# OECD-FAO Agricultural Outlook 2013-2022

## HIGHLIGHTS

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# OECD – FAO
# AGRICULTURAL OUTLOOK
# 2013-2022

HIGHLIGHTS

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# *Foreword*

The *Agricultural Outlook, 2013-2022*, 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. This year's edition contains for the first time a chapter on world cotton markets. Chapter 2 has been prepared with assistance from the Agricultural Information Institute (AII) of the Chinese Academy of Agricultural Sciences and the Ministry of Agriculture (MoA) of the Government of China. However, responsibility for the information and projections contained in this document remain those of the OECD and FAO, and do not necessarily reflect the views of the AII or of the MoA.

The baseline projection is not a forecast about the future, but rather a plausible scenario elaborated on the basis of specific assumptions regarding the macroeconomic conditions, the agriculture and trade policy settings, weather conditions, longer term productivity trends and international market developments. The projections of production, consumption, stocks, trade and prices for the different agricultural products described and analysed in this report cover the years 2013 to 2022. The evolution of markets over the outlook period is typically described using the annual growth rate or percentage changes for the final year 2022 relative to a three-year base period of 2010-12.

The individual commodity projections are subject to critical examination by national country experts of OECD, other collaborating countries and industry experts prior to their finalisation and publication in this report. The risks and uncertainties around the baseline projections are examined through a number of possible alternative scenarios and stochastic analysis, which illustrate how market outcomes may differ from the deterministic baseline projections.

The fully documented outlook database, including historical data and projections, is available through the OECD-FAO joint internet site www.agri-outlook.org.

## *Acknowledgements*

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

At the OECD, the baseline projections and *Outlook* report were prepared by members of the Agro-Food Trade and Markets Division of the Trade and Agriculture Directorate: Armelle Elasri (publication co-ordinator), Alexis Fournier, Linda Fulponi, Gaëlle Gouarin, Wayne Jones (Division Head), Claude Nenert, Koki Okawa, Ignacio Pérez Domínguez, Garry Smith, Grégoire Tallard (Outlook co-ordinator). The OECD Secretariat is grateful for the contributions provided by the consultant Pierre Charlebois, staff loans from Canada (Paul Lirette), New Zealand (Richard Wallace) and United States (Stephen MacDonald), and Andrzej Kwiecinski (OECD). Meeting organisation and document preparation were provided by Christine Cameron, with editing by Michèle Patterson. Technical assistance in the preparation of the *Outlook* database was provided by Frano Ilicic. Many other colleagues in the OECD Secretariat and member country delegations furnished useful comments on earlier drafts of the report.

At the FAO, the team of economists and commodity officers from the Trade and Markets At the FAO, the team of economists and commodity officers from the Trade and Markets Division contributing to this edition consisted of Abdolreza Abbassian, ElMamoun Amrouk, Pedro Arias, Boubaker BenBelhassen (EST Principal Officer), Concepcion Calpe, Emily Carroll, Merritt Cluff, Cheng Fang, David Hallam (EST Division Director), Holger Matthey (Team Leader), Seth Meyer, Masato Nakane, Jean Senahoun, Shangnan Shui, Timothy Sulser and Peter Thoenes. Marcel Adenäuer from Bonn University joined the team as a consultant. Audun Lem and Stefania Vannuccini contributed from the Fisheries and Aquaculture Department, with technical support from Pierre Charlebois. Research assistance and database preparation were provided by Claudio Cerquiglini, Berardina Forzinetti, Patrizia Masciana, Marco Milo, Fiorella Picchioni and Barbara Senfter. Several other colleagues from FAO and member country institutions improved this report through valuable details and comments. From FAO's Publishing Group, Rachel Tucker and Yongdong Fu provided invaluable assistance. Dr Chen Zhijun (TCI) provided information on climate and water in China.

Chapter 2 of the *Outlook* "Feeding China: Prospects and challenges in the next decade" was written in close collaboration between Chinese colleagues and the Secretariats at OECD and FAO. The team from the Agricultural Information Institute of the Chinese Academy of Agricultural Sciences included Xu Shiwei (Director General), Li Zhemin, Li Zhiqiang, Li Ganqiong, Wu Jianzhai, Kong Fantao and Wang Shengwei. The team from the Market and Economic Industry Division of the Ministry of Agriculture included Cai Ping (Director) and Zhao Zhuo. Wu Laping, Yu Leng, Li Guoxiang, Zhu Xinkai, Yang Jun also contributed data support, modelling advice, policy analyses and other valuable insights.

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# OUTLOOK IN BRIEF

For decades, global agriculture was characterised by policy-induced production surpluses in industrialised countries and stagnating growth in developing countries. Policy reforms and economic growth across the globe have been changing demand and supply fundamentals sufficiently to turn agriculture into a more market-driven sector which provides investment opportunities, particularly in developing countries. Agricultural trade is projected to increase with developing countries capturing most of the export growth.

Expansion of agricultural production is likely to slow at least in the medium term with slower area and productivity growth. Supply should keep pace with demand at prices that are expected to remain relatively high. In this context, measures to reduce food loss and waste will be important in meeting rising demand and for increasing productivity.

With one-fifth of the world's population, high income growth and a rapidly expanding agri-food sector, China is a special focus of this *Outlook*. Developments in Chinese agriculture may have a major influence on world markets. With increasing production constraints and strong demand growth, additional agricultural imports may be anticipated. Still, China should remain self-sufficient in the main food crops despite its relatively limited per capita agricultural resource endowments. Food security has improved as high income and agricultural growth has reduced the number of undernourished people from 21% in 1990 to 12% today but more still needs to be done as the economy expands.

## Key messages

- *Macroeconomic uncertainty*. Although relatively resilient to economic downturns, agricultural markets continue to reflect the impact of a two speed global economy with weak recovery in developed countries and vibrant growth in many developing countries. Rising oil prices are an important and uncertain assumption underlying the agricultural price projections. A depreciating US dollar is expected to reduce the relative competitiveness of other exporters while increasing the purchasing power of many importers.
- *Near term prices adjusting*. Commodity prices are currently high by historical levels. In the first years of this *Outlook*, crop and livestock prices are expected to diverge, reflecting different supply situations. Most crop prices are projected to fall in response to a rebound in production while reduced global livestock inventories allow only a limited supply response keeping meat prices high.
- *Prices firming over the medium-term.* Rising prices for both crop and livestock products are projected over the coming decade due to a combination of slower production growth and stronger demand, including for biofuels, and a supportive macroeconomic environment. Meat, fish and biofuel prices are projected to rise more strongly than primary agricultural products.
- *Inflation adjusted prices remain high.* Over the next decade, average prices for the crop complex (cereals, oilseeds, sugar and cotton) are expected to be relatively flat in real terms compared with the previous decade which included several years of record high prices since

2007. Average real prices for the 2013-22 period are projected well above the 2003-12 average for most of the other commodities covered in this *Outlook*

- *Lower food price inflation.* Recent evidence indicates that consumer food price inflation is currently abating in most countries, as lower prices of food grains, oilseeds, sugar and other products are passed through the food chain contributing to lower the "core" inflation. Nevertheless, with food expenditures accounting for 20-50% or more of household budgets in many developing countries, food affordability remains a main concern for food security.

- *Slower production growth.* Global agricultural production for commodities covered in this *Outlook* is projected to grow at 1.5% annually, on average, compared to 2.1% in the previous decade. This slower growth is expected to be exhibited by all crop sectors and livestock production. These trends reflect rising costs, growing resource constraints, and increasing environmental pressures, which are anticipated to inhibit supply response in virtually all regions.

- *Developing countries increase output.* Higher production growth is expected from emerging economies which have invested in their agricultural sectors and where existing technologies offer good potential for closing the yield gap with the advanced economies, although yield/supply variability may be higher. The share of production from developing countries continues to increase over the outlook period.

- *Strong demand growth.* Consumption of all products covered in this *Outlook* will increase in developing countries, albeit at a slower pace, driven by growing populations, higher incomes, urbanisation and changing diets. Per capita consumption is projected to expand most rapidly in Eastern Europe, and Central Asia followed by Latin America and other Asia.

- *Agriculture trade continues to increase*. Emerging economies will capture much of the trade growth, accounting for the majority of exports of coarse grains, rice, oilseeds, vegetable oil, sugar, beef, poultry and fish. The OECD area share of trade will continue to decline while remaining the major exporters of wheat, cotton, pig and sheep meat and most dairy products.

- *Outlook uncertainties.* Production shortfalls, price volatility and trade interruptions remain a threat to global food security. As long as food stocks in major producing and consuming countries remain low, the risk of price volatility is amplified. A wide spread drought like that experienced in 2012 in the United States and CIS countries, on top of low stocks, could raise crop prices by 15%-40%. A statistical analysis projecting past uncertainty patterns on relevant model drivers into the baseline period, shows crop yield variability to have the largest impact on world prices for wheat, coarse grains and oilseeds with rice somewhat less sensitive. Meat, dairy and biofuel prices are more affected by macroeconomic assumptions such as economic growth and exchange rates. Energy prices add another source of uncertainty, affecting both biofuel markets and input costs. World trade is even more sensitive than production to yield variability and macroeconomic drivers.

**Commodity highlights**

- Relatively low stock-to-use ratios raise concerns about the vulnerability of global cereal markets, but production is expected to increase 1.4% per year with 57% of the total growth coming from developing countries. Thailand is projected to be the leading exporter of rice followed closely by Viet Nam while the United States is expected to remain the dominant exporter of wheat and coarse grains.

- Oilseed production is set to increase faster than cereals, mainly due to yield gains. Palm oil will expand in line with other vegetable oils, maintaining its share at 34% of total vegetable oil production throughout the outlook period.

- Sugar production will increase by almost 2% p.a., primarily from sugar cane in Brazil and India the leading producers. Developing countries will continue to dominate world sugar use and are expected to experience the fastest rates of growth of consumption. Brazil will remain the leading exporter with around 50% of world trade.
- Cotton will continue to lose market share to man-made fibres. China's cotton production is expected to decline 17% while production in India is projected to increase 25%, positioning it as the world's largest producer.
- Ethanol production is expected to increase 67% over the next ten years with biodiesel increasing even faster but from a smaller base. By 2022, biofuel production is projected to consume a significant amount of the total world production of sugar cane (28%), vegetable oils (15%) and coarse grains (12%).
- Developing countries are expected to account for 80% of the growth in global meat production. Per capita meat consumption growth will slow as major developing economies approach the levels of developed countries; while poultry remains the least expensive and most popular choice and accounts for around 50% of the increase in meat consumption.
- Global milk production is expected to increase at a slower rate in the next decade as feed-based dairy operations struggle with high feed costs, while pasture based systems face land competition and water shortages. Developing countries are expected to generate 74% of global milk production gains over the next decade, with India and China alone accounting for 38% of the increase. Global consumption of dairy products in developing countries is projected to grow faster than production, with higher exports from the United States, the European Union, New Zealand, Australia and Argentina.
- Capture fisheries' output is projected to rise by only 5% by 2022 with aquaculture increasing by 35%, despite a slowing growth rate due to higher feed costs and more limited availability of production locations. Aquaculture is projected to surpass capture fisheries as the main source for human consumption by 2015.

**Focus on China**

- With comparatively little agricultural land and water resources, China has made food security and self sufficiency in the key food crops of rice and wheat top policy priorities. Agricultural output grew 4.5 times over the 1978-2011 period following agricultural and rural reforms. However, food price inflation has been rising in recent years, and output is anticipated to slow in the next decade with increasing resource and rural labour constraints.
- Increased availability of food and higher incomes have improved food security significantly with the number of undernourished falling by almost 100 million since 1990, despite adding an additional 200 million people to its population. Reducing the number of persons undernourished remains a major challenge.
- From 2001 to 2012, China's agricultural trade (imports and exports) increased from USD 27.9 billion to USD 155.7 billion. Import dependence doubled from 6.2% to 12.9% with China's net trade deficit in agriculture and food standing at USD 31 billion in 2012.
- It is projected that China's consumption growth will slightly outpace its production growth by some 0.3% p.a., similar to the trend of the previous decade. As a result, a further but modest opening of China's agricultural sector is anticipated although these prospects vary by commodity.
- The government has instituted a policy to prevent any further exit of land from agriculture while the 12th Five-Year Plan sets specific targets for area and production of wheat, rice,

coarse grain, soybeans and tubers. This *Outlook* indicates that these targets could be met or exceeded in the next decade.

- China's imports of oilseeds are expected to rise by 40% over the 2013-22 period, accounting for 59% of global trade. Sugar imports should stay above the tariff rate quota level over the projection period.
- Cotton area is projected to decline 21% as cotton use declines with the intensification of competition in textiles from India and other countries with lower labour costs. This trend of decreasing cotton use is a reversal from the last decade.
- Livestock, both the meat and dairy sectors, will continue to expand, with increasing feed requirements which will result in higher imports of coarse grains, likely beyond the current tariff quota. China is expected to become the world's leading consumer of pigmeat on a per capita basis, surpassing the European Union by 2022.
- Milk production should exhibit considerably slower growth while dairy product consumption is expected to increase 38% by 2022, with fresh dairy products responsible for most of this growth. Dairy imports are projected to rise 20% with skimmed and whole milk powder accounting for 82% of total dairy imports.
- China should maintain its leading role in global fisheries as its aquaculture production continues to increase, albeit at half the rate of the previous decade. China is expected to account for 63% of global aquaculture production in 2022 and remain the world's leading fish exporter.
- Key uncertainties around the agricultural outlook for China include the ongoing sustainability of high levels of economic growth, increasing resource constraints on production and the potential for increased production variability due to climate change generally in the form of more frequent and severe weather events. Uncertainties will persist, and ongoing monitoring and information sharing is advised.

# *Chapter 1.*

# OVERVIEW

The medium term outlook depicts relatively favourable prospects for world agriculture to 2022. In the near term, a dichotomy exists between world crop and livestock sectors. Crop agriculture is characterised by falling prices relative to recent peaks in response to projected large supplies and stock replenishment induced by high prices in recent years. In contrast, livestock product prices are high and increasing at the start of the outlook period, driven up by high feed costs and reduced global livestock inventories and production. Beyond the near term, markets, in general, are expected to begin to tighten and for agricultural prices to firm, with prices in real terms remaining relatively flat for most commodities. Nevertheless, agricultural commodity prices are held above pre 2007 levels, in nominal and real terms, by strong demand, higher input costs and slower productivity growth over the projection period. Market tightening in recent years has been accompanied not only by an increase in the level of agricultural prices but also by a resurgence of commodity and food price volatility, reminiscent of the situation of the 1970s. In these circumstances, prolonged periods of low agricultural product prices driven by ever increasing productivity improvements in a context of low oil and energy prices seem now a feature of a bygone era. Instead, with energy prices high and rising and production growth declining across the board, strong demand for food, feed, fibre and industrial uses of agricultural products is leading to structurally higher prices and with significant upside price risks. The frequency of short term price surges and bouts of high volatility, accentuated in some cases by policy choices, have catapulted agriculture and its future prospects into renewed prominence. This has reflected heightened concerns not only for the public about food security and the adequacy of basic agricultural supplies to meet their future food needs, but also for many governments faced with the risk of social unrest in the event of continuing high food price inflation.

Changing fundamentals have transformed agricultural markets. These changes appear to be here to stay and will shape the evolution of agricultural markets over the medium term. Global production continues to respond to changing market signals, increasing when prices rise and declining as prices fall, while trending upwards overtime. For instance, world production for most crops is projected to increase in 2013 in response to recent high prices caused by droughts in the United States and parts of Europe. Declining production is then anticipated in the following period in response to projected lower global prices of 2013, but with world production averaging higher by the close of the projection period. (Box 1.1 analyses the market impacts of the drought of 2012.) However, recent global output increases have not been sufficient, in general, to drive prices back to previous trend levels i.e. pre-2007 levels. In part this has been due to adverse weather events in key producing countries that have delayed production response to high prices and stock rebuilding, but other factors are also at work. These include longer term trends of declining production growth in crop and livestock sectors across many countries that reflect, in part, fundamental changes in production conditions, including high and rising oil and energy prices, growing resource constraints, increasing environmental pressures and in some cases past under investment in R&D which are anticipated to slow supply response, in virtually all regions.

### Box 1.1. Effects of the 2012 droughts on cereals and oilseeds in the United States and CIS countries

In the summer of 2012 further market disruption took place in global cereal markets. Weather conditions caused one of the most severe drought periods the United States has seen. According to the United States Department of Agriculture (USDA), drought conditions affected approximately 80% of US agricultural land. Despite preliminary expectations of a strong maize growing season due to a mild winter, early planting, and adequate rainfall levels, the drought conditions and high sustained temperatures from June through August damaged crops quite severely (US Bureau of Labor Statistics, 2012). At the same time, according to the Russian Federation's Ministry of Agriculture, a drought destroyed crops in 21 regions of the Russian Federation in an area of 5.5 Mha (around 7% of the sown area in the country). Kazakhstan and Ukraine were also severely affected, with grain and oilseed yields at much lower levels than trend.

In this scenario we use last year's Aglink-Cosimo model (OECD-FAO, 2012) to analyse the *ex post* effects of the 2012 drought. For this we introduce as a scenario shock the observed cereals and oilseeds yields for the 2012/13 marketing season, as projected in the 2012 edition of the *Outlook* report. The following table summarises the shocks introduced to the model, which correspond to the difference between the projected yields for 2012 of last year's *Outlook* (no drought effects) and the yields observed this year (post drought).

**Table 1.1.Yield changes in 2012 due to the drought**

% changes between this year's (observed yields) and last year's *Outlook* (projected yields without drought)

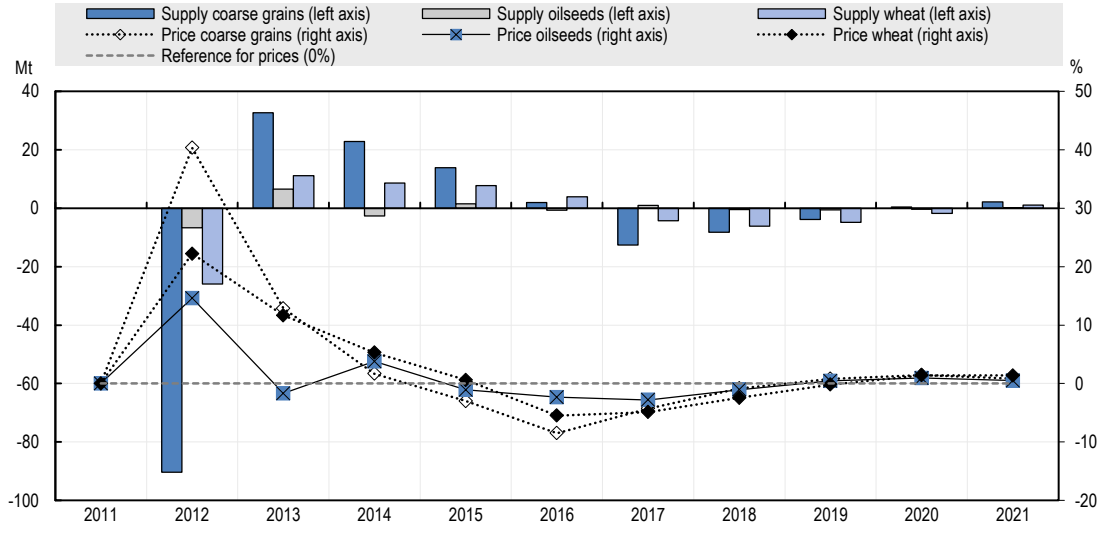
| | Coarse grains | Oilseeds | Wheat | Barley | Maize | Oats | Soyabeans | Sorghum |
|---|---|---|---|---|---|---|---|---|
| Kazakhstan | -28 | -10 | -53 | | | | | |
| Russian Federation | | | -19 | | | | | |
| Ukraine | -6 | -5 | -15 | | | | | |
| United States | | | | | -25 | -1 | -9 | -23 |

*Source*: OECD and FAO Secretariats.

As a response to the drought, production drops considerably in the United States and CIS countries and international prices experience large increases in 2012 (Figure 1.1). The resulting price changes are very much correlated with the size of the shock and the tightness of the market. For instance, lower stock to use ratios for coarse grains compared to wheat or oilseeds provoke a larger short-term reaction on prices. While global supply of coarse grains decreases in 2012 by around 90 Mt compared to a situation without a drought, the reference price (No.2 yellow corn US f.o.b. Gulf Ports) increases by about 40%. In the case of wheat and oilseeds, more moderate effects are observed, with production falling by 26 Mt and 7 Mt, respectively, in 2012, and with prices increasing by 22% and 15%, respectively.

**Figure 1.1. Supply and price dynamics of a drought scenario**

Percentage changes between the counterfactual scenario and the baseline




*Source*: OECD and FAO Secretariats.

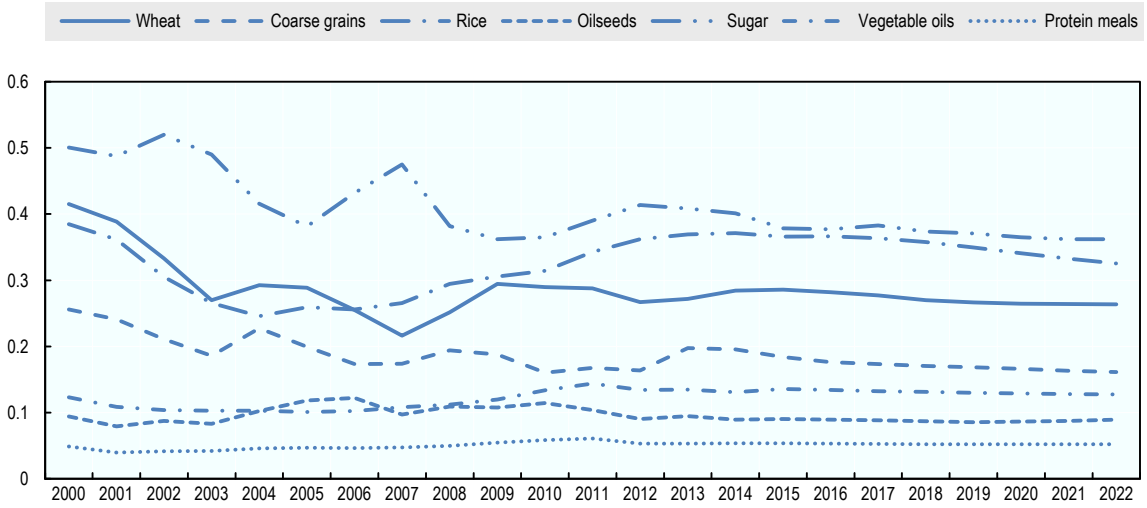
*Sources:* OECD and FAO (2012) *OECD-FAO Agricultural Outlook 2012-2021*, Paris. U.S. Bureau of Labor Statistics (2012) *Beyond the Numbers*, Volume 1, Number 17.

As a result, the constellation of agricultural commodity prices examined in this *Outlook* have become structurally higher with all prices projected to remain at an elevated level over the next decade. For this outlook assessment, nominal commodity price are being projected to rise moderately, and with an abatement of price volatility in the near term as markets give way to more comfortable output expectations and increasing stock cover.

These price projections are predicated on the key assumption of normal production conditions and the absence of unforeseen market shocks such as droughts and animal disease outbreaks. When this assumption is relaxed, as in the discussion of *Outlook* uncertainties in the last section of the chapter, agricultural commodity price prospects clearly become much more variable. Moreover, with stocks-to-use ratios anticipated at or near historical lows for many commodities in later years of the outlook period (Figure 1.2), there is more risk of price rises than falls with further periods of price surges and bouts of enhanced volatility in the coming decade.[1] These short term price surges have been a feature of recent years and could occur again in the event of any substantial production shortfalls, or other restrictions on commodity flows, taking place in major producing and trading regions in the coming decade. Any such events could result in substantially higher average prices for agricultural commodities in the next decade than are currently projected.

**Figure 1.2. Historical and projected stocks-to-use ratios crop products**

Trend in ratios of commodity stocks to consumption, 2000 to 2022




*Source:* OECD and FAO Secretariats.

This report assesses and analyses the prospects for the different crop, livestock, fish and agricultural products-based biofuels in the context of the changes taking place in the various factors that shape the evolution of supply and demand structures in these markets. These include increasing environmental and resource constraints, longer term sustainability goals, and ongoing adjustments in national agricultural policies as well as stronger external influences on agriculture. The factors external to agriculture that will shape global demand and supply for agricultural commodities include slowing population growth and changing population demographics, macroeconomic shocks and the speed of recovery to sustained global economic growth, the increasing co-movement of agriculture with energy and financial markets, and enhanced climatic uncertainties. All these influences are factored into the

1. Only rice stocks to use following consecutive large harvests are approaching recent historical levels.

commodity price projections and market developments that are discussed in the different commodity chapters of the report and highlighted in the overview chapter.

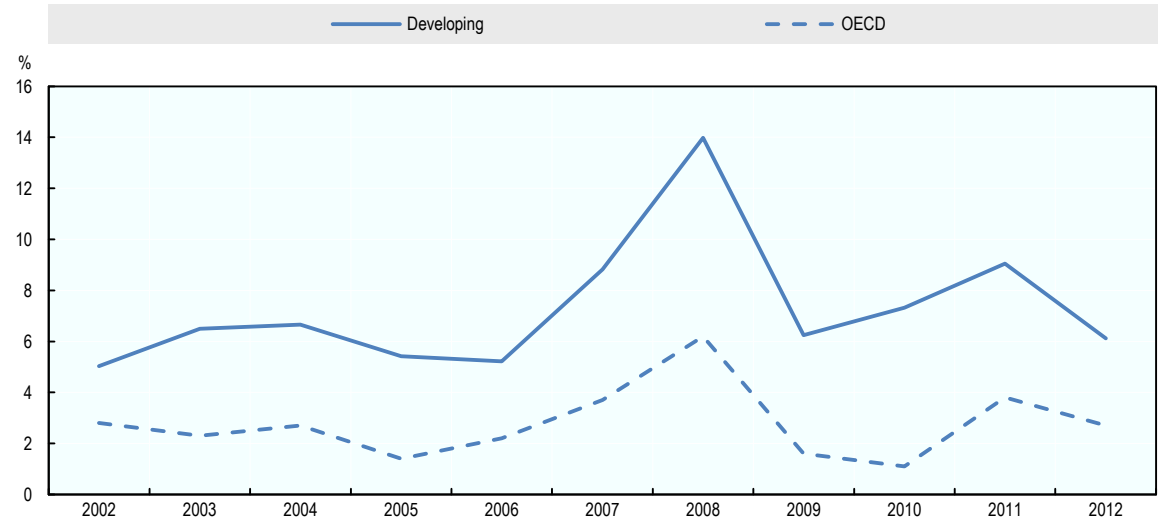
## Food price inflation

Food price movements are closely watched by consumers as well as governments because of their impact on household expenditures and the cost of living. They are particularly important for developing countries and low income groups in OECD countries where food expenditures often account for a large share of household expenditures. Though the *Outlook* does not project retail food prices, it is nonetheless informative to examine recent trends.

High consumer prices have abated at the start of the outlook period. Food price inflation, as measured by the food component of the Consumer Price Index (CPI), slowed over the past year in both OECD and developing countries. In the OECD it fell from 3.8% to 2.7% and in developing countries in the aggregate from over 9% to 6%, with food price increases decelerating in roughly half of OECD countries and almost two-thirds of developing countries. Over the past decade food price inflation has been higher and more variable in developing countries as a whole compared to the OECD area as seen in Figure 1.3. Differences in food price inflation can be attributed to differences in the food basket utilised in the index and the underlying structure of the food systems including costs of production, in addition to the impacts of exogenous factors on supply.

**Figure 1.3. Food price inflation in OECD and developing countries**

Average annual food price inflation rates in per cent, 2002-12




*Source*: CPI-Food Main economic indicators, OECD, OECD Secretariat calculations based on national sources, and ILO-Laboursta, weighted by GNP-PPP per capita, Penn World Tables.

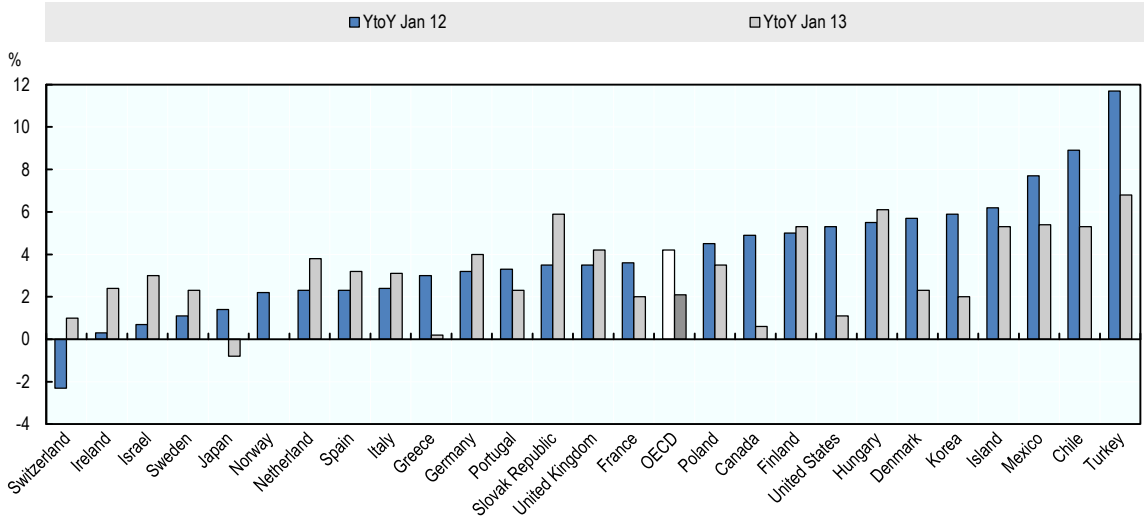
### *OECD countries*

The regional aggregates mask substantial variation between countries. In approximately half of the OECD countries food price inflation increased, rising by over 4% in about a third of them, while overall inflation subsided in over 85% of the OECD countries. Food price inflation continued to outpace overall inflation in the OECD area, the only exceptions being Japan, the United States, Norway, and Turkey. Given the small share of food in total household expenditures in many OECD countries the contribution of food prices to overall inflation remains limited at only half a percentage point on average. However, in Chile,

Mexico, Turkey, Estonia, the Czech Republic, and the Slovak Republic, food expenditure shares average about 20% and food price increases were greater than 5%. In these cases the contribution of food to overall inflation was over one percentage point. A summary of the food price inflation for selected OECD countries is shown in Figure 1.4.

**Figure 1.4. Annual food price inflation rates: Selected OECD countries**

Food price inflation per cent change




*Source:* MEI, OECD, January year on year changes in the consumer price index-food.

### *Emerging economies and developing countries*

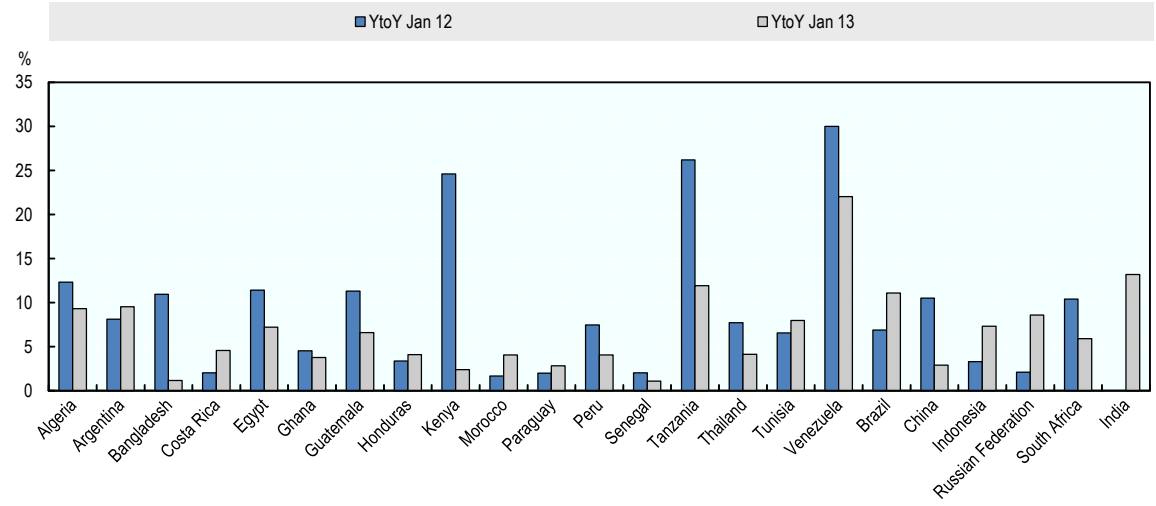
While food price increases in developing countries on average slowed this past year, significant differences between countries remain. Though double digit food inflation was the exception, a few countries did experience food price increases of 10 % or more, Brazil (11%) and Venezuela (22%) are standout examples, but several others hover between 10 to 12% (Uruguay and Nicaragua, Ethiopia, Tanzania, and Malawi). Food price increases slowed in much of Asia, while they were mixed in Africa and in Latin America with countries equally split between those experiencing acceleration in food price increases and those experiencing a decrease over the past year. Food inflation has been generally more volatile and higher among the major emerging economies than in OECD countries over the past decade.

Given the relatively large share of food expenditures in household budgets in developing countries, ranging from 20% to 50% or more, food price changes can significantly affect overall inflation. For approximately two-thirds of the developing countries the contribution of food price increases to overall inflation was less than 2 percentage points, whereas 20% of the countries examined experienced over three percentage points. Food price inflation for selected countries is shown in Figure 1.5.

In general, caution must be exercised in attributing changes in the food component of the CPI directly to those of international food commodity prices without an analysis of input-output structure of the food sector of each country. Commodities generally undergo a substantial transformation through transportation, storage, processing, and marketing before reaching consumers at the retail level. Thus the price link between the two is often not straightforward. Normally it is the structure of the consumer's food basket and the commodity share in its composition that determines the extent of the international commodity price impacts on food prices.

**Figure 1.5. Annual food price inflation rates: Emerging and developing countries**

Food price inflation in per cent




*Note*: Data are not available for India in Jan 2012.

*Source*: MEI, OECD Secretariat calculations based on national Sources and Laborsta, ILO.

## Macro and policy settings

A number of factors will continue to influence the evolution of agricultural markets in the coming decade including the broader macro-economy in which agriculture operates. World economic growth is assumed to improve modestly in 2013 and to increase further over the medium term with a recovery in private demand. The world macroeconomic situation continues to reflect the after effects of the global financial and economic crisis. There remains a two-speed dichotomy between relatively weak and hesitant economic growth, with historically high levels of unemployment, in many developed countries and much higher economic growth with already a recovery to pre-crisis levels of employment in developing countries. As a consequence, developing countries and the large emerging economies are becoming the epicentre of the world economy, as has been the case for agriculture already for many years.

Developing countries and large emerging economies now represent an increasing share of global economic activity, led by high growth in the emerging economies of China, India and other countries of Asia in particular. Although policy actions have lowered risks of crisis in the United States and in the Euro area, this is at the cost of a delayed return to recovery in many member states. For both regions, downside risks remain significant in terms of further setbacks in the Euro area and from excessive fiscal consolidation in the United States. Continued stimulus in Japan and a weaker Yen is expected to help lift it out of recession. Over the longer term, a return to steady economic growth is expected to be supportive of increasing world demand and trade in agricultural products.

Exchange rates are critical to the baseline projections as they influence relative competitiveness for exporters and affordability of purchases for importers and thus agricultural trade between regions. A depreciation of the US dollar with respect to other currencies, such as the Chinese Yuan will increase dollar denominated world prices of agricultural products. Oil and energy prices are assumed to increase over the coming decade and to remain historically high reflecting steady global economic growth. By the end of the projection period in 2022, the price of crude oil is assumed to be around USD 145 per barrel, with an average growth over the period of 2.6% p.a. and slightly above that for consumer price inflation. High energy and oil prices will have effects on both demand and supply of

agricultural products, through higher agricultural supply costs and increased demand for agricultural feedstocks used for biofuels production.

Another factor strengthening demand for agricultural products is population growth. Stronger global economic growth is expected to contribute to the continued slowing in population growth through lower birth rates. The growth in world population is expected to slow to just 1% during the next decade. Developing countries are expected to continue to experience the fastest population gains, with Africa leading the group and growing at 2.3% p.a.

The changes underway in the developing countries with an increasing share of world economic activity and their greater responsiveness of consumption to income growth along with more rapid population gains and large middle classes, are expected to support increased demand and trade for food, feed, fibres and fish over the projection period. When combined with a weaker US dollar, the high economic growth in developing countries should underpin continued high agricultural prices in the coming decade. Low levels of general inflation should sustain food demand in the OECD area while high inflation will dampen demand growth in some emerging countries. Finally, the projections are based on a *status quo* assumption for agriculture and trade policies. The major assumptions underlying the baseline projections are discussed in Box 1.2. An explanation of the procedures involved in the projection of oil prices that are used in the agricultural baseline are discussed in Box 1.3.

**Box 1.2. Macroeconomic and policy assumptions**

***The main assumptions underlying the baseline projection***

The *Outlook* is presented as one baseline scenario that is considered plausible given a range of conditioning assumptions. These assumptions portray a specific macroeconomic and demographic environment which shapes the evolution of demand and supply for agricultural and fish products. These general factors are described below. The statistical tables, at the end of the publication, provide more detailed data for these assumptions.

***The short run global economic outlook has deteriorated***

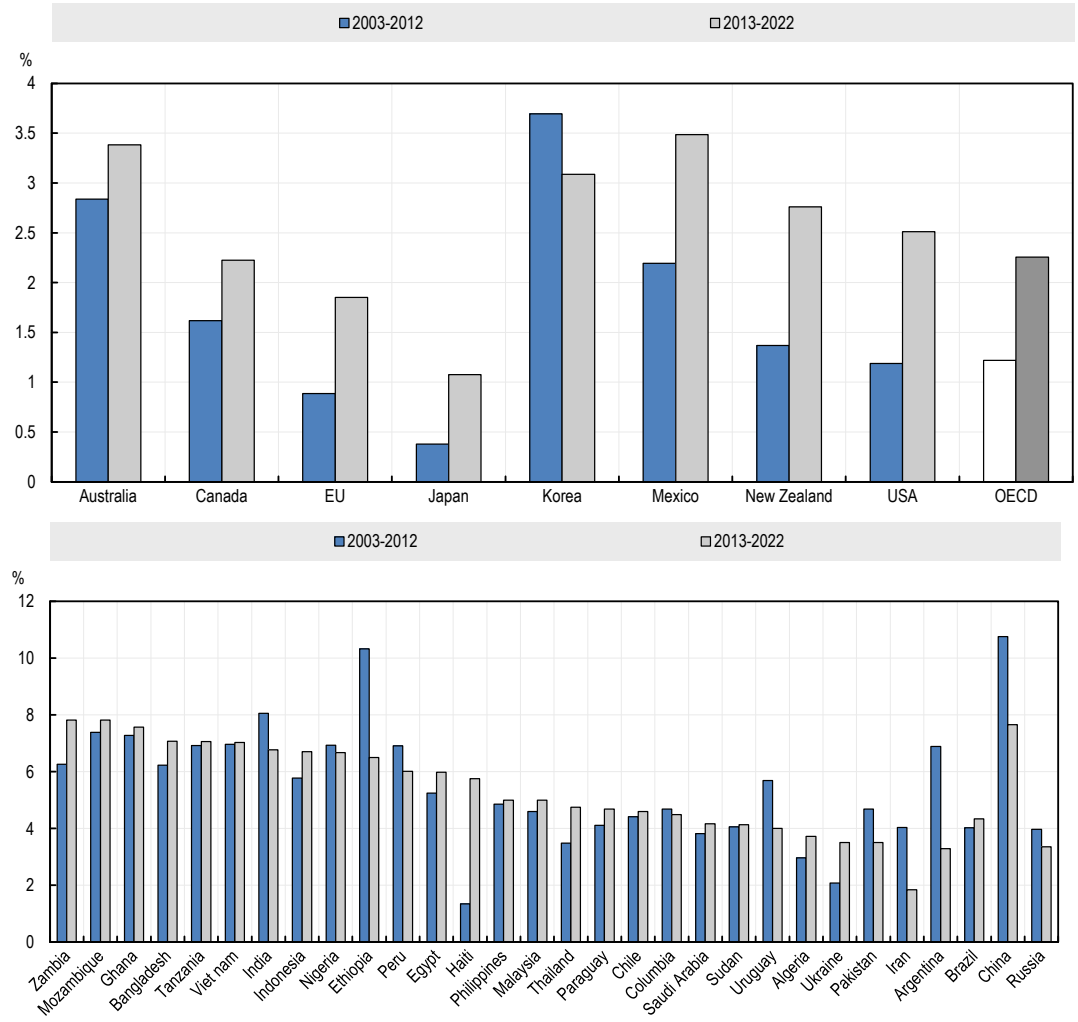
Many OECD economies are still feeling the after effects of the global financial crisis. Even as economic growth has returned, the expansion has been muted. In most cases, GDP growth rates have been below recovery rates following past recessions, while unemployment rates have remained stubbornly high. In the short term, expectations have become more optimistic and expected growth rates have been revised upward moderately as the global economy is beginning to show signs of improvement. The ongoing crisis in the Euro zone has proved difficult to contain due to negative elements that interact and amplify shocks: solvency fears for banks and sovereign debt are feeding on each other due to government guarantees for banks and bank holdings of government bonds. Uncertainties about the long term viability of the monetary union also reinforce fears. Hesitant and uneven recovery is expected over the next two years. Growth in the OECD area is expected to be modest in the short term, with the Euro area remaining in recession until mid-2013. However, expectations in the medium term are for sustained economic growth to return and, in many cases, at a rate above that prevailing during 2002 to 2012.

Although conditions differ across countries, much faster growth is expected to continue in the developing countries. Developing countries have responded to low growth and uncertainty in the OECD area with policy tightening which, in addition to weaker demand from developed countries and domestic factors, has led to some slowdown in economic activity. In Sub Saharan Africa, South Africa is the main country to have been affected by the spill-over from the Euro zone crisis, as a result of strong trade and financial linkages. In general, it is expected that an easing of monetary and fiscal policy will strengthen growth in both emerging and developing countries.

In emerging markets and developing countries, unemployment rates have, on average, declined below pre-crisis levels and in those areas that did not suffer significantly from the financial crisis, such as developing Asia and Latin America, the high employment and income growth is expected to continue to support food demand.

**Figure 1.6. GDP growth remains highly variable**

Average GDP growth rates 2003-12 and 2013-22




*Source*: OECD and FAO Secretariats.

The macroeconomic assumptions used in the Agricultural Outlook are based on the OECD Economic Outlook, (December 2012) and the International Monetary Fund's (IMF) *World Economic Outlook*, (October, 2012). Growth prospects for the OECD area in the short term are assumed to remain relatively weak, with an overall growth rate of 1.38% in 2013 just above the low rate of 1.3% in 2012. EU15 members, as a group, are expected to exhibit minimal growth averaging 0.3% in 2013. However, in the medium term, prospects appear to be better, with a slow but gradual economic recovery to an average growth rate of 1.9%.

Economic growth prospects for other OECD countries in the medium term are also expected to improve to average above 2.2% p.a. Among OECD members, Turkey is expected to have the strongest growth during the next ten years, averaging more than 4.3% p.a. Among the larger economies, the United States and Canada are expected to average 2.5% p.a. during the next ten years while Australia, which managed to avoid recession altogether, is expected to experience growth of around 3.4% p.a. along with Korea and Mexico (respectively 3.1 and 3.4% p.a.)

The assumptions for growth in the non-OECD area (as well as for Chile, Israel and Turkey), have been largely drawn from the IMF. Over the next ten years, China and India are expected to continue growing at an impressive 7.6% p.a. and 6.7% p.a., respectively. These countries remain the high growth leaders, with prospects for substantial market expansion. Another important emerging country, Brazil, is also expected to grow robustly during the medium term, with GDP growth anticipated to average 4.3% p.a. These countries are effectively the main drivers of the world economy.

***Population growth is expected to slow in the coming decade***

World population growth is expected to slow to just 1% p.a. in the next decade. The slowdown in the growth rate is manifested in all regions. Nonetheless, an additional 742 million people needing food will inhabit the planet by 2022. Population prospects and dynamics are an important determinant of the future global economic environment, affecting both the supply and demand for agricultural commodities.

Among OECD countries, Japan's population is expected to shrink during the next decade, exhibiting a negative growth rate of -0.2% p.a. Population in Europe, including members of the European Union, continues to grow but at a low rate and is projected to decline to 0.06% p.a. by 2022. Turkey, Mexico, Australia and the United States have the highest projected population growth rates within the OECD area.

Developing countries are expected to continue to experience the fastest population growth, with Africa as a whole still growing at over 2.3% p.a. Although the population growth rate in Africa is more than double that in any other region it is also slowing in comparison to the last decade.

***Inflation is expected to remain subdued throughout the OECD***

With weak demand and high unemployment characterising many of the developed economies, inflation in most OECD countries, as measured by the Private Consumer Expenditure (PCE) deflator, is expected to remain low in the coming decade despite substantial monetary expansion and quantitative easing promoted by several OECD countries. Inflation for the OECD area over the next ten years is assumed to average 2.1% p.a.

In an effort to stimulate growth, Japan has announced a 2% inflation target and *"quantitative and qualitative monetary easing"*, to spur consumption while combating years of deflation. . Inflation is expected to be problematic in many of the high growth emerging economies. In the medium term, inflation rates between 5-6% are expected for Brazil, India and South Africa.

***Inflation differential drives exchange rate***

Assumptions on exchange rates are critical to the baseline projections, as they can strongly influence relative competitiveness for exporters and affordability for importers and, hence, agricultural trade across regions.

The nominal exchange rate for the period 2013-22 is mostly driven by the inflation differentials *vis-à-vis* the United States (constant exchange rate in real term) Inflation differentials between the United States and certain dynamic economies (South Africa, Brazil and India) will drive down the value of their currencies, more than 30% over the next decade. Brazil is especially a large exporter of many agricultural products and such a large depreciation of its currency will make it an even more formidable competitor. For the other economies, no big adjustments are projected as inflation remains under control during the projection period.

***Energy prices trend upward***

Outlook (December 2012), while oil prices during the projection period are from the *World Energy Outlook* (IEA WEO-2012). In nominal terms, the price is supposed to increase slowly over the outlook period from USD 111 per barrel in 2012 to USD 144 per barrel by 2022, an average annual growth rate of 2.6%.

***Policy considerations***

Policies play an important role in agricultural and fisheries markets, with policy reforms often changing the structure of markets. Policy reforms such as decoupled payments and continued progress towards the elimination of direct price supports imply that policies will have a less direct effect on production decisions in many countries. However, import protection, domestic support and price intervention policies still loom large in many developing countries and with growing impacts that reflect these countries increasing importance in international markets and trade. The *Outlook* assumes that agricultural and trade policies will continue to be applied in line with existing legislation or announcements made. A conclusion to the DOHA Development Agenda is not assumed in this *Outlook*.

**Box 1.3. Energy prices – International Energy Agency – Methodology**

One of the important external drivers of the *Agricultural Outlook* is the crude oil price. Agricultural and energy markets have become increasingly interlinked not only through the supply side as energy is an important input but also on the demand side as the demand for biofuels has shifted outward the demand for several crops including maize, wheat, sugar and various oilseeds as feedstocks.

The oil price assumption used in the *Outlook* is derived from the International Energy Agency's *World Energy Outlook 2012* (WEO). The WEO is derived from several assumptions including government policies, assumed GDP growth rates, demographic trends, along with technological assumptions including energy efficiency. Three different policy assumptions generate three different scenarios and three different price paths for the WEO. For the *Agricultural Outlook* we have chosen the middle price path scenario labelled in the WEO as the "New Policies Scenario". For this scenario, the WEO takes into account existing policy commitments and assumes that recently announced policies are implemented. In September 2009, G-20 leaders who gathered at the Pittsburgh Summit committed to "rationalise and phase out over the medium term inefficient fossil-fuel subsidies that encourage wasteful consumption". In November 2009, APEC leaders meeting in Singapore made a similar pledge, thereby broadening the international commitment to reform. The assumptions concerning the phase-out of fossil-fuel subsidies vary by scenario. In the scenario chosen, they are assumed to be phased out by 2020 (at the latest) in all energy-importing countries and more gradually in those exporting countries that have announced plans to do so. Under this scenario, energy demand grows by more than one-third by 2035 with most (60%) of the growth coming from China, India and the Middle East. By contrast, a renaissance underway in the US energy sector is reshaping the world's energy landscape. The United States currently relies on imports for around 20% of its primary energy demand, but rising production of oil, shale gas and bio-energy means that it is assumed to become all but self-sufficient in net-terms by 2035.

Following a sharp reduction in oil prices at the height of the financial crisis in late 2008, oil prices have risen sharply with the benchmark prices of Brent and West Texas Intermediate futures trading at around USD 115/barrel and USD 93/barrel, respectively in early October 2012. In the New Policies Scenario international oil prices rise, in nominal terms, to USD 144/barrel in 2022. This rising trend reflects higher costs of producing oil from new sources to satisfy increasing demand.

Although the assumed oil price follows a smooth trend, prices in reality may be expected to deviate from these assumed trends - widely at times - in response to economic, energy market or geopolitical developments. The projections in the WEO are subject to a wide range of uncertainties. Key drivers in the energy markets are hard to predict, in part because they interact with each other. In the longer term, policy making is the area in which the greatest uncertainty exists, particularly when it comes to issues such as the extent to which action is taken to mitigate climate change, developments in energy subsidies, decision on nuclear power, and the pricing and production strategies of the major oil and gas exporters.

## Main commodity market developments

### *Agricultural prices to remain at elevated levels*

Higher priced agricultural products over the coming ten years, when compared to the pre-2007 decade, remain a distinct feature of this *Outlook*. The constellation of agricultural products and food prices have been on a higher plateau for several years as highlighted in the previous four *Agricultural Outlook* reports. A number of factors have been shaping the evolution of supply and demand for agricultural and fish products. These include high and rising energy and oil prices leading to increasing production costs and slowing yield and production growth. Slower production growth in combination with strong and rising demand, are projected to hold agricultural product and fish prices collectively at historically high levels. At the same time slower rates of agricultural production growth will also slowdown the replenishment of stocks making commodity markets more susceptible to high price volatility. The confluence of these supply and demand trends imply that prices of agricultural products are destined to rise over time with the main uncertainty being the extent and pace of the increase.

In fact many agricultural product prices are already at high levels at the start of this *Outlook*. In the absence of further market shocks, prices of most agricultural products are

projected to rise only moderately over the projection period from near term levels, although the timing varies between commodities. For instance, in the case of crops, prices decline initially in response to higher global production in 2013. Prices of livestock products, on the other hand, are projected to remain at relatively high levels from the outset for several years into the projection period, in reflection of reduced inventories and higher feed costs reducing livestock producer margins and production initially. Price movements in later years reflect improved profitability and increasing production. In general, prices for both crop and livestock products are projected to firm over the coming decade due to a combination of lower production trends and stronger demand, including for biofuels, on the back of a return to steady global economic growth and a weaker US dollar. Given the projected tighter market conditions for the different agricultural products, further bouts of price surges and increased volatility remain a distinct possibility in the event of any unforeseen market shocks over the course of the projection period.

The general evolution of prices for the selected commodities covered in this *Outlook* assessment over the projection period is shown in nominal terms in Figure 1.7. From Figure 1.7 it is apparent that wheat and maize prices are projected to decline sharply in the near term as production responds to high prices and then to increase gradually over the remainder of the projection period. All prices of the oilseed complex are anticipated to fall significantly in the next two crop years as production rebounds strongly from reduced levels. Oilseeds and product prices are then expected to increase moderately in following years with prices of vegetable oil and for protein meal remaining at elevated levels due to strong demand for food and fuel use of vegetable oil and for protein meal in feedstuffs. The demand for protein meal will be affected by the anticipated strong growth in non-ruminant and milk production in developing countries and by a higher incorporation rate in feed rations in these countries, especially in the LDCs. World rice prices in 2012 were lower than 2011, with the notable exception of Thailand, which reflects its rice pledging policy. Rice prices with more comfortable supplies and slowing demand are projected to remain relatively flat in nominal terms to 2022.

