



OECD-FAO Agricultural Outlook 2009-2018



2009

OECD-FAO Agricultural Outlook 2009-2018



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Foreword

The annual Agricultural Outlook report is prepared jointly by the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organisation (FAO) of the United Nations. The projections and assessments provided in this report are the result of close co-operation with national experts in OECD and some non-member countries, reflecting the combined knowledge and expertise of this wide group of collaborators. A jointly developed modelling system, based on the OECD's Aglink and FAO's Cosimo models, facilitates consistency in the projections. The fully documented outlook database, including historical data and projections, is available through the OECD-FAO joint internet site www.agri-outlook.org.

This report covers biofuels, cereals, oilseeds, sugar, meats, and dairy products over the 2009-18 period. The market assessments are based on a set of underlying assumptions regarding macroeconomic factors, agricultural and trade policies and production technologies. They also assume normal average weather conditions and longer term productivity trends. The Agricultural Outlook presents a consistent view on the evolution of global agricultural markets over the next decade and provides a baseline for further analysis of alternative economic or policy assumptions.

In 2009, agricultural markets are characterised by a reduction in commodity prices following their rapid rise over the 2006-08 period. This report examines the general and commodity-specific factors behind the price declines. There is also a discussion on the evolution of retail food prices which have come down but not as quickly as international commodity prices, and with considerable regional variation. Looking forward, real commodity prices over the 2009-18 period are projected to remain at, or above, the 1997-2006 average. An expected economic recovery, renewed food demand growth from developing countries and the emerging biofuel markets are the key drivers underpinning agricultural commodity prices and markets over the medium term.

This year's Outlook is set against a backdrop of unprecedented financial turmoil and rapidly deteriorating global economic prospects. With macroeconomic conditions changing so quickly, the standard baseline projections are complemented with a scenario analysis of revised short-term GDP prospects and alternative GDP recovery paths. A sensitivity analysis of commodity markets to crude oil prices and a survey of the impact of the economic crisis on various actors in the agri-food chain also contribute to the report's timely assessment of the resiliency of the sector to the global economic crisis.

The issue of food security is high on the political agenda as evidenced by the number of recent high-level summits, including the first ever G8 Agriculture Ministerial in April 2009. Much of the discussion is about the capacity of the agricultural sector to meet the rising demand for food. Is there more land that can be brought into production? Can existing agriculture be more productive while becoming more environmentally sustainable? Will there be enough water? What will be the effects of climate change? This report provides a brief overview of several critical factors: land availability, productivity gains, water usage and climate change.

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At the OECD, the Outlook report was authored by the Agro-Food Trade and Markets Division of the Trade and Agriculture Directorate: Wayne Jones (Division Head), Pavel Vavra (Outlook Co-ordinator), Alexis Fournier, Linda Fulponi, Céline Giner, Franziska Junker, Pete Liapis, Garry Smith and Martin Von Lampe. Additional Directorate contributions were provided by Hsin Huang/Jussi Lankoski (carbon markets), Kevin Parris (water and climate change) and Sungbum Kim/Nicole Franz (fisheries). Research and statistical assistance were provided by Andrea Ascani, Armelle Elasri, Alexis Fournier, Claude Nenert and Nicolas Ruiz. Meetings organisation and document preparation were provided by Christine Cameron with assistance from Marina Giacalone. 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.

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Acronyms and Abbreviations

ACP	African, Caribbean and Pacific countries
ACRE	Average Crop Revenue Election
AMAD	Agricultural Market Access Database
AUSFTA	Australia and United States Free Trade Agreement
AI	Avian Influenza
BNGY	Billion gallons per year
BNLY	Billion litres per year
BSE	Bovine Spongiform Encephalopathy
Bt	Billion tonnes
BTL	Biomass to liquid
CAFTA	Central American Free Trade Agreement
CAP	Common Agricultural Policy (EU)
CCC	Commodity Credit Corporation
CET	Common External Tariff
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
COOL	Country of Origin Labelling
CRP	Conservation Reserve Program of the United States
CMO	Common Market Organisation for sugar (EU)
CO₂	Carbon dioxide
Cts/lb	Cents per pound
Cwe	Carcass weight equivalent
DBES	Date-based Export Scheme
DDA	Doha Development Agenda
DDG	Dried Distiller's Grains
Dw	Dressed weight
EBA	Everything-But-Arms Initiative (EU)
ECOWAP	West Africa Regional Agricultural Policy
ECOWAS	Economic Community of West African States
EISA Act	Energy Independence and Security Act of 2007 (US)
EPAs	Economic Partnership Agreements (between EU and ACP countries)
ERS	Economic Research Service of the US Department for Agriculture
Est	Estimate
E85	Blends of biofuel in transport fuel that represent 85 percent of the fuel volume
EU	European Union
EU-15	Fifteen member states of the European Union
EU-10	Ten new member states of the European Union from May 2004

EU-27	Twenty-seven member states of the European Union (including Bulgaria and Romania from 2007)
FAO	Food and Agriculture Organisation of the United Nations
FMD	Foot and Mouth Disease
FOB	Free on board (export price)
FR	Federal Reserve (US central bank)
FSRI ACT	Farm Security and Rural Investment Act (US) of 2002
FCE Act	Food, Conservation and Energy Act of 2008 US Farm Bill
FTA	Free Trade Agreement
GDP	Gross Domestic Product
G-10	Group of 10 countries (see Glossary)
G-20	Group of 20 developing countries (see Glossary)
GDPD	Gross Domestic Product Deflator
GHG	Green House Gases
GLB	Gross land balances
GMO	Genetically modified organism
HFCS	High Fructose Corn Syrup
HS	Harmonised Commodity Description and Coding System
IEA	International Energy Agency
iLUC	Indirect land-use change
IPCC	Intergovernmental Panel on Climate Change
kt	Thousand tonnes
LAC	Latin America and the Caribbean
La Niña	Climatic condition associated with temperature of major sea currents
LDC's	Least Developed Countries
LICONSA	Leche Industrializada
lw	Live weight
MCI	Multiple cropping index
MERCOSUR	Common Market of the South
MFN	Most Favoured Nation
Mha	Million hectares
MPS	Market Price Support
Mt	Million tonnes
MTBE	Methyl Tertiary Butyl Ether
NAFTA	North American Free Trade Agreement
NLB	Net land balances
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
PCE	Private Consumption Expenditure
PIK	Payment in kind programme (US)
PROCAMPO	Mexican Farmers Direct Support Programme
PPP	Purchasing Power Parity
PRRS	Porcine Reproductive and Respiratory Syndrome
PSE	Producer Support Estimate
Pw	Product weight
R&D	Research and Development
RED	Renewable Energy Directive in the EU

Rse	Raw sugar equivalent
Rtc	Ready to cook
RFS	Renewable Fuels Standard in the US, which is part of the Energy Policy Act of 2005
Rwt	Retail weight
SFP	Single Farm Payment scheme (EU)
SMP	Skim milk powder
SPS	Sanitary and Phytosanitary measures
STRV	Short Tons Raw Value
T	Tonnes
t/ha	Tonnes/hectare
FTP	Total factor productivity
TRQ	Tariff rate quota
UK	United Kingdom
UN	The United Nations
URAA	Uruguay Round Agreement on Agriculture
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
USDA	United States Department of Agriculture
VAT	Value added tax
v-CJD	New Creutzfeld-Jakob-Disease
WAEMU	West African Economic and Monetary Union
WMP	Whole milk powder
WTO	World Trade Organisation

Symbols

AUD	Dollars (Australia)	kg	Kilogrammes
ARS	Pesos (Argentina)	KRW	Korean won
Bn	Billion	lb	Pound
BRL	Real (Brazil)	Mn	Million
CAD	Dollars (Canada)	MXN	Mexican pesos
CNY	Yuan (China)	NZD	Dollars (New Zealand)
EUR	Euro (Europe)	p.a	Per annum
gal	Gallons	RUR	Ruble (Russia)
Ha	Hectare	THB	Thai baht
hl	Hectolitre	USD	Dollars (United States)
INR	Indian rupees	ZAR	South African rand

THE OUTLOOK IN BRIEF

- The macroeconomic environment underlying this medium term Outlook, based on the OECD's and World Bank's medium term economic projections from December 2008, continues to evolve rapidly due to the ongoing financial and economic crisis. Because of the turmoil in the economic environment, the baseline projections must be interpreted with caution. The possible impacts of this deteriorating economic crisis on the baseline projections have been analysed both qualitatively and quantitatively within the present report, although an assessment of the full impact of the current global credit crunch and economic contraction on agricultural markets goes beyond the scope of this Outlook.
- A stronger than expected agricultural commodity supply response last year, particularly in developed countries, and much lower oil prices have resulted in significantly lower commodity prices from 2007-08 highs. Continued weakness in the general economy will further dampen commodity prices over the next 2-3 years, which should then strengthen with economic recovery.
- The situation varies by commodity, but average prices in real terms (adjusted for inflation) for the next 10 years are still projected at, or above, the levels of the decade prior to the 2007-08 peaks. Average crop prices are projected to be 10-20% higher in real terms relative to 1997-2006, while for vegetable oils real prices are expected to be more than 30% higher.
- Meat prices in real terms are not expected to surpass the 1997-2006 average, while reduced consumer incomes in the beginning of the projection period will tend to encourage substitution to cheaper meats, favouring poultry over beef. Average dairy prices, in real terms, are likely to be slightly higher in 2009-18 relative to 1997-2006, driven up by rising energy and vegetable oil prices, with a 12% increase in average butter prices being the most notable.
- Despite the significant impact of the global financial crisis and economic downturn on all sectors of the economy, agriculture is expected to be relatively better off, as a result of the recent period of relatively high incomes and a relatively income-inelastic demand for food.
- Global economic prospects are now more pessimistic than earlier in the year when this Outlook was prepared. In response, the Outlook includes a special focus on the resiliency of agriculture to economic recession. The analysis suggests that the reduction in agricultural prices, production and consumption, associated with lower incomes is likely to be moderate, as long as economic recovery begins within 2-3 years.
- This special focus provides an assessment of an even deeper and more prolonged recession with lower GDP and incomes than in the Outlook baseline. Demand for higher cost livestock products, such as beef, pork and dairy, would be the most seriously affected. Beef prices would be about 9% below those projected in the baseline. The reductions in crop and biofuel prices associated with the lower GDP scenarios were only about one-half those for livestock products. Among cereals, maize prices were the most responsive to lower GDP, reflecting its use primarily as a feed ingredient, rather than a biofuel feedstock.
- The special focus also includes a survey of the impact of the financial market turmoil and economic crisis on agri-businesses, from input suppliers to retail. The sector seems to be weathering the recession fairly well to date. However, downstream sectors are experiencing difficulties in obtaining access to credit. Trade finance constraints are having significant impacts on firms and should these tight credit markets persist, firm viability could be in peril. Access to credit was viewed as the key issue, particularly by smaller agri-food firms in both OECD and non-OECD countries surveyed.
- The special focus also examines the sensitivity of agricultural prices to crude oil prices. Energy and agricultural prices have become much more interdependent with industrialised farming, more processing and increased transport, as well as the emergence of the biofuels industry (particularly for maize, oilseeds and sugar feedstocks). Crude oil prices are highly volatile and some projections are well above those used in this Outlook.

- The crude oil price over the medium term assumed for the baseline is about 60% higher than the 1997-2006 average, in real terms, moderately increasing to USD 70 per barrel by the end of the projection period. If crude oil prices increased to the USD 90 to 100+ per barrel level used in last year's *Outlook*, agricultural prices would be significantly higher; with the largest impact on crops, driven mainly by reduced crop production with higher input costs, but also increased feedstock demand for biofuels.
- Biofuel markets increasingly depend on government mandated use, but prospects remain uncertain, due to such unpredictable factors as the future trend in crude oil prices, changes in policy interventions and developments in second-generation technology. Biofuels will struggle to compete with relatively low fossil fuel prices as long as crude oil prices remain in the USD 60-70 range assumed for most of this *Outlook*, although biofuel support policies underpin ethanol and biodiesel prices and production. A projected rapid expansion of biofuel production to meet mandated use will continue to have inflating price impacts for such feedstocks as wheat, maize, oilseeds and sugar.
- Once economic recovery begins most of the growth in agricultural production and consumption will continue to come from developing countries. This is particularly evident for livestock products where the primary drivers are income and population growth, with a trend towards higher animal protein diets and continuing urbanisation.
- For almost all commodities, projected growth in imports and exports of developing countries exceeds that of the OECD area. Continued expanding South-South trade is a key feature of the *Outlook*. Nevertheless, OECD countries will continue to dominate exports of wheat, coarse grains and all dairy products.
- A key focus of last year's *Outlook* was the large hike in food prices associated with rising commodity prices. While commodity prices have since declined, food prices have remained high in many countries. Still, food inflation has come down. Over the 3 and 6 month periods ending February 2009, the decline in food price indices in many countries has been accelerating.
- According to recent FAO work using longer term population and income projections, global food production needs to increase more than 40% by 2030 and 70% by 2050, compared to average 2005-07 levels. There is substantial additional land available for use in agriculture. Some 6 billion ha could be added to the current 1.4 billion ha of cropland. Over half of the additionally available land is found in Africa and in Latin America. These regions account for most of the available land that has the highest suitability class for rain-fed crop production. But historical expansion of arable land has been slow, and bringing more marginal land into production can involve considerable investment and lower average yields, while possibly incurring social and environmental costs.
- Crop and livestock productivity continues to rise at longer term trend rates, at least in the most productive areas, and there is considerable potential for further increases over the next 10-20 years. To capitalise on this potential requires development and adaptation of new technologies, but growth in public agricultural research expenditures is slowing. In many regions, like Central and Eastern Europe and Sub-Saharan Africa, productivity can be significantly increased using existing technologies with better access to inputs, infrastructure development and extension services.
- Agriculture accounts for over 40% of water use in OECD countries and use has been growing. Irrigation accounts for 99% of this use and major developing countries like China and India have large areas under irrigation. The FAO projects a substantial slowdown in expansion of the area under irrigation, and future agricultural production will be increasingly conditioned by water availability.
- Climate change is an important variable in future production possibilities. It will clearly add to the risks of water stress as well as the incidence and severity of floods, and likely shift production frontiers.
- Behind this fairly positive *Outlook* for agricultural commodity markets lies a more disturbing story about hunger and food insecurity for some 1 billion people. Food security is not only about solving the urgency in the short term; it is also about addressing the longer term issues of poverty alleviation and economic growth. Greater investment in agriculture, more effective development aid and reforms to trade and domestic policies are all part of the solution.

Chapter 1

Overview

Preparation of the 2009 OECD-FAO *Agricultural Outlook* report, in this year of unprecedented global economic turmoil, has been particularly difficult and requires additional caution on the part of readers when interpreting the results as the macroeconomic situation is constantly unfolding.

The Outlook baseline incorporates a serious global economic slowdown but reflects a less profound recession than that foreseen by major economic institutions in late March 2009. The macroeconomic assumptions in the baseline have GDP contracting in many regions of the world and, in the OECD area as a whole, with a resumption of economic growth projected for 2010; higher growth then continues throughout the remainder of the projection period. A special assessment of certain aspects of the impact of the unfolding economic crisis on agriculture is provided in Chapter 2.

World markets at a glance

Such was the force of the 2008 high food price shock which reverberated across countries, especially in the economically vulnerable ones, that some even raised questions about the future reliability of international markets to deliver sufficient quantities of food at affordable prices. Since then agricultural commodity prices have fallen substantially, but food prices in a number of developing countries have remained high well into 2009.

Without doubt, the influence of the macroeconomic factors in determining the contours of the world agricultural landscape has never been so profound. These forces transcend agricultural sectors, spilling over from one commodity to another and also transcend geographical boundaries, given the greater interdependence of the world economy. Continuing macroeconomic turbulence is likely to be a feature of the near term period.

In the immediate aftermath of last year's high-price crisis, there has again been evidence of the rapid responsiveness of global agriculture. High international commodity prices have transmitted signals to farmers to allocate more resources and increase agricultural production. When measured at the global level, the cereal sector for instance, reassuringly responded with a 7% expansion in output. However, not all farmers responded similarly as high world prices are not transmitted to local producers in many instances. A decomposition of the response of farmers by economic regions reveals that: output expansion in developed countries amounted to over 12%, but developing countries together could only muster less than 1% increase in their cereal production.

This lack of response from a large part of the world underscores the need for policy reform and additional investment in productive agriculture, particularly in many developing countries. Structural problems are likely to persist, especially for the Least Developed Countries (LDCs), limiting their capacity to produce. The projections for them are marked by growing net imports of basic food commodities. In these countries, population numbers continue to increase rapidly and domestic production growth is unable to keep pace with demand.

Despite low economic prospects and much lower energy prices than seen in earlier market projections, this Outlook paints a picture of sustained crop prices in nominal and even in real terms (allowing for inflation) that remain well above the levels observed prior to the 2007-08 price peaks, i.e. during the 1997-2006 period. Most livestock prices, in contrast, are expected to remain close to the average levels for that decade in real terms (Figures 1.1 and 1.2).

Producers of cheese, skim milk powder, butter, rice and wheat will face average prices substantially lower than the price received in 2007-08. Nonetheless, the Outlook foresees nominal prices remaining above the average levels of 1997-2006 over the next 10 years, with vegetable oils having the highest increase. On average, the nominal price of all commodities other than pigmeat, will be 20% or more above their 1997-2006 average level.

Figure 1.1. Nominal commodity prices projected 15-60% higher than 1997-2006 but substantially lower than in the 2007-08 peak

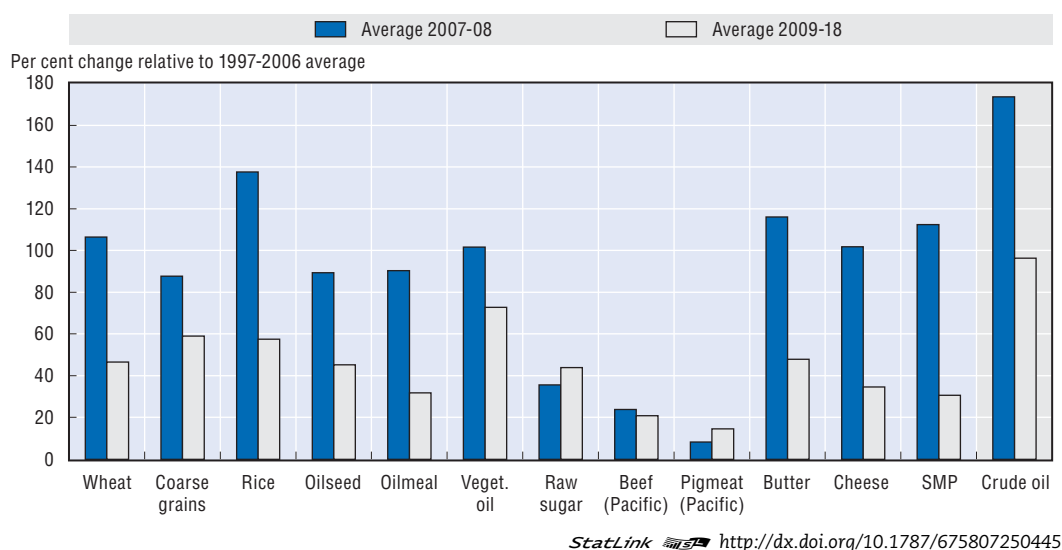
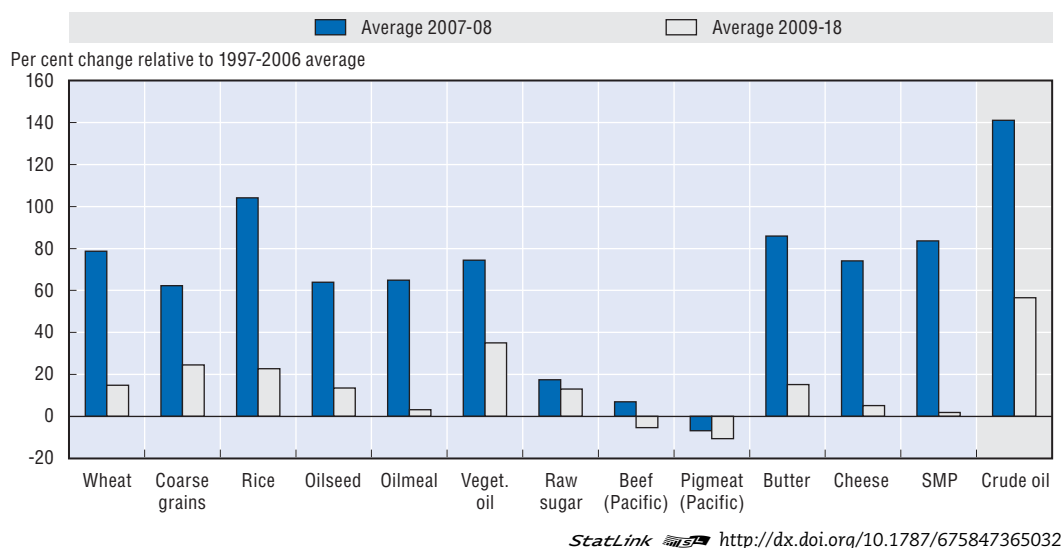


Figure 1.2. Real crop prices to fall from peaks but to remain above 1997-2006 average



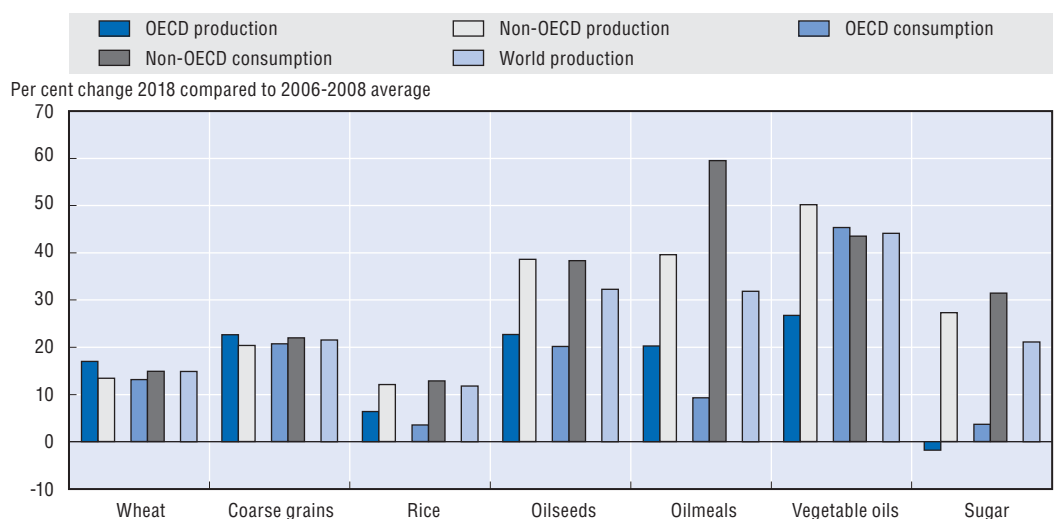
Similar developments are manifested in the crude oil price assumption with nominal prices substantially below recent peaks, but almost double the average price seen during the 1997-2006 decade. Moreover, the crude oil price scenario discussed in Chapter 2 illustrates that returning to high price levels of around USD 100 per barrel (as assumed in last year's edition of the *Agricultural Outlook*), would lift crop prices by an additional 20% to 30%, but with livestock product prices increasing less, by around 10%.

Prices when adjusted for inflation, that is, in real terms, are also expected, on average, to be much below their 2007-08 average peak levels (Figure 1.2). The agricultural commodities expected to undergo the largest fall in real prices, compared to their 2007-08 average, are: rice, wheat, butter, cheese and skim milk powder. But, over the outlook period, real prices of products other than beef and pigmeat, are expected to be above their average 1997-2006 levels. In real terms, the average crude oil price assumption for the next decade is substantially below its 2007-08 peak and remains well above, by around 60%, the 1997-2006 average level.

The increases in most commodity prices in the period 2007-08 and lingering concerns about the potential deleterious effects of climate change on agriculture have highlighted the issue of the potential precariousness of the state of future food availability especially in developing countries. For the medium term, however, the projections imply an increase worldwide of 10% or more for all products included in the outlook suggesting more ample future supplies. As indicated in Figure 1.3 for crops and Figure 1.4 for livestock products, relative to 2006-08 average, worldwide production of vegetable oils in 2018 is expected to be more than 40% greater, while that of oilseeds, oilmeals, poultry, butter and whole milk powder is expected to be more than 30% greater. Other than wheat and coarse grains, the Outlook foresees agricultural commodity production increasingly shifting away from developed countries towards developing regions, especially among emerging and middle income countries. This shift is especially pronounced for meat and dairy products.

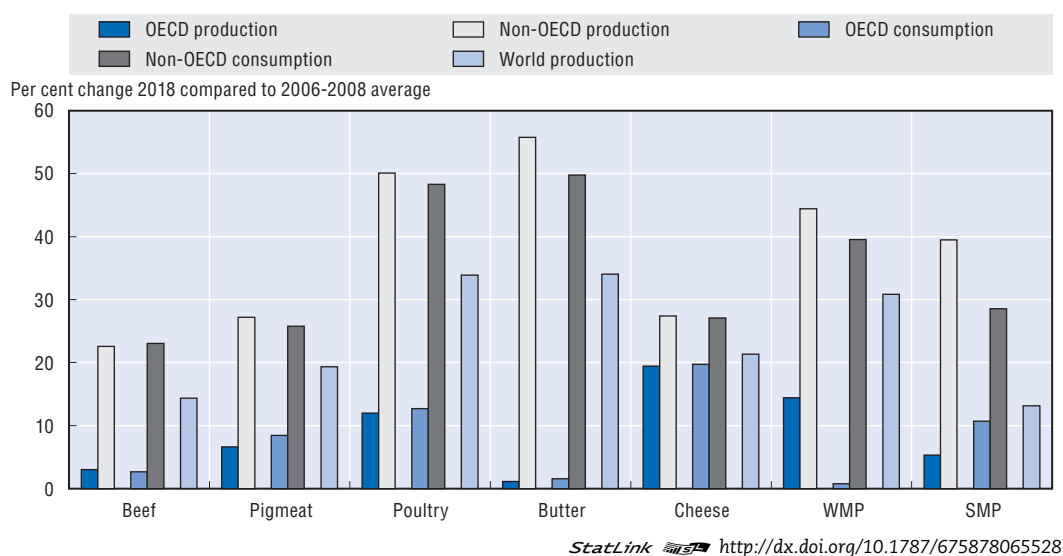
Growth in consumption of agricultural products is also expected to relocate to the developing world driven by stronger population and rising incomes. Relative to average consumption during 2006-08, oilmeals use in developing countries will be almost 60%

Figure 1.3. **Crops production and consumption growth from 2006-08 average to 2018, per cent**



StatLink <http://dx.doi.org/10.1787/675850772786>

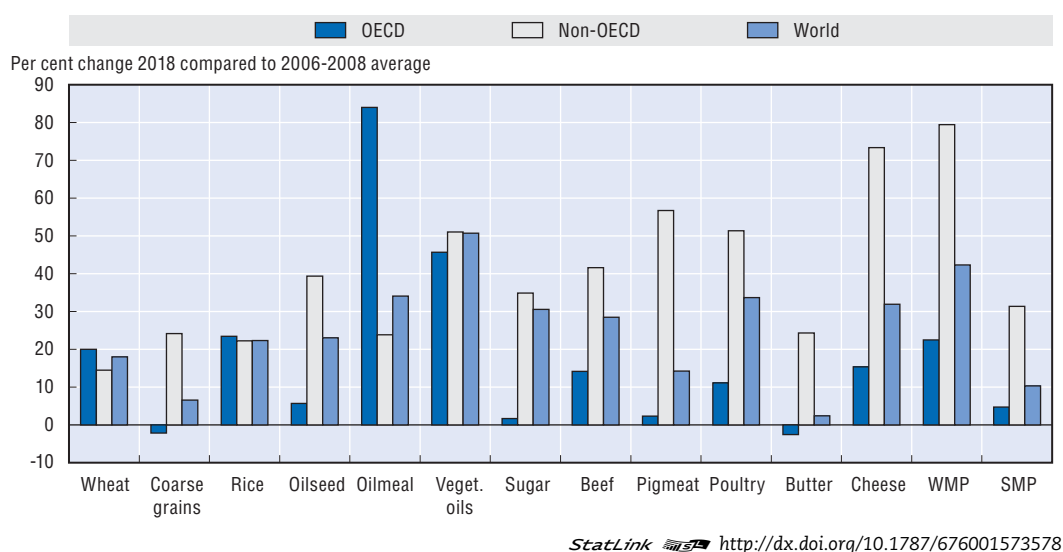
Figure 1.4. **Livestock production and consumption growth from 2006-08 average to 2018, per cent**



greater in 2018, while consumption of butter and poultry will be some 50% greater and that of vegetable oils will be about 40% larger.

Reflecting the changing global production and consumption landscape, international agricultural markets are progressively becoming characterised by the emergence of non-traditional exporters who are exploiting their emerging comparative advantage in agricultural production. Figure 1.5 reflects the percentage change in exports in 2018 relative to average exports during 2006-08. This shows that trade will continue to deliver products where they have ready markets as exports expand over the next decade. But, butter and coarse grains exports from OECD countries are expected to contract by 2018 compared to their averages during 2006-08. In contrast, a larger share of wheat, rice and

Figure 1.5. **Export growth from 2006-08 average to 2018, per cent**



especially oilmeal exports will be delivered by OECD countries. Interestingly, over the next ten years, non-OECD countries are expected to provide the fastest growth of value-added agricultural and food products such as beef, pork, poultry, butter, cheese, skim milk powder and whole milk powder, if not always the largest share of trade in all these products.

Main trends in commodity markets

Grain markets find a new equilibrium

Prompted by exceptionally high farm gate prices and supported by favourable growing conditions, farmers around the world delivered record wheat and coarse grain crops in 2008, even though the production response was disproportionate between developed and developing countries. Importantly, the growth in output enabled grain inventories to be replenished to levels that calmed and restored confidence in markets. Higher inventories should, other things being equal, provide a buffer for an anticipated contraction in global grain output in 2009 to more normal levels. With the prospect of lower prices over the course of the Outlook than anticipated last year, there will be less incentive to expand new, less productive arable area in many countries or in higher expenditures on yield enhancing inputs. Instead, relative price changes will prompt mainly the reallocation of existing land and resources among grain and oilseed crops with those crops offering the highest returns gaining the most ground. Therefore, much of the growth in world grain output is expected to stem from productivity gains, but yield growth is not expected to match the rate attained in the previous decade.

Declining growth in *per capita* demand for staple foods remains an important feature characterising wheat and rice markets. Although the direct food consumption of grains is generally resilient to falling household incomes, demand for grains from other sectors is much more exposed to macroeconomic turbulence. For instance, demand from the biofuel sector for energy feedstocks, particularly for maize in the United States and increasingly for wheat in Europe, is likely to be supported by mandates rather than through competition with petroleum products which, with the help of tax concessions and other forms of public support, was the case in the past few years. Feed grain demand by livestock sectors while continuing to be an important growth driver, particularly in developing countries, will also be moderated by the macroeconomic environment as the consumption for these commodities is much more sensitive to changes in income, though prospects appear brighter ahead.

Wheat transactions fuel expanded grain trade

Growth prospects in global grain trade remain firm but only after several years of hesitant performance. The economic downturn, twinned with liquidity constraints, looks likely to take its toll on international grain trade and other commodity exchange as well. However, assuming that confidence returns to markets early in the coming decade, world wheat trade is projected to expand at an average annual rate of almost 2% over the remainder of the projection period. The US, the EU and Australia are set to govern global wheat supplies, but by the end of the Outlook, the CIS country group is expected to be the dominant source of wheat exports. Developing countries will continue to fuel global wheat demand, such as those situated in South and East Asia, as well as Africa, such as Nigeria and Egypt, to feed fast growing populations. Saudi Arabia is also projected to confirm its status as a major importer in view of the recent change in policy to gradually phase out large production subsidies. Overall rising *per capita* incomes and expanding populations

fuelling the food markets of developing countries are behind increased imports and global demand that has outpaced domestic production capacity. But generally, growth in *per capita* food consumption of wheat is expected to remain modest or even to decline in some countries, notably in China. Diets in these countries are slowly shifting towards more value added food products in the face of rising incomes; a phenomenon that has already taken place in much of the OECD area.

In the case of coarse grains, prospects for trade expansion beyond the rate of the preceding decade are much more subdued. The growth in international demand for coarse grains will be predominantly driven by increased feed demand from livestock industries in developing economies, which are expected to resume their rapid pace of expansion after several years of lacklustre growth. Imports by these countries, as a group, are expected to grow to 97 million tonnes, representing nearly three-quarters of the world total, offsetting the anticipated decline in deliveries to developed countries.

Productivity increases support the rice sector but climate change could forestall progress

The high price event of 2008 demonstrates just how much political weight rice continues to carry around the world, as the reasons behind the doubling of international quotations over 2006-08 had more to do with government interventions and trade restrictions than with supply and demand fundamentals. The totality of all uncoordinated policy interventions which were made in the hope of shielding domestic markets from external events, only served to heighten international rice prices and volatility.

Soaring rice prices in 2007 and 2008, combined with an intensification of government support, stimulated a strong expansion in paddy cultivation in 2008, demonstrating that the sector can quickly react to improved economic incentives when they arise. The tendency for rice plantings to expand may well continue in the next few years, especially in those countries that have renewed their commitments to rice self-sufficiency goals. However, by the end of the Outlook, the area under rice is expected to have changed little from current levels reflecting offsetting country adjustments. Most of the world's largest producers may witness a contraction, with the retrenchment likely to occur in the less efficient subsistence farming sectors, while commercial rice cultivation may be expected to gain ground. Plantings are, however, anticipated to keep rising in Sub-Saharan Africa where large tracks of land suitable for rice cultivation are available. Among OECD countries, rice cultivation is projected to shrink, consistent with either prevailing policies or a down grading of support, or due to less favourable growing conditions. But the decline in production is expected to be less pronounced than in the past decade, when most of the sectoral adjustments were made.

As with the other cereal crops, productivity increases are foreseen to remain the principal engine of production growth and lay behind a projected 9% expansion in rice production by 2018. The impact of hybrids and genetically modified strains could be capped by other resource constraints, such as declining soil fertility, and rising competition for land, water and labour. Rice continues to be primarily a basic food staple and this importance is being extended to many parts of the world. However, where rice constitutes the primary staple, especially in Asia, sustained income growth and dietary diversification is expected to depress *per capita* rice consumption, by as much as 2 kg over the outlook. Rising demand elsewhere will drive increased trade flows, especially shipments to Sub-Saharan African countries. OECD countries, as a group, are projected to import more rice,

led by the European Union amid stagnating production with policy reform and rising consumption. Few upheavals are foreseen on the export side of the market, with traditional exporters fulfilling their role over the outlook, but several LDCs in South East Asia could emerge as important suppliers to the global market. Nevertheless, government interventions to regulate the market will again likely be the overriding factor in shaping international rice flows and prices. Lessons learnt from the recent high price episode suggest that world rice carryover stocks could significantly increase over the projection period, but stock levels are not expected to revert to the record highs reached in the late 1990s.

Edible oil demand drives the oilseed complex

Of all the arable crops, markets for oilseed commodities look set to undergo the greatest expansion. By the end of the projection period, global oilseed production is expected to be double the level observed 20 years prior. While still high relative to other crops, the rate of growth over the next 10 years, however, will not match that observed during the previous decade. Much of the foreseen expansion will be concentrated in Brazil, the EU and Argentina, supported by land reallocation from competing crops, diverted pasture lands and some new arable land being brought into production. Such positive prospects are projected to materialise after a difficult few years that have confronted the sector, especially in South America, where a price-led production expansion was constrained by adverse weather conditions and farm liquidity problems. However, the importance of this region in driving the global oilseed sector should not be underestimated: over the period 2009-18, Brazil's share of global exports is expected to grow from 30-39%, and should emerge as the leading oilseed exporter, eventually surpassing the lead position held by the United States. In addition, the differential export tax system in Argentina should deter oilseed exports and encourage domestic crushing, paving the way for much larger shipments of oilmeals and vegetable oils in coming years.

World oilseeds crush will continue to be dictated by vegetable oil demand. The pace of growth in this sector will likely exceed the rate of expansion in oilseed production. Indeed, largely driven by sustained income growth once the current economic crisis is overcome, vegetable oils, both from oilseed crops and from palm, will remain the fastest growing commodity in terms of consumption covered in this outlook. Much of the projected demand growth will arise from the food sector, where developing countries situated in Asia could account for almost two-thirds of the global rise in use, but increasing biofuel mandates still play an important role. The relative importance of vegetable oil as an energy feedstock will be increasingly contingent on politically set biofuel mandates and other support policies, as the profitability of biodiesel production *vis-a-vis* fossil diesel prices remains a particular challenge. Current projections indicate that the derived demand for vegetable oil in biodiesel production could represent 20% of global vegetable oil consumption by the close of the outlook period.

The rising intensification of livestock sectors, which is projected in developing countries, is expected to be a key demand driver for the protein meal market, in contrast to rather stagnant demand for this commodity among OECD countries. At the end of the projection, China is expected to surpass the European Union as the leading oilmeal consumer. Substantial growth is also anticipated in Brazil, the CIS group and in India. Domestic demand in the latter country for protein meals has been declining for several years to the benefit of exports, but a reversal could take place on account of projected low

prices of oilmeal relative to feedgrains. In the United States, oilmeal usage has likely been constrained by the increasing availability of low cost dried distiller's grains, a by-product of ethanol production, which is expected to displace almost 8% of future meal consumption by 2018. In spite of rapidly rising oilmeal consumption in non-OECD countries, when consumption is expressed as a ratio of non-ruminant meat production, average consumption levels in these countries remain far below levels in the OECD area. The contrast is even more striking among the LDCs, where for a 1% share of global non-ruminant meat production, their share of global protein meal usage amounts to just 0.5%.

Policy reform and energy demand set to shape sugar markets

An exception to last year's soaring price episode for most commodities was the international sugar market where prices remained relatively low. If recent history can be taken as a guide, many non-sugar factors, including the outlook for crude oil and other commodities, exchange rates and freight rate developments affecting export competitiveness of sugar industries, and the performance of sugar futures markets with further financial market integration can be expected to continue to affect sugar prices and their volatility. As a consequence, the sugar market has entered a period of greater instability and uncertainty given a growing number of price determinants in addition to traditional market fundamentals. The outlook is further obscured by ongoing policy reform in sugar sectors in major producing and trading regions such as in the EU as well as in North America.

After losing ground in the base year to other crops with expected higher returns, global sugar cane production is projected to register a marked acreage expansion, which by 2018 would give rise to a combined output increase of 21%. How much of this translates into additional sugar production will rest on the allocation of sugar cane to ethanol production in Brazil, the world's leading sugar producer and exporter, and a major ethanol producer based on sugar cane juice as the feedstock. The upswing in sugar beet cultivation, on the other hand, is expected to be far less dramatic owing to a sharp contraction in the EU harvested area, following policy reforms. The adoption of improved sugar varieties is expected to some degree to sustain crop productivity over the outlook period; albeit at a slower rate when compared to the last decade.

Compared to other commodities, the demand for sugar is relatively passive to changes in world prices, but much more responsive to income changes. This is evident from periods in the past when world consumption slowed down sharply during times of recession. The unprecedented global financial crisis and deepening economic downturn in the world economy in 2009 can be expected to have some immediate impact on per capita consumption, but over the medium term, high demand growth of the developing countries should remain steadfast in the wake of fast population growth, and with diets increasingly geared towards processed and convenience foodstuffs utilising sugar. The opposite development is projected in OECD countries, where consumption could stagnate on account of declining population growth and dietary shifts away from sugar amid increasing health awareness and concerns with obesity. Non-OECD countries should account for virtually all the increase in world sugar production and consumption over the Outlook. By 2018, their share in both market aggregates could rise to the proximity of 80% of the world total.

The EU could emerge as the leading global sugar importer, on account of sectoral reform that has led to a huge structural contraction in sugar production and sugar beet

cultivation. The majority of sugar inflows to the EU will be sourced under preferential import arrangements with the African, Caribbean and Pacific (ACP) countries in the context of new Economic Partnership Agreements (EPAs) and with LDCs under the Everything-But-Arms (EBA) initiative, but uncertainty prevails regarding export capacity and incentives in many of these countries. Under provisions in the North American Free Trade Agreement (NAFTA), the United States' sweetener market became fully integrated with Mexico in 2008; in the same year, the US's new multi-year farm legislation (the FCE Act) also came into effect. This will result in higher US market prices that are expected to encourage increased sugar imports from the NAFTA member, Mexico. The Outlook foresees that the United States will re-surface as a major net importer of sugar (as is the case of the EU), with some additional inflows originating outside NAFTA countries, especially from those that have negotiated to fill the country's WTO tariff free quota and from third countries with Free Trade Agreements.

With low production costs and the potential to bring substantial additional land into production, Brazilian sugar production is expected to grow some 36% over the Outlook, and this could propel exports to new heights. Overall, outcomes hinge on the price relative between ethanol and sugar, which is foreseen to regulate a 60% share of cane being diverted to ethanol production by 2018.

Poultry and pigmeat demand in non-OECD countries underpins the global meat sector

Meat prices also proved an exception to the high price event of last year. Falling profit margins as a result of inflated feed costs, in some instances, prompted livestock farmers to liquidate herds, increasing meat supplies and lowering prices. These additional supplies tended to dampen any upward pressure on prices. In other instances, farmers downsized operations by not restocking herds after slaughter. But perhaps the most important factor that capped price increases was the onset of a contraction in demand induced by falling purchasing power around the world with the economic downturn. Of the meat sectors hardest hit, beef meat and pigmeat stand out. Confronted with declining budgets, consumers are expected to switch from higher priced animal proteins to less expensive meat products such as poultry.

