 388**	**5.22**	**1.77**
LEAST DEVELOPED COUNTRIES (LDC)	2 240	3 119	14.84	2.09	1 868	2 638	20.38	1.87
OECD[3]	**91 307**	**103 380**	**2.75**	**1.07**	**82 307**	**93 237**	**2.52**	**1.10**
BRICS	**175 032**	**210 878**	**5.24**	**1.79**	**152 251**	**186 500**	**5.36**	**1.98**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.19.1. Other oilseed projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**152 814**	**177 995**	**3.08**	**1.41**	**20 507**	**23 589**	**4.07**	**1.20**	**21 372**	**23 589**	**4.48**	**1.20**
NORTH AMERICA	24 946	26 379	5.72	1.14	1 016	1 191	1.26	1.20	11 650	12 281	5.37	1.41
Canada	20 478	22 043	6.12	1.32	248	248	-1.67	-0.04	11 017	11 747	5.62	1.53
United States	4 467	4 336	4.23	0.27	768	943	2.62	1.55	633	534	2.11	-0.96
LATIN AMERICA	5 862	8 789	2.33	3.61	1 811	2 305	2.02	1.81	902	1 310	6.11	1.64
Argentina	4 367	6 976	2.67	4.16	1	1	0.00	0.00	694	1 058	7.67	1.86
Brazil	454	583	5.10	2.22	5	5	-10.71	0.00	79	101	8.96	-0.54
Chile	199	237	11.86	1.51	14	10	-4.49	-2.53	9	13	18.68	2.25
Colombia	2	3	0.00	2.25	7	7	0.00	0.48	0	0	..	..
Mexico	111	119	3.08	0.61	1 752	2 255	2.21	1.91	3	4	15.23	0.00
Paraguay	190	223	-3.10	1.54	5	4	0.00	-1.53	32	40	-2.59	1.79
Peru	6	8	0.00	2.02	1	1	0.00	-1.59	0	0	..	..
EUROPE	61 930	73 597	4.03	1.32	4 874	4 193	1.27	-1.51	3 946	4 800	0.95	1.98
European Union[1]	28 174	30 391	1.41	0.64	4 302	3 703	1.62	-1.66	897	638	-1.82	-0.22
United Kingdom	2 074	2 304	-0.42	0.04	281	187	-4.38	-0.19	262	377	2.72	0.07
Russia	13 175	17 659	7.96	2.29	190	202	7.67	-0.13	368	738	9.72	6.61
Ukraine	16 697	20 873	7.78	1.68	33	36	7.47	-0.18	1 943	2 481	0.95	1.64
AFRICA	9 281	11 045	1.81	1.62	493	571	5.63	1.90	203	148	-1.26	-3.18
Egypt	117	140	-0.48	1.50	72	71	5.01	0.19	21	23	6.10	-0.19
Ethiopia	99	120	4.85	1.83	0	0	..	..	0	0	..	..
Nigeria	2 125	2 486	0.29	1.31	4	73	0.00	41.97	42	1	-10.32	-34.41
South Africa	1 015	1 246	3.91	1.63	49	12	-2.69	-8.68	3	3	-19.03	0.94
ASIA	47 335	54 047	1.17	1.33	12 287	15 304	6.07	1.96	2 249	1 923	10.77	-1.56
China[2]	28 603	31 629	1.24	1.03	5 332	7 397	14.72	3.14	649	591	3.18	-0.12
India	11 717	14 275	0.39	1.95	267	308	8.24	-0.54	678	277	10.80	-9.10
Indonesia	637	745	-2.42	1.68	252	243	5.37	-0.73	1	1	-3.81	0.06
Iran	359	426	4.19	0.67	200	282	45.93	2.09	1	1	0.00	-0.18
Japan	23	24	1.46	0.76	2 368	2 407	-0.19	0.08	0	0	..	..
Kazakhstan	1 036	1 266	10.68	1.58	7	7	-0.72	-0.12	468	674	36.99	1.95
Korea	15	15	3.04	0.04	27	27	-1.94	0.07	0	0	..	..
Malaysia	5	6	1.85	1.66	44	49	2.76	1.03	4	3	1.97	-1.02
Pakistan	748	834	-3.41	1.19	1 300	1 529	4.94	1.66	5	5	-28.47	-0.21
Philippines	20	23	0.53	1.42	61	72	2.12	1.53	0	0	..	..
Saudi Arabia	3	4	0.00	3.48	4	4	0.00	-1.07	1	2	0.00	1.08
Thailand	90	102	-0.15	1.31	58	55	4.20	-0.62	4	4	8.16	0.45
Turkey	1 816	2 225	7.71	2.26	706	869	-3.80	1.25	65	45	6.86	-0.91
Viet Nam	330	389	0.76	1.60	174	217	433.26	1.56	35	31	9.41	-1.54
OCEANIA	3 462	4 138	2.53	1.17	26	26	-1.12	0.00	2 422	3 127	2.41	1.25
Australia	3 449	4 125	2.54	1.18	21	21	1.16	0.00	2 421	3 126	2.42	1.25
New Zealand	10	10	0.00	-0.01	5	5	-6.70	0.02	1	1	0.00	0.00
DEVELOPED COUNTRIES	**92 541**	**106 821**	**4.45**	**1.28**	**8 639**	**8 221**	**1.08**	**-0.59**	**18 518**	**20 911**	**4.19**	**1.53**
DEVELOPING COUNTRIES	**60 274**	**71 174**	**1.23**	**1.61**	**11 868**	**15 368**	**6.80**	**2.30**	**2 854**	**2 678**	**6.63**	**-1.05**
LEAST DEVELOPED COUNTRIES (LDC)	6 346	7 317	1.48	1.42	178	370	-5.87	7.36	105	98	5.29	-0.28
OECD[3]	**60 960**	**65 992**	**3.17**	**0.90**	**10 653**	**10 822**	**0.56**	**-0.02**	**15 324**	**16 499**	**4.13**	**1.27**
BRICS	**54 964**	**65 392**	**2.39**	**1.58**	**5 842**	**7 924**	**13.60**	**2.84**	**1 776**	**1 710**	**6.49**	**-0.32**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.19.2. Other oilseed projections: Consumption, domestic crush

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		DOMESTIC CRUSH (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**151 943**	**177 960**	**2.96**	**1.41**	**130 822**	**154 675**	**3.27**	**1.46**
NORTH AMERICA	14 211	15 300	5.33	0.90	12 086	13 208	6.03	0.90
Canada	9 654	10 562	6.38	1.01	9 195	10 140	6.46	0.97
United States	4 557	4 738	3.47	0.66	2 890	3 068	4.92	0.66
LATIN AMERICA	6 778	9 782	1.71	3.45	6 325	9 241	1.79	3.56
Argentina	3 678	5 918	1.59	4.64	3 549	5 731	1.58	4.67
Brazil	382	486	4.24	3.12	316	417	3.68	3.58
Chile	206	234	9.54	1.27	186	212	9.34	1.23
Colombia	9	10	0.00	0.92	8	9	0.00	1.14
Mexico	1 860	2 370	2.24	1.84	1 735	2 243	2.73	1.94
Paraguay	163	187	-2.20	1.41	133	150	-2.47	1.25
Peru	7	8	0.00	1.73	3	3	0.00	1.36
EUROPE	62 923	72 989	3.93	1.09	57 751	67 246	3.88	1.13
European Union[1]	31 568	33 455	1.44	0.38	28 376	29 894	0.99	0.38
United Kingdom	2 093	2 112	-0.57	0.01	1 925	1 973	-0.94	0.10
Russia	13 062	17 120	7.68	2.11	12 432	16 255	8.43	2.06
Ukraine	14 791	18 434	8.97	1.68	13 791	17 473	9.43	1.76
AFRICA	9 588	11 466	2.04	1.71	5 844	6 605	2.45	1.10
Egypt	169	187	1.05	1.25	118	132	3.23	1.52
Ethiopia	99	120	4.85	1.83	62	71	8.44	1.15
Nigeria	2 088	2 557	0.69	1.76	733	689	0.68	-1.18
South Africa	1 076	1 253	3.26	1.45	966	1 120	3.25	1.45
ASIA	57 343	67 386	1.78	1.56	47 784	57 408	2.26	1.74
China[2]	33 451	38 433	2.52	1.42	27 157	32 196	3.32	1.71
India	11 096	14 278	0.10	2.27	9 640	12 621	0.13	2.37
Indonesia	889	986	-0.54	1.03	297	349	3.88	1.38
Iran	556	708	10.09	1.22	519	645	10.63	1.00
Japan	2 412	2 432	-0.02	0.09	2 394	2 414	0.04	0.09
Kazakhstan	551	597	3.53	1.14	422	441	3.35	0.93
Korea	42	42	-0.72	0.06	38	38	-0.72	0.06
Malaysia	45	51	2.72	1.26	44	50	2.79	1.23
Pakistan	2 050	2 356	1.52	1.49	1 920	2 197	1.83	1.44
Philippines	80	95	1.66	1.51	68	81	1.89	1.69
Saudi Arabia	6	6	0.00	0.88	5	5	0.00	0.95
Thailand	145	153	1.15	0.59	88	101	2.30	1.39
Turkey	2 461	3 046	3.40	2.03	2 258	2 801	3.00	2.05
Viet Nam	485	575	6.26	1.78	361	436	9.33	1.76
OCEANIA	1 100	1 037	3.63	0.92	1 032	968	3.64	0.98
Australia	1 083	1 019	3.76	0.93	1 021	956	3.68	0.99
New Zealand	14	14	-3.30	0.00	10	10	0.00	0.00
DEVELOPED COUNTRIES	**82 669**	**94 137**	**4.02**	**1.04**	**75 015**	**85 892**	**4.07**	**1.07**
DEVELOPING COUNTRIES	**69 274**	**83 823**	**1.81**	**1.83**	**55 807**	**68 784**	**2.26**	**1.98**
LEAST DEVELOPED COUNTRIES (LDC)	6 418	7 587	1.18	1.67	4 422	5 120	1.28	1.42
OECD[3]	**56 241**	**60 320**	**2.35**	**0.63**	**50 294**	**54 017**	**2.13**	**0.64**
BRICS	**59 067**	**71 570**	**2.97**	**1.76**	**50 511**	**62 609**	**3.64**	**1.94**

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.20.1. Protein meal projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**342 967**	**407 162**	**3.90**	**1.53**	**90 567**	**107 472**	**3.27**	**1.28**	**91 834**	**107 472**	**3.10**	**1.28**
NORTH AMERICA	56 021	64 021	2.98	1.10	4 546	4 192	5.42	-0.16	17 242	19 372	5.06	0.84
Canada	6 700	7 699	6.06	1.45	855	756	-3.39	0.23	4 911	5 598	8.69	1.33
United States	49 321	56 322	2.63	1.05	3 692	3 436	8.92	-0.24	12 331	13 774	4.00	0.65
LATIN AMERICA	82 364	103 576	3.19	2.01	9 333	12 076	3.13	2.42	51 180	63 261	3.10	1.98
Argentina	35 296	42 652	3.33	1.64	0	0	..	..	31 381	38 267	3.48	1.72
Brazil	34 478	46 072	2.28	2.59	6	6	-22.22	0.00	15 286	20 163	1.16	2.96
Chile	303	487	5.20	1.93	1 112	1 469	3.01	2.96	7	6	-9.99	-1.20
Colombia	833	980	6.38	1.13	1 434	2 203	11.19	3.67	91	63	5.07	-3.54
Mexico	4 697	5 573	3.30	1.57	2 038	2 582	3.18	2.53	116	111	-1.68	0.00
Paraguay	3 233	3 752	10.34	1.03	7	7	0.38	0.17	2 589	2 985	15.72	0.67
Peru	353	396	16.90	0.96	1 332	1 875	7.51	2.85	5	5	0.00	-0.63
EUROPE	44 614	49 230	3.44	0.93	31 313	31 918	1.06	-0.40	9 039	11 564	5.43	1.79
European Union[1]	26 651	27 871	1.58	0.66	26 144	26 786	1.26	-0.59	1 834	1 708	0.67	-0.78
United Kingdom	1 661	1 539	-0.95	-0.03	3 155	3 003	0.20	0.18	160	167	-2.50	-0.31
Russia	8 064	9 551	8.14	1.18	231	88	-12.31	-0.64	1 458	2 380	5.88	5.05
Ukraine	7 063	8 796	9.42	1.64	42	33	-7.89	-0.08	5 188	6 905	8.91	1.76
AFRICA	9 546	10 478	5.63	1.48	5 370	8 198	4.40	2.46	641	642	1.34	-0.63
Egypt	2 213	2 962	4.79	1.15	1 182	1 316	8.79	3.07	11	7	23.42	-0.33
Ethiopia	98	114	11.41	1.54	0	0	..	..	4	1	3.00	-8.90
Nigeria	876	1 011	3.24	0.46	410	614	31.55	2.15	174	145	7.60	-2.11
South Africa	1 270	1 753	9.60	1.67	713	793	-6.62	3.27	22	23	-16.18	-0.96
ASIA	149 323	178 517	4.72	1.58	36 933	47 334	4.74	2.18	13 661	12 519	-0.01	-1.37
China[2]	91 406	109 159	6.06	1.72	2 602	2 980	4.57	-1.91	1 702	1 879	8.41	1.25
India	18 806	23 369	-0.09	1.94	407	621	23.36	5.02	2 723	1 933	-9.86	-4.78
Indonesia	7 511	9 049	5.74	1.25	4 536	5 347	5.73	1.25	4 864	4 511	6.48	-1.23
Iran	2 249	2 609	15.63	0.71	1 671	2 322	-3.51	3.59	27	9	-28.97	-0.73
Japan	3 517	3 397	0.61	-0.27	1 776	1 865	-2.80	0.17	4	4	-0.86	0.00
Kazakhstan	341	380	2.08	1.16	5	5	0.00	-0.34	86	73	-7.50	-0.41
Korea	811	851	0.86	0.49	3 372	3 980	0.64	1.42	60	60	0.77	0.00
Malaysia	3 356	3 874	1.53	1.16	1 549	1 608	4.54	0.17	2 649	2 660	1.58	-0.17
Pakistan	4 406	5 581	4.98	1.45	672	1 846	2.97	13.63	77	43	-10.29	-4.31
Philippines	1 023	1 319	0.95	1.64	2 953	3 915	7.60	2.34	393	338	-4.39	-2.29
Saudi Arabia	463	676	23.12	1.40	1 489	1 733	13.64	1.58	58	49	20.35	-1.56
Thailand	2 714	3 060	6.74	0.99	3 575	5 162	2.57	2.86	13	14	5.28	-0.31
Turkey	3 419	3 957	4.17	1.46	2 153	3 156	9.87	5.08	115	94	8.90	-3.41
Viet Nam	1 501	1 812	16.02	1.58	5 560	7 476	8.42	2.91	42	27	9.31	-1.49
OCEANIA	1 099	1 340	3.52	3.09	3 072	3 755	7.59	1.84	70	115	-7.63	0.68
Australia	964	1 174	4.06	3.27	840	1 057	5.02	2.08	17	64	-15.83	1.49
New Zealand	8	8	0.00	0.00	2 219	2 684	8.77	1.76	0	0	..	..
DEVELOPED COUNTRIES	**108 728**	**122 194**	**3.10**	**1.01**	**42 174**	**43 594**	**1.53**	**-0.04**	**26 428**	**31 112**	**4.99**	**1.18**
DEVELOPING COUNTRIES	**234 238**	**284 968**	**4.29**	**1.76**	**48 393**	**63 878**	**5.00**	**2.29**	**65 405**	**76 360**	**2.42**	**1.32**
LEAST DEVELOPED COUNTRIES (LDC)	4 782	6 225	6.34	1.95	937	1 393	10.77	4.22	359	410	3.11	0.23
OECD[3]	**99 111**	**110 062**	**2.47**	**0.98**	**48 648**	**52 414**	**2.07**	**0.40**	**19 738**	**21 767**	**4.30**	**0.66**
BRICS	**154 025**	**189 904**	**4.37**	**1.92**	**3 958**	**4 488**	**1.22**	**-0.38**	**21 192**	**26 379**	**-0.03**	**2.15**

.. Not available

Note: Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.20.2. Protein meal projections: Consumption

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28
WORLD	**341 955**	**407 053**	**4.05**	**1.53**
NORTH AMERICA	**43 305**	**48 841**	**2.48**	**1.07**
Canada	2 658	2 857	-0.10	1.34
United States	40 647	45 984	2.67	1.06
LATIN AMERICA	**40 532**	**52 368**	**3.39**	**2.14**
Argentina	3 919	4 384	2.99	0.94
Brazil	19 131	25 915	3.19	2.30
Chile	1 428	1 946	3.77	2.70
Colombia	2 178	3 117	9.52	2.99
Mexico	6 619	8 043	3.40	1.89
Paraguay	664	765	0.96	2.43
Peru	1 680	2 265	9.01	2.50
EUROPE	**66 815**	**69 576**	**2.05**	**0.17**
European Union[1]	50 944	52 949	1.43	0.06
United Kingdom	4 657	4 375	-0.06	0.12
Russia	6 835	7 259	7.73	0.15
Ukraine	1 861	1 919	10.00	1.19
AFRICA	**14 333**	**18 024**	**5.51**	**2.00**
Egypt	3 432	4 270	6.82	1.72
Ethiopia	94	113	11.91	1.73
Nigeria	1 107	1 480	7.89	1.45
South Africa	1 967	2 521	1.78	2.17
ASIA	**172 870**	**213 264**	**5.37**	**1.92**
China[2]	92 227	110 261	6.28	1.61
India	16 576	22 039	2.32	2.91
Indonesia	7 248	9 881	5.67	2.62
Iran	3 887	4 920	5.46	1.97
Japan	5 291	5 258	-0.67	-0.12
Kazakhstan	263	311	8.65	1.53
Korea	4 142	4 771	0.74	1.26
Malaysia	2 247	2 820	3.22	1.94
Pakistan	5 033	7 377	5.18	3.50
Philippines	3 596	4 887	7.21	2.55
Saudi Arabia	1 895	2 359	15.60	1.60
Thailand	6 280	8 205	4.36	2.13
Turkey	5 468	7 005	6.33	3.04
Viet Nam	7 154	9 260	10.12	2.65
OCEANIA	**4 101**	**4 980**	**7.17**	**2.19**
Australia	1 788	2 167	5.47	2.73
New Zealand	2 225	2 692	9.01	1.76
DEVELOPED COUNTRIES	**124 391**	**134 666**	**2.22**	**0.62**
DEVELOPING COUNTRIES	**217 565**	**272 387**	**5.25**	**2.01**
LEAST DEVELOPED COUNTRIES (LDC)	**5 357**	**7 204**	**7.31**	**2.45**
OECD[3]	**128 036**	**140 690**	**2.09**	**0.80**
BRICS	**136 737**	**167 995**	**5.26**	**1.82**

Note: Average 2016-18est: Data for 2018 are estimated.
1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.21.1. Vegetable oil projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**202 563**	**239 817**	**4.05**	**1.45**	**80 243**	**95 417**	**3.50**	**1.33**	**81 852**	**95 417**	**3.69**	**1.33**
NORTH AMERICA	17 866	19 952	3.79	1.04	4 560	5 100	3.08	0.08	4 669	5 068	1.86	1.63
Canada	4 434	4 815	6.37	1.14	264	184	-3.99	-4.03	3 325	3 604	5.21	1.28
United States	13 432	15 138	3.08	1.00	4 296	4 916	3.69	0.27	1 344	1 463	-3.42	2.55
LATIN AMERICA	27 151	34 550	4.01	2.21	4 859	4 839	2.85	-0.22	11 116	15 307	4.69	2.89
Argentina	9 289	11 738	3.10	2.15	18	18	5.44	0.00	6 111	8 263	3.19	2.40
Brazil	9 312	12 019	2.81	2.37	504	514	1.04	0.00	1 454	2 804	-2.06	7.61
Chile	116	164	6.34	1.70	454	499	6.83	0.68	1	1	-8.45	-0.10
Colombia	1 938	2 506	8.29	2.44	739	716	10.30	-1.11	855	992	21.43	1.12
Mexico	1 924	2 335	3.42	1.65	1 032	1 064	3.61	0.42	66	54	2.24	0.00
Paraguay	784	911	9.37	1.04	13	11	-1.44	-1.02	679	796	16.45	1.03
Peru	249	303	12.14	1.77	563	703	6.30	1.71	1	1	0.00	-0.17
EUROPE	28 390	32 783	3.99	1.11	12 934	12 015	1.96	-1.33	11 357	14 144	9.45	1.81
European Union[1]	14 474	15 277	1.24	0.50	9 668	8 793	1.78	-1.66	2 034	2 161	4.44	0.31
United Kingdom	941	1 016	-0.77	0.04	1 094	1 125	1.14	0.00	214	231	-4.90	-0.82
Russia	5 938	7 604	8.91	1.90	1 070	1 104	4.86	-0.15	2 808	4 011	17.40	3.67
Ukraine	6 406	8 068	9.41	1.73	262	226	-4.61	-1.48	5 960	7 287	10.54	1.50
AFRICA	8 131	9 388	3.67	1.48	11 563	15 819	4.88	2.72	1 312	1 073	-1.34	-2.28
Egypt	561	729	3.88	0.88	2 006	2 622	2.32	2.27	151	107	-9.85	-2.22
Ethiopia	54	62	9.92	1.40	518	896	17.54	5.67	0	0	..	..
Nigeria	1 637	1 799	1.81	0.63	1 449	2 393	6.23	4.83	48	45	-11.51	-2.78
South Africa	555	709	6.09	1.59	843	861	0.86	0.42	25	25	-17.67	-0.37
ASIA	119 638	141 479	4.16	1.40	45 991	57 290	3.76	1.90	52 461	58 746	2.87	0.90
China[2]	28 254	33 857	5.25	1.71	8 706	8 635	-1.03	-1.28	274	246	0.16	0.18
India	8 913	11 055	0.14	2.02	15 186	22 077	7.30	3.67	76	61	-3.04	-0.67
Indonesia	44 592	52 641	6.67	1.22	94	91	0.58	-0.02	30 540	35 104	6.02	1.07
Iran	666	782	13.89	0.79	1 291	1 683	-1.91	3.01	56	12	-19.49	-2.92
Japan	1 508	1 486	0.56	-0.11	882	967	2.02	0.46	1	1	45.72	0.00
Kazakhstan	245	263	2.71	1.03	106	111	0.91	0.02	60	65	22.61	-0.02
Korea	215	225	0.86	0.45	1 122	1 101	4.62	-0.51	5	4	-14.14	0.00
Malaysia	22 311	25 577	1.13	1.20	1 237	1 083	-7.76	-1.06	18 049	20 290	-0.65	1.07
Pakistan	1 997	2 432	1.96	1.43	3 205	4 076	5.38	2.62	91	66	-3.91	-2.48
Philippines	1 744	2 087	-0.12	1.58	1 233	1 466	12.97	1.32	894	757	-2.19	-1.30
Saudi Arabia	107	156	22.69	1.39	769	1 016	12.33	2.00	73	58	19.95	-1.96
Thailand	3 597	4 305	7.67	1.55	305	631	11.37	5.95	520	350	1.29	-5.61
Turkey	1 732	2 131	3.70	1.82	1 434	1 257	5.34	-0.92	510	487	9.00	0.92
Viet Nam	625	755	9.26	1.62	1 007	1 265	5.01	2.04	133	131	-0.95	-2.00
OCEANIA	1 387	1 665	2.68	2.12	337	354	3.98	0.46	937	1 079	3.14	1.34
Australia	524	576	3.88	2.39	204	209	5.20	0.21	193	190	8.00	0.16
New Zealand	5	5	1.17	0.00	100	117	3.60	1.53	0	0	..	..
DEVELOPED COUNTRIES	**50 012**	**56 813**	**3.74**	**1.06**	**19 999**	**19 814**	**2.30**	**-0.73**	**16 331**	**19 512**	**6.58**	**1.73**
DEVELOPING COUNTRIES	**152 551**	**183 004**	**4.15**	**1.57**	**60 244**	**75 603**	**3.93**	**1.95**	**65 521**	**75 905**	**3.07**	**1.23**
LEAST DEVELOPED COUNTRIES (LDC)	3 838	4 744	3.01	1.83	7 417	9 996	7.16	2.88	453	371	3.41	-2.57
OECD[3]	**39 621**	**43 513**	**2.52**	**0.86**	**21 252**	**20 912**	**2.75**	**-0.74**	**7 775**	**8 293**	**2.58**	**1.10**
BRICS	**52 972**	**65 245**	**4.13**	**1.90**	**26 309**	**33 191**	**3.53**	**1.86**	**4 638**	**7 147**	**5.41**	**4.81**