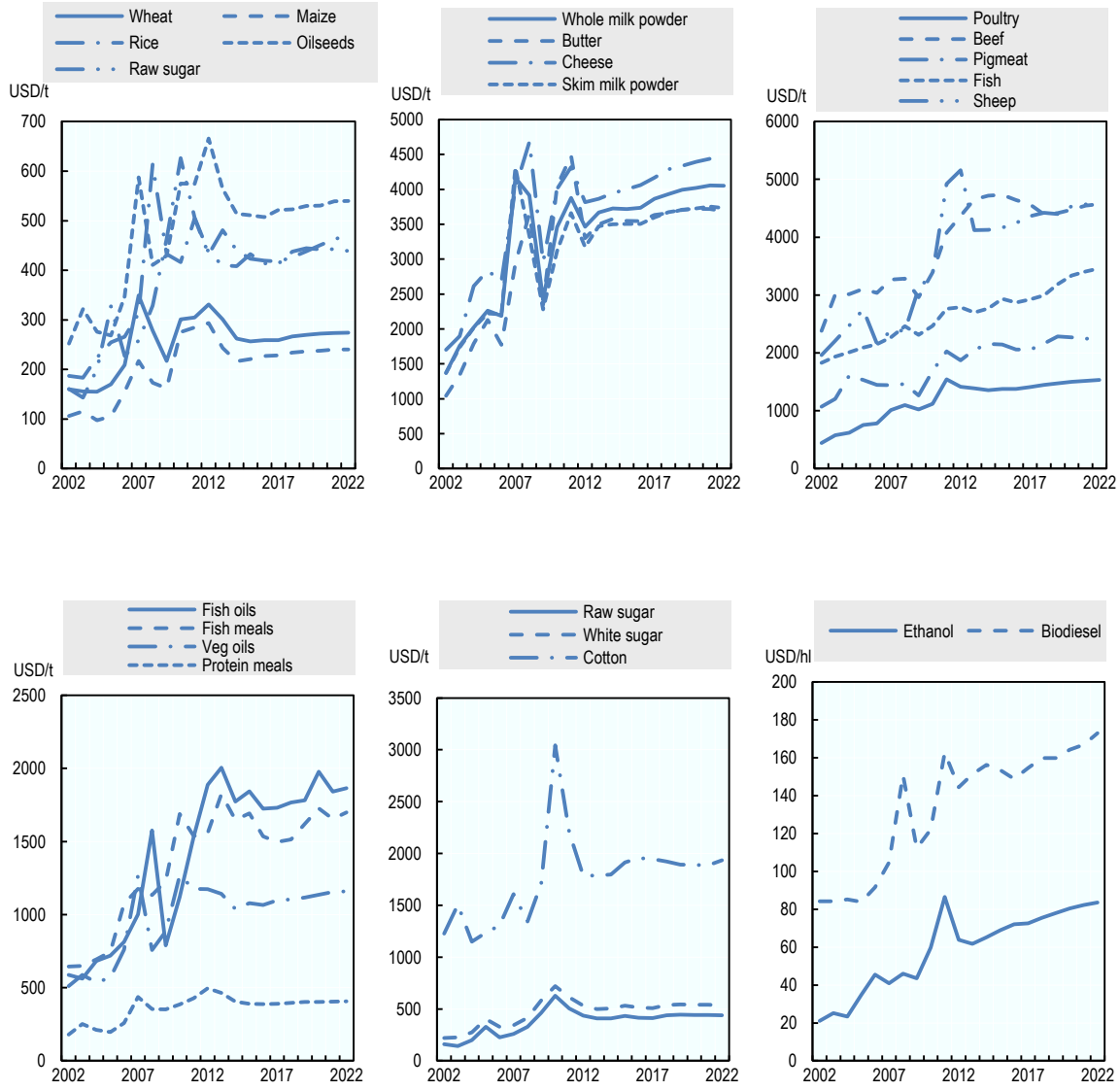
Global raw sugar prices have already declined by some 26% over the twelve months prior to the start of this *Outlook*, and with world white sugar prices having followed suite and falling by 20%. Sugar prices are expected to continue to ease downwards in the near term in response to consecutive years of a large and growing global sugar surplus and increasing stock replenishment. With steady demand growth and larger ethanol production to utilise increasing sugar cane supplies in Brazil, world sugar prices are projected to turn up in following years and average higher over the projection period. A relatively large *white sugar premium* (difference between raw and refined sugar prices) at the outset is expected to narrow over the course of the outlook period reflecting rising demand for raw sugar for processing and as additional refined sugar supplies come on stream from new toll and destination refineries. The world indicator cotton price is expected to remain relatively stable during the next decade as the volatility surrounding the 2010 spike in cotton prices subsides. By 2022, world cotton prices are expected to be lower in nominal terms than at the start of the projection period.

In terms of livestock products, prices for red meats are high at the start of the outlook period due to depleted livestock inventories and high feed and production costs. They are projected to continue at high levels for beef in the near term. Higher beef production in following years with gradual livestock inventory expansion leads to some easing in prices. Pig meat prices rise in the near term and then decline for several years before rising again in a production cycle with a moderately upward trend over the projection period. Poultry prices, with a quicker production turnaround, rise less strongly than for red meats. All meat prices increase in the later years of the outlook period as demand strengthens and as livestock producers moderate production growth to maintain returns. An upswing in international dairy prices at the start of the outlook is expected to continue with prices, in nominal terms firming

throughout the projection period. However, prices in real terms are expected to ease back after 2014, especially for butter.

**Figure 1.7. Price trends in nominal terms of agricultural commodities to 2022**

Price trends in nominal terms for agricultural commodities to 2022




*Source*: OECD and FAO Secretariats.

Fish product prices are projected to rise strongly over the coming decade as a result of strong demand, rising production costs and slowing production growth with continuing price volatility associated with supply swings. Rising prices are also projected for fish-meal and fish oil to 2022 with continuing rapid growth in per capita consumption and slowing production trends. Prices of biofuels are projected to continue to rise over the coming ten years with expected high crude oil prices and continuing biofuel policies around the world that promote demand. Ethanol prices are anticipated to rise more strongly than those for biodiesel.

In comparing the different product groups, prices of vegetable oils are projected to rise relative to protein meals. Oilseed and sugar prices rise more than cereal prices and cotton prices. Meat and dairy product prices rise relative to the costs of feeds of protein meals and cereals. Fish prices rise relative to meat prices and biofuel prices rise relative to the costs of the main agricultural feedstocks of cereals, vegetable oils and sugar crops.

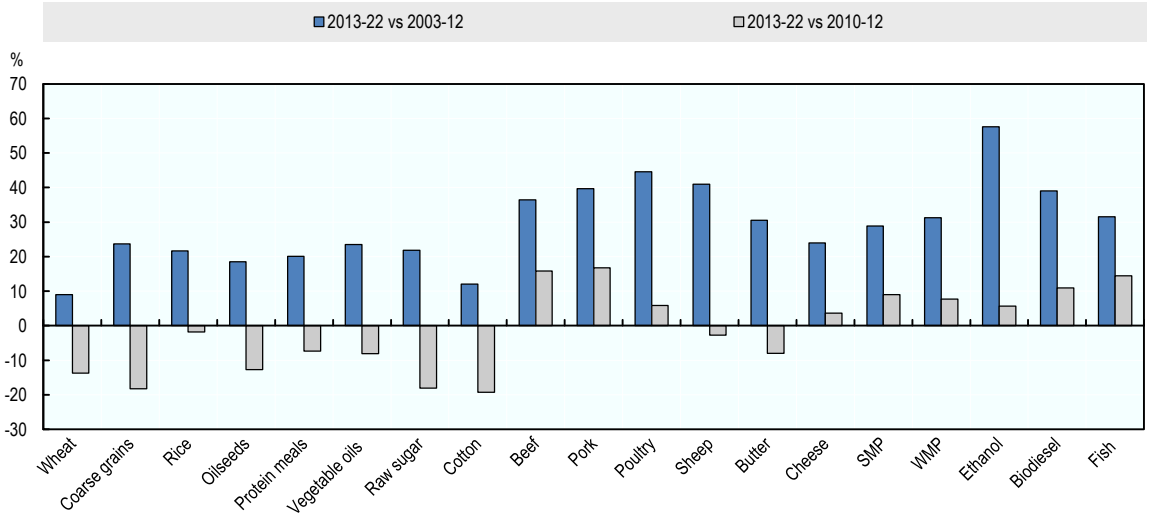
Figures 1.8 and 1.9 present another dimension of the evolution of prices of the agricultural commodities covered in this *Outlook*. In Figure 1.8, the average level of agricultural prices in nominal terms in the projection period 2013-22 is compared with the average of prices of these products in the base period (2010-12) and in the previous decade (2003-12). Figure 1.8 makes the same price comparison but with price changes in real terms (i.e. when adjusted for inflation). The last decade includes all the recent periods of commodity price spikes associated with the food crisis of 2007-08, the heat wave in the former CIS countries in 2010 and the drought of 2012 in the US maize belt and parts of Europe. When the comparison is made with the base period of 2010-12, only in the case of livestock products, (excluding butter), fish and biofuels are the average level of prices in nominal terms higher in the projection period.

When the comparison is made in real terms, only in the case of beef, pig meat, and fish do prices average higher in the projection period relative to the base period and the last decade (Figure 1.9). In comparison to the last decade, the prices of feedstuffs of maize and protein meals are projected to average higher, by 1-4%, over the next decade. Beef prices in real terms are projected to average 13% higher, pigmeat 16% higher and poultry meat price 21% higher in 2013-22. Milk powder prices are expected to average 8-10% higher in real terms, while fish prices are projected to be 9% higher and biodiesel and bio ethanol some 16-32% higher in real terms over the projection period compared to average levels achieved in the last decade.

In making the comparison with the average level of prices in the base period (2010-12), real price increases over the projection period are only projected for beef (3%), pigmeat (2%) and fish products (1%). For all other commodities, prices are projected to be lower in real terms. Nonetheless, growth in demand for food and feed products, along with continuing biofuel demand, is projected to hold the prices for cereals, oilseeds, sugar, cotton, fish and livestock products on a higher plane in the coming decade, and above levels achieved in the pre-2007 decade, in both nominal and real terms.

**Figure 1.8. All agricultural commodity prices to average higher in nominal terms in 2013-22 relative to the last decade but with a mixed picture compared to the base period**

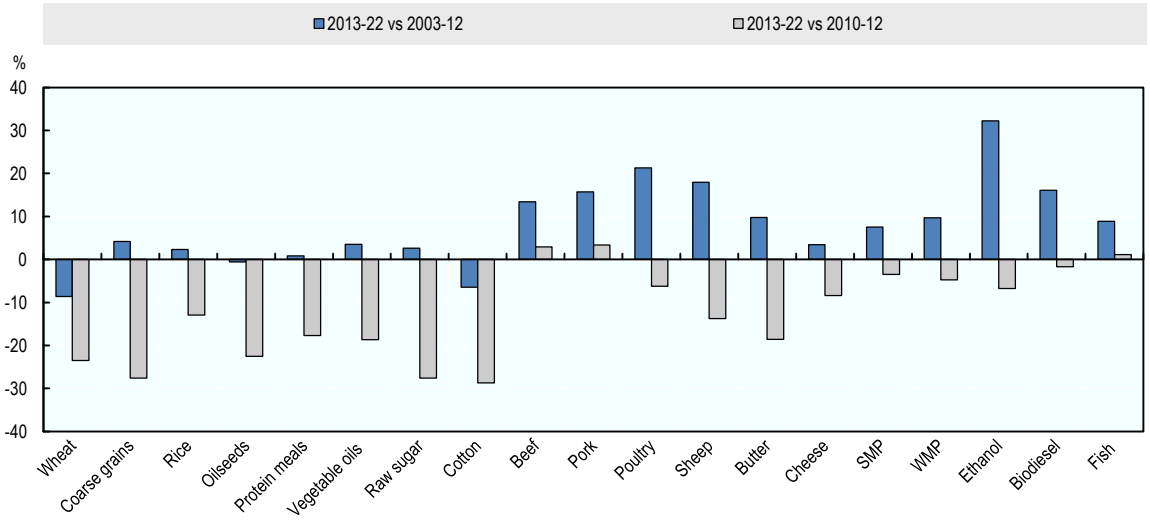
Per cent change in average nominal prices in 2013-22
relative to different base periods 2010-12 and 2003-12




*Source:* OECD and FAO Secretariats.

**Figure 1.9. Only beef, pigmeat and fish prices to average higher in real terms in 2013-22 relative to the base period and the previous decade**

Per cent change in average real prices
relative to different base periods 2010-12 and 2003-12




*Source:* OECD and FAO Secretariats.

### *Food demand strongest in developing countries*

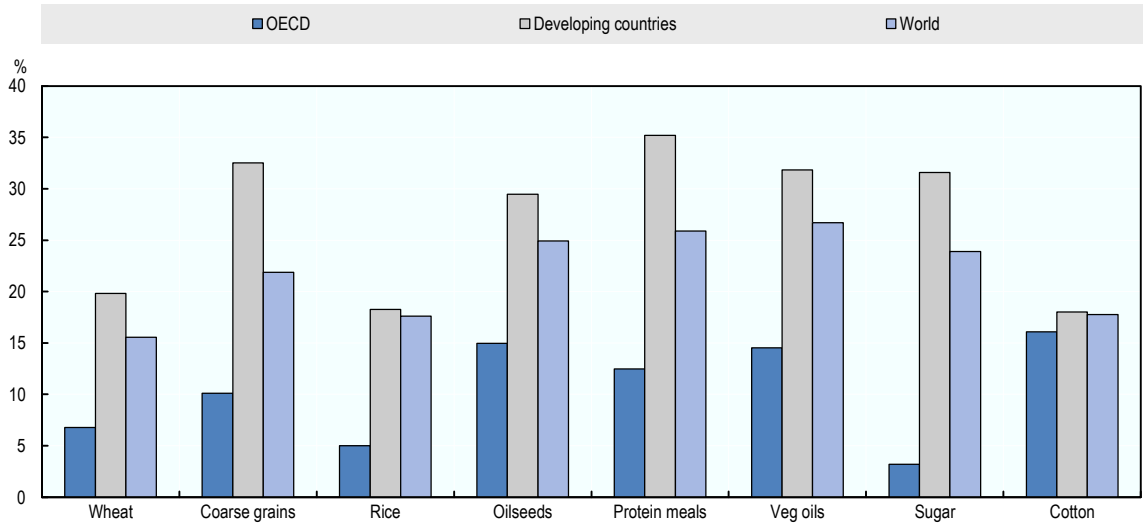
Consumption of agricultural products has demonstrated its resilience in the face of world economic shocks and a prolongation of reduced growth prospects and high unemployment in developed countries, punctuated by periods of high and volatile prices. It is recognised as the fundamental driver of agricultural markets over the medium term. Relatively fast growth in demand over the projection period is expected to contribute to tighter markets and hold agricultural product prices on a higher level than in the past. The developing countries and emerging economies play an increasingly important role in agricultural markets to 2022 in bringing about these changing market fundamentals.

Developing countries are expected to be the leading source of demand growth for agricultural products, with the projections indicating that consumption in these countries will increase for all products covered by the *Outlook*. Higher consumption of agricultural products is being driven by growing populations and their increasing concentration in large urban centres and mega cities, rising per capita incomes, expanding middle classes, and with the growing affluence of the large emerging economies and developing countries contributing to dietary changes. These developments are expected to sustain strong demand for agricultural products of food, feed and fibre to 2022 and be reinforced eventually be a return to stable economic growth and demand in the developed countries (Figure 1.10). The developing countries with their higher income propensities to consume are projected to continue to diversify their diets with a movement away from basic staples and grains to higher protein foods, including meats and dairy products as their incomes and general affluence increase. Higher consumption of meat and dairy products also leads to increased indirect demand for coarse grains and some growth in protein meals use in feed deficit regions as domestic livestock inventories expand to meet part of the increased demand (Figure 1.11).

Despite faster growth, per capita consumption of agricultural products is generally lower in the developing countries than in the developed countries, although exceptions can exist depending on such things as traditional foods and consumption practices such as for rice. Per capita consumption of agricultural products is expected to continue to grow faster in the developing countries over the outlook period as they increase their overall consumption shares. However, considerable variations in per capita consumption levels exist among these countries for the different agricultural products, and these differences are expected to persist over the projection period. Aggregate food consumption in per capita terms is projected to expand most rapidly in Eastern Europe and Central Asia where income growth is projected to be the highest. Food consumption per capita is also expected to be high in Latin America and Asia, but less so in Sub-Saharan Africa, due to wide disparity in income growth and its distribution; features which have not led to strong food consumption increases in the past. For the developed countries, where food expenditures represent a low proportion of family budgets, food demand is not particularly responsive to either income changes or prices, as markets are close to saturation for many products covered in this *Outlook*. In these markets, increased human consumption of agricultural products is more dependent on population growth and changing demographics and with changes in lifestyles associated with higher incomes driving demand for variety in diets based on added value processed products, convenience foods and meals prepared and eaten outside the home. Increasing feed use in these countries is being fuelled by rising demand for livestock products for home markets and export, and the growth in livestock inventories and their composition as well as feeding practices (pasture versus prepared rations).

**Figure 1.10. Higher consumption of crop products**

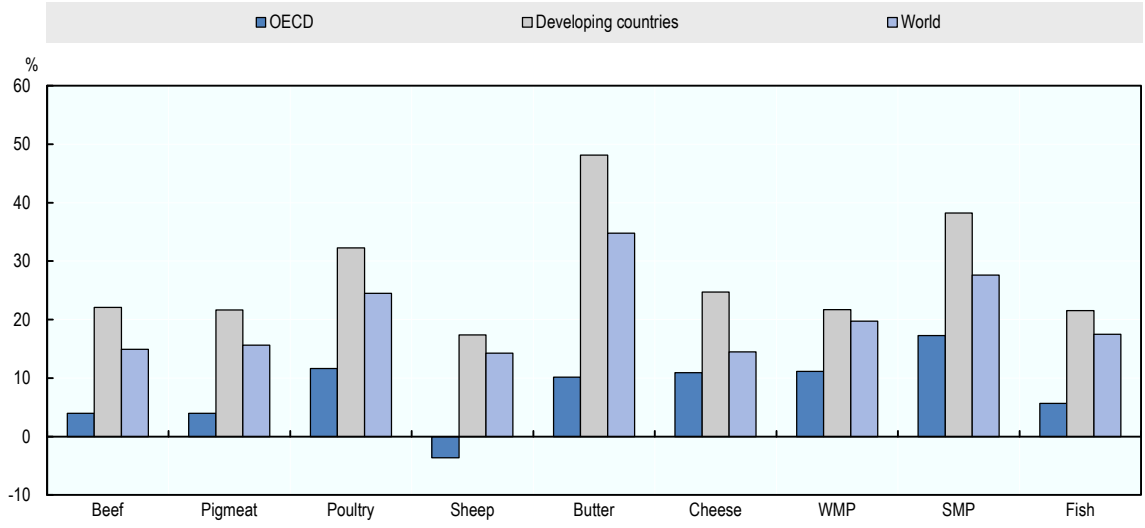
Per cent change 2022 relative to average 2010-12




*Source*: OECD and FAO Secretariats.

**Figure 1.11. Higher consumption of livestock and fish products**

Per cent change 2022 relative to 2010-12




*Source:* OECD and FAO Secretariats.

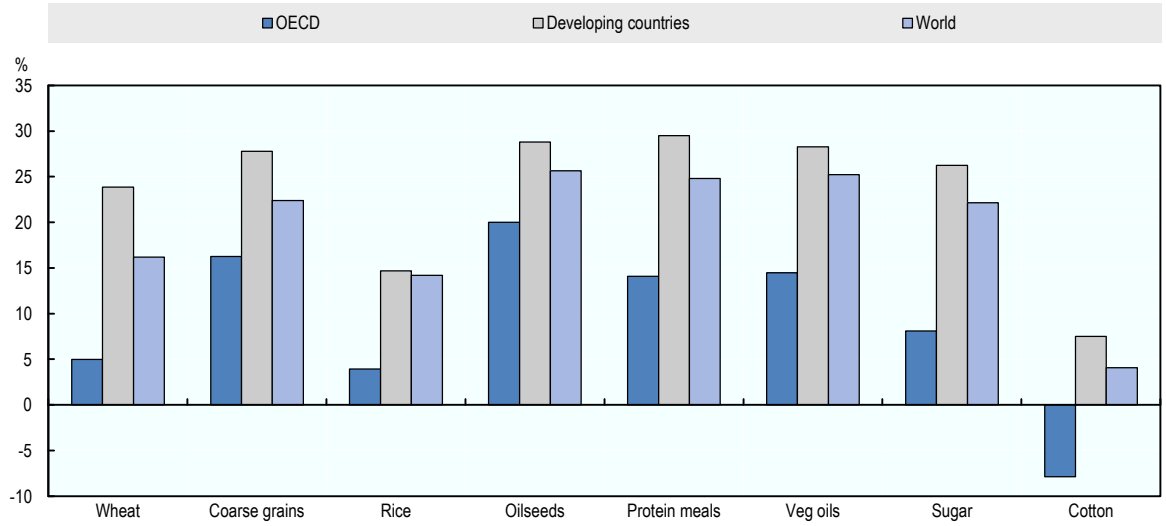
### *Global agricultural production to increase but at a slower pace*

World prices are expected to be sufficiently remunerative in the next decade to encourage further investment in agricultural production and technological enhancements to permit output to continue to expand to 2022 (Figures 1.12 and 1.13). Agricultural output for the products covered in this output grew by 2.1% p.a. over the last decade and this *Outlook* projects a slowing of output growth to 1.5% p.a., but still faster that population growth, with growth in output per person estimated at 0.5% p.a. A number of factors are expected to cause production to grow less rapidly than in the past. Land available for agricultural production is becoming more limited. Although some additional land is still available to bring into crop production in a few emerging countries such as Brazil and Russia, most countries now face limits on the

availability of suitable land for agriculture in part due to intensive competition from other uses. In these countries, most of the area expansion projected for specific crops in the *Outlook* is mainly the result of competing land away from other agricultural pursuits (crops or pasture) on the basis of higher net returns. This is expected to be the case for oilseeds, with additional land being attracted from other crops such as wheat and maize over the projection period. With new cultivatable land in shorter supply, or concentrated in specific regions of the developing world, much of the increase in agricultural production to 2022 will come from higher yields.

**Figure 1.12. Change in the production of crops**

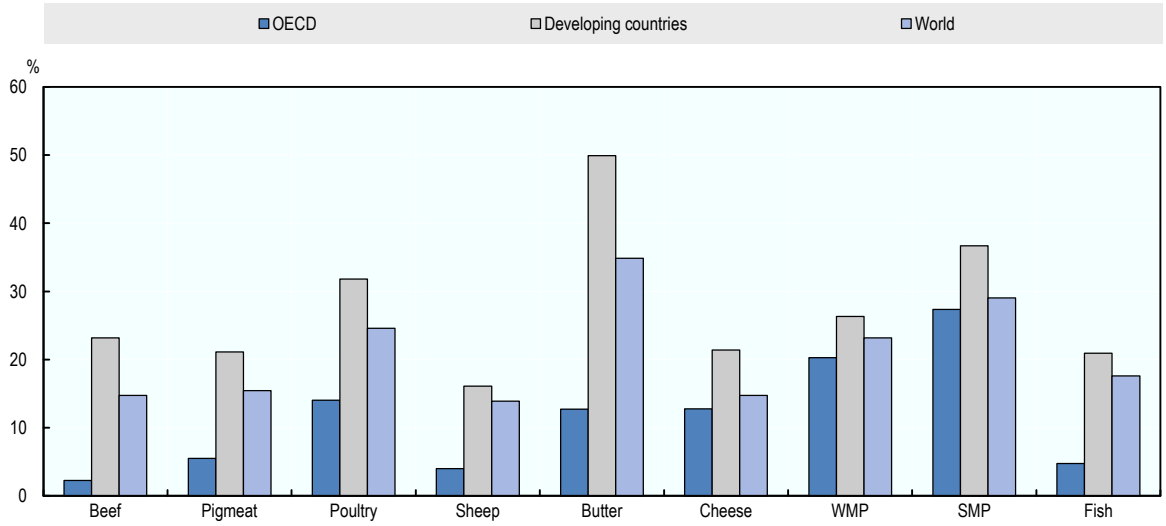
Per cent change 2022 relative to 2010-12




*Source*: OECD and FAO Secretariats.

**Figure 1.13. Change in the production of livestock and fish products**

Per cent change 2022 relative to 2010-12



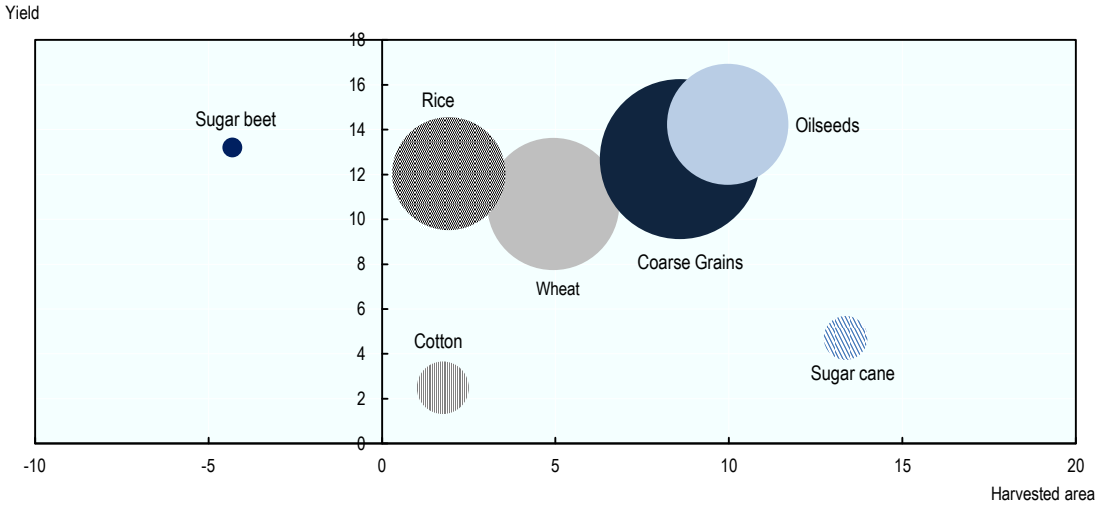

*Source:* OECD and FAO Secretariats.

However, average world yield growth for crops and especially for cereals has been slowing at least for the past two decades, in part due to reduced investment in crop research and development and dissemination of improved varieties. Despite increasing attention now being given to agricultural productivity any improvements will take time to be realised. As a result, the trend to slower yield growth is anticipated to continue over the projection period in part due to higher costs of production and growing resource constraints.

Figure 1.14 illustrates the percentage changes in crop areas and yields of the main crops covered in the *Outlook*. Wheat and coarse grains yields are estimated to increase by about 11% on average between the base year and 2022. This is well above the yield increases forecasted for other crops such as sugar cane and cotton and below those for oilseeds. However, when considering the area expansion over the projection period, coarse grains are projected to experience a larger growth (8%) than wheat (5) or rice (2). This area expansion is larger than projected for cotton (2) and sugar beet (-4.3), but below the projections for oilseeds area. The additional demand for biofuel feedstocks over the projection period (mainly maize and rapeseed) is driving the large expansion of coarse grains and oilseeds in developed countries. In developing countries, the main driver is the feed demand for livestock production. Globally, coarse grains represent the largest share of total harvested area (35%), followed by wheat (23%) and oilseeds (20%).

**Figure 1.14 Arable crop areas and yield changes**

Per cent change 2022 relative to 2010-12




*Note*: The size of the circles represents the crop area share of total area in the base year. For instance, coarse grains has the largest share of all crops considered.

*Source*: OECD and FAO Secretariats.

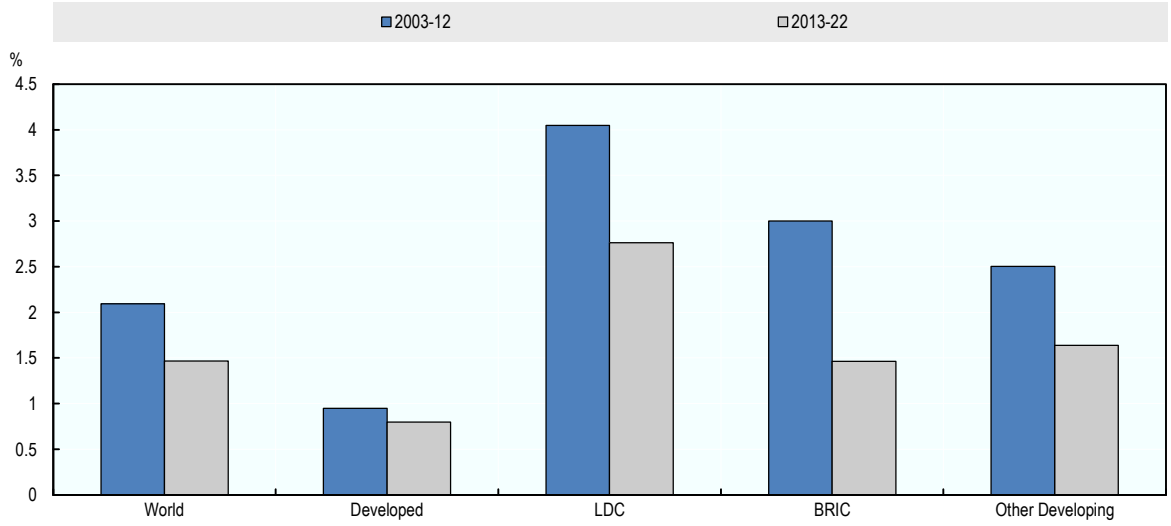
With prices of fertilisers and other farm chemicals and machinery costs closely related to oil prices, any rise in oil prices is expected to quickly translate into increasing production costs. In addition, some inputs such as water are becoming increasing constrained in availability to agriculture and more costly to procure needed supplies. Higher energy and oil prices and rising costs of other inputs are factored into the commodity price projections through higher agricultural supply costs. Higher production and supply costs will reduce the profitability of capital and input intensive agriculture and this development can be expected to further slow the growth in production. At the same time it will likely encourage production growth in countries with less intensive farming practices due to higher net returns, such as pasture-based dairy and meat operations. An exception will be countries such as the United States and Brazil, in which exchange rate depreciation will help to offset some of these cost

disadvantages to preserve the competitiveness of their agricultural production on world markets. Overall, the increasing scarcity of arable land, water constraints and rising input and energy costs in agriculture all serve to highlight the critical importance of achieving higher agricultural productivity in a more sustainable manner both at the farm level and upstream and downstream sectors of the food supply chain. This will be required to ensure the increasing food supplies needed by an expanding global population and to reduce upside price pressures over the longer term.

Slower output growth is expected to be a feature of agricultural production in both the developed and developing countries' agriculture sectors in the coming decade (Figure 1.15). Developed and the large emerging economies in particular are projected to enter a period of lower yield and production growth for most crops. This will also apply to livestock sectors of meats and dairy, but with the downward adjustments perhaps less pronounced in some cases than for crops. For livestock production, these developments reflect a combination of moderately rising feed costs, higher energy costs and a growing scarcity of inputs such as water and suitable land. However, the projected growth in global agricultural production will still be sufficient to outpace the increase in global population with output per person estimated at 0.5% p.a. Short term supply response to changing prices has been faster in the past in the developed countries with their highly capital and input intensive farming practices and capacity to adjust variable input usage rapidly. Nonetheless, agricultural production over the longer term is projected to continue to grow more rapidly in the developing countries and this will further increase their share of global agricultural output to 2022.

**Figure 1.15. Average annual growth in net agricultural output to slow**

Per cent change in least squares growth 2003-12 and 2013-22




*Source*: OECD and FAO Secretariats.

Many of the developing countries and emerging economies have continued to invest in their agricultural sectors and pursued policies to encourage production. They have the potential to increase land devoted to agriculture and improve productivity simply by narrowing the yield gap with the advanced economies' agricultural farming practices. Both area expansion and higher yield growth are expected to sustain the shift in market share to developing countries that has been underway for some time. However, what lies ahead is not all clear sailing for world food markets. High yield variability, due in part to more variable weather conditions and low input farming practices in some developing countries, is expected to be one of the factors behind continued market and price variability in the next decade. The implications of regional yield variability for the market outcomes projected in this report are elaborated on further in the uncertainties section at the end of the chapter. With developing

countries accounting for an increasing share of global agricultural production, the developed countries' share of world production of all the commodities covered in this *Outlook* declines over the projection period. For the OECD area, growth in production is anticipated to increase by just over 1% p.a. Only in the case of certain dairy products, biofuels and fish oil does production in the developed countries continue to dominate world output, having lost this status for all the other products examined in this *Outlook* some time ago. Despite this trend, the traditional agricultural producers in developed countries with their high productivity, yields and overall technical efficiency will also continue to expand production, albeit less rapidly than in the past, to remain large suppliers over the projection period of a range of products to the world market.

### *Commodity projection highlights*

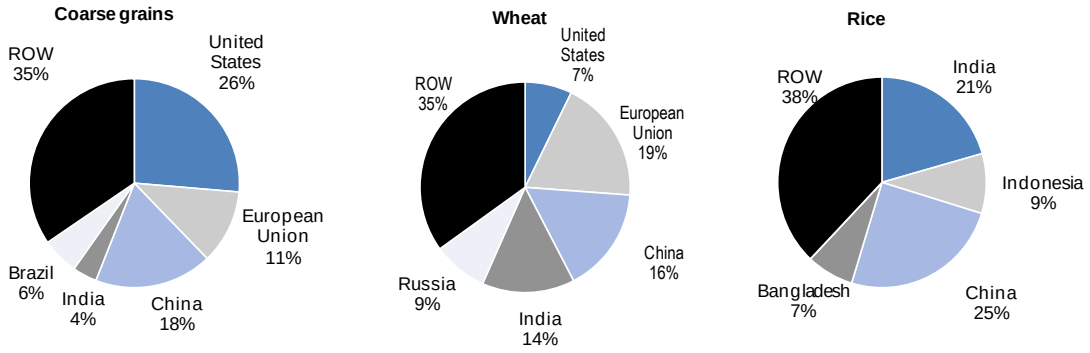
The main developments affecting the commodity markets are discussed in the commodity chapters. The following section highlights the key features of the supply and demand projections for the different commodities.

*Tighter wheat and coarse grain markets than for rice*

World production of wheat and coarse grains is projected to increase by 16% and 22%, respectively, above the base period of 2010-12 by 2022. In both cases, however, production growth will be influenced by a slowdown in yield growth that is not compensated by area expansion. For instance, world average wheat yields are projected to increase on average by 0.9 % p.a. over 2013-22, down from 1.5% in the previous decade. For coarse grains, the projected yield growth is 0.8% p.a. for the coming decade, down from 1.7% p.a., in the last ten years. A similar phenomenon is anticipated for rice, with yields growth projected at around 1% over the projection period, less than half the 2.4% p.a. achieved during the past decade. Traditional cereal producers such as the United States, Canada, Australia and the European Union are all projected to increase cereal production to 2022, but with the developing countries of Asia, Africa and Latin America accounting for around 60% of the increase. Developing countries, which hold a dominant share of global rice production, are foreseen to account for virtually all of the projected production increase.

**Figure 1.16. Production shares for wheat, coarse grains, and rice in 2022**

Change in production share 2022 relative to 2010-12




*Source:* OECD and FAO Secretariats.

Wheat use is expected to remain driven by food consumption, with direct human consumption a stable 68% of total use over the outlook period and with feed use growing at a slower pace than in the past. Rising demand for coarse grains is driven by growing feed and industrial use, primarily biofuel production with government use mandates. Per capita use of rice for food is anticipated to rise only moderately. Cereal stocks rebuild from low levels on

the back of larger harvests in the near term, but stocks-to-use remain below historical averages; except in the case of rice where world stocks remain at higher levels. Low stocks will help support higher prices but also expose the cereal markets to the risk of increased volatility. Figure 1.16 illustrates the production shares of wheat, coarse grains and rice production.

*Strong demand and high returns support expanded oilseed and products production*

World production of oilseeds and the by-products of protein meals and vegetable oils are projected to increase by 26% over the outlook period as remunerative prices continue to attract land from other crops and with yields increasing, but at a slower rate than in the past. Production of palm oil is also projected to expand to reach a 34% share of total vegetable oil production, but with output increasing at a slower rate than in the past due to increasing land constraints in the key producing countries of Malaysia and Indonesia.

Although per capita vegetable oil use for food, which is driven mainly by population growth and rising per capita incomes, rises most rapidly in the developing countries, it will still remain below the relatively stable use rates of developed countries by 2022. Faster growth of vegetable oil use for biodiesel is expected in developed countries, particularly in the European Union to 2022 as a result of the Renewable Energy Directive (RED). Annual growth in protein meal consumption is expected to be slower in many developing and developed countries, due to existing high penetration of these meals in many animal rations. LDC countries will continue to expand the use of protein meals in feed rations. Reduced global stocks-to-use in most years of the *Outlook* will be supportive of prices over the projection period, but with considerable upside price risks in the event of any major production shortfalls.

*Steady consumption growth leads to tighter sugar markets*

World sugar production is projected to increase by 1.9% p.a. over the projection period to reach nearly 212 Mt in 2022, an increase of around 38 Mt over the base period. Moderate yield growth, lower than in the previous decade, will account for most of the additional production that is projected to come from sugar cane rather than sugar beets. Brazil and India will remain the leading producers based on sugarcane. Other large producers are the European Union, the United States, Australia, Thailand and China.

Strengthening global demand is driven mainly by faster consumption growth in developing countries, where more rapid population gains and rising per capita incomes support increasing sugar use which grows by 2.5% p.a. This compares to relatively stable sugar consumption growth of less than 0.5% p.a. in the mature sugar markets of many developed countries. The developing countries of Asia and Africa are expected to retain their dominant share of world sugar use. Additional ethanol production from sugarcane, especially in Brazil, and possibly from sugar beets in the European Union after removal of production quotas, will lend support to sugar markets. Stocks-to-use is expected to decline over the medium term as markets tighten, providing support for sugar prices but also increasing the risk of upside price volatility.

*Global cotton markets to tighten moderately as stock drawdown continues in China*

This year's *Outlook* is the first to include projections for world cotton markets, an important agricultural product for a number of developed and developing countries alike. World cotton production is expected to grow by 1.6% p.a. marginally more slowly than consumption at 1.7% p.a. to reach 27.2 Mt in 2022, as the unusually high global stocks that accumulated during 2011-13 are gradually reduced. China's cotton production is expected to decline by nearly 17%, due to policy actions, while India's production is projected to rise by 25% due mainly to increasing yields, albeit with slower yield growth than in the previous

decade. A larger area planted to cotton and higher yields are expected in LDC Sub-Saharan Africa, in part due to the application of new production technology. In terms of use, overall growth in world cotton consumption is expected to be marginally below its long term average rate to 2022 and to continue to lose market share to man-made fibres (MMF). Consumption of cotton in India is expected to grow far more than in any other country, and India's textile industry will be poised to overtake that of China in the coming decade.

After rising sharply in 2011-13, global cotton stocks and stocks-to-use are expected to gradually decline over the projection period. Most of the changes in stockholdings are expected to take place in China, where stock reduction is anticipated, offsetting some increase in stocks in the United States and relatively stable stocks elsewhere.

*Biofuels demand for agricultural feedstocks to grow less rapidly*

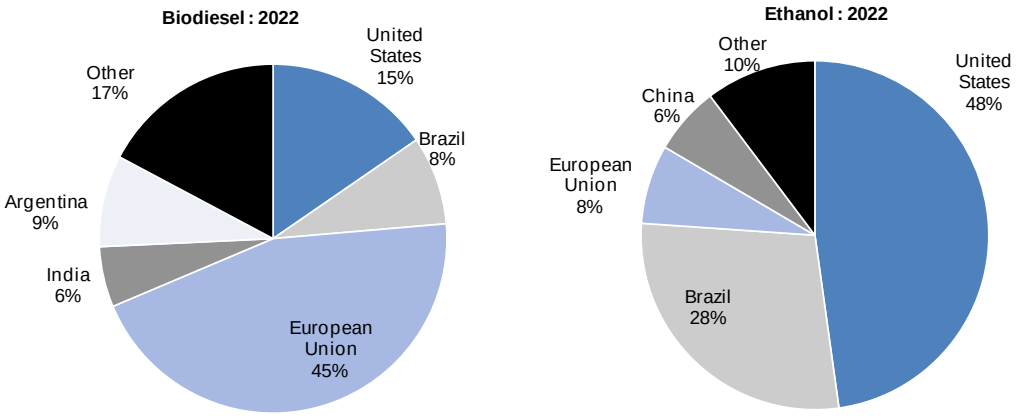
Use of agricultural feedstocks in biofuels production remains an important component of long term demand for agricultural products that holds prices at historically high levels. By 2022, world ethanol production is projected to increase by almost 70% compared to the average of 2010-12, growing by 4% p.a. to reach some 168 bnl. Production will grow less rapidly than in the previous decade, when global output grew at 18% p.a. due mainly to a slowdown in US ethanol production. The three major producers are expected to remain the United States, Brazil, and the European Union. Biofuel production is projected to consume a growing share of global production of sugar cane (29%), vegetable oil (15%), and coarse grains (12%) by 2022 .

Production and use in the United States and the European Union are mainly driven by the policies in place (i.e. Renewable Fuel Standard 2 (RFS2) and the Renewable Energy Directive (RED), respectively). In the United States the total biofuel mandate is projected to be binding throughout the projection period, with over 40% of total maize use projected to go into ethanol production. The growing production of ethanol in Brazil is linked to domestic demand from the growing fleet of flex-fuel vehicles and exports to the United States to fill its advanced biofuel mandate. Bio-ethanol production in developing countries is projected to increase by over two-thirds by 2022 with Brazil accounting for 80% of this supply increase and much of the rest coming from India and China. In the latter two countries, less than half of their ethanol production is consumed in the domestic fuel market. India's production is expected to double with molasses the major feedstock used. The growth in China is expected to come from cassava and sorghum with the likelihood of continuing restrictions on industrial use of domestic maize for ethanol production due to food security concerns.

Global biodiesel production is projected to grow slightly faster than ethanol production, at 4.5% p.a. to reach 41 bnl in 2022, but still increasing less rapidly than in the last decade. The European Union is expected to be by far the major producer and user of biodiesel. Other significant players are Argentina, the United States and Brazil, as well as Thailand and Indonesia (Figure 1.17). Total biodiesel production of developing countries is projected to increase to 14 bnl in 2022. Consumption in almost all countries of the world will be dictated by the on-going government use policies rather than commercial considerations.

**Figure 1.17. Country shares of bio-ethanol and bio-diesel production by 2022**

Per cent shares by country in 2022




*Source:* OECD and FAO Secretariats.

*Reduced livestock inventories sustain higher livestock product prices at outset*

Lower global livestock inventories are a feature of livestock markets at the start of the *Outlook*. High feed costs and reduced forage supplies from drought in the United States and in other parts of the world in 2012 have initially lead to lower producer margins and production of meats. As feed costs fall, forage and pasture conditions improve and demand strengthens over the projection period, higher livestock sector returns provide an incentive for a moderate pace of livestock inventory expansion and increased supplies of livestock products. Livestock producers are anticipated to moderate the pace of inventory growth to maintain margins and profitability. As a result of rising energy, higher operational expenses, and rising input constraints of land and water necessary for expansion, global livestock inventories and livestock product supplies of meats and dairy products expand less rapidly over the projection period than in the past decade.

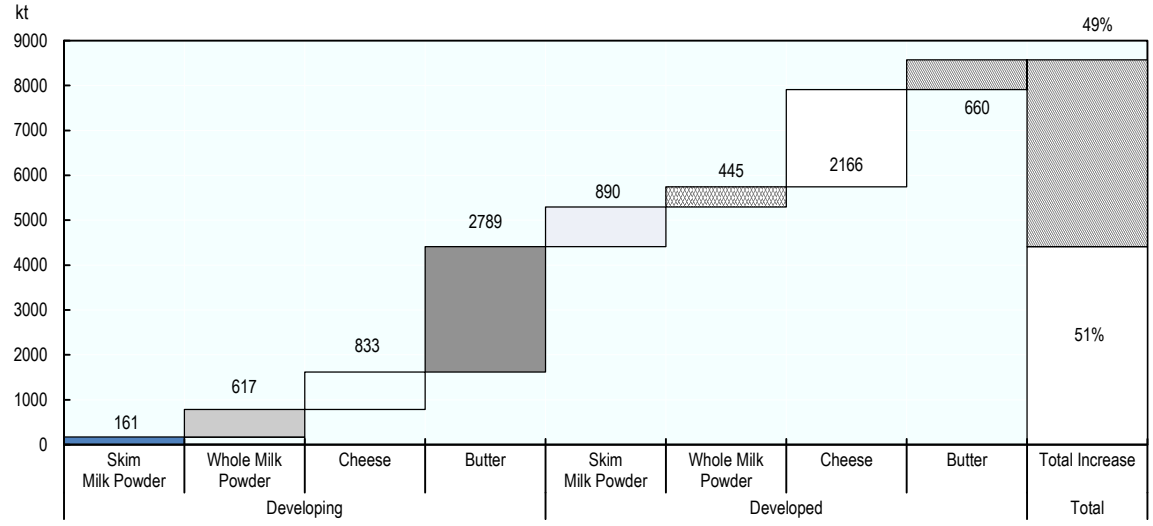
*Slower production growth for dairy products despite strengthening demand*

World milk production is projected to increase by 168 Mt, the majority of which (74%) is anticipated to come from developing countries. India and China alone accounts for nearly 40% of the change in global milk supplies. The average annual growth rate of global production over the projection period is estimated at 1.8% which is below the 2.3% p.a. witnessed in the last decade. The slowdown in growth reflects increasing shortages of water and suitable land in developing countries and similar limitations with increasing procurement costs with environmental restrictions in developed countries. Figure 1.18 suggests that developing countries will collectively account for 51% of the increase in dairy products over the projection period with butter production enjoying the largest increase. For the developed countries, cheese production will increase the most of all dairy products to 2022.

Consumption of dairy products in developing countries is expected to increase on average at about 2.2% p.a. and to basically match the growth in supplies. The expansion in demand reflects robust income growth and growing affluence, increasing populations, further westernisation of diets and greater access to refrigeration facilities. In contrast, consumption in the developed world is projected to increase on average by less than 1% p.a. and to be less than the growth in production.

**Figure 1.18. Dairy product production shares to grow in developing countries**

Production growth by region and dairy product, 2022 relative to base period 2010-12




*Source:* OECD and FAO Secretariats.

*Meat production growth to be centred on developing countries*

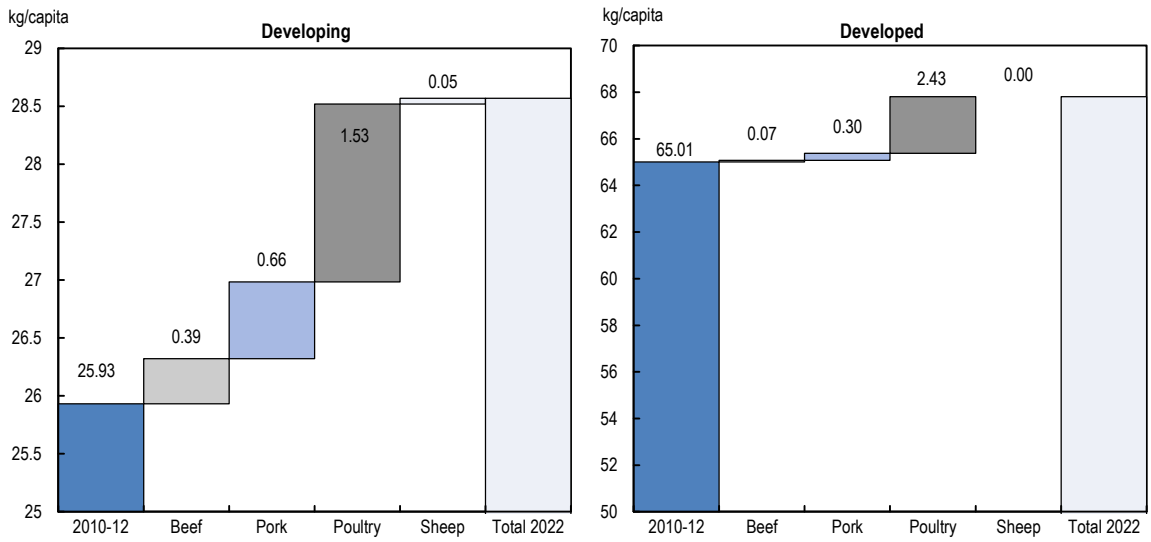
An increase in meat production over the projection period is expected to originate predominantly in developing countries, which will account for approximately 80% of the additional output to 2022. However, growth in meat supplies will be lower than in the previous decade. This will be due to a combination of factors including rising energy and feed costs that translate into higher production costs, increasing pressure from competing land uses (pasture *vs.* crops) and growing water constraints. As a consequence, world production growth is projected to slow to 1.6% p.a. during the coming ten years, compared to an average of 2.3% p.a. in the previous decade.

Larger meat production is expected to originate mostly from productivity growth, notably from improved genetics, animal health and feeding practices in both the poultry and pig meat sectors, where production cycles are shorter and technical change more rapid than for beef and sheep meat. By the same token, further productivity gains are expected to be harder to achieve in coming years, particularly in the advanced economies, as existing high levels of technical efficiency and economies of scale are bound to experience diminishing marginal returns. A notable example is expected for poultry, with a decline projected in production growth in developed economies from 3.7% p.a. over the last decade to 1.9% p.a. over the projection period to 2022. A similar phenomenon, albeit less marked, is expected for pigmeat, with production growth decelerating from 1.8% p.a. to 1.4% p.a. over the next decade. Future productivity gains in these industries will increasingly depend on how well the sector invests in research and development and technological innovation, rather than simply wider diffusion of existing technology.

Figure 1.19 reveals that despite the projected faster growth in meat consumption in developing countries, per capita consumption of meats will remain much higher, in fact more than double, in the developed countries by 2022. Per capita consumption growth is projected to be spread over all the meat types in the developing countries with the largest increase expected for poultry consumption, followed by pig meat and beef. In contrast, only marginal growth in per capita meat consumption is anticipated in the developed countries to 2022 as a result of aging populations, changing lifestyles and diets affecting consumption and will primarily be concentrated on poultry consumption.

**Figure 1.19. Growth of per capita meat consumption by region and meat type, 2022 vs. 2010-12 (kt c.w.e. or r.t.c)**

Per capita consumption shares by region and meat type, 2022 relative to 2010-12




*Source:* OECD and FAO Secretariats.

Income growth in developing and BRICS countries combined with strengthening demand, with a return to steady economic growth, in the developed countries are key factors underlying the projected expansion of meat demand. Growth of global meat consumption should average 1.6% annually for the next decade, down from 2.3% in the previous decade. Despite lower growth overall, poultry meat will grow the fastest as the cheapest and most accessible source of meat protein. Poultry will still account for 46% of the additional meat consumed by 2022 relative to the base period and outpace the growth in consumption of pigmeat, beef and sheep meat.

*Aquaculture to surpass capture fisheries contribution to world fish consumption*

World fisheries production is projected to expand over the course of the projection period, to reach 181 Mt by 2022. This represents an increase of more than 18% above the average of the base period. Recovery of certain fish stocks due to the implementation of better management of resources as well as reduced fish discards and waste levels, as required by changes in legislation governing national fisheries, should lead to a slowdown in world capture fisheries production to just a 5% expansion over the projection period. Aquaculture production is projected to continue to expand over the projection period, albeit at a slower pace of 2.4% p.a. down from nearly 6% p.a. in the last decade, to reach 85 Mt in 2022, an increase of 35% from the base period. This slower production growth will be mainly due to lower availability and less optimal production locations; the high costs of fishmeal, fish oil and other feeds; and increasing energy costs, along with the growing scarcity of suitable sites for farming. Notwithstanding the slower production growth, aquaculture will still remain one of the fastest growing sectors when compared to other food-producing systems. The share of aquaculture in total fishery production is projected to grow from 41% on average in 2010-12 to 47% in 2022.

Consumption of fish products is expected to increase strongly over the coming decade. World per capita fish food consumption is projected to reach 20.6 kg in 2022, up from nearly 19 kg on average in 2010-12. The average annual growth rate will be lower in the second half of the *Outlook* when fish start to become more expensive as a protein source in comparison with meats. Per capita fish consumption is projected to increase in all continents except

Africa, with Oceania and Asia showing the highest growth rate. Per capita fish consumption will continue to be higher in the more advanced economies. Aquaculture's share of human consumption of fish is projected to exceed that of capture fisheries in 2015 and to reach 53% of total human consumption by 2022. Consumption of fishmeal and fish oil is expected to be constrained by production which will continue to be dependent mostly on the highly regulated capture fisheries.

*Agricultural trade to increase in response to strong demand in developing countries*

The projections confirm, as summarised in Table 1.2, that the emerging economies will capture much of the growth in agricultural trade. By 2022 developing countries will account for the majority of exports of coarse grains, rice, oilseeds, vegetable oils, protein meals, sugar, beef, poultry meat, fish and fishmeal. Latin America, particularly Brazil, remains a major growth centre for agricultural production and is expected to be joined by Eastern Europe to make these two regions important suppliers of agricultural markets in the coming decade. On the import side, the food deficit regions of the Middle East, Africa and Asia are projected to have the strongest growth in food demand and agricultural imports over the coming decade due to more rapid increases in population and per capita incomes and growing affluence with large and growing middle classes in many countries.

China is the epicentre of agriculture in Asia and is driving many of the changes underway in world agriculture. China's agriculture is the subject of a special chapter in this *Outlook*. As the world's most populous country China is already one of the largest consumers and producers of agricultural products and has experienced very rapid production growth over the last 50 years. Agricultural production is based on intensive farming practices on small and fragmented farm holdings that have been able to produce large quantities of agricultural foods, fibre and fish products from limited supplies of land, water and other resources. With a policy priority for food self-sufficiency, particularly in grains, China has also achieved a high reduction in food insecurity. China is already one of the world's leading importers of a wide range of agricultural products, particularly oilseeds, cotton, and fish products, and a major exporter of many other agricultural products. The projections for China to 2022 indicate that consumption growth will likely exceed that of production in the next decade. Food demand is also expected to slow but with the mix changing towards more protein in the national diet. These trends raise a number of questions on how China will respond to emerging constraints affecting agricultural production and to what extent it will turn further to world markets for increasing agricultural and food imports. These and other issues are addressed in Chapter 2 of this report.

The OECD area's share of trade of agricultural commodities continues to decline in general as illustrated in Table 1.2. The list of agricultural products for which the OECD countries remain the main source of exports has shrunk overtime as developing countries production and trade has expanded. They now include wheat, pig meat, sheep meat, and dairy products of butter, cheese, milk powders, as well as cotton and fish oil. For imports of agricultural products, the only ones for which the OECD area remains the main destination are protein meal, fish and fish oil. For all the other products the main origins and destinations for agricultural products lies in the developing countries and emerging economies.

Despite these broad trends in favour of the increasing importance of developing countries, the traditional agricultural exporters of advanced economies such as Australia, Canada, the European Union, New Zealand and the United States will remain important players in global trade for a wide range of agricultural commodities in the coming decade. In addition to their trade in bulk agricultural commodities, these countries also have a large footprint in the faster growing trade of value added processed agricultural products.