After the turning point is reached in the economic downturn, the remainder of the meat Outlook is characterised by moderate increases in production and consumption in developing countries and a more stable path of development in the mature OECD markets. Overall global production growth – a little under 2% per year – is expected to be registered and this will be at a slower pace than witnessed in the past 10 years. The expansion of meat production in non-OECD countries could outpace growth in OECD countries by a factor of 2:1, such that 87% of the expected growth in global production can be attributed to non-OECD countries. Renewed investment, capacity building, improved infrastructures and the introduction of modernised, intensive and integrated production technologies, are the main factors spurring higher growth in these countries. This is especially true for poultry in the emerging economies of China, Brazil and India, and to some extent in the CIS group of countries which could lower their import dependency on meat products. As a result, some of the emerging countries, notably Brazil, will be able to increase substantially their presence in supplying international meat markets. Given abundant land resources, capital and technology in combination with policy reforms and disease controls, Brazil is expected to assume one-third of total world meat exports by the end of the outlook;

fuelling a 25% rise in meat shipments compared to the 2006-08 period. A handful of major exporters including the United States, Canada, Argentina and Australia, alongside Brazil, will remain the dominant traders in world markets. In contrast, the export share of the EU is expected to further deteriorate over the Outlook, owing to policy reform and rising domestic consumption.

The resumption of a trend of increasing purchasing power in developing countries with economic recovery, will lead to dietary changes that are increasingly orientated towards protein foodstuffs and additional protein of animal origin and away from staple foods of vegetal origin. Overall meat consumption in developing countries is expected to account for around 82% of projected global growth. Much of this expansion will take place in Asia and the Pacific region, especially in China and also in Latin America, led by Brazil. Such growth will reflect in particular the rise in consumption of cheaper sources of animal protein, mainly poultry and pigmeat. Import dependency in meat products is likewise expected to grow in many dynamic developing countries as demand surpasses the domestic capacity for meat production throughout the duration of the Outlook, although the credit crisis can be expected to slow meat trade to certain destinations in the short-term. Among the developed countries, the United States is set to assume the mantle of world's largest meat importer by 2018, followed closely by Japan and then the EU.

Another development in the Outlook for meat demand concerns the further entrenchment of established consumer preferences. In countries where pork consumption is traditionally high, such as in Asia, pigmeat consumption will continue to grow at a faster rate than any other type of meat. Similarly, in countries where beef meat production is important and international prices have little impact on domestic production, such as in East Africa, beef meat will remain the preferred type of meat consumed.

Developing countries fuel dairy output growth but only few participate in export expansion

The spectacular increase in international dairy prices was followed by a rapid decline with prices falling by half to two-thirds from the record levels of mid-2007. Prices were driven down by increased production, responding to earlier price rises, and by retreating demand. The economic contraction is expected to weaken demand and put pressure on dairy prices in the short term, but prices are projected to strengthen when economic prosperity returns to global consumers. Dairy demand over the medium term is expected to expand particularly in developing countries where increased consumption is not only governed by income and population growth, but also driven by factors such as changing preferences, changing diets and dietary diversification, all of which will be encouraged by further urbanisation with economic growth and development. These drivers are likely to be reinforced by growth in dairy marketing, increased product availability and retailing channels. Over the outlook, dairy products are expected to remain among the agricultural commodities for which consumption exhibits the highest growth rates.

In tandem to these broader changes, the outlook foresees dairy sector as more competitive and more responsive to market signals. Rising supply potential in developing countries stimulated by investment and restructuring, will enable future production growth and improved domestic marketing linkages, placing these countries in a stronger competitive position in regional and global markets. As a result, milk production gains over the outlook period will be overwhelmingly driven by output growth in non-OECD countries, which could capture as much as 81% of the anticipated total increase. Much of the

expansion is set to originate in Asia, including India, the largest producing country in the world, and also China and Pakistan. Milk production growth will allow such gains to be transformed to higher butter output in South Asia (India and Pakistan) and greater WMP production in South East Asia (China) – the two products and the two sub regions set to drive the global dairy expansion. Brazil is also foreseen to fuel world dairy output through higher WMP production. It remains, however, uncertain how much the milk production expansion and needed investment activities in developing countries will be impinged by the unfolding economic crises and financial credit constraints.

Among the OECD countries, New Zealand is to remain a country recording the strongest milk production growth in percentage terms. In Australia, dairy cow inventories are expected to increase in 2009 for the first time in seven years with a return to normal seasonal conditions paving the way for the country's more positive dairy outlook, but for such prospects to translate to material gains, much would rest on future water availability. Policy interventions are expected to contribute to shaping the dairy production outlook landscape. For instance, the EU has decided to abolish the long standing milk production quota system in 2015 allowing efficient milk producers to expand. The United States has confirmed support to its milk producers through provisions in the 2008 US Farm Act (FCE Act). Milk production growth in the United States could account for more than 40% of additional milk production in the OECD area.

In spite of an expected expansion in trade, international dairy markets will continue to be classified as “thin” and hence susceptible to price swings. World exports of dairy products are expected to grow for all products with only a few developing countries able to erode the shares of the traditional OECD exporters of New Zealand, Australia, the EU and the United States. However, given that the composition of international dairy product trade is expected to increasingly favour WMP and value added products, an opportunity is presented for the Mercosur countries of Argentina, Brazil and Uruguay to challenge the dominance of the traditional exporters.

Import markets will remain rather fragmented compared to those for exports. The six largest importers of dairy products are expected to account for less than half of the world market. Developing countries are expected to absorb 96% of global WMP deliveries, 92% of SMP shipments, 57% of traded butter and 44% of cheese exports. Significantly narrowing the dairy trade deficit with OECD countries presents a challenge for developing countries for the years to come. An important future endeavour, especially for developing countries, will be the ability to maintain an image of dairy products as being healthy and safe. The need to ensure the safety and quality of dairy products is expected to result in increasingly strict requirements for producers in the future and more stringent testing of milk at various stages of distribution and processing.

Biofuel demand likely to be driven more by policy mandates than by markets

Prospects for biofuels are increasingly driven by quantitative mandates, either in the form of blending requirements or set as minimum biofuel quantities to be used in the national transport sectors. Under these circumstances, general uncertainties about other factors, including feedstock prices, crude oil prices and changes in policy measures other than mandates, become less crucial, although this might change should there arise significantly higher crude oil prices than those assumed in this outlook. However, two important areas of uncertainty remain: the pace of commercialisation of second-

generation biofuels; and the options for waiving biofuel mandates if certain conditions related to food security, biofuel economics and environmental issues are met.

With the exception of Brazilian ethanol production, the commercial viability of biofuel supply has been, and still remains, a challenge for many sectors throughout the world. Recent developments have shown that in spite of weakening feedstock prices which translate into falling production costs, even lower crude oil prices have left biofuels struggling to compete with fossil fuels. It is not surprising, therefore, that public support measures will be the most important drivers of ethanol and biodiesel markets throughout the projection period.

With both total transportation fuel use and the share of diesel fuels rising across the world,¹ and stimulated by rising mandated demand for blending with transportation fuel, global biofuel production is foreseen to undergo a rapid expansion, going beyond doubling of base year levels, to reach 192 billion litres by 2018: 148 billion litres of ethanol and 44 billion litres of biodiesel. Such a prospect arises in spite of the recent slump in crude oil prices and projection of only a moderate increase in the future.

The world reference ethanol price, which averaged USD 48 per hl in 2008 is expected to fall by a fifth in the current year, and then to trend gradually upwards to 2018. The strengthening of prices over the outlook is the net result of an expansion in policy-induced use around the world and the dampening effect of rising growth potential in Brazilian ethanol production and exports. Similarly, owing to the influence of mandates, particularly in the United States and the European Union, biodiesel reference prices could remain well above production costs of fossil diesel. International biodiesel prices are expected to fall in 2009 and then to steadily rise towards 2018.

United States, Brazil and the EU continue to dominate biofuels

Policy implementation in the United States, with the passage of the Energy Independence and Security Act (EISA) and particularly the Renewable Fuels Standard, could pave the way for domestic ethanol distilleries to produce 63 billion litres by 2018; some 83% above the 2008 volume, but resulting in total biofuel use, remaining some 24 billion litres below the level mandated for that year. Cellulosic ethanol could make some progress, but with only 5.4 billion litres expected to be produced, will fall short of the 26.5 billion litre requirement set for 2018. In the EU, following the introduction of the new Renewable Energy Directive which calls for a 10% share of renewable energy in the transport fuel mix by 2020, ethanol production is set to rise markedly over the projection period, reaching an average share of 6.6% in gasoline fuel usage by 2018. Imported ethanol will play an increasingly important role in fulfilling the mandate, and inflows could rise to 3 billion litres by the end of the outlook. Ethanol in Brazil will remain a rapidly expanding and increasingly export-oriented sector, and production should grow by around 9% annually on average over the next ten years. With sugar cane juice remaining the cheapest of the main feedstocks for ethanol, Brazil will continue to be very competitive in supplying an ever expanding international market, where global trade could reach 13 billion litres by 2018.

The EU biofuel sector is particularly focused on biodiesel, and while this focus is expected to decline somewhat in favour of ethanol, biodiesel could attain an energy share of 7.4% in fossil diesel usage by 2018. As a result, the EU is projected to remain by far the largest biodiesel market, accounting for more than half of all global biodiesel output throughout the outlook. Steadfast biodiesel demand will be met by both increased

domestic production and, particularly towards the end of the projection period, growing biodiesel imports. Given high biodiesel prices, growth in biodiesel usage in the United States will almost entirely be driven by mandates which require 3.8 billion litres of biodiesel to be used in 2012. By contrast, biodiesel use in Brazil is assumed to grow rapidly following ambitious government targets, and could represent 4% of fuel usage by 2018, compared to just under 2% in 2006-08.

The stage was set last year for many developing countries, especially in Sub-Saharan Africa and in South East Asia, to embark on ambitious renewable energy programmes. The recent high oil price event spurred a myriad of project proposals, but most of them were put on hold at the onset of the economic crisis as oil prices fell and future market prospects became uncertain, especially in the context of concerns over longer term food security. A prime example of these constraints is given by *jatropha curcas* in Sub-Saharan Africa where the potential has been extensively debated in recent years, but actual production has been miniscule so far. Given the current investment climate, this year's *Outlook* presents a conservative view on biofuel prospects in many of the developing countries over the projection period.

Agricultural commodity markets have responded strongly to high prices

A major feature of the previous year's *Outlook* concerned the potential for high and protracted prices of almost all agricultural products in real terms. While the relative importance of the many transitory and permanent factors that lay behind today's price trends could change tomorrow, there is lessening evidence to suspect that the world has undergone any structural upward shift in real agricultural commodity prices. For such a tendency to occur, the underlying forces that provide momentum to agricultural product supply will need to be continually outweighed by the forces that drive stronger demand for these products. But the high price event of last year showed that price signals did provoke a significant supply response. Assisted by a downturn in the global economy, this response was sufficient to calm markets and to restore some confidence in the international arena, though at the expense of aggressive stock building and policy measures to enhance self-sufficiency.

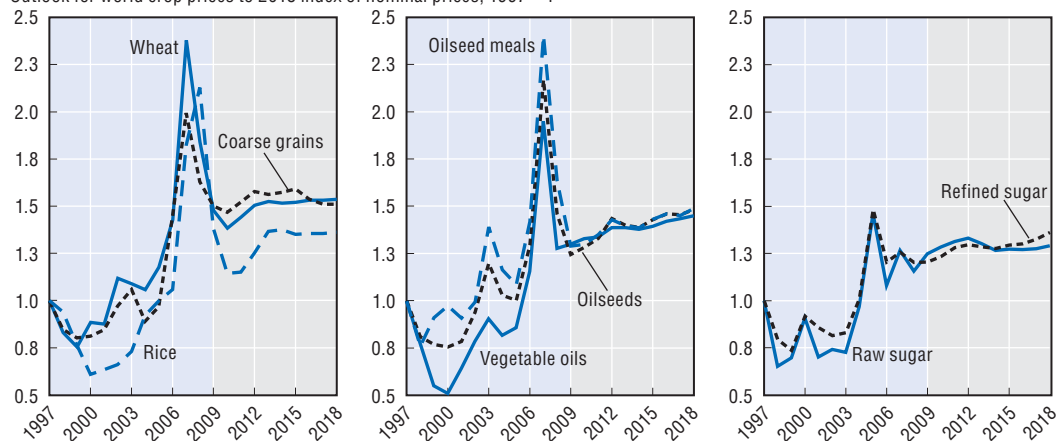
However, further episodes of strong price fluctuations cannot be ruled out, nor can future short-lived crises. This is particularly evident when considering the heightened linkages between crop and energy prices. Energy markets have long influenced the supply side of crop production, *inter alia*, through their direct effect on fertiliser, production and transportation costs. However, with the emergence of the biofuel sectors, particularly in the important crop production and exporting markets of OECD countries, have now forged a more dynamic link to crude oil markets particularly for grains, oilseeds and sugar, but also indirectly to other land competing crops. It is increasingly apparent that variability in crude oil prices now substantially impacts crop prices, even though this link is weakened by the increasing importance of quantitative biofuel mandates as illustrated in Chapter 2. In addition, given much more macroeconomic interdependence and globalisation in the world today, the fragility of economies could be exposed from the transmission of global financial and economic shocks onto domestic markets, profoundly affecting the competitive positions of nations wishing to trade on international markets, or to build domestic capacity. Finally, more frequent weather disturbances associated with climate change may render yields much more variable, leading to instability in trade flows and hence international prices being prone to greater swings.

Productivity increases and higher stocks to contain prices but energy linkages to add pressure

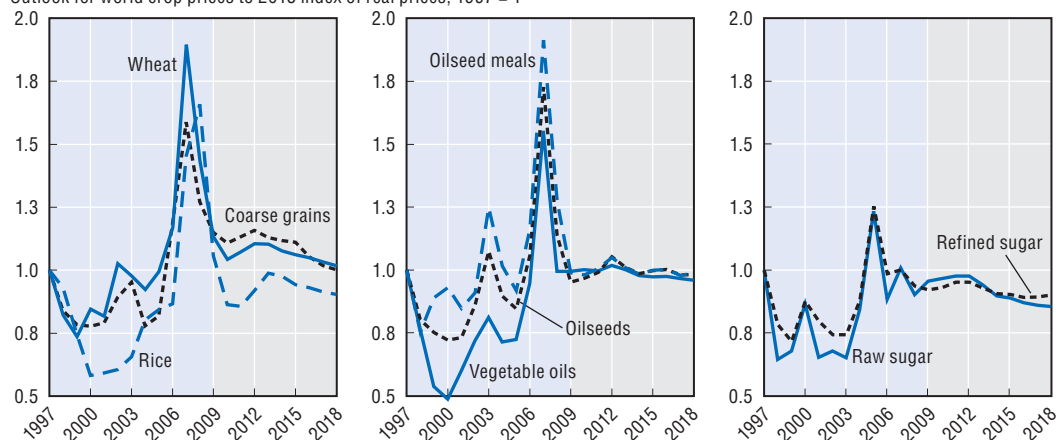
World cereal inventories, having reached very low levels in recent years, are expected to increase over the projection period, bolstering stock-to-use ratios to the tune of 30% for grains and 22% for rice, which should help to buffer or restrain upward price movements. As a consequence, wheat prices in real terms are projected to resume their long-term decline, albeit from a higher level and at a somewhat slower rate. Coarse grain prices in real terms should also resume their downward trend, but only from around 2015 when the United States' mandate for maize-based ethanol reaches its maximum level. Concerning rice quotations, the trend in falling real prices could stabilise, making rice slightly more expensive relative to wheat. Nevertheless, in nominal terms most crop markets are expected to see increasing prices over the Outlook (Figure 1.6).

Figure 1.6. **Outlook for world crop prices to 2018**

Outlook for world crop prices to 2018 index of nominal prices, 1997 = 1



Outlook for world crop prices to 2018 index of real prices, 1997 = 1



Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/676124208586>

Rising demand for vegetable oils, both for food and to fuel the growing biodiesel sector is expected to weigh heavily over the medium-term, leaving stock to use ratios in the oilseed complex under some pressure. However, prices of oilseeds, oilseed meal and vegetable oil, once corrected for inflation, are expected to remain stable over the Outlook, but would stay above longer term trend levels, especially for vegetable oils and oilseeds and markedly increase in nominal terms (Figure 1.6).

Some strengthening in sugar prices and the white differential towards the end of the Outlook

Lower expected growth in sugar consumption and imports in the developing countries undergoing economic contraction, could spell weaker sugar prices over the near term. However, thereafter a recovery in demand growth accompanied by stock rundowns could see quotations firming by the end of the projection period. The white sugar premium is projected to narrow in the near term when new refining capacity comes on stream, but then to widen by 2018 when increasing supplies of raw sugar arrive on the market. Together with rising sugar refining costs, this should keep white supplies relatively tight (Figure 1.6).

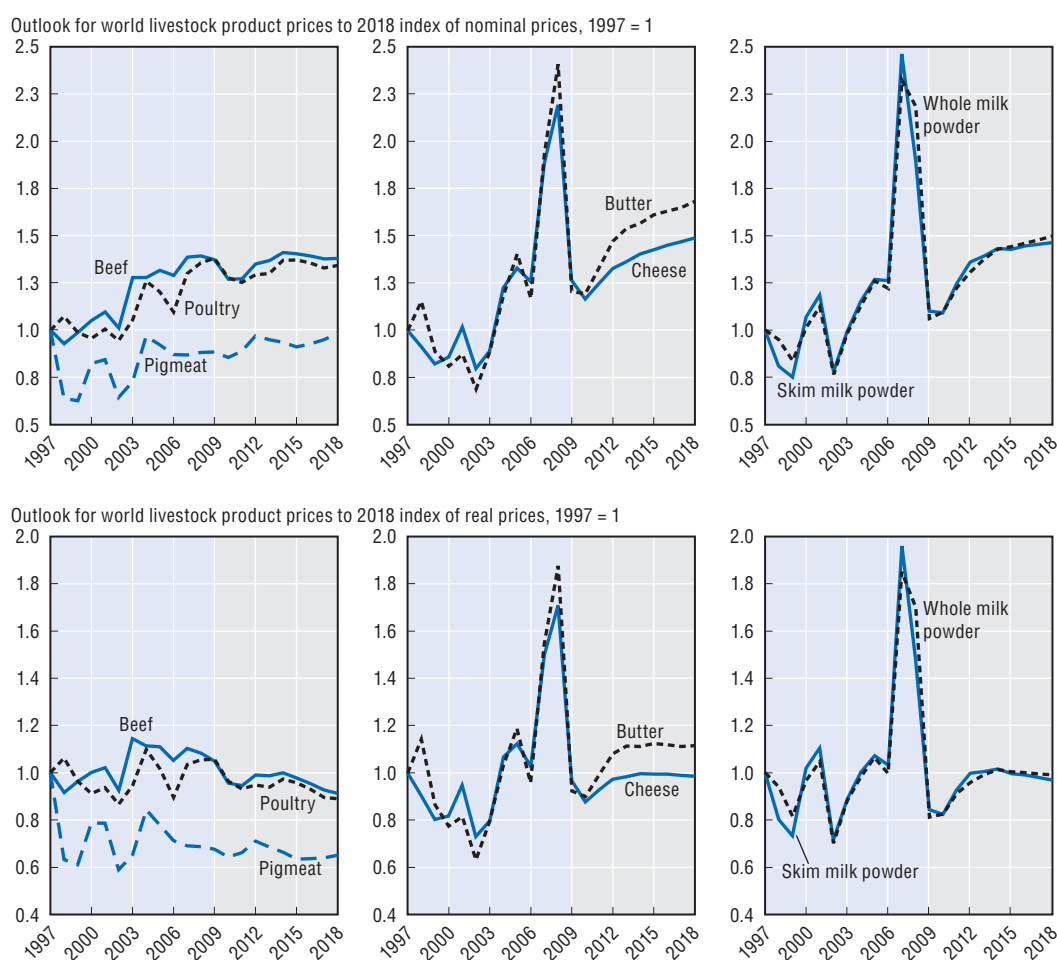
Meat quotations likely to fall in real terms but dairy product prices to hold firm

Notwithstanding the effects of falling incomes in the short-term, relatively stable feed costs and domestic meat capacity growth in major exporting countries as well as traditional importing countries is likely to bear down on real international meat prices, while in nominal terms prices are expected to increase initially – staying relatively flat in the second half of the projection period (Figure 1.7).

Spurred by rising global incomes, world dairy product prices are expected to rebound from 2011 onwards, even in real terms. While this upward trend could dissipate in the second half of the projection period, average prices in real terms over the outlook period are expected to stay slightly above the 1997-2006 average, with butter quotations especially supported by rising energy and vegetable oil prices (Figure 1.7).

However, it is likely that continued weakness in the general economy will somewhat dampen commodity prices, at least, over the next 2-3 years. As demand for food is relatively income inelastic, less adjustment in consumption patterns to recession can be expected especially in the higher income OECD countries. Chapter 2 looks at this issue in more detail. The income scenarios discussed in Chapter 2, based on assumptions of a deeper recession, suggest only moderately lower commodity prices and production and consumption adjustments, when compared to outcomes from the outlook baseline, with livestock producers facing a larger demand response to income changes than crop producers.

For the crop and biofuels products maize is the most responsive crop to the income fall, reflecting the higher income elasticity from its primary use as a feed ingredient in livestock rations (see Chapter 2 for full description). Nevertheless, it should be noted that the Chapter 2 scenario analysis does not take into account reduced import demand due to cancelled import orders resulting from financial crises and credit constraints. The impact of credit restrictions goes beyond the Aglink-Cosimo model capability, but it is discussed qualitatively in Chapter 2.

Figure 1.7. **Outlook for world livestock product prices to 2018**

Source: OECD and FAO Secretariats.

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Main trends in food prices

Food prices remain high but are falling

Rising commodity prices in 2007-08 contributed to sharp increases in food prices, particularly in developing countries where food is purchased in a less processed form. While commodity prices have recently declined, this change has not yet worked its way through to food prices in all countries. Over the past year, ending in February 2009, food price inflation continued to outpace overall inflation; however it has come down from last year's high rates.

While the outlook does not project food prices, there is a great deal of interest in how fluctuations in commodity markets translate into changes in the cost of food. For this reason, it is instructive to examine how food prices around the world have changed in recent months as commodity prices have declined. The food price evolution described here is based on the food price component of the Consumer Price Index (CPI), and is simply the price changes of a fixed basket of foods measured at the retail level.²

The specific foods composing the basket are selected to reflect consumption patterns in different urban areas.³ Thus, the measure provides a good indication of overall change

in the cost of food that consumers actually face when making purchases. Food is a particularly important component of the CPI in low income countries because food purchases account for a large share of total consumer spending. Detailed information on the CPI and food price data as well as the latter's contribution to inflation is provided in the Annex Tables to this report.

How important is the food component in the CPI?

Food price increases are an important component of overall inflation, which is frequently a major guide in the setting of wage-demands and other income assistance benefits. Inflationary pressures, particularly those associated with food price increases, have also generated vociferous social tensions at times and, thus, such indicators are closely watched by governments.

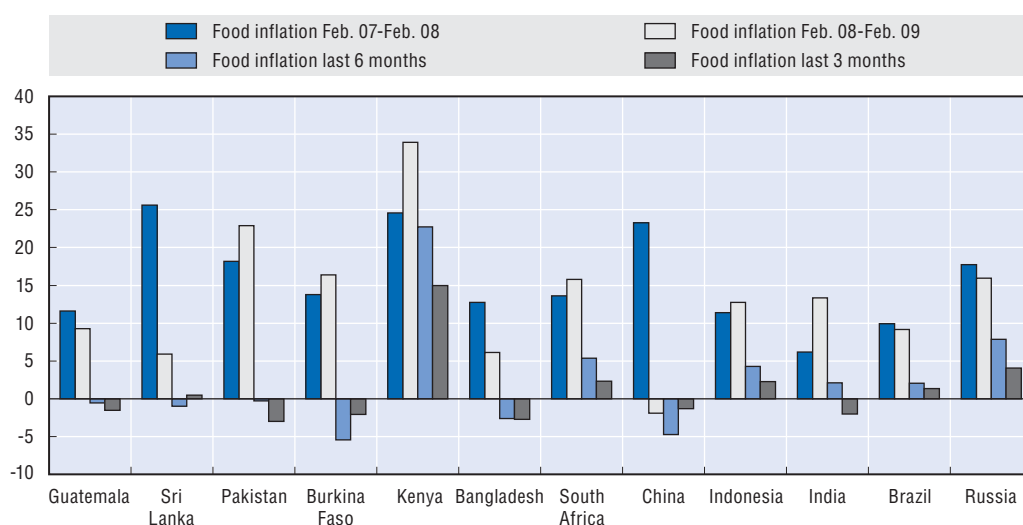
The weight of the food component in the CPI varies significantly across countries reflecting the structure of household expenditures. In high income countries, the share of food in the CPI ranges from 10% to 20% but in the low and middle income countries it is substantially higher, generally in the 40-60% range. For example, the food component accounted for 47% of the CPI in Sri Lanka, 58% in Malawi, 47% in India and 49% in Peru in 2008, but was only about 10% of the CPI in Germany, United Kingdom and the United States and about 20% in Japan, Mexico, and Spain. While information on consumer expenditures according to socio-economic groupings would provide greater understanding of the impacts of food price increases in a given country, very few countries undertake their surveys in this fashion.

Rising food prices has meant larger shares of income being devoted to food expenditures, thus leaving less money available for non-food items, such as housing, transportation, health and educational services particularly in developing countries. Because of its importance and high visibility, food price inflation continues to be a closely watched economic indicator. Governments have often responded to rising food prices with a wide range of policies designed either to support incomes and/or to reduce food costs and this in both OECD and non-OECD countries.

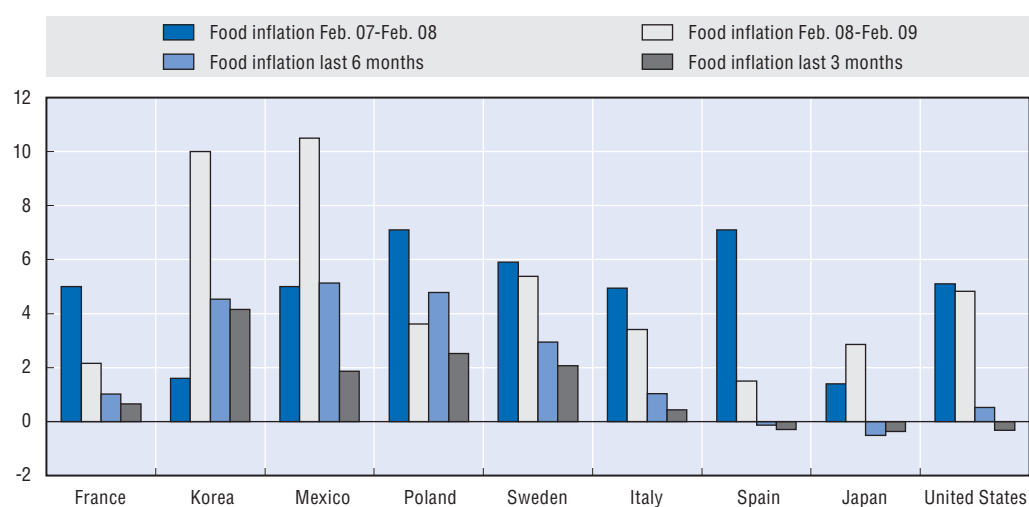
How fast have consumer food prices been rising?

Food price inflation measured over the past 12 months, ending February 2009, has declined from that of a year ago in many countries. But for a number of countries it has continued to increase for instance in Japan, Mexico, Korea, and the United Kingdom as well as for non-OECD countries such as Ghana, Kenya, India, Pakistan, and South Africa. Food prices continued to increase in most countries through the summer of 2008 along with commodity prices – agriculture and oil – as these worked their way through to food prices with at different speeds. The speed and degree of transmission of commodity prices from international to domestic markets as well as their contribution to the composition of the food prices, determines their impact on the food price index.⁴ Where transmission is rapid, complete and where agricultural commodity content of food is large, food prices should adjust rapidly to changing commodity prices. But if transmission is slow, then effects of previous commodity price increases also appear with a lag. This may account for overall price increases occurring after commodity prices have come down.

A closer look at food price inflation over the recent 6 and 3-month intervals indicates that there has been a marked slowing in food price increases in recent months and with many countries experiencing negative rates of change (Figures 1.8 and 1.9). For instance,

Figure 1.8. **Food price inflation for selected non-OECD countries**

Source: OECD Secretariat.

StatLink <http://dx.doi.org/10.1787/676177085356>Figure 1.9. **Food price inflation for selected OECD countries**

Source: Main Economic Indicators.

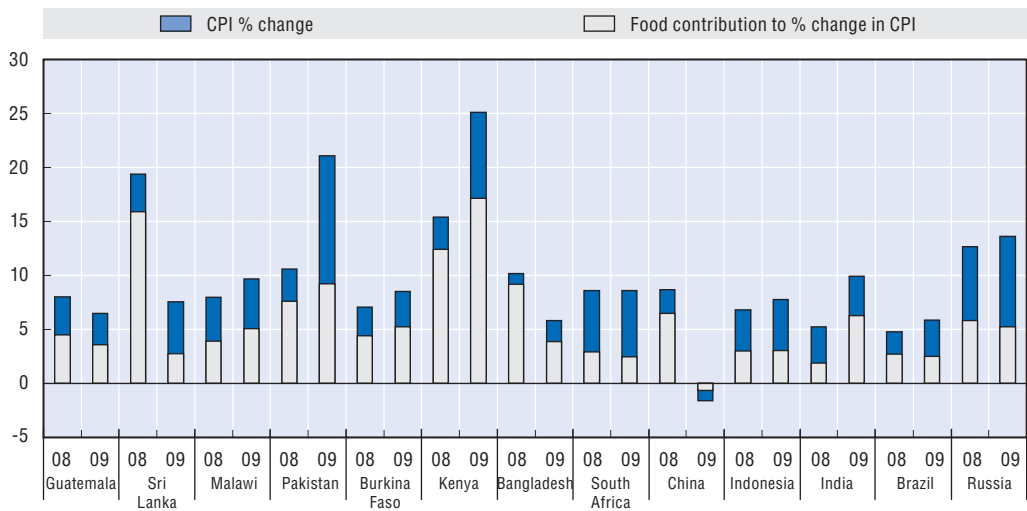
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the percentage change in the food price index was negative in countries, such as Estonia, China, Chile, Bangladesh, Senegal, Pakistan, the US, Japan and Spain. In China, for example, there has been a spectacular reversal in food price inflation: from over 20% in 2007 to -1.9% in 2008 with a further acceleration in the decline over the past 6 months, at -4.8%, but this decrease has now slowed. In the other countries, that is, Brazil, Russia and Indonesia, there has also been a slowing of food price increases but they have not been as significant as in the case of China. Annualising the recent 3-month rate of increase would imply a halving of food price inflation from last year in Brazil and about 25% reduction for Russia and Indonesia.⁵ But there is substantial variation among countries and generalisations are not possible.

What has been the effect of food prices on overall inflation?

In high income countries, the contribution of food price increases to overall inflation has been quite limited over the past year ending February 2009, generally below 1% (Figures 1.10 and 1.11). This is not only because food prices increases were relatively moderate but because the share of food in the total consumer basket is small. In the US, Italy and Japan food price increases contribute about half a percentage point to inflation and less than .3 percentage points in countries such as Switzerland, France and Germany. As would be expected, the impact of food price inflation on overall inflation in low income countries is much larger. For example, food price increases contributed over 8 percentage

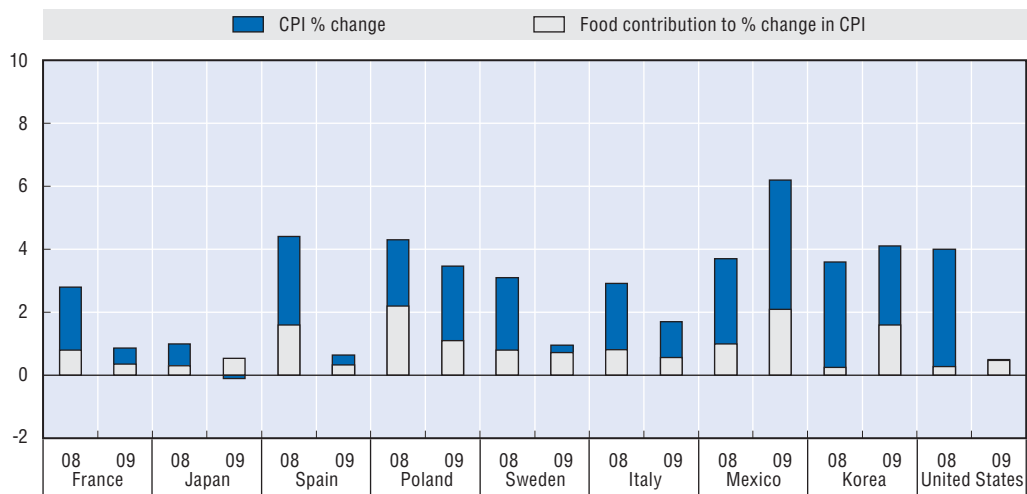
Figure 1.10. Contribution of food to inflation for selected non-OECD countries
(% change over previous year February to February)



Source: OECD Secretariat.

StatLink  <http://dx.doi.org/10.1787/676187186730>

Figure 1.11. Contribution of food to inflation for selected OECD countries
(% change over previous year February to February)



Source: OECD Secretariat.

StatLink  <http://dx.doi.org/10.1787/676187186730>

points to an overall inflation rate of 21% in Pakistan and 2.5 percentage points to an overall rate of 5.9% in Brazil. These are significant contributions, even if absolute numbers may not be very large.

This brief snapshot of food price changes in selected countries indicates a slowing of food price inflation and in many cases there is deflation in food prices. This should not be misconstrued to imply that food prices have fallen significantly yet in absolute terms, since the food price indices indicate that prices remain high relative to pre 2007 levels, at least for the set of countries examined here.

The Outlook and food security

This outlook paints a fairly positive picture for agricultural markets: an agri-food sector relatively resilient to the current economic crisis, real commodity prices to remain above historical averages; with production, consumption and trade to increase in developing countries. But behind this scenario lies a more disturbing story where world food insecurity has increased in the past couple of years, with extreme poverty and rising hunger. High food costs, combined with the global credit crunch, falling international trade and investment flows, lower remittances and budgetary pressures on development aid, are reversing the progress made in combating global poverty, with an estimated 1 billion people now below the hunger threshold. Chapter 3 examines the longer term supply side of the food security issue.

Notes

1. Assumptions for transport fuel consumption are based on data obtained from IEA, national and other sources. Assumed growth in major biofuel producing and using countries is generally close to or below historical trends.
2. Data for OECD countries is taken from the *OECD Main Economic Indicators*, April, 2009 and for non-OECD countries from the national statistical services.
3. The share of agricultural inputs in the cost of the food basket varies across countries. For instance in the United States they account for only 20-25% of the total, with the remainder attributed to labour, energy and distribution costs. In low income countries, the value of the share of agricultural inputs in final food prices is much higher as other costs are generally lower and diets contain a larger share of foods, which are highly processed or subject to high distribution costs. Changes in agricultural food commodity prices and in food prices are generally highly correlated, but the pass through effects depend on structure of consumption. As well, a number of policy variables may affect international price transmission, where agricultural food commodities are a significant part of the consumer's food basket. To better understand the linkages between these international prices and domestic food prices, rigorous analysis of food systems and statistical properties are needed.
4. Both food commodities and oil are important components in food costs. In OECD countries, oil accounts for about 20% of final food prices, about the same as commodities, on average.
5. For comparison purposes it would be necessary to annualise the 3-month change in prices. If deseasonalised, these rates can be simply multiplied by 4.

Chapter 2

How Resilient is Agriculture to the Global Economic Crisis?

The deepening of the financial and economic crisis

Business is not as usual

This year's *Agricultural Outlook* was produced under particularly unusual circumstances. What makes this year exceptional is the fact that the global macroeconomic environment – which forms the bedrock of our agricultural market projections – continues to deteriorate.

Since the beginning of 2009 there has been a constant flow of increasingly pessimistic macroeconomic news from virtually all sources. The OECD in its *Interim Economic Report* for March 2009 concluded that the world economy is in the midst of its deepest and most synchronised recession since the post war period (OECD, 2009a). The result is lower output, reduced trade and capital flows and higher unemployment world wide as well as a steep decline in consumer and business confidence. This global downturn in economic activity is accompanied by a precipitous decline in international trade. The collapse in international trade may explain why the crisis has spread so rapidly to so many economies. Both the credit crisis and the drop in demand, amplified by the prevalence of global supply chains, are seen as major causes of the collapse in international trade flows.

Moreover, it is not yet clear that the economic crisis and its consequences have bottomed out. Bank lending remains tight, however there are signs that equity markets are beginning to pick up. Overall, the prognosis about the depth and duration of the global contraction is highly uncertain and makes difficult any projections of key macroeconomic indicators such as income growth, employment and trade over the medium-term. Both the OECD and the World Bank have revised down their short-term expectations for growth for 2009 and 2010, though both expect a rebound in 2010. However economic growth will likely remain below potential and its recovery path uncertain.

What does it all mean for the Agricultural Outlook?

Because food is a basic necessity, the agri-food sector is expected to be more resilient than other sectors to the present crisis. But this does not mean that it is immune to the economic contraction and financial market turmoil. And the risks faced by agriculture are likely to be accentuated with any deepening and prolongation of the period of economic downturn.

The decline in real income should dampen demand for agricultural commodities, and, all else equal, decrease agricultural product prices. These impacts are likely to be less in high income countries where the elasticity of demand with respect to changes in incomes are low for most agricultural products and where food markets are close to saturation, than in low-income developing countries. The impacts can also differ greatly among the various agricultural sub-sectors and commodities. For instance, changes in the composition of demand can be expected for some products such as meat and dairy, which have higher elasticity or response of demand to income changes.

Falling agricultural commodity prices in the economic downturn may help compensate consumers for some of the income loss, while on the supply side, lower oil prices may help farmers, through reduced costs of oil related inputs, to offset the cost-price squeeze. At the same time, both oil prices and income changes can have implications for biofuel use and hence for the derived demand for feedstock commodities. The net effect on the agricultural sector is thus complex and will depend on the product and country being examined. The various outcomes for the main commodity markets of lower GDP and income growth are discussed below.

Impact assessment of alternative scenarios

The baseline projections in this report reflect the medium term economic projections from the OECD and World Bank, most recently available at the time of writing, which date to end-2008. These macroeconomic assessments foresaw the deterioration in the global economy particularly in 2009, with a turnaround projected for 2010 and included lower economic growth rates for most countries than in last year's report. Nevertheless, both Organisations have since significantly revised downwards their assessments for world economic prospects and GDP growth in the near term, without, however, providing estimates for the period after 2010, and therefore limiting their direct incorporation in the present base projections.

The medium term macroeconomic projections were also subject to much lower assumptions on crude oil prices relative to last year's *Outlook*. In the meantime, however, oil prices have continued their descending path, and in December 2008 had reached levels significantly below USD 40 per barrel. Indeed, in January 2009, the US Energy Information Administration of the Department of Energy published short-term projections for crude oil prices indicating lower levels for both 2009 and 2010, compared to those assumed in the December 2008 *OECD Economic Outlook*. Thus, the initial OECD medium term assumptions were supplemented with short term updates for 2009 and 2010 from the US Energy Information Administration, which reflects the lower crude oil spot market prices and shows some strengthening of crude oil prices concomitant with the projected economic recovery in 2010. From 2011 onwards, the medium term crude oil price assumptions remain those used by OECD at the end of 2008 in the context of its *Economic Outlook*, with prices moderately increasing to about USD 70 per barrel.

Two elements most directly linked to the economic contraction deserve a more detailed quantitative assessment. As the recession is defined as a decline in real income (or GDP) over a sustained period of time (usually 2 quarters), the initial baseline projections, as outlined in more detail in the second part of this report, were made subject to a sensitivity analysis. This was based on alternative GDP growth estimates of the latest short term updates provided by the OECD and World Bank, complemented by relatively simple and transparent assumptions on longer term growth (recovery) developments. The strong decline in crude oil (and energy) prices as observed particularly during the second half of 2008, constitutes another highly relevant element of the analysis for agriculture, and something that is, at least partly, directly linked to the crisis. As growth in economies declines and indeed economic output shrinks in a number of countries, energy consumption in general, and crude oil use in particular, decline, putting downward pressure on oil prices. In order to isolate the possible impact of these two elements, the impacts of alternative GDP growth and crude oil price assumptions are assessed individually. These additional scenarios are described in some detail in this section,

followed by an analysis of their impacts on the main agricultural product markets in the following section. The sensitivity of agricultural product market projections to higher oil prices than those assumed in the current baseline are discussed in Box 2.1.

Some of the wider ramifications for agriculture of the financial crisis cannot be quantified and are addressed more qualitatively in the final part of this chapter. Changes in exchange rates are another macroeconomic variable that can be expected to have important implications for agricultural markets, although direct relationships with the evolving crisis cannot always be drawn. These currency implications were discussed in last year's edition of the *OECD-FAO Agricultural Outlook, 2008-2017* and are not repeated here.

Lower income growth and different recovery scenarios

Two alternative scenarios were defined to partially analyse the potential implications of the further deepening of the economic contraction that has taken place in 2009 and which assume a different speed of recovery from recession over the coming decade. Both these scenarios build upon the most recent short term macroeconomic updates published by OECD and the World Bank, and both adjust downwards growth rates in GDP of all countries for 2009 and 2010. Data from the OECD's latest assessment cover the G7 countries as well as the four major emerging economies: Brazil, Russia, India and China (the BRICs). Adjustments were also made for all other countries based on World Bank information (Annex A, Table 1). Figures 4.6 and 4.7 in Chapter 4 show the magnitude of these adjustments for major economies and regions.