.. Not available

Note: Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.21.2. Vegetable oil projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**201 163**	**239 711**	**4.24**	**1.43**	**18.2**	**19.7**	**1.98**	**0.81**
NORTH AMERICA	17 729	19 980	4.04	0.64	39.6	39.2	1.29	0.79
Canada	1 389	1 390	5.98	-0.05	32.3	28.3	2.55	-1.07
United States	16 340	18 591	3.89	0.70	40.4	40.5	1.20	0.95
LATIN AMERICA	20 971	24 076	3.58	1.28	20.1	20.8	0.81	0.58
Argentina	3 197	3 491	3.17	1.57	18.9	21.3	0.12	1.14
Brazil	8 424	9 729	4.17	1.13	25.4	25.3	0.39	0.57
Chile	571	662	6.85	0.91	11.3	13.1	1.40	0.99
Colombia	1 818	2 228	5.43	1.69	20.3	24.8	3.46	1.76
Mexico	2 892	3 345	3.55	1.27	22.4	23.1	2.14	0.24
Paraguay	118	127	-5.74	0.86	16.2	15.3	-6.91	-0.22
Peru	810	1 005	7.77	1.71	9.6	11.4	4.81	1.47
EUROPE	30 193	30 630	1.75	-0.22	24.1	25.1	1.38	0.29
European Union[1]	22 279	21 891	1.31	-0.43	23.7	23.7	0.36	0.20
United Kingdom	1 822	1 910	1.04	0.13	27.5	27.3	0.40	-0.36
Russia	4 254	4 696	5.47	0.14	29.6	33.2	5.39	0.33
Ukraine	704	1 001	-2.75	2.53	11.9	19.5	-3.26	3.61
AFRICA	18 403	24 119	5.07	2.48	9.8	10.5	2.34	0.76
Egypt	2 437	3 240	4.94	2.14	8.1	11.0	2.40	2.46
Ethiopia	572	958	16.63	5.34	5.0	6.8	13.73	3.32
Nigeria	3 029	4 145	4.32	2.91	10.3	11.0	2.24	0.56
South Africa	1 394	1 546	4.20	0.93	13.4	14.0	2.13	0.46
ASIA	113 080	139 967	5.05	1.79	17.5	20.2	2.72	1.23
China[2]	37 206	42 246	4.30	1.03	26.4	29.1	3.76	0.69
India	24 238	33 014	4.45	3.07	11.0	14.9	0.96	3.07
Indonesia	13 574	17 698	8.93	1.51	19.7	25.0	3.97	1.33
Iran	1 875	2 450	3.25	2.26	10.7	12.5	0.12	1.48
Japan	2 368	2 452	1.09	0.11	18.5	19.9	1.18	0.48
Kazakhstan	289	309	0.45	0.83	15.1	14.7	-0.97	-0.01
Korea	1 325	1 322	4.12	-0.35	14.0	13.5	-0.44	-0.63
Malaysia	5 301	6 340	5.04	0.92	27.0	27.8	4.04	-0.39
Pakistan	5 097	6 434	4.21	2.19	20.2	22.1	2.45	0.95
Philippines	2 097	2 793	7.32	2.36	12.7	14.4	6.63	1.35
Saudi Arabia	794	1 111	12.58	2.12	19.2	23.9	9.10	1.14
Thailand	3 410	4 582	9.02	2.91	12.2	16.0	7.16	2.68
Turkey	2 673	2 900	4.32	0.69	24.3	24.5	1.96	0.09
Viet Nam	1 501	1 887	7.55	2.20	2.4	4.3	3.52	5.96
OCEANIA	786	939	2.80	2.39	19.2	20.0	1.35	1.20
Australia	538	595	3.41	2.36	22.0	21.5	1.93	1.24
New Zealand	104	122	3.48	1.46	22.2	23.7	2.40	0.66
DEVELOPED COUNTRIES	**53 877**	**57 086**	**2.51**	**0.19**	**26.4**	**27.1**	**1.34**	**0.53**
DEVELOPING COUNTRIES	**147 287**	**182 625**	**4.94**	**1.85**	**16.2**	**18.1**	**2.36**	**0.98**
LEAST DEVELOPED COUNTRIES (LDC)	10 808	14 358	5.81	2.69	8.7	9.7	2.90	1.14
OECD[3]	**53 239**	**56 109**	**2.62**	**0.19**	**27.1**	**27.3**	**1.10**	**0.46**
BRICS	**75 517**	**91 232**	**4.39**	**1.68**	**19.7**	**22.4**	**2.70**	**1.14**

Note: Average 2016-18est: Data for 2018 are estimated.
1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.22. Main policy assumptions for oilseed markets

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
ARGENTINA												
Export tax[1]												
Soybean	%	29.0	28.9	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Other oilseeds	%	4.0	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soybean meal	%	27.0	28.9	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Soybean oil	%	27.0	28.9	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
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[2]												
Voluntary coupled support												
Soybean	mln EUR	86	27	28	29	29	30	31	31	33	34	35
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	165.2	150.7	150.7	150.7	150.7	150.7	150.7	150.7	150.7	150.7	150.7
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	%	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
INDONESIA												
Protein meal tariff	%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
PAKISTAN												
Protein meal tariff	%	11.0	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	%	1.0	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 2016-18est: Data for 2018 are estimated.The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. In Argentina, a temporary export tax is applied on all goods from September 4th 2018 until December 31st 2020. A specific export tax of 18% will be added for soybean and soybean products; future decrease envisaged but no fixed schedule.
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%).

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.23.1. Sugar projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**177 620**	**206 769**	**1.73**	**1.52**	**56 381**	**63 245**	**1.06**	**1.93**	**61 445**	**66 917**	**1.53**	**1.82**
NORTH AMERICA	7 717	8 015	1.51	0.08	3 795	3 657	-3.29	-0.07	122	112	-12.54	0.00
Canada	100	104	1.66	0.52	1 137	1 150	-0.12	0.00	35	30	-8.07	0.00
United States	7 617	7 911	1.51	0.07	2 658	2 507	-4.41	-0.10	87	82	-14.15	0.00
LATIN AMERICA	54 853	59 659	-0.40	1.86	2 030	1 476	-3.42	-1.50	31 048	33 209	-0.84	2.73
Argentina	1 914	2 338	0.00	2.13	0	0	-77.78	..	334	820	2.30	8.92
Brazil	33 891	36 373	-1.52	2.31	1	0	35.00	..	23 775	25 690	-1.60	3.53
Chile	235	304	-3.81	2.60	489	450	1.35	-0.39	0	0	..	..
Colombia	2 214	2 072	0.61	0.13	110	126	-13.13	6.22	561	198	-5.56	-5.86
Mexico	6 038	6 565	2.27	1.07	22	10	-34.23	-0.03	1 367	1 472	3.56	0.52
Paraguay	136	141	0.94	1.34	107	89	10.69	-0.21	107	83	7.74	0.21
Peru	1 180	1 887	1.94	4.06	376	83	7.01	-10.16	139	189	7.51	2.98
EUROPE	28 578	31 131	2.48	1.19	3 541	2 763	-10.12	-3.31	4 498	6 457	4.07	5.29
European Union[1]	17 681	18 791	1.50	0.87	1 549	1 022	-10.58	-5.57	2 574	3 435	3.57	5.44
United Kingdom	1 168	1 161	0.10	1.33	1 016	1 057	-2.96	-0.56	234	237	-7.93	0.32
Russia	6 262	6 902	7.50	1.48	252	74	-23.46	-10.94	406	1 007	34.84	11.37
Ukraine	2 010	2 453	1.69	2.40	1	0	-74.82	..	577	825	94.70	4.92
AFRICA	11 265	16 664	2.71	3.21	13 594	15 971	3.64	3.04	3 980	3 227	1.87	0.18
Egypt	2 635	4 089	4.83	3.77	1 321	1 252	-0.94	0.08	211	141	-1.11	-0.08
Ethiopia	502	1 313	9.08	6.43	160	9	4.06	-13.78	46	342	477.26	11.36
Nigeria	47	72	4.50	1.57	1 402	1 986	4.18	3.33	0	0	-6.09	..
South Africa	1 930	3 098	-0.83	3.48	463	79	-2.68	-5.94	205	573	-15.19	6.32
ASIA	70 065	85 955	2.98	1.33	33 044	38 974	3.24	2.39	17 608	19 482	5.67	0.15
China[2]	10 351	13 269	-1.60	1.65	4 756	6 835	11.54	1.78	97	96	5.23	2.27
India	28 123	33 860	3.39	0.56	1 922	32	7.00	-14.85	2 834	2 046	16.37	-5.57
Indonesia	2 247	2 657	0.44	1.42	4 679	7 696	8.76	4.73	0	0	..	..
Iran	1 828	2 563	10.03	2.61	677	189	-11.71	-10.23	2	0	-65.45	..
Japan	744	749	0.55	-0.01	1 339	1 296	0.47	-0.52	4	5	15.91	0.00
Kazakhstan	30	32	2.72	2.52	456	520	2.31	0.62	8	5	-4.66	-0.62
Korea	0	0	..	..	1 885	2 135	1.78	1.01	318	375	-0.92	2.28
Malaysia	0	0	-77.61	..	1 988	2 434	1.57	2.66	134	52	-9.65	-2.59
Pakistan	6 592	7 775	6.51	2.06	8	11	-32.31	0.46	894	1 125	23.13	-1.22
Philippines	2 267	2 441	0.49	1.03	95	84	14.16	0.60	170	94	-7.88	-4.79
Saudi Arabia	0	0	..	..	1 487	1 916	2.53	2.10	322	391	4.08	2.00
Thailand	12 570	15 567	5.43	1.83	0	0	-61.71	..	8 766	12 178	5.36	1.54
Turkey	2 675	3 283	1.39	1.98	93	26	45.86	-6.90	165	757	2.05	11.59
Viet Nam	1 510	2 145	4.65	2.37	192	320	0.29	17.41	68	20	241.22	-15.02
OCEANIA	5 142	5 345	3.99	0.44	375	404	-0.05	-0.15	4 190	4 429	4.39	0.34
Australia	4 887	5 034	4.07	0.36	84	120	-3.86	0.00	3 978	4 201	4.45	0.33
New Zealand	0	0	..	..	247	239	0.74	-0.13	22	20	-0.28	0.00
DEVELOPED COUNTRIES	**44 083**	**48 364**	**2.31**	**1.03**	**11 880**	**10 884**	**-4.74**	**-0.80**	**9 080**	**11 561**	**2.68**	**3.07**
DEVELOPING COUNTRIES	**133 537**	**158 405**	**1.55**	**1.68**	**44 501**	**52 361**	**3.26**	**2.61**	**52 366**	**55 356**	**1.38**	**1.57**
LEAST DEVELOPED COUNTRIES (LDC)	3 888	5 462	3.87	3.17	8 944	11 528	6.80	4.70	2 466	348	6.60	-8.00
OECD[3]	**41 417**	**44 229**	**1.79**	**0.78**	**11 263**	**10 937**	**-3.12**	**-0.53**	**8 792**	**10 624**	**2.50**	**2.41**
BRICS	**80 556**	**93 501**	**0.66**	**1.54**	**7 395**	**7 019**	**1.31**	**1.26**	**27 317**	**29 412**	**-0.77**	**2.79**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated. Sugar data are expressed on a tel quel basis.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.23.2. Sugar projections: Consumption, food

Marketing year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**170 757**	**202 543**	**1.60**	**1.55**	**22.7**	**24.2**	**0.43**	**0.59**
NORTH AMERICA	11 521	11 558	0.13	0.03	31.9	29.6	-0.57	-0.67
Canada	1 220	1 224	0.47	0.05	33.3	30.5	-0.52	-0.75
United States	10 300	10 335	0.09	0.03	31.7	29.5	-0.58	-0.66
LATIN AMERICA	26 431	27 919	-0.06	0.52	41.1	39.5	-1.16	-0.31
Argentina	1 560	1 520	-0.66	-0.23	35.2	31.3	-1.66	-1.05
Brazil	10 967	10 747	-1.19	-0.05	52.4	48.1	-2.06	-0.62
Chile	752	756	0.34	0.07	41.7	38.9	-0.53	-0.57
Colombia	1 747	1 999	1.70	1.19	35.6	38.0	0.74	0.58
Mexico	4 579	5 070	1.37	0.88	35.5	34.9	-0.02	-0.14
Paraguay	133	146	1.18	0.88	19.5	19.0	-0.14	-0.22
Peru	1 358	1 760	2.87	2.33	42.2	48.7	1.55	1.27
EUROPE	27 578	27 334	-0.01	-0.13	37.1	36.9	-0.10	-0.09
European Union[1]	16 776	16 278	0.18	-0.36	37.9	36.8	0.10	-0.33
United Kingdom	1 944	1 981	-0.30	0.39	29.4	28.3	-0.94	-0.11
Russia	5 817	5 965	0.49	0.17	40.4	42.2	0.41	0.36
Ukraine	1 541	1 626	-2.50	0.68	34.9	39.0	-2.02	1.23
AFRICA	20 426	28 988	3.89	3.20	16.4	18.0	1.26	0.81
Egypt	3 613	5 119	3.85	3.15	37.0	44.0	1.68	1.56
Ethiopia	587	972	5.88	4.52	5.6	7.2	3.20	2.25
Nigeria	1 449	2 042	4.27	3.25	7.6	8.1	1.55	0.70
South Africa	2 135	2 585	2.16	1.73	37.7	40.8	0.79	0.74
ASIA	83 542	105 419	2.50	2.11	18.7	21.7	1.46	1.38
China[2]	16 337	19 947	2.44	1.68	11.6	13.8	1.92	1.51
India	25 602	32 345	2.53	2.17	19.1	21.7	1.30	1.22
Indonesia	6 944	10 265	4.61	3.61	26.3	35.2	3.35	2.72
Iran	2 519	2 749	0.99	0.77	31.0	31.2	-0.22	0.08
Japan	2 111	2 040	-0.82	-0.34	16.6	16.6	-0.71	0.03
Kazakhstan	502	548	1.39	0.60	27.6	27.3	-0.10	-0.23
Korea	1 598	1 759	2.85	0.83	31.4	33.5	2.43	0.57
Malaysia	1 839	2 354	3.58	2.31	58.2	65.2	1.86	1.10
Pakistan	5 148	6 603	2.30	2.27	26.1	27.8	0.22	0.60
Philippines	2 143	2 425	1.49	1.19	20.4	19.8	-0.13	-0.19
Saudi Arabia	1 230	1 517	3.10	1.83	37.4	39.3	0.45	0.44
Thailand	2 943	3 335	2.09	1.27	42.6	47.9	1.70	1.21
Turkey	2 429	2 543	1.18	0.18	30.1	29.1	-0.38	-0.36
Viet Nam	1 583	2 421	4.69	3.59	16.6	23.1	3.55	2.73
OCEANIA	1 259	1 324	-0.54	0.42	31.6	29.0	-2.04	-0.80
Australia	925	959	-1.11	0.28	37.8	34.6	-2.52	-0.81
New Zealand	220	218	0.36	-0.12	46.8	42.4	-0.69	-0.90
DEVELOPED COUNTRIES	**46 923**	**47 559**	**0.15**	**0.09**	**33.2**	**32.6**	**-0.25**	**-0.18**
DEVELOPING COUNTRIES	**123 834**	**154 984**	**2.20**	**2.05**	**20.3**	**22.5**	**0.83**	**0.93**
LEAST DEVELOPED COUNTRIES (LDC)	10 166	16 350	5.53	4.40	12.0	15.1	3.07	2.10
OECD[3]	**43 884**	**44 398**	**0.34**	**0.06**	**33.1**	**32.0**	**-0.20**	**-0.31**
BRICS	**60 857**	**71 590**	**1.54**	**1.48**	**19.3**	**21.3**	**0.71**	**0.94**

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.Sugar data are expressed on a tel quel basis.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.24. Main policy assumptions for sugar markets

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
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	%	69.4	88.3	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0
EUROPEAN UNION[2]												
Voluntary coupled support												
Sugarbeet[3]	mln EUR	178.0	180.2	169.3	169.3	169.3	169.3	169.3	169.3	169.3	169.3	169.3
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	%	100.0	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	230.3	240.0	240.0	240.0	240.0	240.0	240.0	203.0	203.0	203.0	203.0
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	1 463	1 422	1 426	1 487	1 596	1 761	1 843	1 951	2 038	2 188	2 250
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	%	58.5	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8	60.8

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated. The sources for tariffs and Tariff Rate Quotas are the national questionnaire reply, UNCTAD and WTO.

1. Refers to mainland only.
2. Production supported by a EU sugar production quota at 13.5 million tonnes of sugar and 720 kt of HFCS until 30 september 2017.
3. Implemented in 10 Member States.

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.25.1. Meat projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[4]		Growth (%)[5]		IMPORTS (kt cwe)[6]		Growth (%)[5]		EXPORTS (kt cwe)[6]		Growth (%)[5]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**323 876**	**364 383**	**1.74**	**1.09**	**33 028**	**39 262**	**3.05**	**1.48**	**33 577**	**39 762**	**3.01**	**1.39**
NORTH AMERICA	49 220	55 216	1.09	0.79	2 674	2 840	3.11	0.70	9 177	11 054	1.35	1.25
Canada	4 833	5 268	0.43	0.60	638	728	0.44	1.03	2 005	2 309	1.28	0.89
United States	44 387	49 947	1.17	0.81	2 036	2 112	4.09	0.58	7 172	8 745	1.38	1.35
LATIN AMERICA	52 156	61 411	1.80	1.40	4 363	5 226	4.92	1.46	8 435	11 363	1.85	2.68
Argentina	5 498	6 706	1.67	1.52	52	51	-5.30	0.30	494	1 141	-3.21	5.90
Brazil	26 678	30 263	1.60	1.08	53	67	5.50	1.17	6 212	8 190	1.74	2.62
Chile	1 474	1 801	1.21	1.83	528	581	11.59	0.35	335	379	2.81	0.54
Colombia	2 739	3 542	3.99	2.26	192	294	15.51	2.50	27	57	-2.21	3.54
Mexico	6 605	8 168	2.17	1.75	1 941	2 102	5.93	0.54	321	378	13.49	0.83
Paraguay	687	802	4.47	2.16	37	49	8.47	0.39	360	426	6.85	2.67
Peru	1 866	2 278	4.56	1.55	82	231	14.61	7.75	5	3	-5.65	-1.54
EUROPE	62 710	64 825	1.82	0.23	5 187	5 244	-3.77	-0.01	7 902	8 247	4.66	0.25
European Union[1]	43 462	43 986	1.06	0.05	1 594	1 667	-1.15	0.25	6 002	6 206	3.79	0.21
United Kingdom	3 900	4 025	1.89	0.24	1 832	1 999	1.12	0.82	792	711	2.50	-0.62
Russia	10 338	11 218	5.56	0.58	939	702	-12.81	-2.18	229	305	35.68	2.35
Ukraine	2 157	2 405	1.83	1.44	299	355	-5.94	-1.26	333	401	28.40	1.10
AFRICA	16 941	20 322	2.35	1.88	2 959	4 496	5.23	4.29	300	311	7.41	1.33
Egypt	2 081	2 763	2.15	2.43	438	645	7.22	3.74	7	8	8.54	-0.41
Ethiopia	498	585	-2.80	1.71	0	0	..	..	17	25	8.02	3.27
Nigeria	1 189	1 346	0.58	1.42	4	7	-4.03	4.03	1	1	..	-1.97
South Africa	3 142	3 906	2.57	2.27	630	762	8.58	1.77	170	196	21.22	3.47
ASIA	136 393	155 282	1.84	1.35	17 327	20 826	5.17	1.47	4 574	5 138	7.05	0.84
China[2]	83 592	92 216	1.07	1.14	3 371	3 489	17.83	-1.26	518	579	-1.03	2.25
India	7 141	9 121	2.63	2.26	1	15	-9.40	26.35	1 651	1 639	9.30	0.44
Indonesia	3 217	3 921	5.19	2.25	175	290	8.89	4.04	1	1	-10.60	-0.36
Iran	3 030	3 600	2.95	1.80	166	165	-3.48	-0.22	81	82	11.71	0.74
Japan	3 323	3 312	0.50	-0.18	3 011	3 246	2.90	0.49	17	17	7.61	-0.21
Kazakhstan	867	1 078	2.40	1.86	262	279	0.55	2.45	12	11	45.03	-2.02
Korea	2 470	2 719	3.48	0.67	1 323	1 544	5.90	1.11	29	32	-0.98	0.00
Malaysia	2 092	2 483	4.19	1.67	340	444	6.10	2.70	183	170	5.11	-1.03
Pakistan	3 599	4 610	4.52	2.18	34	39	9.76	1.22	74	87	6.84	1.24
Philippines	3 504	4 276	2.75	1.85	542	924	9.68	4.43	11	7	-6.99	-0.47
Saudi Arabia	682	922	2.58	2.30	991	952	1.29	1.50	73	62	21.12	-1.44
Thailand	2 923	3 546	2.10	1.54	25	22	8.18	-1.33	1 129	1 537	7.20	2.14
Turkey	3 412	4 167	6.21	1.81	48	68	3.55	-2.02	536	715	15.24	0.20
Viet Nam	4 970	6 014	3.00	1.80	1 465	1 957	8.69	3.54	38	12	5.77	-8.28
OCEANIA	6 456	7 327	1.89	1.30	516	629	3.00	1.81	3 190	3 651	2.42	1.53
Australia	4 915	5 717	2.17	1.53	333	389	2.20	1.57	2 124	2 576	2.91	2.12
New Zealand	1 403	1 445	0.98	0.35	78	94	6.74	1.33	1 063	1 073	1.45	0.23
DEVELOPED COUNTRIES	**128 554**	**138 978**	**1.56**	**0.59**	**12 582**	**13 459**	**-0.14**	**0.60**	**20 491**	**23 191**	**2.81**	**0.94**
DEVELOPING COUNTRIES	**195 322**	**225 405**	**1.86**	**1.41**	**20 446**	**25 802**	**5.52**	**1.98**	**13 086**	**16 571**	**3.33**	**2.05**
LEAST DEVELOPED COUNTRIES (LDC)	10 940	13 063	4.12	1.93	1 176	2 181	3.83	6.72	27	24	-4.83	-1.46
OECD[3]	**121 749**	**132 333**	**1.36**	**0.63**	**13 587**	**14 804**	**2.93**	**0.66**	**20 415**	**23 153**	**2.63**	**0.88**
BRICS	**130 891**	**146 724**	**1.60**	**1.18**	**4 996**	**5 034**	**3.47**	**-0.96**	**8 780**	**10 908**	**3.19**	**2.25**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.25.2. Meat projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[4]		FOOD (kg rwe/cap)[5]		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**323 399**	**363 611**	**1.74**	**1.10**	**34.7**	**35.1**	**0.63**	**0.15**
NORTH AMERICA	42 929	47 331	1.10	0.70	95.3	97.2	0.43	-0.01
Canada	3 134	3 371	0.63	0.71	68.6	67.8	-0.24	-0.04
United States	39 795	43 960	1.14	0.69	98.3	100.5	0.50	0.00
LATIN AMERICA	47 688	54 580	2.07	1.15	59.6	62.3	1.05	0.33
Argentina	5 056	5 616	2.21	0.81	89.0	90.3	1.35	0.00
Brazil	20 363	21 823	1.67	0.53	77.7	78.0	0.89	-0.04
Chile	1 662	1 997	3.23	1.64	73.8	82.4	2.35	0.98
Colombia	2 872	3 741	4.67	2.29	47.8	58.2	3.91	1.69
Mexico	8 011	9 615	2.85	1.49	50.6	54.2	1.54	0.46
Paraguay	365	427	2.92	1.46	40.9	42.2	1.52	0.35
Peru	1 943	2 506	4.90	2.00	51.5	59.3	3.63	0.95
EUROPE	60 013	61 630	0.87	0.22	64.8	66.8	0.89	0.27
European Union[1]	39 015	39 209	0.67	0.05	70.3	70.9	0.67	0.10
United Kingdom	4 939	5 312	1.51	0.58	60.5	61.6	0.91	0.10
Russia	11 097	11 648	1.73	0.34	62.6	66.9	1.93	0.52
Ukraine	2 116	2 353	-1.20	1.04	39.1	46.4	-0.63	1.62
AFRICA	19 561	24 523	2.67	2.32	12.7	12.3	0.11	-0.03
Egypt	2 537	3 425	2.91	2.65	20.8	23.6	0.99	1.11
Ethiopia	461	546	-3.37	1.86	3.2	2.9	-6.48	-0.35
Nigeria	1 250	1 460	0.38	1.72	5.3	4.6	-2.41	-0.82
South Africa	3 604	4 461	2.79	2.09	52.3	57.8	1.46	1.07
ASIA	149 749	171 627	2.08	1.36	27.0	28.5	1.07	0.65
China[2]	86 363	95 050	1.48	1.02	49.0	52.9	0.96	0.86
India	5 481	7 488	1.21	2.73	3.5	4.3	0.53	1.83
Indonesia	3 512	4 375	5.09	2.34	11.1	12.5	3.88	1.48
Iran	3 113	3 696	2.56	1.73	32.4	35.3	1.35	1.01
Japan	6 307	6 543	1.50	0.15	39.7	42.8	1.67	0.52
Kazakhstan	1 120	1 348	1.81	2.02	48.4	53.1	0.44	1.20
Korea	3 738	4 231	4.10	0.84	58.0	63.8	3.71	0.59
Malaysia	2 264	2 772	4.24	2.01	61.0	65.3	2.58	0.80
Pakistan	3 552	4 554	4.51	2.20	14.2	15.1	2.56	0.52
Philippines	4 039	5 197	3.54	2.27	31.2	34.6	2.02	0.90
Saudi Arabia	1 720	1 928	1.53	1.93	44.9	42.7	-1.09	0.52
Thailand	1 661	1 780	-0.14	0.83	19.6	20.8	-0.45	0.78
Turkey	3 140	3 799	5.63	1.69	32.0	35.7	3.77	1.12
Viet Nam	6 450	8 007	4.14	2.21	53.0	59.8	2.89	1.33
OCEANIA	3 459	3 920	1.79	1.27	70.7	70.0	0.44	0.04
Australia	2 793	3 144	1.71	1.25	92.9	92.5	0.44	0.14
New Zealand	425	469	2.03	0.75	74.0	74.8	1.23	-0.02
DEVELOPED COUNTRIES	**120 573**	**128 978**	**1.13**	**0.54**	**68.5**	**71.0**	**0.82**	**0.28**
DEVELOPING COUNTRIES	**202 826**	**234 632**	**2.12**	**1.42**	**26.8**	**27.5**	**0.80**	**0.32**
LEAST DEVELOPED COUNTRIES (LDC)	11 967	15 128	4.15	2.55	11.4	11.2	1.79	0.32
OECD[3]	**114 792**	**123 746**	**1.34**	**0.58**	**69.4**	**71.6**	**0.87**	**0.22**
BRICS	**126 907**	**140 470**	**1.55**	**1.00**	**32.3**	**33.7**	**0.78**	**0.48**