**Table 1.2. Share of OECD in world imports and exports of agricultural products declines**

Per cent share of world exports and imports, 2003-12 and 2013-22

| COMMODITY | EXPORT | | IMPORT | |
|---|---|---|---|---|
| | Average 2003-2012 | Average 2013-2022 | Average 2003-2012 | Average 2013-2022 |
| Wheat | 66.07 | 58.59 | 23.61 | 21.73 |
| Rice | 12.98 | 10.33 | 14.46 | 13.82 |
| Coarse grains | 62.01 | 48.78 | 47.79 | 38.15 |
| Oilseeds | 50.30 | 46.27 | 38.79 | 26.75 |
| Protein meals | 16.54 | 16.99 | 62.84 | 53.19 |
| Beef | 49.75 | 47.44 | 53.21 | 46.81 |
| Pig meat | 78.65 | 83.89 | 55.08 | 45.32 |
| Poultry meat | 9.86 | 6.92 | 24.35 | 19.59 |
| Sheep meat | 77.49 | 80.58 | 41.71 | 32.92 |
| Fish | 35.89 | 32.85 | 59.30 | 52.56 |
| Fish meal | 38.14 | 35.91 | 41.84 | 39.72 |
| Fish oil | 49.52 | 57.71 | 90.63 | 79.85 |
| Butter | 83.35 | 81.00 | 19.20 | 15.15 |
| Cheese | 69.60 | 64.15 | 41.51 | 31.51 |
| Skim milk powder | 82.03 | 89.32 | 20.20 | 17.37 |
| Whole milk powder | 69.91 | 74.56 | 5.59 | 2.41 |
| Vegetable oils | 7.74 | 8.08 | 29.10 | 25.26 |
| Sugar | 18.72 | 12.84 | 26.10 | 22.29 |
| Cotton | 48.63 | 50.23 | 23.91 | 23.23 |

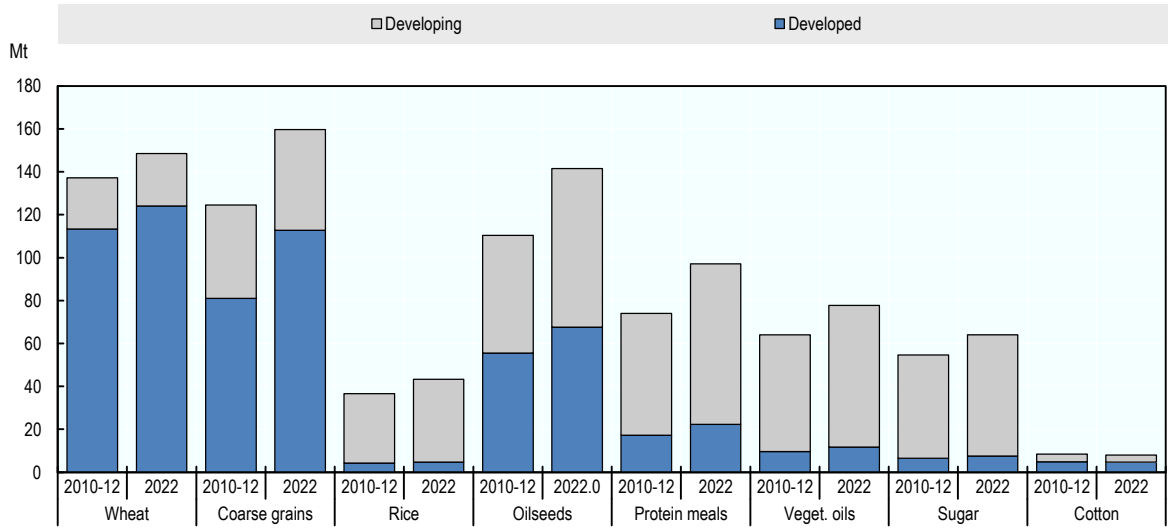
*Source*: OECD and FAO Secretariats.

Emerging country exporters of cereals in the developing world are projected to gain market shares in coarse grains and rice trade while traditional cereal exporters such as the US account for much of the growth in coarse grain trade over the medium term (Figure 1.20). Russia, Ukraine, Kazakhstan and other countries of Eastern Europe collectively account for 51% of the projected increase in cereal exports to 2022. As rice is largely consumed where it is produced it remains thinly traded, although the volume of trade has increased to around 8% of world consumption over the last decade or so. Global rice trade is likely to be facilitated by growing imports by African countries, where climate and infrastructure limit the ability of domestic production to satisfy growing demand. Imports of cereals are also projected to be dominated by developing countries where rising demand is expected for food and also for feed for expanding livestock production in feed-deficit countries. Key growth markets are projected to be China, Mexico, the Middle East, North Africa and South East Asia.

The growth in international trade in oilseeds and oilseed products has surpassed that of wheat and coarse grains for a number of years. Continued strong growth in global demand for vegetable oil and protein meals particularly in China and countries of Asia is expected to maintain oilseed and product trade above that for cereals throughout the coming decade. China is projected to maintain its dominating role in global oilseed imports which are projected to rise by 40% to nearly 83 Mt in 2022. The country's preference for importing seeds as opposed to vegetable oils and protein meals to capture the value-added through domestic crush is projected to continue, although crushing capacity is expected to stabilise. Vegetable oil exports are expected to be dominated by Indonesia and Malaysia with palm oil representing two-thirds of total vegetable oil exports in the next decade (Figure 1.21). The European Union, China and India account for the majority of the more diversified imports of these vegetable oils by 2022. China and the European Union are expected to remain the leading protein meal importers, followed by the United States and Brazil.

**Figure 1.20. Increasing exports of crop products**

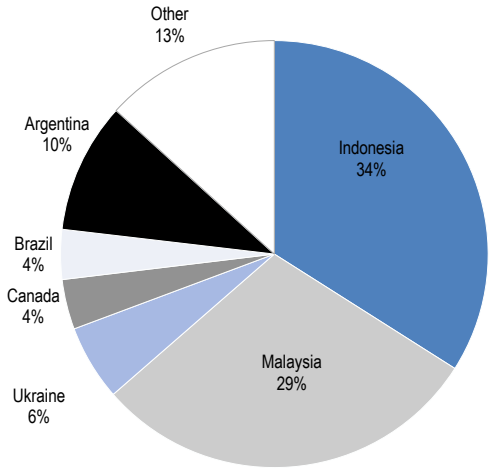
Exports of agricultural crop commodities in million tonnes, 2010-12 and 2022




*Source:* OECD and FAO Secretariats.

**Figure 1.21. Indonesian and Malaysian exports dominate vegetable oil export trade in 2022**

Per cent share of exports by country in 2022




*Source*: OECD and FAO Secretariats.

There is more of a mixed picture for trade in biofuels. Global ethanol trade is set to increase strongly, while that of biodiesel only moderately. Most of this increase in ethanol shipments is due to an anticipated growing two-way trade between Brazil and the United States that under the assumptions of this *Outlook* will be generated as a result of implementation of the US advanced biofuel mandate. The United States is expected to import about 14.6 bnl of sugar cane-based ethanol from Brazil by 2022, since ethanol from this source qualifies for the US advanced biofuel mandate. At the same time, the United States is expected to export nearly 7 bnl of its maize-based ethanol by 2022. A large share of US exports is expected to go to Brazil to help meet domestic fuel demand for its growing fleet of flex-fuel vehicles.

In the case of biodiesel trade, Argentina is expected to remain the major exporter followed by Indonesia. The European Union remains the world's largest importer of biofuels throughout the projection period, particularly ethanol from Brazil and biodiesel from Argentina. Argentina and Brazil are projected to remain the world's largest biofuel exporters with exports expanding over the projection period.

Sugar export availabilities are heavily concentrated in a handful of countries with Brazil dominating the group and accounting for just over 50% of global exports in 2022. The majority of sugar entering international trade will continue to be raw sugar although refined sugar will increase its share of global sugar trade during the coming decade. Other leading sugar exporters are Thailand, Australia and Mexico. Mexican exports of sugar to the United States are projected to increase as part of a two-way sweetener trade under NAFTA. Under the integrated NAFTA market, the United States is expected to export additional quantities of lower priced isoglucose (HFCS) to Mexico that will substitute for sugar use in liquid sweetener applications such as beverage production. Mexico is projected to ship additional quantities of sugar, including that released from domestic beverage use, to the normally higher priced US sugar market. Global imports of sugar remain more diversified than for exports and are spread over a larger group of countries including the European Union, the United States, China, Indonesia, Russian Federation, Malaysia and Korea. Imports of the Russian Federation and the European Union are projected to decline sharply in the coming decade with policy changes that favour larger domestic production and import replacement. Rising imports of sugar are anticipated in the case of China and Indonesia as domestic production fails to keep up with growing domestic use.

Lower global cotton trade is expected by 2022 as world consumption shifts away from some countries, particularly China, which nonetheless remains the world's largest importer. Higher imports are forecast for Bangladesh, Turkey, Viet Nam and Pakistan. Exports of cotton will continue to be led by the United States, with a large increase in export trade share anticipated by LDC Sub-Saharan Africa. While the US share of world trade is expected to be little different from its long-term average, LDC Sub-Saharan exports are expected to rise by 115% and its share of world trade to more than double by 2022.

A general expansion of trade in dairy products is expected over the coming decade as many developing countries consume more processed milk products with westernisation of national diets. Of the main products, butter, cheese and SMP are likely to show average annual increases of about 1.7-2.1% p.a. The bulk of this growth will be satisfied by expanded exports from the United States, the European Union, New Zealand, Australia and Argentina. Dairy exports of the United States, comprising butter, cheese, SMP and whey powder, are projected to increase by over 55%, respectively, from base period levels. Import markets will remain fragmented with the five largest importers accounting for less than 50% of the global trade in all the main dairy products. In contrast, the five largest exporters account for, on average, over 75% of world exports.

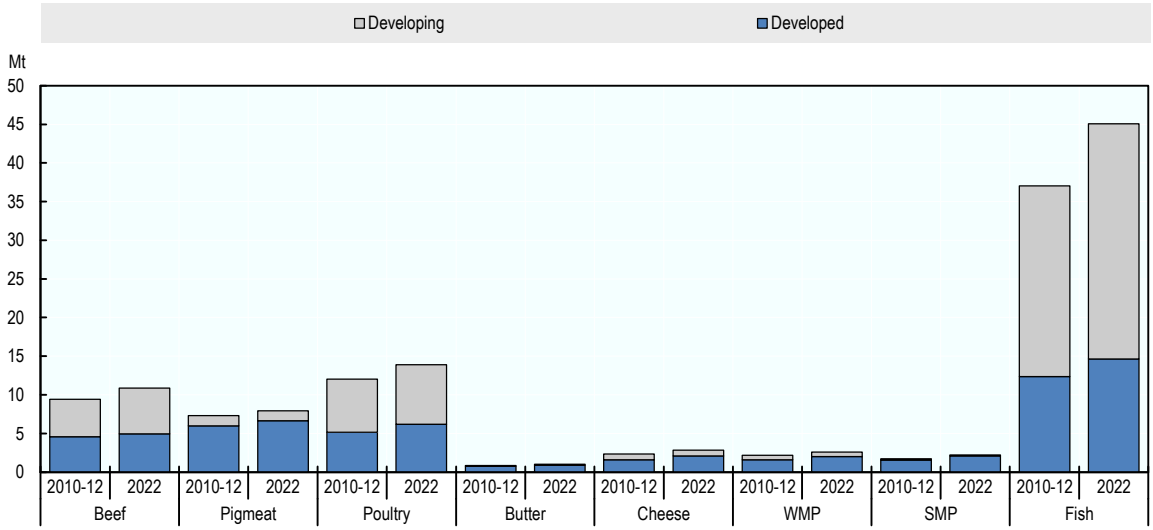
Following a decade of decline, butter import demand is expected to grow as expanding markets in the Middle East, North Africa and China offset moderately lower demand from Russia. Russia is expected to remain the largest import market for cheese, although the fastest growing markets will be found in China and Egypt. The European Union will continue to dominate cheese exports but the United States and New Zealand are set to gain market share. New Zealand is expected to increase its dominance of the WMP export trade accounting for about 56% of exports by 2022. Expansion in demand for SMP imports over the next decade is projected to originate mainly from Asia, with leading destinations in China and Indonesia.

World meat exports are expected to increase by around 19% by 2022, representing, an annual growth of 1.6% and considerably less than the 4.2% p.a. achieved in the previous decade. The main factor behind the decline is the expected growth of domestic meat production in the developing world, encouraging import replacement. Meat exports are

expected to be led by poultry and beef shipments (Figure 1.22). The bulk of the exports are expected to originate from the United States, which will account for one-third of the increase of all meats exported when compared with the base period.

**Figure 1.22. Increasing exports of livestock and fish products**

Exports of livestock and fish products in million tonnes, 2010-12 and 2022




*Source*: OECD and FAO Secretariats.

The United States has greater access to FMD-free markets because Japan has raised the age that beef and beef products from the United States can be imported into Japan This decision followed a BSE risk assessment conducted by the Food Safety Commission of Japan. As US beef is also projected to account for a larger share of the FMD-free "Pacific" market, this will affect the trade performance of its competitors in Oceania, namely Australia and New Zealand, where exports grow less rapidly. On the other hand, Oceania exports of manufacturing beef in North America are anticipated to grow. The European Union is expected to become a smaller meat exporter in the coming decade due to rising production costs. The United States is projected to become the leading meat importing country in 2022, followed by Japan, the Russian Federation, Mexico, Saudi Arabia and Korea. Australia and New Zealand are expected to remain the world's largest sheep meat exporters, to supply growing import markets in the Middle East and Asia.

Fish and fishery products (fish for human consumption, fishmeal on a fish equivalent basis) will continue to be highly traded, with 36% of world fish production (including intra-EU trade and 31% excluding intra-EU trade) projected to be exported in 2022. World trade of fish for human consumption is projected to increase at nearly 2% p.a. over the next decade, a decline in respect to the level experienced in previous ten years (+3% p.a.). Developed countries' share of world imports of fish for human consumption is expected to decline, from 55% to 53%, while developing countries will continue to be responsible for around 68% of world exports. In 2022, some 53% of world fish exports for human consumption are projected to originate from Asia, with China as the world leader. Developing countries will continue to be the main importers of fishmeal (65% of the total in 2022), due to their importance in aquaculture production. China alone should represent 63% of world aquaculture production by 2022, with a 48% share of world fishmeal consumption.

***Security of future food supplies will depend on increasing productivity and reducing waste***

Although the global population growth rate is projected to decline to just over 1% p.a. in the next decade this will still result in an additional 752 million people being added to the planet by 2022, and placing additional demands on the global food system. Additional production will also be necessary to provide feedstocks for expanding biofuel production which has become an important source of additional demand. As noted earlier, the global scope for area expansion remains limited and geographically concentrated in a few regions. In these circumstances, most of the additional agricultural production will need to come from increased productivity, as has been the case in the past. It is estimated that by 2050 agricultural production needs to increase by 60% over the next 40 years to meet the rising demand for food, or the equivalent of an additional 1 bnt of cereals and 200 Mt of meat a year by 2050, when compared with 2005-07 levels[2]. The projections contained in this report suggest that world agricultural production while slowing is nonetheless still on track to meet these longer term supply objectives. Increasing productivity, however, will be the key to containing food prices and in reducing global food insecurity. Productivity gains in the medium term may come primarily from reducing the productivity and yield gaps in developing and least developed countries with those achieved in the developed countries. The increasing role of developing countries in agricultural production, consumption and trade should enhance food security as it spreads global production risk while generating higher incomes and domestic production in many net food importing countries. Measures to reduce food loss and waste will also be critical to meeting rising demand and improving productivity in the food supply chain.

At the same time there is a growing need to improve the sustainable use of available land, water, marine ecosystems, fish stocks, forests and biodiversity. It is estimated that some 25% of all agricultural land is highly degraded, with growing water scarcity a fact for many countries. Many fish stocks are over-exploited, or in risk of being over-exploited. There is also a growing consensus that climate change and extreme weather events will increase.

**Risks and uncertainties**

The baseline is *not* a forecast but rather a projection of future outcomes conditional on a specific set of assumptions about the policies in place, the responsiveness of market participants and the future values of exogenous market drivers. In the same vein, partial stochastic analysis does not attempt to forecast the implications of all possible uncertainties for future market outcomes; instead, it allows the policy maker to select specific sources of uncertainty and quantify the likely range of variation around the deterministic baseline values that derives from these identifiable sources of uncertainty.

Each year, the *Outlook* attempts to identify key risks and uncertainties which are perceived for the projection. This year, a special effort was undertaken with the Aglink-Cosimo model to perform "partial stochastic analysis" to help discern the relative importance of key specific risks. This analysis involves performing multiple simulations (up to 500) that draw alternative values from distributions for key driving variables, and analyses their impacts on selected important outcomes for variables such as prices, production, trade, etc. Partial stochastic analysis does not attempt to forecast the implications of all possible uncertainties for future market outcomes. Instead, it allows the policymaker to select specific sources of uncertainty and to quantify the likely range of variation around the deterministic baseline values that derives from these identifiable sources of uncertainty.

2. FAO (2009) How to Feed the World in 2050, FAO High-Level Expert Forum, Rome, 12-13 October

The objective of the partial stochastic analysis reported below is to assess how uncertainty surrounding particular key assumptions about the macroeconomic setting and crop yield levels might affect the baseline projections, and the extent to which the underlying uncertainty is transmitted to various elements of the projected agricultural market developments.[3]

In these stochastic experiments, various macroeconomic and agriculture-specific drivers, which are taken as given when calculating the deterministic baseline, are treated as uncertain, and the range of probable values around the baseline outcomes corresponding to this uncertainty is analysed. The quantification of future uncertainty assumed for these drivers is based on their variability around expected values as observed in the recent past.

***Sources of uncertainty analysed***

Agricultural market outcomes depend partly on global macroeconomic conditions and crop yield fluctuations. However, the future values of these variables are not known with certainty. A total of 97 variables representing these sources of uncertainty were treated stochastically in order to analyse the implications for the deterministic baseline projections.

- *Global macroeconomic drivers:* the analysis allows for uncertainty in thirty-two variables: real Gross Domestic Product (GDP), the Consumer Price Index (CPI) and the GDP Deflator in the United States, Europe,[4] China, Japan, Brazil, India, the Russian Federation and Canada;[5] national currency-US dollar exchange rates for the last seven of these countries or regions; and the world crude oil price.
- *Agricultural yields*: uncertainty affecting the yields of 14 crops in 16 major producing countries is also analysed, giving a total of 65 product-country-specific uncertain yields (see Methodology in the full publication for further explanation).

The variability of the market outcomes calculated by the model was studied to answer the following questions: Which baseline projections are more vulnerable to the underlying uncertainty in these drivers? Are some commodities more affected than others? Are the baseline projections for some countries more subject to uncertainty than others? Is more uncertainty transmitted to market outcomes from the macroeconomic drivers or from the drivers of crop yields?

***Summary of results***

*Relative uncertainty of the macroeconomic drivers*

The extent of the variability in the macroeconomic drivers obtained by repeated sampling of errors from the assumed distributions is measured by the average annual coefficient of variation (ACV). It is calculated for each variable in two steps: first, for each year of the projection period, the (annual) coefficient of variation (the standard deviation divided by the mean) capturing the spread of outcome values is calculated. In order to avoid extreme results, the values lying between the $10^{th}$ and $90^{th}$ percentiles are taken. Second, these annual CVs are averaged across the projection period to create the ACV. Table 1.3 summarises the variability in the macroeconomic conditions. This variability characterises the macroeconomic uncertainty used as an input in the stochastic simulations.

3. The methodology is detailed in: Burrell, A., Z. Nii-Naate (2013): "Partial stochastic analysis with the European Commission's version of the AGLINK-COSIMO model" *JRC Scientific and Technical Reports*, European Commission, JRC76019: http://ftp.jrc.es/EURdoc/JRC76019.pdf.

4. EU15 only. EU15 comprises of over 90% of EU GDP.

5. These countries account for over 70% of global GDP.

Table 1.3 reveals from the magnitude of the numbers in the cells that, consistent with the economic literature and casual observation, the uncertainty characterising the CPI, the GDP deflator and real GDP is relatively small. By contrast, forecasting exchange rate fluctuations (except for the Chinese Yuan) and oil prices is very difficult. Consequently, the (past) forecast errors and spread of (future) possible projected values of exchange rates and the crude oil price are significantly larger than for the GDP deflator, real GDP and CPI.

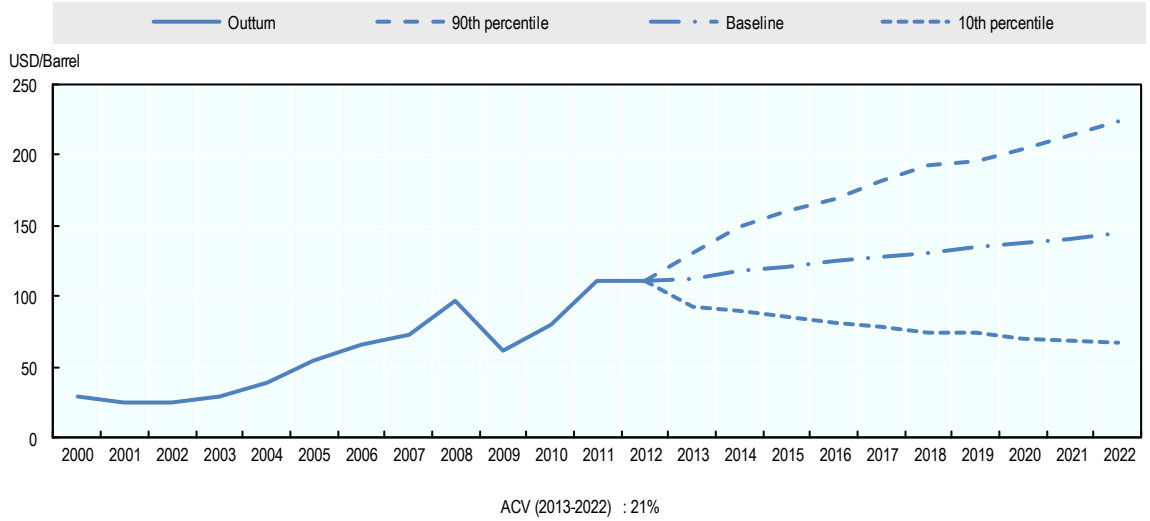
**Table 1.3. ACVs (%) of key macroeconomic variables and the crude price, 2013-22**

| | Brazil | Canada | China | EU[1] | India | Japan | Russia | USA | World |
|---|---|---|---|---|---|---|---|---|---|
| CPI | 4.4 | 0.5 | 2.9 | 0.8 | 4.4 | 0.9 | 3.4 | 1.2 | |
| GDP deflator | 3.5 | 2.6 | 5.5 | 0.5 | 3.6 | 0.9 | 7.8 | 0.5 | |
| GDP | 2.9 | 2.5 | 2.1 | 2.8 | 2.4 | 4.2 | 6.2 | 2.7 | |
| National currency / USD | 22.1 | 7.9 | 2.5 | 10.5 | 9.6 | 8.9 | 14.4 | | |
| Crude oil price | | | | | | | | | 21.3 |

*Note*: For the CPI, GDP deflator and GDP, figures refer to EU-15. The exchange rate is the EUR-USD rate.
*Source*: JRC-IPTS, European Commission.

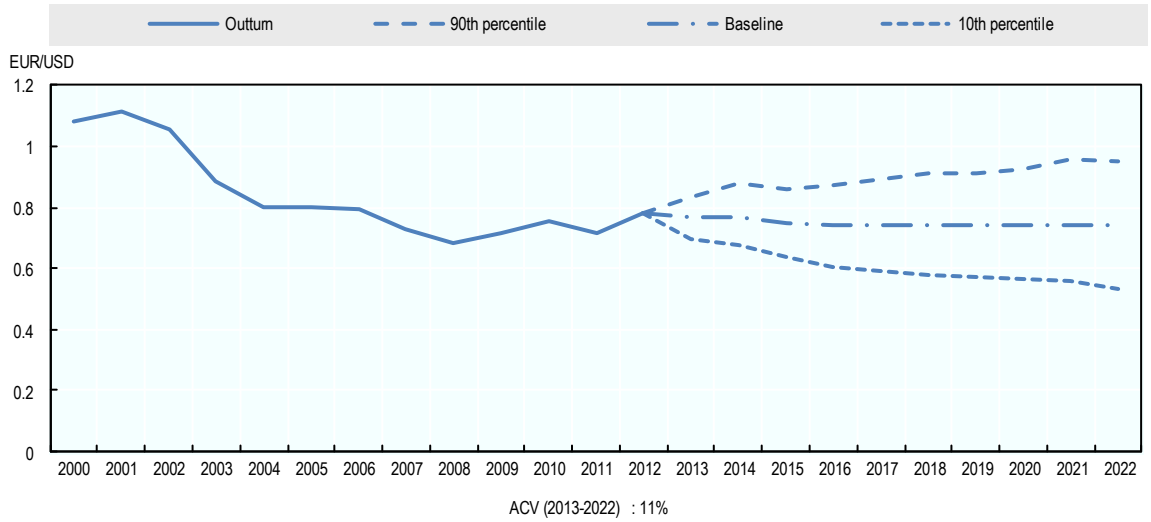
Figures 1.23 and 1.24 depict the more probable ranges the crude oil price and the EUR-USD exchange rate. The most extreme lower and upper values have been removed and the spread between the 10th and 90th percentiles is shown. The 10th and 90th percentiles of the world crude oil price projections are around USD 67 and USD 233/barrel for 2022. The 10th and 90th percentiles of the EUR-USD exchange rate in 2022 are EUR 0.53 and EUR 0.95 per US dollar, respectively, and represent lower and upper bounds to EU competitiveness.

**Figure 1.23. Crude oil price (USD/barrel)**




*Source:* JRC-IPTS, European Commission.

**Figure 1.24. EUR/USD exchange rate**




*Source:* JRC-IPTS, European Commission.

### *Relative impact of uncertainty on market outcomes by commodity*

The degree of variability observed in the AGLINK-COSIMO simulated crop yield outcomes is also summarised by the average annual coefficient of variation (ACV). Table 1.4 summarises the variability in selected crop yields due to the uncertainties analysed.

**Table 1.4. ACVs (%) of yield for selected arable crops, 2013-2022**

| | Argentina | Australia | Brazil | China | EU12 | EU15 | India | Kazakhstan | Mexico |
|---|---|---|---|---|---|---|---|---|---|
| Common wheat | **14** | **70** | **29** | **5** | **15** | **7** | **7** | **30** | **13** |
| Coarse grains | 6 | 19 | 6 | **3** | | | | | 7 |
| Maize | **15** | | **12** | 5 | **27** | **8** | | | **17** |
| Oilseeds | 9 | 18 | 5 | | 9 | 4 | | **37** | |
| Rapeseed | | **39** | | 1 | **14** | **9** | | | |
| Soybeans | **20** | | **12** | | | 1 | | | |
| Rice | 1 | | 1 | **3** | 2 | **21** | **8** | | |
| Sugar beet | | | | **25** | **5** | 9 | | | |
| Sugar cane | **26** | **14** | **5** | **18** | | | **16** | | 6 |

| | Paraguay | Russia | Thailand | Ukraine | Uruguay | USA | Viet Nam | World |
|---|---|---|---|---|---|---|---|---|
| Common wheat | **59** | **20** | | **33** | **39** | **10** | | 2 |
| Coarse grains | **22** | | | **22** | **27** | 7 | | 2 |
| Maize | | | | | | **15** | | |
| Oilseeds | **19** | | 1 | **25** | 1 | 5 | 1 | 2 |
| Rapeseed | | | | | | | | |
| Soybeans | | | | | | **11** | | |
| Rice | | | **5** | | | **5** | **8** | 1 |
| Sugar beet | | **21** | | | | **15** | | 3 |
| Sugar cane | | | **16** | | | **8** | | 2 |

*Source*: JRC-IPTS, European Commission.

The ACVs reported in Table 1.4 capture the variability of yields due to crop yield uncertainty only. The shaded cells correspond to yields that are treated as stochastic, and which have been "shocked" in each run according to their probability distribution. ACVs in non-bold text cells are for crops that are not treated as stochastic but whose solutions vary across runs because of uncertainty that is transmitted to them from the stochastic variables via the model. Empty cells contain zeros; these crop yields are not treated stochastically, and the uncertainty from other variables that is transmitted to them via the model is negligible.

Crop yield uncertainty is shown to be greatest in Uruguay, Paraguay, Kazakhstan and Australia and smallest in Europe, China and the United States. Average yield uncertainty at global level is much smaller than at country and regional level. It should be borne in mind that these results are based on the variability observed at the end of the 20th and beginning of the 21st centuries, and on the assumption that yield variation is not correlated between geographically separated regions.

***Relative impacts of macroeconomic and crop yield uncertainty***

The joint impact of the macroeconomic and yield uncertainties can be broken down according to whether it derives from macroeconomic conditions or crop yields. Table 1.5 shows the impacts for selected variables of each type of uncertainty separately, in comparison with the joint impact.

Production and use[6] of the four crop products shown in Table 1.5 are affected largely by uncertainty in yields. This is more marked for production than for use, indicating the role played by stocks in reducing supply-side pressure on these markets. The volumes of global trade in these products are more uncertain than their production and use, with the greater part of the uncertainty coming from crop yield uncertainty. However, a degree of macroeconomic uncertainty is also transmitted to these trade volumes, and in the case of rice, uncertainty from this source alone is more comparable in magnitude with the uncertainty coming from yields. Uncertainties accumulate in world market prices, which adjust to clear global markets.

Beef, pig and poultry meat markets are less affected by the uncertainties analysed. For these products, the impacts of macroeconomic uncertainty are comparable or greater than those of yield uncertainty. More crop yield uncertainty is transmitted to pork and poultry production relative to beef, reflecting their greater use of purchased feed. Traded volumes and world market prices for meats are also more subject to macroeconomic uncertainty than to yield uncertainty. Cheese production, use, trade and world market price are much more sensitive to uncertainty from macroeconomic conditions than from yields, as the raw ingredient (milk) is a relatively small component of total cost, production processes are industrialised, and due to a relatively high income elasticity of demand, cheese markets are more influenced by demand fluctuations. For both protein meals and vegetable oils, production and use are more sensitive to uncertainty from crop yield than macroeconomic conditions. Yield uncertainty is important for traded volume and world market prices for protein meal, but for vegetable oils, macroeconomic uncertainty dominates, due to the use of this commodity as a biodiesel feedstock.

Production and use of the two biofuels are potentially more responsive to macroeconomic uncertainty (GDP and crude oil price) transmitted from the demand side of the market. However, domestic markets are relatively stable,[7] with uncertainty being transmitted massively to trade volumes, and to a lesser degree to world market prices.

6. Use includes human consumption, feed use, biofuel use and other.

7. The extent to which biofuel mandates are fulfilled in those countries concerned is fixed exogenously. For more details, see the biofuels chapter in this volume.

**Table 1.5. ACVs (%) for selected baseline variables, conditional on macroeconomic and crop yield uncertainty separately and jointly, 2013-2022**

| | Global production | | | Global use | | | World trade | | | World market price | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Macro and Yield | Macro | Yield | Macro and Yield | Macro | Yield | Macro and Yield | Macro | Yield | Macro and Yield | Macro | Yield |
| Wheat | 2.5 | 0.3 | 2.5 | 0.9 | 0.2 | 0.9 | 4.4 | 0.9 | 4.3 | 12.9 | 6.7 | 10.5 |
| Coarse grains | 2.4 | 0.3 | 2.3 | 1.0 | 0.2 | 1.0 | 5.0 | 2.1 | 4.5 | 13.4 | 7.5 | 10.7 |
| Oilseeds | 2.8 | 0.8 | 2.7 | 1.8 | 0.8 | 1.6 | 4.0 | 1.5 | 3.8 | 15.6 | 8.3 | 13.4 |
| Rice | 1.5 | 0.5 | 1.4 | 1.1 | 0.5 | 1.0 | 3.8 | 1.2 | 3.5 | 11.3 | 4.4 | 10.1 |
| Beef | 0.5 | 0.4 | 0.2 | 0.5 | 0.4 | 0.2 | 3.3 | 3.0 | 1.2 | 11(7) | 11(6) | 3(4) |
| Pork | 0.5 | 0.4 | 0.3 | 0.5 | 0.4 | 0.3 | 2.1 | 1.3 | 1.6 | 9(8) | 8(7) | 5(5) |
| Poultry | 0.8 | 0.5 | 0.6 | 0.8 | 0.5 | 0.6 | 3.1 | 2.9 | 1.2 | 7.7 | 6.5 | 4.1 |
| Cheese | 0.6 | 0.5 | 0.1 | 0.6 | 0.5 | 0.1 | 2.5 | 2.2 | 0.9 | 6.3 | 5.5 | 2.8 |
| Skimmed milk powder | 0.3 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 | 0.8 | 0.5 | 0.6 | 5.2 | 4.5 | 2.6 |
| Protein meal | 1.6 | 0.7 | 1.5 | 1.4 | 0.6 | 1.3 | 1.4 | 0.8 | 1.1 | 11.4 | 8.0 | 7.8 |
| Vegetable oils | 0.9 | 0.3 | 0.8 | 0.7 | 0.3 | 0.6 | 0.6 | 0.5 | 0.2 | 6.9 | 5.7 | 3.8 |
| Ethanol | 3.4 | 2.9 | 1.4 | 3.4 | 2.9 | 1.4 | 18.4 | 13.6 | 10.3 | 12.7 | 12.3 | 2.3 |
| Biodiesel | 3.0 | 2.7 | 0.9 | 3.0 | 2.7 | 0.9 | 19.7 | 18.2 | 6.4 | 10.3 | 9.4 | 4.3 |

*Note*: AGLINK-COSIMO distinguishes two world markets for these meats (Atlantic and Pacific), with trade flows being allocated to each according to the foot and mouth disease status of the exporter, preferential bilateral trade links and so on. The first ACV shown for world market prices refers to the 'Atlantic' market, the second to the 'Pacific' market.

*Source*: JRC-IPTS, European Commission.

### *Investigating specific risks*

Although in this analysis the normal distribution is used to characterise the spread of uncertain values, thus assuming that a particular driver's uncertainty is symmetrically distributed around its most likely value, it is still possible to investigate the implications of asymmetric or even one-sided risks. This can be done by analysing a subset of the simulated solutions in which the values of one or more drivers lie in a particular range. For example, one could select runs that are based on unusually high rates of price inflation in a specific region, or on bumper yields for biofuel feedstock crops worldwide. A limitation of this approach is that, if a specific risk is defined very narrowly, it may result in a subset of runs that is too small to be reliable. However, that can be remedied by increasing the number of initial draws.

To illustrate this approach, two scenarios were investigated, each defined by a combination of less likely circumstances: i) lower-than-normal yields for three major crops in 2022; and ii) a lower-than-expected world crude oil price in three consecutive years, 2020-2022. For each scenario, a subset of the runs corresponding to the relevant ranges of values for the drivers concerned were isolated from the full set of solutions, and the outcomes in the subset were analysed.

The use of joint probability distributions means that in the selected subsets the averages of other stochastic variables, even though they are not constrained to lie within a particular range, are different from the averages when all simulation solutions are considered, and different from the trend values assumed in the deterministic baseline. Moreover, when the subset is selected according to crop yield criteria, it is almost certain that the average values of the macroeconomic variables will also differ from those of the full set of solutions, due to sampling variation, although macroeconomics variables and crop yields are assumed to be uncorrelated.

#### *Lower-than-average crop yields*

This scenario was implemented by selecting the runs in which US maize yield, Russian wheat yield and Brazilian soybean yield in 2022 all fell between their $10^{th}$ and $50^{th}$ percentiles. These restrictions yielded a subset of 19 simulation solutions (4.7% of the total number of solved runs).

Although only three crop yields were forced below their most likely value by the selection criteria, the positive correlations between crop yields within regions means that the yield levels of many competing crops were also below average. Moreover, in this subset of simulations, the oil price (assumed to be uncorrelated with yields) turns out to be 7% lower than in the baseline. The average outcomes in the subset are compared with the deterministic baseline values. The key results are described below.

World market prices for grains and oilseeds are on average considerably higher in this subset of runs than in the baseline (wheat: +12%, coarse grains: +16%, oilseeds: +14%). These steep rises occur even though global production of each crop is only 2% or less below the baseline levels, thereby indicating the tightness of world grain markets. However, at country level, production is on average considerably lower than in the baseline in various key trading countries including the United States (maize: -6%), Russia (wheat: -11%, oilseeds: -11%), Brazil (soybeans: -10%, sugar cane: -11%) and Ukraine (wheat: -5%, coarse grains: -9%, oilseeds: -8%), which helps to explain the results for world market prices. These trends are not followed in the European Union, where production of major crops is higher by 2% or less, depending on the crop, since EU yields are not correlated with yields in the regions selected for this exercise.

Average world market prices of other agricultural commodities are also considerably higher than in the baseline, between 5% and 9% for the main meats and 4% for dairy products. The volume of world trade is lower for all grains and oilseeds except rice, unchanged for meats and higher for cheese and butter. Average feed costs for both ruminants and non-ruminants are considerably higher than in the baseline (+15% in Australia, +15-16% in North America, depending on the country and type of feed, and +15% in the European Union).

Ethanol production is on average 5% below the baseline, due to both the increase in feedstock prices and the loss of competitiveness vis-à-vis cheaper crude oil. However, global production of biodiesel and vegetable oils hardly changes. World market prices are on average 6% above baseline levels for ethanol and 3% higher for biodiesel, and that of vegetable oils is 4% higher. The volume of global trade in biofuels is on average much higher (ethanol: +9%, biodiesel: +17%).

*Lower-than-expected world crude oil price*

To investigate the implications of this specific risk, runs in which the crude oil price lay between the 30$^{th}$ and 50$^{th}$ percentiles of its distribution in the three years 2020-22 were selected. This selection criterion yielded a subset of 81 runs (20% of the solved runs), for which the average crude oil price over the three years is USD 117 (17% below the baseline value). In this subset, the macroeconomic context differs from that of the baseline: there is a small appreciation of the US dollar against the yen compared with the baseline, and the Euro loses 2% of its value against the US dollar. By contrast, the value of the Russian rouble and the Brazilian real against the US dollar is 4% and 3% higher, respectively, than in the baseline. Finally, this lower-than-expected range of crude oil prices is associated with lower levels of GDP (-1%) in the main trading countries, including Brazil; only in China and India is real GDP virtually the same as in the baseline.

The key impacts found for agricultural commodity markets were as follows. World market prices for some biofuel feedstocks are lower than in the baseline (coarse grains: -3%, vegetable oils: -2%, wheat: -4% (three-year averages of subset averages)). However, some regional price effects for feedstocks are more marked (for example: sugar cane in Brazil: -6%, rapeseed in the European Union: -6%). World market prices for biofuels are also lower in this subset of runs than in the baseline (ethanol: -7%, biodiesel: -5%), reflecting similar price changes in key producing countries (the United States, Brazil and the European Union). The largest falls in biofuel production occur in Brazil (ethanol: -7%) and the United States (biodiesel: -5%). EU production is about 2% lower for both biofuels. The net effect of the lower competitiveness of biofuels against crude oil at global level is an average production fall of 2-3%. The annual impact of lower than expected crude oil prices on key variables is quite stable over the three years considered, and there is no apparent emergence of any trends due to oil prices over the three consecutive years.

## Conclusion

This analysis provides a glimpse of how partial stochastic analysis can be used to supplement the information provided by the deterministic baseline, by showing which baseline variables are more affected by the uncertainty associated with a given set of exogenous variables. Moreover, for policies that are triggered or modified when a variable exceeds or falls short of a fixed threshold (for example, a quota becomes binding when the ceiling is reached, or a farm payment becomes payable when market return falls to a given level) partial stochastic analysis can indicate, when relevant uncertainties are taken into account, the probability that the threshold is reached, although the deterministic baseline value of the trigger variable may itself be quite distant from the threshold. It is also possible to use partial stochastic analysis to investigate the implications of specific risks, characterised by one or more uncertain variables falling within a defined range of their possible values.

The sensitivity analysis indicates that if the pattern and extent of crop yield variability that was observed over the last two decades continues over the following decade, then crop yield uncertainty will be greatest in Uruguay, Paraguay, Kazakhstan and Australia and smallest in Europe, China and the United States. Average yield uncertainty at the global level is much smaller than at country and regional level. Nonetheless, considerable uncertainty will still be transmitted to world markets for grains and oilseeds, with the uncertainty of world market prices, relative to the projected baseline, about double that of traded volumes. Crop yield uncertainty will also affect world market outturns for livestock products, especially meats, but to a smaller extent. In all these markets, yield-induced uncertainty is compounded by the uncertainty assumed in key macroeconomic variables, the most variable being exchange rates and the crude oil price.

The baseline projections for world trade in biofuels in 2022 must be viewed as particularly uncertain, even with the assumption that all mandates are filled. In these markets, the uncertainty transmitted from crop yield variability is dominated by that generated by macroeconomic variables on the demand side due to uncertainties in incomes and crude oil-based fuel prices.

At the same time, it is stressed that this type of stochastic analysis does not forecast the evolution of future uncertainties. To obtain a projection of how uncertainty is likely to evolve in future years, relevant information must be obtained elsewhere from prospective statistical studies, biophysical modelling or from a panel of experts. These projections of uncertainty could then be used as an input into the stochastic model. In the work reported here, a hypothetical scenario involving a historically-based profile of uncertainty has been run through the model, in the spirit of a sensitivity analysis, in order to assess how robust the deterministic baseline is to this particular uncertainty profile.

## *Chapter 2.*

# FEEDING CHINA: PROSPECTS AND CHALLENGES IN THE NEXT DECADE[1]

The historic economic and social transformation of China which has been evidenced in the past three to four decades has and will continue to have huge potential implication for international agricultural markets which are the focus of this *Outlook*. China, which now holds one-fifth of the world's population, is endowed with little arable land and water supplies relative to its population base. Indicators point to continued robust growth in domestic demand for agricultural products, but also to potential challenges on the supply side. China has undertaken significant market reforms and depending on future policy options, may engage world markets more or seek its own means to meet its increasing domestic demand.

China's success in increasing agricultural production and in feeding better its growing population in the past three decades has been remarkable. Since joining the World Trade Organization in 2001, however, trade patterns have started to change. While it remains self sufficient in specific food security commodities, China's doors have opened to certain commodities such as oilseeds and trade has grown exponentially. For some commodities, including pigmeat, dairy products, maize, and sugar, imports have grown considerably in recent years. Retail food price inflation has been significant since 2000. While it would appear that substantial room exists for productivity gains to sustain domestic market advantage, constraints of land, water, and even rural farm labour appear to limit future supply response.

On the macroeconomic side, exchange rate appreciation due to high growth in exports of labour intensive manufacturing products also has made agricultural imports more attractive. On the other hand, China's agricultural policies are fundamentally addressed to goals of reducing the rural/urban income divide (Box 2.1), as well as enhancing food security through policies for raising agricultural production and improving productivity. Furthermore, consumption trends for both calories and protein in China, compared to the higher income economies of the OECD, indicate that the gap has significantly narrowed. Demand pressure with high income growth is expected to sustain in the medium term, but it should ease considerably compared to recent past experience.

This chapter begins by reviewing the performance of China's agriculture in recent decades and situates the sector in the context of current domestic and global conditions. It then presents the outlook for China in the context of domestic and international factors and policies which condition its medium term prospects. This includes a detailed look at certain macroeconomic and demographic factors, the emerging challenges which need to be addressed, and policy responses which will certainly underlie sectoral performance. The

1. This chapter has been developed and written in collaboration among FAO, OECD, the AII of CAAS, and the Ministry of Agriculture of China. However, the data, analysis and projections are those of FAO/OECD and do not necessarily represent those of its collaborating partners.

baseline projection for key commodities is then provided, followed by an assessment of the key risks and uncertainties that could have a major potential impact on the outlook.

The baseline builds on the consensus of country and industry collaborators, which for the first time includes commodity experts at the Agricultural Information Institute of the Chinese Academy of Agricultural Sciences (CAAS). The baseline is not a forecast in the usual sense of the term but a plausible outcome intended to facilitate discussion concerning policy choices by confirming a forward looking perspective in the context of apparent risks. While neither this chapter nor the *Outlook* in general are intended to assess agricultural policy developments or to recommend policy options, the agricultural policy environment is considered in the context of the impact on markets and trade. It also excludes consideration of the industrial, infrastructure and tax policy environment.[2]

## The success of China's agriculture

Over the course of the past four decades, China has displayed vigorous growth. In 2011, the Chinese economy, as measured by its gross domestic product (GDP), was almost 20 times larger in volume terms than it was in 1980. The agricultural sector, as measured by FAO's net agricultural output index grew by 4.5 times over the same period. The rapid growth in both national income and agricultural output has contributed to substantially higher national food availability and a much improved access to food. The details surrounding such success has many dimensions, including a changing policy environment, increased national investments, and improved factor productivity, all amid a rapidly changing rural, demographic and economic landscape, regional differences but also critically rising land and water constraints.

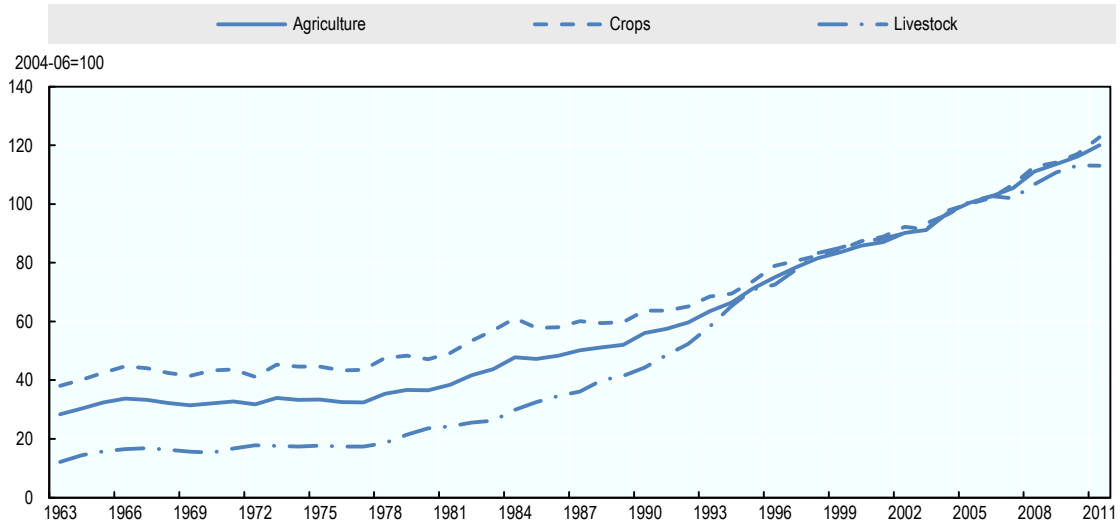
### *High growth in production*

Growth in agriculture accelerated rapidly after the economic and rural reforms in the late 1970s (Figure 2.1). Per capita agricultural output, as measured by FAO's net agricultural production index, grew a modest 1.1% p.a. from 1961-1978. However, from 1978 to 2011, output growth averaged over 3.8% p.a. in per capita terms, with crop production growing 2.9% p.a. and livestock growing, albeit from a smaller base, by a large 5.6% p.a. in response to demand from high income growth. Livestock product growth was particularly strong during the decade post 1986, but slowed as the market matured and meat consumption levels reached higher levels. Growth in agricultural output has slowed in the past decade but is still in excess of 3% p.a. in per capita terms, almost twice the global rate of 1.7% p.a.

Since 1978, China's grain production (cereals, coarse grains, oilseeds) increased 93% from 305 Mt in 1978 to 590 Mt in 2012. Over this period, cotton output has risen by a factor of 2, oil crops 5, sugar crops 4, and fruits by factor of 34. The sizeable gains in crop output have been achieved despite a decline in arable land area, due to increases in yields and increased multiple cropping. Over the period, yields have increased at trend rates for wheat at 2.3% p.a., maize at 1.7% p.a., rice at 1.2% p.a., and soybeans at 1.2% p.a. Multiple cropping - the ratio of total area sown to total arable area, reached a high in 2011 at 1.35 (based on *China Statistical Yearbook*). Production of livestock and fish products have shown significant increase, meat by a factor of 8 times, milk 16, and aquatic species by 11 times with those from aquaculture growing by 31 times since 1978 (Figure 2.2).

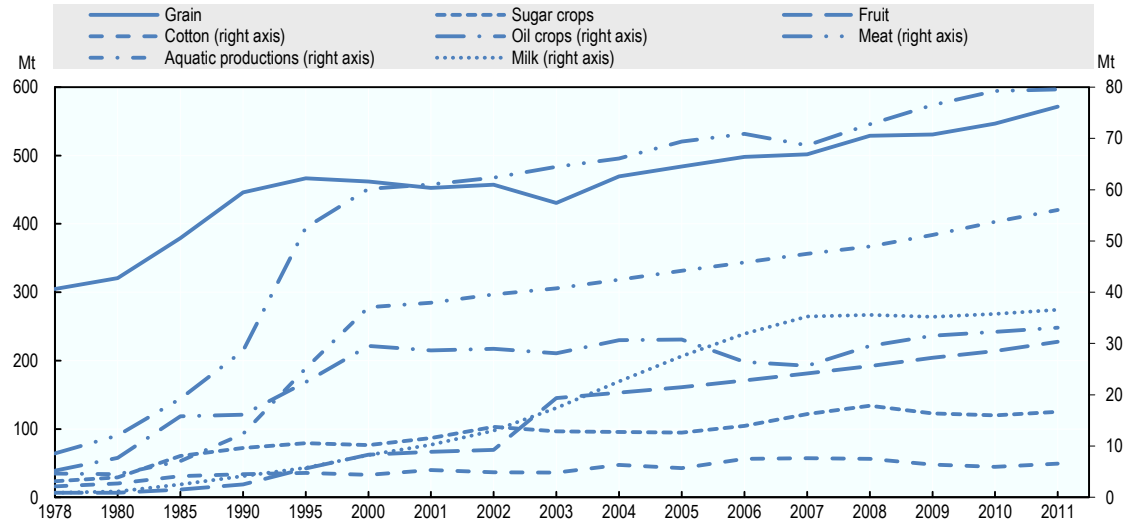
2. For the latest review of agricultural policy developments in China as well as OECD and selected emerging economies, see OECD (*forthcoming*), *Agricultural Policy Monitoring and Evaluation 2013*.

**Figure 2.1. Agricultural production in China**




*Source*: FAOSTAT.

**Figure 2.2. Production of major agricultural products in China**




*Source*: National Bureau of Statistics, China.

Higher output has been achieved as a result of high investment. Real net investment in farm capital has increased at a trend rate of over 9% per year as the government has attached a high importance to improve and modernise agricultural production systems.

- The power of agricultural machines increased by over seven-fold in the past three decades. The number of large and medium-size farm tractors, rice transplanters and corn combines in 2012 were 4.9 million, 5.1 million and 2.3 million respectively. The mechanisation level in sowing and reaping has exceeded 55%, not only for wheat, but also for rice and corn.

- Infrastructure for irrigation and water conservation has improved significantly. By 2011, the effective area with irrigation reached 62 Mha, 37% above that in 1978. The development and improvement of infrastructure in irrigation and water conservation have

enhanced the ability of preventing natural disasters, providing a solid foundation for assuring agricultural production capacity.

- New prospects have been opened up in the development of modern agriculture. The pattern of agricultural development has changed with better supporting infrastructure surrounding the sector. The policy environment is more supportive to higher productivity growth with a greater emphasis on science and technology, and with facilities to improve farm productivity and higher ecological performance.

The contribution of scientific and technological progress in 2012 to growth in agriculture has reached 54.5%, doubling from 27% in the beginning of rural reform.[3] Some important agricultural technologies have emerged with breakthroughs in some core technologies such as hybrid rice, corn, and rapeseed, and transgenic anti-insect cotton. The coverage of improved varieties of farm crops has now exceeded 95% in China. Agricultural science and technology has increased the prevention of plant and animal diseases and control for insect pests, thereby decreasing crop and animal losses. Through research and innovation, agricultural and renewable resources are better managed, promoting sustainable development, and resource conservation.

**Box 2.1. China's evolving agricultural policy priorities**

China's agricultural policy framework has been evolving in line with fundamental reforms carried out since 1978 and resulting in a gradual transition from a centrally planned economy towards a socialist market economy.

During the reform period, agriculture and rural areas more generally provided two major boosts to China's development. The first came from a major transformation in the policy environment in agriculture in the early 1980s when the tightly controlled commune system was replaced by the Household Production Responsibility System (HPRS) in which individual farmers were allowed to lease land from the collectives, becoming largely autonomous in their decision, and responsible for profits or losses from their operations. The second began in the late 1980s when in order to employ workers leaving agriculture and to avoid large-scale migration to the cities, sub-national governments were encouraged to promote the growth of rural non-agricultural industries, commonly known as township and village enterprises (TVEs). These enterprises were the main vehicle for absorbing workers leaving agriculture, necessary for China's growth and development. A uniqueness of China's experience in the late 1980s and in the 1990s was that the bulk of the shift in employment took place within rural economy rather than through migration from rural to urban areas (OECD, 2005).

Up to the late 1990s, the principle agricultural policy objective was to increase agricultural production, especially of food grains. Gradually, more attention was given to supporting rural incomes to address the issue of the growing income gap between urban and rural populations. Accordingly, policies aimed at raising agricultural incomes were adopted with a fundamental shift from taxing agriculture to supporting it. This shift in focus coincided with China's accession to the WTO in December 2001 which placed China's support policies within a framework of internationally recognised rules and regulations. Income support policies were further strengthened through the adoption of the highest priority document of central authorities for 2004 (Document No.1). This document put forward a set of agricultural policy measures which, through their increasing geographical and commodity coverage, became key channels for providing support to China's agriculture. An important, but also symbolic, change in China's approach to agriculture was the abolition of the long established agricultural tax, which was effectively implemented by early 2006, after 2 600 years of its application.

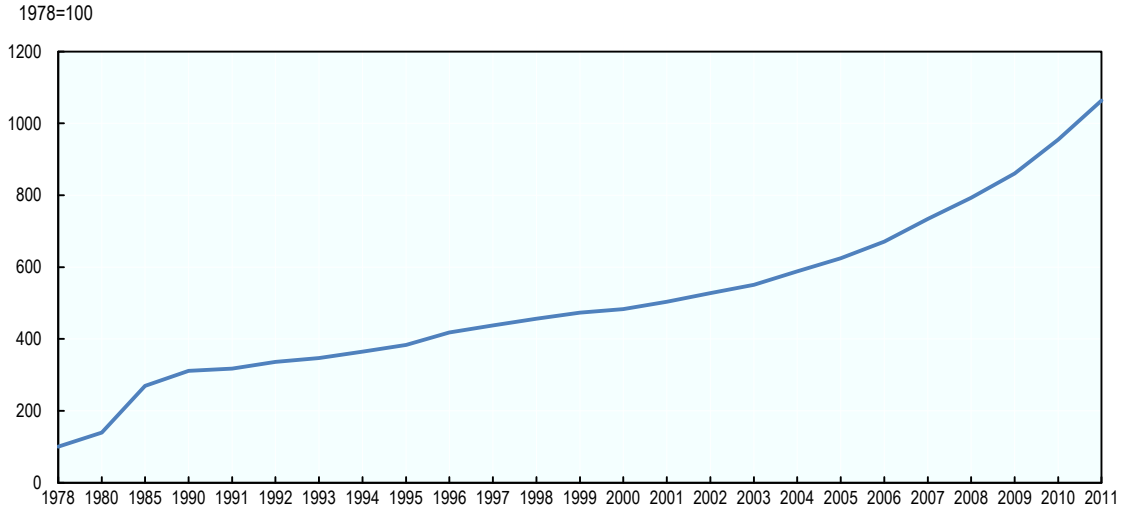
3. Contribution rate to growth by science and technology is computed from output growth compared to input growth of factors of production, including labour, material, and land. This estimate therefore also includes improved efficiencies from better management, factor consolidation, and improved infrastructure.