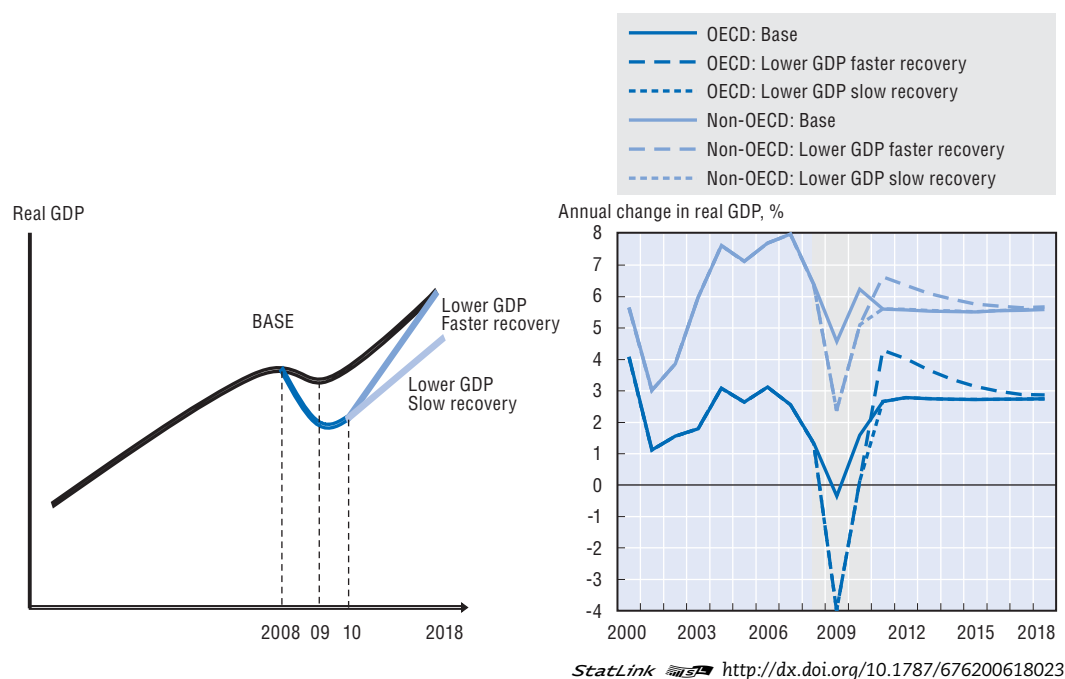
These data do not provide any information about developments beyond 2010. In order to keep the analysis simple and as transparent as possible, two recovery scenarios are proposed.

The first scenario *lower GDP – faster recovery* assumes that, following the depressed levels of GDP for 2009 and 2010, incomes enter a rapidly increasing path and quickly approach the levels of the baseline projections. While those levels are assumed to be fully reached only in 2018 – the final year of the projections in this report – incomes are assumed to approach the baseline levels at a faster speed in the beginning of the 2011-18 period, resulting in only small deviations from the baseline income levels after about 2015.

The second scenario *lower GDP – faster recovery* assumes the same level of lower GDP for 2009 and 2010 as in the first scenario. In this scenario income growth rates in each country in the recovery phase after 2010 are assumed to be the same as in the baseline projections, but starting from the lower 2010 levels. As a consequence, income levels never reach those projected in the baseline. All countries are thus assumed to face persistently lower income levels throughout the remainder of the projection period, as compared to the baseline projections. The alternative recovery assumptions are illustrated in Figure 2.1 below, with the implied changes in aggregate annual growth rates for the OECD and non-OECD areas shown in the right panel.

It is important to emphasise that the scenarios are not indicative of the full impact of the current global financial crisis and economic contraction on agricultural markets as they focus on only one indicator, lower income growth. The results, thus, only partially illustrate the impact. Furthermore, it should be clear from the design of these two scenarios that neither of them should be read as a worst- or best-case scenario. Indeed, at present it is impossible to precisely assess the path of recovery or even when the world will turn the corner, and thus the final depth and duration of the economic downturn. These

Figure 2.1. **Stylised depiction of economic downturn and two alternative recovery assumptions relative to baseline (left panel), and aggregate annual income growth assumptions for OECD and non-OECD regions across scenarios (right panel)**



scenarios are not, therefore, indications of our expectations of future income growth. While the scenarios are based on lower growth assessments, it should be recalled that the baseline projections already imply significantly depressed levels of income, when compared to last year's *Agricultural Outlook*.

It should also be understood that a number of the links between the depressed income levels and agricultural market adjustments are not represented in the Aglink-Cosimo model. For example, the model does not cover the possible (yet unknown) responses in total fuel consumption. To the degree biofuel use and hence biofuel production depends on total fuel use (i.e. particularly in countries where biofuel mandates are expressed in fuel shares rather than in absolute quantities), the simulation results therefore likely underestimate the impact on agricultural markets from this source. Similarly, these scenarios do not account for the possible impact of lower incomes on crude oil prices and any implications these may have on agricultural markets.¹ The scenarios, therefore, should be interpreted as a partial sensitivity analysis for the baseline projections in this report, not as an analysis of the economic crisis.

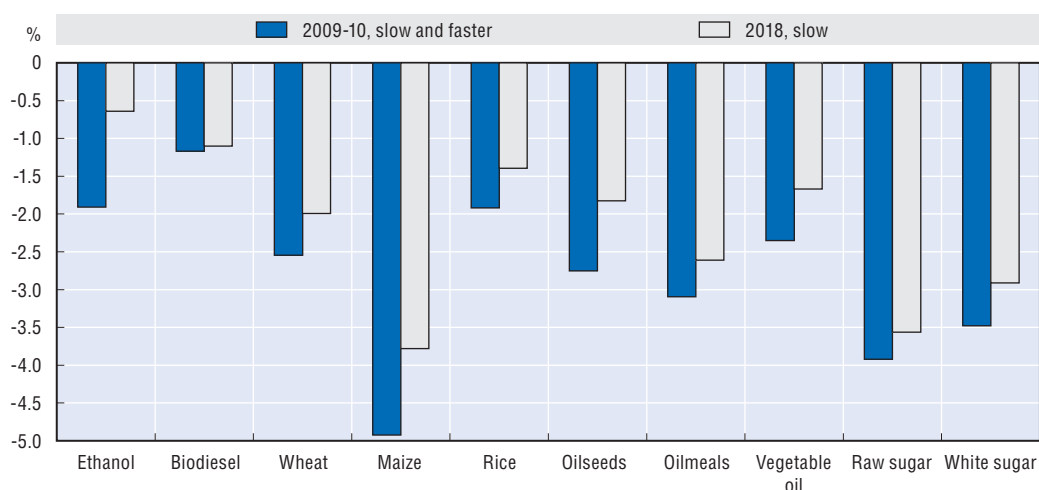
Main results of scenarios

As has been discussed earlier, income changes are expected to be more important for those agricultural commodities with the higher income demand elasticities such as dairy products and meats. These food products form a more important part of diets, along with vegetables and fruits, as per capita incomes increase with economic growth and development. As demand for livestock and dairy products is more reactive to income changes than demand for cereals, grains used for animal feed tend to be more responsive to changes in income than those directed to human consumption. Usually, income

changes have a proportionately greater impact in low income countries because of their higher income elasticities and where food consumption forms a larger part of household budgets, compared to many OECD countries where food expenditures, in general, form a smaller part of household budgets, and are usually less responsive to changes in incomes and prices.

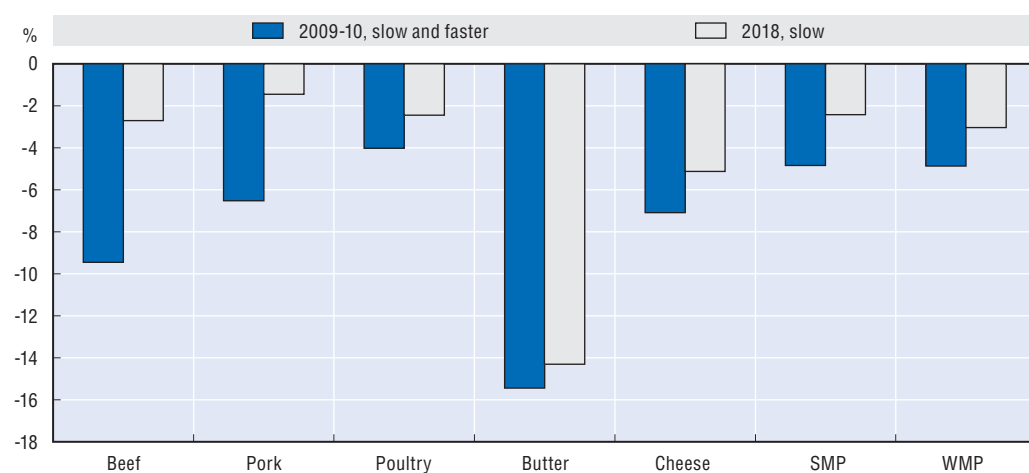
The two scenarios of reduced GDP and income growth have the effect of lowering world prices of all the agricultural products in the near term years of 2009-2010, as shown in Figure 2.2 for crop products and biofuels, and in Figure 2.3 for the main livestock products. All product prices drop below their baseline levels, with the impact being

Figure 2.2. **Percentage change in biofuel and crop prices with lower income growth in alternative GDP scenarios compared to baseline levels**



StatLink <http://dx.doi.org/10.1787/676217681236>

Figure 2.3. **Percentage change in meat and dairy prices with lower income growth in alternative GDP scenarios compared to baseline levels**



Note: The two scenarios “lower GDP – slow recovery” and “lower GDP – faster recovery” are the same for the 2009-10 period – results are therefore shown only once in the first set of bars (2009-10, slow and faster). Given that markets in the “lower GDP – faster recovery” scenario return to, or approach levels very close to, the base projections, longer-term changes for 2018 are shown only for the “lower GDP – slow recovery” scenario (“2018, slow”).

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particularly pronounced in the short run. While for the slow recovery scenario, prices remain below baseline levels throughout the period, the faster recovery scenario (with GDP approaching the levels assumed for the baseline), brings all prices back to, or around, the baseline levels within a few years after 2010, as one would expect from the scenario design. The pattern of adjustment varies between the different commodities under review.

Little impact on biofuel markets

Given that in many countries biofuel use is largely driven by policy-determined mandates, and due to the implicit assumption of transport fuel use being unresponsive to income changes, biofuel market projections are little affected by the lower GDP assumptions. In particular the US Renewable Fuel Standard sets lower bounds at the absolute levels of biofuels to be used in each year, and *de facto* puts an upper limit to maize-based ethanol. Given that the mandates – like those in other countries such as the EU – are found to be binding for most of the Outlook, biofuel use and production shows little impact. Lower feedstock prices, however, tend to reduce production cost, resulting in slightly higher biofuel output in 2009 and 2010 notably from sugar cane (Brazil), wheat (Canada) and particularly vegetable oil (EU), and cause slightly lower biofuel prices. Increasingly binding mandates result in little change in quantities in later years, but prices, particularly for biodiesel, remain below their baseline levels unless incomes completely recover.

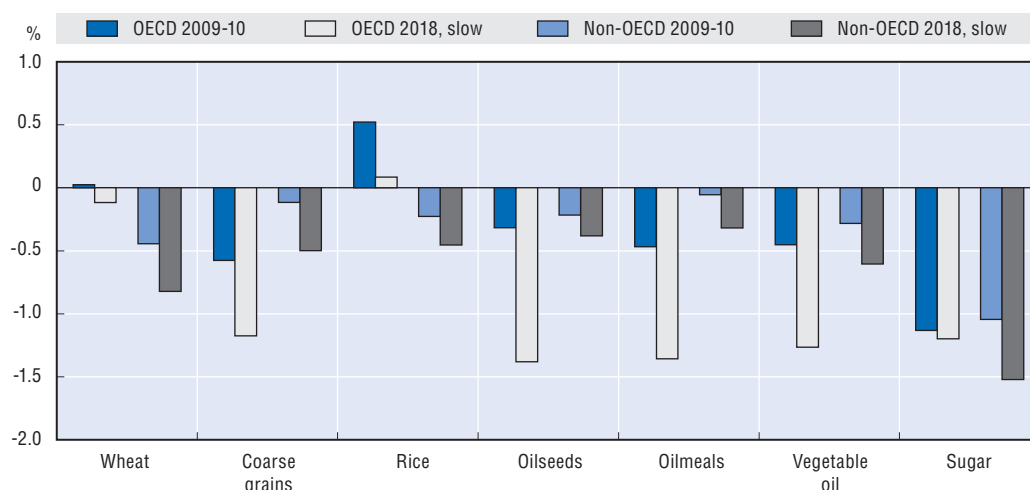
Crops affected moderately, but more than biofuels

As outlined above, food consumption of crops is much less income sensitive than that of livestock products, and so the consumption of food grains – wheat and, particularly, rice – changes very little. This is true for non-OECD regions, but even more so within the OECD area where rice use increases slightly with lower incomes. Income elasticities for vegetable oil products are higher than those for cereals in both developed and developing countries, and so vegetable oil use for food responds more significantly – while the use for the production of biofuels benefits slightly from lower vegetable oil prices. Feed grains are affected by the stronger impact on meat and dairy markets, and in fact feed use of both wheat and coarse grains shows a stronger response to lower incomes than the food use of these commodities. Sugar clearly represents the most income sensitive crop product, particularly in many developing countries, where it competes with HFCS in food and beverage preparations, and as a consequence sugar consumption both in the OECD and elsewhere declines by more than 1% relative to the baseline in the first two years, and by even more than that in later years, if GDP is persistently lower than in the baseline (Figure 2.4).

These impacts on crop consumption, while all relatively modest, tend to become more pronounced over time if GDP remains below baseline levels (slow recovery assumption), as production responds with lower output to the reduced incentives and price effects become smaller over time. If, in contrast, GDP is assumed to return to the baseline level (faster recovery scenario), both consumption and prices return to the levels projected in the baseline of this Outlook.

It is worth noting that the impact, particularly on wheat production, is also higher in OECD countries. This result is primarily due to the fact that yield responses are higher in developed compared to developing countries, since inputs use can be adjusted to affect yields. It is also a fact that price responsiveness in these countries is higher. Wheat production in the OECD area shows twice the supply response to the lower GDP slower

Figure 2.4. **Changes in consumption of crop products in OECD and non-OECD countries due to lower GDP, relative to baseline projections**



Note: "2009-10" and "2018, slow" refer to the average changes in 2009-10 (both "lower GDP – slow recovery" and "lower GDP – faster recovery" scenarios) and in 2018 ("lower GDP – slow recovery" scenario). See note to Figures 2.2 and 2.3 for more details.

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recovery scenario than does the non-OECD area. This higher responsiveness of supply in OECD countries was also demonstrated in response to the high grain prices of 2008.

Livestock products are more sensitive to lower incomes

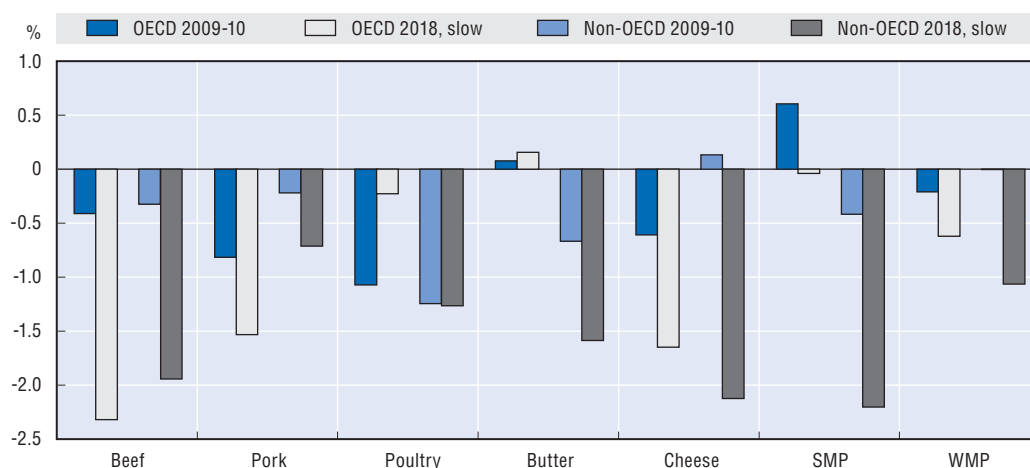
Compared to cereal and oilseed markets, livestock products are much more sensitive to changes in incomes, particularly in the short run, consistent with generally higher income elasticities for meat and dairy products and longer production processes for many of the livestock products. Within OECD countries, this is particularly true for beef, pork and cheese, whereas consumption of cheaper poultry meat shows only a small reduction. Similarly, the consumption of butter and milk powders changes very little in the OECD, due to low income responsiveness, but also significantly lower prices dampening the income response. In fact, the much lower butter prices tend to increase slightly OECD butter consumption.

Consumption particularly of dairy products is affected much more significantly outside the OECD area. Most notably, the strong impact of lower GDP over the entire projection period on international cheese and, particularly, butter markets under the slow recovery scenario stems to a large extent from a collapse of imports by the Russian Federation. Russia is the largest butter and cheese importer and the key player on international markets for these products, but GDP prospects have been revised strongly downwards for this country. Accordingly, consumption in Russia is heavily impacted and imports contract by three-quarters for butter and by half for cheese, resulting in significantly lower cheese and particularly butter prices. However, the design of the slow recovery scenario assumes a stable deviation of GDP below the baseline level after 2010 which may be considered rather pessimistic. This underlines the importance of economic developments for the dairy Outlook as income growth remains one of the key drivers underpinning international dairy markets.

Beef consumption, too, responds relatively strongly in non-OECD countries, given high income elasticities and a significant reduction in supplies in the longer run. In the initial years, the longer production cycle results in larger price changes than changes in production and consumption quantities. The much shorter production cycle particularly in poultry results in almost immediate production cuts, causing prices to fall significantly less than those for beef or even pork, and putting further pressure on poultry consumption in developing countries.

Consequently, prices for livestock products are affected more significantly than those for crops. Butter prices, in particular, fall by nearly 16% for 2009-10, and by 14% by 2018 in the slow recovery scenario, compared to the baseline projections. Price effects for other dairy products range from 5-7% lower in the short term, and 2-5% in the medium term, if lower income levels persist. Those for meat products are in a similar range with 4-9% lower prices in the short term, and 2-3% lower prices in the longer run.

Figure 2.5. **Changes in consumption of livestock products in OECD and non-OECD countries due to lower GDP, relative to baseline projections**



Note: "2009-10" and "2018, slow" refer to the average changes in 2009-10 (both "lower GDP – slow recovery" and "lower GDP – faster recovery" scenarios) and in 2018 ("lower GDP – slow recovery" scenario). See note to Figures 2.2 and 2.3 for more details.

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Conclusions

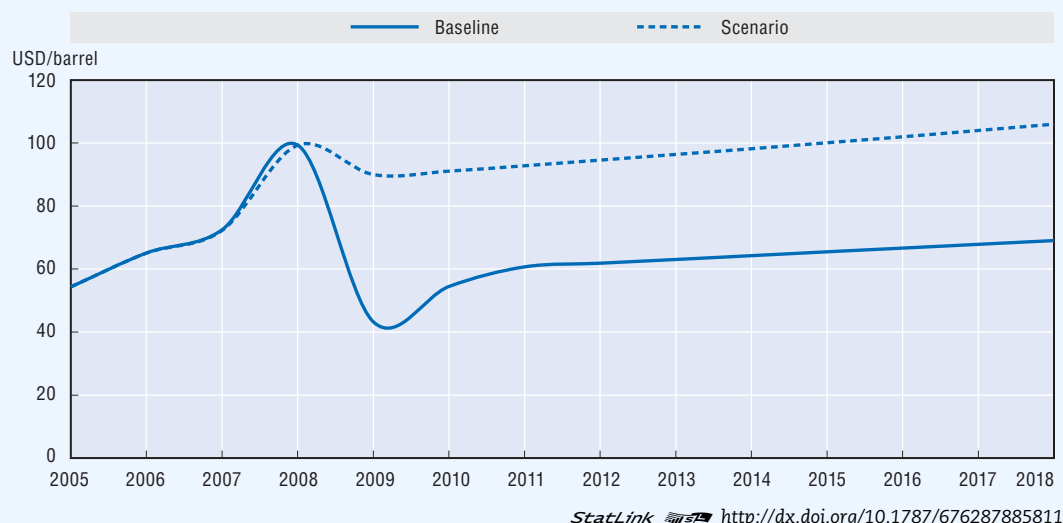
A critical concern in relation to a deeper and longer lasting recession is that of food security, an issue for which the situation in cereals markets is a key factor, particularly for the lower income and poorer developing countries. Low incomes imply less ability to afford purchases of basic needs such as food, expenditures which represent a large proportion of disposable incomes in these countries. It is difficult, with the modelling tools available, to address the full implications for food security of a deeper and longer lasting recession, since economic cycles/recessions have differential impacts across the income distribution of the population. Evidence suggests that the incomes of the poor are disproportionately affected by recession – implying substantial effects on the well-being of certain population groups, although less so on markets.

Box 2.1. The sensitivity of the projections to changes in oil prices

The strong decline in crude oil (and energy) prices as observed particularly during the second half of 2008 constitutes another highly relevant element of the analysis for agriculture, and something that is, at least partly, directly linked to the crisis: as growth in economies declines and indeed economic output shrinks in a number of countries, energy consumption, in general, and crude oil use in particular, decline, putting downward pressure on oil prices. A downward correction seemed likely after prices peaked at more than USD 147 per barrel in July 2008, but this has now been overtaken by events of the unfolding economic crisis. In terms of analysing the sensitivity of the projections to changes in key assumptions, changes in oil prices affect both agricultural production and consumption decisions. It is, therefore, pertinent to examine the sensitivity of the commodity projections to alternative oil price expectations, as discussed in this box.

In order to allow for a quantitative assessment, a scenario has been designed for comparison with the baseline projections based on changing the oil price assumption to the higher level used in last years' report i.e. the 2008 edition of the *OECD-FAO Agricultural Outlook*. At that time, the oil price was assumed to grow from USD 90 per barrel in 2008 to USD 104 in 2018, as represented in Figure 2.6.

Figure 2.6. Baseline and alternative assumptions for crude oil prices



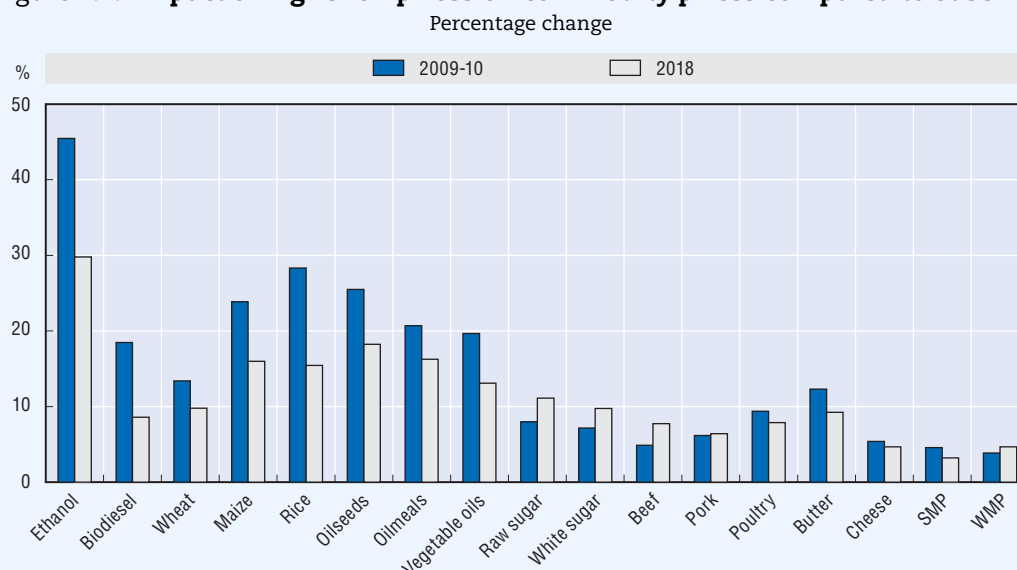
As in the case of the income scenarios, a number of caveats are appropriate. First, as the model implicitly assumes transport fuel consumption to be unresponsive to price changes, in most cases, the simulated impact of changes in the oil prices is likely to underestimate the actual impact on biofuel consumption based on total fuel use – except where the latter is fixed by quantitative mandates. Second, higher oil prices themselves have an impact on economic growth, and, as in the case of the income scenario, this impact cannot be captured with the existing modelling tool. Finally, as for many other models, the Aglink-Cosimo results of a major shock such as the doubling of oil prices in the early years of the projection, or even an increase by 50% towards the end of the simulation period, obviously need to be interpreted with care. As a consequence, the results of this partial analysis should be read as indicative only.

As is evident from Figure 2.7, the impacts found in this analysis are much larger than those for lower incomes – this is due to both the relative size of the shock and the importance of the different factors on agricultural markets. Another result that becomes clear from Figure 2.7 when compared with Figures 2.2 and 2.3 is that crop prices show a significantly higher sensitivity to oil price changes

Box 2.1. The sensitivity of the projections to changes in oil prices (cont.)

compared to livestock products, while the opposite was true for GDP shocks. Given the high energy share in total production costs particularly for crops through fertiliser, chemicals and fuel prices, energy prices have long influenced the supply side of agricultural markets. With the emerging biofuel sector, an additional link is strengthening through the demand for biofuel feedstock commodities, particularly for cereals, vegetable oils and sugar, but indirectly also for other crops competing for the same land. Due to the increasingly mandate-driven dynamics of the biofuel sectors of many countries, however, this element is less pronounced than would be the case under more market-driven conditions.

Figure 2.7. **Impact of higher oil prices on commodity prices compared to baseline**



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Many biofuel mandates are less binding in the early years than towards the end of the Outlook. While higher oil prices would result in global ethanol and biodiesel use to be about 10% and 20% higher than in the baseline, respectively, this effect becomes very small in 2018. The consumption impact for ethanol – less bound by mandates than biodiesel on a global level – is further dampened by significantly higher ethanol prices. The impact on ethanol prices is roughly half the change in crude oil prices

Despite higher biofuel use and production particularly in the short-term, the major link driving up crop prices remains production costs. With much higher crude oil prices, all crop prices would follow substantially different paths than in the current baseline over the projection period to 2018. The growing importance of binding mandates, together with the fact that the changes in oil prices are larger at the beginning than towards the end of the simulation period, results in many of the price effects being smaller in the longer term (+10% – +18% for cereals and oilseeds) than in the short term (+13% – +28%). The reverse is the case for sugar where production adjustments with perennial crops take longer to work through and amount to 10-11% by 2018 (Figure 2.7). Generally speaking, higher oil prices would mainly result in lower crop production because of their impact on production cost, and then reallocate from food to fuel production. Both these effects result in lower food consumption of basic agricultural commodities.

Box 2.1. The sensitivity of the projections to changes in oil prices (cont.)

In general, the impact of a higher crude oil price on the livestock sector is much smaller than for crops. The oil price affects livestock markets through both higher cost of energy use especially for energy and capital intensive production systems as found, for example, in poultry production, and through the impact on feed ingredient costs. On the other hand, the higher cost of feedstuffs is to a certain extent mitigated by increased availability of distilled dry grains (DDGs) a by-product of bioethanol production.

The increased cost of meat production results in reduced global meat production. Generally, the decrease of production is rather small, not exceeding 3.5% in any of the years of the projection period and for each of the different meat types. The largest impact is on the energy and feed intensive poultry sector (2-3% reduction in output compared to the baseline), and small for the less energy and feed intensive ruminant sector (0-1.5% reduction compared to the baseline). Global milk production declines more in the near term years due to lower milk yields, whereas the reductions in following years are increasingly attributable to lower cow inventories.

The decline in production translates into increased world market prices for meat and dairy. The changes in world prices, however, are quite modest. These are, on average between 4% and 7% higher in any of the years of the Outlook than in the baseline projections. In the case of butter, the price is higher in the range of 16% (in the early years) to 9% (at the end of the Outlook) underpinned by higher vegetable oil prices which are themselves propelled by higher crude oil prices and biodiesel production.

Effects of the financial crisis on the agri-food sector: views from industry players²

The previous section focussed on the sensitivity of the baseline projections to lower income growth in two stylised scenarios: real income declines and higher oil prices. This section examines in more detail some of the broader issues arising from the financial crisis, such as credit constraints on domestic and international trade, as well as the consequences of income declines on demand and prices. Furthermore, it takes a wider approach in terms of activities covered by including both the upstream and downstream sectors of the agri-food chain.

Over the past decades, the agri-food chain has become not only more globalised through international trade, as it sources and sells across the globe, but also more integrated into the modern financial system. Consequently, it is more subject to the exogenous fluctuations originating in the macro-economy. Impacts on the specific parts of the agri-food sector have now come to depend on the strength and depth of its linkages to the financial system and the global economy.

Surveying industry views on the impacts of the financial crisis

At present, there is very limited data available to assess the impacts of financial crisis on the agro food sector. To fill – even if only partially – this information gap, the OECD Secretariat carried out structured interviews with over 45 firms/professional associations for the different activities along the agri-food chain as well as with banks dealing with trade finance and agriculture. This information was supplemented with information from publicly available annual reports, newsletters from firms and government websites. Attempts were made to interview players from as many different geographic areas, sub-sectors and activities as possible.³ The questions asked of participants focussed on the

effects of the economic downturn, indirect or direct credit constraints as well as specific questions on trade and trade credit impacts of the financial crisis. Interviews with banks provided insights into credit allocation behaviour. Results should be considered as simply indicative of present tendencies and not necessarily applicable to all agri-food sectors in all OECD or non-OECD countries.

Impacts on the agricultural input industry

Demand for agro-chemicals is expected to remain weak at least through the first half 2009 and then pick up through 2010, according to the multinational input supplier firms interviewed. This could indicate a loss of confidence by farmers in future earnings as these types of inputs tend to move with expected returns. The primary cause for the decline in sales is the global downturn and not farm credit availability. The International Fertilizer Association (IFA) expected demand to remain weak through early 2009. For the current crop year demand is expected to be down by 2.2%.⁴

Access to credit was also not seen as an obstacle to equipment purchases in North America according to the Association of Equipment Manufacturers (AEM) survey, of 2009. Sales have however declined by 24.9% in the US and 9.7% in Canada, in a year-on-year basis as of February 2009.⁵ This is a significant change from the double-digit sales increases over the past two years. In those years, sales were fuelled by increased commodity prices and rising net farm incomes, which have now reversed.

Taking a more global perspective on sales, specific firms have seen sales fall in certain non-OECD markets due in part to the tightening in the access to credit. Importing firms are curtailing, delaying and cancelling orders to deal with credit limitations, whenever this is feasible. This has been the case in Argentina and Brazil where orders have been cancelled due to reported credit constraints. For instance, a major agricultural machinery manufacturer, AGCO, expects sales in Brazil to be 20-30% lower this year, due to tight credit and a weaker local currency making imports more expensive.⁶ It is difficult to disentangle which sales changes are due to changed economic conditions or credit constraints, which were important for countries like Brazil in late 2008.

Impacts on farmers

Downturn in farmer confidence

Recent rural confidence surveys conducted by the Rabobank, for the United States, Australia and New Zealand, indicate that farmer confidence has deteriorated over the past year and even in the recent quarter reflecting the continued deterioration of the global economy and commodity prospects. The future negative impact of the global financial crisis rather than a reflection of own experience appears to dominate sentiment. About 58% of Australian and 29% of New Zealand respondents judged that the worsening of overseas markets and economies would have serious impacts on future sales and incomes via both lower prices and their volatility as demand dampens. In both countries, farmers are streamlining operations and finding cost cutting solutions to deal with the new conditions. Credit availability was not considered to be a significant cause of concern in either Australia or New Zealand.

In the US, survey results suggest that over two-thirds of farmers, regardless of region, revenue group or farm size, expect a decline in incomes for 2009. This is in part due to global economic conditions placing downward pressure on commodity prices. In response,

farmers are adjusting behaviours in terms of investments and about half have now implemented, or plan to invest in, risk management or marketing strategies. Even in terms of machinery purchases, there appears to be an increase in purchases of used machinery, though this market has also softened of late.

Farm credit situation

According to farmer/co-operative associations, in Western Europe in particular, there appears to be little or no impact of the financial crisis on credit availability to the sector, given its generally low debt situation. However, conditions of access to credit are becoming tighter as in other sectors. This is evidenced through increased demands for additional collateral, more limited repayment periods and/or increased financing costs. Most credit to agriculture is provided to meet operating expenses due to the lag between planting, harvest and final sales.

In the US, credit availability is on trend with other years. However a most significant development in the first quarter of 2009 has been the increased demand for short-term finance for operating expenses, which corresponds to periods of declining prices and incomes as cash-flow falls (Board of the Governors Federal Reserve, 2009). In addition there have been some signs of increasing delinquency rates and charge-offs on agricultural loans implying an erosion of loan quality (Henderson, 2009).⁷ The recession is now beginning to generate a number of concerns in the banking sector with respect to loan availability, costs of funds and creditworthiness of borrowers and is leading to increased collateral requirements and reduced loan maturities (Henderson, 2009). This is all the more so the case as farmland values are the main source of collateral and these started to decline in the fourth quarter of 2008. If the recession lingers and agricultural prices weaken further, asset values such as land may begin to decline, and the credit markets for agriculture tighten further.

For many EU countries no significant declines in credit availability were signalled as of the fourth quarter of 2008. According to farm co-operative associations such as Copa-Cogeca in Europe as well as those of individual countries, credit conditions for the agriculture sector are relatively robust, compared to other sectors of the economy. Producers in most major agricultural co-operatives have no difficulty in obtaining bank credit at least for domestic activities. In this case, legal contracts using output as collateral back up the funding arrangements. This is because it is easy, relatively speaking, to recoup funding or the product when the contracts are between firms in the same country. Collateral requirements have been increasing and standards for allocating credit have however tightened substantially since the beginning of the year. This evaluation needs to be nuanced by country and by sector situations, as there may be substantial variations among them. Due to the tight credit situation, many agri-co-operatives are putting a hold on investments in additional processing and storage facilities. Though no figures were given, the changes in decisions were noted to be substantial. Banks were often judged to be overly cautious some of the respondents suggested. This confirms what banks themselves say about their credit allocation decisions – avoid or minimise risk.

Agricultural Policies in OECD Countries: Monitoring and Evaluation 2009 suggests that regardless of the evolution of the volume of credit to the agri-food sector, lenders are expected to require higher levels of collateral for a given loan. However, for the moment the view held is “there are good reasons to argue that the agricultural sector in most OECD

countries is in a good position to confront this crisis, both relative to the past and relative to other sectors", (OECD, 2009b).

Non-OECD perspectives

According to producer associations, traders and banks in Argentina, credit availability for cereals, oilseeds and wine is not an issue as in general the industries self-finance their operations. However, due to low prices and conflicts over government policies, traders as well as certain downstream agri-food firms are experiencing difficulties in acquiring necessary inputs since farmers are reluctant to sell their output and only as needed to meet expenses. Credit constraints are, however, severe in the dairy sector and this is having serious financial consequences on firms. It is unclear whether this is a direct consequence of the global financial crisis.

Last fall, tight credit for farmers in Brazil forced the government to step in to ensure that funds were available for the planting season, even though only about a third of agricultural credit originates from banks. The government increased the amount of demand deposits that banks must lend to the agricultural sector from 25-30%, temporarily.

In Chile, the fruit producer associations do not have credit availability problems at present. However, there is much uncertainty and concern for future demand given the economic recession in their principal trading partners, the EU and the US. A similar situation was reported by some producer groups in South Africa.

In most developing countries the use of bank loans in agriculture is not common. When loans are given they are for very limited time periods with strict selection criteria. In certain regions, loans from input suppliers and traders are used by small and medium farmers. However, if input suppliers are also relying on credit, a tightening of their financing will assuredly affect those to whom they are selling/lending.

In the East Africa region, for countries such as Tanzania, Rwanda, Zambia and Mozambique, the financial crisis has not generated any notable liquidity constraints. Most financial institutions are savings banks and these give few loans to the private sector, preferring to lend to government agencies and institutions. Banks give loans to farmers after harvest via warehouse receipts which permit farmers to better manage the sales of their crops.

Bankers' views

Some bankers were suggesting that an important consequence of the financial crisis will be a structural change in bank lending, be it for trade or other investment purposes. Greater emphasis will be placed on income statements and repayment capacity and the extent to which firms are leveraged, as well as the market risks of their main sector operations. For many firms, the effects of these changes will only begin to be seen in the coming months as loans come due and renewals under stricter criteria are applied.

Interviews with major banks involved in trade finance found that credit was being allocated in a more selective manner as market risks rise. For instance, no new clients are being taken on unless these are subsidiaries of existing clients, and an increased level of collateral is required for loans for all. Even the very big firms/traders with longstanding large credit lines are now subject to increased pressures as credit lines are subject to greater cost or collateral variations, even on a day-to-day basis. In addition, the costs of credit are rising and several layers of credit guarantees may be required for any loan.

Though higher pricing can in part take this into account, some banks appeared more risk averse than others with respect to certain elements, such as institutional and country risk. These risks appear to have risen in importance after recent bank failures in OECD countries.

Another problem arises when destination countries for exports have weak legal systems. In these cases, it is often difficult or impossible to obtain compensation or even make claims, making the risk too high in spite of higher fees. In certain cases, banks are extremely reticent about credit lines for specific export destinations, such as Ukraine, Russia and certain Baltic countries. It is not known whether this is a sectoral issue particular to the agri-food trade or a more widespread one affecting all trade with these countries. For certain emerging and developing countries, the constraint is exacerbated due to lack of support from their own credit institutions and the inability to move successfully in the sea of trade finance documentation. In a context of weakened economic growth and financial turmoil, banks are shying away from all but the most secure transactions to avoid adding risk to their balance sheets. Again, not all banks approach trade finance the same way but the trends are clear; more collateral/own equity and additional required documented guarantees both for the importer and exporter so that the final transaction may have several layers of guarantees.

Firm reputation is a basic ingredient for any credit evaluation, and thus in many instances small firms are reported to have no more difficulty obtaining credit than large ones. However, in a recent bank survey by the IMF and Bankers Association for Finance and Trade (BAFT) on private sector credit developments for trade, indicated that as costs of trade credit are rising the demand for trade credit by small firms may be reduced [Dorsey, 2009]. The same survey found that in commodity trade both country risk and the type of trade coupled with fluctuating prices and long shipping times, has meant that banks are now shying away from these operations.

Agri-food trade

From this preliminary analysis and anecdotal evidence it appears that trade credit constraints are affecting the agri-food sector and, in a number of instances, quite severely. Difficulties in obtaining trade credit/finance for transactions between non-OECD and OECD countries is frequently reported, such as for Russia and Ukraine. However, even transactions between OECD countries and within the EU and within a given country are experiencing credit access difficulties. In part this is due to the general lack of confidence and increased caution on the part of credit providers which the present financial turmoil has generated.

For firms that rely on exports of bulk commodities or semi-processed products for most of their earnings, the trade credit issue is considered critical. With risk perceptions in a state of flux due to the market turmoil, demanding counterparty guarantees are now required of importers and exporters and this is increasing transaction costs and reducing trading opportunities. Risk for a given transaction is now not only a function of a firm's credit worthiness but also of exchange rate and institutional risk, a belief confirmed by bankers' responses. Exchange rate risk is of course a risk firms and traders must bear, but it may affect the banks evaluation of the value of a transaction. While secondary markets for these risks exist, the recent financial market turmoil and extreme exchange rate volatility has, to a large extent, dried up their liquidity. Thus, as banks do not wish to add risky products to their balance sheets, trade credit is simply more selectively allocated.

This was noted by exporters whose traditional markets are now considered more risky destinations. In some instances, exports must now be on a cash basis or not take place at all. This restructuring of credit allocation may also imply that the traditional role of traders with private information on different trading partner credit worthiness will again become important.

Firms which cannot get some ingredients may be forced to shut down temporarily or even exit their business. It has been reported by importers that existing credit line guarantees have increased to an extent that it is literally impossible to import goods. For instance, the inability to access credit for imports has blocked production by agri-food processing firms in a number of African countries, even though the firms are financially sound. And similar experiences were noted by certain medium-sized African supermarkets in sourcing from European suppliers.

On the export side, one co-operative from Denmark expressed strong concern that trade in dairy and pork exports was being held up due to lack of trade finance in importing countries due to the countries' exchange rate and institutional risks. Tightening of trade credit conditions and availability was felt to be curtailing not only their export potential but also actual export activity, so much so that some even allude to the possibility of having to exit the sector completely. For many small and medium sized firms even export credit insurance has dried up in the present economic context. Difficulty in obtaining export credit guarantees has led to a decline in sales particularly to specific trading partners and already risks the economic viability of the firm.

Impacts on food manufacturers

All multinational food firms interviewed did very well in 2008 in spite of weaker earnings towards the end of 2008. Most expected this weakening to continue in the first part of 2009 as income continues to decline and pricing strategies come under pressure. Maintaining market share when price becomes a much more significant determinant of purchases than previously, was seen as critical to coming out of the recession with limited damage to the balance sheet and brand. This has motivated firms to develop product lines that meet consumers' new demand for higher value.

The most severe impacts of tighter credit, along with a decline in demand were noted by the food manufacturing sector. Due to the structural characteristics of the sector, with many small and medium sized firms, they often have difficulty in obtaining bank credit due to their low levels of equity and liquidity. This situation may force already financially fragile firms to exit, generating further economic consequences. In an internal survey of major European food manufacturing association, 40% of the firms were affected by the downturn, of which 70% were small and medium sized. Over 30% reported that financial guarantees for loans had become a constraint and new credit was increasingly difficult to obtain. However, for the financially robust firms there were no credit reductions.

The financing of transactions between firms, as noted previously, remains an issue even within a country. This was noted in the UK, where a firm's production can be blocked due to inability to obtain inputs – raw or processed – due to credit constraints. Several firms in other countries, such as Belgium, Italy and Spain, reported similar difficulties. This situation is likely due to the lack of trust and uncertainty now dominating any form of credit transactions and should prove a temporary disruption. Once the balance sheets of firms or their financial conditions are known, more normal trading conditions should

ensue. Banks can then provide needed credit to the financially sound firms, enabling sales and purchases to flow again, even if they are likely to be more rigorous in their evaluation of balance sheets and thus more selective in credit allocation.

A more rigorous evaluation of a firm's financial standing may mean that highly leveraged firms may have difficulties in renewing loans. New firms, without reputable credit histories, may have to meet much tougher standards in terms of greater collateral, higher cost and shorter repayment periods than was previously the case. This could have implications for the structure of the sector, but it is too early to identify or even speculate on what adjustments may be forthcoming.