Note: Calendar year; except year ending 30 September New Zealand. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).
5. 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 (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.26.1. Beef and veal projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[4]		Growth (%)[5]		IMPORTS (kt cwe)[6]		Growth (%)[5]		EXPORTS (kt cwe)[6]		Growth (%)[5]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**68 441**	**77 476**	**0.66**	**1.06**	**9 971**	**12 161**	**4.44**	**1.61**	**9 773**	**11 928**	**3.67**	**1.64**
NORTH AMERICA	12 884	14 575	-0.13	0.67	1 566	1 661	3.16	0.57	1 777	2 084	2.63	0.58
Canada	1 399	1 538	-1.07	0.74	205	215	-1.16	0.47	473	618	0.78	1.86
United States	11 485	13 037	0.00	0.66	1 361	1 446	4.00	0.58	1 303	1 466	3.52	0.09
LATIN AMERICA	17 527	20 541	0.64	1.31	775	866	0.31	1.03	2 782	4 305	2.83	3.39
Argentina	2 786	3 454	-0.32	1.57	7	7	1.71	0.00	294	795	-3.57	6.65
Brazil	8 890	10 142	0.52	0.99	41	47	5.75	1.92	1 314	2 098	3.41	3.41
Chile	211	241	0.67	1.49	280	337	7.61	1.22	11	11	-1.26	-1.10
Colombia	808	971	-0.06	1.75	6	6	14.83	-1.20	20	48	2.57	4.38
Mexico	1 919	2 211	1.32	1.35	134	137	-6.00	0.39	195	221	17.40	0.83
Paraguay	471	554	5.46	2.55	8	14	22.97	-2.66	351	414	6.66	2.74
Peru	189	216	1.39	1.69	7	7	5.00	-2.92	0	0	..	..
EUROPE	10 744	10 562	-0.25	-0.23	1 379	1 361	-2.57	0.53	1 020	970	3.68	-0.55
European Union[1]	7 141	6 826	-0.17	-0.59	379	375	-1.42	1.04	546	496	3.24	-0.84
United Kingdom	907	857	0.51	-0.53	339	403	1.79	1.56	138	98	1.25	-3.40
Russia	1 633	1 760	-0.55	0.86	503	416	-6.76	-0.80	8	10	6.79	0.00
Ukraine	375	388	-1.81	0.78	2	2	-17.27	-0.85	46	62	15.62	4.55
AFRICA	6 645	7 850	2.12	1.66	652	1 076	2.33	4.77	116	149	5.89	5.05
Egypt	796	905	-0.54	1.32	296	520	4.92	4.03	2	3	21.59	-0.35
Ethiopia	413	487	0.77	1.58	0	0	..	..	0	0	..	..
Nigeria	321	380	3.04	1.66	2	3	17.31	1.90	1	1	..	-1.96
South Africa	1 058	1 413	3.56	3.13	23	16	0.43	-2.85	68	121	19.96	8.41
ASIA	17 464	20 349	1.26	1.54	5 568	7 162	8.79	1.75	1 945	1 945	9.03	0.38
China[2]	6 280	7 150	0.15	1.17	970	1 235	65.40	-0.52	39	35	-8.48	-0.06
India	2 526	2 774	0.04	0.81	0	0	-29.84	..	1 625	1 598	9.92	0.41
Indonesia	425	457	3.57	1.02	165	274	8.49	3.99	0	0	-8.61	..
Iran	481	641	4.50	3.08	142	129	-2.52	-0.62	6	5	32.79	0.13
Japan	471	448	-1.20	-0.67	814	911	1.84	0.45	4	3	24.03	-2.02
Kazakhstan	444	579	1.70	2.26	68	39	-0.74	-1.50	3	3	38.25	0.20
Korea	281	299	0.60	0.49	492	593	5.99	1.35	5	3	2.30	0.00
Malaysia	37	48	11.00	2.28	201	267	4.48	2.90	11	9	5.56	-2.82
Pakistan	1 868	2 374	3.25	2.22	4	4	2.86	-0.30	64	83	9.74	2.40
Philippines	308	361	0.62	1.81	159	213	4.59	2.20	4	4	-1.11	-0.51
Saudi Arabia	41	61	4.08	3.63	168	199	2.44	1.79	17	16	32.32	-1.75
Thailand	196	229	-3.46	1.84	16	14	10.85	-2.83	45	57	13.27	2.92
Turkey	790	938	7.53	4.09	29	45	23.40	-2.98	24	39	11.29	3.51
Viet Nam	359	509	-0.91	2.42	929	1 232	18.73	4.06	0	0	..	..
OCEANIA	3 176	3 599	1.07	1.38	31	35	-0.01	1.22	2 133	2 476	2.17	1.59
Australia	2 502	2 946	1.16	1.79	10	10	-0.17	0.00	1 550	1 914	2.31	2.26
New Zealand	663	643	0.71	-0.30	9	10	7.48	0.14	580	560	1.76	-0.39
DEVELOPED COUNTRIES	**30 189**	**32 719**	**0.21**	**0.57**	**4 019**	**4 230**	**0.48**	**0.63**	**5 006**	**5 657**	**2.77**	**0.92**
DEVELOPING COUNTRIES	**38 252**	**44 757**	**1.03**	**1.43**	**5 952**	**7 930**	**8.03**	**2.18**	**4 767**	**6 271**	**4.70**	**2.33**
LEAST DEVELOPED COUNTRIES (LDC)	3 848	4 537	2.94	1.62	165	377	1.12	8.67	2	1	2.37	-3.01
OECD[3]	**28 072**	**30 315**	**0.28**	**0.53**	**4 204**	**4 665**	**2.30**	**0.83**	**4 831**	**5 429**	**2.79**	**0.82**
BRICS	**20 387**	**23 239**	**0.39**	**1.13**	**1 537**	**1 714**	**7.82**	**-0.55**	**3 054**	**3 862**	**6.19**	**2.13**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.26.2. Beef and veal projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[4]		FOOD (kg rwe/cap)[5]		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**68 567**	**77 570**	**0.72**	**1.05**	**6.4**	**6.5**	**-0.44**	**0.09**
NORTH AMERICA	12 911	14 458	-0.17	0.69	25.0	25.9	-0.91	-0.02
Canada	943	954	-0.72	0.20	18.0	16.7	-1.70	-0.60
United States	11 968	13 504	-0.12	0.72	25.8	27.0	-0.84	0.03
LATIN AMERICA	15 114	16 395	0.27	0.78	16.4	16.2	-0.83	-0.04
Argentina	2 499	2 666	0.25	0.43	39.5	38.4	-0.77	-0.40
Brazil	7 461	7 774	0.29	0.38	25.0	24.3	-0.58	-0.19
Chile	475	562	4.08	1.40	18.4	20.2	3.18	0.74
Colombia	762	891	0.13	1.70	10.9	11.8	-0.81	1.08
Mexico	1 633	1 836	0.14	1.20	8.9	8.9	-1.23	0.17
Paraguay	129	156	3.98	1.47	13.2	14.2	2.62	0.37
Peru	196	223	1.49	1.50	4.3	4.3	0.19	0.45
EUROPE	10 917	10 792	-1.19	-0.08	10.3	10.2	-1.28	-0.05
European Union[1]	6 749	6 518	-0.67	-0.45	10.7	10.3	-0.75	-0.42
United Kingdom	1 109	1 162	0.82	0.45	11.7	11.6	0.18	-0.04
Russia	2 177	2 205	-3.14	0.51	10.6	10.9	-3.22	0.71
Ukraine	323	320	-3.63	0.25	5.1	5.4	-3.15	0.80
AFRICA	7 215	8 876	2.05	2.01	4.1	3.9	-0.53	-0.35
Egypt	1 115	1 447	0.81	2.19	8.0	8.7	-1.29	0.61
Ethiopia	392	472	0.48	1.83	2.6	2.5	-2.06	-0.39
Nigeria	375	482	2.28	2.50	1.4	1.3	-0.39	-0.03
South Africa	1 004	1 287	2.37	2.54	12.4	14.2	1.00	1.54
ASIA	21 644	26 253	2.44	1.63	3.4	3.8	1.40	0.90
China[2]	7 240	8 393	2.31	0.91	3.6	4.1	1.79	0.74
India	901	1 176	-8.19	1.39	0.5	0.6	-9.29	0.44
Indonesia	726	913	3.36	1.97	1.9	2.2	2.12	1.09
Iran	622	770	2.37	2.35	5.4	6.1	1.15	1.65
Japan	1 281	1 357	0.75	0.07	7.0	7.7	0.87	0.44
Kazakhstan	512	617	1.33	1.98	19.7	21.6	-0.16	1.13
Korea	769	889	4.33	1.06	10.6	11.8	3.91	0.80
Malaysia	239	318	3.69	2.89	5.3	6.2	1.97	1.67
Pakistan	1 802	2 289	3.07	2.22	6.4	6.8	0.97	0.54
Philippines	466	575	1.97	1.96	3.1	3.3	0.34	0.57
Saudi Arabia	193	245	1.48	2.50	4.1	4.4	-1.12	1.11
Thailand	125	136	-4.87	0.45	1.3	1.4	-5.23	0.39
Turkey	1 011	1 222	9.94	2.00	8.8	9.8	8.24	1.45
Viet Nam	1 341	1 788	10.59	3.44	9.8	11.9	9.38	2.58
OCEANIA	766	796	-2.00	1.24	13.5	12.2	-3.47	0.01
Australia	664	692	-1.75	1.37	19.0	17.5	-3.15	0.27
New Zealand	82	82	-3.67	0.11	12.2	11.1	-4.68	-0.67
DEVELOPED COUNTRIES	**28 994**	**31 110**	**-0.34**	**0.54**	**14.4**	**14.9**	**-0.74**	**0.26**
DEVELOPING COUNTRIES	**39 572**	**46 460**	**1.56**	**1.42**	**4.5**	**4.7**	**0.20**	**0.30**
LEAST DEVELOPED COUNTRIES (LDC)	3 965	4 907	2.90	2.13	3.3	3.2	0.50	-0.11
OECD[3]	**27 196**	**29 347**	**0.19**	**0.51**	**14.3**	**14.8**	**-0.36**	**0.14**
BRICS	**18 783**	**20 836**	**0.07**	**0.78**	**4.2**	**4.3**	**-0.75**	**0.25**

Note: Calendar year; except year ending 30 September New Zealand. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).
5. 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.27.1. Pigmeat projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[4]		Growth (%)[5]		IMPORTS (kt cwe)[6]		Growth (%)[5]		EXPORTS (kt cwe)[6]		Growth (%)[5]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**119 440**	**128 819**	**1.37**	**0.85**	**8 806**	**9 798**	**3.64**	**0.62**	**8 672**	**9 624**	**2.98**	**0.47**
NORTH AMERICA	13 495	15 020	1.54	0.59	720	782	3.49	0.92	3 909	4 475	2.71	0.37
Canada	2 050	2 200	0.67	0.43	226	279	2.28	0.89	1 373	1 510	2.04	0.43
United States	11 445	12 820	1.71	0.62	494	503	4.11	0.94	2 536	2 966	3.10	0.34
LATIN AMERICA	8 098	10 002	2.75	1.75	1 380	1 704	8.85	1.23	936	1 167	3.46	1.00
Argentina	561	743	9.78	1.70	34	37	-6.47	0.42	13	24	14.75	1.84
Brazil	3 822	4 510	2.25	1.27	1	11	15.55	0.86	602	785	2.18	1.23
Chile	510	630	-0.23	2.09	99	104	32.60	-0.45	172	183	2.79	0.45
Colombia	361	463	8.54	2.17	97	193	32.56	4.10	0	0	..	..
Mexico	1 430	1 948	2.75	2.64	830	937	8.13	0.57	124	151	11.43	0.63
Paraguay	192	225	3.08	1.68	3	3	9.20	-1.52	4	7	57.34	3.01
Peru	156	198	4.17	2.35	12	23	19.36	4.36	0	0	..	..
EUROPE	29 168	29 616	1.27	0.07	1 332	1 372	-6.44	0.21	3 547	3 709	3.38	0.30
European Union[1]	22 872	22 886	0.62	-0.04	156	167	-0.34	0.44	3 168	3 275	3.21	0.19
United Kingdom	885	977	3.10	0.69	805	807	0.03	0.22	239	274	5.71	1.39
Russia	3 513	3 811	6.10	0.47	217	214	-19.84	1.35	58	73	53.70	3.70
Ukraine	718	746	2.55	1.44	16	26	-31.62	-6.98	4	3	19.87	2.56
AFRICA	1 464	1 773	3.89	2.00	276	509	3.78	6.50	28	26	20.97	-1.07
Egypt	0	0	-2.32	..	1	1	26.39	1.62	1	0	..	..
Ethiopia	2	2	1.73	2.46	0	0	..	..	0	0	..	..
Nigeria	276	292	2.37	0.90	1	3	38.96	5.08	0	0	..	..
South Africa	237	287	2.79	1.96	38	47	0.50	1.07	24	23	33.02	-1.06
ASIA	66 665	71 751	1.16	1.10	4 698	4 958	7.30	-0.03	205	191	-0.31	4.10
China[2]	54 342	58 050	0.99	1.11	1 620	1 426	26.49	-2.44	102	109	-3.73	92.82
India	307	290	-2.56	-0.15	1	14	-5.42	33.02	0	0	-22.69	..
Indonesia	359	400	6.62	1.24	4	4	20.65	-0.46	0	0	..	..
Iran	0	0	..	..	4	4	24.96	0.00	3	2	22.03	0.00
Japan	1 280	1 215	-0.19	-0.65	1 308	1 451	3.00	0.80	3	4	15.05	1.04
Kazakhstan	93	83	-1.84	-0.78	27	36	-4.00	3.89	1	1	147.39	-0.69
Korea	1 306	1 400	3.51	0.34	659	722	5.85	0.65	2	2	4.72	0.00
Malaysia	195	197	-1.33	-0.02	29	47	13.04	5.67	5	4	-2.30	-2.30
Pakistan	0	0	..	..	0	0	..	..	0	0	..	..
Philippines	1 861	2 226	1.81	1.76	134	193	8.50	3.48	2	2	-3.22	-0.34
Saudi Arabia	0	0	..	..	20	26	49.34	0.00	3	4	354.67	0.00
Thailand	1 026	1 183	0.66	0.99	1	1	1.47	1.84	24	29	4.04	-3.05
Turkey	0	0	..	..	10	11	7.52	0.00	10	11	7.48	0.00
Viet Nam	3 680	4 327	2.62	1.72	48	96	4.58	5.75	38	11	6.03	-8.42
OCEANIA	550	658	2.20	1.26	399	472	3.09	1.51	47	55	-0.36	0.88
Australia	408	493	2.84	1.16	323	379	2.30	1.61	47	54	-0.48	0.90
New Zealand	46	49	-0.53	0.36	65	80	7.43	1.56	1	1	..	-0.18
DEVELOPED COUNTRIES	**44 823**	**46 857**	**1.32**	**0.24**	**3 863**	**4 214**	**-1.09**	**0.75**	**7 532**	**8 269**	**3.05**	**0.34**
DEVELOPING COUNTRIES	**74 616**	**81 961**	**1.40**	**1.22**	**4 943**	**5 584**	**9.23**	**0.53**	**1 140**	**1 356**	**2.62**	**1.36**
LEAST DEVELOPED COUNTRIES (LDC)	1 983	2 467	5.83	2.21	147	333	1.82	8.81	1	1	-2.79	-0.55
OECD[3]	**42 624**	**45 032**	**1.07**	**0.33**	**4 990**	**5 458**	**3.66**	**0.70**	**7 681**	**8 438**	**3.09**	**0.34**
BRICS	**62 221**	**66 948**	**1.29**	**1.08**	**1 877**	**1 711**	**6.08**	**-1.98**	**787**	**990**	**2.50**	**2.23**

.. Not available

Note: Calendar year; except year ending 30 September New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.27.2. Pigmeat projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[4]		FOOD (kg rwe/cap)[5]		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**119 435**	**128 779**	**1.40**	**0.85**	**12.4**	**12.0**	**0.22**	**-0.10**
NORTH AMERICA	10 314	11 316	1.27	0.71	22.3	22.6	0.52	0.00
Canada	756	795	-0.13	0.57	16.1	15.5	-1.12	-0.23
United States	9 558	10 521	1.39	0.72	23.0	23.4	0.66	0.02
LATIN AMERICA	8 550	10 546	3.49	1.74	10.4	11.6	2.35	0.91
Argentina	582	756	8.13	1.63	10.3	12.1	7.03	0.79
Brazil	3 222	3 734	2.27	1.27	12.0	13.0	1.37	0.69
Chile	437	550	1.50	2.17	18.9	22.1	0.62	1.51
Colombia	458	656	11.29	2.70	7.3	9.7	10.24	2.07
Mexico	2 142	2 743	4.20	1.99	12.9	14.7	2.78	0.96
Paraguay	190	221	2.83	1.59	21.8	22.4	1.49	0.48
Peru	167	222	4.90	2.53	4.1	4.8	3.55	1.47
EUROPE	26 956	27 288	0.46	0.05	28.3	28.7	0.37	0.09
European Union[1]	19 842	19 761	0.30	-0.07	35.0	34.8	0.22	-0.04
United Kingdom	1 451	1 510	0.98	0.32	17.1	16.8	0.34	-0.18
Russia	3 672	3 953	1.47	0.42	19.9	21.8	1.39	0.61
Ukraine	731	772	-0.78	0.97	12.9	14.4	-0.28	1.52
AFRICA	1 713	2 257	3.70	2.90	1.1	1.1	1.08	0.52
Egypt	1	1	3.96	2.09	0.0	0.0	1.79	0.51
Ethiopia	2	3	1.92	2.51	0.0	0.0	-0.66	0.28
Nigeria	279	298	2.47	0.93	1.1	0.9	-0.21	-1.56
South Africa	249	310	1.24	2.09	3.4	3.8	-0.12	1.09
ASIA	71 001	76 296	1.49	0.99	12.4	12.2	0.46	0.27
China[2]	55 747	59 247	1.34	0.98	30.9	32.1	0.82	0.81
India	308	304	-2.53	0.25	0.2	0.2	-3.70	-0.69
Indonesia	347	387	7.31	1.23	1.0	1.0	6.02	0.35
Iran	1	2	..	0.00	0.0	0.0	4.26	-0.68
Japan	2 581	2 662	1.25	0.11	15.8	16.9	1.37	0.48
Kazakhstan	120	118	-2.51	0.41	5.1	4.6	-3.93	-0.42
Korea	1 936	2 120	3.60	0.44	29.6	31.5	3.19	0.18
Malaysia	219	240	-0.14	0.93	5.4	5.2	-1.80	-0.26
Pakistan	0	0	..	..	0.0	0.0	-49.63	-1.64
Philippines	1 992	2 417	2.17	1.89	14.8	15.4	0.54	0.50
Saudi Arabia	17	22	45.52	0.00	0.4	0.4	41.78	-1.36
Thailand	887	954	0.28	0.78	10.0	10.7	-0.10	0.72
Turkey	0	0	..	..	0.0	0.0	-1.55	-0.67
Viet Nam	3 690	4 411	2.63	1.84	30.1	32.8	1.51	0.99
OCEANIA	901	1 075	2.67	1.39	17.7	18.4	1.12	0.16
Australia	683	818	2.75	1.38	21.8	23.0	1.29	0.28
New Zealand	110	129	3.47	1.09	18.3	19.5	2.39	0.30
DEVELOPED COUNTRIES	**41 160**	**42 801**	**0.75**	**0.27**	**22.7**	**22.9**	**0.35**	**0.00**
DEVELOPING COUNTRIES	**78 275**	**85 977**	**1.75**	**1.16**	**10.0**	**9.7**	**0.39**	**0.05**
LEAST DEVELOPED COUNTRIES (LDC)	2 140	2 809	5.53	2.80	2.0	2.0	3.08	0.54
OECD[3]	**39 899**	**42 032**	**1.01**	**0.38**	**23.4**	**23.6**	**0.46**	**0.00**
BRICS	**63 198**	**67 548**	**1.37**	**0.96**	**15.6**	**15.7**	**0.54**	**0.43**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).
5. 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.28.1. Poultry meat projections: Production and trade