Following the 2004 Document No.1, all subsequent annual versions have concentrated on various aspects of agricultural and rural development issues. The most recent ones focused on water conservation to achieve sustainable use of water resources within the next ten years (2011); on investment in agricultural science and technology to help boost agricultural production and farmers' incomes (2012); and on transition to larger-scale farms through the creation of large individual-operated farms, family farms, co-operatives and contracting arrangements between farmers and companies (2013) (OECD, 2013).

### *Rural incomes have increased steadily*

Since reform and the opening up of China, rural incomes have been increasing continually and living standards have been increased substantially. Based on constant prices, per capita annual income of rural residents in 2011 was ten times higher than that in 1978 (Figure 2.3). The major factors that contributed to the income growth included higher agricultural growth, better wages income for migrant workers, higher incomes from non-agricultural activities in rural areas, the elimination of the agricultural tax and increased agricultural subsidies.

**Figure 2.3. China: The growth of per capita annual income for rural residents**




*Source*: National Bureau of Statistics, China.

### *Food security has improved significantly*

According to the World Bank, poverty rates in China have fallen dramatically, from 64% in 1992 to 12% in 2009.[4] High income and agricultural output growth has enabled China to reduce its number of undernourished people. When numbers of undernourished were assessed in 1990, it was estimated that some 254 million people were undernourished, or 21% of the population. Despite the addition of about 196 million people to its population by the year 2010, the estimated number of undernourished, people fell to 158 million, or to 12% of the population (Table 2.1). Despite high success in reducing undernourishment, China still has the challenge to reduce further its number of undernourished people.

4. Percentage of population below USD (2005) 1.25 per day. World Development Indicators (see data.worldbank.org).

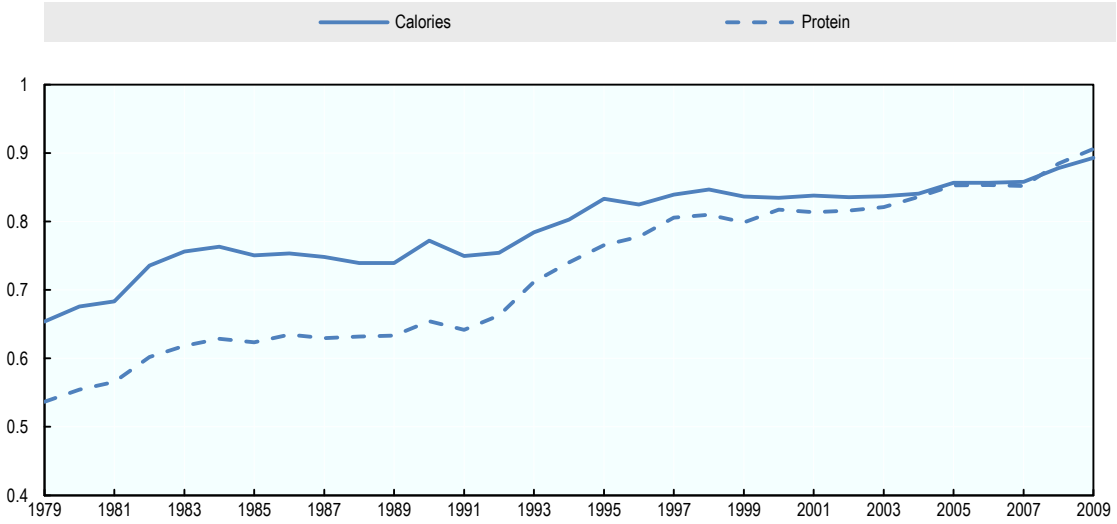
**Table 2.1. Food Insecurity in China: FAO estimates of the number of people undernourished**

| | 1990-92 | 1999-2001 | 2004-06 | 2007-09 | 2010-12 |
|---|---|---|---|---|---|
| Number (million) | 254 | 187 | 176 | 158 | 158 |
| Percentage (%) | 21 | 14 | 13 | 12 | 12 |

*Source*: *State of Food Insecurity* (2012), FAOSTAT.

Progress in achieving higher consumption may imply that future demand pressures in China may moderate compared to the past. On average, daily calorie and protein availability per person in China were estimated at 3 038 kcal, and 94 g in 2009. This compares with the OECD average of 3 402 kcal and 104 g in 2009 respectively. Since 1978, China's calorie availability relative to that of the OECD average (ratio) has increased from 66 to 89%; for protein intake, the ratio has risen from 53 to 90% (Figure 2.4). This rapid convergence in these components, especially for protein, may indicate that China's per capita availability of calories and protein may be approaching the stable equilibrium levels for these components which is characteristic of OECD countries. As this gap closes and with low population growth, demand pressures may ease, at least as far as nutrition is concerned. However, higher availability of proteins, in the form of meat for example, may involve higher resource demands and costs from agriculture.

**Figure 2.4. China's per capita calorie and protein supply, ratio to OECD average**




*Source*: FAOSTAT.

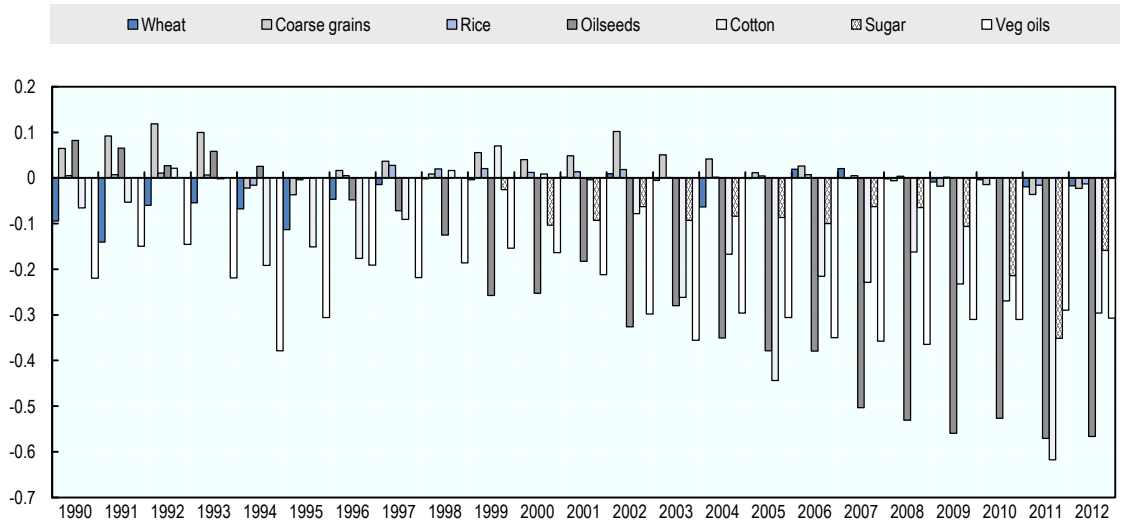
The food security situation in rural China has improved substantially, corresponding with the rise in living standards. In real terms, per capita annual income of rural residents in 2011 was 10 times higher than that in 1978. With the growth of real incomes, consumption patterns have changed considerably. Engel's coefficient (share of expenditures allocated to food) for Chinese rural households steadily dropped from 68% in 1978 to 40% in 2011, and consumption patterns have been changing towards more livestock products (Table 2.2).

### *Trade: Self sufficiency in food security commodities*

Since China joined the WTO in 2001, the openness of its agricultural sector to global markets increased and has resulted in increased trade. From 2001 to 2012, the value of Chinese agricultural trade (total of imports and exports) increased from USD 27.9 billion to

USD 155.7 billion, with an average annual growth rate of 17%. The trade dependence (i.e. trade value per unit of agricultural GDP) of Chinese agriculture increased from 15% in 2001 to 21% in 2011. Import dependence doubled from 6% to 13%. China's net trade deficit in agriculture and food widened further in 2012 to USD 31 billion, up from USD 18.5 billion in 2011.

**Figure 2.5. China: Self-sufficiency for major crops/products**




*Note*: Computed as net exports/consumption, 0 indicates full self-sufficiency, -1 indicates net imports fill all domestic consumption.

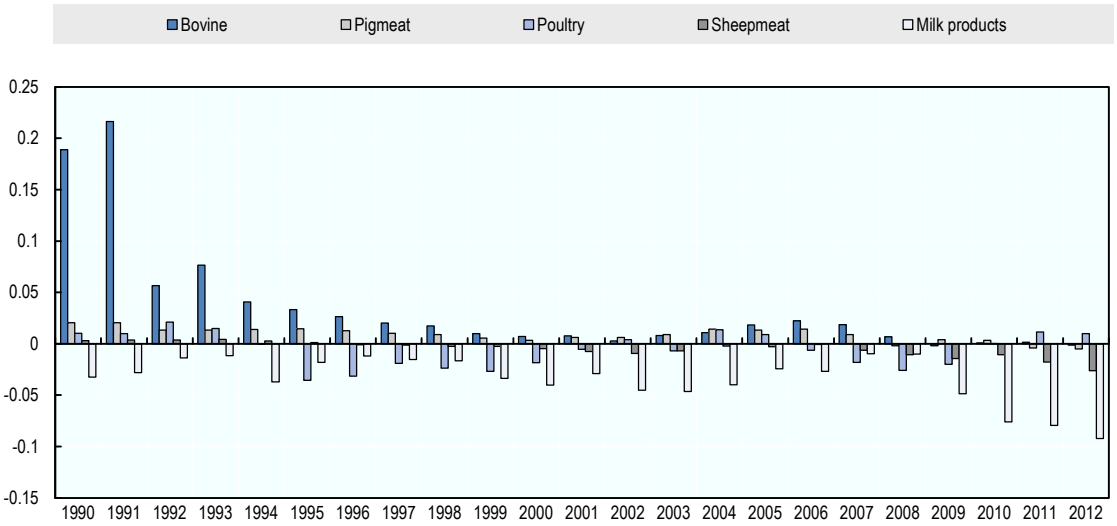
*Source*: FAOSTAT, FAO estimates.

In large part, rapid growth in both commodity supply and demand, strongly supported by its policy framework, has enabled China to achieve a high level of self-sufficiency in basic grains — wheat, rice and coarse grains (Figure 2.5) — which have been considered important for meeting food security objectives. With few exceptions, the self-sufficiency ratio for each of these commodities has ranged between 0.95 and 1.05 since 1995. It is noteworthy that since 2006 China has had a net trade deficit in these grains. However, achieving high self-sufficiency for these commodities has been attained by importing other crops/products which compete for land. For example, China has become the world's largest importer of oilseeds, with a market share in 2011-12 estimated at 54%, accounting for more than 50% of consumption by 2011; these imports have effectively freed some 28 Mha of harvested land, as measured by China's oilseed yields. Similarly for cotton, sugar, and root and tuber crops, China's net import position has deteriorated as competition for land has been steered toward food security commodities.

For livestock products, China has maintained near self sufficiency for all meats with net exports within 1-3% of domestic consumption (Figure 2.6). However, even with net trade at less than 1% of consumption, pig meat imports were some 600 000 tonnes in 2012; such imports are large in the context of global pigmeat trade of about 7.8 Mt. In recent years, following China's melamine crisis and restructuring of its milk and dairy processing sector, imports of dairy products have increased substantially.

For fishery products, China is a net exporter, and by far the leading fish exporter in the world. During the last few years, China has also increased its fishery imports significantly for both domestic consumption and for its fish processing industry, as a growing share of its fishery exports consists of reprocessed imported fish.

**Figure 2.6. China: Self-sufficiency in livestock products**




*Note*: Computed as net exports/consumption, 0 indicates full self-sufficiency, -1 indicates net imports fill all domestic consumption.

*Source*: FAOSTAT, FAO estimates.

### *Markets have improved*

China's agricultural sector has long been influenced by government and government policy. As its state of development has changed, its priorities have evolved (Box 2.1). With successive reforms, China's agricultural sector has been in transition from a planning economy to market based economy which has changed considerably. Prices were set in local regions and provinces, but these practices have now been changed. There are now over 4 300 wholesale agricultural product markets in China, in which over 950 markets have annual returns of more than CNY 100 million. The government has supported infrastructure construction for agricultural product markets and now a large brokerage work force of over 6 million people has been established. Leading agricultural and national business organisations play an important part in the management of agricultural product purchasing and import and export trade. Market services have become more open, unified, competitive and transparent with the establishment of agricultural product "green channel" and "one station" systems that contribute to the orderly movement of agricultural products.

The role of market information is becoming central to improved market efficiency. In 2012, the China Ministry of Agriculture started to collect price information, covering producer, wholesale and retail prices, with daily, weekly, monthly, quarterly and annual reporting integrated into a real-time monitoring system. An agricultural product monitoring and early warning system has also been established so as to help improve the sector's market responsiveness.

Recent statistical studies indicate that domestically, spatial markets for many commodities are now better integrated and hence more efficient (Box 2.2). However, the linkage between international markets and domestic markets varies significantly by commodity. Presently, of the major commodities, prices of all major commodities with the exception of pig meat appear to be statistically integrated with global markets. However the degree of connection to global markets is low for most commodities, with soybeans showing the strongest linkage. Markets are still affected by state enterprises and by tariff rate quotas as well as minimum procurement prices and stock intervention schemes in the cases of rice and wheat.

### Box 2.2. Domestic and international market integration*

***Domestic market integration***

Prior to 1992, agricultural prices in China were largely set by administrative processes. In 1992, China started to build its socialist market system. While prices for certain commodities remained influenced by minimum procurement prices, agricultural markets were gradually liberalised and opened to world markets. Liberalisation of meat, vegetable and fruit markets preceded those for grain, which were finally liberalised in all provinces in 2004. Recent research based on statistical analysis of price movements indicates that Chinese domestic markets are now integrated across provinces.

**Recent research on domestic market integration in China**

| Author | Product | Data period | Result | Price transmission |
|---|---|---|---|---|
| Tian Zhihong (2012) | Corn | 2001-2010 | Integrated | Producing=> deficit regions |
| Wang Ning (2008) | Wheat | 2005.01-2007.12 | Integrated | - |
| Li Min (2006) | Rice | 2001.1-04.12 | Integrated | Producing=> deficit regions |
| Tian Xiaochao (2011) | Hogs | 2000-2008, | Integrated | Producing regions => deficit |
| Wang Yi (2007) | Apples | 1998-2006, | Integrated | Importing =>producing regions |

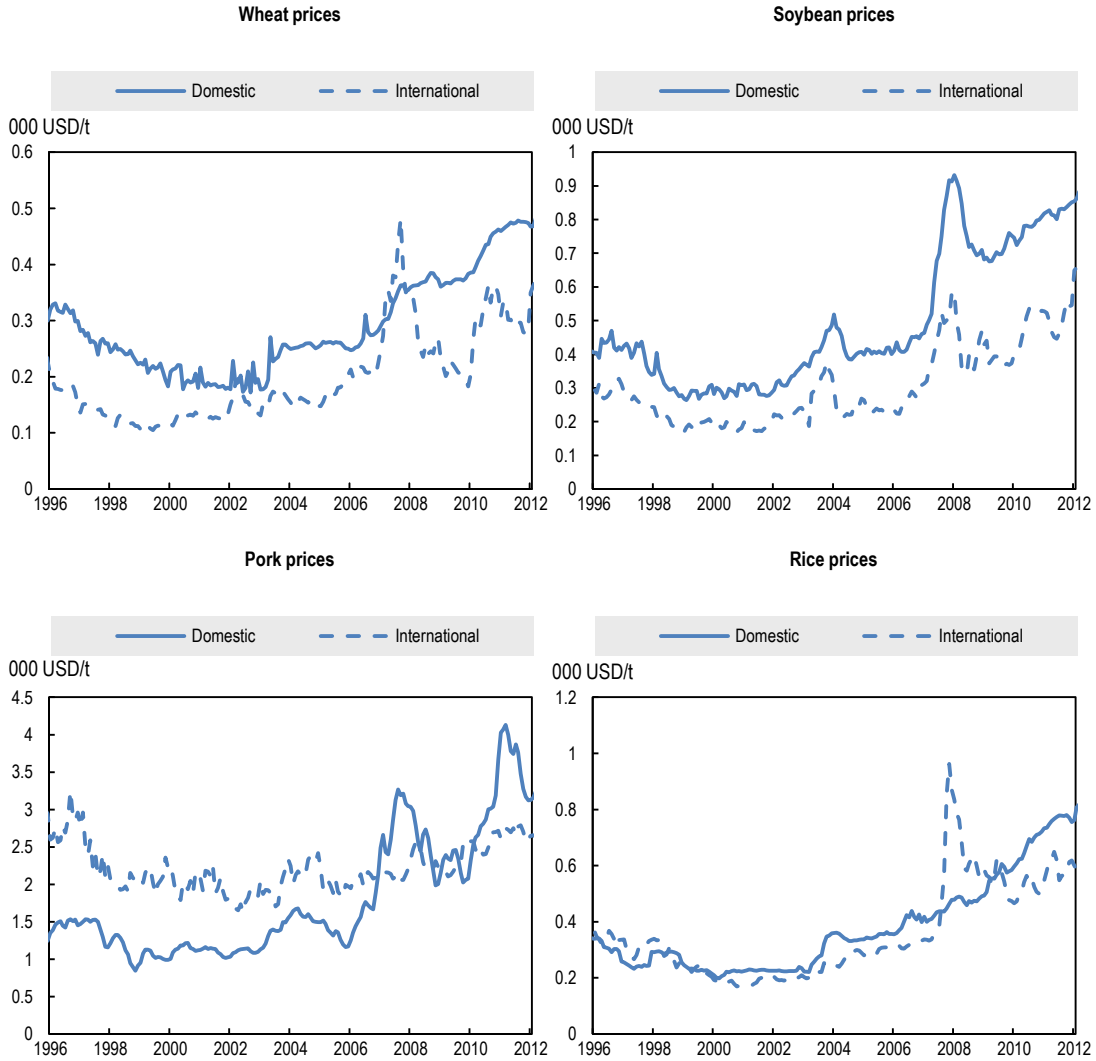
***Global integration***

Statistical tests with monthly wholesale market price data over the period 1996 to 2012 show that with the exception of pigmeat, domestic commodity markets for primary commodities are statistically integrated with international markets. Some domestic markets, such as rice, bovine meat, and pigmeat may also influence international markets. However the degree of market connection ranges considerably, as noted by the Timmer/Revallion Index of Market Connection (IMC), as shown in the table below. As expected, soybeans, maize and wheat show the lowest IMC values (IMC of zero indicates highest connection), whereas commodities such as rice and meat products illustrate much lower connection with international markets. Estimates made separately for the periods 1996-2004 and 2005 to 2012, show that the IMC rose for wheat, rice and beef, and indicate that market connection deteriorated in the latter period, as international market price volatility was not reflected in domestic markets.

***Indexes of market connection***

| | Maize | Soybean | Wheat | Rice | Chicken | Bovine meat | Pigmeat |
|---|---|---|---|---|---|---|---|
| IMC (1996-2012) | 7.1 | 4.0 | 10.1 | 24.6 | 78.8 | 55.8 | (41.4) |
| IMC (1996-2004) | (3.4) | 2.3 | 5.4 | 17.0 | (13.5) | 8.9 | (4.6) |
| IMC (1996-2004) | (10.2) | 3.9 | 27.5 | 39.5 | (7.0) | (46.9) | (52.3) |

IMC of 0 is highest connection, higher values indicate lower connection (Timmer, 1984). IMC=(1+b1)/(b3-b1), where in the case it is shown that international price Granger causes the domestic price PD=(1+b1)*PD(-1)+b2*(PI-PI(-1))+(b3-b1)*PI(-1), where PD is domestic price, and PI is international price expressed in domestic currency. IMC results in brackets are reported but are not appropriate because statistical integration could not be established from the data during these periods.




*Note:* The data used is monthly prices from January 1995 to December 2012. Domestic prices are wholesale market prices from Ministry of Agriculture of China; the world prices are prices in major producing countries from FAO (http://www.fao.org/economic/est/prices). Co-integration tests use the Johannsen procedure.
*Source:* Data from Ministry of Agriculture, China.

*Provided by Wu Laping, Professor, China Agricultural University. The term "integrated" in this text refers to statistical integration where a linear combination of the two prices (made stationary by eliminating trend components) is a statistical error which is randomly distributed. For example, P-b*WP=U, where P is domestic price, WP is world price and U is random error of mean zero.

## The outlook for China's agricultural sector

### *Key factors and constraints underlying China's outlook*

The success of China's agricultural sector has been remarkable. However, recent developments in its market situation raise the questions about whether China's agriculture is at a fundamental cross road in its relationship with international markets and about how emerging forces will shape its development over the next decade. Much will depend on how rising constraints to China's agricultural production evolve, and in particular on the policy environment applied to the sector. The *Outlook* first looks at these conditioning factors which will be assumed to underpin outcomes for the next decade. These factors are many and include some contentious issues which are difficult to assess fully in terms of the extent and timing of their impact in the short, medium and long term. Within this context, the projection of China's major commodity markets is then outlined in detail.

#### *Economic growth slower, but remains strong, stimulating demand*

Growth in China's economy has been phenomenal by any standard of world economic history, with a long spurt in economic growth in the range of 8-12% p.a. over the last three decades. This growth has been largely underpinned by export-led industry, large public investments and a population-demographic dividend associated with a sharp change in fertility rates as adoption of the one-child per household policy took effect in 1979. Relatively cheap labour has situated China with a comparative advantage in labour intensive manufacturing products, resulting in imports of raw materials and large exports of finished value-added products. However, the next decade appears to be one which shows signs of slower growth as competitiveness declines.

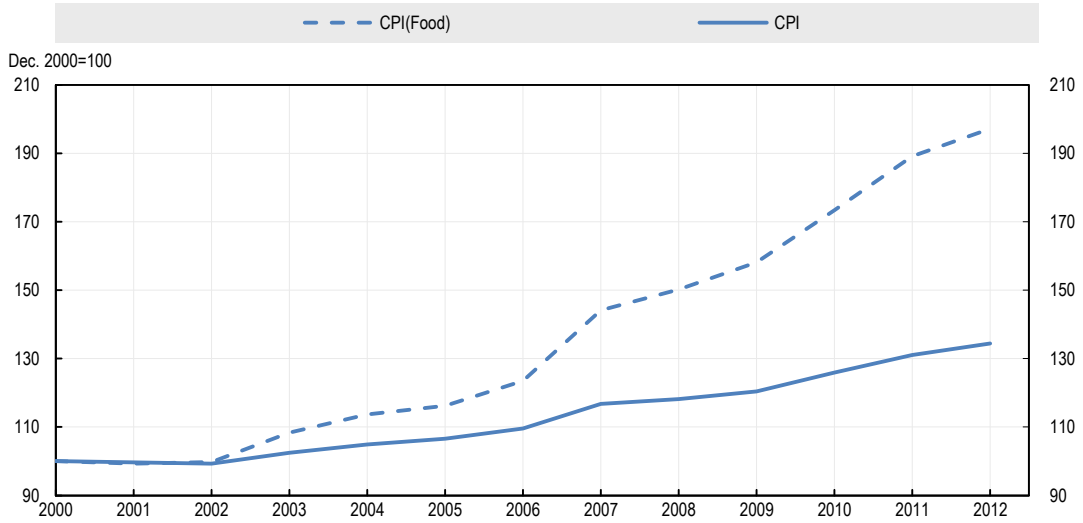
The OECD projects strong GDP growth to gradually slow over the next ten years from the current 8% range toward 6%.[5] This still means that per capita income in China will more than double over the next decade, with an impact on domestic demand for food, particularly for those foods with higher income sensitivity. While China's Engel coefficient has declined as income has risen, and will decline much further in the next decade, it indicates a considerable impact for food demand, especially if income growth is passed down to the lower income population.

While economic growth may stimulate demand, other macroeconomic changes may further limit supply response. First, China's nominal, and especially its "real" exchange rate has appreciated. This trend is assumed to continue. The impact is to make China less competitive against international markets by reducing the Yuan price of imports. Second, labour wage rates have inflated both in urban and in rural settings, creating higher costs of production throughout the market chain, not only on farms but also in the processing and retail sectors. As further noted below, demographic projections indicate that China's working age population will decline over the next decade, increasing further pressure on wages. Higher costs create pressures on net farm incomes and, for example, place China's dominant cotton processing sector at risk compared to other international competitors.

5. See OECD (2012), *China in focus: Lessons and challenges*.

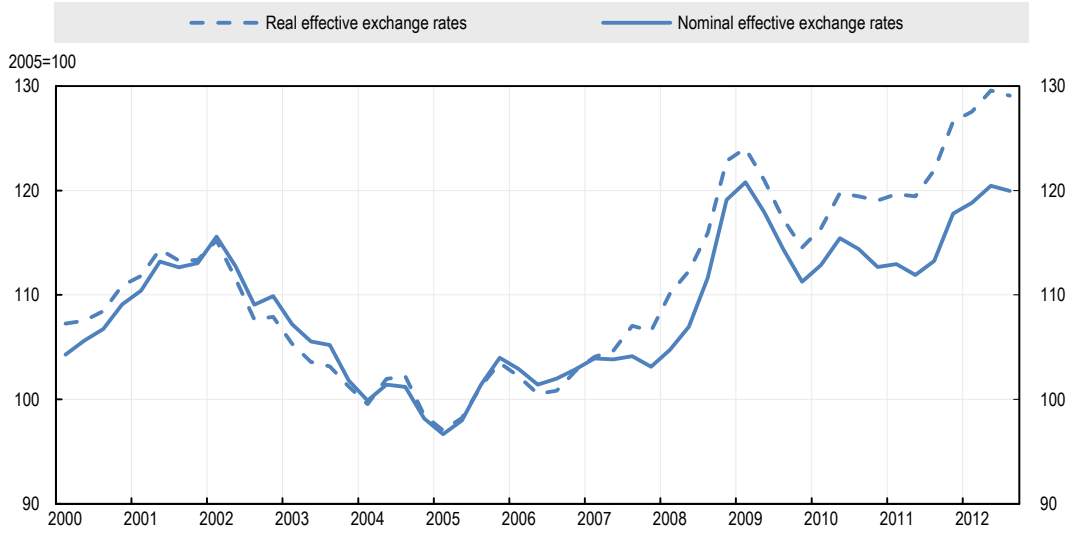
### Box 2.3 Macroeconomic challenges facing China in the next decade

China is expected to continue resilient economic growth, but there are some downside risks for China. The risks include inflation, appreciation of its real exchange rate, as well as possible instability of its financial system and a plunge of property prices, all of which may be exacerbated by further external shocks, such as deepening of the euro zone crisis, or changes in US economic prospects. Inflation in China is already quite high, supported by increases in labour wages. But food price inflation has been remarkably high and will need to be contained. Food currently has a 30% weight in consumer expenditures and high inflation will impact real incomes and consumer demand, dragging economic growth down.




*Source*: Bloomberg.

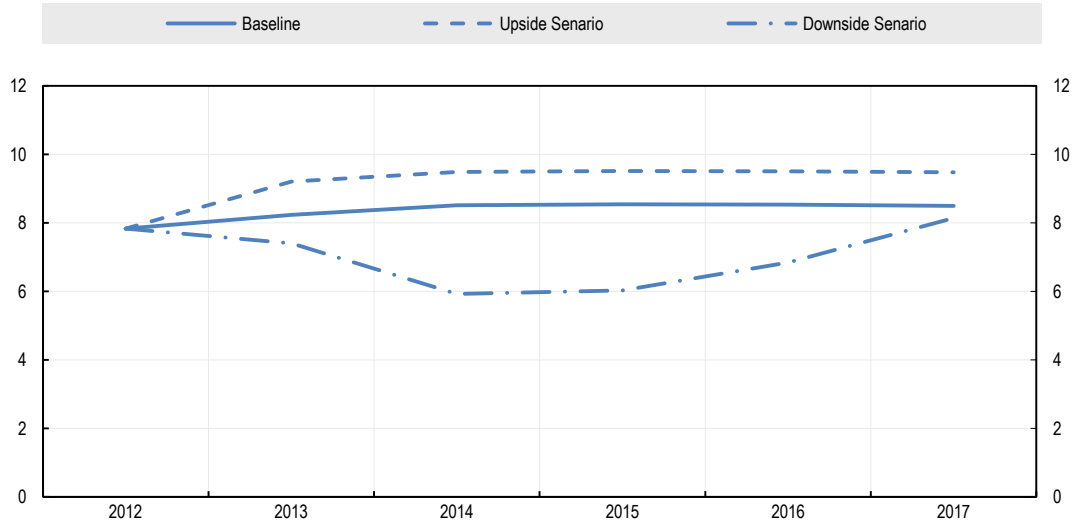
China's real effective exchange rate (nominal rate adjusted for domestic inflation relative to those of trading partners) has appreciated around 30% since 2005. If this trend continues, the result will be to make imports more attractive, and may cause minimum procurement prices to underpin markets. In this case, the government would be pressured to enhance domestic support and protect their producers from international competition. This would not only affect prices and consumption of domestic products, but will deteriorate the fiscal condition and may not be sustainable for a long time.




*Source*: IMF.

OECD has projected that the pace of economic growth in China will slow toward 6% per year. The I upside and downside scenarios, based on IMF estimates, still indicate a range from 6 to 9%, and while a significant range, still indicates anticipated robust growth in the future. However, China's labour force recently decreased for the first time (*Financial Times*, 2013) and there are signs of labour shortage in

the near future. Real average wages have increased more than three-fold since 2000 in many provinces (IMF, 2012b). The concern is that China will eventually reach the so-called Lewis Turning Point, where higher wages will lower competitiveness and compromise future economic growth (Cai and Wang, 2012; IMF, 2012b).




*Source*: IMF and FAO calculations.

*Demographic changes will impede supply, but stimulate demand for value added products*

Since 1992, when it reached its historic high of 844 million, China's rural population declined to 695 million in 2012, a net fall of some 150 million people. UN population projections indicate a further net decline of 100 million people living in rural China by 2022. These are large numbers; the resulting impact on agricultural labour, farm structure, land management and especially rural economies is significant.[6]

Interaction with other demographic and economic developments yields a yet more difficult situation in the rural sector. The slowing of population growth initiated by China's family planning policy (1978), while initially leading to a population dividend with higher per capita income with proportionately fewer workers in the young and inactive segment of the population, has led quickly to a more rapid ageing of the population structure. Emigration out of rural communities, encouraged by higher wages in urban communities, particularly for more highly educated and younger labourers, has left a higher age labour force in rural China. Policies surrounding land tenure may also limit the incentives for younger producers to remain in rural areas and invest in productivity enhancing technologies. Effectively, this situation will continue to deprive the sector of the modern, skilled workforce which it needs for more complex and larger scale farming operations, including using modern machinery and equipment, diagnosing diseases and pests, employing investment and marketing tools, and managing effectively complex operating units. The net result will limit productivity in the future, curbing supply potential, and limiting farm sector competitiveness.

On the demand side, population growth will continue, albeit at a slower rate of 0.3% p.a. compared to 0.5% p.a. in the past decade. The rapid increase in urban population will continue to impact on food demand patterns. While the total population increase is projected by the UN to be some 38 million people to 1.392 billion by 2022, urban population may increase by 138 million over this period. In 2011, the average net income of urban dwellers was almost three times that of rural dwellers. As noted in Table 2.2, consumption patterns are

6. See Barrett, C., ed (2013), Chapter 17 "When China runs out of farmers" by Luc Christiansen.

strikingly different. Not only does food consumption appear higher in urban contexts, which are associated with higher incomes, consumption of meat and dairy and fish products are also much higher. These demographic trends will support changes in diet structure, implying growth in the demand for feed grain and protein meal. They also place higher demand for modern and efficient food marketing chains which establish quality and safety regimes that must be met by supply chains reaching down to the primary sector. Nevertheless, as measured by current data on apparent consumption, consumption of both meat and fish in China on a per capita basis is similar to many OECD countries and an appropriate issue is how much the composition of protein intake will change over the coming decade.

**Table 2.2. China: Food consumption by category, rural vs. urban**

| | 1990 | 1995 | 2000 | 2005 | 2011 |
|---|---|---|---|---|---|
| **Rural** | | | (kg per year/person) | | |
| Grains (unprocessed) | 262.1 | 256.1 | 250.2 | 208.8 | 170.7 |
| Meat and poultry | 12.6 | 13.1 | 17.2 | 20.8 | 20.9 |
| Dairy products | 1.1 | 0.6 | 1.1 | 2.9 | 5.2 |
| Fish | 2.1 | 3.4 | 3.9 | 4.9 | 5.4 |
| Vegetable oils | 3.5 | 4.3 | 5.5 | 4.9 | 6.6 |
| Vegetables | 134 | 104.6 | 106.7 | 102.3 | 89.4 |
| **Urban** | | | | | |
| Grains (unprocessed) | 158.4 | 117.6 | 99.8 | 93.3 | 97.8 |
| Meat and poultry | 25.2 | 23.7 | 25.5 | 32.8 | 35.2 |
| Fresh milk | 4.6 | 4.6 | 9.9 | 17.9 | 13.7 |
| Fish | 7.7 | 9.2 | 11.7 | 12.6 | 14.6 |
| Vegetable oils | 6.4 | 7.1 | 8.2 | 9.3 | 9.3 |
| Vegetables | 138.7 | 116.5 | 114.7 | 118.6 | 114.6 |

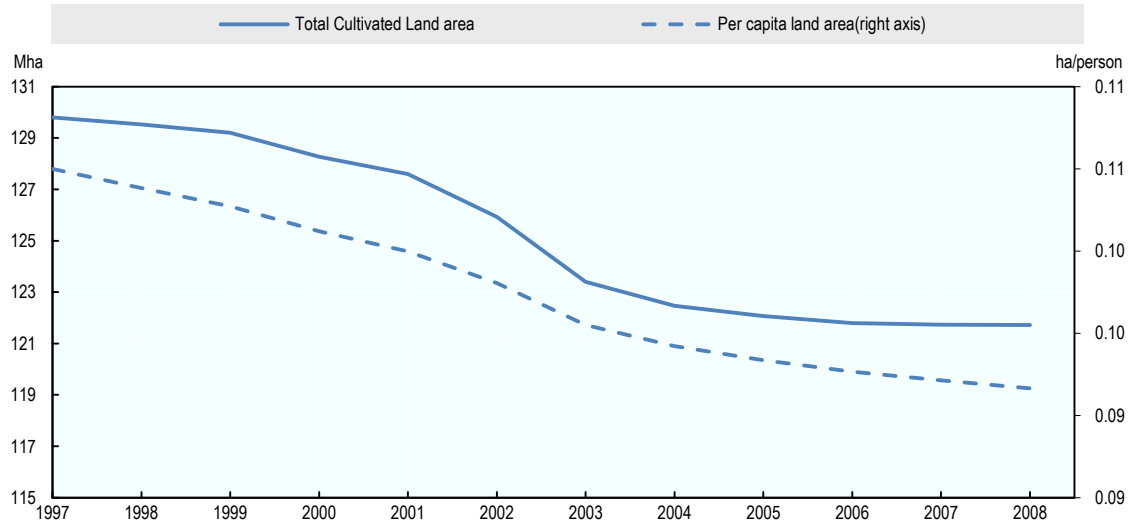
*Source*: National Bureau of Statistics. Note data exclude consumption outside the household and weights of measurement may differ from data of other sources.

*Reduction in arable land will abate, but reduction in quality foreseen, slowing crop yield growth*

The previous section noted that quality labour input in rural China is becoming scarce and more expensive. However, as long recognised, China's land and water issues are the primary constraints to the expansion of agricultural production. Although China has the world's third largest area of arable land, on a per capita basis per capita arable land availability is less than one half of the global average (0.09 *vs.* 0.22 ha per capita), and about one quarter of the average for OECD countries (0.35 ha per capita).

Recently, cultivated land area (arable land including permanent crops) has decreased rapidly. According to the statistics of Chinese Ministry of Land and Resources, national cultivated land decreased from 129.8 Mha in 1997 to 121.7 Mha in 2008, a 6.2% decline (Figure 2.7). During the 10th Five-Year Plan (2001-2005) for agriculture, cultivated area decreased mainly due to planned ecological cropland conversion. However, the 11th Five-Year Plan (2006-2010) arrested this decline and established a legally binding minimum "Red-line" area of 120 Mha. Under the 12th Five-Year Plan, the Red-line continues to apply until 2015. This *Outlook* assumes it will be extended to at least 2022 and effectively sustain land in agriculture over the period. However, pressures from increased urbanisation will likely prevent any expansion in arable area, and with multi-cropping rates near their maximum, competition for land will remain high.

**Figure 2.7. China: Cultivated land area**




*Source*: National Bureau of Statistics.

The quality of cultivated land is also deteriorating. According to current estimates of cultivated land resources, 70% are in low-yield farmland. There is a declining trend in soil quality. Due to serious water/land erosion and soil salinisation/acidification, land degradation has risen to more than 40% of total arable land area. In the northern oasis agricultural area, salinisation problems have become increasingly prominent. In the Ningxia Yellow River Irrigation area, salinisation of the soil has become one of the important issues that affect agricultural production, and the northern part of Yinchuan saline-alkali soil affects more than 49% of the total cultivated area. Second, wind erosion and desertification is increasing. Affected by global warming, reduced rainfall, depletion of surface runoff and groundwater levels, the northern region, especially the northern farming and animal husbandry areas, faces very serious soil wind erosion and desertification problems. Soil pollution has become serious in many areas. In city suburbs, farmland suffers pollution from sewage, garbage and other pollutants. Near mines, farmland suffers pollution from slag and harmful mining drainage. Farmland near factories suffers from pollution by industrial emissions and sewage. According to recent statistics, nearly 20% of the arable land in the total in China is polluted to various degrees. These indicators suggest that productivity will be affected and that the costs of production may need to rise to repair environmental damage.

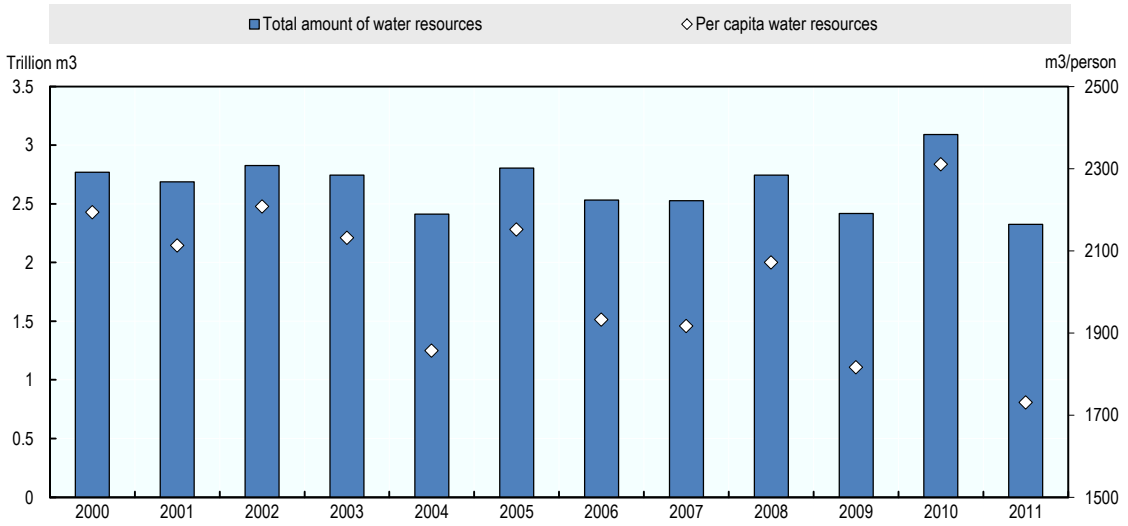
*Less and more variable water resources – impact of climate change is evident*

China has water shortage problems, with relatively low levels of precipitation and high annual variations (Figure 2.8). Its total water resources ranked fourth in the world, but per capita water resource was only one quarter of the world average for the period 2000-11. China's average annual total water resources is 2.7 trillion cubic meters; in 2010, water resources reached 3.1 trillion cubic meters but in 2011 it was only 2.3 trillion cubic meters. The difference between these two years is 33%. Per capita water supplies of 2 194 cubic meters in 2000 decreased to 1 730 $m^3$ in 2011, and annual average per capita water resource was only 2 036 $m^3$.

Although the share of agriculture's water use has trended down in the last decade, it is still more than 60% of total water use. Under the conditions of climate change, reduction of agricultural water availability may affect the stability of food production. According to some experts, the production of one tonne of grain consumed about 1 300 $m^3$ of water in China, but less than 1 000 $m^3$ of water is needed to produce the same quantity of grain in developed countries. Since 2000, the water gap in China's agricultural irrigation system was about

40 billion $m^3$, equivalent to the water demand of 30 Mt of grain, accounting for about 5% of the current grain production. Water shortage, including issues related to water pollution may also affect future expansion of aquaculture production.

**Figure 2.8. The fluctuation in water resources in China**




*Source*: National Bureau of Statistics.

*The policy environment will remain supportive*

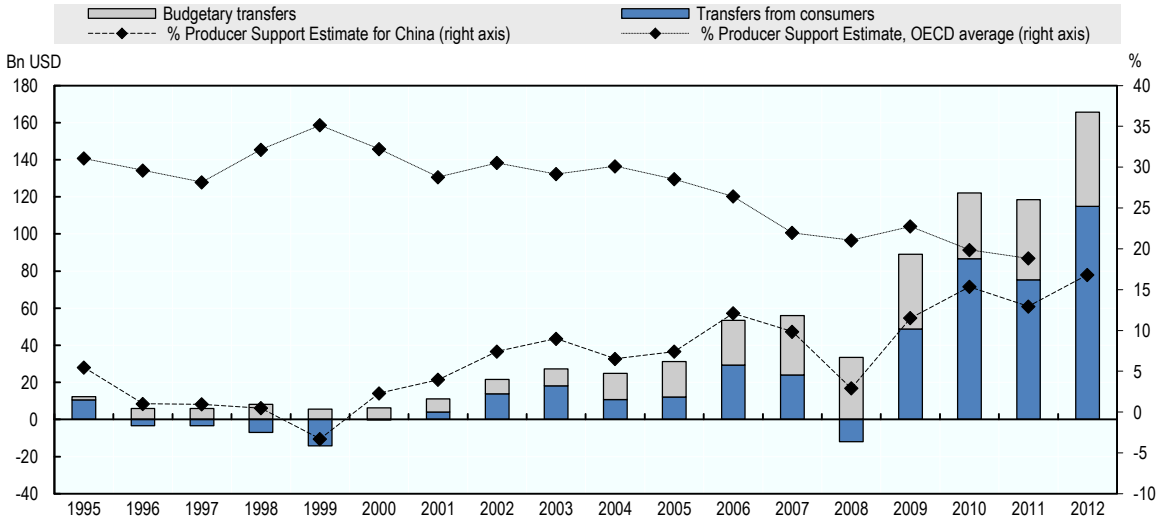
This *Outlook* assumes that the current policy framework will remain intact over the next decade. While government policy has promoted the reform of domestic and, in some cases, international market linkages, the OECD's measure of Producer Support Estimate (PSE) for China has been rising, showing higher transfers in the form of subsidies and price support to producers.[7] While still below the OECD average, the estimate of support has risen since 2000 (Figure 2.9). These transfers reflect the intent of policy to support farmers and rural communities, given large pressures for adjustment.

OECD's PSE for China indicate the nature and extent of measures to increase farmers' incomes. Transfers from consumers associated with minimum procurement prices for rice and wheat and with a growing range of commodities covered by market interventions mechanisms are a main channel for providing support. These may keep prices higher than what they otherwise would be, effectively transferring income to producers, from consumers. In particular, if minimum procurement prices are adjusted for domestic inflation, they will support prices far beyond international price levels and effectively draw in imports up to tariff quota levels, if not beyond. While the amount of transfers provided through this channel has been trending up since the end of the 1990s, it has fluctuated significantly over the last ten years, partly as a result of the government's policy to balance producers' and consumers' interests in the context of reducing price volatility compared to international markets. Thus, high international prices for agricultural commodities, as in 2007 and 2008, were only partly transmitted to domestic markets, resulting in a significant fall in measured market price support to farmers. In 2008, market price support was negative as international prices rose

7. The PSE methodology focuses on transfers targeting farmers individually and the agricultural sector as a whole, thus does not include other policies which create more favourable conditions for the Chinese farmers such as: support for the agro-processing industry, economy-wide development of infrastructure, subsidies for rural health and educations systems as well as for rural pension systems.

above domestic levels, but has increased since then as international prices have fallen from peak levels and as minimum procurement prices have risen.

**Figure 2.9. China: PSE level and composition, 1995-2012**



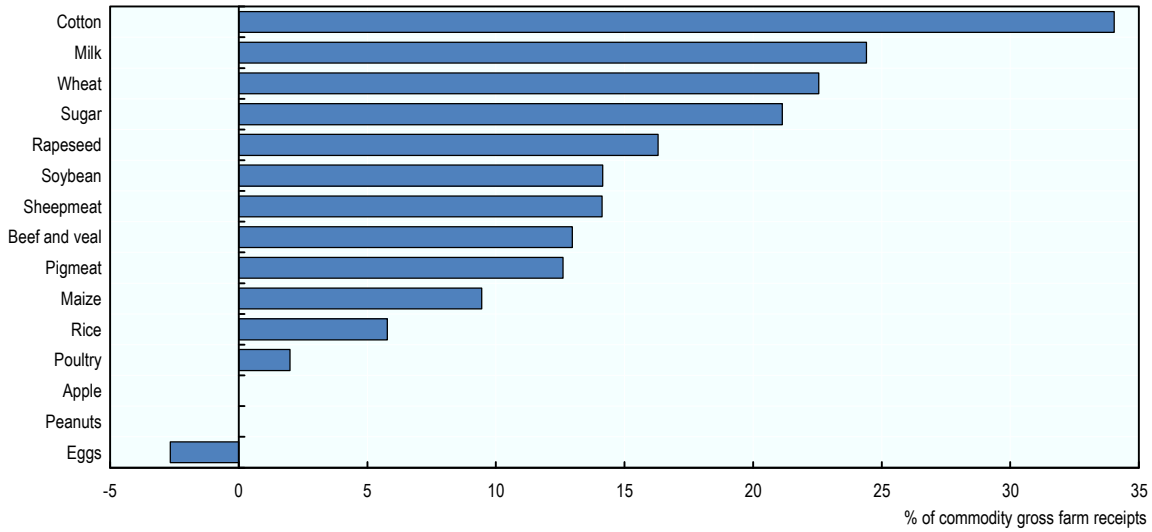

*Source*: OECD, PSE/CSE database, 2013.

Budgetary transfers for producers have been growing constantly since the end of the 1990s and are provided mostly through direct payments for grain producers, payments compensating increase in prices of agricultural inputs, in particular fertilisers and fuels, payments enhancing use of improved seeds and through subsidies for purchases of agricultural machinery. A positive feature of these transfers is that to an increasing extent they are provided through direct payments at a flat rate per unit of land which is effective in supporting farmers' income and have limited influence on production and trade. If these two channels are summed up and related to gross farm revenues (%PSE), it turns out that the level of support in China has been growing closer to the OECD average (Figure 2.9). The level of commodity specific transfers from consumers and taxpayers measured as a percentage of gross farm receipts from the production of a given commodity (Producer Single Commodity Transfer, SCT), shows that the importance of transfers varies considerably by commodity from above 20% for cotton, wheat, milk and sugar, to zero for exportable apples and peanuts and even slightly negative for eggs (Figure 2.10).

Notwithstanding these OECD measures of support, China's domestic support remains well within its WTO commitments. Subsidies under the Green Box at USD 88 billion and USD 100 billion in 2009 and 2010 respectively. Under the Amber Box, non-specific subsidies were 1.6% for non-specific products in these years, and product specific subsidies were less than 8.5% of agricultural output values.

China's medium term policy priorities and its success in achieving these goals will have a large impact on the structure and output of its agricultural sector over the next decade. A summary of the stated priorities is presented in Box 2.4. By identifying clear policy objectives and measurable, quantitative targets, progress towards these goals will be easier to monitor and evaluate over time.

**Figure 2.10. China: Producer single commodity transfers, 2010-12**




*Source*: OECD PSE/CSE database, 2013.

**Box 2.4 China's medium term policy priorities**

China's medium term policy priorities are enunciated in its 12th Five-Year Plan for National Economic and Social Development of the People's Republic of China (2011-2015) and National Modern Agriculture Development Plan (2011-2015), which strive to solve the "Sannong" issues: agriculture, rural community, and farmers. These priorities focus on the following areas.

- Safeguard national grain security, transform agricultural development, and improve agricultural production capacity.
- Increase farmers' income and living standards, narrowing the gap of living standards between urban and rural areas.
- Ensure food quality and safety.
- Protect agricultural resources and promote environmental sustainability.

The 12th Five Year Plan targets include the following.

- Grain-sown area will stay at above 106.7 Mha, and overall production capacity will reach above 540 Mt.[1] Ensure general self-sufficiency in food production.
- Per capita annual net income of rural residents will grow more than 7% and the impoverished population will be significantly reduced.
- New added farmland effective irrigation area will reach 2.7 Mha and efficient utilisation coefficient of agricultural irrigation water will increase to 0.53, grassland degradation will be effectively curbed.
- Improve resource utilisation and land productivity, strengthen risk prevention and emergency management capacity development.

The main measures taken by the government will focus on the following.

- Strengthen agricultural development and institutional reform.
- Enhance policy support and protection for agriculture.
- Promote the opening-up of agricultural markets.
- Improve and develop the legal system supporting the agriculture and food sectors.

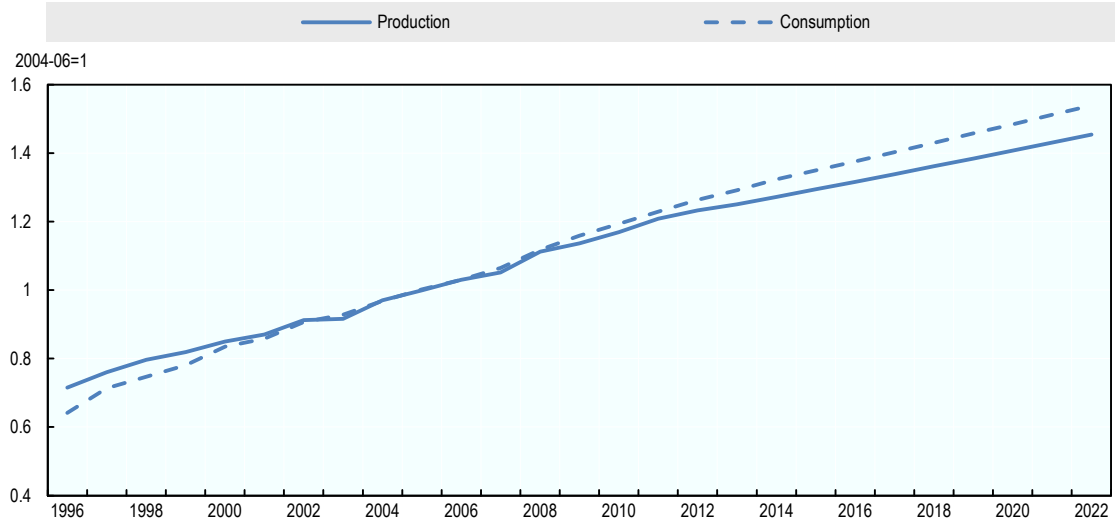
1. The definition of grain used in China's documents includes rice (paddy), wheat, maize and other coarse grains, soybeans and tubers (dry basis).

## The commodity outlook for China 2013-22

### *Overview*

The leading question concerning the commodity outlook for China, in the context of the underlying driving factors and growing production constraints as described in the previous section, is whether supply growth will be able to respond to growth in demand. According to this *Outlook*, the answer varies by commodity. Overall, the *Outlook* portrays consumption growth as exceeding production growth (Figure 2.1). As reflected by indexes of net agricultural production and consumption of commodities contained in the *Outlook*, a slow growing import situation is foreseen over the next decade. This trend was evident in the previous decade when agricultural production grew at 3.2% p.a., compared to consumption, which grew at 3.4% p.a. Over the next decade, growth is again expected to slow down, with agricultural production growing by 1.7% p.a. and consumption by 1.9% p.a. These trends anticipate a further, but modest opening of China's agricultural sector, the details of which can be examined by commodity in the following sections.

**Figure 2.11. China: Consumption will modestly exceed production growth**



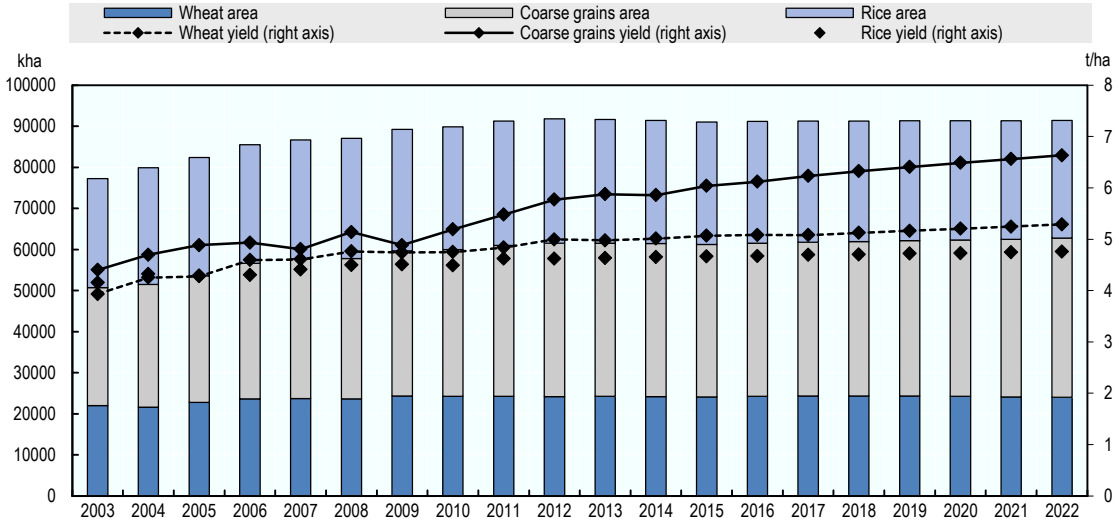

*Source*: OECD and FAO Secretariats.