Impacts on the food retailing and food service sectors

Both food retailers and food service firms/restaurants in the OECD area are being affected by the economic recession as consumers reduce spending and reallocate expenditures across food products and services. This is increasing competition among firms as they attempt to maintain market shares.

Retailers have observed a move by consumers toward the purchase of lower priced products that offer almost equivalent product attributes. Retailers' private label products have benefited from a greater cost consciousness among consumers. This trend began over a decade ago and may only be accelerating due to the recession. While certain branded product categories remain strong, a number of brand name manufacturers have also begun to modify their offerings in response to consumers' price concerns. While quality continues to matter to consumers they appear to be making more trade-offs among product attributes as they reduce total spending.

Restaurant meals are generally thought of as a discretionary expenditure. In France, Italy, the UK and Australia, reductions are expected in away from home meals. In the US, according to the restaurant association, there has been a small decline in expenditures in real terms, but market shares are shifting towards full service family and fast food chains, to the detriment of upmarket restaurants.

Summing up

Players in the agri-food sector, are experiencing both demand and credit effects of the financial market turmoil, though the intensity varies across activities along the chain. In general, the agri-food sector is considered to be more resilient than others, but risks may intensify should the financial crisis and recession be prolonged. Trade credit availability was a significant problem for manufacturers, processors and producer cooperatives involved in trade.

Agricultural firms and producers in the OECD area generally expect a worsening of future sales prospects and prices over the near term, due to the deteriorating global economic conditions and sharp fall in trade. Firms that are more capital intensive and rely more heavily on external finance could be more seriously affected if the recession in the OECD area and general economic downturn elsewhere is both deeper and its duration prolonged. While credit availability for farmers in most OECD countries is not yet constrained as their financial situation coming into the outlook has been buoyed by high commodity prices, despite rising input costs in the past two years, there is a reported tightening of credit standards, increased collateral demands and shorter repayment periods by banks.

Though demand in the downstream industries is slowing somewhat, most firms consider that demand for their agri-food products will be less affected than that for products in the non-food sector. Tighter access to credit was signalled by most firms in the downstream portion of the sector as an emerging problem. Credit conditions are generally perceived to be deteriorating and in many cases restricted access to credit is creating blockages along the chain which is limiting the ability to source raw materials or to move products through different stages of production. But this may be a temporary situation until firms' balance sheets positions are known and interbank lending and transactions recover.

Since credit allocation by banks relies heavily on an evaluation of the firm's ability to repay the loan, small and medium sized firms are reported to be experiencing the greatest difficulty in getting credit due to their limited equity. Highly leveraged large firms may also now be under greater scrutiny. It is too early to fully understand the implications of changing risk evaluations in credit allocations for the food sector.

Regardless of the position in the food chain, firms involved in trade, either imports, exports or both, repeatedly and emphatically listed trade finance constraints as the most binding to their business, due to its impacts on sales. Indeed, trade finance constraints may be exacerbating any downfall in demand and may be putting in peril the economic viability of firms. In a world of global supply chains and distribution systems such constraints may be a determinate factor for the financially fragile firm's survival in the short run. If credit constraints, which affect small and medium firms more severely than larger firms, persist they stimulate structural changes in the industry composition as well as in firms themselves.

The foregoing analyses of the financial crisis effects on the agri-food sector have reflected the short-term consequences of the credit constraints and of the economic downturn. However, recovery in GDP growth rates and international trade expected in 2010 and continuing thereafter through the projection period, should generate a more favourable economic environment for agri-food firms in terms of demand. In addition, if as expected the present tight credit situation loosens as the banking sector resolves its balance sheet issues and resumes lending, then firm activity should pick up both domestically and in terms of international trade. It is, however, likely that the financial crisis will have generated structural changes in credit allocation strategies reflecting a different view of risk taking than before. This may increase required assurances in all lending transactions as has already been indicated by bankers. Over the medium term firms may need to learn to re-adapt business strategies to this evolving credit environment.

Agricultural futures markets and speculative activity

Another consequence of the financial market turmoil over the past 18 months has been the significant decrease in equity market values, which some suspect has affected the futures market activity of the large long traders. Last year's *Outlook* signalled an increased use of futures markets by non-commercial traders, compared to previous periods, with a rise in total contract volumes and their share of contracts. As volumes have declined, the shares of non-commercial open interest long contracts have also fallen except for sugar (Table 2.1). The share of index trader contracts (long) with respect to combined futures and options contracts has, however, increased for maize, wheat and soybeans.

Table 2.1. Futures market activity: Total volume of open interest contracts and distribution over commercial and non-commercial traders^{a, b, c}
(Chicago Board of Trade and New York Board of Trade)

Futures	Corn	Wheat	Soybean	Sugar Futures
Total open interest				
2005	657 417	222 752	272 127	400 084
2008	1 452 992	449 237	596 447	979 085
2009	812 240	305 491	322 897	660 712
% Commercial				
2005	61.6	55.4	59.5	43.8
2008	45.6	48.6	42.9	55.5
2009	50.0	48.0	47.0	50.5
% Non-commercial				
2005	16.9	28.0	19.9	34.8
2008	43.2	42.3	46	33.7
2009	36.2	42.8	39.9	37.4
% index traders –long				
2008	20.2	36.2	23.9	31.1
2009	21.7	40.6	24.9	24.0

a) Commodities Futures Trading Commission (CFTC), www.cftc.gov, *Commitments of traders Long Report*: 25/03/2005, 25/03/2008, 24/03/2009 for total open interest contract volume, and % of commercial and non-commercial long contracts.

b) CFTC, *Commitments of traders, futures and options combined, supplemental report*, 25/03/08, 24/03/2009 for index-trader positions.

c) CFTC, *Commitmentsof Traders, NYBOT*, 25/03/05, 25/03/08, 24/03/09 for Sugar.

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The role of speculators in futures markets has gained renewed interest in political circles.⁸ Frequently questions arise as to whether or not there might be excess speculation in these markets and, if so, can it affect market prices.

Some observers contend that increased participation by speculators in futures markets has increased so markedly in recent years, that it is now excessive and could be a cause of the very recent price gyrations experienced in basic food commodity markets. However it is also probable that their increase reflects expected profit opportunities that originate in the commodity market fundamentals themselves and are signalled to them by hedger activity. Simply put, the increase in speculative activity is due to expected changes in market fundamentals and not *vice versa* (Working, 1960; Irwin *et al.*, 2008; Sanders *et al.*; 2008, Irwin 2009).

Does the increase in the number of non-commercial long contracts imply that there is excess speculation? Futures markets are mainly hedging markets, thus there would be unnecessary or excess speculation if the contract volume held by speculators exceeded the amount necessary to meet hedging needs of commercial traders (hedgers). Workings' T-statistic is used to calculate the excess speculation in futures markets from data provided in the official COT (Commitment of Traders) reports of the CFTC (Commodity Futures Trading Commission, www.CFTC.gov).⁹ A value of 1 for the T-statistic would indicate that speculative activity was the minimum necessary to meet needs of hedgers' activities, both long and short. Values above 1 indicate an excess of speculation, but as noted by Working, this technical excess is economically necessary for a well-functioning market (Sanders *et al.*, 2008). From previous studies, including some dating from the 1950s and 1970s through to 2008, the value of this indicator statistic has ranged from 1.05 to 1.89 for a variety of commodities (Working, 1960; Peck, 1982; Leuthold, 1983; Sanders *et al.*,

2008). These values were obtained before the entry of large non-commercial long traders, such as index traders.¹⁰

Working's T-statistic is calculated from 1-1998 through 3-2009 for wheat-CBOT, corn, soybeans, sugar and crude oil and results are shown in Table 2.2. They are all in excess of 1 but appear to be in line with previous periods as well as findings of other research (Sanders, 2008). A maximum value of 1.27 is found for wheat, but for the period 1998-2002 before the entry of large speculative traders. A closer look at the values indicates that during the recent commodity price increase, 2006-08, this indicator was lower than in the 1998-2002 period.¹¹ Values calculated for each year also find that they are lower in the recent 5-year period than in the previous one. It does not appear that speculation has been excessive in the markets examined given available data and Working's statistic.¹²

Table 2.2. **Working's T-statistic as a measure of excess speculation^a**

Time period	Corn	Crude oil	Soybeans	Sugar	Wheat
1998-2009	1.13	1.08	1.14	1.08	1.23
1998-2002	1.13	1.04	1.15	1.07	1.27
2002-2009	1.13	1.10	1.13	1.09	1.20
2006-2008	1.11	1.12	1.13	1.10	1.20

a) $T = 1 + (SS/HS+HL)$ if $HS \geq HL$ and $1 + SL/(HS + HL)$ if $HS < HL$, SS = Short Speculators, SL = Long speculators
HL = Long Hedgers, HS = Short Hedgers,

Source: OECD Secretariat.

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Some observers do suggest that speculators were responsible in part for recent price rises and not simply to underlying market fundamentals (Robles et al., 2009, Masters, 2008). There is almost no evidence that speculative positions in futures markets directly affect prices, though some have found some evidence over specific intervals for certain commodities. Very preliminary in-house econometric analysis also does not indicate any statistical link between speculators positions and spot prices. Other recent studies have found mixed results on directions of causation (EU, 2008). The topic certainly merits further research to avoid *a priori* judgements in any policy decisions regarding the operation of these markets.

Notes

1. It is interesting to note that while the deteriorated economic prospects should result in lower prices for crude oil prices due to declining energy demand, quotations have actually increased during the first three months of 2009. It is thus obvious that economic growth and prospects, although important, are far from being the only determinant in the price equation for crude oil. Assessing the impact of lower incomes on energy markets would go far beyond the scope of this report.
2. In this survey agri-food refers to the entire agri-food chain from inputs to retail sales.
3. The non-OECD countries included Argentina, Brazil, Chile, South Africa, Ghana and Kenya.
4. According to the IFA declines in crop prices have their greatest impact on potash and phosphates fertiliser whose demand is expected to fall by 4.7% and 8.5% respectively, while nitrogen demand should rise by half a percent.
5. The Association of Equipment Manufacturers (AEM) includes over 800 manufacturers of agricultural and construction equipment in North America and includes foreign firm branches. Data from Ag Flash Reports- retail sales, February 2009, % changes are calculated on a yearly basis. For detailed survey results see: www.aem.com.

6. Brazil Ag Machinery Sales Slow in January, Kieran Gartain, DTN, 11 February, 2009.
7. Delinquency rates on agricultural loans climbed steadily in 2008, rising by 30% during the year. www.federalreserve.gov/releases/charge-off/.
8. Speculators are defined as non-commercial traders, that is, those who enter the market without having an underlying risk position associated with futures. Since there are limits on the non-commercial trades, commercial traders have no interest in being classified as non-commercial and thus the non-commercial category can be considered as those not having any underlying risk to hedge. The debate focuses on the commercial definition which might include some form of underlying financial risk unrelated to commodities.
9. Details on data assumptions and method are available from the OECD Secretariat.
10. There are no statistical criteria to determine different degrees of excess speculation.
11. The calculation of the T statistic relies on the accuracy of the classification of traders in the COT reports and has been discussed both at present in the past by researchers. A trader is commercial if he using the futures market to hedge an underlying product. However the entry into the futures markets by banks/financial operators who operate to hedge against their 'underlying swaps' or OTCs or indices are non-commercial traders.
12. For further information on calculations and results see the website www.agr-outlook.org.

References

- Board of Governors of the Federal Reserve System, (2009), *Agricultural Finance Databook*, E. 15 (125).
- Dorsey, T. (2009), *Survey of private credit by banks*, March 2009, IMF.
- European Union (2008), "Monitoring Price Developments", Commission Staff working document, SEC(2008)2970.
- Henderson, Jason (2009), "Agricultural Credit Conditions", report to the Subcommittee on General Farm Commodities and Risk Management, US House of Representatives, April 1.
- Irwin, S., D. Sanders and R. Merrin (2009), "Devil or Angel? The Role of Speculation in the Recent Commodity Price Boom (and Bust)", Invited paper Southern Agricultural Economics Association Meetings, Atlanta, Ga., 2009.
- Leuthold, R.M. (1983), "Commercial Use and Speculative Measures of Livestock Commodity Futures Markets", *Journal of Futures Markets* 3: 113-35.
- Masters, M. (2008), Testimony before the Committee on Homeland Security and Government Affairs, US Senate, May.
- OECD (2009a), *General Assessment of the Macroeconomic Situation*, OECD, March 31, 2009.
- OECD (forthcoming (a)), *Agricultural Policies in OECD Countries: Monitoring and Evaluation Report 2009*.
- Peck, A., (1982), "Estimations of Hedging and Speculative Positions in Futures Markets Revisited", *Food Research Institute Studies*, Vol. XVIII-2.
- Sanders, D., S. Irwin and R. Merrin, (2008) "The Adequacy of Speculation in Agricultural Futures Markets: Too Much of a Good Thing?", *Marketing and Outlook Research Report 2008-02*, Dept. of Agricultural and Consumer Economics, University of Illinois. Urbana-Champaign.
- Working, H. (1960), "Speculation on Hedging Markets", *Food Research Institute Studies*, Vol. I-1: 3-31.

Chapter 3

Can Agriculture Meet the Growing Demand for Food?

There is unprecedented international interest in the issue of food security. This is not surprising given the total number of undernourished people in the world reached 963 million in 2008, nearly 15% of the world's population. The World Bank's 2008 World Development Report launched this revival by calling for greater investment in agriculture in developing countries if the goals of halving extreme poverty and hunger by 2015 are to be realised. An FAO conference in 2008 stressed that food security was one of the biggest challenges of the century, noting that increased agricultural investment and enhanced productivity was crucial. The 2008 G-8 Summit in Japan called on agricultural ministers to draw up concrete proposals on world food security and a UN Task Force on Global Food Security was set up to promote a unified approach to emergency relief and renewed investment in agriculture.

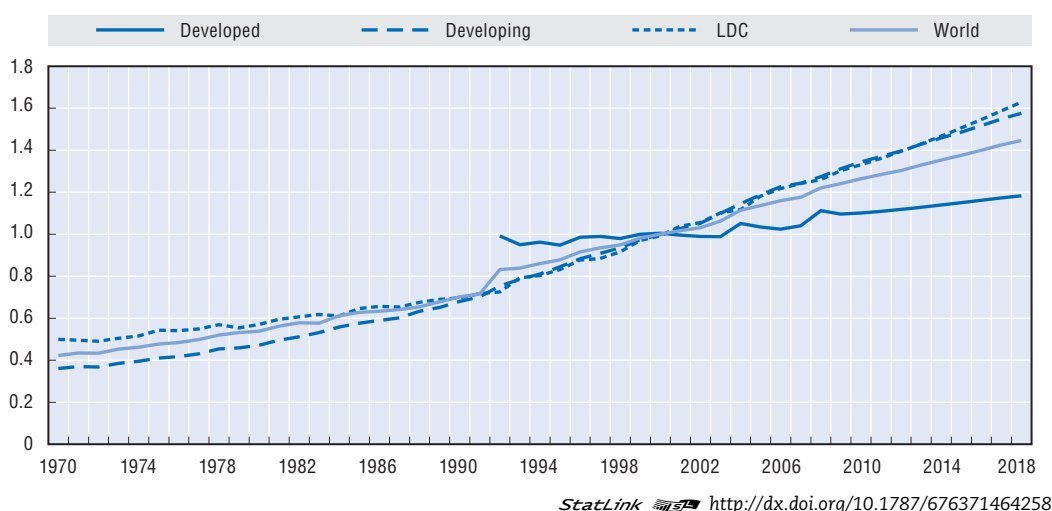
Concerns have not diminished with the return to lower commodity prices after the highs of 2006-08. In the first half of 2009, a high-level meeting on food security was held in Madrid at which OECD countries met to reassess donor responses. The OECD and FAO also brought experts together in Paris to advance the debate on some of the longer term issues relating to agricultural investment, and to address the challenges faced by many poor countries in promoting growth and poverty reduction as their economies transform. While the emphasis by participants differed, it became clear that the remedy for food insecurity needs to combine strategies to both increase investment in agriculture and reduce poverty.

The first G-8 Farming Summit was held in April, where Ministers of Agriculture of the G-8 countries confirmed that agriculture and food security are at the core of the international agenda, while calling for enhanced investment to improve agricultural productivity and expand production as a way to combat world hunger. The G-8 Ministers' Declaration to world leaders also made reference to the need to reduce poverty, to help farmers manage risk and to sustain the benefits of globalisation and open markets.¹ An UN-backed proposal for another world summit on food security in late 2009 is gaining support. The FAO has a major programme of work underway on feeding the world in 2050, which is looking at available resources, technological challenges, investment needs and policy approaches.

An underlying concern in much of this dialogue on food security is whether the industry will be capable of meeting the growing demand for food associated with a projected world population of 9 billion by 2050. Recent analysis² shows that food availability in developing countries will need to increase almost 60% by 2030 and to double by 2050, equivalent to a 42% and 70% growth in global food production, respectively. Will rising food prices drive more of the world's population into poverty and hunger? Can the industry produce almost 50% more food by 2030 and double production by 2050? How much spare capacity is there in terms of land and water? Will new technologies enable us to use scarce resources more efficiently and increase productivity? How will climate change affect various regions in the world?

The FAO has constructed an agricultural production index that shows a sharp rise in world agricultural output over the last 40 years in developing and LDCs (Figure 3.1). The rate of growth has been impressive, although calculating this production index on *per capita* basis would show smaller gains for the LDCs. A key assumption in the *Outlook* is that this rising production trend will continue over the medium term, reflecting the potential for further gains in productivity. For developed countries, increased production is also assumed, although at a slower rate given the already relatively high levels of productivity. If these assumptions are wrong and production does not rise as expected, the impact on commodity and food prices could be dramatic. A number of studies claim yield growth has been slowing down, leaving a general impression that new technology is not being generated as quickly as it once was.

Figure 3.1. **Agricultural production index by region**
(2000 = 1)



Rising food prices and the implications for food security was a central focus of last year's *Outlook* report. It recognised that immediate humanitarian aid was required, but that longer term solutions depended primarily on fostering growth and development in poor countries to improve incomes and purchasing power. On the supply side, the report called for a closer examination of the potential for, and constraints to, increasing agricultural productivity and output, such as technological innovation and climate change. This chapter responds to that challenge by taking a closer look at some of these longer term supply side issues, specifically the available evidence on the amount of land available for agriculture, prospects for agricultural productivity growth and the increasing competition for water resources.

Land and agriculture³

There is more arable land available...

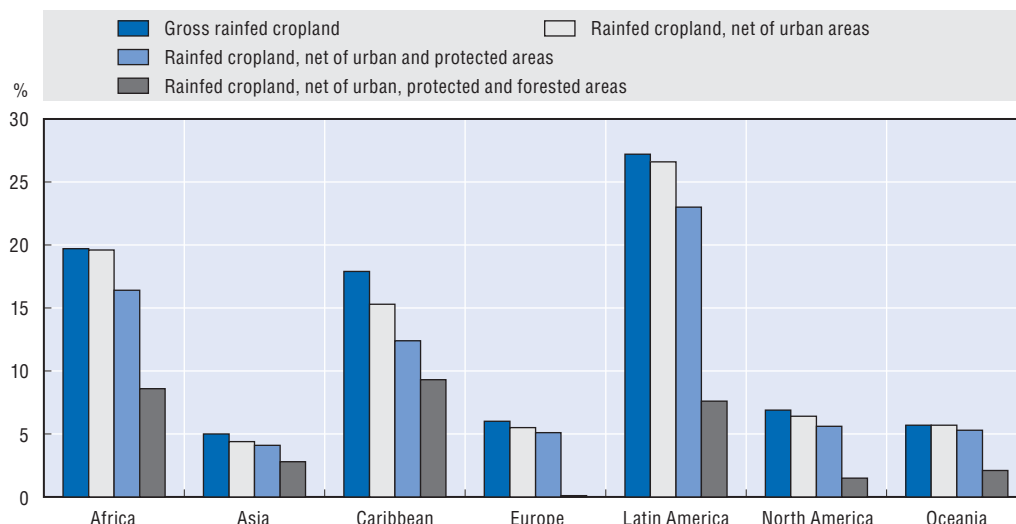
Gross land balances (GLB) are defined as the total land that is potentially suitable for growing crops but which is not currently being cultivated. GLB estimates have been made using agro-ecological modelling (Fischer *et al.* 2002),⁴ taking into account existing soil, climate and terrain conditions in relation to major crop requirements, under various

assumptions of land management. These estimates indicate that on a global basis, the total availability of land, which has from moderate to very high suitability for rain-fed crop production, is about 43 million square kms, (or 4.3 billion ha). Currently cultivated world arable land is estimated at about 1.4 billion ha. Over half of the additionally available land is found in Africa and in Latin America. Furthermore, with estimates of 2.435 and 2.084 million km², respectively, these regions account for most of the land that has the highest suitability class for rain-fed crop production.

These figures of suitable land are gross “optimistic” estimates, since they do not take into account the fact that while certain areas of land may be suitable for cropping; they have already been allocated to other competing and socially-acceptable land uses (*e.g.* forests, urban areas, protected areas). Suitable land resources in these latter areas are thus effectively unavailable for conversion to cropland, except at high social/environmental costs of conversion. For many purposes, it is therefore more realistic to consider net estimates of the availability of suitable land.

The net land balance value (NLB) is derived from the GLB by excluding areas which are currently allocated to either forests, urban areas or protected areas. As expected, the gross availability of suitable cropland decreases when other competing land-use categories are taken into account. For 54 out of the 148 countries for which data are available, competing land uses reduce the gross land balance by more than 10%. The highest percentage decreases occurring when forested areas are excluded, notably in Latin America, Africa and the Caribbean (Figure 3.2).

Figure 3.2. **Gross and net arable land balances by region, 2002**



Note: FAO estimates. Gross and net arable land available by region as a per cent of total land area of the region that is potentially suitable for growing crops but which is not currently being cultivated. The net values shown progressively and cumulatively take into account non-cropland land uses (*viz.* urban, protected areas and forests) of suitable land.

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The competing land use which contributes the most frequently to reducing notably the availability of suitable cropland is forestry. However, the loss of suitable land to urban uses is also important. These numbers suggest that at the world level, some 1.6 billion ha are effectively available for crop expansion. Most of this available land available resides in

Africa and Latin America, with the smallest shares in North America and Europe. While there are significant quantities of land available for expansion, it does not reside in the currently high output zones of temperate world agriculture. Indeed, further expansion in both North America and Europe appears limited in relative terms.

The estimates of NLB do not include another possible source of competition, which is that for growing livestock numbers. Livestock populations are growing and with higher incomes, and particularly in populous countries such as India and China, meat consumption will increase in the future. Therefore, pasture land will remain in high demand and may further limit crop expansion. Furthermore, the boom in bio-fuel demand risks to further limit the amount of cropland available for food production, as feedstocks are provided to biofuel production.

The emergence of carbon markets will also affect land availability because some of the options (biofuels and sequestration) compete for the same land resources. The resulting increased competition for land could increase land prices and may also shift production towards commodities with smaller carbon footprints. Growing pressure to address climate change has created rapidly growing carbon markets that are expected to reach billions of dollars in annual transactions within the next 10 years (Box 3.1). Carbon market transactions have been doubling in volume every year with trading worth several hundred million US dollars a year.

... but historical expansion of arable land has been slow

Arable land refers to land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years). Abandoned land resulting from shifting cultivation is not included (FAOSTAT). Expansion of land in agricultural use has taken place in countries with growing needs for food and employment, with limited access to technology packages that could increase intensification of cultivation. Arable land in the world as a whole expanded slowly since 1961-63 (Figure 3.3). For 2006-07, world arable land was estimated at 1.42 billion ha, 135.6 million ha (or 10.5%) above that of 1961-63, growing slowly at an average annual growth rate of 0.2 %.

The expansion of global arable land has mainly occurred in Asia, Africa, and America (Figure 3.4). Between 1961-63 to 2006-07, arable area increased from 154.5 million ha to 213.1 million ha in Africa (an increase of 58.6 million ha or 38%), and from 412 million ha to 511.5 million ha in Asia. In America, with the exception of North America, arable land also increased, but most of the increase was before 1990. In Brazil alone, arable land increased by 35 million ha (or 145%) during the same period. In general, the countries with low income and a food deficit had a greater expansion of arable land, driven by strong domestic demand for agricultural products. For the group of Net Food Import and Developing Countries (NFIDC), arable land increased by 55 million ha or by 34%. For the landlocked developing countries, the arable land expanded by 73 million ha or by 160%. The net increase of arable land is a total of gross land expansion minus land taken out of production for various reasons, such as degradation or loss of economic viability. Deforestation has been a major factor linked to the arable land expansion in many developing countries.

An opposite tendency has been observed in a number of the Newly Independent States (NIS) over the last 20 years, where economic transformation led to a significant fall

Box 3.1. Agriculture, climate change and carbon markets

Carbon emission markets establish a market-based instrument for trading carbon credits. Carbon trading is seen to be an effective mechanism to curb emissions of greenhouse gases (GHG), while minimizing impacts on economic growth by providing flexibility in meeting emissions regulations. A key driver of carbon markets is the Kyoto Protocol, under which 38 industrialized countries agreed to cut their emissions of greenhouse gases from 5-8% below 1990 levels between 2008-12.

The two main policy options that have gained most interest are carbon taxes and carbon emissions trading systems. In addition to emission reductions, the Protocol approves offsets through enhancement of sinks which absorb greenhouse gases. In the Protocol, agriculture is both an emitter of and a sink for greenhouse gases. In 2005, agriculture contributed about 10-12% of greenhouse gas emissions (GHGs). Agriculture accounts for about 50% of global methane and about 60% of global N₂O emissions (IPCC 2007). The share of agriculture in total emissions of different gases varies considerably between countries.

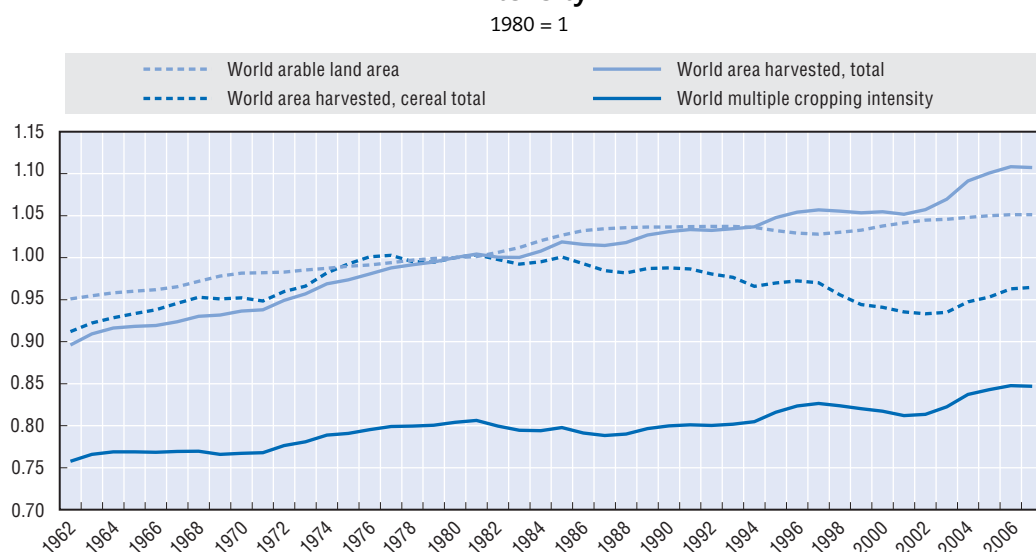
There are at least four ways agriculture may participate in or be influenced by GHG mitigation efforts: reduction of emissions from agricultural production; enhancement of greenhouse gas absorption by creating or expanding sinks; provision of products which substitute for emission intensive products, such as biomass for bioenergy to replace fossil fuels; and through greenhouse gas mitigation policies on agricultural input and output prices (McCarl and Schneider, 2000).

GHG emissions mitigation options in the livestock sector include: reduction of soil carbon losses through improved grassland and pasture management; reduction of methane emissions of livestock through better diets and genetics, and better manure management; and reduction of nitrous oxide emissions through altered diet and improved manure storage and applications methods.

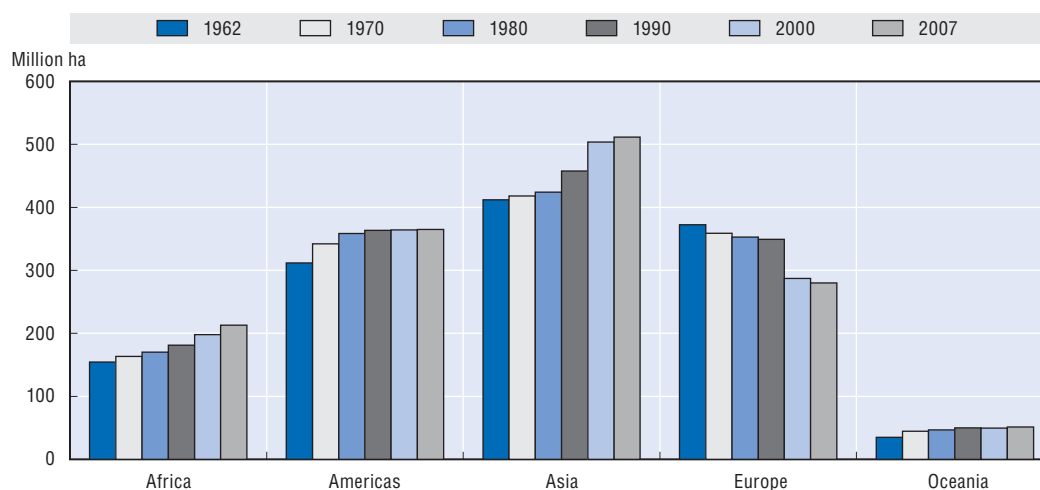
Withdrawing carbon from the atmosphere and storing it in agricultural and forest soils and biomass has the potential to sequester large amounts of carbon. For cropland the main options with the highest potential for storing carbon are afforestation, conversion of cropland to perennial grasses, and switching from conventional tillage (moldboard plough tillage) to reduced tillage or no-till. Options with lower carbon-storing potential include changing crop rotations, elimination of summer fallow, expanding the use of winter cover crops, and improved management of fertiliser, manure and irrigation (Antle 2009, Lewandrowski *et al.* 2004).

Establishing comparability between carbon emission reductions and carbon sequestration requires consideration of the temporary greenhouse mitigation effect of carbon sequestration relative to emission reduction (permanence) and the finite period of time that soil can accumulate additional carbon (soil carbon stock equilibrium). An additional policy issue is whether farmers are paid for carbon sequestered (gross sequestration) or whether they are paid for carbon sequestered and charged for carbon emitted (net sequestration). Given a carbon price of USD 125 per tonne of carbon permanently sequestered, a payment for gross sequestration would reduce emissions by 3.5 MMT at a cost of USD 1.5 billion while a payment for net sequestration would reduce emissions by 7 MMT at a cost of USD 300 million – twice as much carbon at one-tenth the average cost per tonne (Lewandrowski *et al.*, 2004).

Many of the carbon sequestration activities or mechanisms have ancillary benefits and costs which need to be taken into account when designing carbon sequestration policies. For example, reduced tillage usually reduces soil erosion and nutrient runoff, but it may increase the use of herbicides for controlling perennial weeds and thus may ultimately increase herbicide runoff. Conversion of crop land to perennial grasses may improve wildlife habitats and increase species diversity. On the other hand, policy measures that are designed for addressing water quality, such as establishment of green set-asides and buffer strips can contribute to carbon sequestration.

Figure 3.3. **World trend of arable, harvested land areas, and multiple cropping intensity**

Source: Based on FAOSTAT data.

StatLink <http://dx.doi.org/10.1787/676403261565>Figure 3.4. **Arable land by region**

Source: Based on FAOSTAT data.

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in area used for agricultural production. For example, between 1990 and 2007 total area sown to crops declined from 117.7 million to 76.4 million hectares in Russia and from 32.4 million to 26.1 million hectares in Ukraine (OECD 2009a).

In contrast, the developed world has experienced the contraction in arable land: in Europe, arable land declined by 0.9% annually between 1961-63 and 2006-07. In Northern America the decline was 2% annually. The longer term forces determining such declines are sustained yield growth, and farm consolidation combined with a continuing urban expansion, and also affected by phenomena such as policy changes in the industrial countries and political and economic transition issues in the former centrally planned countries.

Cropping intensity has increased...

Multiple cropping is the practice of growing more than one crop on the same land during one year. It involves several alternative patterns of crop management in space and time such as mixed cropping, intercropping, relay-cropping, sequential cropping, double cropping, triple cropping, etc. (FAOSTAT). In this analysis, the multiple cropping index (MCI) is calculated as the sum of area harvested for different crops during the year, divided by the total arable land.⁵

Cropping intensities continue to rise with more multiple cropping and shorter fallow periods. An increasing share of irrigated land in total agricultural land is the major factor for the more multiple cropping. The overall cropping intensity in the world has risen steadily over the period 1961-63 to 2006-07 (Figure 3.3). The highest growth is observed in Africa and Oceania (an increase by 25 percentage points and 16 percentage points, respectively), while there is a significant reduction in Europe (a decrease by 8 percentage points).

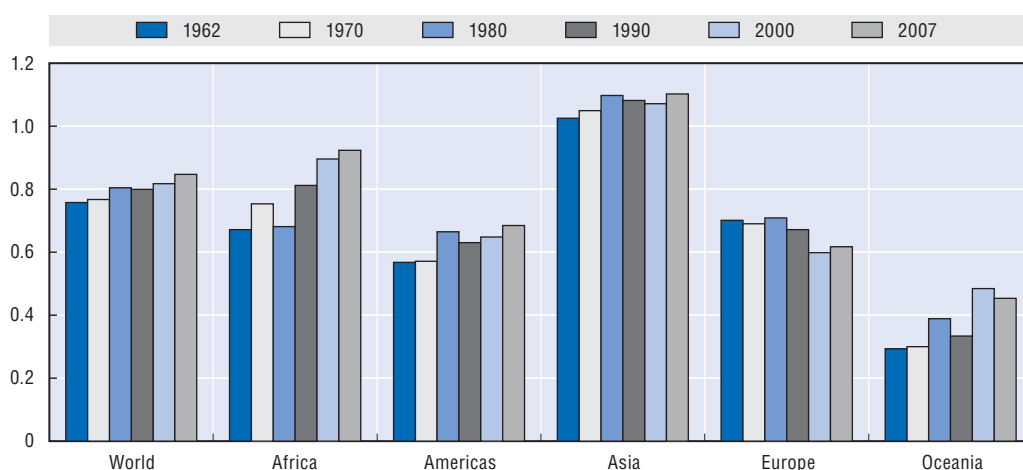
Although the arable area expanded by 135.6 million ha between 1961/63 and 2006/07, harvested area expanded by 229.5 million ha (or 23.6 %) because of increases in cropping intensities. Of the increase in area harvested, about half is attributable to the expansion of arable land, and half to the increase of MCI.

... but there are large regional differences and the pace is slowing

The highest MCI are in Asia and lowest in Oceania, as shown in Figure 3.5. In South and East Asia, about one-third of the arable land is irrigated, which is one of the reasons why the average cropping intensities in Asia are considerably higher than in the other regions. While MCI has increased in all regions, except Europe, there is a significant difference among regions. The highest growth is observed in Africa and Oceania.

Over this same period, harvested area increased 127% (13 million ha) in Oceania and 90% (93 million ha) in Africa. In both cases, about half the increase was from the arable land expansion and half from the increase in MCI. Among sub-regions of Africa, Western Africa

Figure 3.5. Multiple cropping index in selected years



Note: MCI is calculated as the sum of area harvested divided by total arable land (not total cultivated area).

Source: Calculated based on FAOSTAT data.

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accounts for the largest increase (by 52 million ha or 137%). In Asia, harvested area expanded by 141.7 million ha or 33.6% during this period, with about three-quarters of the increase due to arable land expansion and one-quarter to the increase of cropping intensity. Contrary to other regions, Europe had a reduction of 88 million ha or 34%, mostly as a result of the arable land area reduction.

The trends of MCI and harvested area in general are expected to continue, but at a slower pace. As industrialisation and urbanisation continue in many developing countries, more cropland will be used for industrial and residential developments. Rapid industrialisation will also continue to pull labour out of the countryside and agriculture, and lead to less double cropping. Moreover, ever more intensive use of land in production in some regions through multiple cropping is perceived as a leading factor for land degradation and the undermining of its longer term productive potential (FAO 2003). However, a potential for big increase in MCI and harvested area exists in some regions, such as Latin America and some African countries.

Technology and productivity⁶

In developed countries, there have been a wide range of technical advances for agriculture – genetic improvement, chemical fertilisers and pesticides, farm equipment and machinery, and cultural and management practices. Research in both the public and private sectors has been the primary source of new technologies, with the private sector becoming increasingly involved in new technology development and marketing and being the exclusive source of GM (genetically modified) crops in OECD countries. Technologies available to farmers are continuously changing. However, agricultural productivity, which is a reflection of the adoption and diffusion of successful technologies, has slowed over 2000-06 relative to the 1990s in the EU, North America, in high income Oceania and in large developing or transition economies. Among developed countries, an exception to this pattern is Northeast Asian developed countries, such as Japan and Korea, which experienced higher agricultural total factor productivity (TFP) growth in the latter period.

For developing countries as a whole, there is some evidence that crop yield growth has actually accelerated. One recent study on developing countries found crop yield increases for the 1980-2000 period were higher than for 1961-80 for cereals (total), lentils, millet, potatoes, paddy rice, and wheat, while lower for barley, cassava, sorghum and, to a lesser extent, maize (Evenson and Gollin, 2003). The study concluded that the Green Revolution effects on crop yields in developing countries were not confined to the period 1960-80. In fact, yields of many key crops in developing countries actually increased faster over the 1980-2000 period.

In the context of examining the industry's prospects for a significant future supply response, it is yields that are of significant importance and the primary focus of this section. For major crops, evidence of what is happening to yields in frontier production regions is presented. For livestock, the best available evidence is a more global comparison of total factor productivity developments.

Crop yields continue to increase...

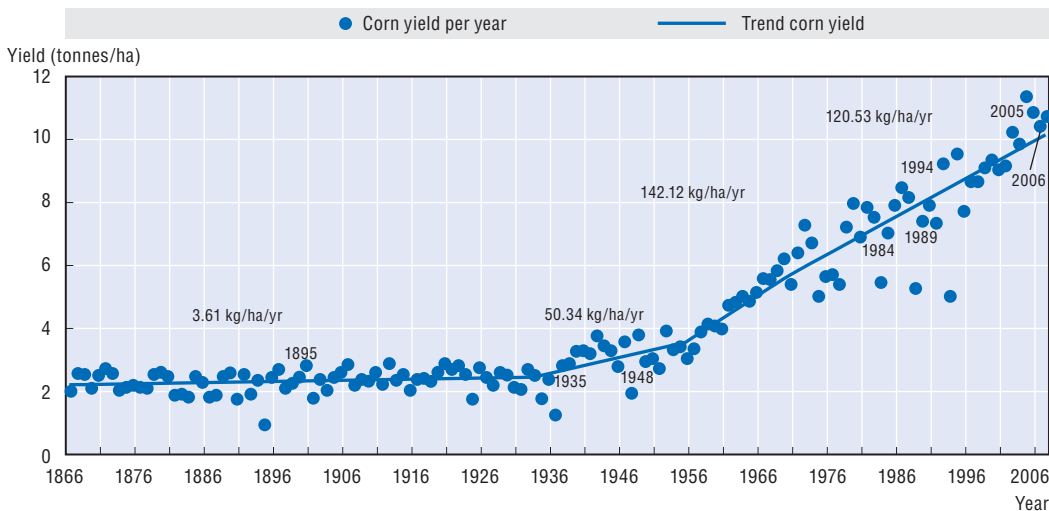
Within the OECD area, the leading production region for corn and oilseeds is the US Midwest, for example, in the state of Iowa, which has rich soils, relatively abundant summer rainfall, temperate growing season, and access to the most advanced corn and soybean varieties. Wheat is the main cereal crop of the EU, and France is the leading producer under

abundant resources. In contrast, wheat is produced in the US Great Plains and Prairie Provinces of Canada under limited resources, especially water, which also limits other inputs, such as fertiliser. The state of Kansas is the leading US producer of wheat. Japan is a high technology producer of paddy rice, which is irrigated or flooded and well fertilised. The Netherlands is on the frontier of potato production with abundant water, fertiliser and good pest control.

The (trend) rate of crop yield improvement in the three main cereal crops of corn, wheat and rice; leading oil crop-soybeans; and the leading vegetable crop for providing energy (potato) in major producing regions of the OECD is roughly unchanged over the past half century. The rate is highest for Dutch potatoes, Iowa corn and French wheat at 324, 120, and 105 kg per hectare per year, respectively, and significantly lower for Kansas wheat, Japanese rice and Iowa soybeans of roughly 25 to 32 kg per hectare per year.⁷ Corn yields in Iowa, however, may be entering a new era, as of 2004, where yields are increasing at a significantly faster rate than 120 kg per hectare per year.

Maise is an important animal feed and food staple, an excellent source of carbohydrates but low in protein. The most important advance in the cultivation of corn was the introduction of hybrids in the early 1930s. Figure 3.6 plots actual corn yields in kilograms per hectare from 1866 to 2007. Since 1970, the trend rate of increase in Iowa average corn yields has been 119 kg per hectare per year, with the state average yield exceeding 10 tonnes per hectare in 2007. However, the state average yields in 2004-07 were somewhat above the trend line, suggesting that a new era of even higher increases in the trend for Iowa average corn yields. This may be due to the new corn varieties adopted by farmers that contain stacked GM traits. For example, 2004 was the first year in which one-half of Iowa's corn acreage was planted to corn varieties containing two or more stacked GM traits, and in 2007, varieties with triple stacked GM traits were widely planted by Iowa farmers, with these hybrids containing Bt for corn borer resistance, IP for corn rootworm and tolerance to the herbicide glyphosate. In particular, the rootworm resistance provided impressive improvement in plant root structures and plant standability under rootworm infested field conditions.