Calendar year

	PRODUCTION (kt rtc)		Growth (%)[4]		IMPORTS (kt rtc)		Growth (%)[4]		EXPORTS (kt rtc)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**121 083**	**141 091**	**2.82**	**1.30**	**13 121**	**16 045**	**1.78**	**2.00**	**13 942**	**16 922**	**2.69**	**1.79**
NORTH AMERICA	22 749	25 517	1.57	0.98	257	281	1.22	1.39	3 489	4 492	-0.53	2.58
Canada	1 368	1 513	1.78	0.72	184	210	0.14	1.90	159	182	-2.53	1.70
United States	21 381	24 005	1.56	1.00	74	71	4.60	0.00	3 330	4 310	-0.43	2.62
LATIN AMERICA	26 151	30 461	2.41	1.36	2 180	2 628	4.95	1.78	4 699	5 875	1.09	2.55
Argentina	2 100	2 454	3.30	1.41	11	6	-7.30	0.00	185	320	-1.42	4.61
Brazil	13 842	15 481	2.18	1.08	3	3	14.86	-1.73	4 296	5 307	1.20	2.55
Chile	740	918	2.58	1.80	149	140	13.68	-0.94	147	182	3.45	0.95
Colombia	1 563	2 100	5.79	2.53	89	95	7.43	0.17	7	9	-1.95	-0.02
Mexico	3 195	3 938	2.46	1.57	967	1 018	7.26	0.54	2	6	-15.79	7.95
Paraguay	21	18	-1.29	-1.99	25	32	5.45	2.38	4	4	23.12	-2.32
Peru	1 482	1 821	5.23	1.47	64	200	15.38	8.93	5	2	-6.08	-1.64
EUROPE	21 531	23 303	3.99	0.65	2 166	2 205	-2.67	-0.53	3 185	3 421	6.85	0.45
European Union[1]	12 839	13 640	2.83	0.53	864	923	-0.70	-0.22	2 247	2 380	4.82	0.42
United Kingdom	1 804	1 879	2.35	0.42	581	693	3.33	1.24	318	262	2.35	-0.93
Russia	4 965	5 393	8.18	0.57	217	69	-15.92	-10.96	158	222	37.31	2.07
Ukraine	1 051	1 256	3.11	1.67	281	326	0.03	-0.62	283	336	34.75	0.62
AFRICA	5 722	7 237	3.03	2.14	2 003	2 881	6.76	3.79	125	99	9.57	-1.91
Egypt	1 158	1 705	4.83	3.08	140	124	14.12	2.66	4	5	3.23	-0.25
Ethiopia	14	17	-18.62	1.59	0	0	..	..	0	0	..	..
Nigeria	203	199	-1.98	0.19	0	0	-47.59	..	0	0	..	..
South Africa	1 687	2 034	2.29	1.86	562	692	10.22	1.96	76	51	24.96	-1.68
ASIA	43 403	52 797	3.15	1.63	6 455	7 958	1.41	2.29	2 381	2 942	6.93	0.98
China[2]	18 304	21 502	1.29	1.10	518	504	-2.49	-0.07	374	430	1.27	0.69
India	3 561	5 224	6.56	3.52	0	1	..	4.50	5	2	5.76	-10.90
Indonesia	2 311	2 921	5.66	2.66	4	5	15.22	3.57	0	0	..	..
Iran	2 184	2 589	3.57	1.69	2	2	-32.90	-0.09	72	75	10.59	0.81
Japan	1 572	1 649	1.68	0.33	867	862	4.22	0.07	10	10	3.18	0.00
Kazakhstan	160	206	8.42	1.76	166	204	2.06	3.18	8	7	57.22	-2.75
Korea	882	1 019	4.65	1.22	157	210	5.38	2.04	22	27	-0.65	0.00
Malaysia	1 858	2 235	4.84	1.82	75	83	7.52	0.89	167	157	5.37	-0.89
Pakistan	1 261	1 704	8.47	2.52	30	34	11.39	1.43	4	4	25.88	-0.48
Philippines	1 276	1 619	5.00	2.02	248	513	15.76	5.86	4	1	-14.26	-0.53
Saudi Arabia	640	861	2.76	2.21	758	681	0.93	1.51	49	39	26.65	-1.48
Thailand	1 698	2 132	3.93	1.83	5	6	4.84	0.95	1 059	1 451	7.11	2.25
Turkey	2 220	2 814	5.98	1.39	8	11	1.72	0.36	502	665	15.92	0.04
Viet Nam	916	1 155	6.75	1.80	487	624	0.14	2.23	0	0	..	..
OCEANIA	1 527	1 775	4.30	1.29	60	92	9.25	3.83	64	94	6.79	3.98
Australia	1 269	1 468	4.05	1.27	0	0	..	..	43	59	3.08	3.85
New Zealand	226	268	5.89	1.29	0	0	..	..	21	34	20.47	4.21
DEVELOPED COUNTRIES	**50 025**	**55 455**	**2.70**	**0.88**	**4 223**	**4 552**	**0.37**	**0.46**	**6 849**	**8 081**	**2.64**	**1.58**
DEVELOPING COUNTRIES	**71 058**	**85 636**	**2.91**	**1.59**	**8 898**	**11 493**	**2.54**	**2.68**	**7 093**	**8 840**	**2.72**	**2.00**
LEAST DEVELOPED COUNTRIES (LDC)	3 014	3 775	5.83	2.19	860	1 467	4.93	5.89	19	16	-6.92	-2.21
OECD[3]	**48 323**	**54 097**	**2.33**	**0.93**	**3 900**	**4 198**	**3.36**	**0.47**	**6 811**	**8 121**	**2.10**	**1.51**
BRICS	**42 359**	**49 634**	**2.67**	**1.30**	**1 300**	**1 269**	**-3.42**	**-0.27**	**4 910**	**6 012**	**1.79**	**2.33**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.28.2. Poultry meat projections: Consumption, food

Calendar year

	CONSUMPTION (kt rtc)		Growth (%)[4]		FOOD (kg rwe/cap)[5]		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**120 487**	**140 253**	**2.74**	**1.33**	**14.1**	**14.8**	**1.55**	**0.36**
NORTH AMERICA	19 491	21 347	1.91	0.70	47.5	48.1	1.16	-0.01
Canada	1 395	1 581	2.10	1.11	33.5	34.8	1.10	0.33
United States	18 096	19 766	1.90	0.67	49.1	49.7	1.17	-0.03
LATIN AMERICA	23 632	27 214	2.90	1.15	32.3	33.9	1.77	0.33
Argentina	1 926	2 140	3.78	1.00	38.3	38.8	2.73	0.17
Brazil	9 549	10 177	2.68	0.39	40.2	40.1	1.78	-0.18
Chile	741	876	3.92	1.49	36.1	39.7	3.02	0.83
Colombia	1 644	2 186	5.92	2.42	29.5	36.5	4.92	1.80
Mexico	4 160	4 950	3.45	1.35	28.3	30.0	2.04	0.32
Paraguay	42	45	1.41	0.90	5.4	5.2	0.08	-0.20
Peru	1 541	2 020	5.58	2.03	42.2	49.2	4.22	0.97
EUROPE	20 769	22 088	2.89	0.55	24.6	26.2	2.79	0.59
European Union[1]	11 712	12 182	2.49	0.49	23.3	24.2	2.42	0.52
United Kingdom	2 067	2 310	2.61	0.83	27.5	29.0	1.95	0.33
Russia	5 025	5 240	4.85	0.20	30.7	32.6	4.77	0.39
Ukraine	1 049	1 246	-0.52	1.30	20.9	26.3	-0.03	1.85
AFRICA	7 600	10 019	3.81	2.64	5.4	5.5	1.18	0.26
Egypt	1 294	1 824	5.59	3.06	11.7	13.8	3.39	1.47
Ethiopia	14	17	-18.63	1.59	0.1	0.1	-20.69	-0.62
Nigeria	203	200	-2.58	0.21	0.9	0.7	-5.13	-2.26
South Africa	2 173	2 675	3.44	1.97	33.7	37.1	2.06	0.97
ASIA	47 472	57 812	2.73	1.75	9.3	10.5	1.69	1.02
China[2]	18 448	21 576	1.16	1.08	11.5	13.2	0.65	0.92
India	3 557	5 223	6.56	3.54	2.3	3.1	5.29	2.57
Indonesia	2 315	2 926	5.66	2.67	7.7	8.8	4.39	1.78
Iran	2 114	2 516	3.09	1.71	22.9	25.1	1.85	1.02
Japan	2 423	2 501	2.30	0.24	16.7	17.9	2.43	0.61
Kazakhstan	318	402	4.51	2.56	15.4	17.7	2.98	1.71
Korea	1 017	1 202	4.81	1.39	17.5	20.1	4.39	1.13
Malaysia	1 765	2 161	4.89	2.01	49.1	52.7	3.15	0.80
Pakistan	1 287	1 735	8.48	2.51	5.7	6.4	6.27	0.83
Philippines	1 520	2 130	6.34	2.82	12.7	15.3	4.65	1.42
Saudi Arabia	1 349	1 503	1.45	2.00	36.1	34.2	-1.15	0.61
Thailand	646	686	0.33	0.96	8.2	8.7	-0.05	0.90
Turkey	1 726	2 159	4.06	1.84	18.8	21.7	2.45	1.29
Viet Nam	1 403	1 779	3.71	1.95	12.9	14.9	2.59	1.11
OCEANIA	1 523	1 773	4.36	1.28	33.7	34.2	2.79	0.05
Australia	1 227	1 409	4.08	1.17	44.2	44.8	2.60	0.07
New Zealand	205	234	4.99	0.92	38.4	40.0	3.89	0.13
DEVELOPED COUNTRIES	**47 622**	**51 966**	**2.52**	**0.74**	**29.7**	**31.4**	**2.11**	**0.47**
DEVELOPING COUNTRIES	**72 865**	**88 287**	**2.88**	**1.69**	**10.5**	**11.3**	**1.51**	**0.57**
LEAST DEVELOPED COUNTRIES (LDC)	3 855	5 226	5.74	3.12	4.0	4.3	3.28	0.85
OECD[3]	**45 634**	**50 215**	**2.48**	**0.81**	**30.2**	**31.8**	**1.93**	**0.43**
BRICS	**38 751**	**44 890**	**2.51**	**1.12**	**10.8**	**11.8**	**1.67**	**0.58**

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).
5. 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.29.1. Sheep meat projections: Production and trade

Calendar year

	PRODUCTION (kt cwe)[4]		Growth (%)[5]		IMPORTS (kt cwe)[6]		Growth (%)[5]		EXPORTS (kt cwe)[6]		Growth (%)[5]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**14 912**	**16 997**	**1.57**	**1.36**	**1 130**	**1 258**	**2.41**	**0.88**	**1 191**	**1 288**	**1.80**	**1.00**
NORTH AMERICA	92	104	-0.90	1.33	131	116	4.55	-0.50	3	3	-13.55	-0.38
Canada	16	18	0.78	0.92	24	24	1.63	0.59	0	0	..	..
United States	76	87	-1.22	1.42	107	92	5.30	-0.75	3	3	-13.89	0.04
LATIN AMERICA	380	406	-0.30	0.53	28	28	-2.71	0.55	18	16	-7.56	-3.09
Argentina	51	56	-1.23	0.96	0	0	..	..	2	2	-17.03	-0.36
Brazil	124	130	1.77	0.45	8	7	1.32	-0.40	0	0	..	..
Chile	14	12	-2.25	-2.41	0	0	..	..	5	3	-2.14	-7.85
Colombia	8	8	-3.98	0.21	0	0	..	..	0	0	..	..
Mexico	61	70	1.42	1.32	10	10	-4.70	-0.43	0	0	..	..
Paraguay	4	4	1.36	0.69	0	0	..	..	0	0	..	..
Peru	39	42	-0.34	0.59	0	0	..	..	0	0	..	..
EUROPE	1 267	1 344	-0.05	0.50	310	306	-3.10	0.64	150	146	0.44	0.23
European Union[1]	610	634	-1.35	0.54	194	201	-3.10	0.97	41	55	3.47	3.01
United Kingdom	304	312	0.31	0.02	106	95	-2.59	0.03	98	77	-1.28	-1.85
Russia	227	254	2.97	0.69	3	2	-14.62	0.32	4	..	74.60	..
Ukraine	14	15	-5.09	0.64	0	0	..	..	0	0	..	..
AFRICA	3 110	3 462	1.01	1.80	29	31	-2.22	2.99	32	37	1.50	0.93
Egypt	126	153	-0.91	2.29	1	0	-22.03	..	0	0	..	..
Ethiopia	69	79	-11.22	2.56	0	0	..	..	16	24	8.49	3.38
Nigeria	389	474	-0.75	2.12	0	0	..	..	0	0	..	..
South Africa	160	172	-0.69	1.05	8	7	-1.68	2.06	1	1	14.24	-0.28
ASIA	8 861	10 384	2.19	1.39	606	748	7.08	1.12	42	59	-5.12	0.81
China[2]	4 666	5 514	2.52	1.52	263	323	20.81	0.06	3	4	-14.79	-0.35
India	747	832	-0.61	1.03	0	0	..	..	21	38	-1.65	3.70
Indonesia	122	143	0.35	1.15	2	6	16.55	11.98	0	0	..	..
Iran	365	369	-1.66	0.62	18	31	24.47	1.60	0	0	..	..
Japan	0	0	..	..	22	23	-6.18	-0.36	..	..	..	..
Kazakhstan	171	211	2.64	2.08	0	0	..	..	0	0	..	..
Korea	2	2	0.70	0.00	15	20	19.73	1.37	0	0	..	..
Malaysia	2	3	5.60	3.33	36	47	9.33	2.39	0	0	..	..
Pakistan	470	532	1.15	1.03	0	0	..	..	7	1	-7.79	-19.88
Philippines	60	70	1.17	1.23	1	5	4.61	27.33	0	0	..	..
Saudi Arabia	0	0	-55.34	..	45	46	-2.14	0.99	3	4	0.90	-0.98
Thailand	2	3	4.63	1.23	2	2	9.83	4.20	0	0	..	..
Turkey	402	416	5.08	0.18	1	1	5.46	-0.47	0	0	..	..
Viet Nam	15	23	9.04	2.68	1	5	-30.15	21.17	0	0	..	..
OCEANIA	1 203	1 296	1.32	1.11	26	29	-3.05	1.82	945	1 027	2.93	1.21
Australia	735	810	2.51	1.32	..	..	..	..	484	549	5.54	1.62
New Zealand	468	485	-0.35	0.76	4	4	-1.30	0.00	461	478	0.63	0.76
DEVELOPED COUNTRIES	**3 517**	**3 946**	**1.35**	**1.12**	**477**	**463**	**-1.54**	**0.44**	**1 104**	**1 184**	**2.52**	**1.07**
DEVELOPING COUNTRIES	**11 395**	**13 050**	**1.65**	**1.43**	**653**	**795**	**6.27**	**1.15**	**87**	**104**	**-4.73**	**0.19**
LEAST DEVELOPED COUNTRIES (LDC)	2 094	2 284	2.63	1.83	4	5	0.25	1.97	6	6	8.99	1.16
OECD[3]	**2 729**	**2 889**	**0.91**	**0.71**	**493**	**483**	**-1.11**	**0.43**	**1 092**	**1 164**	**2.38**	**1.01**
BRICS	**5 925**	**6 903**	**1.98**	**1.39**	**281**	**340**	**16.57**	**0.09**	**28**	**44**	**-2.24**	**3.11**

.. Not available

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.29.2. Sheep meat projections: Consumption, food

Calendar year

	CONSUMPTION (kt cwe)		Growth (%)[4]		FOOD (kg rwe/cap)[5]		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**14 911**	**17 009**	**1.72**	**1.35**	**1.7**	**1.8**	**0.54**	**0.39**
NORTH AMERICA	213	210	2.36	0.35	0.5	0.5	1.60	-0.35
Canada	40	41	0.90	0.78	0.9	0.9	-0.10	-0.03
United States	173	169	2.72	0.25	0.5	0.4	1.98	-0.44
LATIN AMERICA	393	425	0.05	0.70	0.5	0.5	-1.05	-0.13
Argentina	49	54	0.14	1.01	1.0	1.0	-0.87	0.17
Brazil	131	138	1.67	0.42	0.6	0.5	0.78	-0.15
Chile	9	9	-2.20	0.31	0.4	0.4	-3.04	-0.34
Colombia	8	8	-4.25	0.29	0.1	0.1	-5.15	-0.32
Mexico	75	86	0.54	1.02	0.5	0.5	-0.83	-0.01
Paraguay	4	4	1.37	0.69	0.5	0.5	0.04	-0.40
Peru	39	42	-0.34	0.59	1.1	1.0	-1.62	-0.45
EUROPE	1 371	1 463	-1.27	0.67	1.6	1.7	-1.37	0.70
European Union[1]	713	747	-2.77	0.72	1.4	1.5	-2.84	0.75
United Kingdom	313	330	-0.25	0.52	4.2	4.1	-0.89	0.02
Russia	222	250	1.89	0.70	1.4	1.6	1.81	0.89
Ukraine	14	15	-5.12	0.64	0.3	0.3	-4.65	1.18
AFRICA	3 033	3 370	0.98	1.85	2.1	1.8	-1.58	-0.50
Egypt	127	153	-1.00	2.31	1.1	1.2	-3.07	0.73
Ethiopia	53	54	-13.86	2.22	0.4	0.4	-16.04	0.00
Nigeria	393	481	-0.78	2.17	1.8	1.7	-3.37	-0.35
South Africa	178	190	0.15	1.03	2.8	2.6	-1.19	0.04
ASIA	9 632	11 266	2.62	1.36	1.9	2.0	1.58	0.63
China[2]	4 929	5 833	3.09	1.43	3.1	3.6	2.57	1.26
India	716	784	-0.51	0.93	0.5	0.5	-1.71	-0.02
Indonesia	125	149	0.61	1.46	0.4	0.4	-0.60	0.58
Iran	376	408	0.32	0.73	4.1	4.1	-0.88	0.04
Japan	22	23	-6.18	-0.36	0.2	0.2	-6.07	0.01
Kazakhstan	171	211	2.64	2.10	8.3	9.3	1.14	1.25
Korea	17	20	16.01	1.33	0.3	0.3	15.55	1.07
Malaysia	41	53	9.20	2.32	1.1	1.3	7.39	1.11
Pakistan	463	530	1.38	1.17	2.1	2.0	-0.68	-0.48
Philippines	61	75	1.22	1.92	0.5	0.5	-0.40	0.53
Saudi Arabia	162	158	1.15	0.71	4.3	3.6	-1.45	-0.67
Thailand	3	4	5.25	2.64	0.0	0.1	4.85	2.58
Turkey	403	417	4.74	0.18	4.4	4.2	3.12	-0.36
Viet Nam	16	28	1.70	4.48	0.1	0.2	0.60	3.62
OCEANIA	269	275	-1.07	0.87	5.9	5.3	-2.56	-0.35
Australia	219	225	-0.82	0.88	7.9	7.1	-2.24	-0.21
New Zealand	28	24	-0.97	-0.37	5.2	4.1	-2.01	-1.15
DEVELOPED COUNTRIES	**2 798**	**3 101**	**0.41**	**1.08**	**1.7**	**1.9**	**0.01**	**0.81**
DEVELOPING COUNTRIES	**12 114**	**13 908**	**2.04**	**1.42**	**1.7**	**1.8**	**0.68**	**0.30**
LEAST DEVELOPED COUNTRIES (LDC)	2 008	2 186	2.60	1.89	2.1	1.8	0.22	-0.35
OECD[3]	**2 064**	**2 152**	**-0.20**	**0.57**	**1.4**	**1.4**	**-0.74**	**0.20**
BRICS	**6 175**	**7 195**	**2.46**	**1.32**	**1.7**	**1.9**	**1.62**	**0.78**

Note: Calendar year; except year ending 30 September for New Zealand. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).
5. 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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.30. Main policy assumptions for meat markets

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
ARGENTINA												
Beef export tax[1]	%	2.7	8.2	8.2	..	..	..	..	..	..	..	..
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	92.5	96.4	98.6	99.2	100.3	101.4	102.2	103.0	103.6	104.2	104.8
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
Out-of-quota tariff	%	249.0	249.0	249.0	249.0	249.0	249.0	249.0	249.0	249.0	249.0	249.0
EUROPEAN UNION[2]												
Voluntary coupled support												
Beef and veal[3]	mln EUR	1 695	1 693	1 693	1 693	1 693	1 693	1 693	1 693	1 693	1 693	1 693
Sheep and goat meat[4]	mln EUR	484	491	496	496	496	496	496	496	496	496	496
Beef basic price[5]	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[5,6]	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	340.4	359.8	369.0	378.3	387.5	389.0	390.6	392.2	392.7	393.2	393.7
Pig tariff-quota	kt cwe	176.7	203.5	216.9	230.3	245.7	246.6	247.5	248.4	249.3	250.2	251.1
Poultry tariff-quota	kt rtc	1 011.5	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	1 038.7
Sheep meat tariff-quota	kt cwe	295.1	296.1	296.3	296.5	296.7	296.9	297.1	297.1	297.5	297.7	297.9
JAPAN[7]												
Beef stabilisation prices												
Upper price	JPY/kg dwt	1 208.3	1 255.0	1 255.0	1 255.0	1 255.0	1 255.0	1 255.0	1 255.0	1 255.0	1 255.0	1 255.0
Lower price	JPY/kg dwt	905.0	925.0	925.0	925.0	925.0	925.0	925.0	925.0	925.0	925.0	925.0
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	596.7	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[8]												
Beef and veal tariff-quota	kt pw	220.0	220.0	220.0	220.0	220.0	220.0	220.0	220.0	220.0	0.0	0.0
In-quota tariff	%	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff[9]	%	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	%	83.3	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	%	53.3	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Pigmeat tariff-quota[10]	kt pw	430.0	430.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
In-quota tariff	%	..	..	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Out-of-quota tariff	%	65.0	65.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Poultry tariff-quota	kt pw	357.3	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 C.30. Main policy assumptions for meat markets *(cont.)*

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
CHINA												
Beef tariff	%	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
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	%	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1
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 2016-18est: Data for 2018 are estimated.

1. In Argentina, a temporary export tax is applied on all goods from September 4th 2018 until December 31st 2020.
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. Implemented in 24 Member States.
4. Implemented in 22 Member States.
5. Price for R3 grade male cattle.
6. Safety-net trigger.
7. Year beginning 1 April.
8. Intended for countries which whom Mexico has no free trade agreements.
9. 25% for frozen beef.
10. Eliminated in 2020 and replaced by import tariff.