### *Cereals*

*Production – growth will slow*

China's wheat production is projected to be 127 Mt by 2022, about 8% higher than the production in the base period of 2010-2012, but with slower annual growth relative to the previous decade (Figure 2.13). By 2022, the wheat area is projected to be 1% lower than the base period (Figure 2.12). The production increase is attributed to yield growth. Annual yield growth for wheat is projected at only 0.6%, which is lower than that of the period 2003-12 (2.3%). As the area is decreasing slightly, how to improve productivity will be a key issue in the coming years. But raising yields will also bring pressures. Wheat stocks increase slowly over the projection period, exceeding the five-year average but lower than the period before 2003, reaching 51 Mt by 2022 (Figure 2.13). The ratio of wheat stocks to utilisation will approach 40%, which is about the same level as in 2013.

**Figure 2.12. China: Slight decrease in area with slow yield growth**




*Source*: OECD and FAO Secretariats.

China's coarse grain production is projected to attain 257 Mt by 2022, up 28% from the base period (Figure 2.13). The coarse grain area is projected to be 6% higher than the base period, with an increase of maize at 8%. Coarse grain yields are projected to increase by 1.5% p.a., well below historical trends (Figure 2.12). Competition for land, and land quality concerns remain limiting factors to production growth, but coarse grain will take a higher share of land area. The key driver of growth is high demand for feed for a growing livestock sector. Stocks of coarse grain are projected to 56 Mt by 2022, about 1% below the 2013 level. The ratio of coarse stocks to utilisation will drop to 23%, 3 percentage points lower than 2013 (Figure 2.13).

Rice production in China is projected to reach 137 Mt by 2022, 1% lower than the production in the base period (Figure 2.13). The annual growth rate during the *Outlook* period is projected at -0.2%, significantly lower from the 2.3% p.a. of the previous decade. The main driver behind this contraction is identified as the declining harvested areas at a pace of about -0.5% p.a., an annual yield growth of just 0.3% (Figure 2.12). Rice stocks are projected to remain around the 100 Mt level over the *Outlook*. Although the stock-to-use ratio for rice should fall to 70% by 2022, it remains at a relatively high level (Figure 2.13).

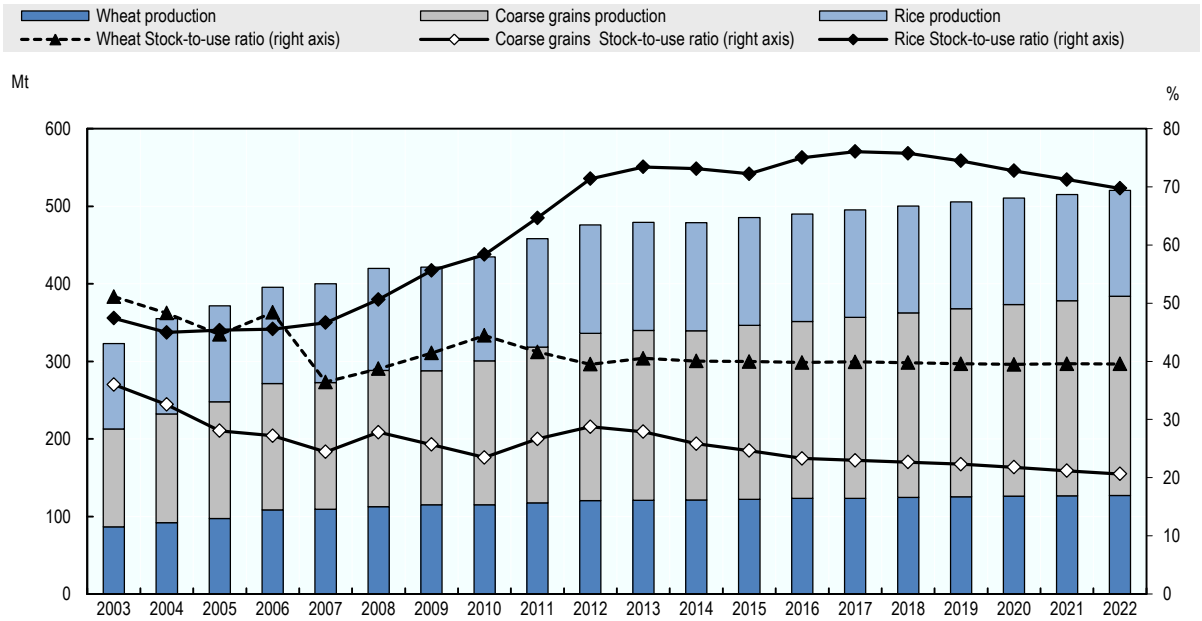
China's total wheat consumption is projected to reach 129 Mt by 2022. Wheat is expected to remain as a commodity that is predominantly consumed for food, about 63% of total use by 2022, 3% below the share in 2013 as more will be used as feed. Per capita food consumption is projected to reach 59 kg per person, roughly 1 kg decrease from 2013, and about 6 kg lower than the world average level. China's wheat feed utilisation is expected to reach 30 Mt by 2022, growing at a much slower pace than during the historical period, and representing 23% of total use, about 2 percentage points higher than in 2013. Feed use of wheat in China rose rapidly in the last decade from only 5.5 Mt to 26 Mt in 2012 given rising demand for feed and a more favourable price of wheat compared to coarse grains. Other use of wheat is projected to increase from 15 Mt in 2013 to 17 Mt in 2022 (Figure 2.14).

China's utilisation of coarse grains is projected to increase by 35% by 2022, compared to base period and reach 270 Mt, driven mainly by expansion in demand for feed. The projected annual growth (2.1%) is less than observed over the previous decade (5.2%) largely because China will exercise strict control over the industrial usage of maize. Food use is projected to reach 19 Mt, which is a rise of 2 kg per capita over the period. Total feed use is projected at

176 Mt, growing at 2.6 % p.a., slightly more than the 2.5 % growth in non-ruminant meat output (Figure 2.15).

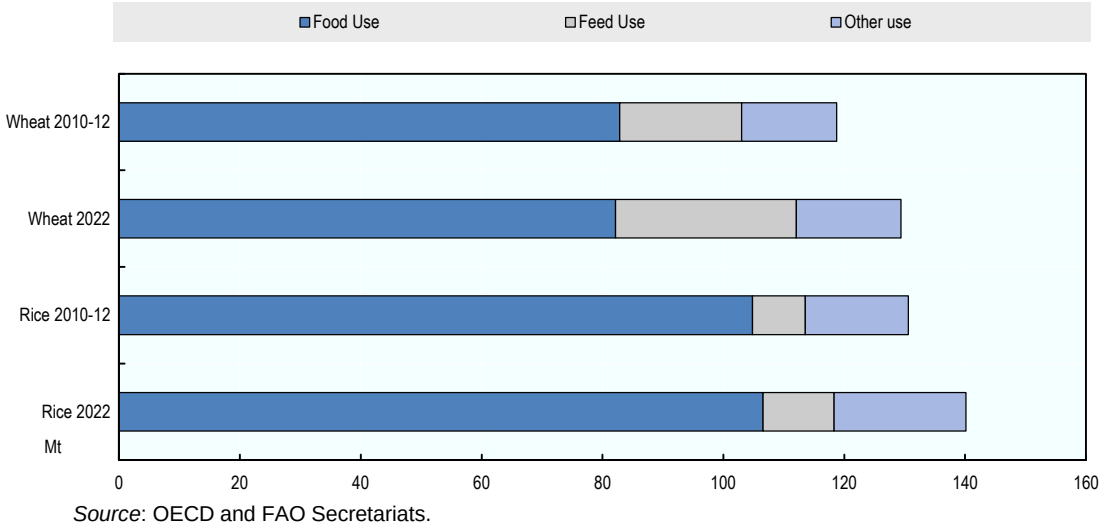
Rice consumption is set to increase a modest 0.3% p.a. over the *Outlook*. Rice is consumed chiefly as food (78%), and consumption is set to reach 107 Mt in 2022, up slightly from 106 Mt in 2013. However in per capita terms rice food consumption is projected to decline by 0.2% p.a. to 76.5 kg. This decline continues the trend of the previous decade as consumers spend additional income on other foods (Figure 2.15).

**Figure 2.13. Cereal production and stock ratios in China**



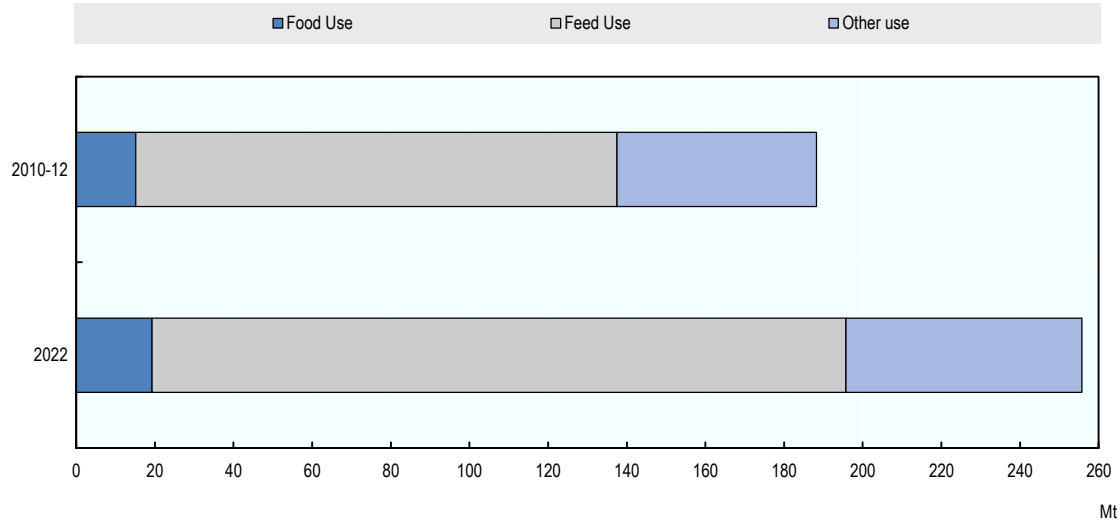

*Source*: OECD and FAO Secretariats.

**Figure 2.14. China: Wheat feed consumption increases, rice food consumption stagnant**




*Source*: OECD and FAO Secretariats.

**Figure 2.15. China: Coarse grain feed consumption increasing with meat production**

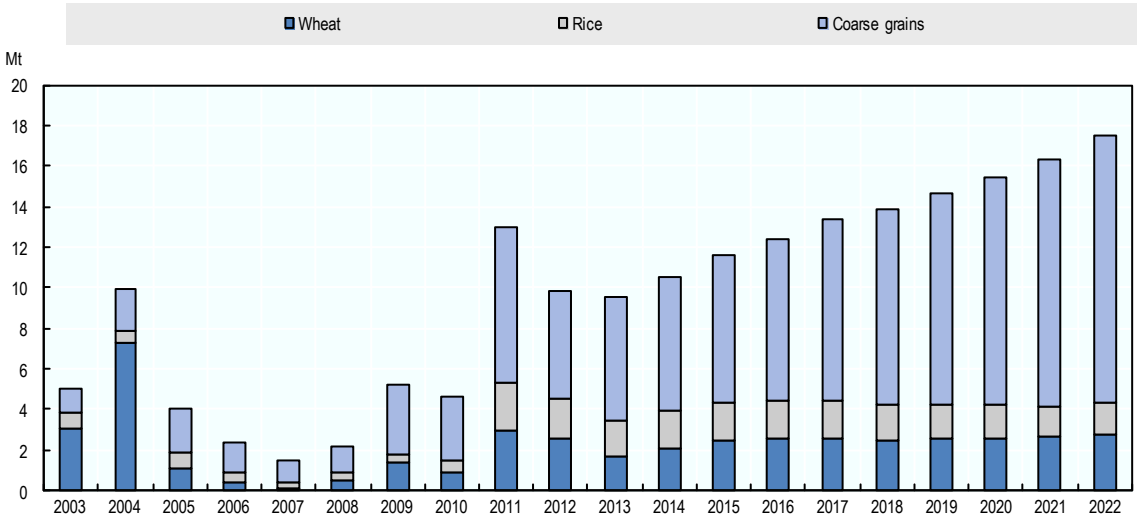



*Source*: OECD and FAO Secretariats.

*Increasing imports of wheat and maize*

China's export of cereals will continue at a very low level, but imports will expand except for rice. China's import of wheat in 2022 is projected to expand to 2.8 Mt, up from an average of 2.1 Mt in the base period, still maintaining China at about 98% self sufficiency. However, imports of coarse grains are projected to reach 13.2 Mt, and beyond the limit of China's tariff quotas. This sharp rise is mainly driven by stronger import demand for feed. Imports may also be affected by the decision to allow imports of maize for industrial purposes. China's import of rice, contrary to wheat and coarse grains, is projected to decline to 1.5 Mt, somewhat lower than the average of the base period 2010-2012. The sharp increase during the period 2011-12 will not be sustained because of sufficient domestic supply and accumulated stock (Figure 2.16).

**Figure 2.16. China's cereals imports**

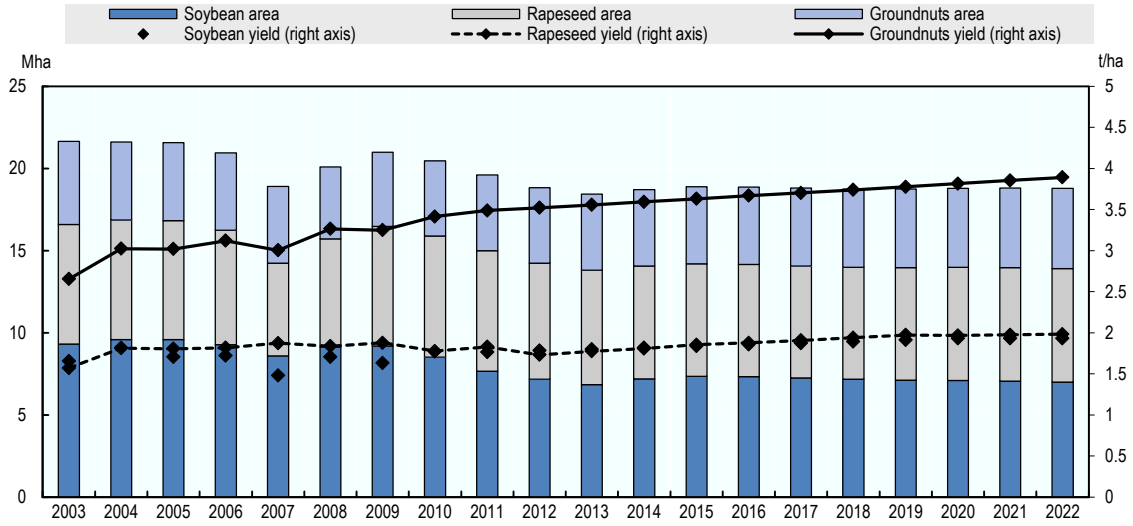



*Source*: OECD and FAO Secretariats.

### *Oilseeds and oilseed products*

The oilseed sector in China is relatively less supported by the government than other crops, and tariffs are low. China's oilseeds production is projected to exceed 48 Mt by 2022, about 8% higher than the production in the base period (Figure 2.18). Compared to the previous decade, growth is expected to increase moderately, mostly driven by a small increase in area, with the exception of rapeseed. Annual yield growth for oilseeds is projected at 1.1%, slightly lower than that of the last decade (1.3%). Largely due to higher yield levels, soybean production is projected to reach 13.5 Mt by 2022, 14% above the level of 2013, recovering from the decrease trend during 2003-12. Rapeseed plantings in China are expected to decline to 6.9 Mha, about 2% lower than the current level, mainly due to high marginal costs of planting increases and sustained profitability of competing crops such as maize. The yield of rapeseed is projected to grow at 1.3% per years and expected production will reach 13.7 Mt by 2022, increasing about 11%. Groundnut production, another important oilseed of China, is projected to reach 19 Mt by 2022, 15% higher than in 2013, growing at the same stable pace as during the historical period, while the annual yield growth rate is expected to be 1% (Figure 2.17).

**Figure 2.17. China's main oilseed area and yield growth**

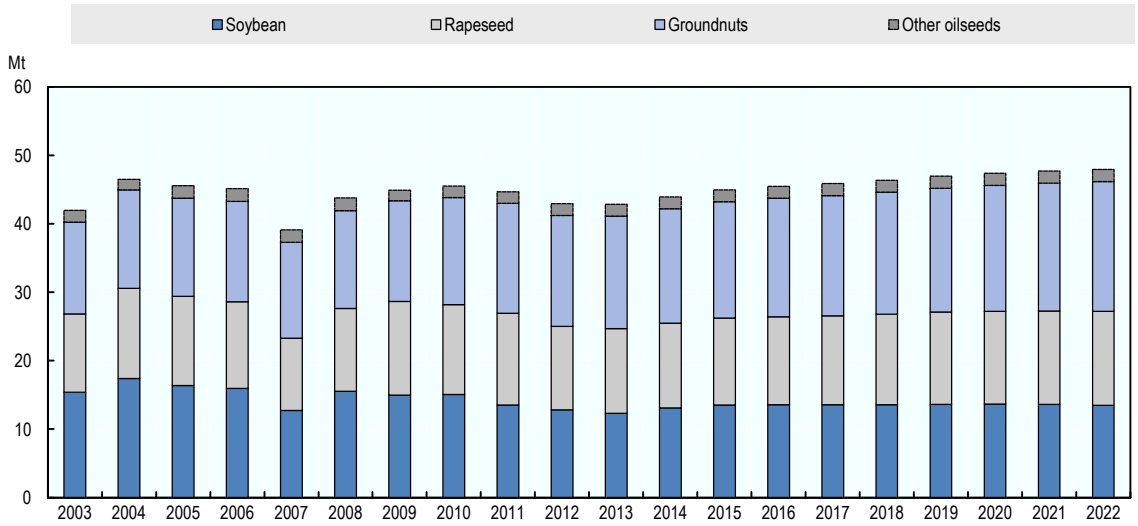



*Source*: OECD and FAO Secretariats.

Increased consumption has lead to a concurrent increase in China's oilseeds stocks. However, over the projection period, stocks stabilise around 18.3 Mt by 2022, which represents an annual growth rate of only 0.1%, significantly lower than the growth rate during the previous ten years (16.5% p.a.). The ratio of oilseeds stocks to utilisation will approach 14.2%, about 2-3 percentage points below that of recent levels.

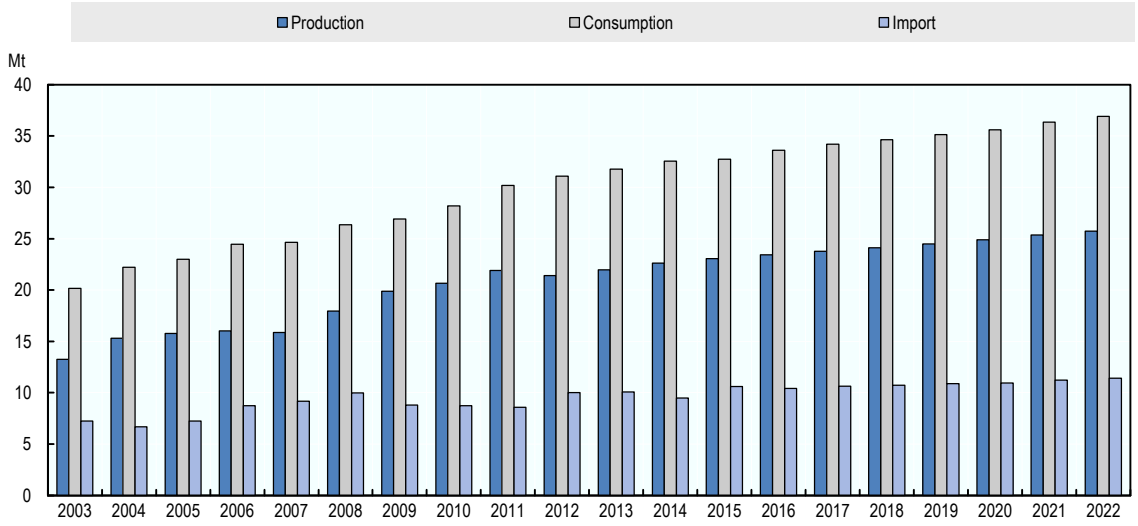
China's vegetable oil production, relying on both domestically grown and imported seed, is projected to reach 25.7 Mt by 2022, up 21% from the base period (Figure 2.19). The annual growth rate during the next decade is projected at 1.7%, well below the level of the previous decade (5.4% p.a.). Vegetable oil consumption is expected to grow by 1.6% p.a., about one-third of the rate observed during 2003-12 (4.5% p.a.). Vegetable oil in China is consumed mainly as food and is expected to reach 36.6 Mt by 2022, up 16% from 2013, accounting for 99% of total domestic use. Per capita consumption is projected to reach 26 kg, an increase of around 13% from 2013, while the annual growth rate (1.4% p.a.) is slower than the level during the last decade (4.0% p.a.).

**Figure 2.18. China's oilseed production and composition**




*Source*: OECD and FAO Secretariats.

**Figure 2.19. China's vegetable oil production, consumption and imports**




*Source*: OECD and FAO Secretariats.

China's oil meal output is projected to increase by 21%, reaching almost 75 Mt by 2022. Oil meal production continues to rely on crush of both domestically grown and imported seed. The annual growth of production is expected to be 2%, markedly lower than the level during 2003-12 (7.4%). This reflects the much higher base level of production and the fact that demand driven by livestock industries will grow also at a slower pace than before.

*Imports of oilseeds rise to over 80 Mt*

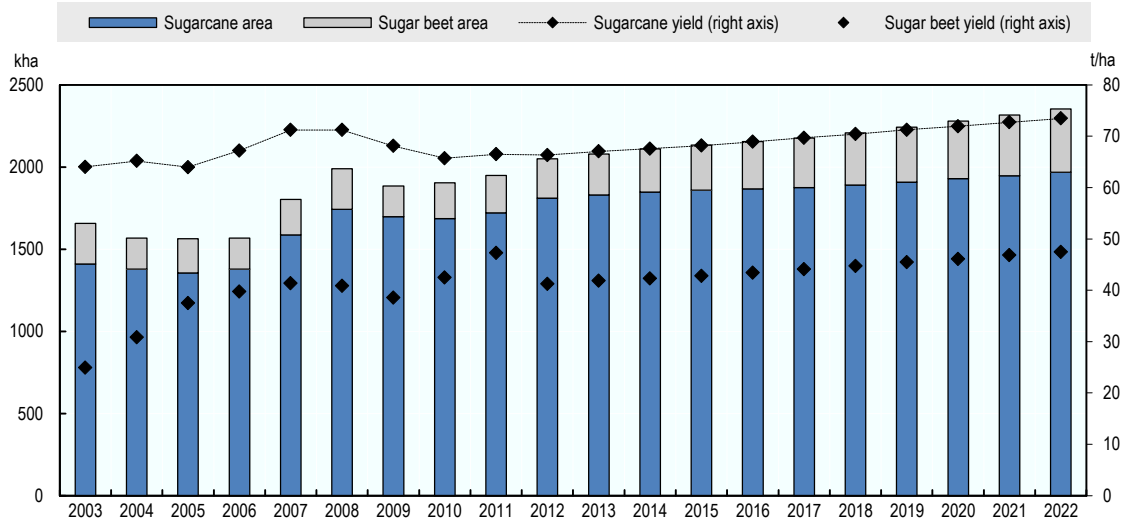
China's export of oilseeds will continue to decrease and remain at a very low level. Imports will reach 83 Mt, 41% higher than the base period level, and will account for 59% of global trade, up from around 54% in the base period. Import growth should slow down compared to the last decade, on account of the deceleration in growth of the crushing sector, as demand growth for both protein meal and vegetable oil eases, from a higher base. The annual growth rate is expected at 2.6%, down from 13.3% p.a. in the previous ten years. As for vegetable oils, China's imports are expected to reach 11.4 Mt, up 25% from base period

values, with an annual growth rate (1.6% p.a.) less than half of the previous decade (3.5% p.a.). Because China covers a considerable part of its oil requirements via the crushing of imported oilseeds, the annual growth of imports will also be somewhat slower than that of production and consumption (Figure 2.19). With respect to protein meals, China's imports are projected to expand to 5.8 Mt by 2013, significantly up 267% from the base period, because of the development of the livestock industry and the relative small scale in the base year.

### *Sugar*

China's sugar production is projected to expand faster in the coming ten years to reach 16.4 Mt, about 28% higher than the production in the base period (Figure 2.21). Annual growth for sugar production is projected at 2.7%, about the same as that of the last decade. Perennial sugarcane production continues to dominate sugar beets in the production of sugar. Although sugar beet production is expected to grow at 6.5% per year, markedly faster than sugarcane (1.8% p.a.) over the next ten years, sugarcane will still account for 89% of total sugar output by 2022.

**Figure 2.20. China's sugar area and yield growth**




*Source*: OECD and FAO Secretariats.

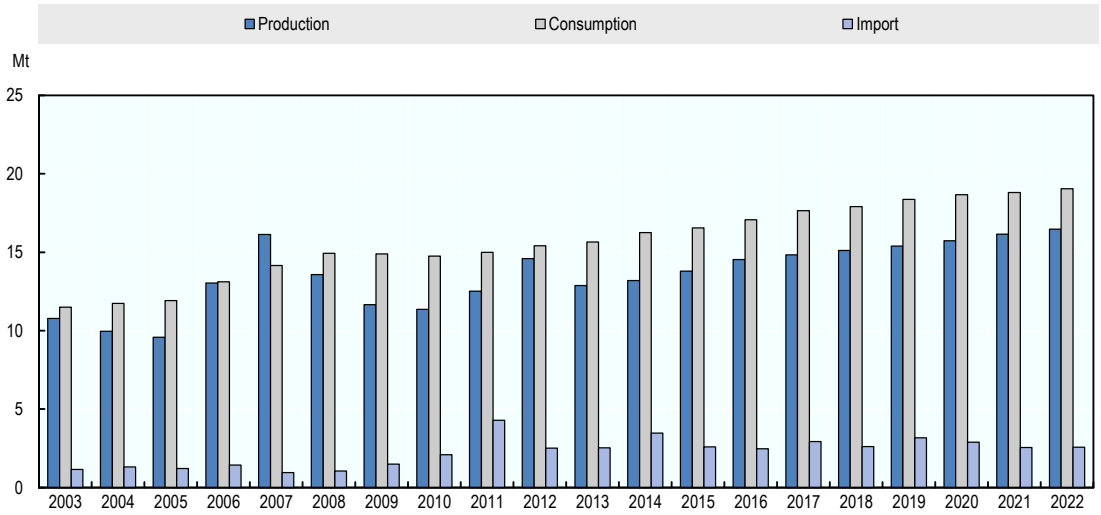
Sugarcane planting area in China is expected to reach 2 Mha by 2022, up 13% from the base period, with a yield growth rate at 1% p.a. during the projection period, higher than the level in the previous ten years (0.4% p.a.). Sugar beet area is projected to increase to 0.4 Mha by 2022, about 55% above the current year, and the annual yield growth rate over the next ten years is expected to be at 1.5%, higher than that of the last decade (0.7%) (Figure 2.20).

China's sugar consumption is projected to reach 19.1 Mt by 2022, up 27% from the base period, due to rising incomes and growing populations. Per capita sugar consumption is projected to increase to 14 kg per person, roughly 3 kg higher than in the base period.

#### *Imports of sugar to rise above import quotas*

China's import of sugar in 2022 is projected to reach 2.6 Mt. China's recent import growth should slow down significantly compared to the last decade, and remain below the peak reached in 2011. The sharp increase of imports during 2011/12 and 2012/13 will not be sustained in the *Outlook* because of sufficient sugar stocks, which expanded to 4.1 Mt in 2012/13, almost double the level during the last ten years, and production is increasing with demand (Figure 2.21).

**Figure 2.21. China's sugar production, consumption and imports**

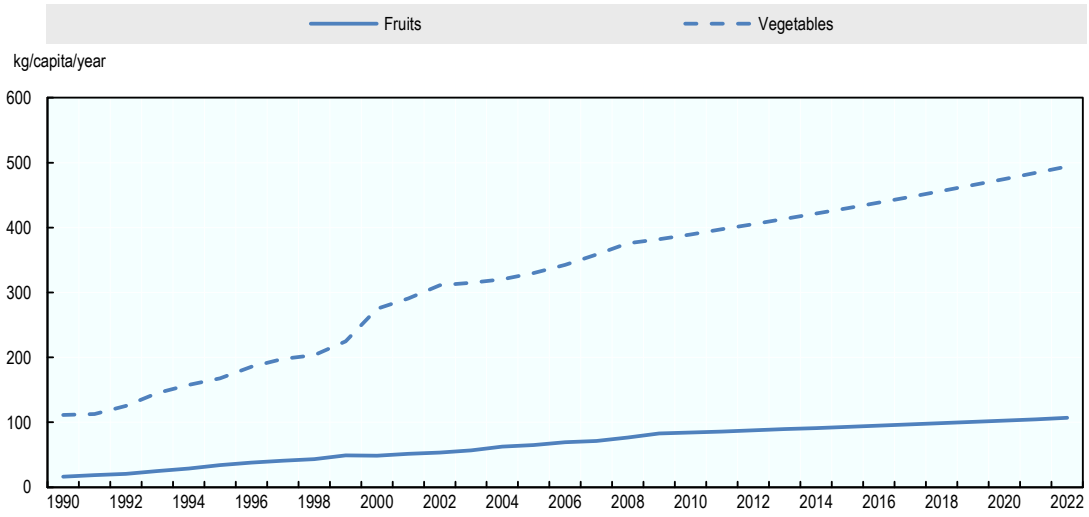



*Source*: OECD and FAO Secretariats.

### *Vegetables and fruit*

The *Outlook* does not include international markets for vegetables and fruits. These markets can be very important in the agricultural sectors of certain countries, and this is very much the case for China in terms of farm value and growth. In the last decade, per capita consumption of vegetables grew at a rate of 6% p.a., and that for fruits grew at 3.5% p.a. (Figure 2.22). It is anticipated production in these sectors will both grow in the 2-3% p.a. range over the next decade, with slower growth due to rising water and labour constraints. The crop areas of these commodities measured 20 Mha for vegetables and 12 Mha for fruit in 2011, representing almost 20% of total crop area sown in that year. It is projected that total area to these crops will rise to 38 Mha by 2022, further pressuring area competition with other crops for scarce land and water resources.

**Figure 2.22. China: Per capita vegetable and fruit consumption is rising rapidly**

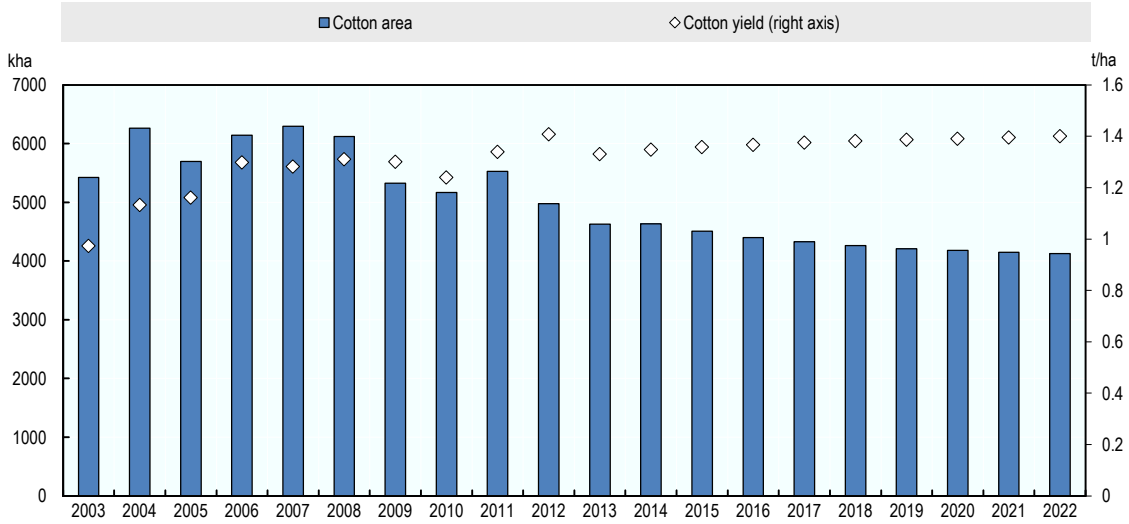



*Source*: OECD and FAO Secretariats.

### *Cotton*

China's cotton production is projected to decrease as a result of a decline in area to 5.8 Mt by 2022, about 17% lower than in the base period of 2010-12. By 2022, the harvested area for cotton is projected to be 20% lower than the base period. Yield will continue to expand, but at a slower pace than in the past, reaching 1.40 t/ha by the end of the projection period (Figure 2.23).

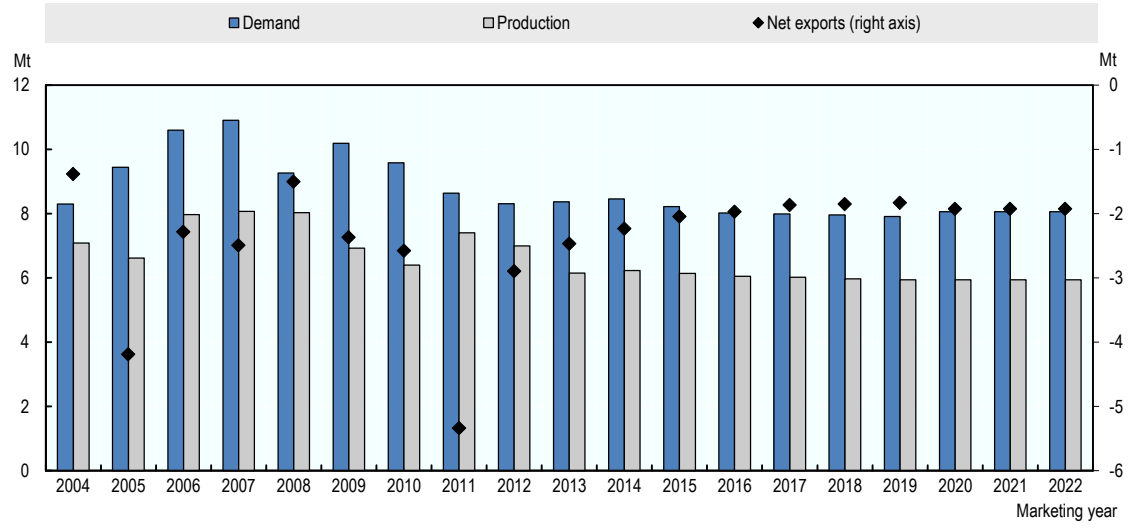
**Figure 2.23. China: Decrease in area and yield growth also slows**




*Source*: OECD and FAO Secretariats.

While domestic consumption of textile products is likely to increase, the intensification of competition in cotton spinning products, especially from India and other countries with low cost labour, the use of cotton in China will decline. Total cotton utilisation is projected to reach 8 Mt by 2022, decreasing at a rate of 0.4% p.a. over the *Outlook* period, which is significantly different to the trend shown in the last decade.

**Figure 2.24. Production, utilisation and net trade for cotton in China**



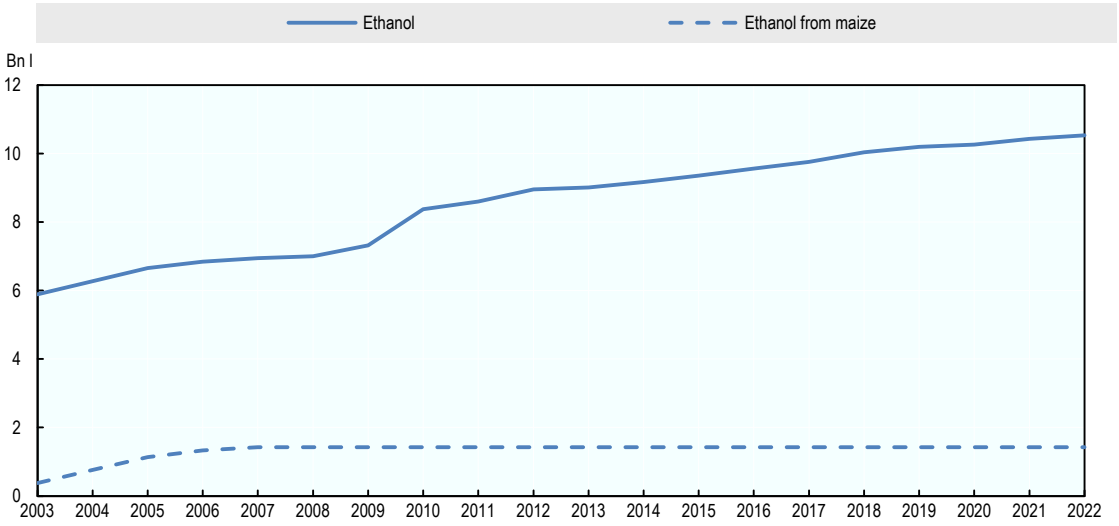

*Source*: OECD and FAO Secretariats.

Due to the decrease of domestic utilisation, cotton imports will experience a further reduction and is projected to decrease to 1.9 Mt by 2022, 1.7 Mt (46%) lower than in the base period 2010-12.

### *Bio-fuels*

In the previous decade, ethanol production grew from just under 6 bnl, to 9 bnl by 2012. About three-quarters of ethanol production is used in non-fuel uses, although fuel use has been increasing. Production feed stocks have been primarily cassava and specific grains such as sorghum. The rapid increase in production of ethanol from maize, before 2007, raised concerns, given the sensitivity of using this food security crop for non-food purposes. Further increases in ethanol production from maize have been prohibited since 2007.

**Figure 2.25. China: Ethanol production grows slowly, with no direct impact on maize**



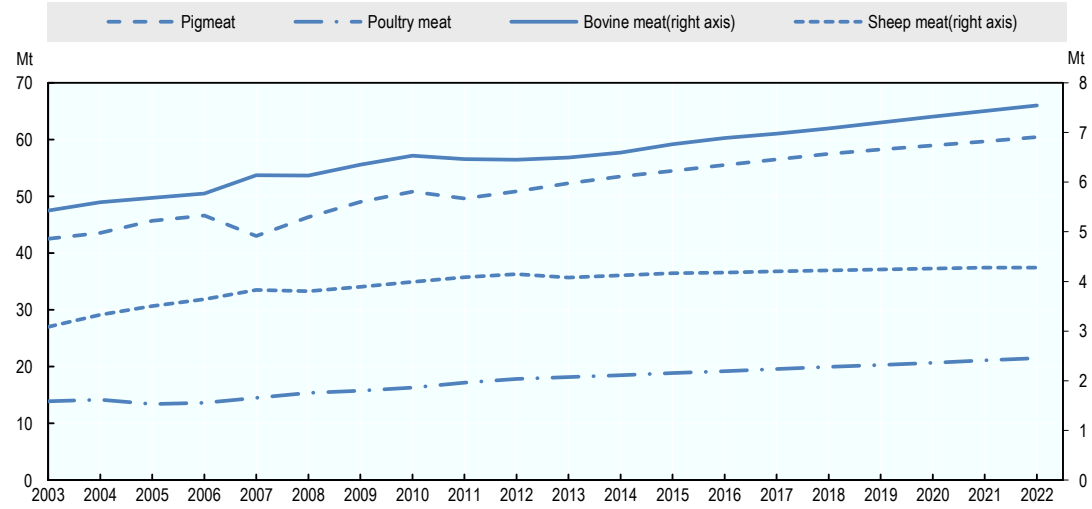

*Source*: OECD and FAO Secretariats.

Production of ethanol is anticipated to rise to 10.5 bnl by 2022, a rise of 1.8% annually over the *Outlook* period. Production of ethanol from maize will remain less than 1.5 bnl with the remaining production using feedstocks from other crops (Figure 2.25). Trade in ethanol is anticipated to remain negligible over the *Outlook* period.

### *Meat*

In response to increasing demand, total meat production in China should reach 93 Mt by 2022, an increase of 1.5% p.a. over the *Outlook* period. This is somewhat lower than the 2.3% p.a. in the previous decade. Pigmeat production is projected to increase by 1.6% on average each year, while that for poultry and sheepmeat may grow 1.9% and 0.5% respectively. Bovine meat is anticipated to grow 1.7% p.a. However, each of the meat categories will grow more slowly than in past ten years, as higher prices slow consumption growth. In terms of share in total meat production, on a retail weight basis, pigmeat will remain by far the highest at 63%, followed by poultry at 25%, bovine meat at 7%, and sheep at 5% (Figure 2.26).

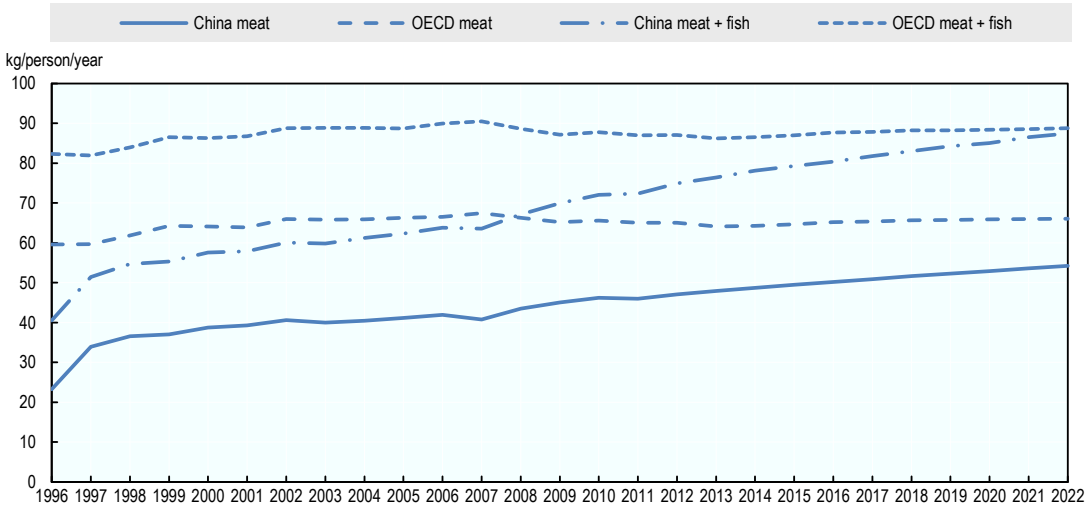
**Figure 2.26. China: Meat production – Pigmeat will continue to dominate**




*Source*: OECD and FAO Secretariats.

Consumption growth will mirror production growth for China's meat sector. Total meat consumption on a retail weight basis will grow by 1.6% p.a., which is lower than 2.5% p.a. in the last ten years. Per capita consumption will increase by 7 kg p.a. over the period. Pigmeat will capture 66% of the additional meat consumption over the projection period, and poultry meat will experience the fastest increase rate of increase at 1.7% p.a. Total meat consumption in China will be about 54 kg/capita p.a., compared to 64 kg/capita in OECD countries (Figure 2.27). However, average pigmeat consumption in China will be some 34 kg/capita (retail weight basis) compared to the OECD average of 22 kg/capita. OECD consumers eat much more poultry at 28 kg/capita compared to China at 14 kg/capita, and much more bovine meat at 14 kg/capita compared to China at 4 kg/capita. When assessing meat consumption comparatively in this manner, account should be taken of fish consumption, which has grown rapidly in China in recent years (see Fish section). It is projected that over the *Outlook* period, China's total of meat and fish consumption may converge to the average of OECD countries in per capita terms (Figure 2.27).

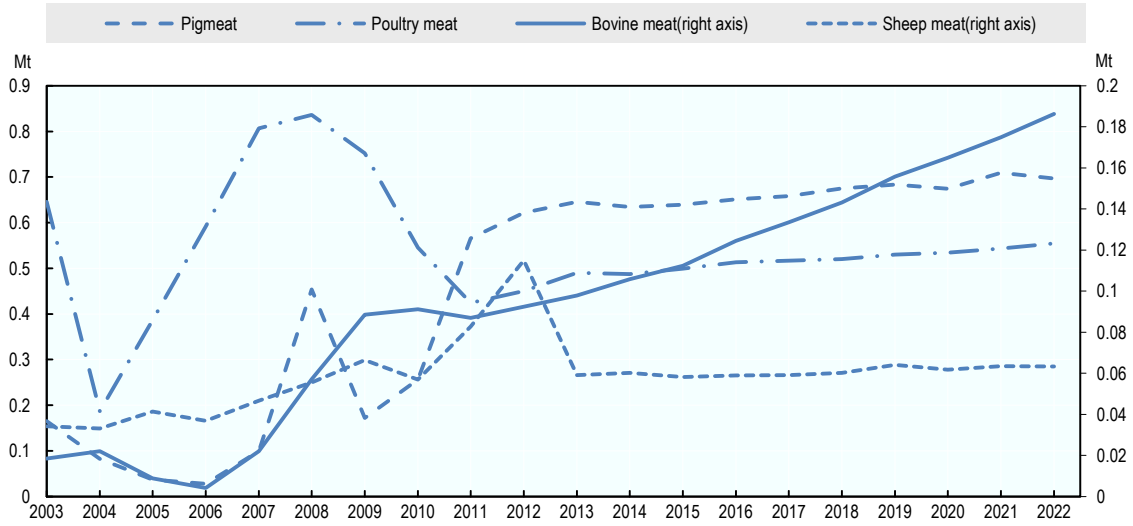
**Figure 2.27. China: Per capita meat consumption is rising towards OECD levels**




*Source*: OECD and FAO Secretariats.

With strong meat prices through the projection, Chinese meat imports are expected to increase by 3% p.a. and reach 1.7 Mt by 2022, driven by population and income growth and high income elasticity of demand. Bovine meat will become the fastest growing import sector with a growth rate of 7% p.a. (Figure 2.28).

**Figure 2.28. China: Bovine will be the fastest meat import sector**




*Source*: OECD and FAO Secretariats.

### *Fish and seafood*

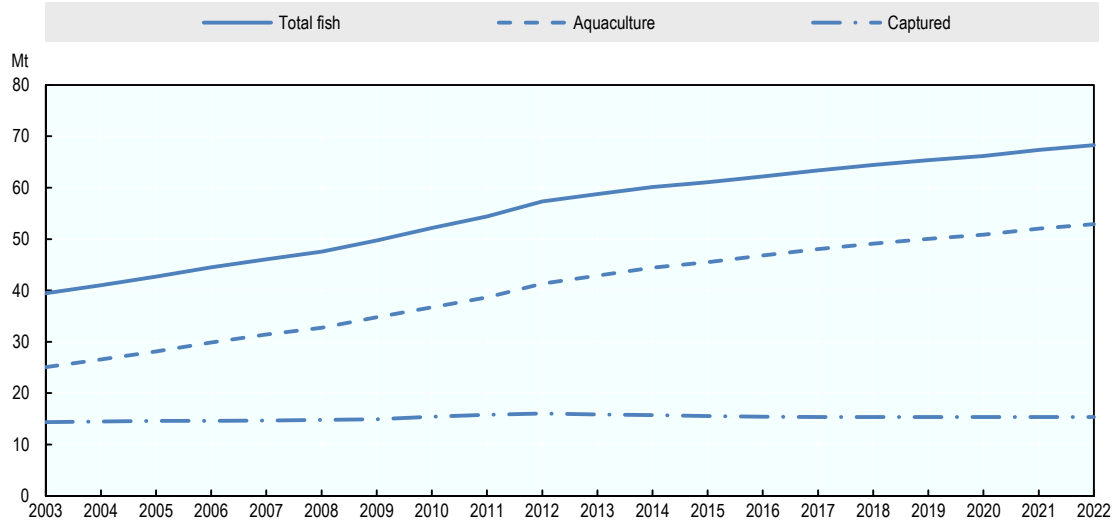
China capture and aquaculture fisheries production is projected to reach about 69 Mt by 2022, a growth of 26% above the average level for 2010-12. The increase will be driven by aquaculture, which will rise by 37% over the *Outlook* period compared to a 3% decline of capture fisheries. Aquaculture production is projected to reach about 53 Mt, or 63% of global aquaculture production (Figure 2.29). However, due to water and land constraints, a slowing down of aquaculture growth is anticipated, from an average annual rate of 5.4% per year in the last decade to 2.4%. Notwithstanding the slower growth rate, aquaculture will continue growing faster than the animal food-producing sectors. There are significant concerns, however, that expanding aquaculture production at this rate will encounter considerable environmental challenges. Environmental issues are attracting more attention, and the government is setting new regulations and enhancing technological innovation to strengthen sustainability and environmental responsibility in aquaculture (12$^{th}$ Five-Year Plan for Chinese Fishery). For capture fisheries also, the government is setting regulations to improve fishery resources through volume controls, curbing illegal, unreported and unregulated fishing (IUU), as well as encourage structural adjustment and efficiency.

Due to growing demand, per capita fish consumption is expected to expand over the next decade, reaching 42.6 kg in 2022, growing at the rate of 1.5% p.a. Total fish consumption is projected to reach 63 Mt in 2022, 26% more than the average level for 2010-12 (Figure 2.30). But growth is expected to slow to 1.8% p.a. over the projection period compared to 3.7% in the previous decade.

Rising fish consumption reflects the change in availability of fish and other alternative products. Growth in consumption will be the result of complex interactions between several factors, including rising living standards, population growth and dietary changes linked to rapid urbanisation with an increase in demand for animal food.

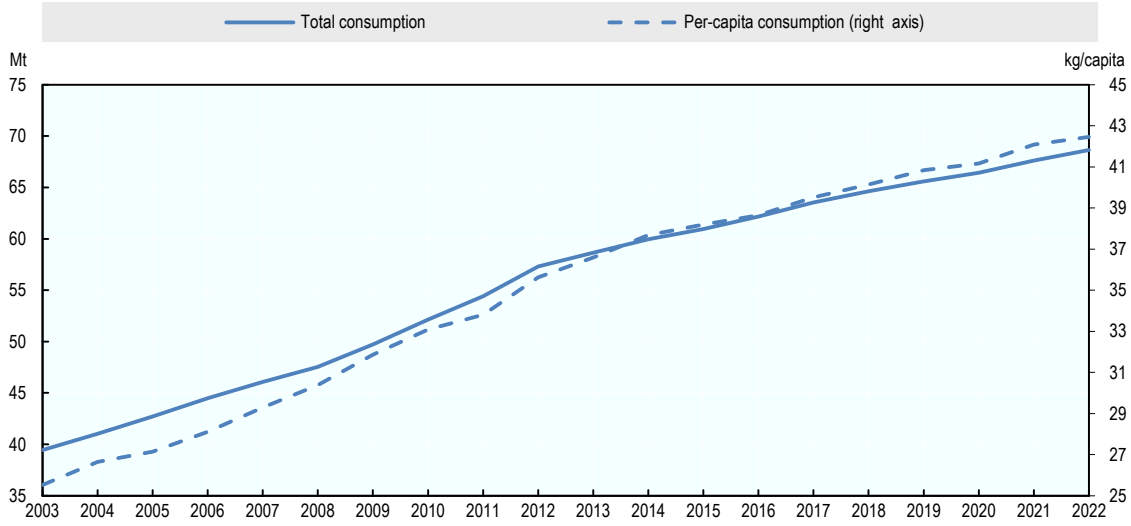
Imports and exports of fish are expected to expand moderately over the *Outlook* period. Fish imports for human consumption will reach 4.4 Mt, growing by 2.1% p.a. in the next decade and its share of domestic consumption in China will gradually rise from 7% to 8%. China will remain the world's leading exporter with total exports reaching almost 10 Mt by 2022, an increase of 28%. A significant share of fish exports will continue to consist of reprocessed imported raw material.

**Figure 2.29. China: Aquaculture drives total fishery production increase**




*Source*: OECD and FAO Secretariats.

**Figure 2.30. China: Fish consumption grows more slowly**




*Source*: OECD and FAO Secretariats.

### *Dairy*

Milk production over the *Outlook* period reflects considerably slower growth from the last decade with an average growth rate estimated at 2.4% p.a. Total production will reach almost 58 Mt by 2022 (Figure 2.31). Although the growth rate is lower than the 6.9% level witnessed in the last decade, the dairy sector remains among the fastest growing sectors covered in the *Outlook*. Slower growth is largely due to reform of the production-processing chain following the melamine crisis in 2008-09. The projection includes lower growth of cow inventories with per cow productivity growth at 0.7% p.a.

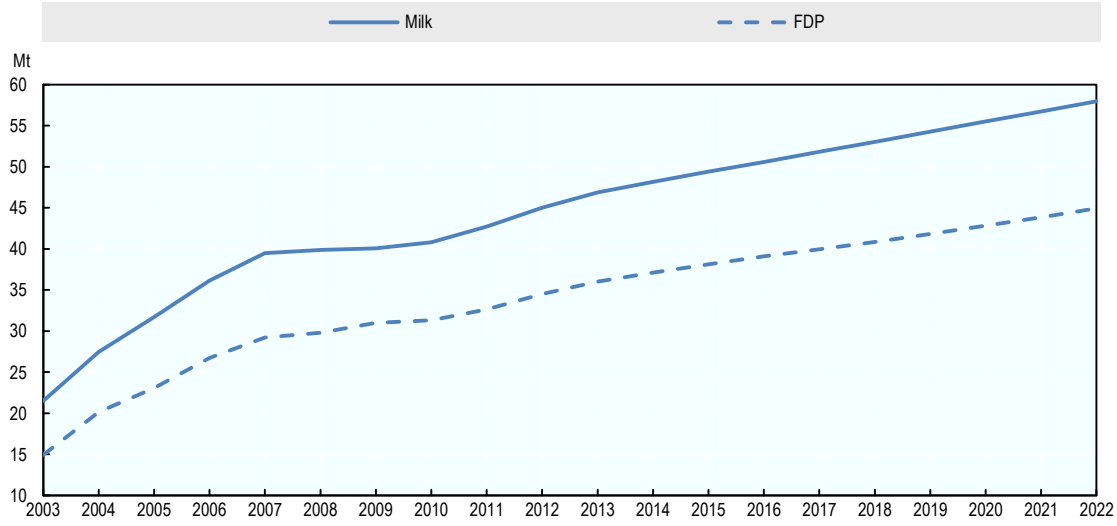
Whole milk powder (WMP) and cheese production will experience the largest increase of 32%, while skim milk powder (SMP) and butter will gain 3% and 21% respectively. Production of fresh dairy products will absorb most of the additional milk production, growing by 36% compared to the base period 2010-12.