Figure 3.6. Average Iowa corn yields

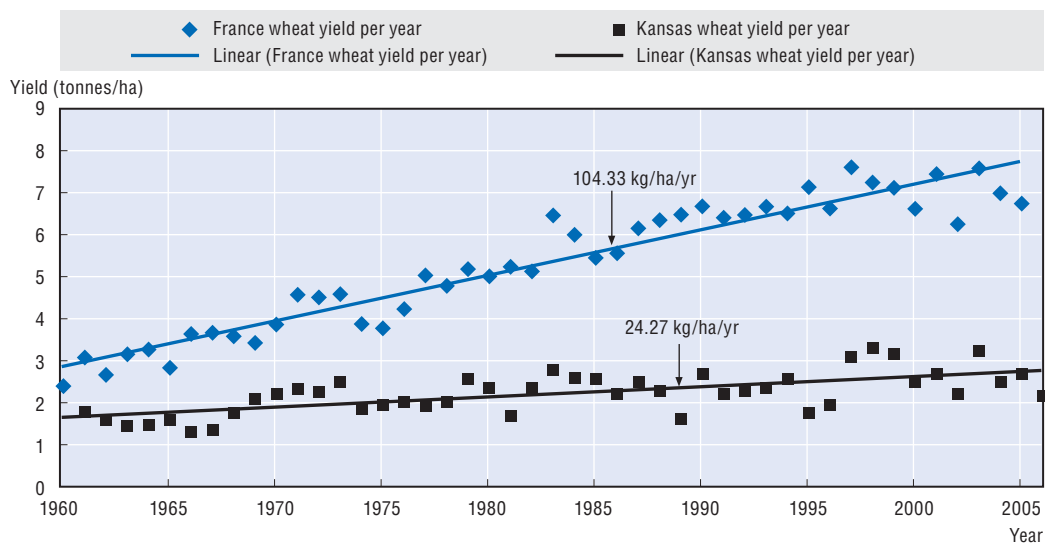


Source: Huffman (2009).

StatLink  <http://dx.doi.org/10.1787/676541658888>

Wheat production is widespread throughout the world and supplies much of the world's dietary protein and food supply. The rate of increase in Kansas wheat yields over the 1950-2007 period was 24.27 kg per hectare per year, with average yield in 2007 at 2.15 tonnes per ha (Figure 3.7). Much of this increase was due to the development of new wheat varieties. Wheat yields in France averaged 2.3 tonnes per ha in 1960 and have a strong linear trend upward over 1961-2007 at 104 kg per ha per year. The predicted wheat yield based on the linear trend is 7.6 tonnes per ha in 2007 but this was 15% above actual average yield. An as yet unpublished study by INRA argues that the reductions in wheat yield growth in France since the early 1990s was due to climate change.⁸ While yield increases may have slowed in recent years, French wheat yields have improved much faster than in Kansas, a reflection of the use of lower quality land for wheat production in Kansas.

Figure 3.7. **Average wheat yields, Kansas and France**



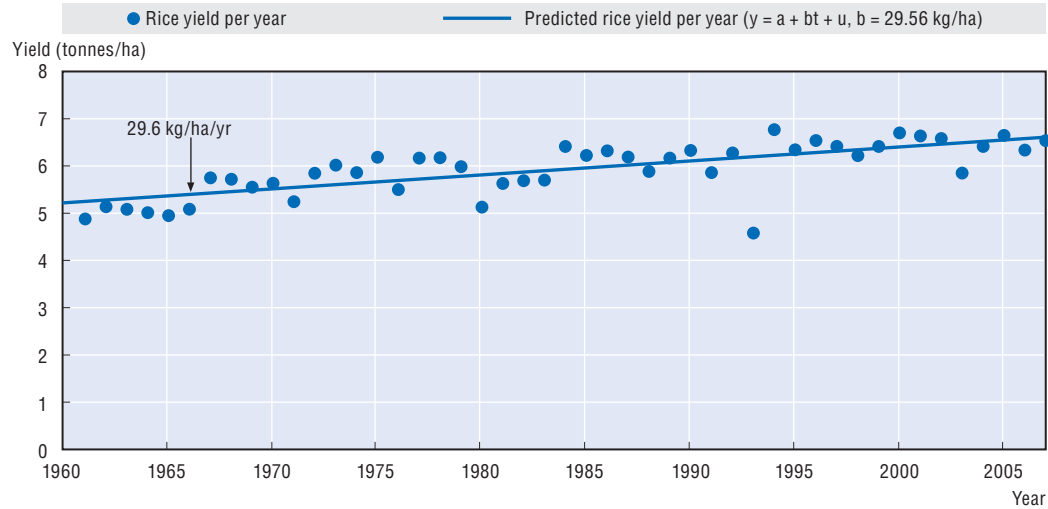
Source: Huffman (2009).

StatLink <http://dx.doi.org/10.1787/676546646027>

Rice is the world's most consumed cereal after wheat, providing more than 50% of the daily calories ingested by more than half of the world population. Japanese country-wide average rice yields were 4.8 tonnes per ha in 1960 and increased to 6.5 tonnes per ha in 2007 (Figure 3.8). The trend rate of increase in average yields is 29.6 kg per ha per year. Paddy rice in Japan is intensive agriculture on good quality land and the average rate of yield increase compares favourably to dry land low-resource input wheat in Kansas. However, it lags behind wheat yield gains in France and dry land, resource abundant corn yields in Iowa.

Soybean production is the leading source of vegetable oil in North and South America and China. Figure 3.9 shows Iowa average soybean yield trends over a 60-year period. The average trend rate of increase is 31.9 kg per ha per year. In contrast to hybrid maize, the development of new soybean varieties for the US Maise Belt has been primarily by the public sector up to the mid-1970s (Huffman 1987). In 1970, the US passed a Plant Variety Protect Act (PVP) providing better intellectual property protection to new soybean varieties and private sector on soybean varieties have gradually replaced public sector varieties.

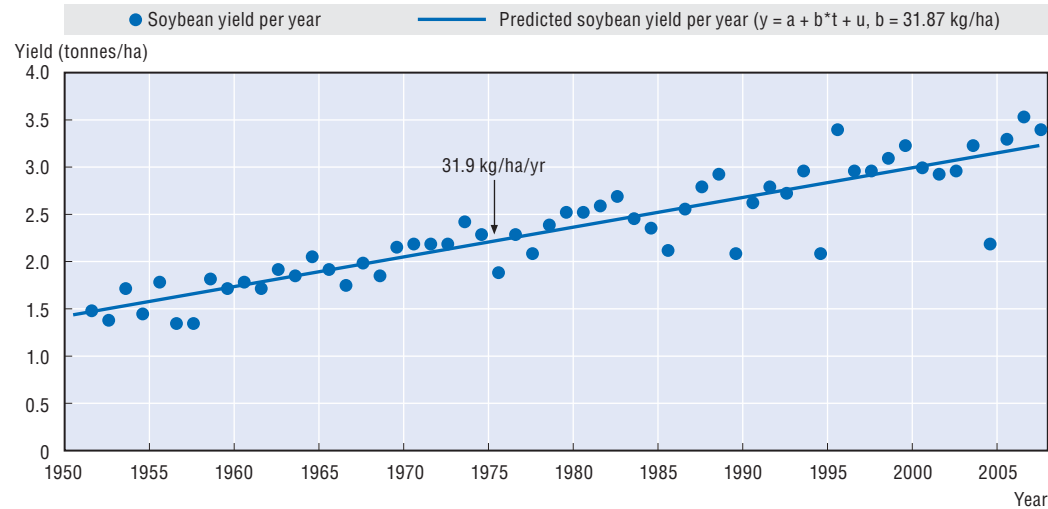
Figure 3.8. Japan rice yields



Source: Huffman (2009).

StatLink  <http://dx.doi.org/10.1787/676688645863>

Figure 3.9. Iowa soybean yields
Iowa State average soybean yields, 1950-2008



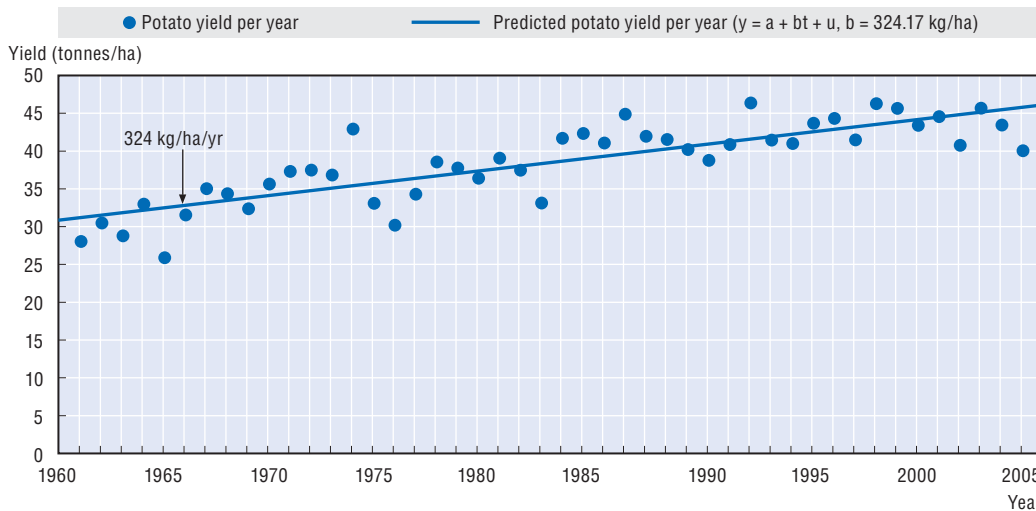
Source: Huffman (2009).

StatLink  <http://dx.doi.org/10.1787/676711005564>

Currently, virtually of the planted soybean varieties in Iowa are developed and marketed by private seed companies. Starting in 1996, varieties containing GM herbicide tolerance (HT) became available to Midwestern farmers. The same linear yield trend is observed for the 1996-2008 period when HT soybean varieties were being rapidly adopted by farmers.

2008 was the international year of the potato. It is the world's number one non-grain food commodity, with consumption expanding rapidly in developing countries, which now account for more than half of the global harvest. Figure 3.10 plots Dutch potato yields from 1961. For over more than a half century, the trend has been constant at 324 kg per ha per year. The average potato yield in 2007 was about 44.7 tonnes per ha. These comparisons

Figure 3.10. Dutch potato yields



Note: Ware, starch and seed potatoes.

Source: Huffman (2009).

StatLink  <http://dx.doi.org/10.1787/676728355281>

show that trend yield increase in Dutch potatoes is large relative to the yield increases in other major food crop sources of calories such as corn in the US Corn Belt, wheat in France or rice in Japan.⁹

... and livestock productivity growth has accelerated

Technical advances in livestock production are a result of genetic improvement of animals, improved disease control, improved structures and improved management practices. Steady improvements in animal genetics have occurred with the use of artificial insemination, which is now widespread and pervasive in modern dairy, swine and poultry production. Cross-breeding was a new technique in swine production in the 1950-60s, but it has since spread to beef herds as a means to improve genetics for rapid growth and quality attributes of meat. Livestock production in the US, Spain, the Netherlands, Denmark, Belgium and Germany have become specialised into large units for broilers and layers and also cattle finishing in the US, which reduces labour intensity.

The largest dairy herds in OECD countries are in the US West and South – Florida, Arizona and California where herd sizes are 5 000-10 000 cows. Extremely large dairy herds have not been adopted in the US Upper Midwest and New York or in Europe where herd sizes are typically still 100-200 cows. Switzerland and Norway have even smaller average dairy cow herd sizes. Totally automated dairy cow feeding and milking exists in some advanced European countries, but not in the US where relatively cheap immigrant farm workers have been integrated into factory-type specialised livestock operations.

A recent publication, *Handbook of Agricultural Economics*, 2007, provides a global comparison of livestock productivity of 115 regions (92 developing and 23 high income regions) over two periods – 1961-80 and 1981-99. The later period showed higher total factor productivity (TFP) growth with Asia showing the fastest expansion followed by Latin America, with Sub-Saharan Africa remaining relatively stagnated over the period (Table 3.1). Acceleration of TFP growth in the latter period was mainly the result of an increased rate of expansion of the technical frontier.

Table 3.1. Livestock total factor productivity growth
Technical change and efficiency

	1961–1980			1981–1999		
	Total factor productivity	Technical change	Efficiency	Total factor productivity	Technical change	Efficiency
South Africa	–0.73	0.67	–1.39	1.3	0.74	0.56
Sub-Saharan Africa	0.01	0.01	0	0.02	0.03	0
Africa	0.17	0.31	–0.14	0.63	0.21	0.43
China	0.32	1.04	–0.72	6.27	0.82	5.4
India	–1.05	0.64	–1.67	1.66	1.62	0.05
Asia	–0.75	1.11	–1.85	2.54	2.33	0.21
Mexico	0.39	0.77	–0.38	1.41	0.64	0.76
Brazil	–2.38	1.1	–3.44	1.73	1.07	0.66
Latin America	–0.44	1.01	–1.43	1.15	1.55	–0.39

Source: Alejandro Nin, Simeon Ehui and Samuel Benin (2007) using FAO (2003) data.

StatLink  <http://dx.doi.org/10.1787/680555526381>

The report also estimated average productivity growth gains over the 1961–2001 period for ruminants (beef and dairy) and non-ruminants (pigs and poultry) within the livestock sector. For developed, developing and LDCs, productivity growth gains were much higher for non-ruminants (Table 3.2). For non-ruminants, productivity gains in developing countries slightly outpaced developed countries, while for ruminants developed countries showed much higher average gains. LDCs lagged well behind in non-ruminant livestock productivity gains but matched the gains of developing countries for ruminants.

Table 3.2. Annual total factor productivity growth rates for livestock, 1961–2001

Region	Ruminants	Non-ruminants
Developed countries	0.93	2.11
Developing countries	0.38	2.38
Least developed countries	0.4	1.24

Source: Ludena et al. (2005).

StatLink  <http://dx.doi.org/10.1787/680572162512>

The contribution of technical change and efficiency to TFP growth varies across regions and species. Biological and natural resource differences lead to different production processes. TFP growth is driven by land productivity and changes in output per head of animal stock in countries with high labour/land ratios like China and India, while in countries with low labour/land ratios like Brazil, for example, increases in livestock productivity have come from increases in labour productivity.

Expenditures on research and development continue to rise...

The 1950s and 1960s saw science increasingly applied to agriculture in developed countries with rapidly rising productivity growth, whether measured by yields, labour productivity or TFP. New crop varieties were being developed that could be fairly quickly adapted by developing countries. The 1960s and 1970s saw this process extended to developing countries as the green revolution raised yields, especially in the densely populated countries of Asia.

The international transmission of productivity enhancing technologies depends on the rate at which new technology becomes available, the extent to which it is allowed and encouraged to spill over into other jurisdictions and the capacity of the recipient countries to identify, customise and diffuse what is available. For many developing countries, infrastructure and institutional weaknesses are more of a constraint to increasing productivity than the level of research expenditure. To capitalise on the potential to improve productivity growth in developing countries requires development, adaptation and adoption of appropriate technologies. There is technology “on the shelf” for developing countries to adapt and those with good institutional capability can prosper under these circumstances. South Africa is a case in point. Following the establishment of majority rule, there were over 4 000 employees in the Agricultural Research Council. Studies showed that the South African research system concentrated on adaptive R&D and had consistently high rates of return (Thirtle *et al.*, 1998; Townsend and Thirtle, 2001).

Public investment in agricultural research continues to rise in real terms but growth rates in public agricultural research expenditures declined in the 1980s, and continued to fall in the 1990s (Beintema and Stads, 2008). The average expenditure growth rate for 32 high income countries was 0.52% for the 1990-2000 period, down from 2.43% the previous decade (Table 3.3). For Sub-Saharan Africa as a whole, the growth rate was actually negative in the 1990s, and in about half of the 24 countries in the region for which time-series data is available. The growth rate in public agricultural research expenditures declined but remained positive for Asia and Pacific, Latin America and the Caribbean and West Asia and North Africa. These regional trends hide a growing divide between the scientific haves and have-nots. In the Asia-Pacific region, just two countries, China and India, accounted for 89% of the increase in regional spending from 1995 to 2000, and 67% of the regions total expenditure in 2000. In high income countries, public agricultural research expenditures increased as a share of Ag GDP to 2.35% over the 1980-2000 period, while it has remained relatively flat (and much lower) in low and middle income countries (Table 3.4). The private sector has become an increasingly important contributor to research and development in agriculture.

Table 3.3. Growth rates in public agricultural research expenditures

Country group	1976-81	1981-91	1991-2000
	(percentage)		
Low and middle income :			
Sub-Saharan Africa (45)	0.94	1.02	-0.15
Asia-Pacific (26)	7.98	4.67	3.35
Latin America and the Caribbean (25)	8.54	1.86	0.32
West Asia and North Africa (12)	n.a.	4.12	2.93
<i>Subtotal (108)</i>	<i>6.36</i>	<i>3.02</i>	<i>1.91</i>
High income (32)	2.5	2.43	0.52
Global total (140)	n.a.	2.66	1.1

n.a.: not available.

Source: Beintema, N. M and Stads G. (2008), calculated by authors based on ASTI datasets, MOST (various years), OECD (various years), and Pardey *et al.* (2006); 1976-81 growth rates are from Pardey and Beintema (2001).

StatLink  <http://dx.doi.org/10.1787/680633667846>

Table 3.4. **Public agricultural research expenditures as a share of Ag GDP**

Country group	Agricultural R&D spending as a share of Ag GDP		
	1981	1991	2000
	(percentage)		
Low and middle income :			
Sub-Saharan Africa (45)	0.86	0.76	0.65
Asia-Pacific (26)	0.33	0.37	0.39
Latin America and the Caribbean (25)	0.91	1.08	1.19
West Asia and North Africa (12)	0.6	0.6	0.74
<i>Subtotal (108)</i>	<i>0.56</i>	<i>0.56</i>	<i>0.55</i>
High income (32)	1.51	2.08	2.35
Global total (140)	0.91	1	0.98

Source: Beintema, N. M and Stads G. (2008), calculated by the authors based on ASTI datasets, MOST (various years), OECD (various years), and Pardey et al. (2006); GDP deflators are from World Bank (2008c).

StatLink  <http://dx.doi.org/10.1787/680681656338>

... with private sector research and development a major driving force

The private seed industry has set as a goal doubling corn, soybean and cotton yields in the US by 2030. Average corn yield increases would need to be three times the trend growth over the 1970 to 2007 period, or about 6 bushels per acre per year. This is clearly an ambitious goal. They have successfully tested drought tolerant corn varieties for the US Western Great Plains. The drought tolerance is to boost yields by 7-10% in a one-year drought. However, this technology for drought tolerance enables the corn plant to withdraw a larger share of the moisture in the subsoil and to avoid shutting down physiological processes under water and heat stress. However, if the drought lasts for multiple years, these varieties are unlikely to have advantages beyond the first year. For many areas faced with extended periods of drought such as Australia, the US Great Plains, Africa, the current technology may have limited application. New third generation corn varieties developed for the US which have insect tolerance for three below ground pests, have great potential for improving root structures and root volume of the corn plants, which indirectly improves drought tolerance, but also improves nutrient uptake and standability against strong wind and rain, which makes harvesting easier.

Over the next decade, private sector developed and marketed GM technology for wheat and rice varieties remains uncertain. Monsanto, for example, is planning to re-enter the market with new wheat varieties over the next decade. Wheat production in the US and Canada is largely low-resource input agriculture, and new varieties have been developed primarily by public sector research. Over the next decade the trend rate of yield increases, which are modest, are expected. In Australia, researchers are attempting to develop perennial wheat varieties, including salt tolerant ones that will over time yield significantly more grain than annual wheat varieties. There is also an attempt to introduce new perennial plants, e.g., chicory, wild relatives of lucerne, cocksfoot, and birdsfoot trefoil, as a pasture crop for cattle and sheep. The goal is to increase the carrying capacity of grazing lands.

Research is also underway that will increase soybean yields. Soybean germplasm has been identified that will significantly increase soybean yields in conjunction with second generation herbicide tolerant varieties. The target increase is a 6-10% yield increase compared to elite conventional soybean varieties. Soybean and canola varieties in North

American are over 90% GM herbicide tolerant (HT), and other oilseed crops are likely to come under competitive pressure to incorporate GM for HT because of the indistinguishable nature of the oils.

The potential for future benefits from GM potato varieties developed by the private sector are large and likely to be realized by 2019 in OECD countries, Argentina, Brazil, China and perhaps Russia. New GM varieties for late blight and Colorado potato beetle resistance would create valuable biological pest resistance to all sizes of potato farms, including home plots/gardens. Also, new GM traits for product-enhanced potato varieties will be released for sale to farmers in the near future. They are expected to contain high levels of anti-oxidants and vitamin C and low acrylamide levels.

Water and climate change

Competition for water will increase...

Water scarcity is an increasing threat in many regions, as water pollution and consumptive use reduce available sources, while populations grow and competition between different uses increases. In 2005, 35% of the population of the OECD was living in areas characterised by severe water stress, compared with 44% worldwide (OECD, 2008b). At a global level, some 1.2 billion people live in basins where the physical scarcity of water is absolute (human water use has surpassed sustainable limits) (CA, 2007). By 2025, 1.8 billion people will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be under stress conditions, mostly in non-OECD countries.

Water withdrawals are projected to increase at a much higher pace in developing relative to OECD countries, and for non-agricultural compared to agricultural uses. At the same time, global demand for food and non-food agricultural products will continue to increase mainly as a result of the growth in incomes, population and urbanisation. This will chiefly be driven by developing countries, but agricultural production in many of these countries will be much more constrained by pressures on the natural resource base, including land and water, notably in China and India.

Agricultural water withdrawals are dominated by developments in irrigation, as this is assumed to account for 99% of agricultural water withdrawals (the remainder is accounted for by livestock), and, in particular, by China and India as the volumes involved in these countries are so large. Both FAO (2003) and CA (2007) project a substantial slowdown in expansion of area under irrigation compared to past decades. Future gains in irrigated agriculture will come from improved performances of existing irrigation in all irrigated regions of the world, in order to meet the projected global increase in agricultural commodity production.

OECD countries are expected to be a continuing and expanding source of food and non-food agricultural commodity exports, mainly to Asian, African and Middle Eastern countries. Such an expansion in OECD agricultural production and exports will necessitate improved productivity in agriculture, both in rainfed and irrigated farming systems (see Box 3.2 for developments in agricultural water use in the OECD area).

Box 3.2. Agricultural water resource use in OECD countries

Agriculture accounted for 44% of total water use in 2002-04, although for a number of countries the share is over 60%. Agricultural water use grew by 2% over the period between 1990-92 and 2002-04, mainly driven by an increase in the area irrigated, compared to a 1% increase for all water uses; however, for some countries in more recent years this trend is reversing with agricultural water use diminishing compared to growth in other water-consuming sectors. The area irrigated rose by 8% compared to a reduction of 3% in the total agricultural area between 1990-92 and 2002-04, although in a number of countries the area irrigated has been decreasing. Agriculture abstracts an increasing share of its water supplies from groundwater, and the sector's share in total groundwater utilisation, although data are limited, was above 30% in one-third of OECD countries in 2002.

Some positive developments: Increases in physical water productivity by agriculture, through better management and uptake of more efficient technologies, such as drip irrigation and adoption of water-saving farm practices, has contributed to higher farm production. Overall, the OECD average water application rate per hectare irrigated declined by 9% between 1990-92 and 2002-04, while in most cases the volume of agricultural production increased. The adoption of drip irrigation, low pressure irrigation systems, and other water-saving technologies, are becoming more widespread, while there are also some improvements in flood irrigation systems (e.g. laser levelling of fields, neutron probes for soil moisture measurement, scheduling of irrigation to plant needs, and faster flow regimes) and irrigation canal networks (e.g. replacing earth with concrete linings for irrigation canals). Pollutant discharges from farmland into water bodies have been declining recently in many OECD regions, but information on the trends in pollutants from irrigated land is patchy.

Some negative developments: Groundwater use for irrigation is above recharge rates in some regions, which is also undermining the economic viability of farming in affected areas and leading to harmful environmental impacts, such as reduced flows of connected surface waters. Farming is a major and growing source of groundwater pollution in some countries, mainly from nutrients, pesticides and salinity. This is of concern where groundwater provides a major share of drinking water supplies for both human consumption and farming. Over-exploitation of surface water resources in certain areas is damaging ecosystems by reducing water flows below minimum flow levels in rivers, lakes and wetlands, which is also detrimental to recreational, fishing and cultural uses of these aquatic ecosystems.

Sources: OECD (2009b); OECD, (2009d); OECD (2008a).

... but will agricultural water use still increase or will it decline?

A substantial level of variation can be noted among projections for 2025 (Table 3.5). Projections of global irrigation water withdrawals differ for a number of reasons including, for example: data sources (note the differences in base year global irrigation withdrawals in Table 3.5); definitions with irrigation water use defined as total withdrawals or crop evapotranspiration; underlying model structures and estimates of irrigation water use efficiency, and assumptions made in developing models. This highlights the need to improve the base water use data in projection models and refine model specifications.

According to the Comprehensive Assessment of Water Management in Agriculture (CA, 2007), water withdrawal for irrigation is expected to increase by 13% between 2000 and 2050, with all the increase taking place in developing countries. Preliminary

Table 3.5. **A selection of global projections for irrigation water withdrawals**

Source	2000	2025	Change 2000-2025
	Cubic kilometres	Cubic kilometres	%
OECD (2008b)	2 874	26 311	-8
Shen <i>et al.</i> (2008)	2 658	3 388 – 3 665 ^b	+27 to +38
IWMI (2007)	2 630	2 800 – 3 400 ^b	+6 to +29
Alcamo <i>et al.</i> (2007)	2 498	2 341 – 2 366 ^d	-5 to -6
Shiklomanov (2000)	24 883	3 097	24
Seckler <i>et al.</i> (2000)	24 693	2 915	18
Alcamo <i>et al.</i> (2000)	2465 ^{c, d}	2 292 – 2 559 ^b	-7 to +4
IFPRI (2008)	2 245	2 491 – 2 594 ^{a, b}	+11 to +15

a) Projection year is 2030 instead of 2025.

b) Projections show data for a range of different scenarios.

c) Base year is 1995 instead of 2000.

d) Projections include total agricultural water withdrawals (i.e. including water for livestock).

Sources: OECD, adapted from CA (2007) and other sources.

StatLink  <http://dx.doi.org/10.1787/680716828207>

projections prepared in the framework of FAO's *Agriculture – Towards 2030 and 2050* (FAO, forthcoming) confirm these projections, with a global increase in agricultural water withdrawal between 2006 and 2050 estimated to be in the order of 10%. However, OECD (2008a) together with a study by Alcamo (2007), predict a decline in the world's agricultural water withdrawal while other comparable studies project an increase (Table 3.5). What is certain is that projected increases in global production will necessitate further improvements in water efficiency by agriculture to avoid additional stress on scarce water resources in many regions.

... and what will be the effect of climate change?

The direction of future policies to address the management of water resources in agriculture are projected to be greatly influenced by climate change and climate variability. A survey of OECD countries reveals the incidence and severity of flood and droughts has been increasing for the majority of countries, although there is significant regional variation within and across OECD countries (OECD, 2009b). Many of these countries also project that with climate change the incidence and severity of flood and drought events may continue to increase. Climate change is expected to affect the function and operation of existing water infrastructure (e.g. irrigation systems) as well as water management. Moreover, current water management practices may not be robust enough to cope with the impacts of climate change on, for example, water supply reliability, flood risk, agriculture and ecosystems. The Intergovernmental Panel on Climate Change (IPCC) report on climate change and water (Bates *et al.*, 2008), concludes that “observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change, with wide-ranging consequences for human societies”. Climate change's main water-related impacts with regard to agriculture are expected to be felt in terms of shifting and more variable hydrological regimes. Specifically concerning agriculture, the IPCC projects that changes in water quantity and quality due to climate change are expected to affect food availability, stability, access and utilisation (Table 3.6).

Climate change is expected to have a dual effect on irrigated agriculture. First, higher evaporative demand as a function of overall temperature increases will translate into

Table 3.6. **Summary of key 2007 IPCC 4th Assessment for Agriculture by warming increments**

Global mean annual temperature change relative to the 1980-99 (°C) baseline

Sub-sector	Region	+1°C to +2°C	+2°C to +3°C	+3°C to +5°C
Food crops	Global		550 ppm CO ₂ (approx. equal to +2°C) increases crop yield by 17%; this increase is offset by temperature increase of 2° C assuming no adaptation and 3° C with adaptation.	
	Mid- to high latitudes	Cold limitation alleviated for all crops. Adaptation of maize and wheat increases yield 10% to 15%; rice yield no change; regional variation is high.	Adaptation increases all crops above baseline yield.	
	Low latitudes	Wheat and maize yields reduced below baseline levels; rice is unchanged. Adaptation of maize, wheat, rice, maintains yields at current levels.	Adaptation maintains yields of all crops above baseline; yields drop below baseline for all crops without adaptation.	Adaptation maintains yields of all crops above baseline; yield drops below baseline for all crops without adaptation. Maize and wheat yields reduced below baseline regardless of adaptation, but adaptation maintains rice yield at baseline levels.
Pastures and Livestock	Temperate	Cold limitation alleviated for pastures; seasonal increased frequency of heat stress for livestock.	Moderate production loss in swine and confined cattle.	
	Semi-arid	No increase in net primary productivity; seasonal increased frequency of heat stress for livestock.	Reduction in animal weight and pasture production, and increased heat stress for livestock.	
	Tropical			Strong production loss in swine and confined cattle.
Fibre	Temperate		Yields decrease by 9%	
Real Agricultural Prices and Trade	Global	Real agricultural prices: -10% to -30%	Real agricultural prices: -10 to +30%	Real agricultural prices: +10 to +40% Cereal imports of developing countries to increase by 10-40%

Note: These conclusions are based on the quantitative projections across a range of emission scenarios used by the IPCC, while adaptation to climate change is not included in these estimations. For the full documentation on the methodologies and scenarios used by the IPCC, see reference below.

Source: Easterling et al., 2007.

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higher levels and intensities of water withdrawals. Second, the anticipated increase in volatility of rainfed production will put pressure on irrigated areas to buffer the global production risk. The demand for more reliable agricultural production systems at local and regional level is expected to increase and trends toward more precision agriculture with more secure supply chains are already evident. However, despite the long experience in dealing with climatic variability in many arid and semi-arid countries, institutional rigidity persists and some of the most productive areas of contiguous irrigation are at risk from institutional failures as much as hydro-environmental constraints.

Many other reports from OECD government agencies have reinforced the IPCC view on climate change (e.g. Australia, CSIRO, 2008; Canada, Lemmen, et al., 2007; EU, European

Parliament, 2008 and Portuguese Ministry of Environment, 2007; United States, USEPA, 2008). Overall these reports have indicated that in terms of the linkages between climate change, water resources and agriculture, farming systems are increasingly vulnerable to changes in water availability and temperature, as well as the growing incidence and severity of flood and drought events, and this will require high levels of adaptive responses. In some situations climate change will also lead to beneficial opportunities for agriculture, such as an increase in wheat yield potential in Northern Europe and overall crop yields in North America.

Summary and key messages

So can agriculture meet the rising demand for food? This chapter only provides a brief overview of some of the supply-side issues but it does suggest that production could be increased considerably. The three critical supply factors examined – land, productivity and water – do not appear to pose insurmountable barriers to increasing agricultural production. However, there are substantial risks that must be managed and investments that must be undertaken to ensure future food security. Moreover, growing societal concerns about the environment, intensive farming, use of GM technology, food quality, etc. will increasingly play a role in shaping the structure of agricultural production over the medium-term.

Bringing more land into production will involve higher costs and prices

There is substantial additional land available for use in agriculture. Most of the land available resides particularly in Sub-Saharan Africa (SSA) and South America. Relatively much less land is available in the currently high output zones of North America and Europe. In terms of numbers, of the world's land surface of some 13.2 billion ha, about 4.3 billion are moderately to highly suitable as rainfed cropland. After adjustment for currently cultivated cropland of about 1.4 billion ha and for forested and urban/protected areas, some 1.6 billion ha remain available for cropland expansion.

Despite the availability of additional land, however, land use in agriculture has actually grown very slowly for decades, falling in some regions and growing in others, primarily in developing countries. The best rainfed cropland is already being used, and expansion to other areas would incur higher input costs on average. Existing land is also being used with increased cropping intensity as the practice of multiple-cropping has spread, particularly in areas where land is relatively scarce, such as in Asia. Infringement on forested areas would obviously make considerably more land available for agriculture but would incur high social and environmental costs. Existing land is being used more intensively in most regions, as the practice of multiple cropping has spread.

A key unanswered question is how much of the available cultivable land would actually be brought into production under given market conditions? Projected price levels may not be sufficient given the past record of higher value use elsewhere. If additional lower productivity land is brought into production, it is not clear what the potential additional output would be, as this depends on the quality of the land in question. Additional analysis of the potential supply response is needed to address these critical issues.

Research and development is an investment priority

It would be a mistake to conclude that crop yields for major cereal, oilseed, and vegetable crops in all producing areas of OECD countries (or of the world) could match those of the most productive regions or that the trend rate of increase in crop yields is the same everywhere. However, evidence suggests that the rate of increase in crop yields has

been constant over roughly half a century, and in particular, the rate of increase is not declining as some studies claim. A similar story can be made for global livestock production, at least based on available information up to 2001.

Public and private agricultural research capital and public agricultural extension can introduce new technologies that can enhance agricultural productivity. If the growth in public agricultural research expenditures is slowing, this may have predictions for future gains in agricultural productivity. Huffman (2009) suggests that the peak impact of R&D investment today on agricultural productivity will not occur for almost a decade. Thus, the foundations for new agricultural technologies of 2018 are being laid today. If investments in research are not keeping pace relative to those of recent decades, then agricultural TFP growth 10 years from now may be lower than observed today.

Reforming institutions and infrastructure is a necessary condition

If there is less technology internationally available from the world's leading national agricultural research stations, the effect on the urbanised countries may not be great. The Eastern and Central European countries have a long way to go to increase efficiency levels to match Northern Europe, so reorganisation matters more than technical progress.¹⁰ In Latin America, countries such as Brazil and Argentina are industrialising and commercialising agriculture and have their own research capacity that may well increase yields as a result. They are almost certain to increase labour productivity as agriculture is mechanised and TFP should be driven by labour productivity growth. For the upper end of the transforming countries the same is true, as China and India have the research capacity to generate yield growth and the withdrawal of labour from agriculture will raise labour productivity and TFP.

It is the smaller countries, with less public research capacity and less industrialisation that may be at risk from productivity stagnation if they do not attract private technology providers. All TFP studies show that Sub-Saharan Africa (SSA) lags behind, but that productivity has been improving since the mid 1980s. The key seems to be institutions, incentives and better policy and infrastructure. It is efficiency change, rather than new technology and SSA could have reasonable growth in TFP and yields on this basis alone. A major difference between Asia and Africa is that in Asia, yield growth has been translated into increased labour productivity and better incomes. In SSA, yield increases have improved labour productivity very little, so there is a difficult question as to whether the relatively land abundant countries can follow a path of labour saving technical change.

Water use management in agriculture has to improve

Agriculture currently accounts for 44% of total OECD area water use, while for many countries the share is over 60%. Moreover, agriculture water use has been growing faster (2%) than for other water users (1%) between 1990-92 and 2002-04 for the OECD area. Changing dietary habits towards meat and dairy products in developing countries are key drivers impacting on water use by agriculture. In some regions, the expansion of biofuel and bioenergy production could place additional stress on water resources. The economic and environmental costs of agricultural water pollution are high, with the impacts of intensive groundwater use in agriculture constraining agricultural production, resulting in a wide range of social and environmental externalities.

The anticipated growth in world population to 9 billion by 2050 will involve a major expansion in demand for water, primarily for industrial uses but also in response to maintain the integrity and economic value of increasing environmental services

(e.g. wetlands). Some 44% of the world's population are already living in areas under severe water stress, mostly in non-OECD countries, and this share is projected to rise. Given that agriculture is the dominant water user in most countries, it will be crucial that agriculture substantially improves its efficiency in the use of water in the future.

Agriculture must adapt to climate change

Climate change will only add to the risks of water stress as well as the incidence and severity of floods. The IPCC suggests that with a 3-5°C increase in global mean annual temperatures, developing countries may need to increase cereal imports by 10-40% while real agricultural prices could be 10-40% higher. Asian, African and Middle Eastern countries will encounter the greatest pressure on water resources, especially from the future growth in non-agricultural water use. It is likely that OECD countries will continue to be a major source of farm exports to these countries, which in turn will necessitate OECD countries to further improve their management of water resources.

Two unknowns that will influence the future course of agricultural development centre on energy and the environment. If oil prices rise, agriculture will need to adjust to more expensive fertiliser, fuel and transport, while competition between food and biofuels could also become more intense. Rising concerns and government regulations over climate change, biodiversity and resource management will push agriculture towards greater sustainability and lower environmental costs. It remains to be seen how energy efficient technologies can be developed.

Investment in agriculture is necessary but insufficient for food security

Care also needs to be taken to the wider political, social and economic framework that would stimulate overall development, raise incomes and reduce poverty. In many cases, poverty is the underlying cause of food insecurity, and policies to improve the purchasing power of poor households through broad based economic development are essential. Hundreds of millions of people are simply not earning enough income to buy food that is otherwise available, be it at the high prices that prevailed in 2008 or at the much lower ones of a decade ago.

Within an objective of overall economic growth, the development of economically viable rural areas must be a primary policy objective to fight poverty and to manage migration flows from rural to urban areas. Agriculture can and should contribute to economic growth and rural development in developing countries along with other sectors that have high growth potential. Necessary conditions for agriculture to be an engine of growth usually include gains in productivity, integration of local and international markets and the creation of productive rural employment.

Fisheries sustainability is critical to overall food supplies

While not usually associated with the Outlook report, fisheries should be a consideration in any discussion about food security. Fish proteins accounted for 15% of total world animal protein supplies in 2003. Global fish production has increased about 8 times in volume since 1950 to reach some 145 million tonnes in 2006. Capture fisheries production has stabilized at 90-95 million tonnes over the past decade while aquaculture production has increased significantly and now contributes 36% of the total fish production. FAO and other organisations have projected total fish production to increase by 10-15% over the next ten years (Box 3.3).

Box 3.3. Fisheries and aquaculture: Responding to the growing demand for food*

Fish is highly nutritious, rich in micronutrients, minerals, essential fatty acids and proteins and therefore significantly contributes, quality-wise, to overall protein intake. Global per capita fish consumption has increased over the past four decades, rising to 16.4 kg in 2006. Regionally, two-thirds of the total food fish supplies is consumed in Asia (in particular, China) while under 5% is consumed in Africa. Fish consumption is closely related to income, among other things, with per capita fish consumption in developing countries at 14.4 kg in 2006 compared with 23.9 kg in developed countries.

Some 37% of fish production was traded internationally in 2004. The quantity of fish and fish products exported in 2004 was 53 million tonnes, a 13% increase compared to 1994. Over the same period, the value of exports increased by 51%, reaching a record value of USD 71.5 billion in 2004. Fish and fish products represent one of the most important commodity groups in the exports from developing countries. The share of fishery product exports in total agricultural trade (including forestry products) increased from 5% in 1976 to 14% in 2004 for these countries.

The FAO estimated fish production in 2020 to reach 163 million tonnes with aquaculture accounting for 70 million tonnes or 43%, up from 32% in 2004 (see Table below). A 2003 study by the International Food Policy Research Institute (IFPRI) estimated that total fish production would reach 170 million tonnes by 2020 (capture fisheries 116 million; aquaculture 54 million tonnes) with global per capita fish consumption increasing to 17.1 kg. It could be expected that the growing share of aquaculture may progressively increase competition for feed destined to livestock production.

Fish production in 2004 and projections

	2004	2010	2020	2020
Information source	FAO statistics ^b	SOFIA 2002 ^c	SOFIA 2002 ^c	IFPRI study ^d
Total capture	95	93	93	116
Aquaculture	45.5	53	70	54
Total production	140.5	146	163	170
Percentage for food	75%	82%	85%	77%

a) All figures – other than percentages – are in million tonnes.

b) Based on latest statistics of the FAO Fishery Information, Data and Statistics Unit.

c) FAO. 2002. *The State of World Fisheries and Aquaculture 2002*. Rome.

d) International Food Policy research Institute. 2003. *Fish to 2020: supply and demand in changing global markets*, by C. Delgado, N. Wada, M. Rosegrant, S. Meijer and M. Ahmed. Washington, DC.

Source: FAO, SOFIA 2006.

Various measures and instruments have been developed to achieve sustainable fisheries such as the FAO Code of Conduct for Responsible Fisheries. The Code of Conduct emphasises efforts to deter Illegal, Unregulated and Unreported (IUU) fishing. Regional high seas fisheries management organisations, as well as national governments, have been under pressure to establish more efficient systems to manage fishery resources in a sustainable and responsible manner and stop IUU fishing, through strengthening monitoring, control and surveillance activities. Various programmes have been established and implemented in light of the call of the World Summit on Sustainable Development in 2002 to rebuild fish stock to sustainable levels by 2015.

Box 3.3. Fisheries and aquaculture: Responding to the growing demand for food* (cont.)

As many fisheries in OECD countries are characterised by excessive capacity (i.e. too many vessels and fishermen) decommissioning or buy-back programmes of fishing fleets, and accompanying policy measures, have been adopted as a means of restructuring national fishing fleets in many countries. In 2008, the OECD Council approved policy guidelines and best practices for the design and implementation of decommissioning schemes.

* Statistics in this Box are from the FAO if not otherwise indicated. Fisheries statistics are difficult to acquire and should be interpreted with caution.

The future potential of the industry is linked to the ability of policy makers to provide a conducive policy landscape for sustainable and profitable operations. In recent years, national and international policy debates have focused on sustainable and responsible fisheries and stock rebuilding, recognising that major fish stocks are either overexploited or at very high levels of exploitation.