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.31.1. Butter projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**10 906**	**13 035**	**2.22**	**1.90**	**994**	**1 252**	**2.05**	**1.63**	**1 077**	**1 252**	**1.35**	**1.63**
NORTH AMERICA	953	1 043	1.95	0.54	48	33	22.05	-5.06	28	35	-2.20	0.10
Canada	107	146	2.99	1.75	18	12	15.42	0.00	0	0	3.72	..
United States	846	898	1.82	0.36	29	21	28.15	-7.03	28	35	-2.26	0.23
LATIN AMERICA	450	507	2.81	1.38	62	79	1.48	1.89	39	41	-0.84	1.58
Argentina	32	33	-6.40	1.00	0	0	..	..	9	6	-8.30	1.98
Brazil	99	103	3.64	0.33	4	5	2.11	2.60	0	1	-29.06	-3.88
Chile	23	26	2.48	1.00	6	9	26.59	3.57	4	3	9.62	-3.44
Colombia	21	21	0.26	0.17	0	0	..	..	0	0	..	..
Mexico	201	233	6.64	1.48	31	36	-0.12	2.72	10	12	29.91	2.09
Paraguay	0	0	..	..	0	0	..	..	0	0	..	..
Peru	4	4	2.64	3.47	6	11	6.64	2.64	0	0	..	..
EUROPE	2 760	3 026	1.69	1.01	257	329	-0.20	2.25	463	645	2.68	3.11
European Union[1]	2 003	2 212	1.82	1.01	61	117	-1.91	5.02	297	450	1.58	3.23
United Kingdom	145	142	2.39	-0.01	97	99	-0.33	0.46	55	42	8.89	-1.33
Russia	314	331	0.69	0.53	91	97	3.13	1.45	2	3	-5.31	0.00
Ukraine	105	95	4.42	-0.22	2	11	-22.31	5.78	13	2	42.78	-5.91
AFRICA	310	374	0.33	2.31	124	159	-1.96	2.04	9	8	3.06	1.70
Egypt	122	139	-0.47	1.62	54	74	0.43	3.03	1	0	-29.25	..
Ethiopia	17	25	-0.28	3.93	0	0	..	..	0	0	..	..
Nigeria	12	16	1.06	2.93	5	5	-18.69	0.21	0	0	..	..
South Africa	12	15	-0.69	5.23	6	5	8.41	-4.39	3	4	16.92	4.60
ASIA	5 748	7 371	2.77	2.67	466	590	3.51	1.53	37	25	0.38	-2.76
China[2]	98	103	-1.22	0.70	96	139	18.30	2.04	1	1	-10.39	1.00
India	4 224	5 561	3.40	2.87	4	38	-9.49	27.60	7	0	-0.47	-40.47
Indonesia	0	0	..	..	23	25	6.55	3.21	0	0	..	..
Iran	210	264	0.43	2.53	42	33	-3.38	-0.73	1	0	-20.56	..
Japan	61	60	-2.59	0.01	12	12	27.49	0.00	0	0	..	..
Kazakhstan	13	18	-1.75	4.09	8	8	0.89	-2.26	0	0	..	..
Korea	2	3	0.51	2.00	10	13	5.26	2.66	0	0	..	..
Malaysia	0	0	..	..	20	22	7.52	0.44	9	8	12.68	-0.44
Pakistan	729	861	1.59	2.12	1	3	..	0.66	0	0	..	..
Philippines	0	0	..	..	22	7	-5.19	4.15	0	0	..	..
Saudi Arabia	5	4	-0.74	0.77	52	61	6.54	0.91	3	2	1.33	-0.91
Thailand	0	0	..	..	13	14	4.99	0.08	1	1	16.68	-0.08
Turkey	210	281	3.86	3.10	12	1	-0.14	-23.52	0	0	..	..
Viet Nam	0	0	..	..	10	25	-0.61	4.31	0	0	..	..
OCEANIA	686	714	0.96	0.49	37	61	7.43	3.48	502	498	0.84	0.34
Australia	104	98	-3.68	-0.21	32	57	9.58	3.61	22	6	-15.37	-9.80
New Zealand	579	613	2.01	0.61	1	0	3.00	..	480	491	2.39	0.58
DEVELOPED COUNTRIES	**4 522**	**4 921**	**1.52**	**0.85**	**386**	**486**	**2.38**	**1.33**	**998**	**1 185**	**1.53**	**1.75**
DEVELOPING COUNTRIES	**6 384**	**8 115**	**2.75**	**2.59**	**608**	**766**	**1.87**	**1.84**	**79**	**67**	**-0.57**	**-0.28**
LEAST DEVELOPED COUNTRIES (LDC)	201	234	1.02	1.90	15	20	6.22	1.66	4	4	14.19	-0.36
OECD[3]	**4 349**	**4 778**	**1.88**	**0.91**	**312**	**389**	**2.71**	**1.33**	**900**	**1 043**	**1.31**	**1.41**
BRICS	**4 747**	**6 112**	**3.08**	**2.65**	**201**	**284**	**6.94**	**3.04**	**14**	**9**	**-2.15**	**-5.03**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.31.2. Butter projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**10 847**	**13 035**	**2.29**	**1.90**	**1.4**	**1.6**	**1.10**	**0.93**
NORTH AMERICA	965	1 043	2.48	0.38	2.7	2.7	1.71	-0.34
Canada	119	159	3.54	2.06	3.3	4.0	2.52	1.25
United States	846	884	2.33	0.10	2.6	2.5	1.60	-0.60
LATIN AMERICA	478	543	3.22	1.49	0.7	0.8	2.08	0.66
Argentina	27	26	-2.73	2.00	0.6	0.5	-3.71	1.16
Brazil	103	107	3.85	0.46	0.5	0.5	2.94	-0.11
Chile	25	32	4.53	2.13	1.4	1.6	3.63	1.47
Colombia	21	21	0.28	0.17	0.4	0.4	-0.67	-0.44
Mexico	223	257	4.89	1.62	1.7	1.8	3.46	0.59
Paraguay	0	0	..	..	0.0	0.0	-51.07	-0.10
Peru	10	15	4.40	2.85	0.3	0.4	3.06	1.79
EUROPE	2 567	2 710	1.25	0.70	3.5	3.7	1.15	0.74
European Union[1]	1 779	1 879	1.62	0.75	4.0	4.2	1.54	0.77
United Kingdom	186	199	0.13	0.53	2.8	2.8	-0.51	0.03
Russia	403	425	0.89	0.74	2.8	3.0	0.81	0.93
Ukraine	94	104	1.15	0.47	2.1	2.5	1.65	1.01
AFRICA	425	525	-0.46	2.24	0.3	0.3	-2.98	-0.13
Egypt	175	213	-0.13	2.09	1.8	1.8	-2.21	0.51
Ethiopia	17	25	-0.28	3.92	0.2	0.2	-2.81	1.66
Nigeria	18	21	-9.54	2.17	0.1	0.1	-11.90	-0.34
South Africa	14	16	-0.76	1.22	0.2	0.2	-2.09	0.23
ASIA	6 177	7 936	2.84	2.61	1.4	1.6	1.79	1.87
China[2]	192	240	5.36	1.45	0.1	0.2	4.82	1.28
India	4 221	5 599	3.36	2.95	3.2	3.8	2.12	1.99
Indonesia	23	25	7.61	3.25	0.1	0.1	6.32	2.36
Iran	252	297	-0.23	2.11	3.1	3.4	-1.43	1.41
Japan	72	72	-1.34	0.01	0.6	0.6	-1.23	0.38
Kazakhstan	20	26	-0.95	1.72	1.1	1.3	-2.40	0.88
Korea	12	16	3.68	2.54	0.2	0.3	3.27	2.27
Malaysia	12	14	5.10	0.98	0.4	0.4	3.35	-0.22
Pakistan	730	864	1.61	2.11	3.7	3.6	-0.46	0.44
Philippines	22	7	-5.22	4.16	0.2	0.1	-6.73	2.74
Saudi Arabia	53	63	5.63	0.97	1.6	1.6	2.92	-0.41
Thailand	12	13	4.40	0.09	0.2	0.2	4.00	0.03
Turkey	221	282	3.64	2.29	2.7	3.2	2.03	1.73
Viet Nam	10	25	-0.61	4.33	0.1	0.2	-1.69	3.46
OCEANIA	235	277	3.27	1.29	5.9	6.1	1.71	0.06
Australia	109	149	4.99	1.75	4.5	5.4	3.49	0.65
New Zealand	121	122	2.41	0.74	25.8	23.8	1.33	-0.04
DEVELOPED COUNTRIES	**3 930**	**4 223**	**1.56**	**0.67**	**2.8**	**2.9**	**1.15**	**0.39**
DEVELOPING COUNTRIES	**6 917**	**8 812**	**2.73**	**2.55**	**1.1**	**1.3**	**1.35**	**1.42**
LEAST DEVELOPED COUNTRIES (LDC)	213	250	1.17	1.92	0.3	0.2	-1.18	-0.32
OECD[3]	**3 780**	**4 125**	**2.07**	**0.83**	**2.8**	**3.0**	**1.51**	**0.45**
BRICS	**4 933**	**6 387**	**3.21**	**2.68**	**1.6**	**1.9**	**2.36**	**2.14**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.32.1. Cheese projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)4		IMPORTS (kt)		Growth (%)4		EXPORTS (kt)		Growth (%)4	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**23 343**	**26 743**	**1.71**	**1.22**	**3 016**	**3 631**	**3.47**	**1.76**	**3 087**	**3 631**	**1.87**	**1.76**
NORTH AMERICA	6 117	7 131	2.86	1.29	180	213	0.73	1.00	321	368	9.63	1.11
Canada	471	559	3.00	1.55	28	55	3.62	4.29	12	10	3.02	0.00
United States	5 645	6 573	2.85	1.27	152	158	0.27	0.07	309	358	10.00	1.14
LATIN AMERICA	2 376	2 827	1.88	1.76	332	430	5.33	1.88	156	150	0.30	0.21
Argentina	537	595	0.46	1.00	1	1	-17.49	0.00	49	53	-1.25	1.94
Brazil	757	950	2.32	2.00	35	50	4.63	2.42	3	5	-3.59	4.26
Chile	94	98	4.22	0.59	37	56	20.40	4.76	6	3	-8.12	-4.27
Colombia	58	55	0.05	-0.17	3	7	25.04	4.60	0	0	-19.49	..
Mexico	351	381	3.60	0.94	116	153	5.83	3.17	6	3	2.53	0.66
Paraguay	0	0	..	..	3	4	14.10	0.97	0	0	..	..
Peru	23	30	2.37	2.75	6	8	11.63	2.26	0	0	..	..
EUROPE	11 536	13 071	1.42	1.06	1 040	1 200	1.00	1.05	1 793	2 281	3.19	2.17
European Union[1]	9 775	11 093	1.27	1.03	198	206	2.63	0.54	1 303	1 755	3.47	2.60
United Kingdom	454	514	2.79	1.05	492	513	2.13	0.37	170	168	5.93	-0.51
Russia	630	754	5.03	1.62	220	317	-3.69	2.57	13	11	-3.73	-1.04
Ukraine	127	123	-8.09	-0.04	9	34	-3.36	9.15	7	2	-29.87	-8.38
AFRICA	974	1 043	-0.17	1.04	162	238	1.22	3.73	83	39	-10.52	-2.02
Egypt	636	656	-0.14	0.65	31	85	0.60	9.21	52	7	-15.49	-8.43
Ethiopia	6	9	0.11	3.63	0	0	..	..	0	0	..	..
Nigeria	10	9	1.91	-1.63	1	4	-28.87	17.70	0	0	..	..
South Africa	43	54	-0.38	2.69	14	10	11.24	-3.26	10	14	25.93	3.37
ASIA	1 613	1 862	0.72	1.62	1 187	1 430	6.25	2.27	226	247	-6.45	3.40
China[2]	247	258	-1.46	0.68	104	169	24.36	4.49	0	0	..	..
India	4	1	11.44	-5.49	3	3	11.09	1.37	6	5	13.09	-1.35
Indonesia	0	0	..	..	25	34	6.29	2.77	2	1	13.40	-2.69
Iran	294	318	0.22	0.99	0	0	..	..	35	68	-9.64	5.30
Japan	47	49	0.41	0.02	271	328	4.57	1.39	0	0	..	..
Kazakhstan	26	41	4.54	5.03	22	24	-0.20	-1.24	1	2	-4.21	0.39
Korea	34	51	4.21	3.42	119	164	10.47	2.99	0	0	..	..
Malaysia	0	0	..	..	22	30	10.56	2.87	0	0	..	..
Pakistan	0	0	..	..	4	5	18.32	3.16	0	0	..	..
Philippines	2	1	65.73	-3.01	33	41	10.29	2.02	0	0	-28.46	..
Saudi Arabia	197	236	1.17	2.17	142	98	3.28	1.71	100	33	-13.24	-1.68
Thailand	5	2	0.00	-8.76	15	23	13.38	3.22	0	0	..	..
Turkey	201	271	2.98	2.64	11	5	9.06	-6.13	48	109	8.54	6.54
Viet Nam	0	0	..	..	5	10	2.09	4.04	0	0	..	..
OCEANIA	727	809	1.64	0.78	114	120	6.18	0.75	508	547	2.25	0.70
Australia	353	383	0.37	0.26	102	107	5.80	0.81	172	162	1.02	-0.56
New Zealand	374	426	2.98	1.28	10	11	11.16	0.00	336	384	2.95	1.28
DEVELOPED COUNTRIES	**18 746**	**21 443**	**1.86**	**1.14**	**1 668**	**1 925**	**1.94**	**1.03**	**2 640**	**3 221**	**3.68**	**1.79**
DEVELOPING COUNTRIES	**4 597**	**5 300**	**1.10**	**1.56**	**1 347**	**1 706**	**5.68**	**2.65**	**447**	**410**	**-5.87**	**1.56**
LEAST DEVELOPED COUNTRIES (LDC)	342	383	0.29	1.36	24	20	4.14	2.30	0	0	..	..
OECD[3]	**18 203**	**20 813**	**1.90**	**1.11**	**1 620**	**1 859**	**3.81**	**1.26**	**2 440**	**3 038**	**3.95**	**1.89**
BRICS	**1 681**	**2 018**	**2.52**	**1.69**	**375**	**550**	**1.34**	**2.94**	**32**	**35**	**3.23**	**1.19**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.32.2. Cheese projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**23 287**	**26 742**	**1.89**	**1.23**	**3.1**	**3.2**	**0.71**	**0.26**
NORTH AMERICA	5 964	6 975	2.36	1.29	16.5	17.9	1.60	0.58
Canada	486	602	2.90	1.79	13.3	15.0	1.89	0.98
United States	5 478	6 373	2.31	1.25	16.9	18.2	1.58	0.55
LATIN AMERICA	2 552	3 106	2.38	1.85	4.0	4.4	1.25	1.02
Argentina	489	542	0.55	0.91	11.0	11.2	-0.47	0.07
Brazil	788	995	2.43	2.01	3.8	4.4	1.54	1.43
Chile	126	151	8.48	2.08	7.0	7.8	7.55	1.43
Colombia	61	62	0.94	0.26	1.2	1.2	-0.01	-0.35
Mexico	461	531	4.15	1.54	3.6	3.7	2.73	0.51
Paraguay	3	3	16.06	1.10	0.4	0.4	14.54	0.00
Peru	29	38	3.61	2.66	0.9	1.0	2.28	1.60
EUROPE	10 810	11 991	1.13	0.87	14.6	16.2	1.03	0.91
European Union[1]	8 695	9 545	1.03	0.77	19.6	21.6	0.95	0.79
United Kingdom	777	859	1.80	0.96	11.7	12.3	1.15	0.46
Russia	837	1 061	2.33	1.93	5.8	7.5	2.25	2.12
Ukraine	130	156	-3.02	1.60	2.9	3.7	-2.53	2.15
AFRICA	1 053	1 242	1.32	1.62	0.8	0.8	-1.25	-0.73
Egypt	614	734	2.28	1.51	6.3	6.3	0.15	-0.06
Ethiopia	6	9	0.23	3.51	0.1	0.1	-2.31	1.26
Nigeria	11	13	-9.63	1.56	0.1	0.1	-11.99	-0.95
South Africa	47	51	-0.63	1.01	0.8	0.8	-1.96	0.02
ASIA	2 574	3 046	3.86	1.79	0.6	0.6	2.81	1.06
China[2]	352	427	2.39	2.02	0.2	0.3	1.87	1.85
India	0	0	..	..	0.0	0.0	-65.80	0.33
Indonesia	23	33	5.74	2.96	0.1	0.1	4.47	2.06
Iran	259	250	-0.66	0.08	3.2	2.8	-1.85	-0.60
Japan	319	376	3.87	1.21	2.5	3.1	3.99	1.58
Kazakhstan	48	64	2.22	2.26	2.6	3.2	0.72	1.42
Korea	153	214	8.80	3.10	3.0	4.1	8.37	2.83
Malaysia	22	30	10.59	2.96	0.7	0.8	8.75	1.74
Pakistan	4	5	18.34	3.16	0.0	0.0	15.93	1.48
Philippines	34	43	11.27	1.81	0.3	0.3	9.50	0.42
Saudi Arabia	238	301	24.96	2.53	7.2	7.8	21.75	1.13
Thailand	20	24	8.60	1.98	0.3	0.4	8.19	1.92
Turkey	163	167	2.01	0.37	2.0	1.9	0.43	-0.17
Viet Nam	5	10	2.03	4.06	0.1	0.1	0.92	3.20
OCEANIA	334	382	3.16	0.82	8.4	8.4	1.61	-0.41
Australia	284	327	2.95	0.79	11.6	11.8	1.49	-0.31
New Zealand	48	53	4.55	0.96	10.3	10.3	3.46	0.17
DEVELOPED COUNTRIES	**17 790**	**20 145**	**1.61**	**1.04**	**12.6**	**13.8**	**1.20**	**0.76**
DEVELOPING COUNTRIES	**5 498**	**6 597**	**2.84**	**1.83**	**0.9**	**1.0**	**1.46**	**0.71**
LEAST DEVELOPED COUNTRIES (LDC)	365	402	0.48	1.40	0.4	0.4	-1.86	-0.82
OECD[3]	**17 398**	**19 633**	**1.78**	**1.01**	**13.1**	**14.1**	**1.23**	**0.63**
BRICS	**2 024**	**2 533**	**2.30**	**1.96**	**0.6**	**0.8**	**1.46**	**1.42**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.33.1. Skim milk powder projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**4 411**	**5 024**	**3.28**	**1.33**	**2 444**	**3 046**	**5.80**	**1.67**	**2 481**	**3 046**	**7.41**	**1.67**
NORTH AMERICA	1 164	1 391	3.46	1.21	2	1	-8.16	0.00	693	970	11.24	2.66
Canada	104	121	4.02	0.14	1	0	-46.60	..	54	65	26.85	-1.09
United States	1 060	1 270	3.40	1.32	1	1	18.79	0.00	639	906	10.47	3.00
LATIN AMERICA	298	366	3.07	2.19	435	535	6.90	1.74	97	151	12.54	0.59
Argentina	40	43	2.68	1.05	0	0	..	..	25	25	7.02	2.07
Brazil	155	188	2.67	1.79	32	29	9.68	0.00	0	0	..	..
Chile	28	37	11.33	1.98	12	13	13.25	1.62	2	2	6.86	-1.30
Colombia	4	7	-4.45	5.52	12	18	55.49	3.84	0	0	..	..
Mexico	41	59	6.45	4.20	310	403	6.98	1.98	51	104	97.58	0.00
Paraguay	0	0	..	..	0	0	..	..	0	0	..	..
Peru	0	0	..	..	21	29	6.26	2.50	0	0	..	..
EUROPE	1 865	2 088	5.22	1.35	213	192	8.85	-0.57	943	1 150	10.26	1.82
European Union[1]	1 461	1 651	6.14	1.40	35	30	8.03	-1.16	733	933	12.24	1.89
United Kingdom	73	75	3.13	0.19	37	37	-4.71	0.29	49	48	11.32	-0.29
Russia	74	71	1.71	-0.89	110	94	22.53	-0.65	1	1	33.89	0.00
Ukraine	112	114	0.40	0.33	1	1	-28.28	0.28	30	12	5.00	-5.96
AFRICA	19	23	0.00	2.17	354	435	3.20	1.99	12	14	7.62	-0.80
Egypt	0	0	..	..	76	108	8.36	3.83	0	0	-23.19	..
Ethiopia	0	0	..	..	0	0	-16.06	..	0	0	..	..
Nigeria	0	0	..	..	44	67	1.96	2.63	0	0	..	..
South Africa	15	18	0.07	1.89	7	6	9.33	-1.63	6	7	12.81	1.66
ASIA	399	443	0.40	1.30	1 426	1 864	5.85	1.84	162	152	7.57	-0.73
China[2]	27	21	-10.61	2.13	237	344	14.26	1.99	0	1	6.34	0.00
India	224	276	5.92	2.13	0	0	-44.37	..	16	20	2.35	-0.28
Indonesia	0	0	..	..	164	217	4.40	2.67	1	1	3.13	-2.60
Iran	0	0	..	..	20	7	-1.34	0.57	14	1	6.32	0.00
Japan	121	116	-3.35	-0.48	48	42	6.78	-2.01	0	0	..	..
Kazakhstan	3	3	0.10	-0.32	20	30	13.55	2.26	0	0	..	..
Korea	9	9	-0.03	0.00	22	19	7.85	-0.29	0	0	..	..
Malaysia	0	0	..	..	137	170	6.74	1.77	36	32	25.89	-1.74
Pakistan	0	0	..	..	45	61	16.92	2.91	1	1	13.90	-2.83
Philippines	0	0	..	..	180	267	6.29	1.71	0	0	..	..
Saudi Arabia	0	0	..	..	58	65	1.49	1.41	9	6	-14.80	-1.39
Thailand	0	0	..	..	60	58	1.42	-0.09	9	9	23.51	0.09
Turkey	0	0	..	..	51	59	31.06	0.00	51	59	91.72	0.00
Viet Nam	0	0	..	..	59	131	1.27	3.86	0	0	..	..
OCEANIA	666	714	0.36	1.10	13	18	7.32	0.75	575	610	0.63	0.93
Australia	223	221	0.57	0.99	8	10	10.58	0.00	164	149	1.64	-0.13
New Zealand	443	493	0.28	1.18	3	3	-3.53	0.00	411	461	0.29	1.28
DEVELOPED COUNTRIES	**3 844**	**4 339**	**3.35**	**1.21**	**319**	**308**	**8.30**	**-0.35**	**2 219**	**2 739**	**7.19**	**1.89**
DEVELOPING COUNTRIES	**567**	**684**	**2.84**	**2.14**	**2 125**	**2 738**	**5.48**	**1.92**	**262**	**307**	**9.48**	**-0.14**
LEAST DEVELOPED COUNTRIES (LDC)	0	0	..	..	122	160	6.73	3.36	5	6	9.91	-2.74
OECD[3]	**3 601**	**4 093**	**3.46**	**1.24**	**558**	**647**	**7.14**	**1.02**	**2 170**	**2 742**	**7.94**	**1.75**
BRICS	**495**	**574**	**2.56**	**1.58**	**386**	**473**	**13.53**	**1.23**	**23**	**29**	**3.60**	**0.18**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.33.2. Skim milk powder projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**4 361**	**5 026**	**2.62**	**1.13**	**0.6**	**0.6**	**2.15**	**0.26**
NORTH AMERICA	469	425	-3.24	-1.47	1.2	1.0	-2.79	-2.41
Canada	47	59	-7.83	1.65	0.6	0.5	-9.53	0.79
United States	423	366	-2.71	-1.88	1.3	1.0	-2.27	-2.56
LATIN AMERICA	637	750	4.25	2.21	0.9	1.0	3.19	1.43
Argentina	15	18	-2.45	-0.20	0.3	0.4	-3.43	-1.02
Brazil	187	217	3.50	1.53	0.6	0.7	2.65	0.95
Chile	39	49	12.70	2.02	2.2	2.5	11.73	1.36
Colombia	16	25	14.86	4.30	0.3	0.5	13.77	3.66
Mexico	301	358	4.44	2.99	2.3	2.5	3.01	1.94
Paraguay	0	0	..	..	0.0	0.0	-19.68	0.00
Peru	21	29	6.28	2.50	0.7	0.8	4.91	1.45
EUROPE	1 114	1 130	2.58	-0.21	1.4	1.4	4.50	0.07
European Union[1]	744	747	2.40	-0.46	1.5	1.5	5.59	-0.08
United Kingdom	59	63	-4.54	0.63	0.9	0.9	-5.16	0.13
Russia	182	164	9.24	-0.75	1.3	1.2	9.15	-0.56
Ukraine	82	104	-1.45	1.42	1.9	2.5	-0.96	1.97
AFRICA	361	445	2.89	2.10	0.3	0.3	0.29	-0.26
Egypt	76	108	8.52	3.84	0.8	0.9	6.26	2.24
Ethiopia	0	0	..	..	0.0	0.0	-19.84	0.00
Nigeria	44	67	1.99	2.64	0.2	0.3	-0.67	0.11
South Africa	17	17	0.12	0.60	0.3	0.3	-1.21	-0.39
ASIA	1 665	2 155	4.23	1.93	0.4	0.4	3.20	1.25
China[2]	264	364	8.56	1.99	0.2	0.3	8.01	1.82
India	208	256	5.41	2.34	0.2	0.2	4.15	1.38
Indonesia	163	216	4.42	2.70	0.6	0.7	3.16	1.81
Iran	5	6	-26.88	0.69	0.1	0.1	-27.75	0.00
Japan	169	158	-0.76	-0.91	1.1	1.1	-1.27	-0.43
Kazakhstan	23	33	12.29	2.03	1.3	1.6	10.65	1.19
Korea	34	28	1.99	-0.20	0.7	0.5	1.58	-0.46
Malaysia	101	138	3.48	2.80	3.2	3.8	1.76	1.59
Pakistan	44	61	17.23	2.99	0.2	0.3	14.84	1.30
Philippines	180	267	6.30	1.71	1.7	2.2	4.60	0.32
Saudi Arabia	49	59	12.05	1.76	1.5	1.5	9.17	0.37
Thailand	52	49	-0.12	-0.12	0.7	0.7	-0.50	-0.18
Turkey	0	0	-65.43	..	0.0	0.0	-65.97	-0.05
Viet Nam	58	131	1.30	3.89	0.6	1.2	0.20	3.03
OCEANIA	116	122	2.18	1.85	2.9	2.7	0.64	0.61
Australia	79	82	3.26	3.01	3.2	3.0	1.79	1.89
New Zealand	35	35	0.00	-0.05	7.4	6.8	-1.05	-0.83
DEVELOPED COUNTRIES	**1 927**	**1 911**	**0.68**	**-0.40**	**1.3**	**1.2**	**1.59**	**-0.56**
DEVELOPING COUNTRIES	**2 434**	**3 115**	**4.45**	**2.20**	**0.4**	**0.4**	**3.08**	**1.09**
LEAST DEVELOPED COUNTRIES (LDC)	117	154	6.60	3.69	0.1	0.1	4.12	1.41
OECD[3]	**1 976**	**2 000**	**0.70**	**0.05**	**1.4**	**1.3**	**1.43**	**-0.18**
BRICS	**858**	**1 018**	**6.34**	**1.46**	**0.3**	**0.3**	**5.69**	**0.92**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.34.1. Whole milk powder projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**5 317**	**6 107**	**3.25**	**1.20**	**2 472**	**2 841**	**1.92**	**1.08**	**2 458**	**2 841**	**3.63**	**1.08**
NORTH AMERICA	49	63	1.54	0.14	13	8	3.22	0.00	29	32	9.60	0.71
Canada	8	7	-4.24	-1.90	2	2	-5.16	0.00	1	1	4.39	0.00
United States	41	56	2.77	0.44	11	6	6.53	0.00	28	32	9.73	0.72
LATIN AMERICA	1 488	1 964	2.49	2.70	336	316	-1.32	-0.53	272	359	0.35	3.47
Argentina	153	163	-5.25	0.72	0	0	-50.07	..	100	132	-6.15	1.65
Brazil	566	830	2.17	3.42	89	62	5.66	-0.93	7	9	3.07	7.16
Chile	66	68	-2.91	0.38	7	6	18.64	0.57	6	6	-10.48	-0.56
Colombia	41	42	-0.03	1.28	29	48	59.10	2.90	1	0	-34.88	..
Mexico	221	254	0.96	1.24	43	45	10.95	1.07	8	2	-0.74	-13.49
Paraguay	0	0	..	..	2	2	5.05	0.00	2	2	66.09	0.01
Peru	0	0	..	..	18	23	11.29	1.42	0	0	..	..
EUROPE	852	1 023	0.57	1.80	82	71	3.28	0.16	432	601	2.55	2.64
European Union[1]	715	851	1.33	1.83	23	19	-3.48	0.00	369	509	3.97	2.72
United Kingdom	42	50	1.47	1.38	18	21	-2.14	1.63	30	37	-2.51	0.37
Russia	33	40	-7.57	0.49	39	28	23.58	-0.54	2	2	25.67	0.00
Ukraine	5	4	-8.12	-1.39	0	1	-15.95	2.69	2	1	-8.66	-2.62
AFRICA	26	31	0.28	3.08	576	733	-0.29	2.09	19	15	4.90	0.33
Egypt	0	0	..	..	47	73	5.86	3.91	4	0	9.11	..
Ethiopia	0	0	..	..	1	2	0.21	1.58	0	1	..	0.00
Nigeria	0	0	..	..	73	104	-8.70	2.49	1	0	9.51	..
South Africa	15	21	-0.43	3.45	4	3	7.37	-2.57	5	6	8.61	2.63
ASIA	1 460	1 449	3.96	-0.03	1 436	1 686	3.86	1.06	291	284	0.34	-0.27
China[2]	1 342	1 278	4.14	-0.49	470	600	8.39	1.44	3	3	-10.73	-0.27
India	5	7	83.98	3.12	0	0	-25.21	..	1	2	1.84	8.70
Indonesia	76	115	3.01	4.57	50	50	-0.93	-0.17	2	2	-27.56	0.06
Iran	1	1	-1.67	1.90	2	2	-9.63	0.01	2	1	-1.45	0.47
Japan	10	13	-3.26	2.32	0	0	..	..	0	0	..	..
Kazakhstan	15	19	0.19	3.12	4	0	3.35	-22.36	0	0	..	..
Korea	2	2	-2.78	0.00	4	4	10.99	-1.07	0	0	..	..
Malaysia	0	0	..	..	36	39	4.95	0.22	23	23	7.55	-0.22
Pakistan	0	0	..	..	3	2	-11.71	0.73	1	1	-13.31	0.00
Philippines	0	0	..	..	33	29	-4.80	0.00	20	29	-9.67	0.00
Saudi Arabia	0	0	..	..	103	94	2.12	1.94	15	2	-10.14	-1.90
Thailand	0	0	..	..	49	53	7.92	0.43	2	2	-11.18	-0.43
Turkey	0	0	..	..	0	0	-23.87	..	0	0	-7.82	..
Viet Nam	0	0	..	..	34	76	-1.03	1.95	6	0	0.11	..
OCEANIA	1 442	1 578	5.35	0.33	28	27	8.33	-0.23	1 414	1 549	5.70	0.34
Australia	70	72	-8.98	0.10	21	19	11.33	-0.58	56	55	-8.47	0.13
New Zealand	1 372	1 506	6.89	0.35	3	3	11.66	0.00	1 358	1 493	6.90	0.35
DEVELOPED COUNTRIES	**2 383**	**2 718**	**3.23**	**0.91**	**133**	**111**	**4.41**	**-0.43**	**1 882**	**2 189**	**4.86**	**0.93**
DEVELOPING COUNTRIES	**2 934**	**3 389**	**3.26**	**1.44**	**2 339**	**2 730**	**1.79**	**1.15**	**576**	**651**	**0.41**	**1.61**
LEAST DEVELOPED COUNTRIES (LDC)	3	3	4.75	3.32	207	270	0.81	2.39	9	8	3.27	-1.08
OECD[3]	**2 562**	**2 895**	**3.18**	**0.85**	**137**	**130**	**3.75**	**0.53**	**1 858**	**2 136**	**4.90**	**0.83**
BRICS	**1 960**	**2 175**	**3.26**	**0.90**	**602**	**693**	**8.35**	**1.09**	**18**	**23**	**1.60**	**4.02**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.34.2. Whole milk powder projections: Consumption, food