Although dairy product consumption is expected to increase by around 38% from the 2010-12 base period, this is much slower than the past decade, since the base is now much higher. While consumption of all dairy products will increase considerably, fresh dairy production will account for most of the volume increase.

Per capita consumption of butter is expected to grow by 1% p.a. while cheese, fresh dairy products, SMP and WMP gain 3%, 2%, 3% and 2% respectively over the *Outlook* period. This increase is mostly driven by income levels and the growing influence of multinational companies which are introducing new retail products and processing efficiencies, as well as government programmes that promote, for example, school milk consumption.

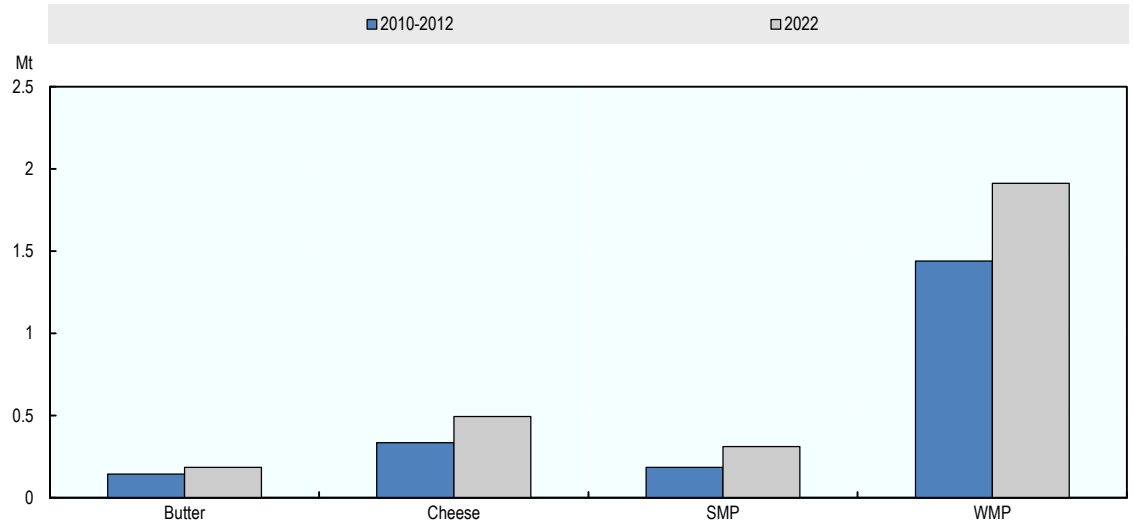
The total dairy product import growth (in milk equivalent) is projected to rise by about 60% in 2022 compared to the base period, largely as a result of slower growth in domestic production. The rate of import growth of milk products significantly differs among categories (Figure 2.33). Imports of SMP and WMP account for 88% of total dairy product imports. These products are primarily used in the processing of foods where animal proteins and fats are required.

**Figure 2.31. Growth of milk production in China slows**



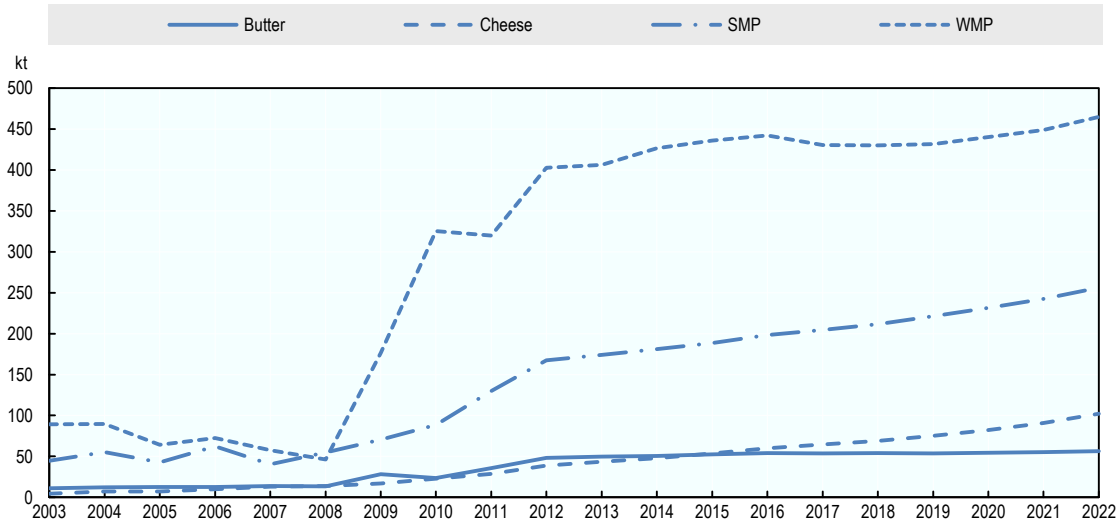

*Source*: OECD and FAO Secretariats.

**Figure 2.32. Growth of dairy product consumption in China**




*Source*: OECD and FAO Secretariats.

**Figure 2.33. China: Dairy product imports will remain high over the outlook period**




*Source*: OECD and FAO Secretariats.

## Risks and uncertainties

The *Outlook* provides a plausible projection for China's markets, given the assumptions underlying the conditions of these markets. As such, it would appear that China, despite a strong demand context, with high growth in incomes, will continue to meet its main policy objectives for food self-sufficiency, especially for food security sensitive products, including wheat, rice and vegetable oils. If high income growth is sustained, China's food security situation is most certainly to improve. According to this *Outlook*, achieving these objectives with a slowdown in the growth of crop yields will require an increase in imports of maize for feeding a growing livestock sector. Sugar imports may also rise above tariff quotas. However, the *Outlook* projections suggest that while income growth and urbanisation continue at a fast pace, their marginal impact has been slowing.

Three broad types of scenarios are examined which illustrate the sensitivities of the *Outlook* to possible risks. One potential risk concerns the overall macroeconomic projection. Another concerns issues such as those related to increasing constraints on land and water, or due to rising environmental issues, which may inhibit agriculture's ability to meet rising demand. A third scenario examines risks related to climate change and the potential domestic and international market impacts that could result from potentially lower and more variable crop yields. This section seeks to evaluate these risks with stylised model based scenario analysis with the OECD-FAO global commodity model.

***Impacts of alternative economic growth***

China's last recession was in 1993. Since that year, economic growth has ranged between 5% and 15% every year, at a trend growth rate of 9.6% per year. The assumption underlying the projection of this *Outlook* is that economic growth will slow to a trend rate of 7.4% p.a. This may seem to be a considerable slow down, but at this trend rate Chinese per capita incomes will still double over the projection period. Sustaining the previous trend growth would obviously add to the demand pressure on China's commodity markets. Given current policy objectives, this growing demand would likely require higher coarse grain and oilseed imports to feed the growing livestock sector, as well as to meet further growth in vegetable oils production. A naïve higher growth scenario, where GDP growth remains at 9.6% p.a. over the *Outlook* period, was conducted with the OECD-FAO commodity model. Results illustrate potential outcomes, whereby meat consumption rises by 6% and production by 4.5% by 2022, inducing an increase in meat imports of some 65% compared to the baseline. Higher meat production induces higher feed grain production, and a 14% rise in imports of coarse grain. In this scenario, world coarse grain prices rise almost 4%, but Pacific pigmeat prices rise by 8%.

A weaker growth scenario is generally viewed as more likely than a stronger growth scenario. The issue concerns how long China's high growth can be sustained. The development literature refers to the "Lewis Turning Point" or the condition in which fast growing developing economies outrun the labour market competitiveness that has driven export let growth. Recent literature suggests that this point would not be experienced in China within the horizon of this *Outlook*. However, in recognition of this issue, a low growth scenario, with a strong drop in growth by 2016, to 4% p.a. out to 2022 provides alternative assessment of the sensitivities of the *Outlook* to lower growth. This scenario portrays a drop in meat production and consumption by 6% and 7.5% respectively, and a drop in meat imports by 45% by 2022 compared to the baseline. Pacific pigmeat prices fall by almost 5% in this scenario. These economic growth scenarios are extreme, but illustrate the sensitivity of the China's and global markets to its economic performance.

***Impacts of increasing constraints to production***

While the *Outlook* illustrates that China will achieve its basic targets for self-sufficiency and grain production, it is apparent that environmental challenges exist with relatively limited, and potentially shrinking, arable land and depleting water resources. In this context, policy choices could be made, for example, to: a) import more meat, for example to contain environmental problems associated with livestock production and limit the growth in feed requirements, and/or b) lower competition for land and land stress associated with high intensity crop production by importing more coarse grain, to meet rising demand. With arable land potentially falling to the limit of the "red line", importing coarse grain area would reduce intensity of crop production and perhaps enable further growth in other rapidly growing high value vegetable and fruit crops. These scenarios illustrate the types of choices available to address issues of domestic resource constraints, but imply higher imports from global markets.

*a) Increase pigmeat imports*

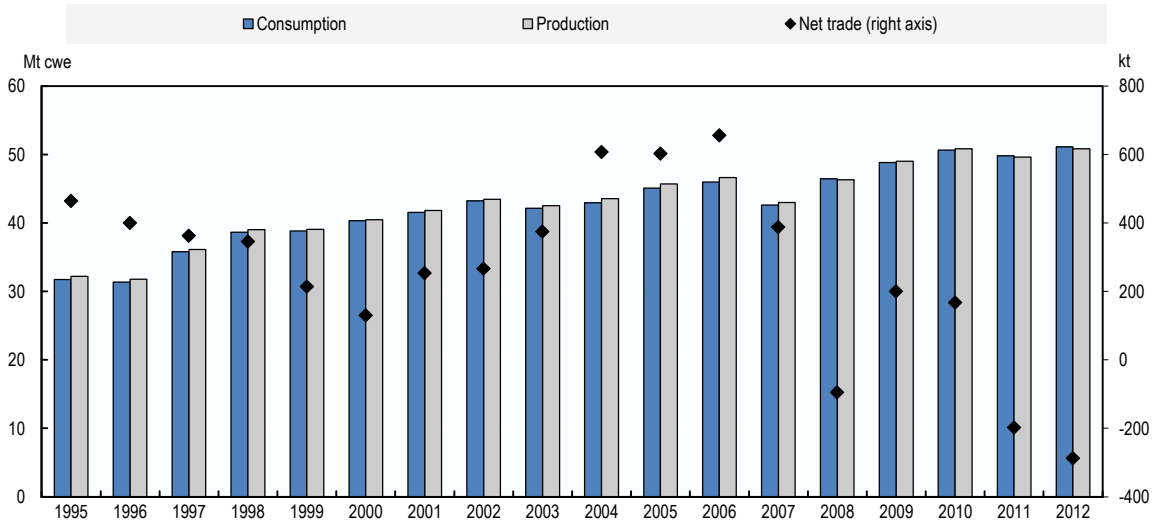
China has been emerging as a major player in the world pigmeat market. Its market presence is not only due to its leading position as the world's largest pork producer and consumer, but also increasingly due to the volatility of its pig meat trade, which has cycled between a trade surplus of over 600 Kt in 2006, and a deficit of over 200 Kt in 2012 (Figure 2.34).

Per capita pigmeat consumption in China increased to 38 kg in 2010, up 13% in ten years. It is expected that total consumption will continue its upward trend over the *Outlook* period, with average annual growth estimated at 1.6%. Coarse grain consumption in China represented roughly 18% (213 Mt) of world consumption in 2012 and is estimated to continue growing by 1.3% over the *Outlook* period. Historically, China has been mostly self-sufficient in pigmeat and coarse grains. Over the *Outlook* period, China's average self-sufficiency levels for pigmeat and coarse grains are roughly 100% and 95%, respectively. Maintaining these self-sufficiency levels in both commodities over the ten-year period will be a challenge. Management of land and water constraints, for example, will play a major role in China's ability to remain self-sufficient. In the next decade, China's pig population will rise to almost 550 million head, further stressing the environment, often in areas surrounding cities.

A scenario analysis was undertaken that assumes lower growth in pigmeat production such that pigmeat and coarse grain self-sufficiency levels are both at 95%.[8] Chinese pigmeat production decreases by an annual average of 2.3 Mt (a 1% annual decline in self-sufficiency). As a counterbalance to this lower production, Chinese pigmeat imports increase by an annual average of 1.5 Mt. These imports are distributed among current top Chinese pork suppliers: the European Union, the United States, Canada, and Brazil.

The increase in Chinese pigmeat imports is sufficient to have international price effects. On average, the Atlantic and Pacific pigmeat prices would increase by 5% and 8%, respectively, over the *Outlook* period and EU prices would be 5% higher. Also, with Chinese pigmeat imports more than doubling over the *Outlook* period, domestic prices become more closely linked to international prices, rising 6% and resulting in some reduction in domestic consumption.

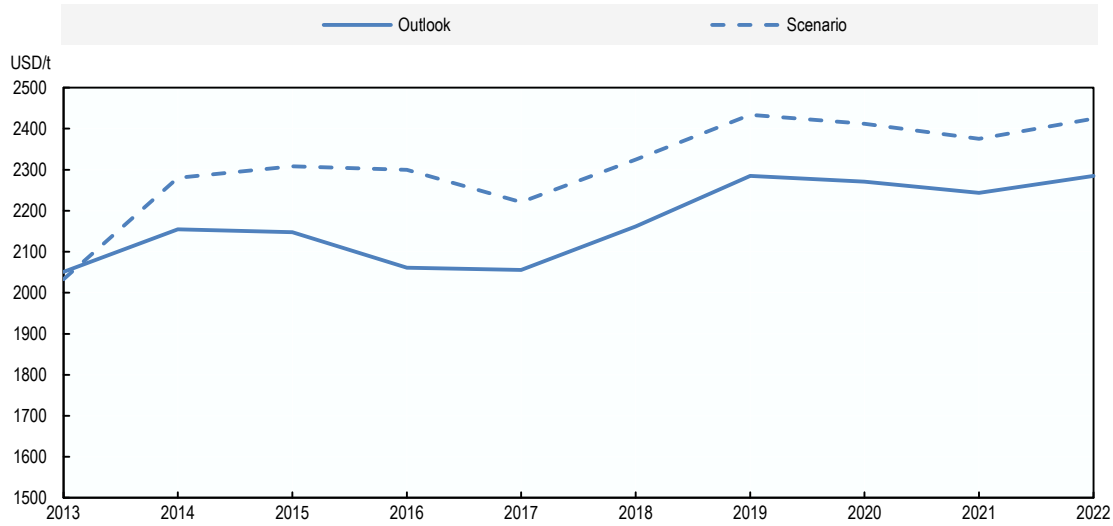
**Figure 2.34. China pork production consumption and trade**




*Source*: OECD and FAO Secretariats.

8. See Chapter 7 on meat for more detail on the specifications and results of this scenario.

**Figure 2.35. Impact on global pork prices of higher imports by China**




*Note:* The price reference chosen is for the Pacific markets. Price impacts in other markets are similar.
*Source*: OECD and FAO Secretariats.

*b) Opening coarse grain markets*

With land quality erosion and with urbanisation pressure to reduce arable land, one option is to reduce crop production and cropping intensity. In the last decade, China opened its markets to oilseed imports, largely recognising its land base was insufficient to support growing demand for both protein meals and vegetable oils. In so doing, it facilitated the achievement of self-sufficiency in basic food security crops — wheat rice and maize by reducing competition for land. The imports of oilseeds were the equivalent of some 28 Mha by 2012, and according to the projection of this *Outlook*, would replace some 34 Mha by 2022. Higher demand growth for livestock products requires higher supplies of feed, and imports of maize have been increasing in recent years. This trend is anticipated to continue as production for higher income sensitive meat and dairy products grows. Growing area allocation to feed grains will pressure other crops. One option is to open markets for coarse grain, allowing yet higher imports.

To illustrate the impact which the opening of coarse grain markets would have on China and international markets, a scenario was undertaken in which the price of maize in China was set at the world reference price, plus fixed trading cost.[9] Compared to this *Outlook* projection, the scenario aligns domestic prices with international prices and clears domestic markets with trade. The results indicate that imports of coarse grain could be 28 Mt higher than the baseline projection by 2022. Increased imports would reduce domestic grain prices by some 17% and raise international market prices by 8%. In this scenario, domestic rice and wheat prices would decline by about 3%, while their international market counterparts rise about 1% for rice and 3% for wheat compared to the baseline projection. Lower feed grain prices enable livestock sectors to expand, by about 1% for pigmeat and milk, 1.6% for poultry, and 0.2% for bovine meat. In the scenario area harvested for grains in China remains near 2012 levels compared to an increase of about 0.7% p.a. in the baseline projection. This scenario is highly stylistic, and results are only indicative. However, they show that, similar to oilseeds, without an increase in crop and animal productivity, higher consumer demand will place increasing pressure on China's resource base, and may induce significant imports from international markets.

9. See Box 4.3 in Chapter 4 on cereals for more explanation of the scenario and results.

### *Impacts of climate change*

The *Outlook* provides a "single line" projection for key outcomes under strict assumptions concerning underlying driving forces. These, however, are subject to high uncertainty or variations, such as is the case for crop yield outcomes. The current impact associated with climate change has not been effectively evaluated, and most studies which have, include time frames beyond that of this *Outlook*. However, given the intensity of land and water use, and the growing fragility of these productive assets, it is anticipated that climate change will play a large role in China's future. As shown by simplified scenario analysis, even small changes in China's markets have potential for global impact. Alternative yield trends, with higher variation could impact China's self-sufficiency targets and perhaps as importantly may impact world markets, as apparently small percentage variations in domestic production could invoke large changes in trade.

In the past 100 years, average annual mean temperature in China increased by 0.5-0.8 C. According to some studies, it may further increase by 1.3-2.1 C by 2020, and by 2.3-3.3 C by 2050 in comparison with 2000. The frequency and intensity of extreme weather events are most likely to increase; water scarcity and droughts in the northern part may increase, and water logging and floods in the southern part may also increase. Food availability will be impacted by changes in temperature, water availability, extreme weather events, soil condition, and pest and disease patterns. While the temperature rise and fertilisation function of $CO_2$ may bring some benefits to crop production, it is likely that if no proper adaptive action is taken, production of the three major food crops in China, i.e. rice, wheat and maize, may decline. It has been estimated by some sources that total food production in China could be reduced by 14-23% in comparison with 2000.[10] Such a scenario would have large implications for domestic and international markets, further underscoring the basic fact that China's resource base, on a per person basis, is and will continue to be both intensively used fragile.

## Conclusion

The prospects for China's agriculture, and potential implications for global markets have been studied often in the past several decades. The challenge is clear: feeding China in the context of its rapid economic growth and limited resource constraints is a daunting task with both potential risks and opportunities for global markets. The *Outlook* projects that the challenge will remain omnipresent in market assessments over the coming decade, and deserves ongoing monitoring and analysis.

China has been thus far very successful at meeting its key goals. How can this success be sustained? Continuing the success, given rising issues of land degradation, water depletion, pollution, rural labour shortages and such poses significant policy challenges for the next decade. Nevertheless, China is anticipated in this *Outlook* to meet its production targets, and make further gains in food security indicators, albeit at likely higher support for agriculture. As for global agriculture, enhancing productivity growth will remain a key priority for China. An important issue for the longer term relates to the extent of expansion which will be required to meet rising demand, the growth of which is set to slow considerably by 2022. China has opened several key markets, and trade will continue expanded vigorously in some cases to help meet higher demand.

The *Outlook* projects a further opening of markets in the next decade, both for China, as for many other countries. As markets are increasingly integrated markets, global information sharing to support policy cohesion will be critical in best utilizing global resources to feed the world's population sustainably in the longer term.

10. See China National Development and Reform Committee, *National Strategy on Climate Change*, June 2007.

## Table 2.A.1. Commodity projections for China

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wheat[1]** | | | | | | | | | | | | |
| Production | mt | 117.7 | 120.7 | 121.3 | 122.1 | 123.2 | 123.5 | 124.5 | 125.5 | 126.3 | 126.5 | 127.1 |
| Area harvested | mha | 24.2 | 24.2 | 24.2 | 24.1 | 24.2 | 24.3 | 24.3 | 24.3 | 24.3 | 24.1 | 24.0 |
| Consumption | mt | 118.8 | 121.7 | 123.1 | 124.1 | 125.2 | 125.6 | 126.5 | 127.6 | 128.4 | 128.6 | 129.4 |
| Per capita consumption | kg | 61.5 | 60.0 | 60.0 | 60.1 | 59.9 | 59.4 | 59.4 | 59.5 | 59.5 | 59.1 | 59.0 |
| Exports | mt | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Imports | mt | 2.1 | 1.7 | 2.1 | 2.4 | 2.5 | 2.6 | 2.4 | 2.5 | 2.6 | 2.6 | 2.8 |
| Ending stocks | mt | 49.6 | 49.3 | 49.3 | 49.6 | 49.8 | 50.1 | 50.3 | 50.5 | 50.7 | 50.9 | 51.2 |
| **Coarse grains[1]** | | | | | | | | | | | | |
| Production | mt | 200.7 | 219.2 | 218.0 | 224.2 | 228.2 | 233.3 | 238.0 | 242.4 | 246.9 | 251.6 | 256.8 |
| Area harvested | mha | 37.0 | 36.6 | 36.6 | 36.6 | 36.6 | 36.6 | 36.6 | 36.6 | 36.6 | 36.6 | 36.6 |
| Consumption | mt | 200.7 | 223.8 | 228.0 | 232.8 | 237.9 | 242.1 | 247.1 | 252.5 | 258.1 | 264.0 | 270.1 |
| Per capita consumption | kg | 11.2 | 12.1 | 12.1 | 12.3 | 12.4 | 12.6 | 12.8 | 13.1 | 13.3 | 13.6 | 13.9 |
| Exports | mt | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Imports | mt | 5.4 | 6.0 | 6.6 | 7.3 | 8.0 | 9.0 | 9.7 | 10.4 | 11.2 | 12.2 | 13.2 |
| Ending stocks | mt | 53.0 | 62.5 | 58.9 | 57.4 | 55.5 | 55.6 | 56.0 | 56.3 | 56.2 | 55.9 | 55.7 |
| **Rice[1]** | | | | | | | | | | | | |
| Production | mt | 138.0 | 139.5 | 139.5 | 139.0 | 138.6 | 138.5 | 138.0 | 137.8 | 137.3 | 137.1 | 136.6 |
| Area harvested | mha | 30.2 | 30.1 | 30.0 | 29.8 | 29.7 | 29.5 | 29.3 | 29.2 | 29.0 | 28.9 | 28.7 |
| Consumption | mt | 130.6 | 135.6 | 139.0 | 140.7 | 138.2 | 138.4 | 139.2 | 140.2 | 140.6 | 140.5 | 140.1 |
| Per capita consumption | kg | 77.8 | 77.8 | 78.6 | 78.6 | 77.3 | 76.9 | 77.1 | 77.5 | 77.6 | 77.2 | 76.6 |
| Exports | mt | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Imports | mt | 1.7 | 1.8 | 1.9 | 1.9 | 1.9 | 1.8 | 1.8 | 1.7 | 1.6 | 1.5 | 1.5 |
| Ending stocks | mt | 84.7 | 99.5 | 101.6 | 101.6 | 103.7 | 105.3 | 105.5 | 104.4 | 102.3 | 100.1 | 97.7 |
| **Oilseeds[1]** | | | | | | | | | | | | |
| Production | mt | 44.4 | 42.9 | 43.9 | 45.0 | 45.5 | 45.9 | 46.4 | 47.0 | 47.4 | 47.7 | 48.0 |
| Area harvested | mha | 20.6 | 19.4 | 19.7 | 19.8 | 19.8 | 19.8 | 19.7 | 19.7 | 19.8 | 19.8 | 19.7 |
| Consumption | mt | 102.4 | 107.7 | 111.4 | 114.2 | 116.5 | 118.5 | 120.5 | 122.4 | 124.7 | 127.2 | 129.2 |
| Exports | mt | 0.9 | 0.8 | 0.8 | 0.7 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 |
| Imports | mt | 58.9 | 65.1 | 67.1 | 70.0 | 71.6 | 73.0 | 74.5 | 75.8 | 78.2 | 80.6 | 82.8 |
| Ending stocks | mt | 18.3 | 17.7 | 16.6 | 16.6 | 16.6 | 16.4 | 16.2 | 16.0 | 16.4 | 17.1 | 18.3 |
| **Protein Meals[2]** | | | | | | | | | | | | |
| Production | mt | 65.5 | 68.2 | 71.0 | 72.4 | 73.6 | 74.6 | 75.7 | 76.8 | 78.1 | 79.7 | 80.8 |
| Consumption | mt | 66.2 | 68.2 | 71.5 | 73.9 | 75.7 | 77.5 | 79.1 | 80.8 | 82.8 | 84.8 | 86.4 |
| Exports | mt | 0.9 | 1.3 | 1.1 | 0.8 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 |
| Imports | mt | 1.6 | 1.3 | 1.6 | 2.5 | 2.9 | 3.5 | 3.9 | 4.4 | 5.0 | 5.4 | 5.8 |
| Ending stocks | mt | 5.5 | 4.9 | 4.9 | 5.0 | 5.1 | 5.2 | 5.2 | 5.2 | 5.3 | 5.3 | 5.4 |
| **Vegetable Oils[2]** | | | | | | | | | | | | |
| Production | mt | 21.3 | 22.0 | 22.6 | 23.1 | 23.4 | 23.8 | 24.1 | 24.5 | 24.9 | 25.4 | 25.7 |
| Consumption | mt | 29.8 | 31.8 | 32.6 | 32.7 | 33.6 | 34.2 | 34.6 | 35.1 | 35.6 | 36.3 | 36.9 |
| Per capita consumption | kg | 21.9 | 23.2 | 23.6 | 23.7 | 24.2 | 24.6 | 24.8 | 25.1 | 25.4 | 25.9 | 26.3 |
| Exports | mt | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Imports | mt | 9.1 | 10.1 | 9.5 | 10.6 | 10.4 | 10.6 | 10.7 | 10.9 | 10.9 | 11.2 | 11.4 |
| Ending stocks | mt | 6.9 | 7.1 | 6.5 | 7.3 | 7.3 | 7.4 | 7.5 | 7.5 | 7.6 | 7.7 | 7.8 |
| **Sugar[1]** | | | | | | | | | | | | |
| Production | mt | 12.8 | 12.9 | 13.2 | 13.8 | 14.5 | 14.8 | 15.1 | 15.4 | 15.7 | 16.2 | 16.5 |
| Consumption | mt | 15.1 | 15.6 | 16.3 | 16.6 | 17.1 | 17.7 | 17.9 | 18.4 | 18.7 | 18.8 | 19.1 |
| Per capita consumption | kg | 11.2 | 11.5 | 11.9 | 12.1 | 12.4 | 12.8 | 13.0 | 13.3 | 13.5 | 13.5 | 13.7 |
| Exports | mt | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Imports | mt | 2.9 | 2.5 | 3.5 | 2.6 | 2.5 | 2.9 | 2.6 | 3.2 | 2.9 | 2.5 | 2.6 |
| Ending stocks | mt | 2.6 | 4.0 | 4.4 | 4.2 | 4.1 | 4.2 | 3.9 | 4.1 | 4.0 | 3.9 | 3.8 |
| **Beef and veal** | | | | | | | | | | | | |
| Production[3] | mt cwe | 6.5 | 6.5 | 6.6 | 6.8 | 6.9 | 7.0 | 7.1 | 7.2 | 7.3 | 7.4 | 7.5 |
| Consumption | mt cwe | 6.5 | 6.5 | 6.6 | 6.8 | 6.9 | 7.0 | 7.1 | 7.3 | 7.4 | 7.5 | 7.6 |
| Per capita consumption[4] | kg | 3.4 | 3.4 | 3.4 | 3.5 | 3.5 | 3.6 | 3.6 | 3.7 | 3.7 | 3.8 | 3.8 |
| Exports | mt cwe | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Imports | mt cwe | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 |
| Ending stocks | mt cwe | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Pigmeat** | | | | | | | | | | | | |
| Production[3] | mt cwe | 50.4 | 52.3 | 53.5 | 54.5 | 55.5 | 56.5 | 57.5 | 58.3 | 59.0 | 59.7 | 60.4 |
| Consumption | mt cwe | 50.5 | 52.6 | 53.8 | 54.8 | 55.8 | 56.8 | 57.8 | 58.6 | 59.3 | 60.1 | 60.8 |
| Per capita consumption[4] | kg | 29.2 | 30.2 | 30.7 | 31.2 | 31.7 | 32.1 | 32.6 | 33.0 | 33.3 | 33.7 | 34.1 |
| Exports | mt cwe | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.4 |
| Imports | mt cwe | 0.5 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| Ending stocks | mt cwe | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Poultry** | | | | | | | | | | | | |
| Production | mt | 17.1 | 18.1 | 18.5 | 18.8 | 19.2 | 19.6 | 19.9 | 20.3 | 20.7 | 21.1 | 21.5 |
| Consumption | mt | 17.0 | 18.1 | 18.4 | 18.8 | 19.2 | 19.5 | 19.9 | 20.3 | 20.7 | 21.1 | 21.5 |
| Per capita consumption[4] | kg | 11.1 | 11.7 | 11.9 | 12.1 | 12.3 | 12.5 | 12.7 | 12.9 | 13.1 | 13.4 | 13.6 |
| Exports | mt | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Imports | mt | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 |
| Ending stocks | mt | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

## Table 2.A.1. Commodity projections for China *(cont.)*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fish** | | | | | | | | | | | | |
| Production | mt | 54.6 | 58.7 | 60.0 | 60.9 | 62.2 | 63.5 | 64.6 | 65.6 | 66.4 | 67.6 | 68.6 |
| Consumption | mt | 50.1 | 53.9 | 55.5 | 56.4 | 57.1 | 58.5 | 59.5 | 60.6 | 61.1 | 62.5 | 63.1 |
| Per capita consumption | kg | 34.2 | 36.6 | 37.7 | 38.2 | 38.6 | 39.5 | 40.1 | 40.8 | 41.2 | 42.1 | 42.5 |
| Exports | mt | 7.8 | 8.4 | 8.4 | 8.5 | 8.6 | 9.1 | 9.2 | 9.3 | 9.6 | 9.5 | 10.0 |
| Imports | mt | 3.2 | 3.6 | 3.9 | 4.0 | 3.6 | 4.0 | 4.1 | 4.2 | 4.3 | 4.5 | 4.4 |
| **Butter** | | | | | | | | | | | | |
| Production | kt | 109.6 | 117.5 | 119.9 | 121.4 | 121.8 | 124.3 | 126.2 | 128.4 | 130.1 | 131.5 | 132.6 |
| Consumption | kt | 142.1 | 163.8 | 166.9 | 170.5 | 172.5 | 174.3 | 176.6 | 178.7 | 181.0 | 183.1 | 185.3 |
| Per capita consumption | kg | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Exports | kt | 3.3 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Imports | kt | 35.8 | 49.8 | 50.5 | 52.6 | 54.2 | 53.5 | 53.9 | 53.8 | 54.4 | 55.0 | 56.3 |
| **Cheese** | | | | | | | | | | | | |
| Production | kt | 303.9 | 320.6 | 329.0 | 336.7 | 343.9 | 352.1 | 361.7 | 369.8 | 378.5 | 385.5 | 391.5 |
| Consumption | kt | 333.7 | 363.9 | 376.5 | 390.1 | 403.5 | 416.4 | 430.3 | 444.7 | 460.2 | 476.1 | 493.4 |
| Per capita consumption | kg | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 |
| Exports | kt | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Imports | kt | 30.1 | 43.6 | 47.8 | 53.7 | 59.9 | 64.7 | 68.9 | 75.2 | 82.1 | 90.9 | 102.3 |
| **Whole milk powder** | | | | | | | | | | | | |
| Production | kt | 1 095.0 | 1 198.0 | 1 214.2 | 1 240.5 | 1 269.1 | 1 312.5 | 1 347.6 | 1 379.4 | 1 406.6 | 1 432.0 | 1 450.9 |
| Consumption | kt | 1 438.3 | 1 597.9 | 1 634.8 | 1 670.1 | 1 704.8 | 1 736.1 | 1 770.8 | 1 804.0 | 1 839.4 | 1 873.6 | 1 908.4 |
| Per capita consumption | kg | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.4 |
| Exports | kt | 6.0 | 6.2 | 6.2 | 6.2 | 6.3 | 6.7 | 6.9 | 7.1 | 7.2 | 7.3 | 7.2 |
| Imports | kt | 349.3 | 406.2 | 426.7 | 435.8 | 442.1 | 430.3 | 430.2 | 431.7 | 440.0 | 448.9 | 464.7 |
| **Skim milk powder** | | | | | | | | | | | | |
| Production | kt | 56.0 | 57.6 | 58.5 | 58.9 | 59.0 | 60.0 | 61.0 | 60.7 | 60.5 | 59.7 | 57.9 |
| Consumption | kt | 184.4 | 231.2 | 239.3 | 247.3 | 257.0 | 264.2 | 272.2 | 281.7 | 291.7 | 301.8 | 313.8 |
| Per capita consumption | kg | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Exports | kt | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Imports | kt | 128.6 | 173.9 | 181.2 | 188.7 | 198.2 | 204.5 | 211.4 | 221.3 | 231.5 | 242.4 | 256.2 |
| **Whey powder** | | | | | | | | | | | | |
| Net trade | kt | -329.0 | -398.6 | -419.3 | -439.6 | -460.5 | -482.5 | -506.8 | -528.0 | -548.8 | -567.8 | -585.4 |
| **Cotton** | | | | | | | | | | | | |
| Production | kt | 6 933.0 | 6 152.6 | 6 242.7 | 6 118.4 | 6 011.5 | 5 955.3 | 5 887.6 | 5 835.1 | 5 807.4 | 5 789.8 | 5 779.6 |
| Consumption | kt | 8 842.6 | 8 261.8 | 8 235.8 | 8 187.3 | 8 079.0 | 8 057.8 | 8 045.0 | 8 010.8 | 7 995.0 | 7 966.7 | 7 953.8 |
| Exports | kt | 13.3 | 5.1 | 4.5 | 4.7 | 4.8 | 4.8 | 4.5 | 4.4 | 4.5 | 4.4 | 4.4 |
| Imports | kt | 3 617.0 | 2 325.6 | 2 176.0 | 2 079.0 | 2 026.1 | 1 945.4 | 2 046.1 | 2 089.0 | 1 960.7 | 1 952.0 | 1 946.7 |
| Ending stocks | kt | 5 348.5 | 7 982.1 | 8 160.4 | 8 165.8 | 8 119.6 | 7 957.7 | 7 841.9 | 7 750.8 | 7 519.4 | 7 290.1 | 7 058.2 |

*Note:* Average 2010-12est: Data for 2012 are estimated.

1. Crop year: Beginning crop marketing year - see glossary of Terms for definitions
2. Marketing year.
3. Gross indigenous production.
4. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.

*Source:* OECD and FAO Secretariats.

## Table 2.A.2. Main policy assumptions for China

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cereals** | | | | | | | | | | | | |
| Wheat tariff-quota | kt | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 | 9 636.0 |
| 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 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 | 7 200.0 |
| In-quota tariff | % | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Out-of-quota tariff | % | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 | 41.7 |
| Rice tariff-quota | kt | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 | 5 320.0 |
| 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 |
| **Oilseeds** | | | | | | | | | | | | |
| Tariffs | | | | | | | | | | | | |
| Soybeans | % | 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 |
| **Sugar** | | | | | | | | | | | | |
| 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 |
| Over-quota tariff | % | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 |
| **Meat** | | | | | | | | | | | | |
| Beef tariff | % | 15.5 | 15.5 | 15.5 | 15.5 | 15.5 | 15.5 | 15.5 | 15.5 | 15.5 | 16.5 | 16.5 |
| 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 |
| **Cotton** | | | | | | | | | | | | |
| 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 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Out-of-quota tariff | % | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |

*Note:* Average 2010-12est: Data for 2012 are estimated.
*Source:* OECD and FAO Secretariats.

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# ANNEX TABLES

*Please note that the numbering of the annex tables is the same as that of the full publication.*

## Table A.1. Economic assumptions

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **REAL GDP[1]** | | | | | | | | | | | | |
| Australia | % | 2.8 | 3.0 | 3.2 | 3.8 | 3.7 | 3.5 | 3.4 | 3.3 | 3.2 | 3.1 | 3.1 |
| Canada | % | 2.6 | 1.8 | 2.4 | 2.3 | 2.3 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.1 |
| Chile | % | 5.7 | 4.4 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 |
| European Union | % | 1.1 | 0.3 | 1.5 | 1.9 | 2.0 | 1.9 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Japan | % | 1.8 | 0.7 | 0.8 | 0.9 | 0.9 | 1.0 | 1.1 | 1.1 | 1.2 | 1.3 | 1.3 |
| Korea | % | 4.1 | 3.1 | 4.4 | 3.3 | 3.2 | 3.1 | 3.0 | 3.0 | 2.9 | 2.7 | 2.6 |
| Mexico | % | 4.4 | 3.3 | 3.6 | 3.3 | 3.4 | 3.4 | 3.5 | 3.5 | 3.6 | 3.6 | 3.6 |
| New Zealand | % | 1.0 | 2.4 | 2.9 | 2.5 | 2.6 | 2.7 | 2.8 | 2.8 | 2.8 | 2.9 | 2.9 |
| Norway | % | 1.8 | 2.5 | 2.0 | 4.2 | 4.0 | 3.9 | 3.7 | 3.6 | 3.4 | 3.3 | 3.1 |
| Switzerland | % | 1.9 | 1.1 | 2.3 | 2.5 | 2.4 | 2.4 | 2.4 | 2.3 | 2.3 | 2.3 | 2.3 |
| Turkey | % | 6.9 | 3.5 | 4.0 | 4.3 | 4.4 | 4.4 | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 |
| United States | % | 2.1 | 2.0 | 2.8 | 2.9 | 2.7 | 2.5 | 2.4 | 2.4 | 2.3 | 2.3 | 2.4 |
| Algeria | % | 2.7 | 3.4 | 3.3 | 3.4 | 3.9 | 4.0 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Argentina | % | 6.3 | 0.5 | 3.3 | 3.0 | 3.2 | 3.3 | 3.4 | 3.4 | 3.4 | 3.3 | 3.3 |
| Bangladesh | % | 6.3 | 6.1 | 6.7 | 7.1 | 7.2 | 7.3 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Brazil | % | 3.9 | 4.0 | 4.1 | 4.8 | 4.6 | 4.5 | 4.3 | 4.2 | 4.1 | 4.1 | 4.0 |
| China | % | 9.1 | 8.5 | 8.9 | 9.0 | 8.5 | 8.1 | 7.7 | 7.2 | 6.8 | 6.5 | 6.1 |
| Egypt | % | 3.0 | 3.0 | 4.5 | 6.0 | 6.5 | 6.5 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 |
| India | % | 7.3 | 6.0 | 6.4 | 6.7 | 6.9 | 6.9 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Indonesia | % | 6.2 | 6.3 | 6.5 | 6.6 | 6.7 | 6.8 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Iran | % | 2.3 | 0.8 | 1.5 | 1.8 | 2.0 | 2.0 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Malaysia | % | 5.5 | 4.7 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Pakistan | % | 3.3 | 3.2 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Russian Federation | % | 4.0 | 3.8 | 4.1 | 4.4 | 3.9 | 3.5 | 3.2 | 3.0 | 2.9 | 2.8 | 2.8 |
| Saudi Arabia | % | 6.0 | 4.2 | 3.8 | 4.3 | 4.3 | 4.2 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 |
| South Africa | % | 2.9 | 3.0 | 3.9 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 |
| Ukraine | % | 4.1 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Uruguay | % | 6.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| OECD[2,3] | % | 2.0 | 1.4 | 2.2 | 2.4 | 2.4 | 2.3 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| **PCE DEFLATOR[1]** | | | | | | | | | | | | |
| Australia | % | 2.4 | 2.8 | 2.3 | 2.6 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.6 | 2.6 |
| Canada | % | 1.7 | 1.1 | 1.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.2 | 2.2 |
| Chile | % | 2.6 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| European Union | % | 2.4 | 1.9 | 1.7 | 2.1 | 2.0 | 2.0 | 1.9 | 1.9 | 2.0 | 2.0 | 1.9 |
| Japan | % | -1.1 | -0.6 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Korea | % | 2.9 | 2.4 | 2.8 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 |
| Mexico | % | 4.6 | 4.3 | 3.9 | 3.7 | 3.6 | 3.5 | 3.5 | 3.5 | 3.5 | 3.2 | 3.2 |
| New Zealand | % | 2.1 | 1.4 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 |
| Norway | % | 1.4 | 1.2 | 2.1 | 3.3 | 3.2 | 3.1 | 3.1 | 3.1 | 3.1 | 2.9 | 2.9 |
| Switzerland | % | 0.2 | 0.0 | 0.3 | 1.8 | 1.9 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Turkey | % | 7.9 | 6.5 | 5.3 | 5.0 | 5.0 | 5.0 | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 |
| United States | % | 2.1 | 1.8 | 2.0 | 1.7 | 1.9 | 1.9 | 2.0 | 2.0 | 2.1 | 2.0 | 2.0 |
| Algeria | % | 5.6 | 5.0 | 4.5 | 4.0 | 4.0 | 4.0 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 |
| Argentina | % | 14.7 | 14.1 | 11.3 | 11.7 | 11.0 | 10.9 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 |
| Bangladesh | % | 9.1 | 6.7 | 6.3 | 5.9 | 5.5 | 5.5 | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| Brazil | % | 6.4 | 5.5 | 5.2 | 4.4 | 4.4 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| China | % | 4.9 | 2.9 | 3.6 | 3.8 | 3.9 | 3.9 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Egypt | % | 10.5 | 10.7 | 12.1 | 10.0 | 8.0 | 6.5 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| India | % | 10.4 | 9.6 | 8.3 | 6.4 | 5.1 | 5.0 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Indonesia | % | 5.0 | 5.1 | 4.9 | 4.7 | 4.5 | 4.0 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Iran | % | 19.7 | 21.8 | 18.3 | 15.5 | 15.5 | 15.5 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Malaysia | % | 2.3 | 2.4 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Pakistan | % | 11.6 | 10.4 | 11.0 | 12.0 | 13.0 | 13.0 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 |
| Russian Federation | % | 9.9 | 5.7 | 3.9 | 3.7 | 3.8 | 3.8 | 3.9 | 3.9 | 4.0 | 4.0 | 4.0 |
| Saudi Arabia | % | 5.1 | 4.6 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| South Africa | % | 5.0 | 5.2 | 5.0 | 4.8 | 4.7 | 4.7 | 4.8 | 4.8 | 4.8 | 4.8 | 4.8 |
| Ukraine | % | 6.4 | 7.4 | 5.3 | 5.0 | 5.0 | 5.0 | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 |
| Uruguay | % | 7.6 | 7.6 | 7.1 | 6.0 | 6.0 | 6.0 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 |
| OECD[2,3] | % | 2.1 | 1.8 | 2.0 | 2.1 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 | 2.2 | 2.2 |

## Table A.1. Economic assumptions *(cont.)*

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GDP DEFLATOR[1]** | | | | | | | | | | | | |
| Australia | % | 3.2 | 1.7 | 2.3 | 2.6 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.6 | 2.6 |
| Canada | % | 2.4 | 1.4 | 1.8 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 2.2 | 2.2 |
| Chile | % | 4.3 | 2.8 | 3.2 | 3.1 | 3.0 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 |
| European Union | % | 1.4 | 1.6 | 1.7 | 2.1 | 2.1 | 2.1 | 2.0 | 1.9 | 1.9 | 1.9 | 1.8 |
| Japan | % | -1.7 | -0.5 | 0.7 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Korea | % | 2.2 | 1.6 | 1.5 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 |
| Mexico | % | 4.4 | 4.0 | 4.2 | 3.7 | 3.6 | 3.5 | 3.5 | 3.5 | 3.5 | 3.2 | 3.2 |
| New Zealand | % | 2.9 | 2.0 | 1.9 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 |
| Norway | % | 5.3 | 2.0 | 2.6 | 3.3 | 3.2 | 3.1 | 3.1 | 3.1 | 3.1 | 2.9 | 2.9 |
| Switzerland | % | 0.3 | 0.2 | 0.4 | 1.8 | 1.9 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Turkey | % | 6.9 | 7.2 | 5.1 | 4.5 | 4.7 | 4.5 | 4.7 | 4.7 | 4.7 | 4.7 | 4.7 |
| United States | % | 1.8 | 1.8 | 1.9 | 1.7 | 1.9 | 1.9 | 2.0 | 2.0 | 2.1 | 2.0 | 2.0 |
| Algeria | % | 13.7 | 3.8 | 2.2 | 1.8 | 1.7 | 1.5 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Argentina | % | 16.3 | 14.1 | 11.3 | 11.7 | 11.0 | 10.9 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 |
| Bangladesh | % | 7.4 | 6.6 | 6.4 | 6.0 | 5.6 | 4.9 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 |
| Brazil | % | 7.0 | 5.3 | 5.1 | 4.4 | 4.4 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| China | % | 5.3 | 2.4 | 1.5 | 3.8 | 3.9 | 3.9 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Egypt | % | 10.4 | 12.2 | 10.8 | 9.1 | 7.9 | 6.4 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| India | % | 8.9 | 8.8 | 8.6 | 7.5 | 7.1 | 7.1 | 7.6 | 7.6 | 7.6 | 7.6 | 7.6 |
| Indonesia | % | 7.7 | 7.3 | 8.0 | 7.8 | 7.6 | 7.5 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| Iran | % | 17.9 | 16.8 | 14.6 | 12.8 | 13.0 | 13.4 | 13.4 | 13.4 | 13.4 | 13.4 | 13.4 |
| Malaysia | % | 4.1 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Pakistan | % | 13.9 | 10.4 | 11.0 | 12.0 | 13.0 | 13.0 | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 |
| Russian Federation | % | 11.9 | 6.4 | 4.5 | 3.7 | 3.8 | 3.8 | 3.9 | 3.9 | 4.0 | 4.0 | 4.0 |
| Saudi Arabia | % | 13.8 | -0.3 | -1.6 | -0.7 | -0.4 | -0.3 | -0.8 | -0.8 | -0.8 | -0.8 | -0.8 |
| South Africa | % | 7.1 | 5.3 | 5.1 | 4.9 | 4.7 | 4.7 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Ukraine | % | 11.9 | 9.4 | 6.5 | 6.5 | 7.0 | 6.5 | 6.6 | 6.6 | 6.6 | 6.6 | 6.6 |
| Uruguay | % | 8.3 | 5.8 | 6.6 | 6.0 | 5.6 | 5.5 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 |
| OECD[3] | % | 1.6 | 1.7 | 1.9 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 | 2.2 | 2.1 | 2.1 |
| **WORLD OIL PRICE** | | | | | | | | | | | | |
| Brent crude oil price[4] | USD/barrel | 100.7 | 112.8 | 117.8 | 121.1 | 124.5 | 127.8 | 131.1 | 134.4 | 137.8 | 141.2 | 144.6 |
| **EXCHANGE RATES** | | | | | | | | | | | | |
| Australia | AUD/USD | 1.01 | 0.96 | 0.96 | 0.97 | 0.98 | 0.98 | 0.99 | 1.00 | 1.00 | 1.01 | 1.02 |
| Canada | CAD/USD | 1.01 | 1.00 | 1.00 | 1.01 | 1.01 | 1.02 | 1.02 | 1.02 | 1.02 | 1.03 | 1.03 |
| Chile | CLP/USD | 492.11 | 476.00 | 479.00 | 487.00 | 487.00 | 487.00 | 489.79 | 492.59 | 495.42 | 498.25 | 501.11 |
| European Union | EUR/USD | 0.75 | 0.77 | 0.77 | 0.75 | 0.74 | 0.74 | 0.74 | 0.74 | 0.74 | 0.74 | 0.74 |
| Japan | JPY/USD | 82.27 | 79.42 | 79.42 | 78.87 | 78.24 | 77.54 | 76.80 | 76.04 | 75.28 | 74.53 | 73.78 |
| Korea | 000 KRW/USD | 1.13 | 1.09 | 1.09 | 1.10 | 1.12 | 1.13 | 1.14 | 1.16 | 1.17 | 1.18 | 1.19 |
| Mexico | MXN/USD | 12.75 | 13.23 | 13.23 | 13.41 | 13.55 | 13.66 | 13.76 | 13.86 | 13.95 | 14.01 | 14.06 |
| New Zealand | NZD/USD | 1.30 | 1.22 | 1.22 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 |
| Algeria | DZD/USD | 74.76 | 79.75 | 82.22 | 84.23 | 86.16 | 87.63 | 89.72 | 91.85 | 94.04 | 96.28 | 98.57 |
| Argentina | ARS/USD | 4.19 | 4.78 | 4.78 | 4.87 | 4.91 | 4.92 | 4.93 | 4.94 | 4.95 | 4.96 | 4.98 |
| Bangladesh | BDT/USD | 75.79 | 86.98 | 91.01 | 94.79 | 98.43 | 101.65 | 105.69 | 109.89 | 114.26 | 118.80 | 123.52 |
| Brazil | BRL/USD | 1.80 | 2.07 | 2.07 | 2.15 | 2.23 | 2.31 | 2.39 | 2.47 | 2.56 | 2.64 | 2.73 |
| China | CNY/USD | 6.51 | 6.23 | 6.23 | 6.26 | 6.29 | 6.32 | 6.35 | 6.38 | 6.42 | 6.47 | 6.52 |
| Egypt | EGP/USD | 5.78 | 6.42 | 7.51 | 8.18 | 8.68 | 9.09 | 9.92 | 10.83 | 11.81 | 12.89 | 14.06 |
| India | INR/USD | 47.85 | 53.21 | 56.22 | 58.61 | 60.26 | 61.73 | 64.07 | 66.50 | 69.02 | 71.63 | 74.34 |
| Indonesia | 000 IDR/USD | 9.08 | 9.50 | 9.27 | 9.22 | 9.15 | 9.06 | 8.95 | 8.85 | 8.74 | 8.64 | 8.54 |
| Iran | 000 IRR/USD | 11.53 | 14.30 | 15.57 | 16.79 | 18.10 | 19.52 | 21.11 | 22.81 | 24.66 | 26.66 | 28.82 |
| Malaysia | MYR/USD | 3.12 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Pakistan | PKR/USD | 86.42 | 99.46 | 110.88 | 124.01 | 139.13 | 155.99 | 174.57 | 195.36 | 218.63 | 244.67 | 273.81 |
| Russian Federation | RUB/USD | 30.31 | 31.74 | 31.74 | 31.83 | 31.94 | 32.09 | 32.26 | 32.47 | 32.70 | 32.95 | 33.22 |
| 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 | 7.59 | 8.65 | 8.99 | 9.32 | 9.63 | 9.95 | 10.30 | 10.67 | 11.05 | 11.44 | 11.85 |
| Ukraine | UAH/USD | 7.97 | 8.35 | 8.64 | 8.90 | 9.17 | 9.44 | 9.74 | 10.04 | 10.36 | 10.68 | 11.01 |
| Uruguay | UYU/USD | 20.10 | 19.95 | 20.81 | 21.68 | 22.58 | 23.50 | 24.48 | 25.51 | 26.57 | 27.68 | 28.84 |

## Table A.1. Economic assumptions *(cont.)*

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **POPULATION**[1] | | | | | | | | | | | | |
| Australia | % | 1.4 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.1 | 1.1 | 1.1 |
| Canada | % | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 |
| Chile | % | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 | 0.6 |
| European Union | % | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |
| Japan | % | 0.0 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 | -0.3 |
| Korea | % | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 |
| Mexico | % | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.8 |
| New Zealand | % | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.9 |
| Norway | % | 0.7 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| Switzerland | % | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Turkey | % | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.8 |
| United States | % | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| Algeria | % | 1.4 | 1.4 | 1.3 | 1.3 | 1.2 | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 |
| Argentina | % | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 |
| Bangladesh | % | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 |
| Brazil | % | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 0.6 | 0.6 | 0.6 |
| China | % | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 |
| Egypt | % | 1.7 | 1.7 | 1.7 | 1.6 | 1.6 | 1.5 | 1.5 | 1.4 | 1.4 | 1.3 | 1.3 |
| India | % | 1.4 | 1.3 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.1 | 1.1 | 1.1 | 1.0 |
| Indonesia | % | 1.0 | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 |
| Iran | % | 1.1 | 1.1 | 1.0 | 1.0 | 0.9 | 0.8 | 0.8 | 0.7 | 0.7 | 0.6 | 0.6 |
| Malaysia | % | 1.6 | 1.6 | 1.6 | 1.5 | 1.5 | 1.5 | 1.4 | 1.4 | 1.4 | 1.4 | 1.3 |
| Pakistan | % | 1.8 | 1.8 | 1.8 | 1.7 | 1.7 | 1.6 | 1.6 | 1.6 | 1.5 | 1.5 | 1.5 |
| Russian Federation | % | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.1 | -0.2 | -0.2 | -0.2 | -0.2 | -0.3 |
| Saudi Arabia | % | 2.2 | 2.1 | 2.1 | 2.0 | 2.0 | 2.0 | 1.9 | 1.8 | 1.8 | 1.7 | 1.6 |
| South Africa | % | 0.6 | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| Ukraine | % | -0.6 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.6 | -0.6 |
| Uruguay | % | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 |
| OECD[3] | % | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 |
| World | % | 1.1 | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 0.9 |

*Note:* For OECD member countries (except Turkey, Chile and Israel), 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. 92, December 2012. For other economies, historical macroeconomic data were obtained from the IMF, World Economic Outlook, October 2012. Assumptions for the projection period draw on the recent short term update of the OECD Economics Department, projections of the OECD Economic Outlook No. 91, projections of the IMF, and for population, projections from the United Nations World Population Prospects Database, 2010 Revision (medium variant). Data for the European Union are euro area aggregates except for population.
Average 2010-12est and 2012est: Data for 2012 are estimated.