Many countries are investing heavily in the sector expecting that future demand for high quality seafood will be met by farmed fish. However, aquaculture has economic, environmental and social implications which may be poorly evaluated or inadequately addressed within current policy frameworks. For example, the availability of suitable sites for aquaculture is often cited as one of the constraining factors in the aquaculture industry in many OECD countries.

Notes

1. Final Declaration of the G8 Agriculture Ministers meeting, 18-20 April, Cison di Valmarino, Italy: www.g8agricultureministersmeeting.mipaaf.com/it/.
2. FAO (2006): World agriculture: Towards 2030/2050 – Interim report. Rome; and Bruinsma, J. (2009, forthcoming): The resource outlook to 2050 – By how much do land, water use and crop yields need to increase by 2050? Paper to the FAO Expert Meeting on “How to Feed the World in 2050”, Rome, 22-24 June 2009. Growth rates are based on 2005-07 average historical data.
3. The background material for this section was contributed by H. George and F. Nachtergaele of the Natural Resources Management and Environment Department at FAO, and Cheng Fang and Merritt Cluff from the Trade and Markets Division. Some of the work reported here was extracted from an unpublished draft report prepared in 2006 on State of Land and Water Resources (SoLAW) by the FAO Land and Water Division.
4. One major drawback requiring further research is the effect of land degradation on the quality of the land, which is not taken into account in the agro-ecological approach of Fischer *et al.* (2002).
5. Total area and not cultivated area, as often no data are available.
6. Major contributions to this section were provided by W. Huffman, Iowa State University, Department of Economics; J. Piesse of King's College London and University of Stellenbosch, Republic of South Africa; C. Thirtle, Imperial College London and University of Pretoria, Republic of South Africa.
7. Standard weights: 45 pounds of rough rice per bushel; 56 pounds of shelled corn per bushel, and 60 pounds of wheat, soybeans, and potatoes per bushel. Also, one pound per acre equals 1.121 kilograms per ha.
8. Gilles Charmet, INRA, *Les causes du plafonnement du rendement en grandes cultures*, presentation to the 2009 Salon International de l'Agriculture.

9. One notable difference between potato and corn grain is the water content. Number 2 yellow corn is standardized to 14% moisture content. In contrast, potatoes are 72-75 % water (FAO 2009).
10. A recent FAO report noted that world average grain yields have risen by approximately 1.5% per year since 1991, with average annual gains ranging from 0.6% in Western Europe to 3.7% in Brazil. During the same period, both Ukraine and Kazakhstan experienced a decrease in grain yields while Russia remained stable. By 2016, grain yields in Russia, Kazakhstan and Ukraine are likely to increase by 11% (compared to 2004-06 levels), due to better farm management, increased application of agricultural inputs and plant genetics. Still, the report suggested there is a much larger yield increase potential in these three countries considering soil quality, climatic conditions and current levels of productivity. (FAO, 2008).

References

- Agricultural Economics Association Annual Meeting, Providence, RI, July.
- Alcamo, J., M. Florke and M. Marker (2007), "Future long-term changes in global water resources driven by socio-economic and climatic changes", *Journal of Hydrological Sciences*, Vol. 52, No. 2, April, pp. 247-275.
- Alcamo, J., T. Heinrichs and T. Rosch (2000), *World Water in 2025 – Global modelling scenarios for the World Commission on Water for the 21st century*, World Water Series Report No. 2, Center for Environmental Systems Research, University of Kassel, Germany.
- Alejandro Nin, Simeon Ehui and Samuel Benin (2007), "Livestock Productivity in Developing Countries: An Assessment" (Chapter 47) in *Handbook of Agricultural Economics: Agricultural Development: Farmers, Farm Production and Farm Markets*, Vol. 3.
- Antle, J.M. (2009), *Economics of carbon sequestration in agricultural soils*. Consultant report prepared for the Trade and Agriculture Directorate, OECD.
- Bates, B.C., Z.W. Kundzewicz, S. Wu and J.P. Palutikof, Eds. (2008), *Climate Change and Water*, Technical Paper of the Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp, www.ipcc.ch/ipccreports/tp-climate-change-water.htm.
- Beintema, N. M. and G. Stads (2008), *Measuring Agricultural Research Investments: A Revised Global Picture*, ASTI Background Note October 2008) www.asti.cgiar.org/pdf/global_revision.pdf.
- Bot, A.J., Nachtergaele, F.O. and Young, A. (2000), Land resource potential and constraints at regional and country levels. *World Soil Resources Reports*, 90.
- Comprehensive Assessment of Water Management in Agriculture (CA) (2007), *Water for food water for life: A comprehensive assessment of water management in agriculture*, International Water Management Institute, Colombo, Sri Lanka, and Earthscan Publications, London. www.iwmi.cgiar.org/Assessment/.
- CSIRO (2008), *An overview of climate change adaptation in Australian primary industries: impacts, options and priorities*, National Climate Change Research Strategy for Primary Industries, CSIRO, Australia.
- Easterling, W.E., P.K. Aggarwal, P. Batima, K.M. Brander, L. Erda, S.M. Howden, A. Kirilenko, J. Morton, J.-F. Soussana, J. Schmidhuber and F.N. Tubiello (2007), *Food, fibre and forest products*, in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 273-313, www.ipcc.ch/ipccreports/ar4-wg2.htm.
- European Parliament (2008), *Climate change-induced water stress and its impact on natural and managed ecosystems*, Policy Department, Economic and Scientific Policy, European Parliament, Brussels, Belgium.
- Evenson, R.E. (2001), *Economic Impacts of Agricultural Research and Extension*. In G.L. Gardner and G. Rausser, Eds., *Handbook of Agricultural Economics*, Vol. 1A (Agricultural Production). New York, NY: Elsevier, pp. 574-628.
- Evenson, R.E. and D. Gollin (2003), *Crop Variety Improvement and Its Effect on Productivity: The Impact of International Agricultural Research*. Cambridge, MA: CABI.
- Falck-Zepeda, J.B., G. Traxler and R.G. Nelson (2000), *Recent Creation and Distribution from Biotechnology Innovations: The Case of Bt Cotton and Herbicide-Tolerant Soybeans in 1997*. *Agribusiness*/ 16:21-32.
- FAO (forthcoming), *World Agriculture: towards 2030-2050 An FAO Perspective*. Rome, Italy.

- FAO (2008), "Grain Production and Export Potential in CIS Countries", a report prepared for an EBRD seminar, Fighting Food Inflation through Sustainable Investment, 10 March, 2008, London.
- FAO (2003), *World Agriculture: towards 2015/2030 An FAO Perspective*. Earthscan Publications, London.
- FAO and UNEP, (1999), *The future of our land. Facing the challenges*. Available at: www.fao.org/DOCREP/004/X3810E/X3810E00.HTM.
- Fischer, G., van Velthuizen, H., Shah, M., and Nachtergaele, F.O., (2002), *Global Agro-ecological Assessment for Agriculture in the 21st Century: Methodology and Results*. Research Report, IIASA, Laxenburg, Austria, FAO, Rome, Italy, 119 pp. + CD-ROM.
- Global Forests Resources Assessment, (2000), <http://edcsns17.cr.usgs.gov/glcc/fao/index.html>.
- Griliches, Z. (1960), *Hybrid Corn and the Economics of Innovation*. Science 132:275-280.
- Huffman and Evenson (2006), *Science for Agriculture: A Long-Term Perspective*. Ames, IA: Blackwell Publishing.
- Huffman (2009), *Technology and Innovation in World Agriculture: Prospects for 2010-2019*. Iowa State University, Department of Economics Working Paper #09077, April.
- Huntington, T. G. (2006), *Evidence for intensification of the global water cycle: Review and synthesis*, Journal of Hydrology, Vol. 319, pp. 83-95.
- IFPRI (2003), "Fish to 2020: Supply and Demand in Changing Global Markets".
- IWMI (2007), *Water for food water for life: A comprehensive assessment of water management in agriculture*, International Water Management Institute, Columbo, Sri Lanka, www.iwmi.cgiar.org/Assessment/.
- Irwin, S., D. Sanders and R. Merrin (2009), *Devil or Angel? The Role of Speculation in the Recent Commodity Price Boom (and Bust)*. Invited paper Southern Agricultural Economics Association Meetings, Atlanta, Ga., 2009.
- LandScan (2002), *World Population*. Oak Ridge National Laboratory, SEDAC, CIESIN, Columbia University, USA. Available at www.ornl.gov/sci/landscan/.
- Lemmen, D.S., Warren, F.J., Lacroix, J., and Bush, E. (editors), 2007: *From Impacts to Adaptation: Canada in a Changing Climate 2007*, Government of Canada, Ottawa, Ontario, Canada, http://adaptation.nrcan.gc.ca/assess/2007/toc_e.php.
- Lewandowski, J., Peters, M., Jones, C., House, R., Sperow, M., Eve, M. and Paustian, K. (2004), *Economics of sequestering carbon in the US agricultural sector*. USDA/ERS, Technical Bulletin, Number 1909.
- Ludena, C.E., Hertel, T.W., Preckel, P.V., Foster, K., Nin Pratt, A. (2005). *Disaggregate productivity growth in livestock: A directional Malmquist Index approach*, Presented at the American Beintema, N. and Stads, G. (2008), *Measuring Agricultural R&D investments: A revised global picture*, IFPRI. Washington, DC.
- McCarl, B.A. and Schneider, U.A. (2000), *US Agriculture's Role in a Greenhouse Gas Emission Mitigation World: An Economic Perspective*. Review of Agricultural Economics, 22(1): 134-159.
- OECD (2009a), *Agricultural Policies in Emerging Economies: Monitoring and Evaluation 2008*.
- OECD (2009b), *Managing water for all: An OECD perspective on pricing and financing*, www.oecd.org/water.
- OECD (2009c), *Agricultural Policies in OECD Countries: Monitoring and Evaluation Report 2009*.
- OECD (2009d), *Sustainable Management of Water Resources in Agriculture*.
- OECD (2008a), *Environmental Performance of OECD Agriculture Since 1990*, www.oecd.org/tad/env/indicators.
- OECD (2008b), *OECD Environmental Outlook to 2030*, Paris, France, www.oecd.org/env.
- Paarlberg, Robert. *Starved for Science: How Biotechnology is Being Kept Out of Africa*. Cambridge, MA: Harvard University Press, 2008.
- Piesse J and Thirtle C, (2009) *Prospects for agricultural productivity growth: Will there be a slowdown in developing countries?* King's College London, <http://kcl.ac.uk/schools/sspp/mgmt/research/papers/international/piesse-productivity.html>.
- Portuguese Ministry of Environment (2007), *Water scarcity and drought: A priority of the Portuguese Presidency*, Lisbon, Portugal.
- Seckler, D., D. Molden, U. Amarasinghe and C. de Fraiture (2000), *Water issues for 2025: A research perspective*, IWMI, Columbo, Sri Lanka.

- Shen, Y., T. Oki, N. Utsumi, S. Kanae and N. Hanasaki (2008), "Projection of future world water resources under SRES scenarios: water withdrawal", *Journal of Hydrological Sciences*, Vol. 53, No. 1, February, pp. 11-33.
- Shiklomanov, I. (2000), "Appraisal and assessment of world water resources", *Water International*, Vol. 25, No. 1, pp. 11-32.
- Thirtle, C. and Piesse, J. (2008), Factor Endowments, Biased Technological Change, Wages and Poverty Reduction: Can Genetically Modified Crops Bring a Green Revolution to SSA? *International Journal of Biotechnology*, 10:2/3, 184-206.
- Thirtle, C., Townsend, R., Amadi, J., Lusigi, A. and van Zyl, J. (1998), The Rate of Return on Expenditures of the South African Agricultural Research Council, *Agrekon*, 37:4, 621-31.
- Townsend, R and Thirtle, C (2001), Is Livestock Research Unproductive? Separating Health Maintenance from Improvement Research, *Agricultural Economics* 25:3, 177-89.
- USEPA (2008), *The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States*, US Environmental Protection Agency, Washington, D.C., United States.
- World Bank (2008), Agriculture for development, *World Development Report*, Washington, DC.
- World Database on Protected Areas (2005), Available at: http://maps.geog.umd.edu/WDPA/WDPA_info/English/DB_DataLayers.html.

Chapter 4

Macroeconomic and Policy Assumptions

Business is not as usual

This year's Outlook was produced under highly unusual circumstances. The financial turmoil that started with problems in sub-prime mortgages in the United States evolved into a real estate slump following the bursting of the housing price bubble which morphed into a severe credit crunch that has spread into the real economy across many countries in different regions. These developments have shattered the decoupled illusion between the crisis-hit economies of the west and emerging economies. Globalisation, with its expanded supply chains and international financial flows, has created an even more interdependent world and now it seems that all countries are linked. The result is lower output and higher unemployment world-wide, shattering consumer confidence while bringing trade and international capital flows crashing down. At the time of writing, April 2009, the global economy is in the middle of its deepest and most wide-spread recession in more than 50 years. The collapse of industrial production over the past six months is continuing in almost all OECD countries, and with non-OECD countries also slowing, world growth has turned negative. What is more, it is not clear that the worst is behind us or the speed of eventual recovery.

As usual, fourth quarter 2008 medium term macroeconomic projections were used in the preparation of the outlook baseline. Revised, and more pessimistic, income (GDP) projections for 2009 and 2010 were released in late March 2009, although a consistent set of revised medium term macro projections were not available to prepare a new baseline. In recognition of the substantial downward revisions in income growth projected for 2009 and 2010, two scenarios described in Chapter 2 illustrate the effect of lower incomes and different recovery paths on agricultural markets. Both scenarios start with the lower incomes projected for 2009 and 2010 as the starting point. This analysis does not provide a best case/worst case scenario nor is it a full assessment of the impacts of the economic downturn, which would be highly speculative given the uncertainties surrounding future developments and the complex interrelations of the factors involved. Rather, it provides an indication of the sensitivity of agricultural markets to economic downturns and different recovery paths.

In what follows, the underlying macroeconomic assumptions that generate the outlook baseline are first described. Then, more recent economic developments are reviewed to give the reader a broad sense of the macroeconomic forces influencing agricultural markets. This is followed by a more detailed description of the revised short term GDP projections that are used in the scenario analysis.

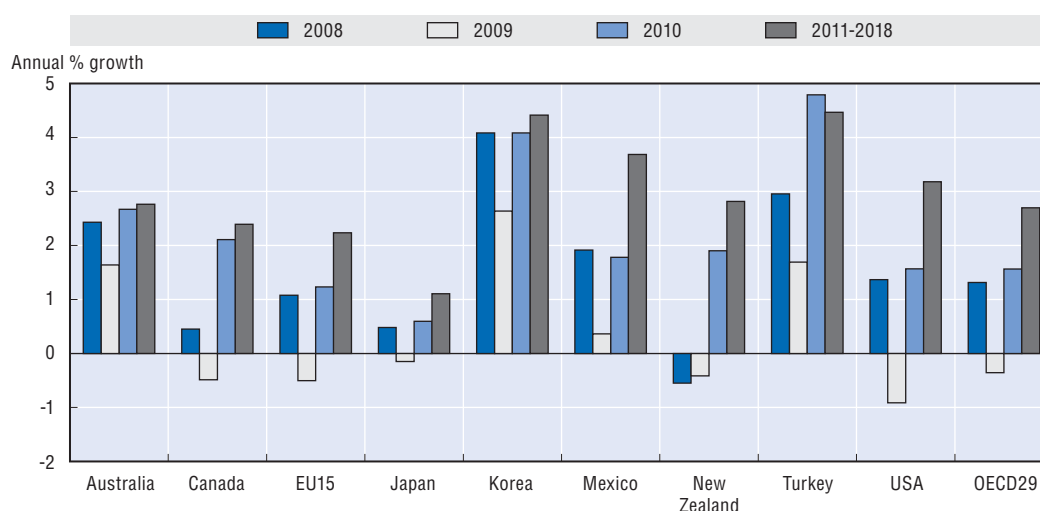
The main underlying assumptions

The outlook baseline incorporates the macroeconomic projections from the fourth quarter of 2008. For OECD countries, these assumptions are from the *OECD Economic Outlook* of December 2008, while the World Bank's *Global Economic Prospects* from November 2008 is the source for non-OECD countries. These projections present a unified and consistent set of data, for the countries considered in the Outlook. Compared to the projections in last

year's Outlook, the macroeconomic projections are considerably more pessimistic in terms of income growth, along with the associated inflationary expectations and exchange rates.

Although there were warning signs during 2008, especially in the third quarter, that the economic conditions in some major economies were deteriorating, the medium projections assumed that the problems would be contained to a few, mostly OECD countries with overinflated housing sectors undergoing severe retrenching as shown in Figure 4.1.

Figure 4.1. **OECD area: Slow down in GDP growth**



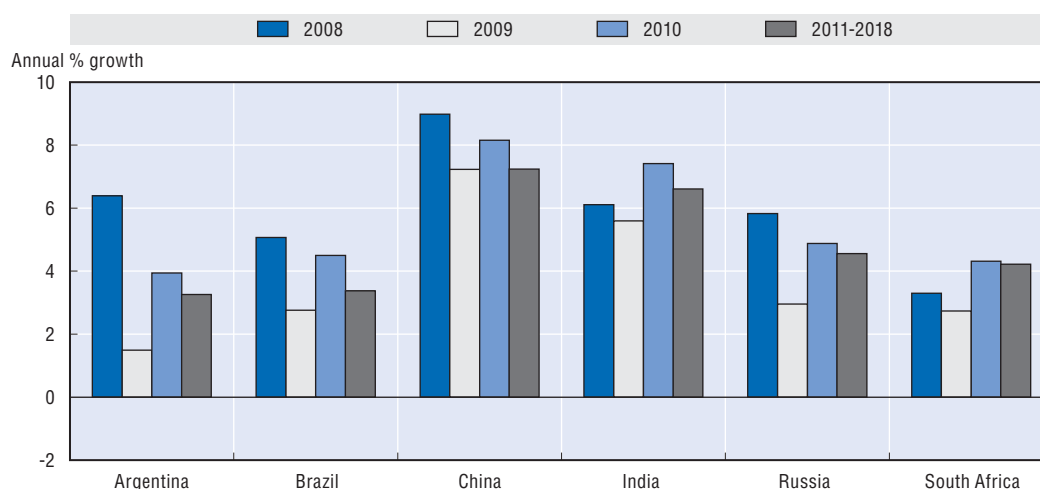
Note: Average annual growth is the least-squares growth rate (see glossary).

Source: OECD Economic Outlook No. 84 (December 2008), World Bank Global Economic Prospects 2009 (November 2008).

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For non-OECD countries, since they were mostly insulated from the housing sector problems of OECD countries, the prospects were expected to be more robust (Figure 4.2)

Figure 4.2. **Non-OECD area: Lower GDP growth**



Note: Average annual growth is the least-squares growth rate (see glossary).

Source: OECD Economic Outlook No. 84 (December 2008), World Bank Global Economic Prospects 2009 (November 2008).

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Of course, there have been considerable negative developments since these income projections were made that have materially deteriorated expectations on income growth for 2009 and 2010. These latest developments suggest that the projections in the baseline are somewhat optimistic and are discussed more fully below.

Slower population growth in the coming decade

Income is a major driver for agricultural markets as it is an indicator of ability to pay for goods and services. Another driver is population. Population growth will decline over the next decade, down to 1.1% per year on average. Nonetheless, some 77 million people a year will be added to world population over the next ten years to approximately 7.5 billion people in 2018. The biggest increase is expected in Africa (more than 2% per year on average), while the population in Europe is not expected to increase much during the next decade (Table 4.1).

In the European Union, population growth is less than half the rate of the previous decade or 0.2% per year for EU15 and 0.1% per year for EU27. Within the OECD area, Turkey, Mexico, Australia and the United States expand their population the most. In contrast, Japan is expected to exhibit a slightly negative growth rate of -0.21% per year by 2018.

Assumptions for China are that the current trend will continue during the next decade at a rate close to 0.53% per year (an additional 7.3 million people each year). Strong growth is expected in India and Brazil, 1.27% and 1.05% per year respectively, adding an additional 16.4 million and 2.2 million to the world's population.

Table 4.1. **Slow down in population growth**

Annual percentage growth

	Population	
	1999 – 2008	2009 – 2018
World	1.22	1.07
Africa	2.38	2.20
Latin America and Caribbean	1.29	1.09
North America	1.01	0.87
Europe	0.31	0.09
Asia and Pacific	1.24	1.05
Oceania Developed	1.15	0.91

Note: Average annual growth is the least-squares growth rate (see glossary).

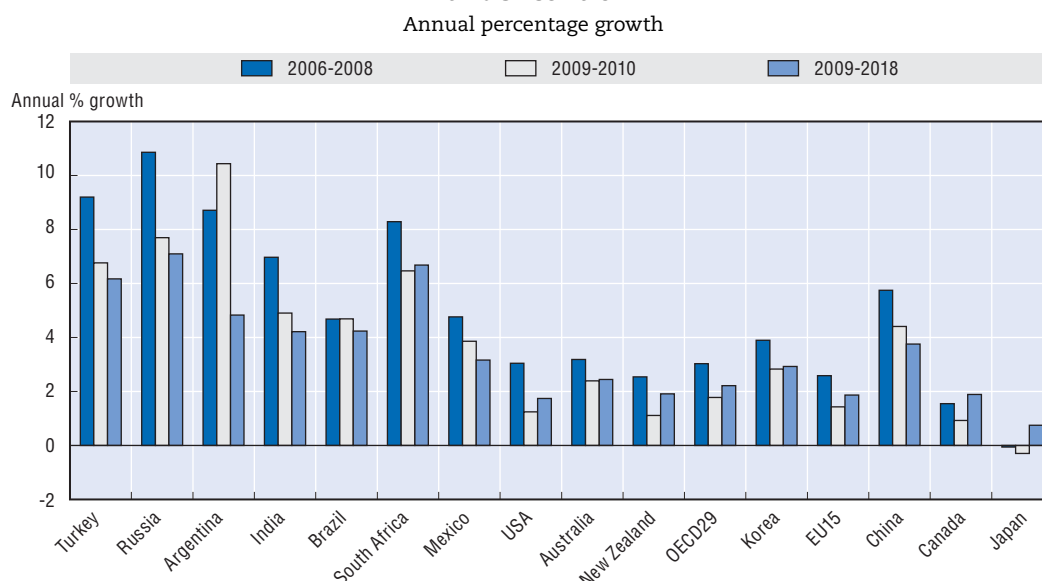
Source: UN World Population Prospects (2006 Revision).

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Inflation to remain low across the OECD area

Inflation is expected to remain at a low level during the next decade in most OECD countries (with some risk of deflation in the short term in some countries, such as Japan, Spain, Ireland or the United Kingdom). The high commodity and other raw material prices of 2007-08 did not materially fuel inflation in most countries, as monetary authorities were able to keep inflation under control (Figure 4.3). Since the summer of 2008 however, many agricultural and other commodity prices have fallen sharply reflecting the slowdown in economic activity lowering inflation fears for the short term. However, falling prices, along with falling income growth and drastic cutbacks in consumer spending combined with a global surplus of aggregate supply, have caused some to question whether the world is headed toward a deflationary period.

Figure 4.3. **Despite an increase in some countries, inflation expected to remain under control**



Note: Average annual growth is the least-squares growth rate (see glossary).

Source: OECD Economic Outlook No. 84 (December 2008), World Bank Global Economic Prospects 2009 (November 2008).

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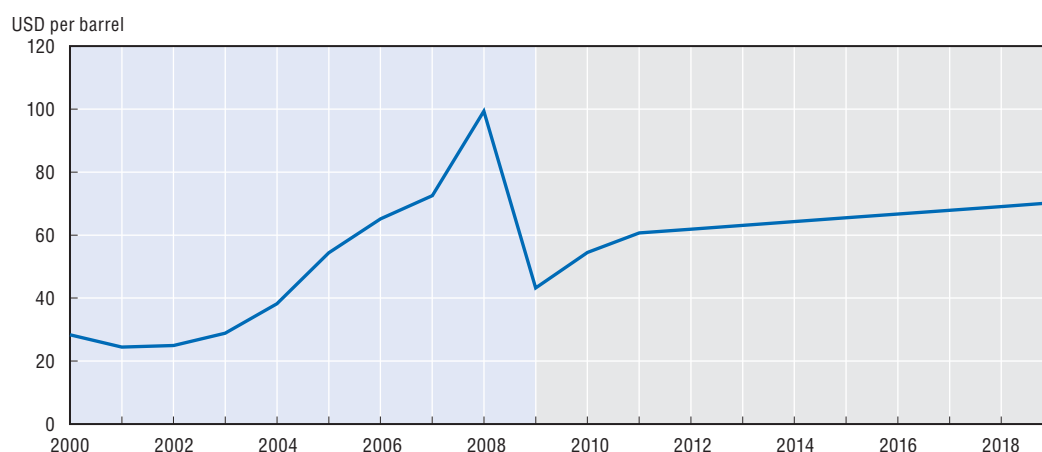
For OECD countries, as a whole, the baseline assumes that inflation will be just over 2% per year, with Turkey as an outlier with expected inflation rate exceeding 5% per year. Inflation rates above 5% *per annum* are also expected in some non-OECD countries such as Russia, Argentina and India. These rates are lower from those which these countries experienced during the 2006 to 2008 period.

Oil prices fluctuated markedly in 2008

Oil price is an important input in the *Outlook* as it reflects energy, transport and fertiliser costs. Oil prices increased dramatically since the start of this decade culminating in a price of around USD 150 a barrel in the summer of 2008 (Figure 4.4). According to the *OECD Economic Outlook*, this was due to much stronger than expected demand and a weaker than anticipated oil supply response to the rising prices. However, during 2008, prices fluctuated widely ranging between USD 40 – USD 150 a barrel. Current expectations are that this run-up in the price of oil will not reoccur in the medium term. This should mitigate somewhat the cost-price squeeze farmers may face given falling commodity prices.

Slowing economic activity in major countries began to depress prices after the peak in the summer of 2008. Since November 2008, oil prices have ranged between USD 40 and USD 55 per barrel. Normally, the oil price used to generate the outlook is based on information from the *OECD Economic Outlook*. For this year however, the short term oil price projections did not fully reflect the most recent market conditions. Hence, for the first two years of the *Outlook* the oil price is from the US Energy Information Agency. For subsequent years, the oil price from the *OECD Economic Outlook* is used. The oil price is expected to exhibit a slow progression over the period from USD 44 per barrel in 2009 to USD 70 per barrel in 2019 (Figure 4.4). The future of oil prices is an important factor of uncertainty given the fluctuations that were experienced in 2008. To illustrate the uncertainties, results from a scenario using the higher oil prices from last year's *Outlook* is presented in Chapter 2 (Box 2.1).

Figure 4.4. Oil price to recover following a sharp drop in 2008



Source: US Energy Information Agency and OECD Economic Outlook No. 84 (December 2008).

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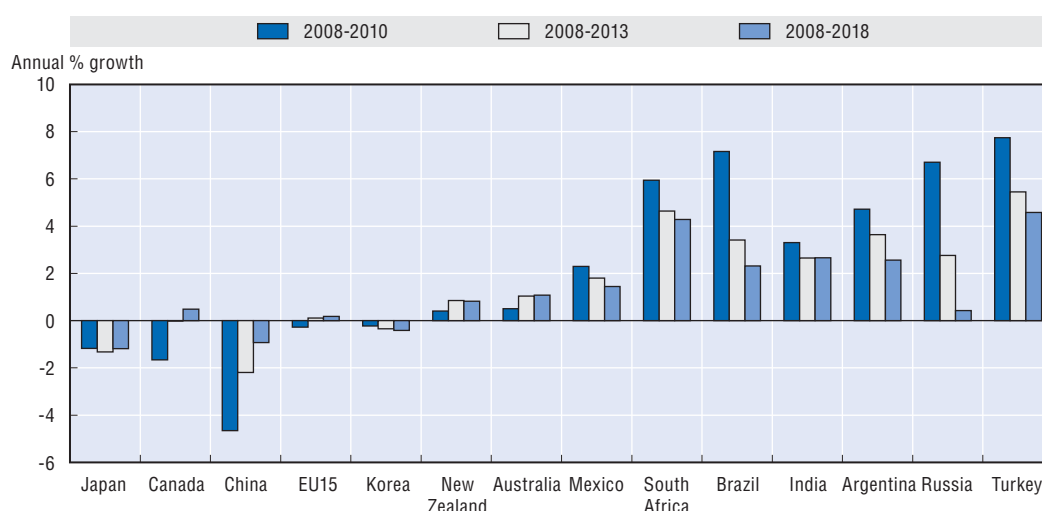
Inflation to reduce the value of the currency of some dynamic economies in the long term

The havoc in the financial markets since the middle of 2008 has spilled over into the currency markets. The US dollar, which had been depreciating until early summer, has since changed direction reflecting higher risk aversion and its status as a reserve currency. How exchange rates will adjust to the on-going economic and financial turmoil is uncertain.

Under the assumption of constant real exchange rates, inflation differentials vis-à-vis the United States is the main determinant of the projections for exchange rates over the outlook period. This implies a strengthening of the US dollar against most currencies (Figure 4.5).

Figure 4.5. US dollar strengthening against most other currencies

In local currency versus US dollar



Note: Average annual growth is the least-squares growth rate (see glossary).

Source: OECD Economic Outlook No. 84 (December 2008), World Bank Global Economic Prospects 2009 (November 2008).

StatLink <http://dx.doi.org/10.1787/677005023865>

Assumptions on exchange rates are essential to the baseline projections, as they can significantly influence relative competitiveness and hence agricultural trade between regions. The US dollar is the currency in which the majority of agricultural trade is denominated.

Over the course of the outlook period, the Euro exchange rate is projected to remain stable. However, very low levels of inflation in Japan relative to the United States mean that the yen is expected to appreciate further. The currencies of high growth, high inflation countries such as Brazil, India, Turkey and South Africa, are particularly lower in the medium term, thereby increasing their opportunities for agricultural export while slowing their import demand with the change in their terms of trade.

Domestic support and trade policy affect agricultural markets

Agricultural and trade policies play an important role in both domestic and international markets for agricultural commodities and food products. Agricultural policies are becoming increasingly targeted and directed towards achieving specific objectives reaching identified beneficiaries, while responding more broadly to national, regional and global concerns. At the same time, non-agricultural policies, such as energy, environmental and rural development measures, have a growing impact on the agri-food sector. Policies change the composition and levels of both production and consumption, thereby creating (or sometimes correcting) market distortions and influencing prices. There is a tendency towards increased price responsiveness on the supply side with ongoing policy reform in some OECD countries. Also, relatively elastic supply and demand in a growing number of developing countries, coupled with an increasing proportion of these countries in world trade, has assisted adjustments in agricultural markets.

The US has a new Farm Act (the Food, Conservation and Energy Act) which came into force in 2008. The counter-cyclical dimension of commodity programmes is reinforced with higher loan rates for several commodities under the Marketing Assistance Loan programme and higher target prices for most commodities in the Counter-Cyclical Payments (CCPs) programme. Direct payments and marketing assistance loan benefits are also reduced for producers who opt into the programme. In addition, a new optional revenue based countercyclical programme, Average Crop Revenue Election (ACRE) begins in 2009 as an alternative to the Counter-Cyclical Payments. Rates for fixed direct payments remain constant and restriction on producing fruits and vegetables is retained, except for a limited pilot programme in some states for vegetables contracted for processing, while the payment area is reduced from 85% to 83.3% of base acres. Price support programs for dairy and sugar are retained, but their administration is altered. On the trade front, the new Farm Act includes an expanded mandatory Country of Origin Labelling (COOL). The Export Enhancement Program has been repealed and the Export Credits Guarantee Programs have been modified to make them consistent with the WTO ruling in the cotton case. (For more details see *Agricultural Policies in OECD Countries: Monitoring and Evaluation* 2009).

The Outlook this year also includes the Energy Independence and Security Act of 2007 which established a 36 billion gallon (136 billion litres) Renewable Fuel Standard (RFS) until 2022. Maize based ethanol constitutes the main biofuels in the coming decade and is to increase to 15 billion gallons (56.8 billion litres) until 2015. However, other biofuels are explicitly mentioned in the Act, including cellulosic biofuels as well as biodiesel. The

blending of biodiesel into fossil diesel is required starting with 500 million gallons (1 billion litres) by 2009, increasing to at least 1 billion gallons (3.8 billion litres) by 2012.

The European Union's Health Check was launched in 2007 to assess if CAP reforms since 2003 were working in a larger European Union. Reforms were adopted in November 2008 and will apply from January 2009 onwards. Reforms adopted relevant for the outlook include changes to the intervention system with an abolishment of intervention for pigmeat, set at zero for barley, durum wheat, rice and sorghum, and limited for wheat, butter, and skimmed milk powder purchased at guaranteed prices after which buying in can continue through tender. Milk quotas are set to increase by 1% each year starting with the 2009-10 marketing year until the 2012-14 marketing year, and will expire after 31 March 2015. Furthermore, mandatory set-aside is abolished, arable crop and beef and veal (except suckler cow premium) payments are decoupled from 2010 and by 2012 at latest respectively and basic modulation is increased stepwise to 10% by 2012 (for more details see *Agricultural Policies in OECD Countries: Monitoring and Evaluation* 2009). For sugar, projections take into account the EU sugar reform implemented as of 1 July 2006. These include the progressive reduction of import duties, followed by unrestricted sugar exports to the EU from LDCs under the EBA initiative from 2009, and other African Caribbean and Pacific (ACP) countries under Economic Partnership Agreements from 2015. For other countries, established support measures and policy programmes (such as PROCAMPO in Mexico) are implemented as legislated. Where well-defined termination dates exist, they are factored into the projections; otherwise payments, provisions and other policy measures are assumed to continue through 2018.

No conjecture is included in the outlook projections for the future outcome of negotiations in the WTO for the Doha Development Agenda. As a result, it is assumed that trade policies as agreed in the Uruguay Round Agreement on Agriculture (URAA) will hold for the entire outlook period. Trade flows are increasingly influenced by policies that have been negotiated as part of regional trade agreements such as the North American Free Trade Agreement (NAFTA) and the Mercosur Agreement between Argentina, Brazil, Paraguay and Uruguay. The policy assumptions of the outlook take into account the provisions of these agreements, as well as the European Union's EBA initiative and existing bilateral preferential trade provisions covering specific agricultural commodities. Regional or bilateral trade agreements have not always been explicitly taken into account in the underlying modelling system, but allowance for such agreements has been made where they are expected to have an impact on trade. This is the case for two agreements with the US, the Central American Free Trade Agreement (CAFTA) and the Free Trade Agreement with Australia (AUS-FTA). The latter is expected to have a substantial impact on Pacific region beef trade.

Rapid deterioration in short term global economic outlook

This section provides a brief overview of major macroeconomic developments since the last quarter of 2008 and tries to put them in perspective with regard to the Outlook. The severity and duration of the downturn was initially underestimated by most pundits. But, since the beginning of 2009, there has been a constant flow of increasingly pessimistic macroeconomic updates from virtually all sources. Furthermore, with each update there are caveats indicating that the projections are highly uncertain and that expectations are likely to change over the coming months. In essence, the prognosis is very unclear with

respect to the depth of the contraction and its duration. Furthermore, the macro updates tend to be partial, focusing only on the short-term and only for selected variables. The OECD in its *Interim Report for March 2009* projected the ongoing contraction in economic activity to worsen through 2009. The current sharp downturn in activity is without precedent in the post-war period in terms of both its severity and its synchronicity.

World trade is tumbling

This global downturn in economic activity coincides with a precipitous decline in international trade. From the last quarter of 2008 and the first quarter of 2009, world trade has fallen at an average annual rate of more than 20%, a rate of decline not previously experienced over the last four decades. This contraction in world trade is broad based and affects all regions. The WTO estimates that trade volume will be 9% less in 2009 compared to 2008 while the OECD expects an even more severe 13% decline. Currencies of a number of emerging markets have also come under pressure from increasing risk aversion. Since mid-2008, the exchange rates of Brazil, Indonesia, Mexico, Russia, and Turkey, among others, have exhibited double-digit effective depreciation.

Some countries have reacted to the economic crisis through increases in protectionist measures. The World Bank reported in March 2009, that 17 members of the G-20 have taken a total of 47 trade-restricting measures since November 2008. But, thus far, these and other protectionist measures are not generally seen as the major driving force on trade flows. The OECD attributes the current credit crisis as partly explaining the collapse in international trade but ascribe a larger role to the breakdown in the global supply chains. The collapse in international trade may explain why the crisis has spread so rapidly to so many economies, particularly in Asia, a region that was initially expected to be less severely impacted.

Policy response has been robust

Many governments with teetering economies have introduced fiscal stimulus in an attempt to revive their economies. For the G-20 countries, fiscal stimulus is expected to amount to 1.8% and 1.3% of their GDP in 2009 and 2010 respectively. Monetary policy has also been accommodating. Policy interest rates in most OECD countries are at historically low levels. For example, the rate in March 2009 ranged from 0% to 0.25% in the US, 0.1% in Japan, 0.5% in the UK and 1.5% in the Euro zone in efforts to increase the money supply and stimulate the economy. Countries with fragile financial sectors have attempted to recapitalize the banks and add liquidity through different venues. But, it seems that the financial market turmoil has weakened the monetary transmission mechanism. Lower policy rates have not yet resulted in lower borrowing rates as banks are reluctant to expand their lending portfolios at this time. It seems that most of the additional money is held in banks as excess reserves given the uncertainty of the worth of their balance sheets. In the US, for example, Edlin and Jaffee indicate that in February 2009, excess reserves held by banks totalled USD 643.5 billion compared to excess reserves of only USD 1.8 billion in January 2008. Apparently, the toxic assets problem has yet to be resolved and credit is still tight. In an effort to release credit and facilitate trade, the G-20 announced a USD 250 billion package for the World Bank to be used for trade credit.

But with muted effect thus far

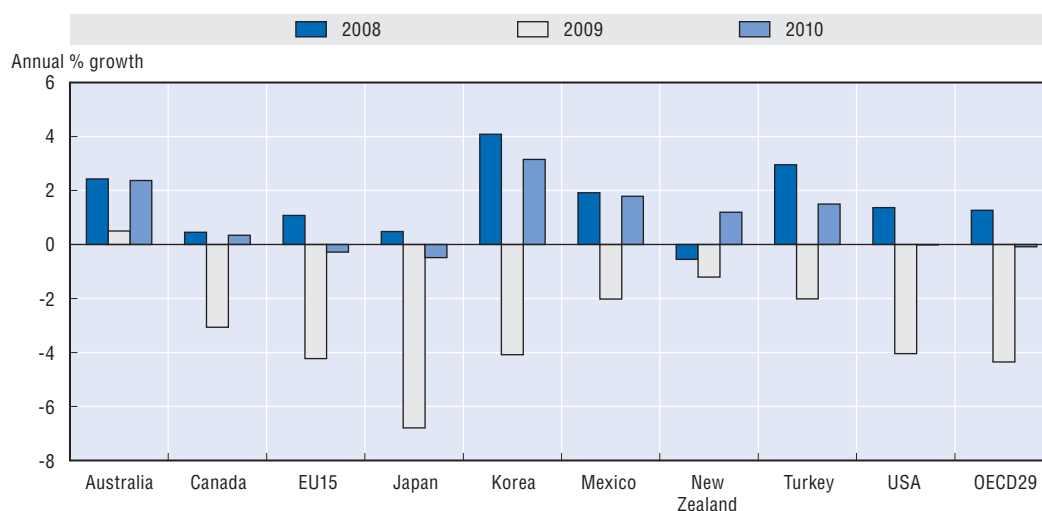
The human cost of the economic crisis in terms of higher unemployment is growing at a terrifying pace. Joblessness in OECD countries is expected to rise sharply with the unemployment rate peaking in 2010 or early 2011, reaching double digit levels in many countries. For OECD countries, this translates into some 25 million additional people unemployed. The intensifying risk of job losses has contributed to sharp declines in household confidence, contributing to an overall cutback in expenditures. The high joblessness rates, in addition to the hardships imposed on the individuals and their families may have further dire consequences for the global economy. The credit crisis began with foreclosures on people who purchased real estate with very high risk sub-prime loans but a second round of foreclosures may now start with lower risk loans falling into default due to layoffs.

Negative world GDP growth expected for the first time

Most economic institutions, including the OECD and the World Bank, have revised their short term expectations for the immediate future significantly downwards, compared to their estimates of only a few months' ago. As of March 2009, the World Bank projected world GDP to fall by 1.7% in 2009 while the OECD expects an even bigger drop of 2.75%. Both organisations expect world GDP to rebound in 2010 but the expectations are for it to remain below potential, and both indicate that there is a great deal of uncertainty and that the current downturn could be deeper and longer than projected.

Figure 4.6 shows the latest revisions in the GDP growth rates for selected OECD countries. This shows that few countries are expected to escape the current turmoil with the decline for all OECD countries averaging around 4%. For some large exporting countries, such as Japan, even though not directly exposed to the financial crisis, the downturn is expected to be even more severe, primarily through the trade channel. Comparing Figure 4.6 with Figure 4.1 shows the severity of the downturn and extent of the downward revisions for OECD countries.

Figure 4.6. **Sharp downturn in short term GDP growth for the OECD**

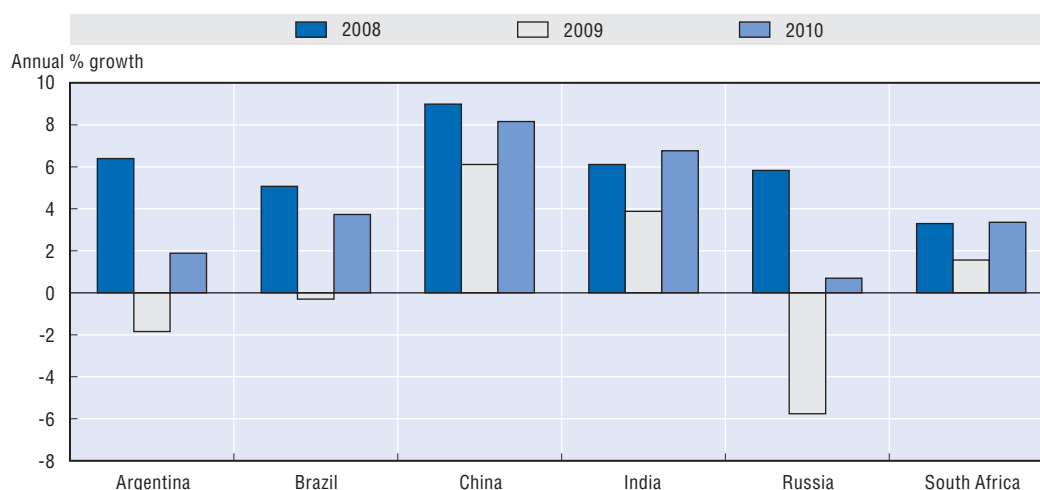


Source: Short term update, OECD March 2009, World Bank March 2009.