Calendar year

	CONSUMPTION (kt)		Growth (%)[4]		FOOD (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**5 315**	**6 095**	**2.49**	**1.19**	**0.7**	**0.7**	**1.29**	**0.23**
NORTH AMERICA	31	39	-2.18	-0.32	0.1	0.1	-2.91	-1.02
Canada	10	9	-4.82	-1.55	0.3	0.2	-5.76	-2.34
United States	21	30	-0.62	0.07	0.1	0.1	-1.33	-0.62
LATIN AMERICA	1 559	1 908	2.11	1.98	2.4	2.7	0.99	1.15
Argentina	54	31	-5.30	-2.44	1.2	0.6	-6.25	-3.25
Brazil	648	882	2.51	3.02	3.1	3.9	1.61	2.43
Chile	68	68	-0.75	0.48	3.7	3.5	-1.61	-0.17
Colombia	69	90	6.44	2.11	1.4	1.7	5.44	1.49
Mexico	256	297	2.13	1.49	2.0	2.0	0.74	0.45
Paraguay	0	0	..	..	0.0	0.0	-71.61	-0.10
Peru	18	23	11.51	1.42	0.5	0.6	10.07	0.37
EUROPE	480	493	-0.02	0.47	0.6	0.7	-0.11	0.50
European Union[1]	347	361	0.04	0.38	0.8	0.8	-0.03	0.41
United Kingdom	30	34	3.82	2.75	0.4	0.5	3.16	2.24
Russia	70	66	0.85	0.05	0.5	0.5	0.77	0.25
Ukraine	4	4	-6.89	-0.38	0.1	0.1	-6.43	0.16
AFRICA	583	748	-0.40	2.17	0.5	0.5	-2.92	-0.20
Egypt	43	73	5.20	3.94	0.4	0.6	3.00	2.33
Ethiopia	1	1	2.07	3.39	0.0	0.0	-0.52	1.14
Nigeria	72	104	-8.78	2.50	0.4	0.4	-11.17	-0.02
South Africa	13	18	-1.76	2.31	0.2	0.3	-3.08	1.31
ASIA	2 606	2 851	4.40	0.62	0.6	0.6	3.34	-0.10
China[2]	1 809	1 875	5.11	0.09	1.3	1.3	4.58	-0.07
India	4	4	25.16	0.94	0.0	0.0	23.66	0.00
Indonesia	124	163	3.70	2.91	0.5	0.6	2.45	2.02
Iran	1	2	-15.19	0.69	0.0	0.0	-16.21	0.00
Japan	10	13	-3.17	2.29	0.1	0.1	-3.06	2.67
Kazakhstan	18	19	0.32	0.61	1.0	1.0	-1.14	-0.22
Korea	6	6	3.40	-0.74	0.1	0.1	2.99	-1.00
Malaysia	13	16	1.95	0.88	0.4	0.4	0.25	-0.31
Pakistan	2	1	-11.62	1.66	0.0	0.0	-13.42	0.00
Philippines	12	0	-41.40	..	0.1	0.0	-42.33	-0.13
Saudi Arabia	87	92	4.13	2.04	2.7	2.4	1.46	0.64
Thailand	47	51	10.36	0.47	0.7	0.7	9.94	0.41
Turkey	0	0	-61.31	..	0.0	0.0	-61.91	-0.05
Viet Nam	28	75	-4.48	1.96	0.3	0.7	-5.52	1.11
OCEANIA	56	56	-1.04	-0.10	1.4	1.2	-2.62	-1.31
Australia	36	36	-3.18	-0.30	1.5	1.3	-4.56	-1.38
New Zealand	16	15	7.04	0.01	3.4	2.9	42.26	-0.77
DEVELOPED COUNTRIES	**610**	**639**	**-0.40**	**0.45**	**0.4**	**0.4**	**-0.87**	**0.18**
DEVELOPING COUNTRIES	**4 705**	**5 455**	**2.96**	**1.28**	**0.8**	**0.8**	**1.58**	**0.16**
LEAST DEVELOPED COUNTRIES (LDC)	202	266	0.80	2.53	0.2	0.2	-1.55	0.28
OECD[3]	**818**	**890**	**0.18**	**0.78**	**0.6**	**0.6**	**-0.41**	**0.40**
BRICS	**2 543**	**2 846**	**4.25**	**0.93**	**0.8**	**0.8**	**3.39**	**0.39**

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.35. Fresh dairy products projections: Production and food consumption

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		FOOD CONSUMPTION (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**413 766**	**509 466**	**2.08**	**2.00**	**55.0**	**60.9**	**0.94**	**1.05**
NORTH AMERICA	26 212	24 418	-1.53	-0.47	72.6	62.6	-2.26	-1.17
Canada	2 896	2 842	-0.93	-0.13	79.1	71.0	-1.91	-0.92
United States	23 315	21 576	-1.60	-0.51	71.9	61.6	-2.30	-1.20
LATIN AMERICA	33 599	39 173	-0.07	1.63	52.0	55.1	-1.12	0.80
Argentina	1 548	1 668	-1.17	0.52	29.0	27.8	-1.70	-0.37
Brazil	14 605	19 078	0.94	2.87	70.3	85.9	0.09	2.26
Chile	492	484	-10.87	0.09	27.3	24.9	-11.64	-0.55
Colombia	6 023	6 241	1.99	0.15	122.8	118.5	1.03	-0.46
Mexico	3 545	3 336	-1.77	-0.48	27.5	23.0	-3.11	-1.49
Paraguay	536	669	1.37	2.23	78.7	86.9	0.04	1.12
Peru	1 716	2 319	1.73	2.86	53.4	64.1	0.43	1.80
EUROPE	77 503	76 776	-0.60	-0.16	102.9	102.6	-0.66	-0.08
European Union[1]	38 118	38 211	-0.16	-0.03	83.7	83.6	-0.14	-0.03
United Kingdom	7 463	6 936	0.53	-0.82	112.8	106.7	-0.12	-0.63
Russia	16 028	15 739	-1.80	-0.18	111.3	111.3	-1.87	0.01
Ukraine	7 271	6 870	-1.78	-0.43	164.4	164.7	-1.29	0.10
AFRICA	33 528	41 426	0.11	2.25	27.0	25.7	-2.43	-0.12
Egypt	1 418	1 650	0.19	1.98	14.5	14.2	-1.90	0.40
Ethiopia	3 157	3 957	-0.77	2.53	30.1	29.5	-3.28	0.30
Nigeria	253	287	2.12	0.89	1.3	1.1	-0.55	-1.60
South Africa	2 628	3 046	0.42	1.27	46.3	48.0	-0.92	0.28
ASIA	239 765	324 359	4.31	2.85	53.7	66.9	3.29	2.11
China[2]	23 344	26 181	-1.53	0.97	17.0	18.8	-1.65	0.86
India	113 835	160 360	5.35	3.24	85.0	107.7	4.09	2.27
Indonesia	774	902	-2.99	1.50	2.9	3.1	-4.16	0.63
Iran	565	679	-10.11	0.17	7.0	7.7	-11.18	-0.51
Japan	4 286	4 428	-0.51	0.30	33.6	36.1	-0.39	0.67
Kazakhstan	4 653	5 208	-0.27	1.09	255.7	259.9	-1.73	0.25
Korea	1 377	1 346	-0.02	-0.24	27.0	25.6	-0.42	-0.49
Malaysia	87	113	2.04	2.55	2.8	3.1	0.34	1.34
Pakistan	45 510	64 979	7.38	3.55	231.0	273.8	5.20	1.85
Philippines	9	12	5.66	2.00	0.1	0.1	3.98	0.61
Saudi Arabia	1 132	1 296	9.87	0.59	34.4	33.5	7.05	-0.78
Thailand	1 076	1 240	2.89	1.24	15.6	17.8	2.50	1.18
Turkey	14 715	18 665	6.28	1.88	182.3	213.4	4.63	1.33
Viet Nam	640	959	9.51	3.83	6.7	9.1	8.32	2.96
OCEANIA	3 159	3 313	1.79	0.37	72.0	65.4	-0.28	-0.89
Australia	2 604	2 707	1.50	0.30	106.5	97.7	0.06	-0.79
New Zealand	535	582	3.62	0.67	50.9	49.8	-1.78	-0.27
DEVELOPED COUNTRIES	**134 484**	**138 531**	**-0.22**	**0.27**	**94.2**	**94.3**	**-0.61**	**0.03**
DEVELOPING COUNTRIES	**279 282**	**370 935**	**3.35**	**2.73**	**45.9**	**53.8**	**2.01**	**1.60**
LEAST DEVELOPED COUNTRIES (LDC)	20 882	27 595	-0.28	2.89	24.7	25.5	-2.60	0.63
OECD[3]	**101 345**	**103 284**	**0.16**	**0.15**	**75.3**	**73.7**	**-0.37**	**-0.19**
BRICS	**170 441**	**224 403**	**2.91**	**2.62**	**54.2**	**67.1**	**2.12**	**2.08**

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.36. Milk projections: Production, inventories, yield

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		INVENTORIES ('000 hd)		Growth (%)[4]		YIELD (t/head)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**826 106**	**981 218**	**2.14**	**1.66**	**681 852**	**773 185**	**0.79**	**1.22**	**1.21**	**1.27**	**1.34**	**0.44**
NORTH AMERICA	107 461	114 218	1.64	0.49	10 350	10 422	0.31	0.05	10.38	10.96	1.32	0.44
Canada	9 833	10 631	2.11	0.59	962	962	-0.07	-0.04	10.22	11.05	2.18	0.64
United States	97 628	103 587	1.60	0.47	9 387	9 460	0.35	0.06	10.40	10.95	1.24	0.42
LATIN AMERICA	81 756	98 155	1.49	1.59	41 367	44 413	-1.73	0.70	1.98	2.21	3.28	0.89
Argentina	10 314	11 616	0.02	0.97	1 738	1 699	-0.18	-0.12	5.94	6.84	0.20	1.09
Brazil	35 234	44 625	2.80	2.02	17 975	19 927	-3.29	1.03	1.97	2.24	6.30	0.99
Chile	2 030	2 111	-2.99	0.53	1 748	1 564	3.20	-0.98	1.16	1.35	-6.00	1.53
Colombia	7 101	7 307	1.69	0.18	5 097	4 556	-1.19	-1.34	1.39	1.60	2.92	1.54
Mexico	12 154	13 340	1.45	0.77	2 504	2 636	0.80	0.47	4.85	5.06	0.65	0.30
Paraguay	536	669	1.37	2.23	220	250	0.75	0.99	2.44	2.68	0.61	1.23
Peru	1 947	2 592	1.78	2.87	1 169	1 349	0.95	1.39	1.67	1.92	0.83	1.45
EUROPE	222 757	235 529	0.79	0.54	42 010	39 604	-0.67	-0.52	5.30	5.95	1.47	1.07
European Union[1]	149 218	159 384	1.30	0.57	21 139	19 957	-0.31	-0.50	6.95	7.90	1.77	1.11
United Kingdom	15 405	16 375	1.32	0.63	1 908	1 908	0.59	-0.09	8.08	8.58	0.72	0.73
Russia	30 284	30 666	-0.84	0.34	8 258	7 713	-1.14	-0.65	3.67	3.98	0.30	1.00
Ukraine	10 294	9 657	-1.43	-0.36	2 890	2 294	-3.81	-1.99	3.56	4.21	2.48	1.67
AFRICA	43 779	53 245	0.10	2.16	218 354	257 094	0.47	1.62	0.20	0.21	-0.36	0.52
Egypt	5 632	6 168	-0.24	1.28	6 843	6 680	0.90	-0.14	0.82	0.92	-1.13	1.42
Ethiopia	3 540	4 513	-0.74	2.69	16 249	20 107	2.47	1.84	0.22	0.22	-3.13	0.83
Nigeria	574	664	1.62	1.53	2 271	2 407	1.58	0.32	0.25	0.28	0.03	1.21
South Africa	3 241	3 840	0.24	1.73	1 006	1 029	0.16	0.36	3.22	3.73	0.09	1.37
ASIA	339 153	447 167	3.82	2.70	363 069	415 029	1.51	1.27	0.93	1.08	2.28	1.41
China[2]	34 689	37 076	-0.21	0.58	12 189	11 457	-0.18	-0.44	2.51	2.88	0.31	1.10
India	168 894	232 835	4.77	3.12	129 704	148 086	1.20	1.47	1.30	1.57	3.53	1.63
Indonesia	1 237	1 608	-1.07	2.74	15 199	17 896	4.07	1.39	0.08	0.09	-4.94	1.33
Iran	6 502	7 827	-1.12	1.90	19 996	21 646	-1.69	0.66	0.33	0.36	0.58	1.23
Japan	7 312	7 504	-0.79	0.29	847	837	-1.57	-0.06	8.63	8.97	0.79	0.35
Kazakhstan	5 177	5 969	-0.21	1.44	4 087	4 251	4.91	0.42	1.27	1.40	-4.88	1.02
Korea	2 069	2 288	0.25	0.95	250	257	0.22	0.26	8.26	8.91	0.03	0.68
Malaysia	87	113	2.04	2.55	105	117	-5.30	0.80	0.83	0.97	7.75	1.74
Pakistan	54 004	75 012	6.25	3.34	35 075	42 595	2.93	1.52	1.54	1.76	3.23	1.80
Philippines	22	21	4.86	-0.51	5	4	-0.49	-2.06	4.02	4.86	5.37	1.59
Saudi Arabia	2 461	2 843	4.45	1.38	4 820	4 781	2.41	-0.10	0.51	0.59	1.99	1.48
Thailand	1 106	1 250	2.81	1.11	235	214	-0.93	-0.66	4.71	5.85	3.77	1.78
Turkey	20 141	25 954	5.54	2.18	26 466	30 739	6.17	0.92	0.76	0.84	-0.60	1.25
Viet Nam	640	959	9.51	3.83	319	404	11.58	2.18	2.00	2.37	-1.85	1.62
OCEANIA	31 200	32 904	1.77	0.54	6 703	6 624	1.10	0.00	4.66	4.97	0.66	0.54
Australia	9 618	9 682	0.12	0.40	1 548	1 489	-0.67	-0.02	6.21	6.50	0.79	0.41
New Zealand	21 514	23 150	2.60	0.60	5 101	5 085	1.70	0.01	4.22	4.55	0.88	0.59
DEVELOPED COUNTRIES	**395 573**	**424 049**	**1.16**	**0.65**	**80 873**	**81 336**	**0.33**	**0.06**	**4.89**	**5.21**	**0.83**	**0.59**
DEVELOPING COUNTRIES	**430 534**	**557 169**	**3.11**	**2.51**	**600 979**	**691 849**	**0.85**	**1.37**	**0.72**	**0.81**	**2.24**	**1.12**
LEAST DEVELOPED COUNTRIES (LDC)	26 738	34 313	-0.02	2.65	205 635	243 308	0.23	1.71	0.13	0.14	-0.25	0.93
OECD[3]	**354 050**	**381 394**	**1.55**	**0.65**	**72 949**	**75 910**	**2.03**	**0.22**	**4.85**	**5.02**	**-0.47**	**0.43**
BRICS	**272 343**	**349 042**	**3.00**	**2.40**	**169 130**	**188 212**	**0.42**	**1.19**	**1.61**	**1.85**	**2.57**	**1.19**

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

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

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Table C.37. Whey powder and casein projections

Calendar year

		Average 2016-18est	2028	Growth (%)[3]	
				2009-18	2019-28
AUSTRALIA					
Net trade, whey	kt pw	86.1	88.1	0.44	0.02
Exports, casein	kt pw	0.5	3.1	-31.92	15.05
CANADA					
Net trade, whey	kt pw	33.8	35.9	10.37	0.50
EUROPEAN UNION					
Whey powder					
Production	kt pw	1 799.8	2 068.1	1.50	1.00
Consumption	kt pw	1 262.5	1 405.7	0.43	0.73
Net trade	kt pw	537.4	662.4	4.49	1.60
Casein					
Production	kt pw	150.8	182.1	3.32	1.50
Consumption	kt pw	124.6	153.6	4.20	3.00
Net trade	kt pw	26.2	28.4	0.63	-3.69
JAPAN					
Net trade, whey	kt pw	-58.4	-58.1	..	..
Casein imports	kt pw	13.5	13.5	-0.82	-0.27
NEW ZEALAND					
Net trade, whey	kt pw	-7.0	-5.4	..	..
Exports, casein	kt pw	180.8	165.8	2.91	0.84
UNITED STATES					
Whey					
Production	kt pw	493.3	544.2	0.37	1.07
Consumption	kt pw	259.2	274.6	-2.08	0.62
Exports	kt pw	234.2	269.6	3.84	1.55
Imports, casein	kt pw	134.3	159.2	6.40	1.38
ARGENTINA					
Net trade, whey	kt pw	70.9	92.2	1.75	2.41
BRAZIL					
Net trade, whey	kt pw	-19.8	-20.0	..	..
CHINA[2]					
Net trade, whey	kt pw	-414.6	-472.6	..	..
RUSSIA					
Net trade, whey	kt pw	-59.7	-64.9	..	..

.. Not available

Note: Calendar year; except year ending 30 June for Australia and 31 May for New Zealand. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Least-squares growth rate (see glossary).

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.38. Main policy assumptions for dairy markets

Calendar year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
CANADA												
Milk target price[1]	CADc/litre	80.9	84.3	85.9	87.3	88.7	90.2	91.7	93.1	94.5	96.0	97.5
Butter support price	CAD/t	7 862.7	8 225.6	8 385.2	8 522.8	8 655.5	8 800.0	8 945.6	9 086.3	9 222.4	9 362.8	9 512.6
Cheese tariff-quota	kt pw	25.3	33.6	38.6	43.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6
In-quota tariff	%	0.7	0.7	0.7	0.7	0.7	0.6	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	844	861	846	846	846	846	846	846	846	846	846
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	1 499.3	1 400.0	1 400.0	1 400.0	1 400.0	1 400.0	1 400.0	1 400.0	1 400.0	1 400.0	1 400.0
Butter tariff-quotas	kt pw	89.5	90.2	90.3	90.3	90.4	90.4	90.5	90.5	90.6	90.6	90.7
Cheese tariff-quotas	kt pw	118.6	119.2	119.5	119.9	120.2	120.5	120.8	121.2	121.5	121.8	122.1
JAPAN												
Direct payments[5]	JPY/kg	10.5	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
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	%	279.9	287.7	284.8	278.0	272.4	267.7	263.0	257.8	253.5	248.9	245.2
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	%	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
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	%	46.7	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	1 202.5	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	1 202.5
RUSSIA												
Butter tariff	%	15.0	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	%	2.9	3.0	2.9	2.9	2.9	2.8	2.8	2.7	2.7	2.7	2.6
Out-of-quota 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-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	%	42.9	42.6	41.9	41.2	40.6	39.9	39.3	38.7	38.1	37.5	36.9
INDIA												
Butter tariff	%	40.0	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	%	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
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 2016-18est: Data for 2018 are estimated.