1. Annual per cent change. The price index used is the private consumption expenditure deflator.
2. Annual weighted average real GDP and CPI growth rates in OECD countries are based on weights using purchasing power parities (PPPs).
3. Excludes Iceland.
4. Short term update for crude oil price from the OECD Economic Outlook No.92, December 2012 and projections from IEA World Energy Outlook 2012.

*Source:* OECD and FAO Secretariats.

## Table A.2. World prices

| | | Average 2010/11-2012/13est | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CEREALS** | | | | | | | | | | | | |
| Wheat[1] | USD/t | 312.5 | 301.3 | 262.3 | 256.5 | 259.4 | 259.3 | 266.6 | 270.0 | 272.3 | 273.4 | 274.2 |
| Coarse Grains[2] | USD/t | 284.6 | 243.4 | 216.4 | 221.1 | 227.2 | 228.2 | 234.1 | 236.4 | 237.7 | 240.3 | 240.6 |
| Rice[3] | USD/t | 451.1 | 480.9 | 440.3 | 423.2 | 419.3 | 417.9 | 426.1 | 438.0 | 451.1 | 462.5 | 470.3 |
| **OILSEEDS** | | | | | | | | | | | | |
| Oilseeds[4] | USD/t | 605.0 | 564.1 | 514.0 | 511.2 | 507.0 | 521.7 | 523.0 | 530.0 | 530.5 | 538.9 | 540.0 |
| Protein meals[5] | USD/t | 436.9 | 464.3 | 403.9 | 389.0 | 387.0 | 390.2 | 396.2 | 401.7 | 403.6 | 404.2 | 406.1 |
| Vegetable oils[6] | USD/t | 1 206.6 | 1 141.4 | 1 038.3 | 1 077.6 | 1 065.2 | 1 097.7 | 1 104.9 | 1 117.6 | 1 136.1 | 1 154.6 | 1 160.3 |
| **SWEETENERS** | | | | | | | | | | | | |
| Raw sugar[7] | USD/t rse | 522.7 | 410.2 | 408.0 | 432.4 | 414.0 | 413.4 | 437.8 | 444.5 | 441.8 | 442.8 | 438.7 |
| Refined sugar[8] | USD/t rse | 621.0 | 498.8 | 503.7 | 530.7 | 512.5 | 507.4 | 538.7 | 545.2 | 541.3 | 540.6 | 536.4 |
| HFCS[9] | USD/t | 524.4 | 340.8 | 388.4 | 431.2 | 442.2 | 405.1 | 374.0 | 363.0 | 369.7 | 365.9 | 357.1 |
| Molasse[10] | USD/t | 182.1 | 195.6 | 194.3 | 206.1 | 196.3 | 185.5 | 194.0 | 195.6 | 198.6 | 193.5 | 193.3 |
| **MEAT** | | | | | | | | | | | | |
| **Beef and veal** | | | | | | | | | | | | |
| Price, EU[11] | USD/t dw | 4 716.8 | 5 245.1 | 5 674.0 | 6 192.6 | 6 014.4 | 6 338.9 | 6 398.4 | 6 763.0 | 7 215.3 | 7 300.7 | 7 256.1 |
| Price, United States[12] | USD/t dw | 3 946.5 | 4 654.1 | 4 716.4 | 4 730.5 | 4 639.9 | 4 568.5 | 4 393.9 | 4 414.8 | 4 475.5 | 4 546.1 | 4 570.3 |
| Price, Brazil[13] | USD/t pw | 3 252.9 | 3 334.8 | 3 526.2 | 3 543.1 | 3 632.1 | 3 598.1 | 3 414.4 | 3 465.8 | 3 557.1 | 3 630.3 | 3 706.5 |
| **Pigmeat** | | | | | | | | | | | | |
| Price, EU[14] | USD/t dw | 2 037.3 | 2 473.5 | 2 659.0 | 2 739.6 | 2 601.1 | 2 600.0 | 2 807.4 | 2 956.6 | 2 982.3 | 2 954.2 | 2 928.2 |
| Price, United States[15] | USD/t dw | 1 860.4 | 2 051.1 | 2 154.6 | 2 147.3 | 2 061.2 | 2 055.4 | 2 162.0 | 2 285.3 | 2 270.7 | 2 243.5 | 2 284.9 |
| Price, Brazil[16] | USD/t dw | 1 511.7 | 1 677.3 | 1 787.4 | 1 820.8 | 1 749.0 | 1 765.4 | 1 856.6 | 1 984.3 | 1 991.6 | 1 979.3 | 2 034.3 |
| **Poultry meat** | | | | | | | | | | | | |
| Price, EU[17] | USD/t rtc | 2 477.8 | 2 321.9 | 2 265.7 | 2 300.0 | 2 300.6 | 2 349.1 | 2 411.2 | 2 461.1 | 2 503.6 | 2 533.1 | 2 525.5 |
| Price, United States[18] | USD/t rtc | 1 133.6 | 1 167.9 | 1 157.2 | 1 174.0 | 1 171.5 | 1 193.6 | 1 220.7 | 1 241.4 | 1 260.3 | 1 272.6 | 1 279.3 |
| Price, Brazil[19] | USD/t rtc | 1 358.2 | 1 389.1 | 1 354.5 | 1 375.0 | 1 378.2 | 1 407.4 | 1 444.8 | 1 474.8 | 1 499.6 | 1 518.4 | 1 531.6 |
| **Sheep meat** | | | | | | | | | | | | |
| Price, New Zealand[20] | USD/t dw | 4 481.2 | 4 119.4 | 4 128.2 | 4 165.7 | 4 244.9 | 4 362.0 | 4 420.2 | 4 397.6 | 4 533.0 | 4 566.0 | 4 636.2 |
| **FISH AND SEAFOOD** | | | | | | | | | | | | |
| Product traded[21] | USD/t | 2 671.3 | 2 698.1 | 2 769.9 | 2 933.0 | 2 870.8 | 2 923.0 | 2 990.8 | 3 187.4 | 3 335.4 | 3 408.1 | 3 462.7 |
| Aquaculture[22] | USD/t | 2 034.8 | 2 047.6 | 2 092.0 | 2 225.1 | 2 224.9 | 2 221.5 | 2 273.0 | 2 422.4 | 2 568.2 | 2 658.3 | 2 700.9 |
| Capture[23] | USD/t | 1 324.5 | 1 386.3 | 1 431.8 | 1 501.8 | 1 513.7 | 1 555.2 | 1 601.5 | 1 681.3 | 1 750.2 | 1 798.1 | 1 842.8 |
| Meal[24] | USD/t | 1 594.2 | 1 824.8 | 1 648.4 | 1 691.6 | 1 534.7 | 1 496.5 | 1 514.8 | 1 620.7 | 1 727.6 | 1 655.2 | 1 700.0 |
| Oil[25] | USD/t | 1 514.7 | 2 004.9 | 1 772.8 | 1 844.5 | 1 725.2 | 1 730.0 | 1 767.4 | 1 782.3 | 1 978.3 | 1 840.4 | 1 864.1 |
| **DAIRY PRODUCTS** | | | | | | | | | | | | |
| Butter[26] | USD/t | 3 943.5 | 3 499.5 | 3 576.8 | 3 547.8 | 3 543.7 | 3 631.7 | 3 659.3 | 3 709.3 | 3 722.0 | 3 717.9 | 3 688.5 |
| Cheese[27] | USD/t | 4 047.0 | 3 865.9 | 3 946.4 | 4 004.8 | 4 061.3 | 4 168.1 | 4 286.3 | 4 334.8 | 4 394.0 | 4 438.0 | 4 444.8 |
| Skim milk powder[28] | USD/t | 3 317.5 | 3 471.7 | 3 498.1 | 3 502.0 | 3 502.8 | 3 599.9 | 3 673.1 | 3 703.8 | 3 727.8 | 3 754.6 | 3 733.0 |
| Whole milk powder[29] | USD/t | 3 600.1 | 3 669.9 | 3 727.3 | 3 717.0 | 3 736.9 | 3 863.0 | 3 930.4 | 3 991.6 | 4 020.2 | 4 055.8 | 4 053.7 |
| Whey powder wholesale price, United States[30] | USD/t | 1 042.3 | 1 139.2 | 1 168.8 | 1 173.1 | 1 176.1 | 1 199.9 | 1 209.0 | 1 230.9 | 1 243.5 | 1 265.0 | 1 272.9 |
| Casein[31] | USD/t | 8 463.6 | 8 706.9 | 8 819.9 | 8 823.4 | 8 935.0 | 9 127.5 | 9 330.7 | 9 436.4 | 9 507.5 | 9 570.0 | 9 673.8 |
| **BIOFUEL** | | | | | | | | | | | | |
| Ethanol[32] | USD/hl | 70.1 | 61.7 | 65.2 | 69.0 | 72.1 | 72.6 | 75.5 | 77.9 | 80.5 | 82.4 | 83.5 |
| Biodiesel[33] | USD/hl | 143.1 | 151.4 | 156.2 | 153.5 | 148.8 | 154.7 | 159.8 | 159.8 | 164.3 | 167.0 | 173.0 |
| **COTTON** | | | | | | | | | | | | |
| Cotton[34] | USD/t | 2 344.2 | 1 788.4 | 1 795.5 | 1 914.8 | 1 954.0 | 1 947.9 | 1 923.7 | 1 892.3 | 1 890.7 | 1 885.3 | 1 935.2 |

# ANNEX A

*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 meat and dairy products on calendar year basis (e.g. 09/10 is calendar year 2009).
Average 2010/11-2012/13est: Data for 2012/13 are estimated.

1. No.2 hard red winter wheat, ordinary protein, United States f.o.b. Gulf Ports (June/May), less EEP payments where applicable.
2. No.2 yellow corn, United States f.o.b. Gulf Ports (September/August).
3. Milled 5% broken,f.o.b. Ho Chi Minh (January/December).
4. Weighted average oilseed price, European port.
5. Weighted average meal price, European port.
6. Weighted average price of oilseed oils and palm oil, European port.
7. Raw sugar world price, ICE contract No11 nearby, October/September.
8. Refined sugar price,Euronext,Liffe,Contract No. 407 London,Europe,October/September.
9. United States wholesale list price HFCS-55 , October/September.
10. Unit import price, Europe (October/September)
11. EU average beef producer price.
12. Choice steers, 1100-1300 lb lw, Nebraska - lw to dw conversion factor 0.63.
13. Brazil average beef producer price.
14. EU average pigmeat producer price.
15. Barrows and gilts, No. 1-3, 230-250 lb lw, Iowa/South Minnesota - lw to dw conversion factor 0.74.
16. Brazil average pigmeat producer price.
17. EU average producer price.
18. Wholesale weighted average broiler price 12 cities.
19. Brazil average chicken for slaughter producer price.
20. Lamb schedule price, all grade average.
21. World unit value of trade (sum of exports and imports).
22. World unit value of aquaculture fisheries production (live weight basis).
23. FAO estimated value of world ex vessel value of capture fisheries production excluding for reduction.
24. Fish meal, 64-65% protein, Hamburg, Germany.
25. Fish oil any origin, N.W. Europe
26. F.o.b. export price, butter, 82% butterfat, Oceania.
27. F.o.b. export price, cheddar cheese, 39% moisture, Oceania.
28. F.o.b. export price, non-fat dry milk, 1.25% butterfat,Oceania.
29. F.o.b. export price, WMP 26% butterfat, Oceania.
30. Dry whey, West region, United States.
31. Export price, New Zealand.
32. Brazil, Sao Paulo (ex-distillery).
33. Producer price Germany net of biodiesel tariff.
34. Cotlook A index, Middling 1 3/32", c.f.r. far Eastern ports (August/July)

*Source:* OECD and FAO Secretariats.

## Table A.3.1. World trade projections, imports

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wheat** | | | | | | | | | | | | |
| **World Trade** | **kt** | **135 767** | **135 001** | **137 596** | **140 729** | **141 445** | **143 209** | **143 691** | **145 789** | **147 290** | **149 054** | **150 442** |
| OECD[1] | kt | 31 159 | 29 268 | 29 898 | 30 557 | 30 990 | 31 394 | 31 489 | 31 453 | 31 435 | 31 410 | 31 395 |
| Developing countries | kt | 107 641 | 107 096 | 109 731 | 112 074 | 112 700 | 114 180 | 114 793 | 116 864 | 118 400 | 120 182 | 121 662 |
| Least Developed Countries | kt | 15 038 | 16 091 | 15 978 | 16 505 | 16 461 | 16 777 | 16 882 | 17 332 | 17 716 | 18 119 | 18 479 |
| **Coarse grains** | | | | | | | | | | | | |
| **World Trade** | **kt** | **123 208** | **132 101** | **136 111** | **138 439** | **142 023** | **144 694** | **148 865** | **152 285** | **155 793** | **158 473** | **162 150** |
| OECD[1] | kt | 54 006 | 52 141 | 52 112 | 52 626 | 54 160 | 53 440 | 55 362 | 56 644 | 57 578 | 57 733 | 58 532 |
| Developing countries | kt | 88 433 | 99 586 | 104 065 | 106 355 | 108 800 | 112 503 | 115 268 | 117 806 | 120 916 | 123 897 | 127 743 |
| Least Developed Countries | kt | 2 354 | 3 552 | 4 001 | 4 374 | 4 397 | 4 660 | 4 911 | 4 947 | 5 005 | 5 002 | 5 063 |
| **Rice** | | | | | | | | | | | | |
| **World Trade** | **kt** | **36 879** | **36 503** | **39 388** | **40 653** | **41 239** | **42 070** | **42 669** | **43 284** | **43 845** | **44 447** | **45 041** |
| OECD[1] | kt | 4 989 | 5 230 | 5 412 | 5 528 | 5 640 | 5 759 | 5 879 | 5 989 | 6 092 | 6 190 | 6 298 |
| Developing countries | kt | 32 051 | 31 420 | 34 119 | 35 226 | 35 687 | 36 397 | 36 874 | 37 377 | 37 834 | 38 314 | 38 826 |
| Least Developed Countries | kt | 6 928 | 6 690 | 7 623 | 7 723 | 7 730 | 7 681 | 7 639 | 7 596 | 7 559 | 7 486 | 7 451 |
| **Oilseeds** | | | | | | | | | | | | |
| **World Trade** | **kt** | **110 714** | **119 621** | **121 133** | **124 798** | **126 778** | **128 589** | **130 563** | **132 361** | **135 366** | **138 337** | **141 194** |
| OECD[1] | kt | 33 185 | 33 790 | 33 168 | 33 571 | 33 768 | 33 931 | 34 238 | 34 512 | 34 877 | 35 328 | 35 719 |
| Developing countries | kt | 85 357 | 93 382 | 95 435 | 98 769 | 100 621 | 102 284 | 103 958 | 105 461 | 108 120 | 110 709 | 113 200 |
| Least Developed Countries | kt | 381 | 327 | 324 | 332 | 334 | 340 | 345 | 347 | 350 | 351 | 356 |
| **Protein Meals** | | | | | | | | | | | | |
| **World Trade** | **kt** | **73 198** | **75 154** | **77 480** | **79 885** | **82 188** | **84 226** | **86 467** | **88 822** | **91 217** | **93 738** | **96 187** |
| OECD[1] | kt | 41 942 | 42 701 | 43 301 | 43 645 | 44 272 | 44 512 | 44 973 | 45 350 | 45 658 | 46 003 | 46 395 |
| Developing countries | kt | 34 390 | 36 030 | 38 216 | 40 622 | 42 669 | 44 801 | 46 901 | 49 149 | 51 543 | 53 981 | 56 381 |
| Least Developed Countries | kt | 527 | 544 | 616 | 670 | 725 | 768 | 821 | 868 | 922 | 978 | 1 035 |
| **Vegetable Oils** | | | | | | | | | | | | |
| **World Trade** | **kt** | **64 207** | **66 539** | **66 879** | **68 395** | **69 409** | **71 010** | **72 450** | **74 009** | **75 636** | **76 931** | **78 226** |
| OECD[1] | kt | 16 832 | 17 198 | 17 150 | 17 128 | 17 286 | 17 767 | 18 029 | 18 523 | 19 151 | 19 206 | 19 263 |
| Developing countries | kt | 47 752 | 49 710 | 50 246 | 51 821 | 52 723 | 53 889 | 55 138 | 56 289 | 57 377 | 58 698 | 60 018 |
| Least Developed Countries | kt | 4 923 | 5 080 | 5 331 | 5 451 | 5 622 | 5 771 | 5 945 | 6 103 | 6 265 | 6 425 | 6 599 |
| **Sugar** | | | | | | | | | | | | |
| **World Trade** | **kt** | **49 741** | **49 493** | **50 605** | **51 686** | **51 811** | **53 056** | **53 508** | **54 214** | **54 821** | **55 395** | **56 710** |
| OECD[1] | kt | 13 504 | 12 605 | 12 240 | 11 177 | 11 464 | 11 550 | 11 385 | 11 378 | 11 283 | 11 028 | 10 975 |
| Developing countries | kt | 33 706 | 34 171 | 35 648 | 37 926 | 37 814 | 38 990 | 39 846 | 40 597 | 41 408 | 42 338 | 43 801 |
| Least Developed Countries | kt | 5 586 | 6 141 | 6 332 | 6 313 | 6 748 | 6 902 | 6 866 | 7 238 | 7 575 | 7 723 | 7 995 |
| **Beef[2]** | | | | | | | | | | | | |
| **World Trade** | **kt** | **7 429** | **7 819** | **8 121** | **8 130** | **8 310** | **8 559** | **8 680** | **8 968** | **9 123** | **9 225** | **9 333** |
| OECD[1] | kt | 3 292 | 3 726 | 3 773 | 3 724 | 3 819 | 3 896 | 3 887 | 3 976 | 4 054 | 4 062 | 4 081 |
| Developing countries | kt | 3 977 | 4 029 | 4 265 | 4 355 | 4 507 | 4 677 | 4 798 | 4 990 | 5 073 | 5 174 | 5 291 |
| Least Developed Countries | kt | 167 | 130 | 290 | 332 | 389 | 455 | 439 | 456 | 411 | 373 | 325 |
| **Pigmeat[2]** | | | | | | | | | | | | |
| **World Trade** | **kt** | **6 566** | **7 103** | **7 096** | **7 172** | **7 304** | **7 317** | **7 367** | **7 417** | **7 449** | **7 565** | **7 643** |
| OECD[1] | kt | 3 204 | 3 359 | 3 335 | 3 371 | 3 436 | 3 421 | 3 441 | 3 442 | 3 398 | 3 375 | 3 371 |
| Developing countries | kt | 3 109 | 3 610 | 3 496 | 3 569 | 3 646 | 3 676 | 3 702 | 3 740 | 3 790 | 3 894 | 3 944 |
| Least Developed Countries | kt | 157 | 205 | 180 | 196 | 202 | 212 | 220 | 234 | 248 | 262 | 276 |
| **Poultry** | | | | | | | | | | | | |
| **World Trade** | **kt** | **11 997** | **12 008** | **12 180** | **12 398** | **12 660** | **12 921** | **13 189** | **13 472** | **13 771** | **14 129** | **14 523** |
| OECD[1] | kt | 2 541 | 2 591 | 2 555 | 2 546 | 2 523 | 2 508 | 2 498 | 2 497 | 2 482 | 2 468 | 2 448 |
| Developing countries | kt | 8 659 | 8 779 | 8 938 | 9 100 | 9 354 | 9 601 | 9 856 | 10 143 | 10 445 | 10 779 | 11 149 |
| Least Developed Countries | kt | 927 | 1 007 | 1 043 | 1 080 | 1 111 | 1 153 | 1 199 | 1 248 | 1 305 | 1 363 | 1 425 |
| **Fish** | | | | | | | | | | | | |
| **World Trade** | **kt** | **37 012** | **38 300** | **39 171** | **39 836** | **40 396** | **41 439** | **42 253** | **42 954** | **43 617** | **44 392** | **45 082** |
| OECD | kt | 20 249 | 20 397 | 20 657 | 21 046 | 21 382 | 21 689 | 22 015 | 22 281 | 22 572 | 22 869 | 23 229 |
| Developing countries | kt | 16 494 | 17 574 | 18 147 | 18 399 | 18 562 | 19 252 | 19 693 | 20 085 | 20 437 | 20 874 | 21 146 |
| Least Developed Countries | kt | 717 | 705 | 698 | 691 | 693 | 689 | 689 | 680 | 683 | 690 | 698 |
| **Fish meal** | | | | | | | | | | | | |
| **World Trade** | **kt** | **3 129** | **3 269** | **3 233** | **3 103** | **3 156** | **3 138** | **3 081** | **3 060** | **2 946** | **3 004** | **3 015** |
| OECD | kt | 1 237 | 1 361 | 1 301 | 1 196 | 1 244 | 1 226 | 1 210 | 1 206 | 1 150 | 1 209 | 1 184 |
| Developing countries | kt | 1 979 | 2 016 | 2 035 | 2 030 | 2 030 | 2 029 | 1 990 | 1 980 | 1 927 | 1 925 | 1 966 |
| Least Developed Countries | kt | 20 | 16 | 17 | 17 | 17 | 17 | 18 | 18 | 18 | 18 | 18 |
| **Fish oil** | | | | | | | | | | | | |
| **World Trade** | **kt** | **836** | **822** | **813** | **771** | **794** | **807** | **812** | **808** | **771** | **783** | **787** |
| OECD | kt | 686 | 686 | 665 | 633 | 631 | 632 | 631 | 624 | 601 | 596 | 594 |
| Developing countries | kt | 258 | 236 | 254 | 240 | 263 | 276 | 282 | 287 | 270 | 285 | 292 |
| Least Developed Countries | kt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Butter** | | | | | | | | | | | | |
| **World Trade** | **kt** | **822** | **860** | **882** | **905** | **924** | **930** | **940** | **956** | **972** | **988** | **1 008** |
| OECD[1] | kt | 134 | 144 | 141 | 138 | 139 | 138 | 139 | 139 | 139 | 138 | 137 |
| Developing countries | kt | 553 | 572 | 589 | 612 | 632 | 644 | 662 | 677 | 695 | 713 | 733 |
| Least Developed Countries | kt | 11 | 9 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 10 |

## Table A.3.1. World trade projections, imports *(cont.)*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cheese** | | | | | | | | | | | | |
| **World Trade** | **kt** | **2 356** | **2 390** | **2 427** | **2 521** | **2 585** | **2 628** | **2 686** | **2 737** | **2 792** | **2 837** | **2 869** |
| OECD[1] | kt | 776 | 780 | 801 | 814 | 821 | 830 | 833 | 839 | 842 | 847 | 822 |
| Developing countries | kt | 1 255 | 1 343 | 1 375 | 1 434 | 1 502 | 1 555 | 1 598 | 1 623 | 1 656 | 1 695 | 1 748 |
| Least Developed Countries | kt | 60 | 70 | 70 | 79 | 90 | 97 | 106 | 108 | 112 | 117 | 123 |
| **Whole milk powder** | | | | | | | | | | | | |
| **World Trade** | **kt** | **2 225** | **2 299** | **2 317** | **2 340** | **2 372** | **2 376** | **2 405** | **2 431** | **2 469** | **2 508** | **2 559** |
| OECD[1] | kt | 66 | 53 | 56 | 58 | 58 | 57 | 58 | 58 | 60 | 62 | 63 |
| Developing countries | kt | 2 176 | 2 239 | 2 255 | 2 275 | 2 308 | 2 314 | 2 338 | 2 360 | 2 393 | 2 431 | 2 477 |
| Least Developed Countries | kt | 227 | 215 | 219 | 223 | 228 | 231 | 236 | 240 | 245 | 249 | 255 |
| **Skim milk powder** | | | | | | | | | | | | |
| **World Trade** | **kt** | **1 624** | **1 784** | **1 826** | **1 869** | **1 917** | **1 953** | **1 998** | **2 036** | **2 076** | **2 121** | **2 156** |
| OECD[1] | kt | 289 | 321 | 326 | 330 | 336 | 338 | 341 | 346 | 351 | 356 | 338 |
| Developing countries | kt | 1 501 | 1 655 | 1 697 | 1 738 | 1 785 | 1 824 | 1 866 | 1 901 | 1 937 | 1 981 | 2 036 |
| Least Developed Countries | kt | 94 | 99 | 99 | 103 | 107 | 111 | 115 | 119 | 123 | 127 | 132 |
| **Cotton** | | | | | | | | | | | | |
| OECD | kt | 1 447 | 1 770 | 1 784 | 1 844 | 1 864 | 1 888 | 1 928 | 1 961 | 2 003 | 2 048 | 2 091 |
| Developing countries | kt | 8 072 | 7 410 | 7 369 | 7 414 | 7 461 | 7 475 | 7 655 | 7 816 | 7 861 | 7 968 | 8 075 |
| Least Developed Countries | kt | 784 | 803 | 864 | 917 | 972 | 1 031 | 1 096 | 1 166 | 1 200 | 1 244 | 1 289 |

*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 2010-12est: Data for 2012 are estimated.

1. Excludes Iceland but includes all EU27 member countries.
2. Excludes trade of live animals.

*Source:* OECD and FAO Secretariats.

## Table A.3.2. World trade projections, exports

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wheat** | | | | | | | | | | | | |
| OECD[1] | kt | 91 620 | 84 488 | 82 697 | 83 164 | 81 753 | 82 370 | 82 041 | 82 554 | 82 968 | 83 553 | 84 036 |
| Developing countries | kt | 23 936 | 24 578 | 26 404 | 26 828 | 26 552 | 26 261 | 25 646 | 25 987 | 25 860 | 25 646 | 25 099 |
| Least Developed Countries | kt | 46 | 42 | 37 | 34 | 32 | 30 | 29 | 27 | 26 | 25 | 24 |
| **Coarse grains** | | | | | | | | | | | | |
| OECD[1] | kt | 60 298 | 58 679 | 66 665 | 68 462 | 70 838 | 71 944 | 74 543 | 75 809 | 77 705 | 78 932 | 81 261 |
| Developing countries | kt | 43 500 | 46 327 | 42 656 | 42 946 | 43 413 | 44 331 | 45 159 | 46 746 | 47 696 | 48 492 | 49 169 |
| Least Developed Countries | kt | 4 251 | 2 046 | 1 662 | 1 623 | 1 598 | 1 537 | 1 485 | 1 461 | 1 441 | 1 440 | 1 420 |
| **Rice** | | | | | | | | | | | | |
| OECD[1] | kt | 4 062 | 3 910 | 3 983 | 4 073 | 4 183 | 4 259 | 4 341 | 4 437 | 4 547 | 4 677 | 4 797 |
| Developing countries | kt | 32 365 | 32 561 | 35 398 | 36 582 | 37 060 | 37 813 | 38 329 | 38 846 | 39 294 | 39 760 | 40 228 |
| Least Developed Countries | kt | 2 048 | 1 636 | 1 291 | 1 492 | 1 850 | 2 364 | 2 818 | 3 238 | 3 632 | 4 021 | 4 434 |
| **Oilseeds** | | | | | | | | | | | | |
| OECD[1] | kt | 51 994 | 57 375 | 56 419 | 58 200 | 59 057 | 58 881 | 59 783 | 60 060 | 60 773 | 61 943 | 62 761 |
| Developing countries | kt | 54 831 | 57 139 | 59 489 | 61 774 | 62 330 | 64 152 | 65 096 | 66 444 | 68 595 | 70 236 | 72 128 |
| Least Developed Countries | kt | 106 | 70 | 76 | 77 | 79 | 81 | 86 | 97 | 109 | 126 | 143 |
| **Protein Meals** | | | | | | | | | | | | |
| OECD[1] | kt | 12 902 | 11 886 | 12 909 | 13 575 | 14 038 | 14 498 | 14 925 | 15 473 | 15 915 | 16 205 | 16 624 |
| Developing countries | kt | 56 744 | 58 845 | 60 018 | 61 536 | 63 116 | 64 511 | 66 193 | 67 851 | 69 643 | 71 693 | 73 567 |
| Least Developed Countries | kt | 200 | 341 | 313 | 328 | 385 | 426 | 493 | 547 | 586 | 630 | 682 |
| **Vegetable Oils** | | | | | | | | | | | | |
| OECD[1] | kt | 5 695 | 5 280 | 5 384 | 5 513 | 5 606 | 5 695 | 5 855 | 5 945 | 5 948 | 5 966 | 6 058 |
| Developing countries | kt | 54 384 | 56 252 | 56 452 | 57 693 | 58 566 | 59 907 | 60 937 | 62 135 | 63 550 | 64 569 | 65 585 |
| Least Developed Countries | kt | 256 | 158 | 151 | 148 | 144 | 141 | 138 | 135 | 133 | 131 | 130 |
| **Sugar** | | | | | | | | | | | | |
| OECD[1] | kt | 6 896 | 7 264 | 7 314 | 8 216 | 7 447 | 7 366 | 7 828 | 7 588 | 7 673 | 7 496 | 7 445 |
| Developing countries | kt | 48 158 | 49 581 | 50 427 | 50 287 | 51 305 | 52 744 | 52 654 | 53 499 | 53 973 | 54 468 | 55 737 |
| Least Developed Countries | kt | 1 213 | 1 832 | 2 037 | 1 684 | 1 788 | 1 780 | 1 877 | 1 963 | 2 011 | 2 003 | 2 057 |
| **Beef[2]** | | | | | | | | | | | | |
| OECD[1] | kt | 3 853 | 3 869 | 3 842 | 3 717 | 3 847 | 3 924 | 3 922 | 4 044 | 4 129 | 4 158 | 4 196 |
| Developing countries | kt | 4 007 | 4 031 | 4 348 | 4 480 | 4 520 | 4 659 | 4 755 | 4 875 | 4 917 | 4 967 | 5 019 |
| Least Developed Countries | kt | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Pigmeat[2]** | | | | | | | | | | | | |
| OECD[1] | kt | 5 787 | 6 167 | 6 217 | 6 278 | 6 397 | 6 397 | 6 430 | 6 461 | 6 481 | 6 592 | 6 675 |
| Developing countries | kt | 1 133 | 1 133 | 1 141 | 1 171 | 1 187 | 1 197 | 1 206 | 1 222 | 1 235 | 1 233 | 1 233 |
| Least Developed Countries | kt | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Poultry** | | | | | | | | | | | | |
| OECD[1] | kt | 5 361 | 5 582 | 5 581 | 5 669 | 5 855 | 5 940 | 6 059 | 6 199 | 6 274 | 6 419 | 6 600 |
| Developing countries | kt | 6 861 | 6 957 | 7 123 | 7 246 | 7 315 | 7 487 | 7 632 | 7 759 | 7 972 | 8 172 | 8 372 |
| Least Developed Countries | kt | 23 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Fish** | | | | | | | | | | | | |
| OECD | kt | 12 398 | 12 747 | 12 937 | 12 950 | 13 242 | 13 559 | 13 845 | 14 206 | 14 258 | 14 571 | 14 652 |
| Developing countries | kt | 24 626 | 25 984 | 26 548 | 27 081 | 27 384 | 28 142 | 28 697 | 29 008 | 29 423 | 29 912 | 30 484 |
| Least Developed Countries | kt | 1 441 | 1 452 | 1 478 | 1 544 | 1 533 | 1 552 | 1 583 | 1 645 | 1 709 | 1 755 | 1 795 |
| **Fish meal** | | | | | | | | | | | | |
| OECD | kt | 900 | 1 072 | 1 072 | 1 031 | 1 041 | 1 044 | 1 032 | 1 055 | 1 025 | 1 043 | 1 051 |
| Developing countries | kt | 2 198 | 2 254 | 2 255 | 2 133 | 2 240 | 2 253 | 2 222 | 2 218 | 2 113 | 2 209 | 2 241 |
| Least Developed Countries | kt | 83 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 | 105 |
| **Fish oil** | | | | | | | | | | | | |
| OECD | kt | 410 | 471 | 476 | 468 | 464 | 478 | 480 | 478 | 461 | 459 | 464 |
| Developing countries | kt | 470 | 475 | 475 | 429 | 468 | 475 | 483 | 481 | 442 | 468 | 473 |
| Least Developed Countries | kt | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Butter** | | | | | | | | | | | | |
| OECD[1] | kt | 680 | 690 | 712 | 733 | 748 | 749 | 757 | 772 | 788 | 802 | 822 |
| Developing countries | kt | 94 | 97 | 99 | 100 | 101 | 104 | 105 | 107 | 109 | 111 | 113 |
| Least Developed Countries | kt | 6 | 7 | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| **Cheese** | | | | | | | | | | | | |
| OECD[1] | kt | 1 413 | 1 513 | 1 531 | 1 609 | 1 662 | 1 683 | 1 711 | 1 738 | 1 771 | 1 801 | 1 823 |
| Developing countries | kt | 732 | 682 | 703 | 716 | 723 | 739 | 760 | 779 | 795 | 807 | 815 |
| Least Developed Countries | kt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Whole milk powder** | | | | | | | | | | | | |
| OECD[1] | kt | 1 565 | 1 725 | 1 741 | 1 759 | 1 783 | 1 768 | 1 787 | 1 804 | 1 845 | 1 885 | 1 940 |
| Developing countries | kt | 573 | 558 | 560 | 564 | 569 | 584 | 590 | 598 | 595 | 593 | 588 |
| Least Developed Countries | kt | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| **Skim milk powder** | | | | | | | | | | | | |
| OECD[1] | kt | 1 491 | 1 601 | 1 644 | 1 684 | 1 731 | 1 760 | 1 799 | 1 834 | 1 872 | 1 917 | 1 953 |
| Developing countries | kt | 138 | 129 | 131 | 131 | 130 | 131 | 132 | 133 | 133 | 133 | 132 |
| Least Developed Countries | kt | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Biofuel[3]** | | | | | | | | | | | | |
| Ethanol World Trade | Mil l | 3 749 | 4 605 | 9 522 | 11 155 | 11 869 | 14 245 | 15 827 | 15 129 | 14 147 | 14 788 | 12 259 |
| Biodiesel World Trade | Mil l | 2 029 | 1 659 | 1 870 | 2 021 | 2 278 | 2 199 | 2 184 | 2 071 | 1 855 | 2 050 | 2 152 |

## Table A.3.2. World trade projections, exports *(cont.)*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cotton** | | | | | | | | | | | | |
| OECD | kt | 3 962 | 3 814 | 3 850 | 3 868 | 3 851 | 3 793 | 3 841 | 3 924 | 4 002 | 4 013 | 4 052 |
| Developing countries | kt | 3 619 | 2 899 | 2 839 | 2 873 | 2 943 | 3 014 | 3 146 | 3 230 | 3 225 | 3 336 | 3 422 |
| Least Developed Countries | kt | 655 | 852 | 860 | 918 | 980 | 1 062 | 1 148 | 1 235 | 1 284 | 1 349 | 1 413 |

*Note:* Average 2010-12est: Data for 2012 are estimated.

1. Excludes Iceland but includes all EU27 member countries.
2. Excludes trade of live animals.
3. Sum of all positive net trade positions

*Source:* OECD and FAO Secretariats.

## Table A.4.1. Biofuel projections: Ethanol

| | PRODUCTION (MN L) | | Growth (%)[1] | DOMESTIC USE (MN L) | | Growth (%)[1] | FUEL USE (MN L) | | Growth (%)[1] | SHARE IN GAZOLINE TYPE FUEL USE(%) | | | | NET TRADE (MN L)[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Energy Shares | | Volume Shares | | | |
| | Average 2010-12est | 2022 | 2013-22 | Average 2010-12est | 2022 | 2013-22 | Average 2010-12est | 2022 | 2013-22 | Average 2010-12est | 2022 | Average 2010-12est | 2022 | Average 2010-12est | 2022 |
| **NORTH AMERICA** | | | | | | | | | | | | | | | |
| Canada | 1 572 | 1 474 | -0.85 | 1 920 | 2 202 | 0.20 | 1 920 | 2 202 | 0.20 | 3.2 | 3.5 | 4.7 | 5.1 | -349 | -729 |
| United States | 47 906 | 79 997 | 3.79 | 46 383 | 87 773 | 4.39 | 44 216 | 85 393 | 4.51 | 5.8 | 10.9 | 8.4 | 15.5 | 1 624 | -7 874 |
| of which second generation | 37 | 16 353 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| **EUROPE** | | | | | | | | | | | | | | | |
| European Union | 6 554 | 12 261 | 6.76 | 8 243 | 16 098 | 7.18 | 5 683 | 13 803 | 8.99 | 3.1 | 8.1 | 4.5 | 11.7 | -1 689 | -3 837 |
| of which second generation | 42 | 425 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| **OCEANIA DEVELOPED** | | | | | | | | | | | | | | | |
| Australia | 349 | 427 | -0.71 | 372 | 453 | -0.67 | 372 | 453 | -0.67 | 1.3 | 1.6 | 2.0 | 2.4 | -23 | -26 |
| **OTHER DEVELOPED** | | | | | | | | | | | | | | | |
| Japan | 101 | 101 | 0.15 | 950 | 1 551 | 4.61 | 350 | 966 | 8.84 | 0.0 | 0.0 | 0.0 | 0.0 | -877 | -1 450 |
| of which second generation | 79 | 78 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| South Africa | 367 | 319 | -1.19 | 190 | 199 | 0.08 | 4 | 6 | 1.02 | .. | .. | .. | .. | 177 | 121 |
| **SUB-SAHARIAN AFRICA** | | | | | | | | | | | | | | | |
| Mozambique | 36 | 72 | 6.94 | 34 | 45 | 2.35 | 2 | 15 | 8.60 | .. | .. | .. | .. | 2 | 27 |
| Tanzania | 34 | 42 | 2.92 | 43 | 50 | 2.89 | 3 | 19 | 9.69 | .. | .. | .. | .. | -9 | -8 |
| **LATIN AMERICA AND CARRIBBEAN** | | | | | | | | | | | | | | | |
| Argentina | 355 | 1 015 | 8.04 | 512 | 1 154 | 7.62 | 344 | 980 | 9.76 | 3.4 | 6.6 | 5.0 | 9.6 | -157 | -139 |
| Brazil | 25 373 | 47 376 | 5.10 | 23 549 | 35 558 | 4.23 | 21 886 | 33 642 | 4.45 | 46.4 | 56.8 | 56.2 | 66.2 | 1 823 | 11 818 |
| Columbia | 352 | 598 | 3.63 | 409 | 603 | 2.55 | 342 | 539 | 2.89 | .. | .. | .. | .. | -58 | -5 |
| Mexico | 210 | 252 | 0.99 | 342 | 404 | 0.99 | 0 | 0 | .. | 0.0 | 0.0 | 0.0 | 0.0 | -132 | -151 |
| Peru | 181 | 402 | 3.15 | 90 | 193 | 2.99 | 70 | 173 | 3.35 | .. | .. | .. | .. | 90 | 209 |
| **ASIA AND PACIFIC** | | | | | | | | | | | | | | | |
| China | 8 643 | 10 531 | 1.83 | 8 566 | 10 090 | 0.96 | 2 133 | 3 890 | 3.72 | 1.5 | 1.8 | 2.2 | 2.7 | 77 | 441 |
| India | 2 258 | 2 971 | 2.41 | 2 294 | 3 057 | 2.62 | 262 | 964 | 11.65 | .. | .. | .. | .. | -36 | -86 |
| Indonesia | 193 | 260 | 2.96 | 156 | 225 | 2.26 | 31 | 95 | 6.08 | .. | .. | .. | .. | 38 | 35 |
| Malaysia | 89 | 96 | 0.16 | 91 | 96 | 0.11 | 0 | 0 | 4.93 | .. | .. | .. | .. | -2 | -1 |
| Philippines | 129 | 269 | 5.57 | 425 | 547 | 0.68 | 230 | 362 | 1.00 | .. | .. | .. | .. | -297 | -279 |
| Thailand | 781 | 1 461 | 4.28 | 640 | 958 | 3.83 | 461 | 783 | 4.90 | .. | .. | .. | .. | 141 | 502 |
| Turkey | 84 | 130 | 3.37 | 123 | 143 | 1.29 | 50 | 68 | 2.78 | .. | .. | .. | .. | -39 | -13 |
| Viet Nam | 345 | 690 | 2.77 | 257 | 437 | 2.12 | 94 | 264 | 3.72 | .. | .. | .. | .. | 88 | 253 |
| **TOTAL** | **100 130** | **167 391** | **4.10** | **99 776** | **167 293** | **4.12** | **79 051** | **145 202** | **4.77** | **6.2** | **10.7** | **9.0** | **15.2** | **3 749** | **12 259** |

*Note:* .. : Not available.
Average 2010-12est: Data for 2012 are estimated.
1. Least-squares growth rate (see glossary).
2. For total net trade exports are shown.
*Source:* OECD and FAO Secretariats.

## Table A.4.2. Biofuel projections: Biodiesel

| | PRODUCTION (MN L) | | Growth (%)[1] | DOMESTIC USE (MN L) | | Growth (%)[1] | SHARE IN DIESEL TYPE FUEL USE(%) | | | | NET TRADE (MN L)[2] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Energy Shares | | Volume Shares | | | |
| | Average 2010-12est | 2022 | 2013-22 | Average 2010-12est | 2022 | 2013-22 | Average 2010-12est | 2022 | Average 2010-12est | 2022 | Average 2010-12est | 2022 |
| **NORTH AMERICA** | | | | | | | | | | | | |
| Canada | 248 | 346 | -3.91 | 319 | 665 | 0.43 | 0.9 | 1.8 | 1.1 | 2.3 | -71 | -318 |
| United States | 3 721 | 6 267 | 1.65 | 3 477 | 6 158 | 1.76 | 1.4 | 2.2 | 1.8 | 2.7 | 244 | 109 |
| **WESTERN EUROPE** | | | | | | | | | | | | |
| European Union | 10 707 | 18 282 | 6.28 | 13 430 | 20 530 | 5.03 | 5.2 | 7.4 | 6.5 | 9.1 | -2 723 | -2 248 |
| of which second generation | 52 | 225 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| **OCEANIA DEVELOPED** | | | | | | | | | | | | |
| Australia | 649 | 734 | 1.10 | 649 | 734 | 1.10 | 2.9 | 2.4 | 3.6 | 3.0 | 0 | 0 |
| **OTHER DEVELOPED** | | | | | | | | | | | | |
| South Africa | 72 | 98 | 2.38 | 72 | 98 | 2.38 | .. | .. | .. | .. | 0 | 0 |
| **SUB-SAHARIAN AFRICA** | | | | | | | | | | | | |
| Mozambique | 66 | 84 | 0.78 | 9 | 49 | 5.81 | .. | .. | .. | .. | 57 | 36 |
| Tanzania | 61 | 96 | 4.29 | 0 | 58 | 119.70 | .. | .. | .. | .. | 61 | 38 |
| **LATIN AMERICA AND CARIBBEAN** | | | | | | | | | | | | |
| Argentina | 2 524 | 3 451 | 2.01 | 784 | 1 467 | 2.98 | 5.6 | 8.4 | 7.0 | 10.3 | 1 740 | 1 984 |
| Brazil | 2 599 | 3 337 | 2.85 | 2 603 | 3 278 | 2.70 | 4.9 | 4.6 | 6.0 | 5.7 | -4 | 59 |
| Columbia | 537 | 926 | 3.54 | 537 | 925 | 3.55 | .. | .. | .. | .. | 0 | 1 |
| Peru | 68 | 105 | 1.68 | 213 | 316 | 2.64 | .. | .. | .. | .. | -145 | -211 |
| **ASIA AND PACIFIC** | | | | | | | | | | | | |
| India | 276 | 776 | 9.15 | 347 | 1 205 | 10.54 | .. | .. | .. | .. | -71 | -429 |
| Indonesia | 1 353 | 2 279 | 3.70 | 341 | 1 432 | 10.10 | .. | .. | .. | .. | 1 012 | 847 |
| Malaysia | 125 | 783 | 13.64 | 50 | 650 | 14.82 | .. | .. | .. | .. | 75 | 133 |
| Philippines | 142 | 378 | 9.43 | 142 | 378 | 9.43 | .. | .. | .. | .. | 0 | 0 |
| Thailand | 706 | 1 465 | 4.93 | 706 | 1 465 | 4.93 | .. | .. | .. | .. | 0 | 0 |
| Turkey | 11 | 17 | 2.73 | 11 | 17 | 2.73 | .. | .. | .. | .. | 0 | 0 |
| Viet Nam | 18 | 103 | 11.18 | 18 | 103 | 11.21 | .. | .. | .. | .. | 0 | 0 |
| **TOTAL** | **24 011** | **40 620** | **4.46** | **23 837** | **40 620** | **4.46** | **3.0** | **4.0** | **3.7** | **4.9** | **2 029** | **2 152** |

*Note:* .. : Not available.
Average 2010-12est: Data for 2012 are estimated.
1. Least-squares growth rate (see glossary).
2. For total net trade exports are shown.
*Source:* OECD and FAO Secretariats.

## Table A.6. World cereal projections

*Crop year*

| | | Average 2010/11-2012/13est | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WHEAT** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | mt | 675.3 | 697.4 | 711.8 | 716.5 | 724.1 | 732.4 | 740.4 | 753.6 | 764.6 | 775.4 | 784.5 |
| Area | mha | 220.9 | 222.8 | 225.5 | 225.4 | 225.9 | 226.6 | 226.9 | 228.6 | 230.0 | 231.1 | 231.8 |
| Yield | t/ha | 3.1 | 3.1 | 3.2 | 3.2 | 3.2 | 3.2 | 3.3 | 3.3 | 3.3 | 3.4 | 3.4 |
| Consumption | mt | 677.1 | 692.2 | 700.8 | 712.0 | 723.8 | 733.1 | 742.9 | 753.6 | 763.4 | 773.2 | 782.4 |
| Feed use | mt | 135.5 | 140.8 | 143.5 | 145.4 | 149.9 | 151.7 | 154.0 | 156.0 | 157.8 | 160.1 | 162.0 |
| Food use | mt | 461.6 | 471.2 | 475.7 | 483.4 | 489.4 | 495.4 | 502.0 | 509.4 | 516.3 | 523.2 | 530.1 |
| Biofuel use | mt | 6.8 | 6.7 | 6.9 | 7.2 | 7.5 | 7.8 | 8.1 | 8.8 | 9.5 | 9.7 | 10.1 |
| Other use | mt | 73.2 | 73.6 | 74.7 | 76.0 | 77.0 | 78.1 | 78.8 | 79.4 | 79.8 | 80.1 | 80.2 |
| Exports | mt | 137.2 | 135.0 | 137.6 | 140.7 | 141.4 | 143.2 | 143.7 | 145.8 | 147.3 | 149.1 | 150.4 |
| Closing stocks | mt | 190.4 | 188.1 | 199.1 | 203.6 | 203.9 | 203.2 | 200.7 | 200.7 | 201.9 | 204.2 | 206.2 |
| Price[1] | USD/t | 312.5 | 301.3 | 262.3 | 256.5 | 259.4 | 259.3 | 266.6 | 270.0 | 272.3 | 273.4 | 274.2 |
| **Developed countries** | | | | | | | | | | | | |
| Production | mt | 346.9 | 362.6 | 368.4 | 367.6 | 370.9 | 374.6 | 377.1 | 382.8 | 387.7 | 392.7 | 396.3 |
| Consumption | mt | 269.8 | 272.7 | 275.7 | 278.5 | 283.4 | 285.9 | 288.9 | 291.4 | 293.9 | 296.1 | 298.1 |
| Closing stocks | mt | 73.1 | 70.0 | 79.3 | 83.3 | 84.5 | 85.3 | 84.3 | 84.8 | 86.0 | 88.0 | 89.6 |
| **Developing countries** | | | | | | | | | | | | |
| Production | mt | 328.4 | 334.8 | 343.4 | 348.8 | 353.2 | 357.8 | 363.3 | 370.8 | 377.0 | 382.7 | 388.2 |
| Consumption | mt | 407.3 | 419.6 | 425.0 | 433.5 | 440.3 | 447.2 | 454.0 | 462.2 | 469.4 | 477.0 | 484.3 |
| Closing stocks | mt | 117.4 | 118.1 | 119.8 | 120.3 | 119.4 | 117.9 | 116.4 | 115.9 | 116.0 | 116.2 | 116.6 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | mt | 275.1 | 278.1 | 281.0 | 278.0 | 279.3 | 280.8 | 280.9 | 283.6 | 285.8 | 287.9 | 288.8 |
| Consumption | mt | 220.2 | 222.2 | 223.2 | 224.3 | 227.4 | 228.8 | 230.9 | 232.3 | 233.6 | 234.4 | 235.1 |
| Closing stocks | mt | 50.8 | 45.3 | 50.2 | 51.4 | 52.5 | 53.5 | 53.0 | 53.3 | 53.9 | 55.2 | 56.3 |
| **COARSE GRAINS** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | mt | 1 149.9 | 1 249.1 | 1 232.6 | 1 234.3 | 1 259.7 | 1 287.6 | 1 312.5 | 1 337.5 | 1 359.4 | 1 382.0 | 1 407.1 |
| Area | mha | 324.2 | 333.8 | 332.5 | 330.9 | 333.0 | 336.1 | 339.0 | 342.6 | 345.7 | 348.6 | 352.0 |
| Yield | t/ha | 3.5 | 3.7 | 3.7 | 3.7 | 3.8 | 3.8 | 3.9 | 3.9 | 3.9 | 4.0 | 4.0 |
| Consumption | mt | 1 155.5 | 1 203.9 | 1 231.7 | 1 247.3 | 1 267.6 | 1 289.6 | 1 314.1 | 1 338.0 | 1 361.1 | 1 384.0 | 1 408.2 |
| Feed use | mt | 602.0 | 644.6 | 660.2 | 668.1 | 679.4 | 693.1 | 708.7 | 721.6 | 735.2 | 750.7 | 767.1 |
| Food use | mt | 215.5 | 226.2 | 230.3 | 234.8 | 239.2 | 244.6 | 250.4 | 256.4 | 262.6 | 268.6 | 274.9 |
| Biofuel use | mt | 137.0 | 156.7 | 163.0 | 163.7 | 166.1 | 166.3 | 167.2 | 170.2 | 171.8 | 172.1 | 172.6 |
| Other use | mt | 161.9 | 136.7 | 138.3 | 139.9 | 141.4 | 143.4 | 145.3 | 146.6 | 147.8 | 148.5 | 149.2 |
| Exports | mt | 124.6 | 130.0 | 134.0 | 136.4 | 140.0 | 142.6 | 146.8 | 150.2 | 153.7 | 156.4 | 160.1 |
| Closing stocks | mt | 189.4 | 237.7 | 240.6 | 229.6 | 223.7 | 223.8 | 224.2 | 225.7 | 226.1 | 226.2 | 227.2 |
| Price[3] | USD/t | 284.6 | 243.4 | 216.4 | 221.1 | 227.2 | 228.2 | 234.1 | 236.4 | 237.7 | 240.3 | 240.6 |
| **Developed countries** | | | | | | | | | | | | |
| Production | mt | 585.1 | 648.3 | 627.5 | 618.3 | 632.8 | 646.2 | 657.4 | 667.1 | 674.9 | 683.2 | 693.0 |
| Consumption | mt | 555.7 | 557.6 | 563.3 | 564.9 | 572.6 | 580.8 | 589.9 | 598.1 | 604.4 | 610.8 | 616.7 |
| Closing stocks | mt | 80.9 | 109.5 | 114.3 | 106.4 | 103.2 | 102.5 | 102.0 | 102.0 | 101.3 | 100.3 | 100.1 |
| **Developing countries** | | | | | | | | | | | | |
| Production | mt | 564.7 | 600.7 | 605.1 | 616.0 | 626.9 | 641.4 | 655.1 | 670.4 | 684.6 | 698.8 | 714.1 |
| Consumption | mt | 599.7 | 646.3 | 668.4 | 682.4 | 695.0 | 708.8 | 724.3 | 739.9 | 756.7 | 773.2 | 791.4 |
| Closing stocks | mt | 108.5 | 128.2 | 126.3 | 123.2 | 120.5 | 121.3 | 122.2 | 123.8 | 124.9 | 125.9 | 127.1 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | mt | 539.0 | 593.4 | 571.5 | 561.6 | 574.5 | 586.6 | 596.6 | 605.0 | 611.4 | 618.2 | 626.6 |
| Consumption | mt | 548.8 | 547.6 | 553.0 | 554.3 | 561.3 | 569.1 | 577.9 | 585.9 | 592.0 | 598.1 | 604.3 |
| Closing stocks | mt | 76.7 | 105.6 | 109.5 | 100.9 | 97.4 | 96.4 | 95.9 | 95.8 | 95.1 | 94.0 | 93.6 |

## Table A.6. World cereal projections *(cont.)*

*Crop year*

| | | Average 2010/11-2012/13est | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RICE** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | mt | 481.1 | 493.7 | 500.5 | 506.7 | 512.4 | 518.2 | 524.0 | 530.3 | 536.4 | 542.9 | 549.3 |
| Area | mha | 161.7 | 162.1 | 162.6 | 162.9 | 163.3 | 163.6 | 163.9 | 164.1 | 164.4 | 164.6 | 164.9 |
| Yield | t/ha | 3.0 | 3.0 | 3.1 | 3.1 | 3.1 | 3.2 | 3.2 | 3.2 | 3.3 | 3.3 | 3.3 |
| Consumption | mt | 468.7 | 486.7 | 496.1 | 505.7 | 510.4 | 517.2 | 524.4 | 531.8 | 538.7 | 545.2 | 551.3 |
| Feed use | mt | 16.1 | 17.4 | 18.3 | 18.9 | 19.6 | 20.3 | 20.9 | 21.5 | 22.1 | 22.7 | 23.3 |
| Food use | mt | 397.3 | 410.3 | 416.7 | 424.0 | 428.7 | 434.2 | 440.3 | 446.8 | 452.8 | 458.2 | 463.0 |
| Exports | mt | 36.6 | 36.5 | 39.4 | 40.7 | 41.2 | 42.1 | 42.7 | 43.3 | 43.8 | 44.4 | 45.0 |
| Closing stocks | mt | 159.4 | 179.6 | 184.1 | 185.0 | 187.1 | 188.0 | 187.5 | 186.0 | 183.7 | 181.4 | 179.5 |
| Price[4] | USD/t | 451.1 | 480.9 | 440.3 | 423.2 | 419.3 | 417.9 | 426.1 | 438.0 | 451.1 | 462.5 | 470.3 |
| **Developed countries** | | | | | | | | | | | | |
| Production | mt | 18.1 | 17.5 | 18.3 | 18.2 | 18.3 | 18.3 | 18.4 | 18.5 | 18.7 | 18.8 | 19.0 |
| Consumption | mt | 18.6 | 18.6 | 19.1 | 19.3 | 19.5 | 19.6 | 19.7 | 19.8 | 19.9 | 20.0 | 20.1 |
| Closing stocks | mt | 4.7 | 4.6 | 5.1 | 5.4 | 5.5 | 5.7 | 5.8 | 6.0 | 6.3 | 6.5 | 6.8 |
| **Developing countries** | | | | | | | | | | | | |
| Production | mt | 463.0 | 476.2 | 482.2 | 488.5 | 494.1 | 499.9 | 505.6 | 511.8 | 517.7 | 524.1 | 530.3 |
| Consumption | mt | 450.1 | 468.1 | 476.9 | 486.4 | 490.9 | 497.6 | 504.7 | 512.0 | 518.8 | 525.1 | 531.2 |
| Closing stocks | mt | 154.7 | 175.0 | 179.0 | 179.7 | 181.5 | 182.3 | 181.7 | 179.9 | 177.4 | 174.9 | 172.7 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | mt | 21.6 | 21.0 | 21.7 | 21.7 | 21.8 | 21.8 | 21.9 | 22.0 | 22.2 | 22.3 | 22.5 |
| Consumption | mt | 22.5 | 22.3 | 22.7 | 22.9 | 23.0 | 23.1 | 23.2 | 23.4 | 23.5 | 23.6 | 23.7 |
| Closing stocks | mt | 6.4 | 6.1 | 6.6 | 6.9 | 7.1 | 7.2 | 7.4 | 7.6 | 7.8 | 8.1 | 8.3 |

*Note:* Crop year: Beginning crop marketing year - see Glossary of Terms for definitions.
Average 2010/11-2012/13est: Data for 2012/13 are estimated.