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Although the downturn may have been initiated within the OECD area, as mentioned above, the decline is worldwide. Figure 4.7 shows the revised expected GDP growth rates for selected non-OECD countries. This shows that some emerging economies will also experience negative growth in 2009, in particular Russia, while most will see their growth rates fall, at least in 2009. The extent of the downward revision in income expectations can be seen by comparing Figure 4.2 with Figure 4.7.

Figure 4.7. **Revised short term GDP growth rates for selected non-OECD countries**



Source: Short term update, OECD March 2009, World Bank March 2009.

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What does it all mean for the Outlook?

To reiterate, expectations about the world economy have deteriorated markedly from late 2008. The world today is different from only a few months ago, and given the uncertainties, conditions and expectations may be very different again in a few months time. Agriculture will be affected along with other sectors, but there are *a priori* reasons to suspect that the impact will be less as food is a necessity and people will be reluctant to severely cut back their food expenditures. Of course, this does not mean that there will not be any effects. Only that they are expected to be more limited overall, although there can be important differences among the various agricultural sub-sectors. High income countries have a very low elasticity of demand with respect to changes in income for most agricultural products. As incomes increase, demand for food increases moderately and when incomes fall demand also falls moderately. However, income elasticity of demand is not uniform across agricultural commodities or across countries. Therefore, changes in the composition of demand can be expected as some products such as meat and dairy have higher elasticity of income demand. Also, one would expect larger changes in lower income developing countries, where in general income elasticity of demand is higher for all products. But, here too, a change in the composition of demand will vary with income elasticities across products and countries.

Additionally, falling agricultural commodity prices relative to last year may help compensate for some of the income loss. On the supply side, falling oil prices compared to last year may help growers offset the cost-price squeeze. The net effect on the agricultural

sector is complex and will depend on the product and country examined. These are discussed in Chapter 2.

Uncertainties abound

As already indicated, there are many uncertainties that make a realistic assessment of expectations over the next decade problematic. One of the uncertainties is the future path of oil and other energy prices as economies recover. Another of the uncertainties is when and how quickly growth will resume. One of the headwinds to a speedy recovery is the fear that housing prices in the US will fall further, another 8-10%, over the next couple of years (Featherstone, 2009). Should this occur and if unemployment continues to mount, more homeowners may default on their loans, generating another credit crunch cycle which may spill over into the real economy, further reducing output and increasing unemployment. A second downside risk is deflation. Further falls in energy, raw materials and other commodity prices coupled with rising unemployment may cause consumers to postpone expenditures in anticipation of further price declines and this may feed on itself further lowering output. On the other hand, fears of future inflation also abound given the current massive stimulus and liquidity injections. Although needed now, how these economic stimuli are unwound as the economy picks up is a concern. Diligence will be needed to curb excess liquidity and limit inflationary pressures. Also the banking problems may not be solved quickly. If, following such massive liquidity infusion, banks continue to be negatively impacted by toxic debt, and if even more capital injections are needed to prop-up the banking sector, confidence may erode further igniting yet another negative cycle. On the other hand, with the push to get credit flowing again, there is a risk of following the same path that contributed to the initial financial crisis. On the upside, the unprecedented monetary and fiscal policy stimulus throughout the OECD area could prove to have a more powerful effect than currently projected. Also, financial markets may return to normality faster than assumed making the recovery stronger and earlier than expected.

References

- Edlin Aaron S. and Dwight M. Jaffee, "Show me the Money", *The Economist Voice*: Vol 6, Issue 4, Article 8.
- Featherstone Allen (2009), "Impacts of the Financial Market Crisis on the Agricultural Sector: A US Perspective", presented to OECD meeting, 18 April 2009.
- International Monetary Fund, "Global Economic Policies and Prospects", Group of Twenty Meeting of the Ministers and Central Bank Governors, March 13-14, 2009, London, UK.
- OECD Economic Outlook, Volume 2008/2, No. 84, December 2008.
- OECD Economic Outlook Interim Report, March 2009.
- OECD *Agricultural Policies in OECD Countries: Monitoring and Evaluation*, 2009.
- World Bank, "Global Economic Prospects 2009: Forecast" Update March 30, 2009.

Chapter 5

Biofuels

World market trends and prospects

Key market drivers

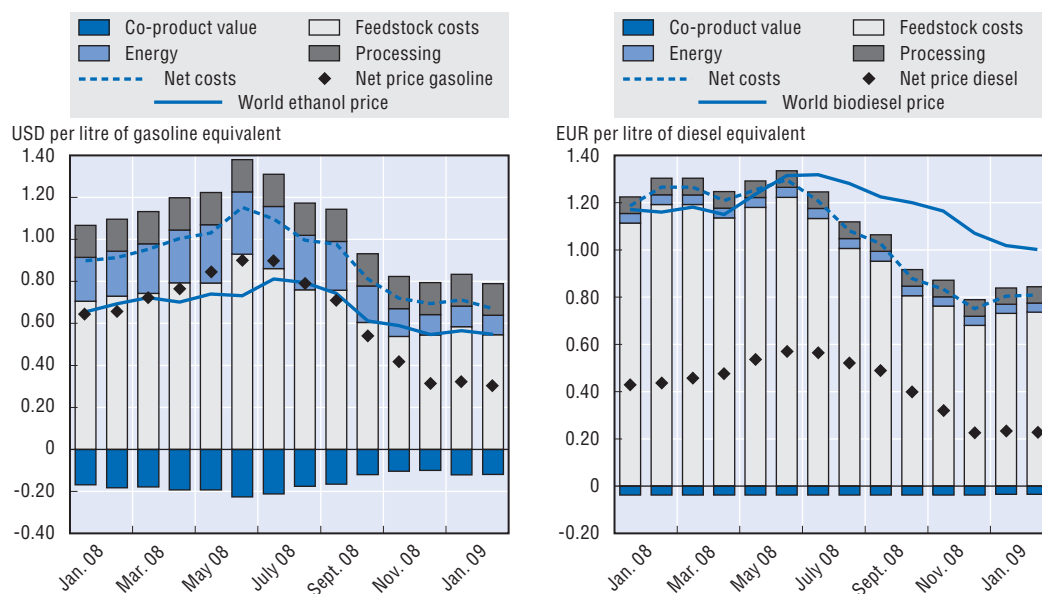
All markets related to biofuels have undergone a rollercoaster ride in 2008. After the passage of the Energy Independence and Security Act (EISA), signed into US law in December 2007, and the proposal by the European Commission for a new Renewable Energy Directive (RED) in January 2008, signals for accelerated growth in the production and use of biofuels were set. Crude oil prices, which started the year just below USD 100 per barrel on a steeply rising curve, had increased public and private interest in biofuels during the first half of the year, while at the same time soaring prices for feedstock commodities squeezed producers' margins, particularly as biofuel prices rose by much less than those for crude oil. At the same time, these high feedstock prices also meant skyrocketing food costs for poor consumers, providing fuel for the wider debate on "food versus fuel" and exacerbating strongly held – though to a large part exaggerated – concerns about the responsibility of increasing biofuels demand for rising food prices.

While wheat prices peaked in March 2008, prices for crude oil as well as those for maize and vegetable oils – the two principal feedstock commodities for ethanol produced in the northern hemisphere, and for biodiesel produced everywhere – kept rising throughout the first two quarters of the year. Crude peaked at USD 147 per barrel, while maize and vegetable oils, just like wheat three months before, reached price levels around three times their respective longer term trend values. With the global financial crisis and severe economic contraction around the world, crop prices and even more so crude oil prices changed directions and fell significantly, further reducing profit margins of biofuel plants. The emerging credit crunch halted or delayed investments around the world which slowed the industry's expansion even more. The situation was further aggravated when the need to ensure sustainable production systems in the biofuel sector increasingly entered political discussions.

The end of 2008 was marked by adoption of the Climate and Energy package including a slightly modified version of the RED by the European institutions, calling for accelerated growth in the use of renewable fuels in the EU transport sector. Early 2009, heavily influenced by the global economic slow-down, also saw the new US Administration's announcement of a USD 1 trillion stimulus package which, among others, could be partly directed towards the accelerated development of cellulosic ethanol.

In consequence, the economic viability of biofuels has remained a challenge for most biofuel production chains throughout 2008. The strong decline in feedstock prices seen since mid-2008 reduces production costs significantly, which should improve the overall economics of biofuel production. With the crude oil price having declined even more strongly than production costs (Figure 5.1), however, and remaining at lower levels while feedstock prices remain relatively strong, the situation will likely change only slowly in favour of biofuels in the near future. With both total transportation fuel use and the share of diesel fuels rising across the world,¹ public support measures in the form of tax benefits

Figure 5.1. **Monthly profitability estimates for US ethanol (left panel) and EU biodiesel (right panel), January 2008-February 2009^a**



a) Estimated based on monthly data on crude oil and feedstock prices and the EURO/USD exchange rate.

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and other subsidies, import tariffs and mandated use of biofuels will therefore drive ethanol and biodiesel production and use throughout the projection period.

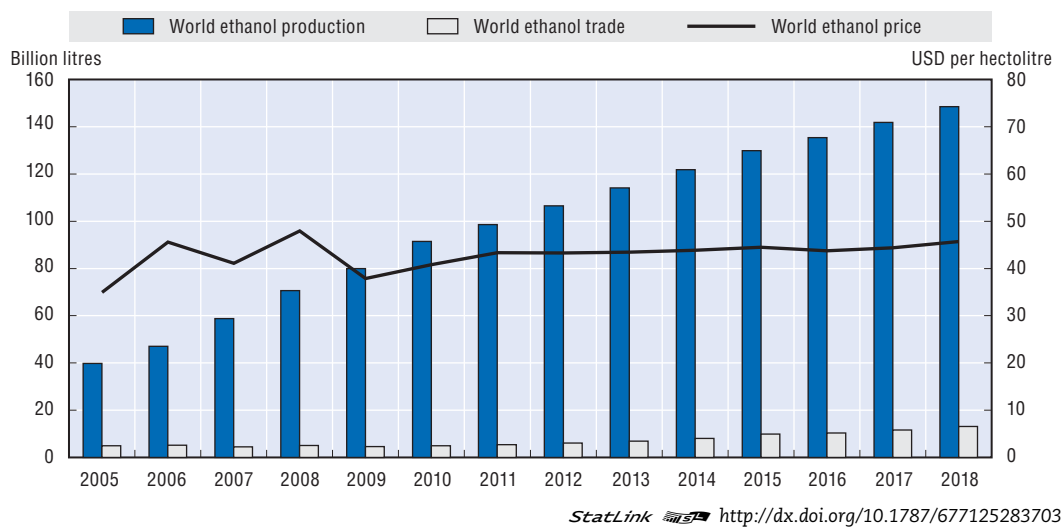
As shown by the scenario analysis discussed in Chapter 2, the projections for biofuel markets outlined below are fairly robust with respect to income changes. With total fuel consumption assumed to remain at baseline levels² and much of the biofuel use determined by politically set mandates and blending obligations, prospects for world ethanol and biodiesel markets change little in response to lower incomes from more pronounced economic contraction compared to the baseline.

Main market developments – ethanol

Public policy to drive global ethanol production increases

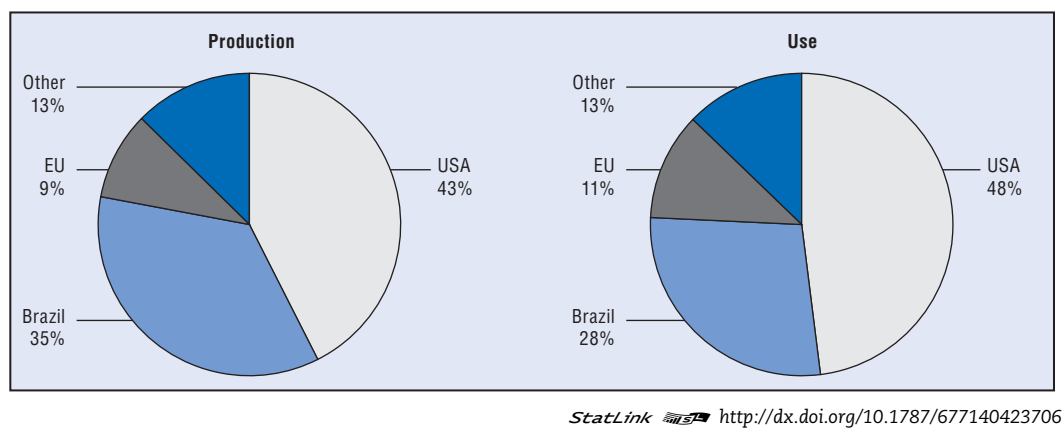
Stimulated by higher demand for fuel use, global ethanol production is projected to continue its rapid growth, albeit at a slightly slower pace than previously expected. It should reach almost 150 billion litres (bnl), Figure 5.2), despite the recent strong decline and only moderate assumed increase in future crude oil prices. The world ethanol price,³ which climbed to an average of almost USD 48 per hectolitre (hl) in 2008 when crude oil prices were high, is expected to fall by 21% in 2009 before following a slow upward trend to about USD 46 per hl by 2018. The price strengthening is fostered by an expansion in policy-induced use around the world, despite the dampening effect of strong growth potential in Brazilian ethanol production and exports. Increased trade in ethanol,⁴ growing by an average of 10% per year over the coming decade and reaching almost 9% of global production, is driven, in particular, by large US import demand. Trade growth is provided almost entirely by expanding export supplies from Brazil – to a large extent channelled through Caribbean countries with increasing duty-free access to the US markets.

Figure 5.2. **World ethanol projections**



While the US has just recently surpassed Brazil as the world’s largest ethanol producer, it has been the largest consumer since 2002 and currently more than one in two litres of ethanol is used within the US. Brazil’s share in world ethanol use is expected to grow slightly from the current 25% with the increasing share of its domestic car fleet composed of flex-fuel vehicles. The new RED is expected to boost the EU’s share in both ethanol production and use, with one in nine litres of available ethanol expected to be used in the European Union by 2018 (Figure 5.3).

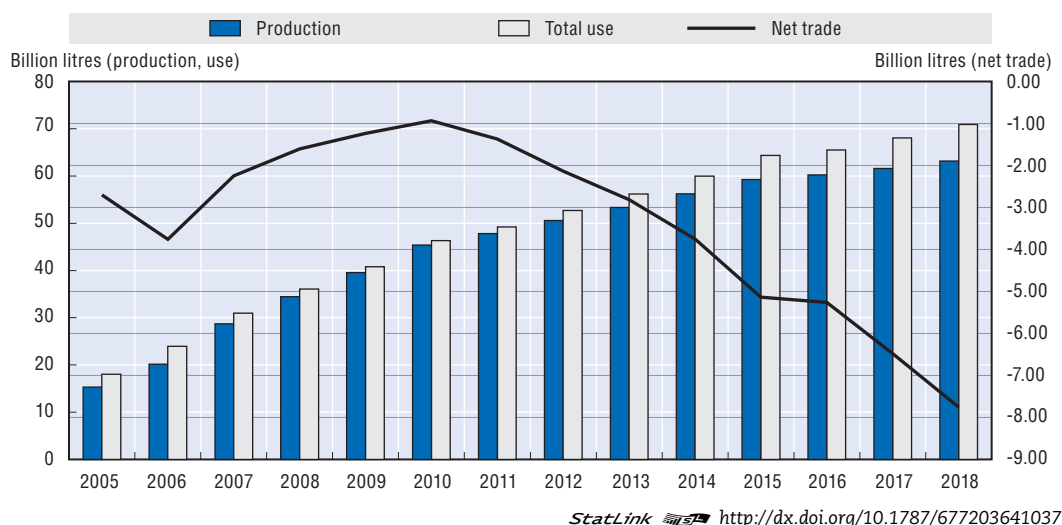
Figure 5.3. **Regional distribution of world ethanol production and use in 2018**



United States

With the implementation of the Energy Independence and Security Act (EISA) and particularly the new Renewable Fuels Standard (RFS), ethanol use – predominantly for fuel – is bound to expand rapidly and to exceed 70 bnl by 2018, doubling the 2008 volume, but still below the original mandate of almost 95 bnl for that year (Figure 5.4). This is mainly based on the assumption that cellulosic ethanol will provide some 5.5 bnl by 2018, a major achievement but falling short of the envisaged 26.5 bnl target. Cellulosic ethanol is expected to be produced mainly from crop residues, notably corn stover – hybrid plants

Figure 5.4. US ethanol market projections



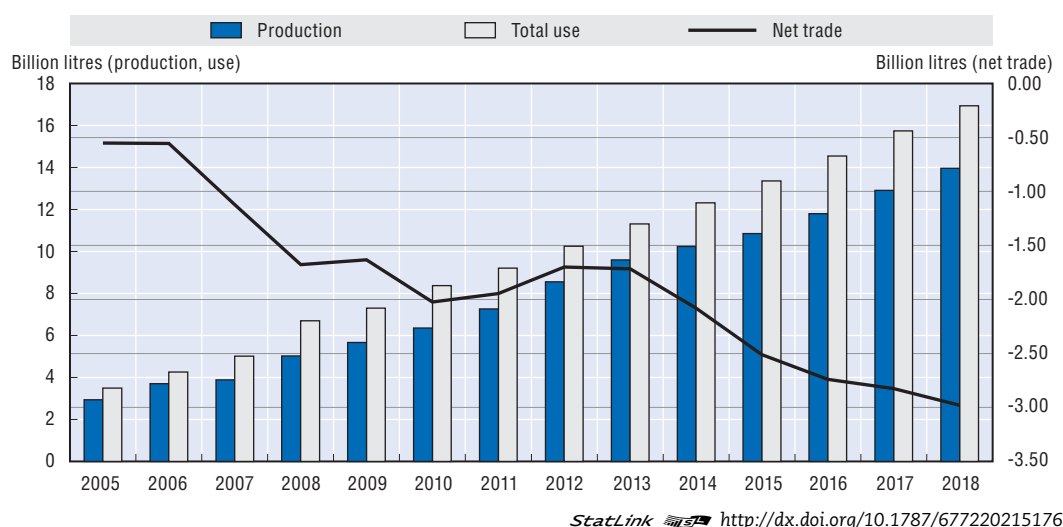
producing both first-generation ethanol from maize-starch and cellulosic ethanol from corn stover are an option that may offer some important cost advantages. Ethanol from dedicated biomass, such as switch grass or fast-growing trees, is expected to gradually contribute to supply after 2012.

Most of the ethanol used will be maize-based from US domestic crop production following the mandate for “conventional ethanol” fixed in the RFS, while some 5 bnl are expected to be imported from Caribbean countries under the Caribbean Basin Initiative and hence avoiding existing import tariffs.⁵ Despite the blenders’ tax credit, ethanol prices remain high relative to gasoline prices making the mandate for ethanol sales an important element of US biofuel policies. Net imports of ethanol could reach almost 7.8 bnl by 2018, making the US by far the largest importer of ethanol.

European Union

EU fuel ethanol use is projected to increase markedly, following the implementation of the new Renewable Energy Directive (RED) which calls for a 10% share of renewable energy in the transport fuel mix by 2020.⁶ While the RED remains to be implemented by member states and translated into national legislation, the contribution of ethanol in the overall mix of biofuels is expected to increase, and ethanol should reach an average share of 6.6% in gasoline-type transport fuels by 2018.⁷ With a total use of more than 17 bnl, the EU confirms its position the third largest ethanol market behind the US and Brazil. Second-generation biofuels may further lift the biofuel shares in the EU, but currently it remains unclear whether their production can reach a commercial scale within the coming decade. Depending on the way the new directive is implemented, the market for high-level blends (E85) used in flex-fuel vehicles remains limited as ethanol prices stay well above gasoline prices in energy terms. Current projections see most of the domestic needs met by domestic ethanol production, given existing import tariffs and as the EU competes with other importing countries, particularly the US, for Brazilian fuel ethanol, driving up import prices. Still imports are projected to fluctuate between 1.7 and 2 bnl per year in the first half of the projection before increasing to some 3 bnl by 2018 (Figure 5.5). Ethanol production in the EU is increasingly cereal based (both wheat and coarse grains), but sugar

Figure 5.5. EU ethanol market projections



beet remains an important feedstock as well. Total ethanol production should increase to 14 bnl by 2018 – almost tripling 2008 output.

Canada

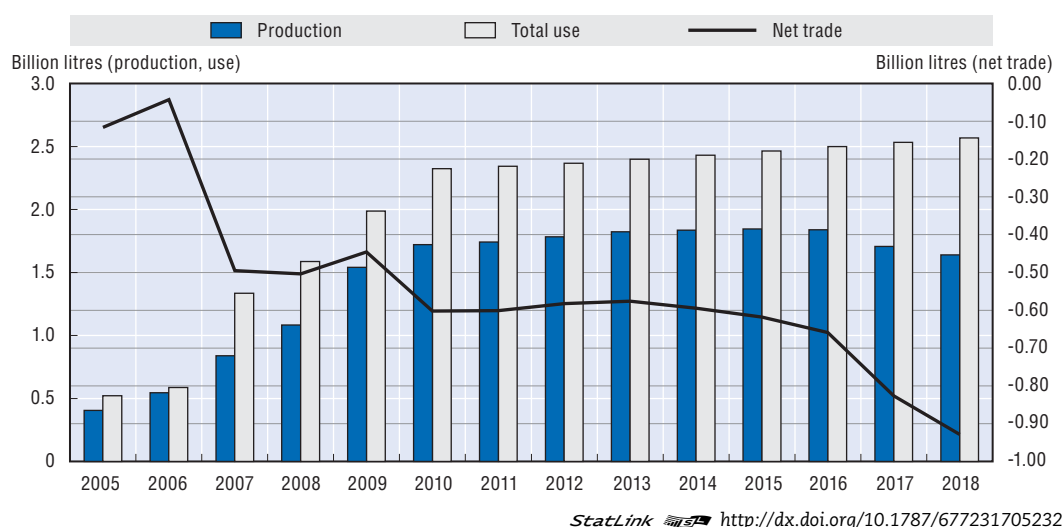
Ethanol use in Canada, mainly determined by blending mandates, has seen strong growth over the past few years. The expansion is projected to slow down after 2010 as E5 mandates (an ethanol share of 3.4% in energy terms, 5% by volume) are filled and maintained. As producers' margins remain tight for large parts of the projection period, Canadian ethanol production is projected to remain largely unchanged until 2016 when direct support for ethanol producers at both national and provincial levels is assumed to end as currently scheduled. It is expected to slightly fall thereafter given that incentives are expected to be reduced further. This leaves the domestic market relying on substantial imports, mainly from Brazil. While some maize-based ethanol is exported to nearby US markets, net imports are expected to average around 0.6 bnl per year before 2016, and to grow to more than 0.9 bnl by 2018 (Figure 5.6).

Other OECD

Australian ethanol production and consumption grows from very low levels to reach about 1 bnl by 2018. The ethanol share in gasoline type fuel use is assumed to increase from 0.5% to 3.3% between 2008 and 2010, but to remain almost unchanged thereafter. Australian ethanol production is based on grains (both wheat and sorghum) as well as molasses from cane sugar production.⁸

Mexican ethanol use is projected to grow by 45% between 2008 and 2018, reaching 232 million litres. Use as a transport fuel is not expected to play a significant role, however. Much of the ethanol will be imported as domestic production remains below 90 million litres.

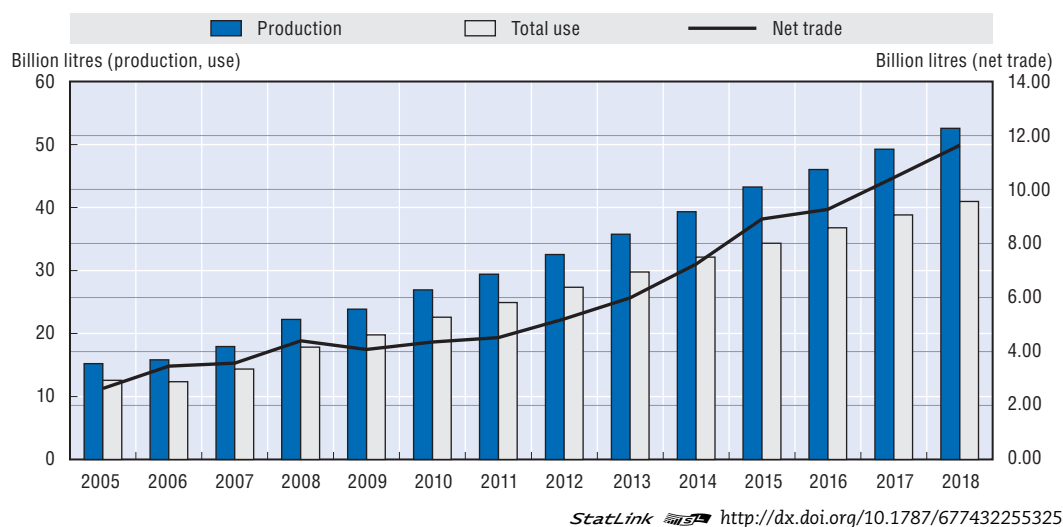
Ethanol net imports by Japan should further grow and reach about 1 bnl by 2010 given the Japanese government target to use 0.5 bnl in the transport fuel mix by that year. Most of the domestic use of ethanol, however, will remain for non-fuel purposes. Assuming no further growth in the use of fuel ethanol and moderate increases in both other use and

Figure 5.6. **Canadian ethanol market projections**

domestic ethanol production, net imports are expected to stay at around 1 bnl per year for the remainder of the projection period.

Latin America

Ethanol production in Brazil remains a rapidly expanding and increasingly export-oriented sector, growing by more than 9% per year on average over the 10-year projection period (Figure 5.7). Due to higher sugar prices relative to ethanol, an increased share of the growing sugar cane output is expected to be channelled to sugar production, thus reducing growth in ethanol supplies and exports in the early years of the projection period. With sugar cane remaining the cheapest of the main feedstocks for ethanol, however, Brazil will continue to be the market leader on expanding international markets. Growth in domestic fuel ethanol use is driven mainly by the growing fleet of flex-fuel vehicles (expected to account for almost two-thirds of the spark-ignition vehicle fleet in Brazil by 2018), which are expected to increasingly use ethanol as the preferred fuel. Total ethanol use is

Figure 5.7. **Brazil ethanol market projections**

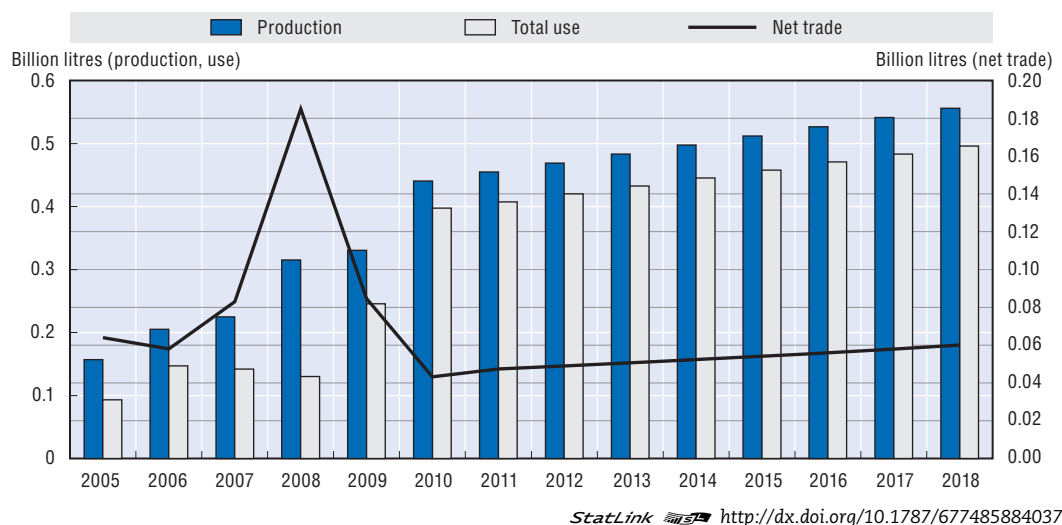
projected to reach almost 41 bnl by 2018, representing more than 71% (79% by volume) of gasoline-type transport fuels, up from a current energy share of about 40%. At the same time, Brazil significantly expands its ethanol exports and remains by far the world's largest ethanol supplier, with net exports reaching almost 12 bnl by 2018. By that year, almost 90% of global ethanol exports are projected to originate in Brazil.

Argentine ethanol use is driven by politically set mandates, supported by tax breaks. In 2007, Argentina decided to blend 5% of biofuels into gasoline and diesel from 2010, and this Outlook assumes that this would result in E5 and B5 blends (i.e. 5% by volume for either of the blends). This should drive ethanol use to 400 million litres by 2010, growing to 500 million litres in 2018. It will remain to be seen to what degree the – largely sugar cane-based – ethanol industry will be able to increase production beyond this level in the medium term. This outlook foresees only limited net trade with production just matching domestic use (Figure 5.8).

Columbia has rapidly become the second most developed sugar cane-based ethanol producer in the Western Hemisphere after Brazil. Having been in operation for only three years, it was able to produce close to 300 million litres in 2008. This rapid development was possible on the basis of a very efficient sugar industry with high sucrose yields and low production costs. Based on these comparative advantages and the projected expansion in sugar cane cultivation, production is expected to grow to about 800 million litres by 2018. Most of the expansion is export oriented, mostly to the United States. However, exports are developing slowly because production has to satisfy increasing domestic blending mandates of up to 10% first. Because gasoline consumption is projected to continue its declining trend of the previous decade, ethanol consumption is curbed once the 10% blending ratio is reached. Subsequently, exports are projected to grow to about 360 million litres by the end of the outlook period.

Currently, there is no fuel ethanol production in Peru, but there are plants under construction. The primary feedstock will be sugar cane. Production is projected to grow about 20% annually to reach 200 million litres by 2018. A blending mandate of 7.8% becomes effective in 2010, which will require about 80 million litres per year. The surplus is expected to be exported with the United States as the primary destination because of the tariff exemption.

Figure 5.8. **Argentine ethanol market projections**



Asia

Expansion in Chinese fuel ethanol use is expected to remain less rapid than earlier projections would suggest, due to both lower oil prices and reduced focus on grain-based ethanol production in Chinese policy. Ethanol shares in gasoline type fuels could reach 2.6% (3.8% in volume terms) by 2018, up from a 1.8% share in 2008. Production should just keep pace with this growth, leaving Chinese ethanol trade at low levels. Maize-based ethanol production is projected to remain important despite the official restrictions on maize and wheat food grains as feedstocks, as new plants for maize-based ethanol have recently been installed. However, most of the output growth will be based on other feedstocks such as sweet sorghum, other low-quality cereals and sweet potatoes.

Ethanol production in Thailand has grown rapidly in recent years, to over 600 million litres, based on molasses and cassava. About half is currently consumed as fuel. The country has ambitious plans to expand its ethanol production to almost 3 bnl by 2018. The Thai government is actively promoting the substitution of all MTBE by ethanol as well as the introduction of E10, E20 and E85 on a national scale. Based on these policies and favourable price ratios, domestic fuel consumption is projected to reach 2 bnl by the end of the projection period. The strong production development still leaves an increasing surplus for export.

The Philippines is another developing country with ambitious biofuel targets. Under its Biofuels Act, passed in 2007, ethanol has to account for at least 5% of gasoline type fuel sales from 2009, rising to 10% in 2011. Production, from sugar cane and molasses, should grow from 68 million litres in 2008 to about 530 million litres in 2018, but this will not be sufficient to satisfy the mandated demand. Up to 50% of the required amount will have to be imported during the mid-years of the Outlook before production fully develops.

In Viet Nam, ethanol is produced only for non-fuel applications. There are no indications of an impending introduction of alternative fuels in the country.

Ethanol production in India, mostly from molasses, reached 1.7 bnl in 2008. Non-fuel consumption accounted for about the same amount, with fuel ethanol use still in its infancy. Moderate growth of nearly 7% per year is anticipated over the outlook. Production is reaching almost 4 bnl by 2018. Driven by a consumption mandate of 20% in the total use of gasoline type fuels by 2017,⁹ fuel ethanol consumption is anticipated to grow rapidly to 2.2 bnl in 2018, consuming just over half of the domestic production. The non-fuel sector use will remain stable. The country will be roughly self-sufficient in total ethanol.

Africa

Projections for ethanol production in African countries such as Ethiopia, Tanzania and Mozambique, based on sugar cane, cassava and molasses feedstocks, are beset by many uncertainties. In general, any significant development there has to be based on direct foreign investments and will be mainly export oriented. The recent high-price period saw myriads of project proposals, but most of them were put on hold at the onset of the economic crisis as oil prices fell and future market prospects became more uncertain. The Outlook presents a conservative view on these countries. Production growth rates for Ethiopia and Mozambique are within their recent ranges of about 2-3% per annum. Tanzania is viewed more favourably, with production reaching higher growth rates, but still remaining below 100 million litres at the end of the projection period. Non-fuel uses continue to dominate the domestic demand in these countries and no significant fuel

sectors are envisaged. Under the current assumptions of market development and profitability, these countries are not seen as emerging exporters during the coming decade. While these least developed countries, Mozambique in particular, have duty free access for ethanol to the EU market under the EBA, the same preferences apply to sugar which intensifies the competition for feedstock.

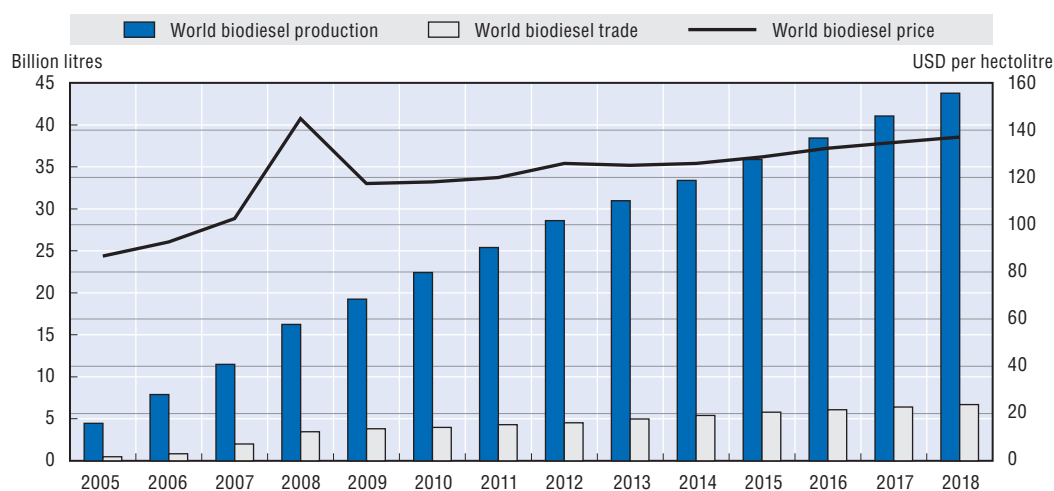
Ethanol production in South Africa is anticipated to pick up beginning in 2012 as investments come on stream to meet established consumption mandates. By 2014, output will reach more than 400 million litres and stay relatively flat for the remainder of the outlook period. Feedstocks are sugar cane and to a lesser extent coarse grains (mostly for cooking fuel applications). Fuel demand fluctuates depending on relative prices, resulting in a variable trade pattern over the outlook.

Main market developments – biodiesel

Global biodiesel production and use remains driven mainly by public policy

Globally, the use of biodiesel is increasingly being driven by blending mandates in a large number of countries, supplemented by tax concessions and other forms of support. Most importantly, both the EU's RED and the US's RFS set ambitious mandates for the use of biofuels in general, with the RFS explicitly specifying a biodiesel mandate. While with 54% of global biodiesel use in 2018 the EU remains the largest biodiesel market in the world, other countries, notably India (17%), the US (9%) and Brazil (7%) are set to reach substantial biodiesel use as well, with Argentina expected to emerge as an important exporter. Global biodiesel production is projected at close to 44 bnl by 2018, 169% above 2008 levels (Figure 5.9). Due to the increasing mandates, and particularly driven by the biodiesel mandate in the US¹⁰, world biodiesel prices¹¹ remain well above production costs of fossil diesel. International prices are expected to fall to USD 117 per hl in 2009 and then to gradually rise to around USD 126 per hl in 2012 and USD 137 per hl in 2018. Other than in the case of ethanol, the share of biodiesel traded internationally is expected to fall slightly as total exports increase less rapidly than production. Increasingly, trade is dominated by south-north flows with Argentina developing a strong export position.

Figure 5.9. World biodiesel projections



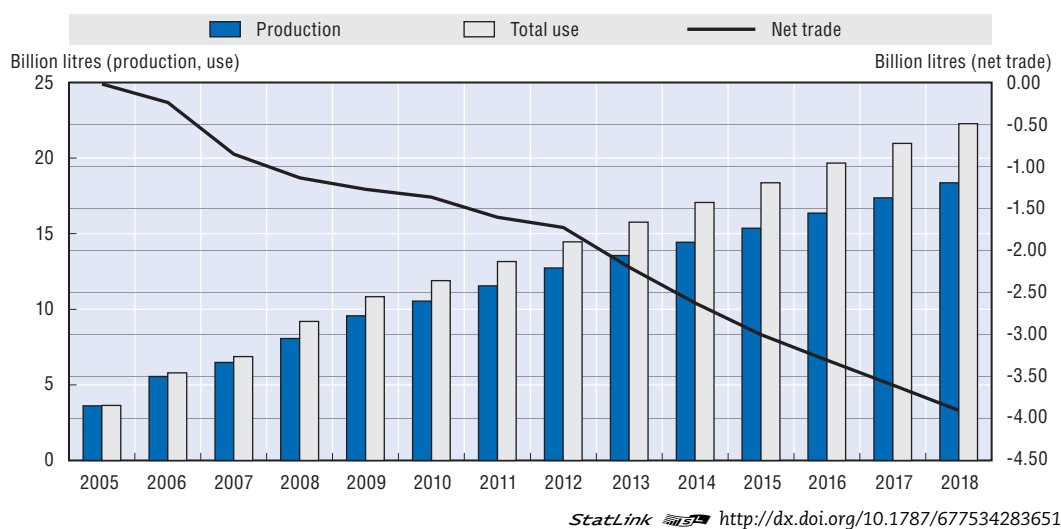
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European Union

While the implementation of the RED by EU¹² member states is pending, this outlook assumes biodiesel to be supported mainly by increasing blending mandates, reaching an energy share in diesel-type fuel use of 7.4% by 2018 (9.1% by volume). In consequence, biodiesel use in the EU should exceed 22 bnl in 2018 – more than 140% above the 2008 level (Figure 5.10). While declining in relative terms, the EU is projected to remain by far the largest biodiesel market, still accounting for more than half of global biodiesel use in 2018. As in the case of ethanol, much will depend on the actual implementation of the RED and in particular on technological developments in the area of biomass-to-liquid (BTL) fuels that could, once commercially available, complement domestic biodiesel supplies.

The strong biodiesel demand will be met by both increased domestic production and, particularly towards the end of the projection period, growing biodiesel imports. Production margins, which have improved considerably from the very difficult year 2007, are projected to fall again in 2009 as biodiesel prices decline. They improve only slowly over the remainder of the projection period despite increasing biodiesel prices. As a consequence, production is set to fall short of domestic use. Net imports should increase only slowly due to reduced US supplies and stronger prices in 2011 and 2012,¹³ but could reach 3.9 bnl by 2018.

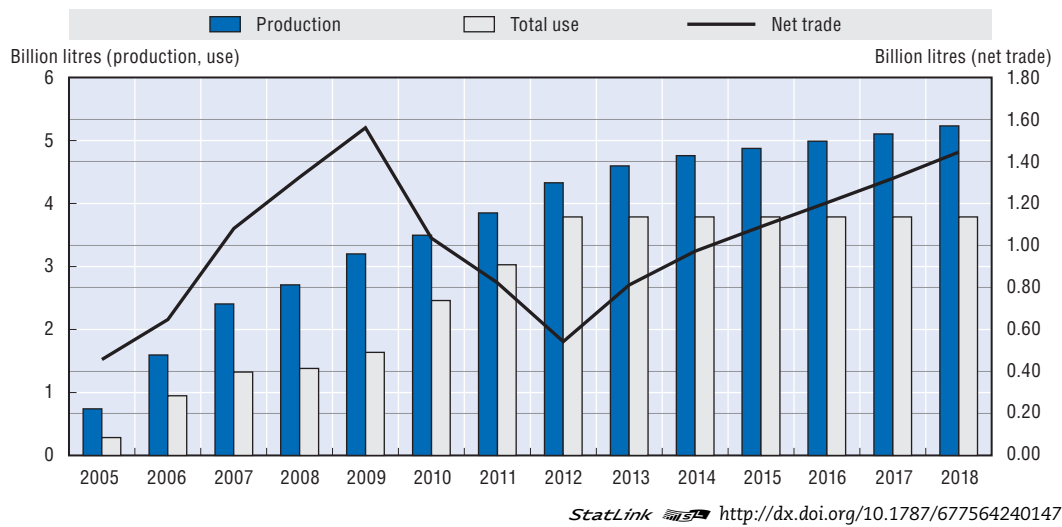
Figure 5.10. EU biodiesel market projections



United States

Given the high biodiesel prices, growth in US biodiesel use is almost entirely driven by the mandate legislated in the new Renewable Fuels Standard which calls for one billion gallons (3.8 bnl) of biodiesel to be used in 2012. While no explicit mandate is legislated thereafter this outlook assumes biodiesel use to be held constant in subsequent years despite the relatively high social costs involved (Figure 5.11). US production, which has increasingly exceeded domestic use in recent years, is projected to increase at a lower rate than consumption, letting net exports fall to some 0.5 bnl by 2012, before increasing again to reach 1.4 bnl by 2018. As discussed above for the EU, these projections partly depend on

Figure 5.11. US biodiesel market projections

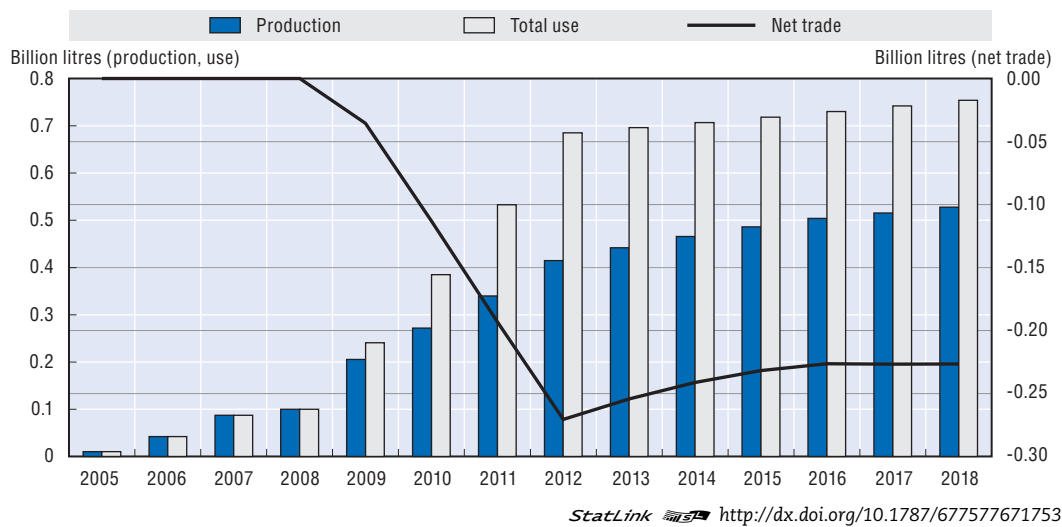


the assumption of continued policy settings with blenders' credits benefitting both domestic users and exports, which may lead to a continuation of the recent temporary EU duties on B99.9 imports from the US.