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 (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.39.1. Fish and seafood projections: Production and trade

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		IMPORTS (kt)		Growth (%)[4]		EXPORTS (kt)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**172 268**	**196 324**	**2.37**	**1.09**	**41 524**	**45 759**	**1.45**	**1.06**	**41 237**	**45 769**	**1.86**	**1.06**
NORTH AMERICA	6 457	6 510	0.87	0.19	5 888	6 526	1.09	1.30	2 788	2 515	0.48	-0.14
Canada	1 040	1 094	-0.71	0.63	641	641	0.23	0.13	823	827	-0.32	0.37
United States	5 417	5 416	1.21	0.10	5 247	5 885	1.20	1.44	1 965	1 688	0.85	-0.39
LATIN AMERICA	14 837	16 551	-1.19	0.37	2 433	2 910	2.55	2.36	4 481	5 275	2.72	0.94
Argentina	815	931	0.03	0.90	70	70	3.70	0.00	593	666	-1.02	0.53
Brazil	1 299	1 523	1.09	1.42	714	871	2.87	2.63	47	62	0.44	0.99
Chile	3 025	3 668	-3.21	0.82	134	135	9.66	0.00	1 483	2 095	4.37	2.33
Colombia	183	211	0.98	0.98	219	276	3.78	2.48	41	47	-9.34	-0.25
Mexico	1 840	2 024	0.96	0.39	509	684	7.85	4.85	238	184	0.80	-1.40
Paraguay	24	32	1.95	1.75	5	5	6.41	0.00	0	..	..	..
Peru	5 109	5 312	-2.55	-0.66	135	133	4.17	0.00	556	584	0.11	-1.81
EUROPE	17 741	19 220	1.30	0.56	11 421	11 994	-0.01	0.50	10 027	11 132	1.14	0.56
European Union[1]	5 859	6 376	0.54	0.55	8 090	8 348	0.94	0.65	2 570	2 809	1.41	0.69
United Kingdom	930	963	2.27	0.31	1 271	1 381	-0.39	0.87	885	825	0.60	-0.56
Norway	3 591	3 890	0.44	0.38	269	226	1.67	-1.39	2 830	3 049	-0.09	0.20
Russia	4 994	5 537	2.51	1.08	758	942	-6.73	-0.06	2 224	2 899	3.58	1.74
Ukraine	109	135	-9.43	0.81	432	459	-3.78	-0.57	16	22	-21.93	-3.23
AFRICA	11 684	13 264	3.80	1.13	4 432	5 906	1.13	2.98	2 736	2 178	4.79	-2.09
Egypt	1 807	2 504	5.44	2.90	560	503	6.27	-0.51	48	45	25.75	0.00
Ethiopia	55	80	16.05	2.95	2	2	12.22	0.00	1	1	-8.41	0.00
Nigeria	1 155	1 282	5.24	0.71	627	986	-11.96	5.87	7	4	-18.50	-5.06
South Africa	577	545	0.18	-0.13	260	336	7.03	1.65	170	163	-0.49	0.13
ASIA	119 899	138 955	3.02	1.30	16 676	17 707	2.62	0.59	20 174	23 590	1.82	1.86
China[2]	62 351	71 529	3.12	1.34	4 301	4 271	4.80	-0.35	8 130	9 164	1.87	2.14
India	11 469	13 643	4.92	1.11	40	60	9.55	4.03	1 267	1 321	5.09	-0.55
Indonesia	12 462	16 253	7.30	2.09	153	203	-6.00	2.57	1 295	2 922	2.28	6.30
Iran	1 182	1 545	8.40	1.93	74	60	2.13	0.00	113	139	11.98	2.96
Japan	3 766	3 451	-3.05	-0.82	3 583	2 994	-0.33	-1.19	706	710	3.04	0.88
Kazakhstan	36	34	-1.84	0.00	60	70	-4.25	2.29	40	40	-1.93	0.00
Korea	1 901	1 865	-2.15	-0.14	1 841	2 006	3.25	0.46	590	707	-2.56	1.13
Malaysia	1 723	1 809	-0.24	0.68	523	538	0.50	-0.15	285	222	-1.62	-1.74
Pakistan	678	707	1.88	0.45	13	13	27.80	0.00	197	212	3.38	0.60
Philippines	2 727	2 755	-2.06	0.33	518	607	11.34	1.60	406	322	3.96	-0.46
Saudi Arabia	120	148	4.41	1.48	319	423	5.52	2.66	66	98	10.65	2.28
Thailand	2 376	2 613	-4.03	0.98	1 924	2 193	2.08	1.46	1 827	2 244	-4.47	1.99
Turkey	624	727	-0.44	1.12	111	132	4.11	1.36	223	268	14.01	2.42
Viet Nam	7 034	8 499	5.06	1.69	336	414	11.62	2.00	2 846	3 197	7.34	1.21
OCEANIA	1 650	1 824	2.22	1.01	675	716	1.47	0.80	1 031	1 079	3.51	0.45
Australia	274	321	0.89	2.01	469	518	0.35	1.07	78	84	3.49	1.96
New Zealand	535	563	-0.30	0.68	51	52	0.30	0.00	402	420	-0.93	0.68
DEVELOPED COUNTRIES	**29 603**	**30 921**	**0.55**	**0.33**	**21 983**	**22 784**	**0.30**	**0.54**	**14 229**	**15 075**	**1.00**	**0.46**
DEVELOPING COUNTRIES	**142 666**	**165 403**	**2.78**	**1.24**	**19 556**	**22 975**	**2.88**	**1.60**	**27 013**	**30 693**	**2.34**	**1.36**
LEAST DEVELOPED COUNTRIES (LDC)	13 119	15 356	3.83	1.34	1 308	2 098	11.22	4.36	1 594	1 158	6.25	-2.91
OECD[3]	**28 824**	**30 378**	**-0.53**	**0.29**	**22 525**	**23 357**	**1.03**	**0.66**	**12 793**	**13 668**	**1.02**	**0.61**
BRICS	**80 689**	**92 777**	**3.26**	**1.28**	**6 073**	**6 480**	**2.52**	**0.18**	**11 838**	**13 609**	**2.45**	**1.74**

.. 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 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.39.2. Fish and seafood projections: Reduction, food consumption

Calendar year

	REDUCTION (kt)		Growth (%)[4]		FOOD CONS. (kt)		Growth (%)[4]		FOOD CONS. (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**15 226**	**15 194**	**-1.25**	**-0.13**	**152 784**	**177 777**	**2.70**	**1.30**	**20.3**	**21.3**	**1.51**	**0.34**
NORTH AMERICA	999	1 026	1.40	0.06	8 202	9 174	1.27	1.09	22.7	23.5	0.52	0.38
Canada	17	18	-12.50	0.27	818	870	0.47	0.53	22.3	21.7	-0.52	-0.28
United States	981	1 009	1.88	0.05	7 384	8 305	1.36	1.15	22.8	23.7	0.64	0.45
LATIN AMERICA	5 599	5 762	-5.18	-0.67	6 740	8 034	2.47	1.71	10.5	11.4	1.34	0.88
Argentina	..	..	..	..	292	335	2.94	1.47	6.6	6.9	1.90	0.63
Brazil	52	44	-1.65	-1.31	1 914	2 288	1.81	1.94	9.1	10.2	0.92	1.36
Chile	1 217	1 322	-8.76	-0.76	276	331	1.73	1.81	15.3	17.0	0.85	1.16
Colombia	..	..	..	..	361	439	4.67	2.06	7.4	8.3	3.69	1.44
Mexico	183	199	-11.01	-0.11	1 927	2 325	4.85	1.78	14.9	16.0	3.42	0.75
Paraguay	..	..	..	..	29	37	2.57	1.49	4.2	4.7	1.23	0.39
Peru	3 958	4 001	-3.33	-0.71	690	801	0.94	1.17	21.4	22.1	-0.36	0.12
EUROPE	2 411	2 254	2.85	-0.59	16 228	17 392	0.36	0.70	21.8	23.4	0.27	0.73
European Union[1]	681	440	-1.92	-3.20	10 522	11 325	1.03	0.78	23.8	25.6	0.95	0.80
United Kingdom	..	..	..	..	1 316	1 520	0.57	1.36	19.9	21.7	-0.07	0.86
Norway	558	555	3.19	0.05	289	337	1.46	1.52	54.5	57.6	0.28	0.60
Russia	419	459	3.23	0.91	3 018	3 030	-1.23	0.19	21.0	21.4	-1.30	0.38
Ukraine	..	..	..	..	525	572	-4.07	-0.14	11.9	13.7	-3.59	0.40
AFRICA	816	822	0.80	0.55	12 489	16 151	2.93	2.40	10.0	10.0	0.33	0.03
Egypt	..	..	..	..	2 320	2 961	5.46	2.27	23.8	25.4	3.26	0.69
Ethiopia	..	..	..	..	57	82	17.10	2.90	0.5	0.6	14.14	0.66
Nigeria	..	..	..	..	1 775	2 264	-3.29	2.69	9.3	9.0	-5.82	0.16
South Africa	313	319	2.37	0.42	354	400	3.02	0.75	6.2	6.3	1.65	-0.23
ASIA	5 283	5 198	1.60	0.54	108 067	125 779	3.21	1.24	24.1	25.9	2.16	0.51
China[2]	2 080	2 060	1.38	0.74	55 442	63 827	3.63	1.18	39.3	44.3	3.11	1.01
India	560	690	9.27	1.56	9 683	11 692	5.29	1.29	7.2	7.8	4.03	0.34
Indonesia	17	25	-6.02	0.00	9 887	12 519	6.10	1.97	37.4	43.0	4.82	1.09
Iran	76	71	2.92	-1.29	1 067	1 396	8.05	1.93	13.1	15.8	6.75	1.24
Japan	540	329	-4.84	-3.72	6 103	5 407	-1.49	-0.99	47.9	44.1	-1.37	-0.63
Kazakhstan	..	..	..	..	55	63	-4.42	2.56	3.1	3.2	-5.82	1.71
Korea	99	100	-2.20	0.00	2 907	2 964	0.39	0.06	57.0	56.4	-0.02	-0.20
Malaysia	102	65	-4.17	-3.09	1 858	2 060	1.48	0.90	58.8	57.1	-0.21	-0.29
Pakistan	132	133	2.02	-0.43	363	375	1.41	0.68	1.8	1.6	-0.65	-0.97
Philippines	..	..	..	..	2 839	3 040	-1.22	0.66	27.1	24.9	-2.80	-0.72
Saudi Arabia	..	..	..	..	373	473	4.26	2.35	11.3	12.2	1.58	0.95
Thailand	426	305	-3.26	-1.82	1 880	2 196	0.90	1.37	27.2	31.5	0.52	1.31
Turkey	104	163	-2.42	2.90	406	422	-2.89	-0.11	5.0	4.8	-4.40	-0.65
Viet Nam	802	923	12.98	2.63	3 605	4 753	2.64	2.15	37.7	45.3	1.52	1.30
OCEANIA	119	132	-1.49	0.08	1 057	1 247	1.61	1.78	26.6	27.3	0.08	0.54
Australia	29	38	-8.13	0.42	635	717	0.69	1.42	26.0	25.9	-0.75	0.31
New Zealand	51	53	-3.54	-0.11	134	141	2.78	0.74	28.5	27.4	1.70	-0.04
DEVELOPED COUNTRIES	**4 379**	**4 056**	**1.13**	**-0.63**	**32 111**	**33 819**	**0.30**	**0.55**	**22.7**	**23.2**	**-0.11**	**0.28**
DEVELOPING COUNTRIES	**10 848**	**11 138**	**-2.09**	**0.06**	**120 673**	**143 958**	**3.42**	**1.48**	**19.8**	**20.9**	**2.04**	**0.37**
LEAST DEVELOPED COUNTRIES (LDC)	484	498	6.79	0.73	12 175	15 679	3.91	2.18	14.4	14.5	1.50	-0.07
OECD[3]	**4 460**	**4 226**	**-4.15**	**-0.84**	**33 050**	**35 035**	**0.65**	**0.61**	**24.9**	**25.2**	**0.10**	**0.23**
BRICS	**3 424**	**3 572**	**2.58**	**0.86**	**70 410**	**81 236**	**3.54**	**1.17**	**22.3**	**24.2**	**2.69**	**0.64**

.. 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 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.40.1. Ethanol projections: Production and use

Calendar year

	PRODUCTION (mln L)		Growth (%)[4]	DOMESTIC USE (mln L)		Growth (%)[4]	FUEL USE (mln L)		Growth (%)[4]
	Average 2016-18est	2028	2019-28	Average 2016-18est	2028	2019-28	Average 2016-18est	2028	2019-28
WORLD	**122 478**	**143 112**	**1.37**	**121 858**	**143 190**	**1.30**	**..**	**..**	**..**
NORTH AMERICA	62 902	64 110	0.07	59 276	62 010	0.22	..	..	..
Canada	1 955	2 047	0.12	3 198	3 229	-0.38	2 983	2 962	-0.57
United States	60 947	62 062	0.07	56 078	58 781	0.25	54 377	57 177	0.26
LATIN AMERICA	33 794	44 321	2.43	34 015	44 140	2.16	..	..	..
Argentina	1 178	1 803	4.33	1 178	1 805	4.24	1 021	1 554	4.39
Brazil	29 341	37 155	2.16	28 927	36 563	1.93	27 186	34 535	1.99
Chile	8	12	4.53	37	31	1.51	..	..	..
Colombia	486	1 337	7.26	668	1 492	5.08	539	1 368	5.68
Mexico	222	275	0.97	363	411	1.05	163	215	2.29
Paraguay	353	916	6.90	335	774	6.79	317	754	7.04
Peru	200	274	2.79	264	351	2.11	186	242	2.16
EUROPE	8 700	9 738	1.06	8 908	9 834	0.86	..	..	..
European Union[1]	6 640	7 406	0.90	6 771	7 406	0.67	5 176	5 716	0.87
United Kingdom	918	1 099	2.67	1 019	1 235	2.34	755	988	3.01
Russia	621	597	-0.24	485	464	-0.49	..	..	..
Ukraine	358	467	2.18	352	459	2.23	175	244	2.74
AFRICA	1 045	1 374	2.19	1 052	1 330	2.27	..	..	..
Egypt	38	55	2.96	35	55	2.99	..	..	..
Ethiopia	104	160	3.80	104	160	3.80	..	..	..
Nigeria	29	70	3.66	178	187	1.22	..	..	..
South Africa	307	330	0.33	95	126	0.88	5	5	0.14
ASIA	15 684	23 241	3.65	18 335	25 624	2.95	..	..	..
China[2]	9 633	14 774	4.25	10 167	15 528	4.05	3 600	8 829	8.42
India	2 398	3 132	1.93	2 680	3 294	1.13	1 023	1 595	2.28
Indonesia	216	272	1.96	154	212	2.58	50	62	2.38
Iran	0	0	..	0	0	..	..	..	..
Japan	77	77	0.01	1 551	1 454	-0.87	833	754	-1.61
Kazakhstan	0	0	..	0	0	..	..	..	..
Korea	153	146	0.05	512	534	-0.02	5	4	-1.76
Malaysia	0	0	..	0	0	..	..	..	..
Pakistan	608	809	2.22	21	22	0.25	2	2	1.94
Philippines	311	459	3.29	723	927	1.50	571	718	1.00
Saudi Arabia	0	6	26.35	60	58	1.12	..	..	..
Thailand	1 807	2 810	3.85	1 808	2 696	3.47	1 517	2 406	3.95
Turkey	109	114	0.33	206	214	0.17	96	89	-1.17
Viet Nam	209	407	3.52	201	387	2.77	101	280	4.00
OCEANIA	353	327	-1.18	271	251	-1.93	..	..	..
Australia	345	320	-1.23	266	245	-2.01	193	170	-2.78
New Zealand	3	1	0.00	0	0	..	..	..	..
DEVELOPED COUNTRIES	**72 340**	**74 593**	**0.19**	**70 134**	**73 722**	**0.27**	**..**	**..**	**..**
DEVELOPING COUNTRIES	**50 138**	**68 518**	**2.83**	**51 725**	**69 468**	**2.53**	**..**	**..**	**..**
LEAST DEVELOPED COUNTRIES (LDC)	369	515	2.89	381	517	2.88	..	..	..
OECD[3]	**71 420**	**73 593**	**0.18**	**70 212**	**73 726**	**0.27**	**..**	**..**	**..**
BRICS	**42 299**	**55 987**	**2.62**	**42 353**	**55 974**	**2.40**	**..**	**..**	**..**

.. Not available

Note: Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.40.2. Ethanol projections: Share in volume terms and trade

Calendar year

	SHARE IN GASOLINE TYPE FUEL USE (%)		IMPORTS (mln L)		Growth (%)[4]	EXPORTS (mln L)		Growth (%)[4]
	Average 2016-18est	2028	Average 2016-18est	2028	2019-28	Average 2016-18est	2028	2019-28
WORLD	**..**	**..**	**10 090**	**10 436**	**-0.51**	**10 486**	**10 436**	**-0.51**
NORTH AMERICA	..	..	2 296	2 684	0.40	5 903	4 805	-2.35
Canada	6.0	6.2	1 306	1 262	-1.05	78	80	1.36
United States	9.7	11.2	991	1 422	1.85	5 825	4 725	-2.40
LATIN AMERICA	..	..	2 741	2 730	-1.19	2 342	2 903	1.23
Argentina	10.8	12.0	15	23	-0.36	16	21	5.46
Brazil	46.3	48.7	1 495	1 522	-1.52	1 731	2 106	1.22
Chile	..	..	29	20	0.00	0	1	0.00
Colombia	..	..	182	155	-5.08	0	0	..
Mexico	0.4	0.4	145	139	1.21	3	3	0.23
Paraguay	..	..	2	5	-0.86	21	147	7.05
Peru	..	..	184	198	0.00	120	121	0.00
EUROPE	..	..	1 281	1 138	-0.70	971	1 107	0.47
European Union[1]	5.6	7.3	534	397	-1.88	320	462	0.92
United Kingdom	4.4	7.1	578	588	0.03	477	451	0.05
Russia	..	..	2	3	-1.00	120	135	0.60
Ukraine	..	..	0	0	..	6	8	0.00
AFRICA	..	..	256	195	0.00	249	239	0.00
Egypt	..	..	1	1	0.00	5	1	0.00
Ethiopia	..	..	0	0	..	0	0	..
Nigeria	..	..	149	117	0.00	0	0	..
South Africa	..	..	14	14	0.00	226	218	0.00
ASIA	..	..	3 506	3 677	-0.59	935	1 294	3.01
China[2]	2.1	3.7	522	848	0.85	86	94	0.96
India	..	..	421	354	-3.41	139	192	3.40
Indonesia	..	..	3	2	0.00	65	61	0.00
Iran	..	..	0	0	..	0	0	..
Japan	1.6	1.9	1 473	1 379	-0.91	1	2	0.02
Kazakhstan	..	..	0	0	..	0	0	..
Korea	0.0	0.0	378	388	0.21	0	0	..
Malaysia	..	..	0	0	..	0	0	..
Pakistan	..	..	0	0	..	587	787	2.28
Philippines	..	..	412	468	0.00	0	0	..
Saudi Arabia	..	..	61	52	0.00	0	0	..
Thailand	..	..	23	4	-14.03	22	118	15.40
Turkey	..	..	98	100	0.00	1	0	..
Viet Nam	..	..	21	14	-5.79	29	34	6.15
OCEANIA	..	..	9	11	-0.91	87	87	0.49
Australia	1.0	1.2	7	9	-1.01	82	84	0.51
New Zealand	..	..	1	1	0.00	5	2	0.00
DEVELOPED COUNTRIES	**..**	**..**	**5 109**	**5 267**	**-0.20**	**7 191**	**6 224**	**-1.79**
DEVELOPING COUNTRIES	**..**	**..**	**4 981**	**5 169**	**-0.81**	**3 295**	**4 212**	**1.73**
LEAST DEVELOPED COUNTRIES (LDC)	..	..	13	3	0.00	1	0	0.00
OECD[3]	**..**	**..**	**5 711**	**5 859**	**-0.14**	**6 793**	**5 812**	**-1.92**
BRICS	**..**	**..**	**2 454**	**2 741**	**-1.13**	**2 301**	**2 745**	**1.21**

.. Not available

Note: Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.41.1. Biodiesel projections: Production and use

Calendar year

	PRODUCTION (mln L)		Growth (%)[4]	DOMESTIC USE (mln L)		Growth (%)[4]
	Average 2016-18est	2028	2019-28	Average 2016-18est	2028	2019-28
WORLD	**36 807**	**43 931**	**0.10**	**37 603**	**44 227**	**0.08**
NORTH AMERICA	7 377	9 304	-1.67	8 830	9 903	-1.65
Canada	513	611	1.10	355	355	0.21
United States	6 864	8 693	-1.85	8 475	9 549	-1.71
LATIN AMERICA	7 860	9 640	1.26	6 459	8 342	1.30
Argentina	2 660	2 769	1.40	1 021	1 265	2.11
Brazil	4 520	5 916	1.10	4 489	5 898	1.09
Chile	0	0	..	0	0	..
Colombia	565	699	1.05	566	702	1.05
Mexico	0	0	..	0	0	..
Paraguay	12	37	9.64	12	37	9.64
Peru	50	140	4.13	318	360	1.42
EUROPE	13 821	13 524	-0.67	15 342	14 863	-1.00
European Union[1]	13 238	12 872	-0.73	14 541	14 009	-1.10
United Kingdom	284	352	1.74	503	554	1.63
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	7 690	11 418	1.82	6 911	11 074	2.73
China[2]	1 031	1 279	1.13	1 020	1 270	1.16
India	165	239	2.15	153	235	2.18
Indonesia	3 748	6 052	1.22	3 173	5 888	2.84
Iran	0	0	..	0	0	..
Japan	16	18	1.61	12	14	2.38
Kazakhstan	0	0	..	0	0	..
Korea	677	678	-0.32	633	655	-0.28
Malaysia	460	545	1.53	342	447	2.01
Pakistan	0	0	..	0	0	..
Philippines	211	287	3.05	211	287	3.05
Saudi Arabia	0	0	..	0	0	..
Thailand	1 383	2 320	4.84	1 368	2 278	4.78
Turkey	0	0	..	0	0	..
Viet Nam	0	0	..	0	0	..
OCEANIA	60	44	1.58	61	45	1.60
Australia	60	44	1.58	61	45	1.60
New Zealand	0	0	..	0	0	..
DEVELOPED COUNTRIES	**21 274**	**22 891**	**-1.08**	**24 245**	**24 825**	**-1.25**
DEVELOPING COUNTRIES	**15 533**	**21 040**	**1.56**	**13 358**	**19 402**	**2.09**
LEAST DEVELOPED COUNTRIES (LDC)	0	0	..	0	0	..
OECD[3]	**21 951**	**23 569**	**-1.06**	**24 877**	**25 481**	**-1.23**
BRICS	**5 716**	**7 434**	**1.13**	**5 662**	**7 404**	**1.14**

.. Not available

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3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).

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Table C.41.2. Biodiesel projections: Share in volume terms and trade

Calendar year

	SHARE IN DIESEL TYPE FUEL USE (%)		IMPORTS (mln L)		Growth (%)[4]	EXPORTS (mln L)		Growth (%)[4]
	Average 2016-18est	2028	Average 2016-18est	2028	2019-28	Average 2016-18est	2028	2019-28
WORLD	**..**	**..**	**4 505**	**3 738**	**-2.61**	**4 081**	**3 420**	**-2.82**
NORTH AMERICA	..	..	2 204	1 390	-0.33	727	791	0.36
Canada	1.2	1.3	262	190	-2.45	422	447	0.12
United States	3.8	4.5	1 943	1 200	0.04	305	344	0.70
LATIN AMERICA	..	..	269	223	0.02	1 649	1 522	0.88
Argentina	11.5	13.1	0	0	..	1 642	1 504	0.85
Brazil	9.9	11.6	0	0	..	7	18	3.74
Chile	..	..	0	0	..	0	0	..
Colombia	..	..	1	3	1.41	0	0	..
Mexico	..	..	0	0	..	0	0	..
Paraguay	..	..	0	0	..	0	0	..
Peru	..	..	268	220	0.00	0	0	..
EUROPE	..	..	2 007	2 101	-4.15	904	740	-5.30
European Union[1]	7.1	8.1	1 727	1 816	-4.76	841	657	-5.79
United Kingdom	1.7	2.3	280	285	1.00	62	83	0.00
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	..	..	22	24	0.99	801	367	-10.99
China[2]	0.9	1.2	9	11	3.46	20	20	0.00
India	..	..	7	7	0.15	19	11	0.19
Indonesia	..	..	0	0	..	574	164	-16.92
Iran	..	..	0	0	..	0	0	..
Japan	0.0	0.1	1	1	0.87	6	5	-0.34
Kazakhstan	..	..	0	0	..	0	0	..
Korea	..	..	0	0	..	44	23	-1.42
Malaysia	..	..	0	0	..	118	98	-0.39
Pakistan	..	..	0	0	..	0	0	..
Philippines	..	..	0	0	..	0	0	..
Saudi Arabia	..	..	0	0	..	0	0	..
Thailand	..	..	5	4	-2.63	20	46	6.83
Turkey	..	..	0	0	..	0	0	..
Viet Nam	..	..	0	0	..	0	0	..
OCEANIA	..	..	1	1	2.37	0	0	..
Australia	0.6	0.5	1	1	2.41	0	0	..
New Zealand	..	..	0	0	..	0	0	..
DEVELOPED COUNTRIES	**..**	**..**	**4 214**	**3 493**	**-2.78**	**1 636**	**1 536**	**-2.80**
DEVELOPING COUNTRIES	**..**	**..**	**290**	**245**	**0.10**	**2 445**	**1 884**	**-2.82**
LEAST DEVELOPED COUNTRIES (LDC)	..	..	0	0	..	0	0	..
OECD[3]	**..**	**..**	**4 214**	**3 493**	**-2.78**	**1 681**	**1 559**	**-2.78**
BRICS	**..**	**..**	**16**	**18**	**1.98**	**46**	**49**	**1.27**

.. Not available

Note: Average 2016-18est: Data for 2018 are estimated.