1. No.2 hard red winter wheat, ordinary protein, United States f.o.b. Gulf Ports (June/May), less EEP payments where applicable.
2. Excludes Iceland but includes all EU27 member countries.
3. No.2 yellow corn, United States f.o.b. Gulf Ports (September/August).
4. Milled, 5% broken, f.o.b. Ho Chi Minh (January/December).

*Source:* OECD and FAO Secretariats.

## Table A.11. World oilseed projections

| | | Average 2010/11-2012/13est | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **OILSEED (crop year)[2]** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | mt | 390.4 | 408.2 | 414.0 | 427.0 | 435.7 | 443.7 | 452.5 | 460.7 | 470.9 | 480.8 | 490.5 |
| Area | mha | 150.0 | 188.8 | 188.6 | 191.1 | 192.8 | 194.3 | 195.9 | 197.3 | 199.6 | 201.8 | 203.5 |
| Yield | t/ha | 1.9 | 2.2 | 2.2 | 2.2 | 2.3 | 2.3 | 2.3 | 2.3 | 2.4 | 2.4 | 2.4 |
| Consumption | mt | 392.0 | 406.2 | 416.2 | 426.6 | 436.3 | 444.5 | 453.3 | 461.6 | 470.7 | 480.5 | 489.6 |
| Crush | mt | 345.3 | 357.5 | 366.5 | 376.5 | 385.0 | 392.4 | 400.5 | 408.2 | 416.7 | 425.8 | 434.3 |
| Exports | mt | 74.5 | 118.6 | 120.1 | 123.8 | 125.8 | 127.6 | 129.6 | 131.4 | 134.4 | 137.3 | 140.2 |
| Closing stocks | mt | 40.3 | 38.5 | 37.2 | 38.6 | 39.0 | 39.2 | 39.4 | 39.5 | 40.7 | 41.9 | 43.8 |
| Price[3] | USD/t | 605.0 | 564.1 | 514.0 | 511.2 | 507.0 | 521.7 | 523.0 | 530.0 | 530.5 | 538.9 | 540.0 |
| **Developed countries** | | | | | | | | | | | | |
| Production | mt | 165.5 | 176.3 | 177.3 | 182.6 | 186.2 | 188.3 | 191.5 | 194.0 | 197.3 | 200.5 | 203.2 |
| Consumption | mt | 136.6 | 139.2 | 142.1 | 145.2 | 148.5 | 151.0 | 153.7 | 156.1 | 158.6 | 160.9 | 163.0 |
| Crush | mt | 124.4 | 126.5 | 128.8 | 132.2 | 134.8 | 137.0 | 139.6 | 141.9 | 144.4 | 146.6 | 148.6 |
| Closing stocks | mt | 14.4 | 13.9 | 14.2 | 15.6 | 16.0 | 16.2 | 16.2 | 16.1 | 16.3 | 16.4 | 16.6 |
| **Developing countries** | | | | | | | | | | | | |
| Production | mt | 224.9 | 231.9 | 236.7 | 244.3 | 249.5 | 255.4 | 261.0 | 266.6 | 273.6 | 280.3 | 287.2 |
| Consumption | mt | 255.4 | 267.0 | 274.1 | 281.4 | 287.8 | 293.5 | 299.6 | 305.5 | 312.2 | 319.6 | 326.6 |
| Crush | mt | 220.9 | 231.0 | 237.7 | 244.3 | 250.1 | 255.4 | 260.9 | 266.3 | 272.4 | 279.1 | 285.6 |
| Closing stocks | mt | 25.8 | 24.5 | 23.0 | 23.0 | 23.0 | 23.0 | 23.3 | 23.4 | 24.4 | 25.6 | 27.2 |
| **OECD[1]** | | | | | | | | | | | | |
| Production | mt | 140.8 | 150.7 | 150.6 | 155.7 | 157.8 | 159.0 | 161.2 | 162.7 | 165.0 | 167.1 | 169.0 |
| Consumption | mt | 123.4 | 125.0 | 127.1 | 129.7 | 132.1 | 133.9 | 135.8 | 137.3 | 139.0 | 140.5 | 141.8 |
| Crush | mt | 112.5 | 113.9 | 115.4 | 118.2 | 120.0 | 121.6 | 123.3 | 124.7 | 126.4 | 127.8 | 129.1 |
| Closing stocks | mt | 13.2 | 13.2 | 13.3 | 14.7 | 15.1 | 15.2 | 15.1 | 15.0 | 15.1 | 15.1 | 15.2 |
| **PROTEIN MEALS (marketing year)** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | mt | 271.5 | 280.9 | 288.3 | 295.5 | 301.7 | 307.0 | 313.4 | 319.3 | 325.7 | 332.4 | 338.8 |
| Consumption | mt | 268.9 | 280.6 | 287.8 | 295.2 | 301.6 | 307.0 | 313.3 | 319.1 | 325.5 | 332.1 | 338.5 |
| Closing stocks | mt | 15.4 | 14.9 | 15.5 | 15.9 | 16.1 | 16.2 | 16.4 | 16.6 | 16.9 | 17.3 | 17.6 |
| Price[4] | USD/t | 436.9 | 464.3 | 403.9 | 389.0 | 387.0 | 390.2 | 396.2 | 401.7 | 403.6 | 404.2 | 406.1 |
| **Developed countries** | | | | | | | | | | | | |
| Production | mt | 87.2 | 88.6 | 90.4 | 92.6 | 94.2 | 95.3 | 97.1 | 98.5 | 100.1 | 101.5 | 102.8 |
| Consumption | mt | 107.3 | 111.5 | 112.2 | 113.5 | 114.8 | 115.1 | 116.5 | 117.3 | 118.3 | 119.3 | 120.0 |
| Closing stocks | mt | 1.3 | 1.2 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.4 | 1.4 |
| **Developing countries** | | | | | | | | | | | | |
| Production | mt | 184.3 | 192.3 | 197.9 | 203.0 | 207.5 | 211.7 | 216.2 | 220.7 | 225.6 | 230.9 | 236.0 |
| Consumption | mt | 161.6 | 169.1 | 175.5 | 181.7 | 186.9 | 191.9 | 196.8 | 201.8 | 207.2 | 212.8 | 218.5 |
| Closing stocks | mt | 14.2 | 13.7 | 14.2 | 14.6 | 14.7 | 14.9 | 15.1 | 15.3 | 15.6 | 15.9 | 16.3 |
| **OECD** | | | | | | | | | | | | |
| Production | mt | 82.6 | 83.8 | 85.2 | 87.0 | 88.2 | 89.0 | 90.3 | 91.2 | 92.4 | 93.4 | 94.3 |
| Consumption | mt | 110.3 | 114.6 | 115.5 | 117.1 | 118.5 | 119.0 | 120.3 | 121.1 | 122.2 | 123.2 | 124.0 |
| Closing stocks | mt | 1.5 | 1.4 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **VEGETABLE OILS (marketing year)** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | mt | 156.2 | 163.3 | 166.9 | 170.9 | 174.3 | 177.5 | 181.2 | 184.6 | 188.3 | 192.1 | 195.7 |
| Of which palm oil | mt | 52.1 | 55.7 | 56.9 | 58.2 | 59.4 | 60.6 | 61.9 | 63.1 | 64.4 | 65.6 | 66.9 |
| Consumption | mt | 154.9 | 163.7 | 167.9 | 170.6 | 174.9 | 178.3 | 181.8 | 185.3 | 189.0 | 192.6 | 196.2 |
| Food | mt | 108.4 | 133.6 | 137.0 | 138.6 | 141.2 | 143.4 | 145.8 | 148.1 | 150.5 | 153.2 | 156.0 |
| Biofuel | mt | 19.4 | 21.0 | 21.5 | 22.5 | 24.0 | 25.1 | 26.2 | 27.1 | 28.4 | 29.1 | 29.7 |
| Exports | mt | 41.8 | 65.6 | 66.0 | 67.5 | 68.5 | 70.1 | 71.5 | 73.1 | 74.7 | 76.0 | 77.3 |
| Closing stocks | mt | 21.3 | 22.1 | 22.0 | 23.1 | 23.5 | 23.6 | 23.8 | 24.1 | 24.3 | 24.7 | 25.0 |
| Price[5] | USD/t | 1 206.6 | 1 141.4 | 1 038.3 | 1 077.6 | 1 065.2 | 1 097.7 | 1 104.9 | 1 117.6 | 1 136.1 | 1 154.6 | 1 160.3 |
| **Developed countries** | | | | | | | | | | | | |
| Production | mt | 39.8 | 40.5 | 41.2 | 42.3 | 43.1 | 43.7 | 44.6 | 45.4 | 46.2 | 47.0 | 47.7 |
| Consumption | mt | 46.9 | 47.7 | 48.3 | 48.9 | 49.8 | 50.6 | 51.3 | 52.1 | 53.3 | 53.7 | 54.1 |
| Closing stocks | mt | 3.4 | 3.3 | 3.3 | 3.4 | 3.5 | 3.5 | 3.5 | 3.6 | 3.6 | 3.8 | 3.9 |
| **Developing countries** | | | | | | | | | | | | |
| Production | mt | 116.4 | 122.8 | 125.7 | 128.6 | 131.2 | 133.8 | 136.5 | 139.2 | 142.1 | 145.0 | 147.9 |
| Consumption | mt | 108.0 | 116.0 | 119.5 | 121.7 | 125.1 | 127.7 | 130.5 | 133.2 | 135.7 | 139.0 | 142.2 |
| Closing stocks | mt | 17.9 | 18.8 | 18.7 | 19.7 | 20.0 | 20.1 | 20.3 | 20.5 | 20.7 | 20.9 | 21.1 |
| **OECD** | | | | | | | | | | | | |
| Production | mt | 34.3 | 34.8 | 35.2 | 36.0 | 36.5 | 36.9 | 37.5 | 37.9 | 38.5 | 38.9 | 39.3 |
| Consumption | mt | 45.8 | 46.5 | 47.0 | 47.5 | 48.2 | 49.0 | 49.6 | 50.5 | 51.6 | 52.0 | 52.4 |
| Closing stocks | mt | 3.0 | 2.9 | 2.9 | 3.0 | 3.0 | 3.1 | 3.1 | 3.1 | 3.2 | 3.3 | 3.5 |

1. Excludes Iceland but includes all EU27 member countries.
2. Beginning crop marketing year - see Glossary of Terms for definitions. Cotton seeds have been extracted from the oilseed total. Based on the cotton outlook, cotton seed production and crush would reach about 50 mt in 2022.
   Average 2010/11-2012/13est: Data for 2012/13 are estimated.
3. Weighted average oilseed price, European port.
4. Weighted average protein meal, European port.
5. Weighted average price of oilseed oils and palm oil, European port.

*Source:* OECD and FAO Secretariats.

## Table A.16. World sugar projections

*Crop year*

| | | Average 2010/11-2012/13est | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WORLD** | | | | | | | | | | | | |
| SUGARBEET | | | | | | | | | | | | |
| Production | mt | 251.7 | 247.7 | 248.3 | 251.5 | 253.2 | 258.6 | 261.9 | 264.8 | 267.6 | 270.0 | 272.5 |
| Area | mha | 4.9 | 4.7 | 4.6 | 4.6 | 4.6 | 4.6 | 4.7 | 4.7 | 4.7 | 4.7 | 4.7 |
| Yield | t/ha | 51.3 | 53.0 | 53.9 | 54.4 | 54.9 | 55.7 | 56.3 | 56.8 | 57.3 | 57.7 | 58.1 |
| Biofuel use | mt | 14.3 | 14.6 | 15.1 | 15.1 | 15.2 | 15.6 | 15.9 | 16.3 | 16.7 | 16.9 | 17.2 |
| SUGARCANE | | | | | | | | | | | | |
| Production | mt | 1 703.9 | 1 741.3 | 1 786.1 | 1 766.8 | 1 820.9 | 1 925.3 | 1 878.6 | 1 932.2 | 1 952.1 | 1 985.4 | 1 996.2 |
| Area | mha | 24.3 | 24.9 | 24.9 | 24.5 | 25.2 | 26.9 | 26.3 | 26.7 | 27.0 | 27.2 | 27.3 |
| Yield | t/ha | 70.1 | 70.0 | 71.7 | 72.1 | 72.3 | 71.6 | 71.5 | 72.4 | 72.4 | 73.0 | 73.1 |
| Biofuel use | mt | 290.7 | 334.4 | 416.2 | 443.2 | 470.2 | 519.7 | 529.4 | 545.2 | 552.0 | 572.9 | 568.7 |
| SUGAR | | | | | | | | | | | | |
| Production | mt rse | 173.7 | 180.5 | 182.9 | 182.4 | 190.3 | 195.3 | 194.7 | 200.2 | 203.7 | 207.9 | 212.2 |
| Consumption | mt rse | 164.8 | 173.1 | 176.4 | 179.0 | 182.6 | 186.4 | 188.9 | 192.7 | 196.8 | 200.5 | 204.2 |
| Closing stocks | mt rse | 64.3 | 70.7 | 70.8 | 67.7 | 68.9 | 71.3 | 70.6 | 71.5 | 71.8 | 72.6 | 73.9 |
| Price, raw sugar[1] | USD/t | 522.7 | 410.2 | 408.0 | 432.4 | 414.0 | 413.4 | 437.8 | 444.5 | 441.8 | 442.8 | 438.7 |
| Price, white sugar[2] | USD/t | 621.0 | 498.8 | 503.7 | 530.7 | 512.5 | 507.4 | 538.7 | 545.2 | 541.3 | 540.6 | 536.4 |
| Price, HFCS[3] | USD/t | 524.4 | 340.8 | 388.4 | 431.2 | 442.2 | 405.1 | 374.0 | 363.0 | 369.7 | 365.9 | 357.1 |
| **DEVELOPED COUNTRIES** | | | | | | | | | | | | |
| SUGARBEET | | | | | | | | | | | | |
| Production | mt | 195.8 | 190.5 | 189.6 | 191.6 | 191.6 | 195.5 | 197.1 | 198.0 | 199.0 | 199.4 | 199.9 |
| SUGARCANE | | | | | | | | | | | | |
| Production | mt | 72.2 | 77.6 | 77.9 | 78.2 | 79.7 | 78.8 | 80.1 | 79.5 | 81.2 | 80.9 | 82.2 |
| SUGAR | | | | | | | | | | | | |
| Production | mt rse | 41.2 | 41.8 | 41.6 | 42.2 | 42.6 | 43.2 | 43.8 | 44.0 | 44.5 | 44.7 | 45.1 |
| Consumption | mt rse | 49.3 | 49.6 | 49.9 | 49.8 | 50.1 | 50.2 | 50.3 | 50.4 | 50.6 | 50.7 | 50.6 |
| Closing stocks | mt rse | 17.2 | 19.7 | 19.8 | 18.2 | 17.8 | 18.2 | 18.2 | 18.3 | 18.4 | 18.2 | 18.2 |
| HFCS | | | | | | | | | | | | |
| Production | mt | 11.7 | 11.6 | 11.6 | 12.1 | 12.3 | 12.6 | 12.7 | 12.8 | 13.0 | 13.1 | 13.3 |
| Consumption | mt | 10.2 | 10.0 | 9.9 | 10.1 | 10.4 | 10.6 | 10.6 | 10.7 | 10.8 | 10.7 | 10.7 |
| **DEVELOPING COUNTRIES** | | | | | | | | | | | | |
| SUGARBEET | | | | | | | | | | | | |
| Production | mt | 55.9 | 57.3 | 58.6 | 59.9 | 61.6 | 63.1 | 64.7 | 66.8 | 68.7 | 70.6 | 72.6 |
| SUGARCANE | | | | | | | | | | | | |
| Production | mt | 1 631.7 | 1 663.7 | 1 708.2 | 1 688.6 | 1 741.2 | 1 846.5 | 1 798.5 | 1 852.6 | 1 870.9 | 1 904.6 | 1 914.0 |
| SUGAR | | | | | | | | | | | | |
| Production | mt rse | 132.6 | 138.7 | 141.3 | 140.2 | 147.7 | 152.1 | 150.9 | 156.2 | 159.2 | 163.3 | 167.1 |
| Consumption | mt rse | 115.5 | 123.6 | 126.5 | 129.2 | 132.5 | 136.2 | 138.6 | 142.3 | 146.2 | 149.8 | 153.6 |
| Closing stocks | mt rse | 47.1 | 51.0 | 51.0 | 49.5 | 51.1 | 53.1 | 52.5 | 53.2 | 53.4 | 54.4 | 55.7 |
| HFCS | | | | | | | | | | | | |
| Production | mt | 2.5 | 2.6 | 2.6 | 2.7 | 2.7 | 2.8 | 2.9 | 3.0 | 3.0 | 3.0 | 3.1 |
| Consumption | mt | 3.7 | 3.9 | 3.9 | 4.2 | 4.3 | 4.5 | 4.6 | 4.8 | 4.9 | 5.1 | 5.3 |
| **OECD[4]** | | | | | | | | | | | | |
| SUGARBEET | | | | | | | | | | | | |
| Production | mt | 163.7 | 163.3 | 162.5 | 165.1 | 164.8 | 168.2 | 168.9 | 168.7 | 168.9 | 168.3 | 168.0 |
| SUGARCANE | | | | | | | | | | | | |
| Production | mt | 108.5 | 118.7 | 116.8 | 116.0 | 118.5 | 118.8 | 121.8 | 121.7 | 124.0 | 124.1 | 125.7 |
| SUGAR | | | | | | | | | | | | |
| Production | mt rse | 39.1 | 40.7 | 40.1 | 40.6 | 41.0 | 41.5 | 42.0 | 41.9 | 42.2 | 42.1 | 42.3 |
| Consumption | mt rse | 44.5 | 44.9 | 45.4 | 45.2 | 45.5 | 45.4 | 45.5 | 45.6 | 45.9 | 46.1 | 46.0 |
| Closing stocks | mt rse | 14.9 | 17.0 | 16.6 | 15.0 | 14.5 | 14.9 | 15.0 | 15.2 | 15.1 | 14.7 | 14.6 |
| HFCS | | | | | | | | | | | | |
| Production | mt | 12.9 | 12.8 | 12.7 | 13.3 | 13.6 | 13.9 | 14.0 | 14.2 | 14.4 | 14.6 | 14.7 |
| Consumption | mt | 12.5 | 12.3 | 12.3 | 12.8 | 13.1 | 13.4 | 13.5 | 13.7 | 13.9 | 13.9 | 14.0 |

*Note:* Crop year: Beginning crop marketing year (Oct/Sept)- see the Glossary of Terms for definitions.
rse : raw sugar equivalent.
HFCS: High fructose corn syrup
Average 2010/11-2012/13est: Data for 2012/13 are estimated.

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 , October/September.
4. Excludes Iceland but includes all EU27 member countries.

*Source:* OECD and FAO Secretariats.

## Table A.19. World meat projections

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WORLD** | | | | | | | | | | | | |
| BEEF AND VEAL | | | | | | | | | | | | |
| Production | kt cwe | 66 891 | 67 212 | 67 955 | 68 934 | 70 066 | 71 180 | 72 438 | 73 485 | 74 440 | 75 422 | 76 531 |
| Consumption | kt cwe | 66 404 | 67 071 | 67 744 | 68 726 | 69 830 | 70 947 | 72 220 | 73 273 | 74 218 | 75 196 | 76 310 |
| PIGMEAT | | | | | | | | | | | | |
| Production | kt cwe | 109 793 | 111 853 | 113 963 | 115 944 | 118 146 | 119 458 | 121 172 | 122 537 | 123 965 | 125 322 | 126 731 |
| Consumption | kt cwe | 109 456 | 111 717 | 113 830 | 115 800 | 117 997 | 119 319 | 121 038 | 122 404 | 123 821 | 125 168 | 126 576 |
| POULTRY MEAT | | | | | | | | | | | | |
| Production | kt rtc | 103 257 | 108 354 | 110 519 | 113 144 | 115 388 | 117 763 | 120 001 | 121 975 | 124 289 | 126 502 | 128 669 |
| Consumption | kt rtc | 103 132 | 108 084 | 110 225 | 112 848 | 115 088 | 117 471 | 119 709 | 121 685 | 123 999 | 126 212 | 128 377 |
| SHEEP MEAT | | | | | | | | | | | | |
| Production | kt cwe | 13 854 | 14 102 | 14 331 | 14 332 | 14 620 | 14 683 | 14 952 | 15 125 | 15 351 | 15 569 | 15 782 |
| Consumption | kt cwe | 13 804 | 14 084 | 14 316 | 14 315 | 14 607 | 14 670 | 14 939 | 15 112 | 15 341 | 15 559 | 15 774 |
| TOTAL MEAT | | | | | | | | | | | | |
| Per capita consumption[1] | kg rwt | 33.7 | 33.9 | 34.1 | 34.4 | 34.6 | 34.8 | 35.1 | 35.2 | 35.4 | 35.6 | 35.8 |
| **DEVELOPED COUNTRIES** | | | | | | | | | | | | |
| BEEF AND VEAL | | | | | | | | | | | | |
| Production | kt cwe | 29 482 | 28 720 | 28 743 | 28 888 | 29 424 | 29 687 | 30 112 | 30 362 | 30 609 | 30 695 | 30 876 |
| Consumption | kt cwe | 29 528 | 28 974 | 29 001 | 29 192 | 29 615 | 29 833 | 30 255 | 30 447 | 30 637 | 30 666 | 30 792 |
| PIGMEAT | | | | | | | | | | | | |
| Production | kt cwe | 41 903 | 41 584 | 42 085 | 42 651 | 43 383 | 43 358 | 43 585 | 43 769 | 44 009 | 44 258 | 44 499 |
| Consumption | kt cwe | 39 647 | 39 059 | 39 684 | 40 196 | 40 862 | 40 826 | 41 041 | 41 205 | 41 396 | 41 530 | 41 721 |
| POULTRY MEAT | | | | | | | | | | | | |
| Production | kt rtc | 42 330 | 43 278 | 43 743 | 44 558 | 45 309 | 46 060 | 46 694 | 47 178 | 47 875 | 48 453 | 49 078 |
| Consumption | kt rtc | 40 502 | 41 186 | 41 642 | 42 412 | 42 976 | 43 658 | 44 177 | 44 502 | 45 110 | 45 555 | 46 009 |
| SHEEP MEAT | | | | | | | | | | | | |
| Production | kt cwe | 3 179 | 3 226 | 3 241 | 3 249 | 3 278 | 3 294 | 3 318 | 3 346 | 3 364 | 3 400 | 3 418 |
| Consumption | kt cwe | 2 713 | 2 733 | 2 732 | 2 723 | 2 741 | 2 748 | 2 755 | 2 765 | 2 774 | 2 797 | 2 800 |
| TOTAL MEAT | | | | | | | | | | | | |
| Per capita consumption[1] | kg rwt | 65.0 | 64.3 | 64.8 | 65.4 | 66.1 | 66.4 | 66.8 | 67.0 | 67.4 | 67.5 | 67.8 |
| **DEVELOPING COUNTRIES** | | | | | | | | | | | | |
| BEEF AND VEAL | | | | | | | | | | | | |
| Production | kt cwe | 37 219 | 38 492 | 39 211 | 40 046 | 40 642 | 41 493 | 42 326 | 43 123 | 43 832 | 44 728 | 45 655 |
| Consumption | kt cwe | 36 876 | 38 097 | 38 742 | 39 534 | 40 215 | 41 115 | 41 966 | 42 825 | 43 581 | 44 531 | 45 518 |
| PIGMEAT | | | | | | | | | | | | |
| Production | kt cwe | 67 890 | 70 270 | 71 878 | 73 293 | 74 763 | 76 101 | 77 587 | 78 768 | 79 956 | 81 064 | 82 232 |
| Consumption | kt cwe | 69 808 | 72 658 | 74 146 | 75 605 | 77 135 | 78 493 | 79 997 | 81 199 | 82 425 | 83 638 | 84 856 |
| POULTRY MEAT | | | | | | | | | | | | |
| Production | kt rtc | 60 927 | 65 077 | 66 776 | 68 586 | 70 079 | 71 702 | 73 307 | 74 797 | 76 414 | 78 048 | 79 592 |
| Consumption | kt rtc | 62 630 | 66 898 | 68 583 | 70 435 | 72 111 | 73 813 | 75 531 | 77 183 | 78 889 | 80 657 | 82 368 |
| SHEEP MEAT | | | | | | | | | | | | |
| Production | kt cwe | 10 675 | 10 876 | 11 089 | 11 082 | 11 342 | 11 389 | 11 634 | 11 779 | 11 987 | 12 169 | 12 364 |
| Consumption | kt cwe | 11 091 | 11 350 | 11 584 | 11 592 | 11 866 | 11 922 | 12 185 | 12 347 | 12 567 | 12 762 | 12 974 |
| TOTAL MEAT | | | | | | | | | | | | |
| Per capita consumption[1] | kg rwt | 25.9 | 26.5 | 26.7 | 27.0 | 27.2 | 27.4 | 27.7 | 27.9 | 28.1 | 28.3 | 28.6 |
| **OECD[2]** | | | | | | | | | | | | |
| BEEF AND VEAL | | | | | | | | | | | | |
| Production | kt cwe | 27 117 | 25 983 | 25 961 | 26 047 | 26 513 | 26 689 | 27 046 | 27 228 | 27 402 | 27 434 | 27 542 |
| Consumption | kt cwe | 26 335 | 25 767 | 25 786 | 25 959 | 26 376 | 26 568 | 26 942 | 27 102 | 27 264 | 27 281 | 27 384 |
| PIGMEAT | | | | | | | | | | | | |
| Production | kt cwe | 40 057 | 39 621 | 40 071 | 40 554 | 41 243 | 41 191 | 41 404 | 41 552 | 41 773 | 42 035 | 42 265 |
| Consumption | kt cwe | 37 207 | 36 536 | 36 925 | 37 371 | 38 000 | 37 943 | 38 148 | 38 268 | 38 414 | 38 531 | 38 688 |
| POULTRY MEAT | | | | | | | | | | | | |
| Production | kt rtc | 41 785 | 42 459 | 42 839 | 43 573 | 44 201 | 44 885 | 45 537 | 45 956 | 46 573 | 47 086 | 47 650 |
| Consumption | kt rtc | 38 967 | 39 489 | 39 816 | 40 448 | 40 866 | 41 455 | 41 975 | 42 253 | 42 780 | 43 134 | 43 496 |
| SHEEP MEAT | | | | | | | | | | | | |
| Production | kt cwe | 2 507 | 2 522 | 2 529 | 2 537 | 2 546 | 2 550 | 2 558 | 2 571 | 2 581 | 2 599 | 2 608 |
| Consumption | kt cwe | 2 055 | 2 039 | 2 017 | 2 007 | 2 004 | 2 001 | 1 990 | 1 982 | 1 983 | 1 987 | 1 981 |
| TOTAL MEAT | | | | | | | | | | | | |
| Per capita consumption[1] | kg rwt | 65.4 | 64.2 | 64.3 | 64.8 | 65.3 | 65.5 | 65.8 | 65.8 | 66.0 | 66.1 | 66.2 |

*Note:* Calendar Year: Year ending 30 September for New Zealand.
Average 2010-12est: Data for 2012 are estimated.

1. Per capita consumption expressed in retail weight. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pigmeat and 0.88 for both sheep meat and poultry meat.
2. Excludes Iceland but includes all EU27 member countries.

*Source:* OECD and FAO Secretariats.

## Table A.25. World fish and seafood projections

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FISH** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt | 153 940 | 161 876 | 164 904 | 165 171 | 169 363 | 171 941 | 173 853 | 175 684 | 175 582 | 179 234 | 181 070 |
| of which aquaculture | kt | 62 924 | 68 262 | 70 682 | 72 529 | 74 705 | 76 584 | 78 380 | 80 144 | 81 593 | 83 515 | 85 124 |
| Consumption | kt | 154 193 | 161 830 | 164 979 | 165 245 | 169 438 | 172 016 | 173 928 | 175 758 | 175 656 | 179 309 | 181 145 |
| of which for food | kt | 131 741 | 138 923 | 142 506 | 144 594 | 147 676 | 150 510 | 152 715 | 154 734 | 156 103 | 158 644 | 160 514 |
| of which for reduction | kt | 15 941 | 16 798 | 16 583 | 14 992 | 16 231 | 16 106 | 15 943 | 15 834 | 14 433 | 15 605 | 15 573 |
| Price | | | | | | | | | | | | |
| Aquaculture[1] | USD/t | 2 034.8 | 2 047.6 | 2 092.0 | 2 225.1 | 2 224.9 | 2 221.5 | 2 273.0 | 2 422.4 | 2 568.2 | 2 658.3 | 2 700.9 |
| Capture[2] | USD/t | 1 324.5 | 1 386.3 | 1 431.8 | 1 501.8 | 1 513.7 | 1 555.2 | 1 601.5 | 1 681.3 | 1 750.2 | 1 798.1 | 1 842.8 |
| Product traded[3] | USD/t | 2 671.3 | 2 698.1 | 2 769.9 | 2 933.0 | 2 870.8 | 2 923.0 | 2 990.8 | 3 187.4 | 3 335.4 | 3 408.1 | 3 462.7 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt | 28 452 | 29 139 | 29 431 | 29 232 | 29 313 | 29 352 | 29 391 | 29 462 | 29 448 | 29 493 | 29 478 |
| of which aquaculture | kt | 4 133 | 4 249 | 4 351 | 4 213 | 4 334 | 4 406 | 4 491 | 4 601 | 4 608 | 4 665 | 4 666 |
| Consumption | kt | 36 741 | 37 498 | 37 833 | 37 914 | 38 135 | 38 242 | 38 395 | 38 385 | 38 434 | 38 532 | 38 817 |
| of which for food | kt | 32 120 | 32 671 | 33 101 | 33 260 | 33 578 | 33 765 | 33 985 | 34 035 | 34 122 | 34 300 | 34 587 |
| of which for reduction | kt | 3 685 | 4 058 | 4 013 | 3 945 | 3 858 | 3 788 | 3 731 | 3 681 | 3 653 | 3 583 | 3 539 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt | 125 488 | 132 737 | 135 473 | 135 939 | 140 050 | 142 589 | 144 462 | 146 222 | 146 134 | 149 741 | 151 592 |
| of which aquaculture | kt | 58 791 | 64 014 | 66 332 | 68 316 | 70 370 | 72 177 | 73 889 | 75 543 | 76 985 | 78 850 | 80 457 |
| Consumption | kt | 117 452 | 124 332 | 127 146 | 127 331 | 131 303 | 133 773 | 135 533 | 137 374 | 137 222 | 140 777 | 142 328 |
| of which for food | kt | 99 621 | 106 252 | 109 405 | 111 334 | 114 098 | 116 745 | 118 730 | 120 699 | 121 980 | 124 344 | 125 927 |
| of which for reduction | kt | 12 256 | 12 740 | 12 570 | 11 047 | 12 374 | 12 318 | 12 212 | 12 153 | 10 780 | 12 022 | 12 033 |
| **OECD** | | | | | | | | | | | | |
| Production | kt | 31 613 | 32 689 | 32 881 | 32 236 | 32 715 | 32 913 | 32 948 | 33 061 | 32 545 | 33 008 | 33 113 |
| of which aquaculture | kt | 5 629 | 5 975 | 6 059 | 6 020 | 6 177 | 6 282 | 6 429 | 6 611 | 6 730 | 6 857 | 6 953 |
| Consumption | kt | 39 451 | 40 339 | 40 601 | 40 332 | 40 855 | 41 043 | 41 118 | 41 137 | 40 859 | 41 306 | 41 689 |
| of which for food | kt | 32 286 | 32 713 | 33 191 | 33 443 | 33 776 | 34 041 | 34 278 | 34 367 | 34 484 | 34 712 | 35 059 |
| of which for reduction | kt | 5 978 | 6 417 | 6 350 | 5 941 | 6 190 | 6 173 | 6 071 | 6 011 | 5 626 | 5 856 | 5 850 |
| **FISH MEAL** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt | 6 103.4 | 6 468.5 | 6 530.4 | 6 198.7 | 6 605.3 | 6 678.8 | 6 727.3 | 6 771.9 | 6 527.8 | 6 929.7 | 7 021.0 |
| from whole fish | kt | 3 572.3 | 3 826.1 | 3 787.2 | 3 426.9 | 3 718.6 | 3 697.2 | 3 671.1 | 3 652.8 | 3 335.0 | 3 613.7 | 3 613.8 |
| Consumption | kt | 6 212.3 | 6 656.4 | 6 666.0 | 6 600.1 | 6 582.4 | 6 783.6 | 6 821.7 | 6 855.4 | 6 901.9 | 6 888.1 | 7 062.8 |
| Variation in stocks | kt | -42.5 | 1.1 | 43.6 | -232.2 | 182.0 | 44.3 | 44.7 | 45.5 | -255.0 | 140.7 | 27.3 |
| Price[4] | USD/t | 1 594.2 | 1 824.8 | 1 648.4 | 1 691.6 | 1 534.7 | 1 496.5 | 1 514.8 | 1 620.7 | 1 727.6 | 1 655.2 | 1 700.0 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt | 1 335.4 | 1 400.0 | 1 412.2 | 1 402.0 | 1 397.8 | 1 391.7 | 1 394.6 | 1 394.1 | 1 398.5 | 1 397.4 | 1 400.5 |
| from whole fish | kt | 828.8 | 941.5 | 937.4 | 923.6 | 905.2 | 890.9 | 883.1 | 872.9 | 868.1 | 853.2 | 844.4 |
| Consumption | kt | 1 923.5 | 1 971.5 | 1 934.4 | 1 828.9 | 1 818.2 | 1 833.5 | 1 814.2 | 1 792.3 | 1 755.9 | 1 743.2 | 1 743.5 |
| Variation in stocks | kt | -9.5 | 6.1 | 7.6 | -43.2 | 39.0 | 1.3 | 1.7 | 0.5 | -42.0 | 37.7 | 2.3 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt | 4 768.0 | 5 068.5 | 5 118.2 | 4 796.7 | 5 207.5 | 5 287.1 | 5 332.7 | 5 377.7 | 5 129.3 | 5 532.3 | 5 620.5 |
| from whole fish | kt | 2 743.6 | 2 884.7 | 2 849.8 | 2 503.3 | 2 813.5 | 2 806.3 | 2 788.0 | 2 780.0 | 2 466.9 | 2 760.6 | 2 769.4 |
| Consumption | kt | 4 288.8 | 4 685.0 | 4 731.5 | 4 771.1 | 4 764.2 | 4 950.1 | 5 007.5 | 5 063.2 | 5 146.0 | 5 144.8 | 5 319.3 |
| Variation in stocks | kt | -33.0 | -5.0 | 36.0 | -189.0 | 143.0 | 43.0 | 43.0 | 45.0 | -213.0 | 103.0 | 25.0 |
| **OECD** | | | | | | | | | | | | |
| Production | kt | 1 798.4 | 1 871.0 | 1 873.9 | 1 784.8 | 1 850.6 | 1 854.1 | 1 843.8 | 1 837.9 | 1 760.1 | 1 820.4 | 1 828.8 |
| from whole fish | kt | 1 327.7 | 1 418.9 | 1 407.7 | 1 315.9 | 1 369.1 | 1 365.8 | 1 346.2 | 1 332.0 | 1 246.1 | 1 293.6 | 1 291.3 |
| Consumption | kt | 2 084.9 | 2 184.5 | 2 148.6 | 2 028.1 | 2 008.6 | 2 038.3 | 2 023.9 | 1 988.7 | 1 942.8 | 1 942.6 | 1 946.1 |
| Variation in stocks | kt | 50.5 | -24.9 | -45.4 | -78.2 | 45.0 | -2.7 | -2.3 | -0.5 | -58.0 | 43.7 | 15.3 |

## Table A.25. World fish and seafood projections *(cont.)*

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FISH OIL** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt | 979.5 | 1 086.8 | 1 088.4 | 988.6 | 1 084.5 | 1 085.1 | 1 081.3 | 1 080.1 | 987.4 | 1 077.5 | 1 079.2 |
| from whole fish | kt | 682.5 | 750.6 | 741.5 | 656.6 | 727.1 | 722.7 | 716.0 | 711.9 | 634.7 | 703.0 | 701.9 |
| Consumption | kt | 1 008.8 | 1 023.0 | 1 042.2 | 1 008.0 | 1 035.3 | 1 060.0 | 1 079.1 | 1 075.3 | 1 047.3 | 1 050.3 | 1 052.1 |
| Variation in stocks | kt | -45.6 | 18.8 | 6.2 | -49.4 | 29.2 | 15.2 | 2.2 | 4.7 | -59.9 | 27.2 | 27.1 |
| Price[5] | USD/t | 1 514.7 | 2 004.9 | 1 772.8 | 1 844.5 | 1 725.2 | 1 730.0 | 1 767.4 | 1 782.3 | 1 978.3 | 1 840.4 | 1 864.1 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt | 368.5 | 398.8 | 400.8 | 397.4 | 395.3 | 392.2 | 390.2 | 388.2 | 387.3 | 384.7 | 383.2 |
| from whole fish | kt | 159.3 | 174.6 | 172.2 | 169.0 | 164.9 | 161.7 | 159.2 | 156.8 | 155.4 | 151.9 | 149.8 |
| Consumption | kt | 631.0 | 639.8 | 621.4 | 590.6 | 590.5 | 591.9 | 590.8 | 582.6 | 568.5 | 559.8 | 552.7 |
| Variation in stocks | kt | -12.3 | 3.3 | 0.7 | -4.9 | 9.7 | -0.3 | -0.3 | -0.3 | -9.9 | 7.2 | 12.1 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt | 611.0 | 688.0 | 687.6 | 591.2 | 689.2 | 693.0 | 691.2 | 691.9 | 600.1 | 692.7 | 696.0 |
| from whole fish | kt | 523.2 | 576.1 | 569.4 | 487.6 | 562.2 | 561.0 | 556.8 | 555.1 | 479.3 | 551.1 | 552.1 |
| Consumption | kt | 377.8 | 383.2 | 420.8 | 417.4 | 444.8 | 468.1 | 488.4 | 492.8 | 478.7 | 490.5 | 499.4 |
| Variation in stocks | kt | -33.3 | 15.5 | 5.5 | -44.5 | 19.5 | 15.5 | 2.5 | 5.0 | -50.0 | 20.0 | 15.0 |
| **OECD** | | | | | | | | | | | | |
| Production | kt | 539.4 | 612.7 | 619.4 | 579.3 | 619.8 | 622.5 | 618.5 | 616.7 | 577.0 | 612.4 | 613.5 |
| from whole fish | kt | 292.8 | 334.4 | 331.7 | 307.8 | 324.4 | 323.5 | 318.0 | 314.8 | 292.1 | 307.2 | 307.0 |
| Consumption | kt | 816.2 | 816.9 | 809.6 | 771.6 | 765.5 | 768.0 | 770.0 | 763.0 | 747.5 | 731.9 | 726.4 |
| Variation in stocks | kt | -1.6 | 10.3 | -1.3 | -26.9 | 21.7 | 7.7 | -0.3 | -0.3 | -29.9 | 17.2 | 17.1 |

*Note:* The term "fish" indicates fish, crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, crocodiles, caimans, alligators and aquatic plants.

Average 2010-12est: Data for 2012 are estimated.

1. World unit value of aquaculture fisheries production (live weight basis).
2. FAO estimated value of world ex vessel value of capture fisheries production excluding for reduction.
3. World unit value of trade (sum of exports and imports).
4. Fish meal, 64-65% protein, Hamburg, Germany.
5. Fish oil, any origin, N.W. Europe.

*Source:* OECD and FAO Secretariats.

## Table A.27.1. World dairy projections: Butter and cheese

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BUTTER** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt pw | 9 899 | 11 025 | 11 276 | 11 569 | 11 845 | 12 046 | 12 287 | 12 536 | 12 797 | 13 059 | 13 348 |
| Consumption | kt pw | 9 908 | 11 009 | 11 281 | 11 580 | 11 871 | 12 073 | 12 303 | 12 552 | 12 802 | 13 064 | 13 352 |
| Stock changes | kt pw | -24 | 20 | 0 | -6 | -21 | -22 | -12 | -12 | -2 | -2 | -1 |
| Price[1] | USD/t | 3 943 | 3 500 | 3 577 | 3 548 | 3 544 | 3 632 | 3 659 | 3 709 | 3 722 | 3 718 | 3 688 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt pw | 4 395 | 4 576 | 4 583 | 4 659 | 4 761 | 4 788 | 4 839 | 4 885 | 4 945 | 4 988 | 5 055 |
| Consumption | kt pw | 3 942 | 4 084 | 4 098 | 4 157 | 4 255 | 4 275 | 4 298 | 4 332 | 4 365 | 4 392 | 4 439 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt pw | 5 504 | 6 449 | 6 693 | 6 910 | 7 085 | 7 257 | 7 448 | 7 651 | 7 852 | 8 071 | 8 293 |
| Consumption | kt pw | 5 966 | 6 924 | 7 183 | 7 423 | 7 615 | 7 798 | 8 006 | 8 220 | 8 437 | 8 673 | 8 913 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | kt pw | 4 013 | 4 132 | 4 140 | 4 207 | 4 296 | 4 308 | 4 348 | 4 382 | 4 431 | 4 474 | 4 523 |
| Consumption | kt pw | 3 485 | 3 566 | 3 569 | 3 619 | 3 708 | 3 720 | 3 743 | 3 761 | 3 784 | 3 811 | 3 839 |
| Stock changes | kt pw | -18 | 20 | 0 | -6 | -21 | -22 | -12 | -12 | -2 | -2 | -1 |
| **CHEESE** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt pw | 20 357 | 21 011 | 21 283 | 21 548 | 21 801 | 22 050 | 22 327 | 22 588 | 22 860 | 23 094 | 23 357 |
| Consumption | kt pw | 20 425 | 21 034 | 21 298 | 21 571 | 21 829 | 22 080 | 22 357 | 22 618 | 22 890 | 23 123 | 23 387 |
| Stock changes | kt pw | 53 | 8 | 18 | 9 | 5 | 2 | 2 | 2 | 3 | 3 | 3 |
| Price[3] | USD/t | 4 047 | 3 866 | 3 946 | 4 005 | 4 061 | 4 168 | 4 286 | 4 335 | 4 394 | 4 438 | 4 445 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt pw | 16 389 | 16 872 | 17 050 | 17 266 | 17 463 | 17 642 | 17 822 | 17 997 | 18 188 | 18 354 | 18 555 |
| Consumption | kt pw | 15 887 | 16 235 | 16 393 | 16 571 | 16 711 | 16 856 | 17 015 | 17 184 | 17 358 | 17 495 | 17 653 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt pw | 3 968 | 4 139 | 4 233 | 4 282 | 4 339 | 4 408 | 4 505 | 4 590 | 4 672 | 4 740 | 4 802 |
| Consumption | kt pw | 4 538 | 4 799 | 4 905 | 5 000 | 5 118 | 5 224 | 5 342 | 5 434 | 5 532 | 5 628 | 5 734 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | kt pw | 15 729 | 16 185 | 16 331 | 16 544 | 16 712 | 16 852 | 17 033 | 17 203 | 17 390 | 17 550 | 17 739 |
| Consumption | kt pw | 15 091 | 15 437 | 15 583 | 15 740 | 15 866 | 15 996 | 16 153 | 16 301 | 16 458 | 16 592 | 16 735 |
| Stock changes | kt pw | 3 | 13 | 18 | 9 | 5 | 2 | 2 | 2 | 3 | 3 | 3 |

*Note:* Calendar year: Year ending 30 June for Australia and 31 May for New Zealand in OECD aggregate.
Average 2010-12est: Data for 2012 are estimated.

1. F.o.b. export price, butter, 82% butterfat, Oceania.
2. Excludes Iceland but includes all EU27 member countries.
3. F.o.b. export price, cheddar cheese, 39% moisture, Oceania.

*Source:* OECD and FAO Secretariats

## Table A.27.2. World dairy projections: Powders and casein

*Calendar year*

| | | Average 2010-12est | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SKIM MILK POWDER** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt pw | 3 617 | 3 948 | 4 011 | 4 073 | 4 159 | 4 233 | 4 300 | 4 381 | 4 487 | 4 556 | 4 668 |
| Consumption | kt pw | 3 648 | 3 923 | 4 000 | 4 058 | 4 147 | 4 215 | 4 282 | 4 366 | 4 473 | 4 543 | 4 655 |
| Stock changes | kt pw | -41 | 13 | -6 | -2 | -4 | 2 | 3 | 0 | -1 | -1 | -3 |
| Price[1] | USD/t | 3 317 | 3 472 | 3 498 | 3 502 | 3 503 | 3 600 | 3 673 | 3 704 | 3 728 | 3 755 | 3 733 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt pw | 3 076 | 3 371 | 3 413 | 3 459 | 3 541 | 3 608 | 3 665 | 3 724 | 3 792 | 3 855 | 3 966 |
| Consumption | kt pw | 1 726 | 1 823 | 1 828 | 1 838 | 1 873 | 1 897 | 1 913 | 1 941 | 1 973 | 1 993 | 2 048 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt pw | 542 | 577 | 598 | 613 | 619 | 625 | 635 | 656 | 696 | 702 | 702 |
| Consumption | kt pw | 1 922 | 2 100 | 2 172 | 2 220 | 2 274 | 2 318 | 2 369 | 2 425 | 2 499 | 2 550 | 2 607 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | kt pw | 2 967 | 3 214 | 3 252 | 3 297 | 3 372 | 3 431 | 3 486 | 3 543 | 3 610 | 3 672 | 3 780 |
| Consumption | kt pw | 1 846 | 1 924 | 1 932 | 1 943 | 1 980 | 2 007 | 2 025 | 2 055 | 2 088 | 2 112 | 2 165 |
| Stock changes | kt pw | -74 | 12 | 0 | -3 | -4 | 1 | 2 | 0 | -1 | -1 | -3 |
| **WHOLE MILK POWDER** | | | | | | | | | | | | |
| **World** | | | | | | | | | | | | |
| Production | kt pw | 4 576 | 4 973 | 4 998 | 5 062 | 5 146 | 5 218 | 5 302 | 5 386 | 5 470 | 5 547 | 5 639 |
| Consumption | kt pw | 4 709 | 4 972 | 4 998 | 5 062 | 5 146 | 5 218 | 5 302 | 5 386 | 5 470 | 5 547 | 5 639 |
| Stock changes | kt pw | 69 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Price[3] | USD/t | 3 600 | 3 670 | 3 727 | 3 717 | 3 737 | 3 863 | 3 930 | 3 992 | 4 020 | 4 056 | 4 054 |
| **Developed countries** | | | | | | | | | | | | |
| Production | kt pw | 2 084 | 2 280 | 2 300 | 2 317 | 2 349 | 2 344 | 2 367 | 2 387 | 2 429 | 2 472 | 2 529 |
| Consumption | kt pw | 557 | 600 | 605 | 606 | 611 | 614 | 619 | 625 | 631 | 634 | 640 |
| **Developing countries** | | | | | | | | | | | | |
| Production | kt pw | 2 492 | 2 693 | 2 698 | 2 745 | 2 796 | 2 874 | 2 935 | 2 998 | 3 041 | 3 075 | 3 109 |
| Consumption | kt pw | 4 152 | 4 373 | 4 393 | 4 456 | 4 535 | 4 604 | 4 683 | 4 761 | 4 840 | 4 913 | 4 998 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | kt pw | 2 359 | 2 534 | 2 558 | 2 582 | 2 617 | 2 617 | 2 647 | 2 675 | 2 724 | 2 772 | 2 838 |
| Consumption | kt pw | 864 | 862 | 874 | 881 | 893 | 906 | 917 | 929 | 940 | 949 | 960 |
| Stock changes | kt pw | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **WHEY POWDER** | | | | | | | | | | | | |
| Wholesale price, United States[4] | USD/t | 1 042 | 1 139 | 1 169 | 1 173 | 1 176 | 1 200 | 1 209 | 1 231 | 1 244 | 1 265 | 1 273 |
| **CASEIN** | | | | | | | | | | | | |
| Price[5] | USD/t | 8 464 | 8 707 | 8 820 | 8 823 | 8 935 | 9 127 | 9 331 | 9 436 | 9 508 | 9 570 | 9 674 |

*Note:* Calendar year: Year ending 30 June for Australia and 31 May for New Zealand in OECD aggregate.
Average 2010-12est: Data for 2012 are estimated.

1. F.o.b. export price, non-fat dry milk, 1.25% butterfat,Oceania.
2. Excludes Iceland but includes all EU27 member countries.
3. F.o.b. export price, WMP 26% butterfat, Oceania.
4. Dry whey, West Region, United States.
5. Export price, New Zealand.

*Source:* OECD and FAO Secretariats.

## Table A.35. World cotton projections

*Crop year*

| | | Average 2010/11-2012/13est | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | 2021/22 | 2022/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WORLD** | | | | | | | | | | | | |
| Production | mt | 26.2 | 23.5 | 24.4 | 24.6 | 24.8 | 25.0 | 25.7 | 26.3 | 26.6 | 26.9 | 27.2 |
| Area | mha | 33.1 | 31.6 | 32.6 | 32.8 | 32.9 | 33.2 | 34.0 | 34.6 | 34.8 | 35.1 | 35.4 |
| Yield | t/ha | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| Consumption | mt | 23.5 | 23.9 | 24.4 | 24.8 | 25.2 | 25.6 | 26.1 | 26.6 | 27.1 | 27.4 | 27.7 |
| Closing stocks | mt | 13.4 | 16.6 | 16.9 | 17.1 | 17.0 | 16.6 | 16.5 | 16.5 | 16.3 | 16.2 | 16.0 |
| Price[1] | USD/t | 2 344.2 | 1 788.4 | 1 795.5 | 1 914.8 | 1 954.0 | 1 947.9 | 1 923.7 | 1 892.3 | 1 890.7 | 1 885.3 | 1 935.2 |
| **DEVELOPED COUNTRIES** | | | | | | | | | | | | |
| Production | mt | 6.5 | 5.6 | 6.1 | 6.1 | 6.0 | 5.9 | 6.1 | 6.2 | 6.2 | 6.3 | 6.3 |
| Consumption | mt | 1.7 | 1.7 | 1.8 | 1.8 | 1.8 | 1.8 | 1.9 | 1.9 | 1.9 | 1.9 | 2.0 |
| Closing stocks | mt | 2.2 | 2.5 | 2.6 | 2.6 | 2.7 | 2.5 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 |
| **DEVELOPING COUNTRIES** | | | | | | | | | | | | |
| Production | mt | 19.6 | 17.8 | 18.4 | 18.5 | 18.7 | 19.1 | 19.6 | 20.1 | 20.3 | 20.6 | 20.9 |
| Consumption | mt | 21.9 | 22.2 | 22.7 | 23.0 | 23.4 | 23.8 | 24.3 | 24.7 | 25.2 | 25.5 | 25.8 |
| Closing stocks | mt | 11.2 | 14.2 | 14.4 | 14.4 | 14.3 | 14.1 | 14.0 | 13.9 | 13.7 | 13.5 | 13.4 |
| **OECD[2]** | | | | | | | | | | | | |
| Production | mt | 5.9 | 4.9 | 5.3 | 5.3 | 5.2 | 5.1 | 5.3 | 5.4 | 5.4 | 5.4 | 5.4 |
| Consumption | mt | 3.0 | 3.1 | 3.2 | 3.2 | 3.2 | 3.3 | 3.3 | 3.4 | 3.4 | 3.4 | 3.5 |
| Closing stocks | mt | 2.0 | 2.2 | 2.3 | 2.4 | 2.4 | 2.3 | 2.3 | 2.4 | 2.4 | 2.4 | 2.3 |

*Note:* Crop year: Beginning crop marketing year - see Glossary of Terms for definitions.
Average 2010/11-2012/13est: Data for 2012/13 are estimated.

1. Cotlook A index, Middling 1 3/32, c.f.r. far Eastern ports (August/July)
2. Excludes Iceland but includes all EU27 member countries.

*Source:* OECD and FAO Secretariats.

# OECD-FAO Agricultural Outlook 2013-2022

The nineteenth edition of the *Agricultural Outlook*, and the ninth prepared jointly with the Food and Agriculture Organization of the United Nations (FAO), provides projections to 2022 for major agricultural commodities, biofuels and fish. Notable in the 2013 report is the inclusion of cotton for the first time and a special feature on China.

Higher costs and strong demand are expected to keep commodity prices well above historical averages with a high risk of price volatility given tight stocks, a changeable policy environment and increasing weather-related production risks. China is projected to maintain its self-sufficiency in certain key food commodities while increasing its trade and integration in world agricultural markets.