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3. Excludes Iceland but includes all EU member countries
4. Least-squares growth rate (see glossary).

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Table C.42. Main policy assumptions for biofuel markets

		2018est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
ARGENTINA												
Biodiesel												
Export tax	%	15.0	15.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
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												
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
Biodiesel												
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
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	10.0	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]	%	5.8	5.9	6.1	6.3	6.6	6.9	7.2	7.5	7.8	8.1	8.4
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	%	7.3	8.2	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	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
THAILAND												
Ethanol												
Blending target[1]	%	8.4	8.5	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2
Biodiesel												
Blending target[1]	%	6.0	6.2	6.6	6.7	6.9	7.0	7.2	7.5	7.7	8.0	8.2
UNITED STATES												
Renewable Fuel Standard[6]												
Total	mln L	73 020	75 405	75 405	75 405	75 405	75 405	75 405	75 405	75 405	75 405	75 405
advanced mandate	mln L	16 239	18 624	18 624	18 624	18 624	18 624	18 624	18 624	18 624	18 624	18 624
cellulosic ethanol	mln L	1 090	1 582	1 693	1 812	1 938	2 074	2 219	2 375	2 541	2 719	2 909
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: 2018est: Data for 2018 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 (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.43.1. Cotton projections: Production and trade

Marketing year

	PRODUCTION (kt)		Growth (%)4		IMPORTS (kt)		Growth (%)4		EXPORTS (kt)		Growth (%)4	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**25 228**	**29 189**	**-0.04**	**1.17**	**8 946**	**11 590**	**0.43**	**1.70**	**8 832**	**11 590**	**0.45**	**1.70**
NORTH AMERICA	4 100	4 271	2.80	0.50	1	1	-16.95	0.13	3 333	3 611	1.87	0.83
Canada	0	0	..	..	0	0	-19.30	..	0	0	..	..
United States	4 100	4 271	2.80	0.50	1	1	23.43	1.10	3 333	3 611	1.87	0.83
LATIN AMERICA	2 484	3 690	2.71	2.32	384	349	-4.50	0.30	1 070	2 568	7.77	3.12
Argentina	217	286	-0.71	1.53	2	2	-18.48	0.16	45	125	4.07	3.76
Brazil	1 947	2 992	2.99	2.63	26	17	-6.97	0.14	964	2 383	8.47	3.18
Chile	0	0	..	..	0	0	-33.92	..	0	0	..	..
Colombia	9	12	-15.06	2.23	23	20	-8.51	-1.21	1	1	98.18	1.22
Mexico	273	356	8.97	0.67	207	176	-3.81	0.08	56	54	5.02	-0.08
Paraguay	4	5	-12.32	1.13	2	1	141.21	-1.14	3	4	-12.64	1.15
Peru	22	26	-5.91	1.81	44	34	-5.44	-1.37	1	1	-10.45	0.48
EUROPE	290	292	1.04	0.54	268	254	-6.75	-0.04	284	277	2.36	0.08
European Union[1]	288	290	1.05	0.54	214	195	-4.63	-0.20	281	276	2.33	0.08
United Kingdom	0	0	..	..	0	0	..	..	0	0	..	..
Russia	1	1	0.21	0.26	37	39	-14.41	0.00	2	0	112.13	..
Ukraine	0	0	..	..	2	2	-11.59	2.01	0	0	..	..
AFRICA	1 726	2 300	5.97	2.10	188	304	1.86	4.11	1 430	2 046	5.59	2.34
Egypt	72	44	-7.67	-8.83	120	187	6.56	3.23	50	53	-6.14	-3.13
Ethiopia	51	57	12.71	1.49	14	46	38.30	9.73	2	1	-4.36	-7.09
Nigeria	51	56	0.43	0.82	1	19	-14.50	22.42	25	1	-3.22	-17.95
South Africa	31	42	14.95	1.48	17	11	-1.41	0.05	10	17	4.24	-0.05
ASIA	15 788	17 642	-1.48	0.90	8 105	10 680	1.12	1.74	1 906	2 111	-6.26	0.54
China[2]	5 505	5 416	-3.44	-0.51	1 414	1 789	-11.52	-0.83	20	24	10.66	0.23
India	6 088	7 212	0.81	1.79	437	259	18.19	-2.21	1 029	1 321	-5.50	2.26
Indonesia	5	6	-4.29	1.45	783	1 185	5.78	3.24	1	0	-45.13	..
Iran	53	57	-2.53	1.42	71	82	1.79	1.93	0	0	..	..
Japan	0	0	..	..	56	58	-3.01	-0.43	0	0	..	..
Kazakhstan	73	83	-0.99	1.25	0	0	..	..	50	64	-4.96	0.73
Korea	0	0	..	..	202	142	-2.18	-3.30	0	0	..	..
Malaysia	0	0	..	..	137	215	4.26	2.46	30	25	-0.64	-2.40
Pakistan	1 736	2 060	-2.86	1.36	607	552	10.47	-1.14	39	48	-18.38	0.47
Philippines	0	0	..	..	14	21	1.55	4.42	0	0	..	..
Saudi Arabia	0	0	..	..	0	0	..	..	0	0	..	..
Thailand	1	1	0.26	1.29	257	228	-4.51	-1.02	0	0	..	..
Turkey	812	1 165	4.15	2.21	822	1 050	1.21	2.10	71	53	8.58	-2.05
Viet Nam	1	1	-16.14	1.45	1 472	2 297	21.52	3.59	0	0	..	..
OCEANIA	839	994	0.56	3.23	1	1	-2.36	0.00	810	977	2.18	3.74
Australia	838	993	0.56	3.23	0	0	..	..	809	976	2.18	3.74
New Zealand	1	1	0.00	0.00	1	1	0.00	0.00	1	1	0.00	0.00
DEVELOPED COUNTRIES	**6 616**	**7 068**	**1.49**	**0.87**	**347**	**330**	**-5.98**	**-0.10**	**5 125**	**5 505**	**0.32**	**0.86**
DEVELOPING COUNTRIES	**18 612**	**22 121**	**-0.52**	**1.27**	**8 599**	**11 261**	**0.80**	**1.76**	**3 707**	**6 085**	**0.75**	**2.53**
LEAST DEVELOPED COUNTRIES (LDC)	1 378	1 923	6.48	2.73	1 678	2 639	9.79	3.53	1 056	1 595	7.67	2.92
OECD[3]	**6 325**	**7 090**	**2.73**	**1.12**	**1 504**	**1 625**	**-1.30**	**0.89**	**4 565**	**4 985**	**1.85**	**1.24**
BRICS	**13 572**	**15 662**	**-0.85**	**1.07**	**1 930**	**2 116**	**-8.97**	**-0.98**	**2 024**	**3 746**	**-0.29**	**2.80**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

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

Source: OECD/FAO (2019), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.43.2. Cotton projections: Consumption

Marketing year

	CONSUMPTION (kt)[4]		Growth (%)[5]	
	Average 2016-18est	2028	2009-18	2019-28
WORLD	**26 215**	**29 176**	**1.03**	**0.66**
NORTH AMERICA	**713**	**657**	**-1.25**	**-1.01**
Canada	0	0	-21.54	..
United States	713	656	-1.22	-1.01
LATIN AMERICA	**1 494**	**1 466**	**-3.20**	**-0.47**
Argentina	152	156	-1.33	0.09
Brazil	725	628	-4.81	-1.68
Chile	0	0	-40.75	..
Colombia	34	30	-11.47	-0.11
Mexico	430	478	0.98	0.54
Paraguay	3	3	-12.67	-0.11
Peru	59	59	-7.45	-0.11
EUROPE	**279**	**270**	**-7.36**	**0.84**
European Union[1]	225	211	-5.27	0.90
United Kingdom	0	0	..	..
Russia	39	40	-14.93	0.19
Ukraine	2	2	-13.39	2.01
AFRICA	**397**	**558**	**1.42**	**2.24**
Egypt	144	178	-0.16	0.49
Ethiopia	62	102	9.82	4.68
Nigeria	34	74	7.19	4.26
South Africa	26	36	2.56	1.84
ASIA	**23 324**	**26 217**	**1.59**	**0.74**
China[2]	8 758	7 186	-1.00	-2.15
India	5 200	6 150	2.58	1.49
Indonesia	773	1 190	5.45	3.23
Iran	114	140	-1.92	1.72
Japan	59	58	-3.80	-0.43
Kazakhstan	13	19	0.41	3.27
Korea	203	142	-1.85	-3.28
Malaysia	98	190	16.92	3.33
Pakistan	2 280	2 563	0.51	0.79
Philippines	13	21	0.76	4.42
Saudi Arabia	0	0	..	..
Thailand	253	229	-4.84	-1.01
Turkey	1 547	2 162	2.62	2.29
Viet Nam	1 429	2 298	21.01	3.59
OCEANIA	**7**	**7**	**-4.04**	**-0.01**
Australia	6	6	-4.57	-0.01
New Zealand	1	1	0.00	0.00
DEVELOPED COUNTRIES	**1 661**	**1 879**	**-1.04**	**1.01**
DEVELOPING COUNTRIES	**24 555**	**27 297**	**1.19**	**0.63**
LEAST DEVELOPED COUNTRIES (LDC)	**1 928**	**2 968**	**7.89**	**3.34**
OECD[3]	**3 185**	**3 715**	**0.29**	**1.02**
BRICS	**14 747**	**14 040**	**-0.17**	**-0.67**

.. Not available

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

1. Refers to all current European Union member States except the United Kingdom.
2. Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Asia aggregate.
3. Excludes Iceland but includes all EU member countries
4. Consumption for cotton means mill consumption and not final consumer demand.
5. Least-squares growth rate (see glossary).

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.44. Main policy assumptions for cotton markets

Marketing year

		Average 2016-18est	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
ARGENTINA												
Export tax equivalent of export barriers	%	4.0	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	4 491.9	5 754.0	5 754.0	5 754.0	5 754.0	5 754.0	5 840.0	6 230.6	6 598.1	6 933.3	7 242.4
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												
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	%	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	%	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

Note: Marketing year: See Glossary of Terms for definitions. Average 2016-18est: Data for 2018 are estimated.

1. If the area is higher than the ceiling, the amount is proportionally reduced.

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

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

Calendar year

	PRODUCTION (kt)		Growth (%)[4]		FOOD CONSUMPTION (kg/cap)		Growth (%)[4]	
	Average 2016-18est	2028	2009-18	2019-28	Average 2016-18est	2028	2009-18	2019-28
WORLD	**221 479**	**261 440**	**2.42**	**1.27**	**15.6**	**16.7**	**0.66**	**0.53**
NORTH AMERICA	5 432	5 649	1.06	0.32	12.4	12.1	0.31	-0.36
Canada	952	991	0.82	0.39	16.0	15.6	0.52	-0.53
United States	4 480	4 658	1.12	0.30	12.0	11.7	0.28	-0.34
LATIN AMERICA	14 014	15 652	-0.51	1.01	12.0	12.4	-0.64	0.30
Argentina	603	652	1.22	1.01	9.3	9.3	-0.51	-0.14
Brazil	6 441	6 308	-3.58	0.07	12.8	11.7	-3.61	-0.53
Chile	265	321	2.26	1.48	13.9	15.1	2.49	0.64
Colombia	1 317	1 694	2.33	1.98	21.7	24.9	1.53	1.26
Mexico	399	434	0.91	0.83	3.3	3.3	-0.03	-0.16
Paraguay	960	1 172	3.73	1.58	41.1	37.5	-0.23	-0.95
Peru	1 599	2 001	3.25	1.83	31.7	35.9	1.77	0.96
EUROPE	24 959	25 044	0.09	0.12	17.1	16.6	-0.39	-0.27
European Union[2]	10 308	9 569	-1.87	-0.62	14.0	12.7	-1.40	-0.81
United Kingdom	1 226	1 262	-0.14	0.22	17.0	16.7	-0.96	-0.25
Russia	6 800	6 591	2.89	-0.01	24.2	25.0	1.28	0.16
Ukraine	5 012	5 723	2.83	1.16	27.4	30.2	1.45	0.89
AFRICA	82 742	104 433	3.83	1.74	36.3	37.1	0.73	0.15
Egypt	1 103	1 395	2.98	1.60	8.0	9.3	0.71	1.29
Ethiopia	2 343	3 016	6.01	1.92	18.7	18.9	2.59	-0.22
Nigeria	30 678	37 754	4.60	1.54	68.5	69.4	1.49	0.09
South Africa	481	591	1.83	1.76	5.9	6.4	-0.71	0.70
ASIA	93 250	109 371	2.54	1.19	10.4	10.8	0.39	0.31
China[3]	42 061	45 308	1.68	0.48	15.4	15.4	0.10	-0.09
India	12 986	16 536	3.25	1.74	7.0	8.1	0.88	1.12
Indonesia	9 076	10 869	2.12	1.58	18.3	19.7	1.24	0.54
Iran	957	1 131	1.25	1.44	10.1	10.7	0.49	0.50
Japan	760	739	-1.01	-0.08	6.4	6.3	-0.55	-0.09
Kazakhstan	753	909	4.37	1.60	22.1	24.7	-0.03	1.01
Korea	197	214	-0.42	0.98	5.0	5.1	4.50	-0.01
Malaysia	37	46	7.48	1.59	3.5	3.9	2.47	1.00
Pakistan	996	1 265	4.26	1.77	3.9	4.5	1.63	1.15
Philippines	1 011	1 248	2.80	1.59	9.4	9.9	1.13	0.35
Saudi Arabia	79	130	-1.73	5.37	4.7	5.2	9.62	0.99
Thailand	10 329	13 300	4.12	2.02	5.2	5.0	-0.34	-0.39
Turkey	764	937	-2.45	1.32	7.1	6.3	-5.27	-0.96
Viet Nam	4 001	4 919	3.81	1.62	3.9	4.1	-0.20	0.87
OCEANIA	1 081	1 290	1.40	1.51	22.7	23.1	-0.32	0.11
Australia	254	273	0.08	0.84	10.6	9.4	-1.04	-1.01
New Zealand	132	148	2.60	1.06	11.9	12.4	-0.13	0.37
DEVELOPED COUNTRIES	**34 365**	**35 364**	**0.44**	**0.30**	**14.0**	**13.7**	**-0.29**	**-0.26**
DEVELOPING COUNTRIES	**187 114**	**226 075**	**2.83**	**1.43**	**16.0**	**17.3**	**0.85**	**0.65**
LEAST DEVELOPED COUNTRIES (LDC)	38 697	49 769	3.62	1.89	27.3	28.2	0.77	0.26
OECD	**19 986**	**19 818**	**-0.87**	**-0.07**	**11.0**	**10.4**	**-0.89**	**-0.56**
BRICS	**68 769**	**75 333**	**1.45**	**0.67**	**11.9**	**12.2**	**-0.07**	**0.10**

Note: Calendar year. Average 2016-18est: Data for 2018 are estimated. Production and consumption are expressed on dry weight basis.

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

Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, *OECD Agriculture statistics* (database). doi: dx.doi.org/10.1787/agr-outl-data-en

Table C.46. 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]	
	2018	2019	2018	2019	2018	2019	2018	2019
OECD								
Australia[1]	1.9	..	-0.3	..	12.8	12.8	0.0	..
Austria	1.8	1.7	2.0	1.2	12.0	12.0	0.2	0.1
Belgium	1.7	2.0	2.2	1.4	17.4	17.4	0.4	0.2
Canada	1.7	1.4	1.6	2.5	11.5	11.5	0.2	0.3
Chile	2.2	2.2	3.9	1.3	18.9	18.9	0.7	0.2
Czech Republic	2.2	2.5	4.5	-0.2	17.0	17.0	0.8	0.0
Denmark	0.7	1.3	1.6	1.1	11.5	11.5	0.2	0.1
Estonia	3.4	2.7	5.7	1.7	21.7	21.7	1.2	0.4
Finland	0.8	1.1	1.5	2.1	13.4	13.4	0.2	0.3
France	1.3	1.2	1.3	2.9	14.7	14.7	0.2	0.4
Germany	1.4	1.4	2.6	0.7	10.4	10.4	0.3	0.1
Greece	-0.2	0.4	-1.2	1.9	17.1	17.1	-0.2	0.3
Hungary	2.1	2.7	4.5	3.8	19.6	19.6	0.9	0.8
Iceland	2.4	3.4	-0.1	4.8	14.9	14.9	0.0	0.7
Ireland	0.2	0.7	-1.7	-1.5	11.7	11.7	-0.2	-0.2
Israel	0.1	1.2	-1.1	4.7	14.3	14.3	-0.2	0.7
Italy	0.9	0.9	1.3	0.7	16.3	16.3	0.2	0.1
Japan	1.4	0.2	3.8	-2.2	19.0	19.0	0.7	-0.4
Korea	0.8	0.8	-1.1	2.6	14.4	14.4	-0.2	0.4
Luxembourg	1.1	1.8	1.8	2.6	11.1	11.1	0.2	0.3
Mexico	5.5	4.4	8.6	5.3	18.9	18.9	1.6	1.0
Netherlands	1.5	2.2	2.2	3.0	11.3	11.3	0.3	0.3
New Zealand[1]	1.1	..	0.0	..	17.4	17.4	0.0	..
Norway	1.6	3.1	2.6	1.2	13.3	13.3	0.3	0.2
Poland	1.9	0.7	4.8	..	24.1	24.1	1.2	..
Portugal	1.0	0.5	1.4	0.2	18.1	18.1	0.3	0.0
Slovak Republic	2.4	2.2	6.7	1.6	18.4	18.4	1.2	0.3
Slovenia	1.5	1.1	2.9	0.8	17.0	17.0	0.5	0.1
Spain	0.6	1.0	1.3	0.9	18.2	18.2	0.2	0.2
Sweden	1.6	1.9	2.3	1.6	13.9	13.9	0.3	0.2
Switzerland	0.7	0.6	1.0	0.8	10.8	10.8	0.1	0.1
Turkey	10.3	20.4	8.8	31.0	26.8	26.8	2.3	8.3
United Kingdom	2.7	1.8	3.7	0.9	11.8	11.8	0.4	0.1
United States	2.1	1.6	1.0	0.7	7.8	7.8	0.1	0.1
OECD Total	2.2	2.1	2.2	1.9	..	..	..	..
Enhanced Engagement								
Brazil	2.9	3.8	-1.5	4.2	22.5	22.5	-0.3	0.9
China	1.5	1.7	-0.5	2.0	33.6	33.6	-0.2	0.7
India	5.1	6.6	4.6	..	35.4	35.4	1.6	..
Indonesia	3.3	2.8	2.9	2.0	19.6	19.6	0.6	0.4
Russia	2.2	5.0	0.3	6.2	32.8	32.8	0.1	2.0
South Africa	4.3	3.9	3.8	2.9	18.3	18.3	0.7	0.5

Table C.46. 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]	
	2018	2019	2018	2019	2018	2019	2018	2019
Non OECD								
Algeria	3.6	2.6	1.8	1.4	43.8	43.8	0.8	0.6
Bangladesh	5.4	5.4	5.3	5.3	28.6	28.6	1.5	1.5
Bolivia	2.9	1.4	3.3	1.5	27.6	27.6	0.9	0.4
Botswana	3.1	3.5	0.4	-0.2	23.7	23.7	0.1	0.0
Bulgaria	1.8	3.0	1.0	3.6	37.2	37.2	0.4	1.3
Colombia	3.7	3.2	0.4	2.1	34.7	34.7	0.1	0.7
Costa Rica	2.4	1.7	2.3	-0.7	21.4	21.4	0.5	-0.1
Dominican Republic	3.9	0.7	5.2	-0.4	29.2	29.2	1.5	-0.1
Ecuador	-0.1	0.5	-0.1	0.4	23.0	23.0	0.0	0.1
Egypt	17.0	12.5	12.9	12.5	26.3	26.3	3.4	3.3
El Salvador	1.5	0.3	2.9	0.8	26.0	26.0	0.8	0.2
Ethiopia	10.5	11.5	13.7	..	57.0	57.0	7.8	..
Ghana	10.3	9.0	6.8	8.0	37.0	37.0	2.5	3.0
Guatelama	4.7	4.1	10.5	9.8	28.6	28.6	3.0	2.8
Haiti	13.2	15.5	13.2	18.9	50.4	50.4	6.7	9.5
Honduras	4.6	4.0	1.7	1.1	31.8	31.8	0.5	0.4
Iraq	0.8	1.1	-0.2	..	35.0	35.0	-0.1	..
Jordan	3.0	3.6	-1.3	3.6	35.2	35.2	-0.5	1.3
Kenya	4.8	4.7	4.7	1.6	36.0	36.0	1.7	0.6
Madagascar	11.3	..	11.3	..	60.0	60.0	6.8	..
Malawi	4.5	8.8	8.4	10.7	50.0	50.0	4.2	5.4
Malaysia	3.5	-0.7	2.7	1.0	56.3	56.3	1.5	0.6
Moldavia	6.5	2.2	8.4	-3.0	60.0	60.0	5.0	-1.8
Morocco	1.8	-0.5	2.2	-3.1	40.4	40.4	0.9	-1.3
New Caledonia	1.4	1.0	1.4	-0.6	21.0	21.0	0.3	-0.1
Nicaragua	5.4	3.3	5.6	1.3	26.1	26.1	1.5	0.3
Niger	7.6	..	7.2	..	40.0	40.0	2.9	..
Nigeria	15.1	11.3	18.9	13.5	51.8	51.8	9.8	7.0
Pakistan	4.4	9.9	3.7	4.3	37.5	37.5	1.4	1.6
Panama	0.4	-0.3	-1.9	0.9	33.6	33.6	-0.6	0.3
Paraguay	4.7	2.4	7.7	-1.0	39.1	39.1	3.0	-0.4
Peru	1.4	2.4	0.2	1.5	25.0	25.0	0.1	0.4
Philippines	3.9	4.4	4.5	5.6	39.0	39.0	1.8	2.2
Romania	4.3	3.3	3.8	3.8	37.4	37.4	1.4	1.4
Rwanda	0.1	1.0	-2.0	-4.3	39.0	39.0	-0.8	-1.7
Senegal	-0.3	0.6	-0.3	0.7	53.4	53.4	-0.2	0.4
Singapore	0.0	0.4	1.1	1.4	21.7	21.7	0.2	0.3
Sri Lanka	5.8	3.7	10.5	-2.1	41.0	41.0	4.3	-0.9
Chinese Taipei	0.9	0.2	0.8	0.8	23.7	23.7	0.2	0.2
Tanzania	4.0	3.0	6.3	0.7	38.5	38.5	2.4	0.3
Thailand	0.7	0.3	0.1	1.3	33.0	33.0	0.0	0.4
Tunisia	6.9	7.1	7.9	7.1	28.7	28.7	2.3	2.0
Uganda	3.0	2.7	2.7	-1.5	27.2	27.2	0.7	-0.4
Zambia	6.2	7.8	4.6	7.7	52.5	52.5	2.4	4.0

.. Not available

1. No data available for January 2019 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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