Canada

Canada is set to introduce a biodiesel blending mandate of 1.6% (2% in volume terms) for all transport diesel as well as heating oil by 2012. With the biodiesel price remaining high relative to that of fossil diesel, it is not expected that biodiesel use will significantly exceed this mandate, which amounts to 750 million litres by 2018 (Figure 5.12). Production should increase significantly following high biodiesel prices, but less rapidly than the mandate-driven domestic use, particularly until 2012. Despite some further growth in domestic supplies thereafter, Canada is set to remain a net importer of biodiesel throughout the projection period.

Figure 5.12. Canadian biodiesel market projections



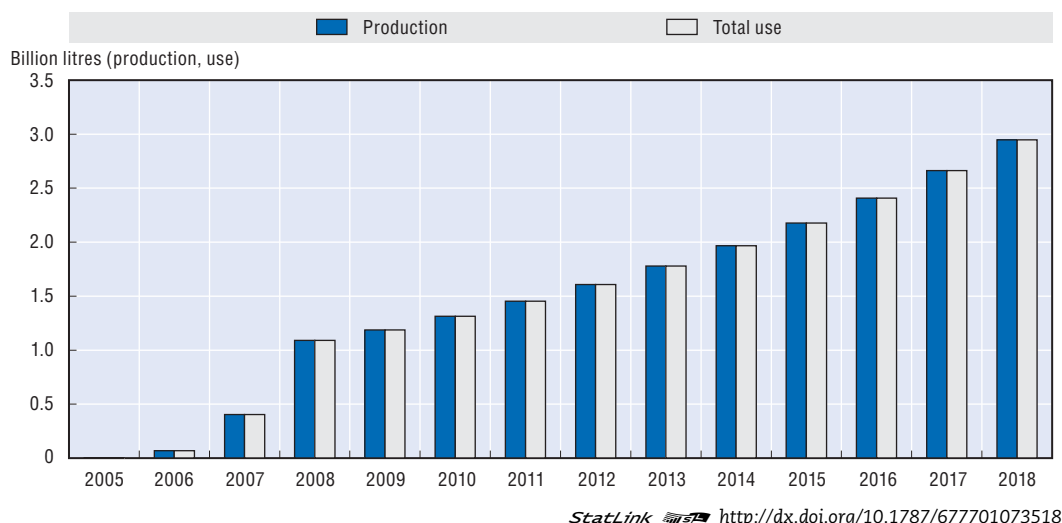
Australia

Biodiesel production, which has increased from very low levels in previous years to reach 0.9 bnl in 2008, is assumed to grow only slowly over the outlook period to just keep pace with the slowly increasing domestic use. Production is based partly on oilseed oils, but mainly from other feedstocks including tallow and used cooking oil. The share of biodiesel in diesel-type fuels is assumed to remain at some 4% in energy terms (4.9% in volume terms), with biodiesel use growing by some 1.5% p.a. along with overall fuel consumption.¹⁴

Latin America

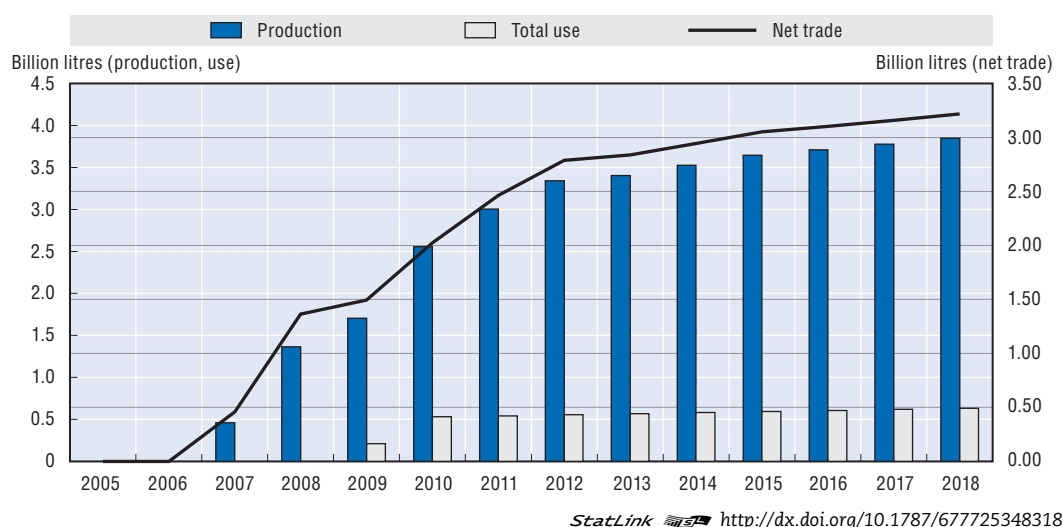
Biodiesel use in Brazil is assumed to grow rapidly following ambitious government targets, and to represent 4% (5% in volume terms) of diesel-type fuel use by 2018, up from less than 1% in 2007 and 1.9% in 2008. This represents a market size of almost 3 bnl, supplied by domestic production (Figure 5.13). Most of this will be based on soybean oil, while the use of non-edible oils such as castor bean and *jatropha curcas* oil is expected to remain relatively small.

Figure 5.13. **Brazil biodiesel market projections**



Argentina has started to develop a strongly export-oriented biodiesel industry which is expected to continually grow at a rapid pace. Production could reach 3.8 bnl by 2018 which would make Argentina the world's third largest producer (after the EU and the US). Given the mandate for a B5 blend (3.4% in energy terms) from 2010 onwards, domestic use of biodiesel is expected to increase from virtually nil in 2008 to more than 530 million litres in 2010, and further growing with overall diesel fuel use to reach 630 million litres by 2018. Achievement of this ambitious growth target would make the country the world's largest exporter of biodiesel with net exports of 3.4 bnl by 2018 (Figure 5.14).

Colombia, the leading palm oil producer in the Americas, is gearing up for a significant biodiesel production push. Production is expected to increase from currently 168 million litres to more than 400 million litres over the coming decade. Legislation requires a 5% blending ratio which absorbs about half of the projected production in 2018. Based on the mandate, domestic demand remains relatively flat over the outlook period leaving an increasing exportable surplus.

Figure 5.14. **Argentine biodiesel market projections**

Asia

The two leading producers of vegetable oil in the world, Indonesia and Malaysia, are naturally seen as potential powerhouses of biodiesel production. So far, these expectations have not materialized. Development in recent years has been rapid, but Indonesia uses still only 1.7% of its palm oil production as feedstock for biodiesel, Malaysia about 3%. Together they currently produce about 900 million litres, which represents only 6% of world biodiesel production, despite their vegetable oil production share of 35%. The current economic climate caused the government of Indonesia's plans to support the development of the biofuel industry to stagnate. Further assistance is unlikely in the near term, growth impulses will come mainly from the EU import demand. The conservative production outlook reflects these assumptions by projecting a total expansion of production to only 1.2 bnl over the projection period. For Malaysia a production expansion of about 80% to 1 bnl is projected. Any mandatory blending requirements have been put on hold, keeping domestic consumption low. Exports are the engine behind the growth in Indonesia and Malaysia; they are projected to grow from a combined 400 million litres to about 1.5 bnl per year.

India's biodiesel industry is expected to be on the verge of break-out into the commercial stage. So far, production is still small, but is expected to grow over 30% annually over the projection period, reaching about 7 bnl in 2018. Because the government is focused on promoting non-edible oils as feedstock for biodiesel, *jatropha curcas* cultivation will expand accordingly. India has targeted a 20% blending of biodiesel by 2017.¹⁵ This goal drives consumption and leaves only a very small exportable surplus.

Africa

The potential of biodiesel production from *jatropha curcas* in Africa has been extensively debated in recent years. Numerous projects have been announced, but actual production has been miniscule so far. The use of edible vegetable oils in African countries is not likely either as they have to be entirely imported. Because of the unresolved technological issues and the unfavorable economic situation, the Outlook for biodiesel production in Africa remains modest. Ethiopia, Mozambique, and Tanzania are projected

to collectively produce less than 250 million litres of *jatropha curcas* derived biodiesel in 2018. Most of this production will be exported. South Africa is the only country in Africa with a significant vegetable oil production. It is expected to develop a biodiesel sector after 2010, which will grow to a capacity of about 100 million litres by 2018. None of it is expected to be consumed domestically.

Key issues and uncertainties

Biofuel markets remain highly dependent on public policies, and particularly with the two major policy packages of EISA in the US and of the RED in the EU, a number of unknowns remain. First, both packages explicitly include sustainability considerations. Increasing requirements for biofuels to meet GHG reduction and other criteria might result in the exclusion of certain biofuels from the benefits of the two legislations. The administrations in Europe and the US will have to deal with a large number of technical questions, and the problem of indirect land-use changes (iLUC) induced by biofuel production might create additional restrictions in the future. This outlook cannot and does not try to analyse these questions. Some of them, in particular the issues of net GHG balances of alternative biofuel chains and the potential of iLUC effects, are discussed in OECD (2008), but much more research and analyses are underway to provide the needed background information for the policy questions at hand. Second, as the EU's RED explicitly allows for renewable electricity used in the transport sector to count towards the 10% energy share in transport fuels, the role electrical vehicles can play remains unknown for the time being. The fact that renewable electricity could receive a weight of 2.5 relative to that of first-generation biofuels (with the weight for second-generation biofuels equal to 2¹⁶), would mean that a small share of wind- or solar-powered electricity in the transport fuel mix together with some second-generation biofuels could reduce the mandate for biofuels to significantly less than 10% in 2020. Thirdly, both legislations aim to avoid negative repercussions for food supplies. In consequence, the fact that large quantities of cereals, vegetable oils and sugar crops are used to produce biofuels could result in a partial waiving of biofuel mandates in years of precarious food crop shortages e.g. due to significant weather-induced disruptions to global food supplies as occurred in 2006 and 2007.

Clearly, however, biofuel market developments not only depend on policies, but also and notably on technological advances. Research spending on the development and improvement (R&D) of ways to make use of cellulosic, hemicellulosic and even woody biomass for the production of liquid fuels is important and advances are notable. IEA (2008, p. 10) estimates that, assuming significant investments in R&D, both ethanol from ligno-cellulose and BTL-diesel could become competitive with fossil fuels by 2030 at crude oil prices of between USD 70-80 per barrel in 2008 dollars.¹⁷ With existing support regimes often favouring second-generation biofuels over first-generation technologies, one can expect commercial production long before economic viability, and indeed the existence of commercial plants is likely to improve more economic outcomes in the longer run.

The biofuel industries – and particularly first-generation biofuels from food and feed crops – significantly depend on developments in a range of other markets. Higher feedstock prices than projected in this outlook or lower prices for fossil energy are likely to negatively impact the speed of the market expansion outlined above, while the opposite holds for lower feedstock or higher crude oil prices. Box 2.1 in Chapter 2 discusses the implications of the much lower oil price assumptions for the present biofuel Outlook, when compared to earlier projections. The strong links between crude oil prices and ethanol

markets are highlighted, while biodiesel markets appear to be less sensitive due to their increasingly mandate-driven nature. Increased fuel efficiencies in the transport sector also could reduce the overall fuel quantities and hence biofuel use in different countries. Biofuels could also be used in other sectors, for example, replacing heating oil as it is the case in Canada.

Finally, it should be noted that the industries themselves are still fairly young and quite dynamic. Projections on biofuel outcomes therefore have a considerable degree of uncertainty. Especially in many developing countries they have only emerged in the last several years or are still in the planning stages. Ambitious public and private investment intentions that were announced last year are now under scrutiny and may be revised depending on the economic situation. Many proclamations in favour of rapid biofuel development were made in the context of high oil prices, steady income growth prospects and widespread environmental support for first generation biofuels. The global economic crisis together with changing views on environmental benefits is currently fueling renewed debates about biofuel targets. Because of these ongoing policy and economic developments, projections on biofuel outcomes have a high degree of uncertainty, particularly for many developing countries.

Notes

1. Assumptions for transport fuel consumption are based on data obtained from IEA, national and other sources. Assumed growth in major biofuel producing and using countries is generally close to or below historical trends.
2. A simplifying assumption which abstracts from the income elasticity of fuel demand.
3. Brazil, Sao Paolo (ex-distillery).
4. Note that trade projections for ethanol, in addition to pure fuel alcohol, also include ethanol for other purposes as well as the ethanol share in gasoline blends.
5. Mostly Brazilian ethanol dehydrated in the Caribbean.
6. The present projections assume the effective mandate for first-generation biofuels to reach some 7.2% of transport fuel use (gasoline- and diesel-type fuels) in energy terms by 2018, based on an 8% share in 2020. The remaining 2% is assumed to be filled by other renewable energy including electricity and second-generation biofuels provided these can develop their commercial validity by then, but not explicitly accounted for in this Report. It should be noted that if renewable electricity and/or second-generation biofuels develop favourably, the required share of first-generation biofuels in the transport fuel mix may end up being lower than the 8% assumed in the present projections.
7. All biofuel use shares are expressed on the basis of energy contained unless otherwise specified.
8. It should be noted that there is considerable uncertainty about the future growth of ethanol production and use in Australia. With sustained relatively high grain prices in particular, it will remain to be seen whether an ethanol share of 3.3% can be achieved.
9. India's government has mandated a 20% blend in gasoline and diesel by 2017. This outlook assumes that the same share is targeted for ethanol in gasoline and for biodiesel in fossil diesel fuels, although obviously other combinations could reach the same average blending ratio.
10. The mandate is formally ending in 2012, but assumed to effectively stay in place throughout the projection period.
11. Producer price German net of biodiesel tariff.
12. See endnote 6 in this chapter for a brief discussion on how the RED-related mandate is implemented in the present projections. While the share of ethanol in the EU biofuel mix is increasing, biodiesel is assumed to remain the most important biofuel for the foreseeable future, with the biodiesel share in diesel-type fuel use slightly exceeding the average share of first-generation biofuels in the total transport fuel mix.

13. Note that these projections do not explicitly account for temporary duties imposed by the Commission on 12 March against imports of B99.9 from the US, US biodiesel exports to the EU benefit from both the blenders' credit of USD 1 per gallon (USD 0.264 per litre, after blending the biodiesel with small quantities of fossil diesel) and relatively high biodiesel prices following EU blending obligations and tax concessions offered by a number of EU member states. If this temporary measure (currently for six months) becomes more permanent it may have substantial implications for the biodiesel trade between the US and the EU.
14. It should be noted that data about the current situation of biofuel markets, and even more so on their medium-term prospects, are scarce and often contradicting. This also holds for Australia, data for which are based on a questionnaire received in 2008, while Acil Tasman (2008) suggest lower historical production and consumption quantities and also indicate, albeit in a more aggregated form, lower projections.
15. India's government has mandated a 20% blend in gasoline and diesel by 2017. This outlook assumes that the same share is targeted for ethanol in gasoline and for biodiesel in fossil diesel fuels, although obviously other combinations could reach the same average blending ratio.
16. Article 3 paragraph 4(c) and Article 21 paragraph 2 of the adopted text, Strasbourg Dec. 17, 2008, available at www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+20081217+SIT+DOC+WORD+VO//EN&language=EN.
17. This corresponds to a nominal oil price of around USD 100 per barrel, assuming continued inflation at about 1.5% per year.

References

- Acil Tasman (2008), *An Assessment of Australia's Liquid Fuel Vulnerability*.
- IEA (2008), *From 1st- to 2nd-Generation Biofuel Technologies – An overview of current industry and RD&D activities*. International Energy Agency, Paris.
- OECD (2008), *Biofuel Support Policies – An Economic Assessment*. Organisation for Economic Co-operation and Development, Paris.

Chapter 6

Cereals

World market trends and prospects*

Key market drivers

Price peaks and increased volatility a feature of cereal markets

Cereal markets in 2008 endured an exceptionally turbulent year. Prices climbed to historically high levels in nominal terms and then fell sharply. Wheat prices soared to their peak in March, rice peaked in May while the run up in maize prices continued through June 2008. The high cereal prices encouraged farmers to increase plantings and this, together with favourable weather conditions in many important growing regions, boosted world cereal production to a new record in 2008. But the increase in crop production was not the only reason for the decline in international prices. Driven by financial crisis in the United States, and a spreading economic slowdown, crude oil prices tumbled after reaching a peak in July. The decline in energy prices contributed to a slower production growth of biofuels than anticipated earlier which, in turn, reduced feedstock demand below previous expectations, particularly of maize for the production of ethanol in the United States. Lower crude oil prices had a substantial impact on the price of maize (and wheat) which ethanol producers have been willing to pay for feedstock. At the same time, the US dollar began to rebound against major currencies and this development also put further downward pressure on prices, particularly on export prices of wheat and major coarse grains. By the end of 2008, the sum of these macroeconomic factors became the dominant feature, shaping price movements of nearly all commodities, cereals included. The severe world economy slowdown and shrinking global liquidity forced investors and speculators to flee the commodities markets, a possible further downward pressure on prices especially in wheat and maize markets. On the other hand, rice prices have continued to be influenced by government policies in major exporting countries.

The year 2009 began with even more uncertainties. As the financial crisis deepened, economic conditions worsened and forecasts for recovery became yet gloomier (see Chapters 2 and 4). While cereal prices fell further during the early months of this year, market trends provided little insight. By March, the US dollar again changed course, falling against major currencies. Crude oil prices increased, as did prices of most other commodities, and a renewed price escalation in cereal markets began to be seen as a possibility. It is in the midst of this continuing uncertainty that this round of projections has been prepared. These extraordinary times call for exceptional approaches in the evaluation of future supply and demand developments for cereals, if not all agricultural commodities. As discussed elsewhere in this report, the changing macroeconomic environment implies movement in many underlying forces that also need consideration: inflation or deflation of general prices, exchange rate movements by key exporters and importers, the responses of input costs including fertilisers but also interest rates and labour, will all impact on markets in diverse

* All dates are on a marketing year basis (e.g. 2008 represents the 2008-09 marketing year) unless stated otherwise. While in general these are June/May for wheat, September/August for coarse grains and January/December for rice, data for individual countries may use slightly different periods.

ways. In this highly uncertain situation, the importance of the macroeconomic and energy environment in driving the present projections is much greater today relative to other drivers than in the past, especially in the next few years. The *Key issues and uncertainties* section of this chapter elaborates the sensitivity of the outlook to some of these drivers in greater detail.

If 2008 was an exceptional year in which many agricultural commodities were traded at extremely high prices, the case of rice, which increased the most during the year, and which caused the most concern for food security in many importing regions, points to policy factors driving markets. Unlike for the other cereals, the reasons behind the surges of rice prices had little to do with the commodity supply and demand fundamentals. Indeed, although there were some brief episodes of supply shortness, the major factor underpinning rice prices was an escalation of policy interventions all conducive to a tightening of the world rice market. The pattern of events in 2008 clearly demonstrated how much political weight rice continues to carry, not only in Asia, but also in Africa and in Latin America and the Caribbean (LAC). In effect, there is evidence that the sum of all uncoordinated policy actions during the crisis actually increased international market volatility. Generally, policy factors, such as increased government intervention, will underscore the continued critical importance that agricultural policies play in affecting global markets over the medium term.

Slower growth in world cereal demand than in the past

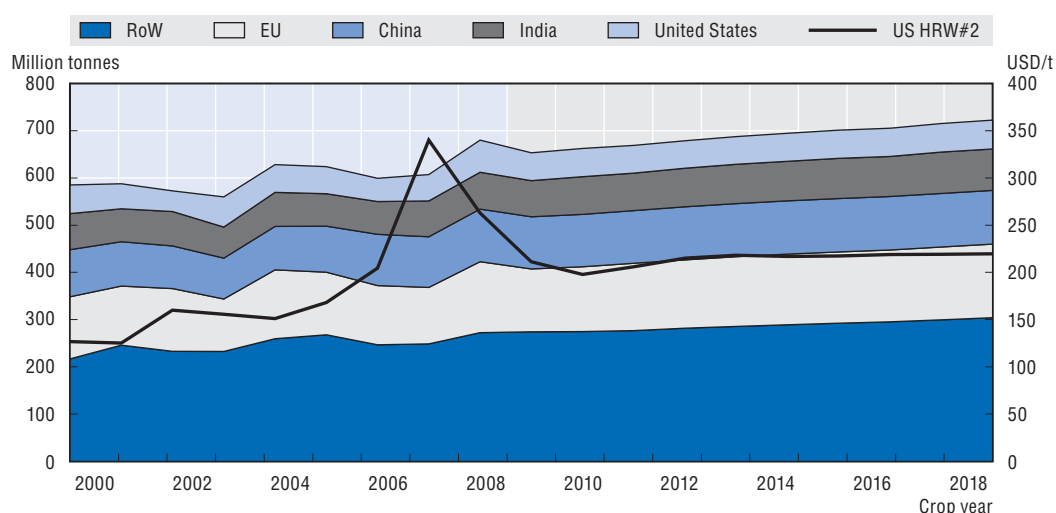
Slow or falling cereal food demand growth in *per capita* terms remains an important feature underlying cereals markets. Poor economic growth in the next few years may only reinforce such weakness. Feedstock demand from the biofuel sector, particularly for maize in the US and increasingly for wheat in Europe, driven not so much by the economics of biofuel production but by mandates which will assure ethanol consumption/production targets are met, remains a key source of additional demand for these cereals. Higher feed demand supported by growing livestock production, particularly pigmeat and poultry, will continue to be important to the growth in the global demand for coarse grains over the medium term particularly in developing countries, although again, such growth will also be tempered by the deteriorating economic environment and the fact that demand for these commodities are much more income sensitive. Finally, a fundamental issue concerns yield growth for cereals, which has been slowing in some regions. While considerable yield-potential gaps exist in most developing regions, a difficult macro environment is unlikely to be conducive to further gains in reducing them.

Main market developments: Wheat and coarse grains

Steady production growth of wheat and coarse grains driven by yield improvements

After a record year in 2008, total world grain production is likely to decline significantly in 2009. Wheat crops are expected to be particularly affected by lower yields after an exceptionally good season in 2008. Coarse grains output is likely to remain largely unchanged, reflecting droughts in Argentina and Brazil as well as the anticipated cut in maize plantings in the US where farmers are expected to shift land to more profitable soybeans, the prices of which remain relatively high, supported by mandate-driven demand for vegetable oils for biodiesel production in both the EU and the US.

With average yield growth slightly below historical trends, wheat production is projected to reach 722 million tonnes by 2018, driven by higher crop prices compared with the previous decade (Figure 6.1). For coarse grains, despite lower yield growth than

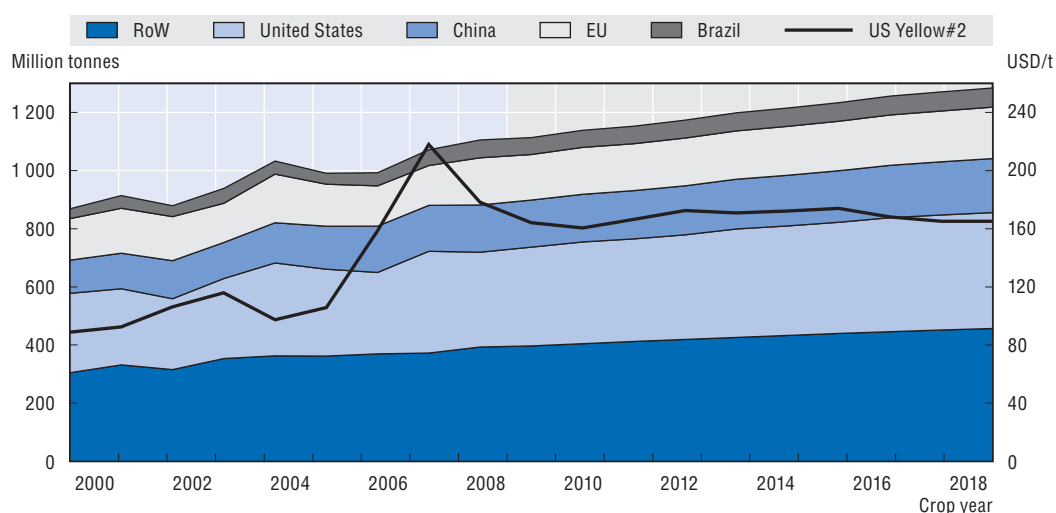
Figure 6.1. **Wheat production and prices**

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observed over the previous ten years, global output is projected at 1 284 million tonnes by 2018 – more than 16% above that of 2008 (Figure 6.2).

With average growth rates of 0.1% and 0.32% per year for wheat and coarse grains, respectively, area expansion is projected to continue to play a smaller role in the expansion than are improvements in yields. Wheat production is projected to be boosted by further increases in yields particularly in Australia, in the EU, major CIS producers, most of north and sub-Saharan Africa, several countries in Latin America, and in major Asian producing countries, including China, India and Pakistan. Similarly, the bulk of the projected increase in coarse grains production is likely to be driven by advancements in yields, particularly in the US, the EU, South Africa, most countries in Latin America, China, Indonesia, and the Philippines.

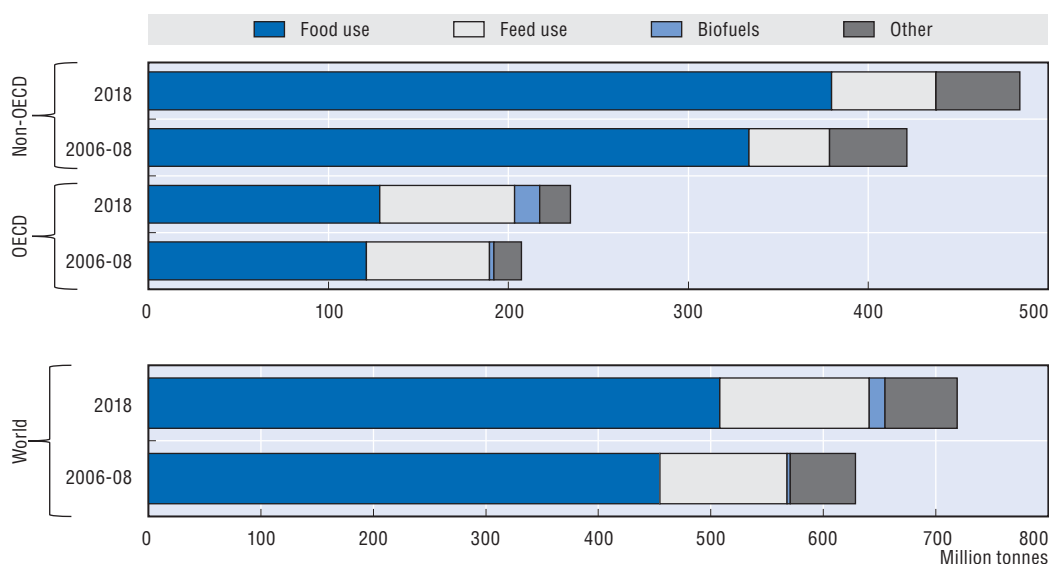
Wheat will remain predominantly a food commodity with direct human consumption growing by 48 million tonnes over the projection period, which is 67% of total anticipated

Figure 6.2. **Coarse grains production and prices**

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growth in utilisation. Global wheat food consumption by 2018 may reach 508 million tonnes. At this level, *per capita* consumption is projected to hover just above 67 kg per person *per annum*, slightly below the current levels. A continuing decline in annual *per capita* wheat consumption levels in China is projected to offset projected increases in most other places, including India, North Africa, and the CIS countries. With 13% of total growth, wheat use as a feedstock for biofuel production (mainly in Europe and Canada) represents a much smaller driver in wheat utilisation, although it almost quadruples during the projection period (Figure 6.3). In the EU and Canada, biofuel production is projected to count for 9% and 15% of total wheat use by 2018, respectively.

Figure 6.3. **Wheat consumption in OECD and developing countries**



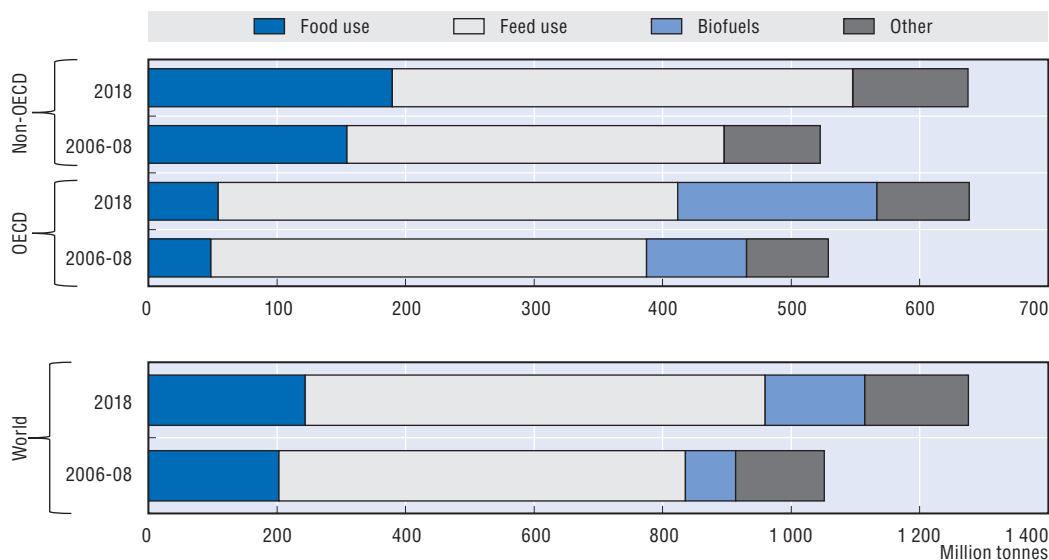
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World feed utilisation of wheat is projected to reach 133 million tonnes, up slightly from the current estimated levels. The EU is projected to remain the predominant consumer of wheat for feed purposes with an annual intake of roughly 57 million tonnes, very close to its current levels. Higher feed use is projected for the CIS, where total feed wheat utilisation could reach 35 million tonnes, with the Russian Federation accounting for 59% of this total.

Growth in coarse grains use will be mainly sustained by its utilisation in ethanol production, predominantly in the US. Driven particularly by the US Renewable Fuels Standard legislated in the Energy Independence and Security Act (Dec. 2007), the use of coarse grains in distilleries is set to increase by 60%, representing 31% of global coarse grain consumption growth and exceeding 12% of total use by 2018 (Figure 6.4). In the US, this share will increase to 43% by 2015 before falling slightly thereafter, as the ethanol from maize mandate is attained.

While growing more moderately, however, feed use is projected to remain the principal outlet for coarse grains producers, both in developed and developing countries. Total feed use is projected to expand by 1.2% per year to 716 million tonnes; of the 79 million tonnes increase in world feed use, 29 million tonnes will be in developed countries *versus* 50 million tonnes in developing countries. This growth, however, does not

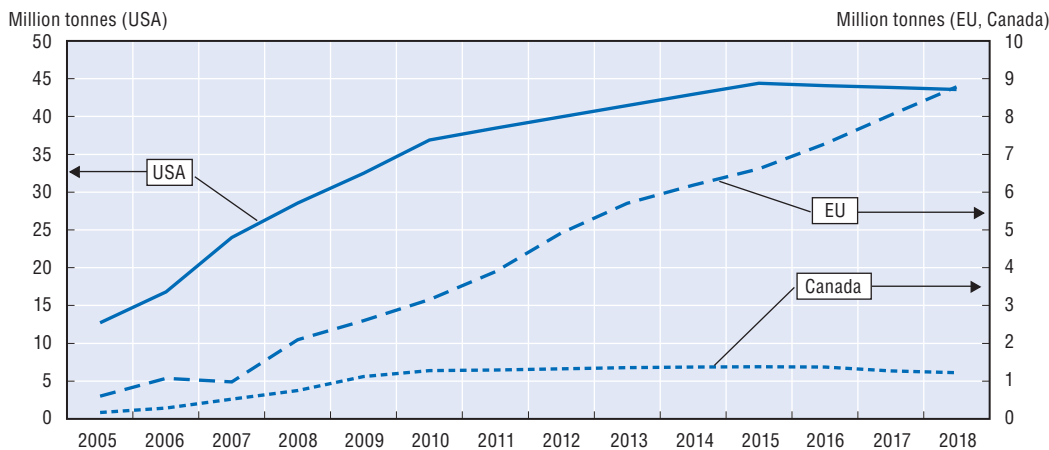
Figure 6.4. **Coarse grains consumption in OECD and developing countries**



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include distillers dried grains (DDG) that are projected to be produced as by products of ethanol production, particular in the US, Canada and the European Union. The production of DDGs has been growing rapidly following the rise of the biofuel sector in these countries (see Figure 6.5), and should reach 54 million tonnes by 2018, most of which will be used by the cattle industry. At the same time growth in coarse grain feed is also expected to be less than growth in animal production, since with higher prices, other feeds, notably oilseed meal, will be increasingly fed to livestock. Growth in feed use in the developing countries may also decelerate slightly in response to relatively high prices. The slower economic growth prospects, particularly during the early years of the projection period, are also seen to dampen coarse grain feed demand in several markets. However, the overall demand prospect in emerging economies is projected to remain strong.

Figure 6.5. **Production of DDGs by major producers of grain-based ethanol**

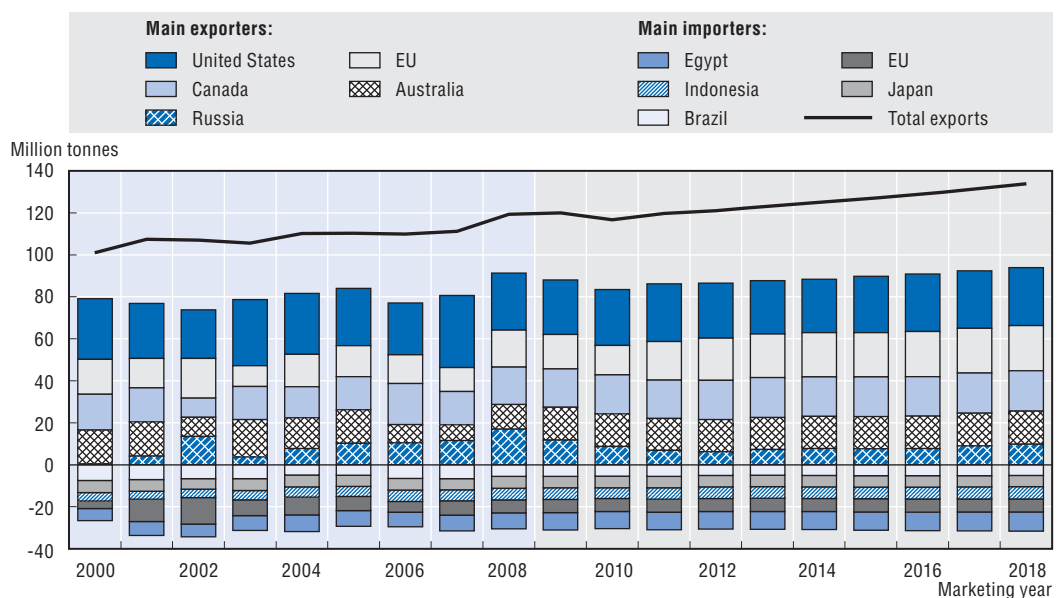


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Trade

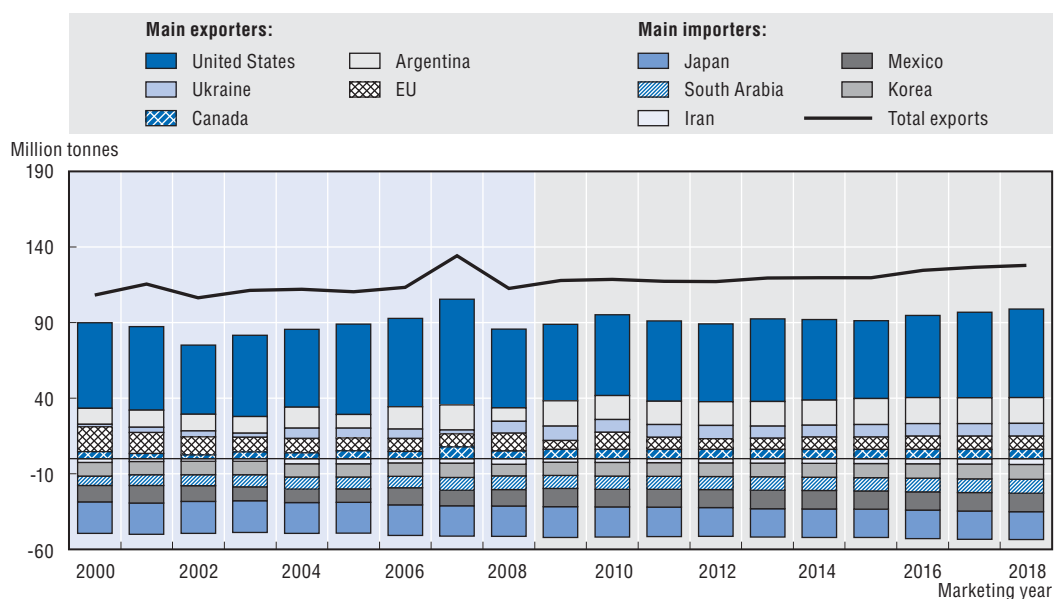
International cereal trade will remain dominated by a few major exporters, although the shares of the big five (the US, the EU, Canada, Australia and Russia being the largest wheat exporters by 2018, the US, Argentina, Ukraine, the EU and Canada being those for coarse grains) is set to decline from above 76% to around 71%, in both cases. Wheat trade (Figure 6.6) will remain more fragmented than coarse grains (Figure 6.7) where the US remains the largest supplier by far, despite its increasing domestic use for ethanol production.

Figure 6.6. Main wheat traders



StatLink <http://dx.doi.org/10.1787/678050663503>

Figure 6.7. Main coarse grains traders



StatLink <http://dx.doi.org/10.1787/678100371520>

The EU is among the main exporters of both wheat and coarse grains, but it also remains the second largest wheat importer, buying mainly high-quality bread wheat and also relatively cheap feed qualities from the Black Sea region.

Aggregate wheat imports by the developing countries are projected to increase by roughly 1.6% per year to 109 million tonnes in 2018, representing 82% of total world trade which is slightly higher than the current level. The biggest increases in terms of volume are projected for Saudi Arabia, Nigeria, Egypt, Mexico and India.

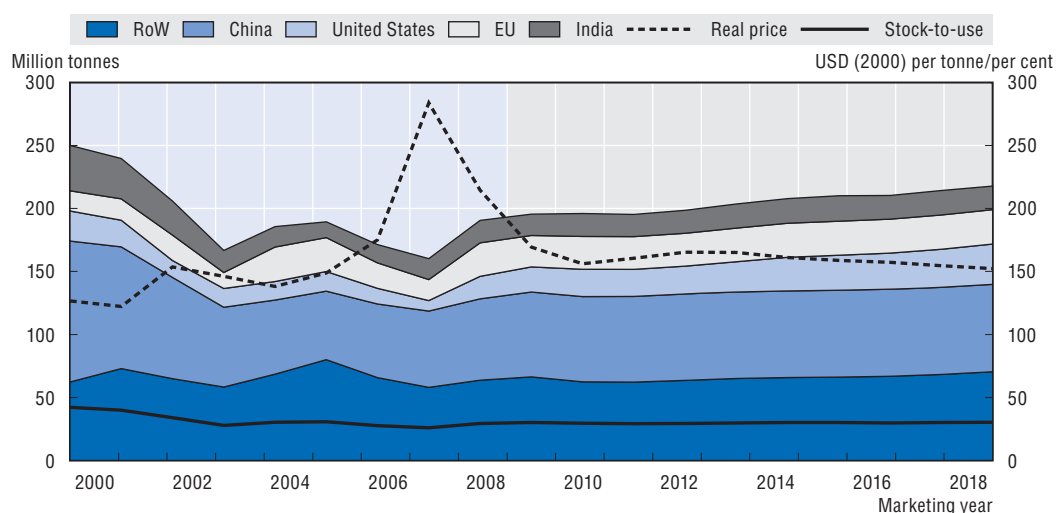
Aggregate imports of coarse grains by the developing countries are projected to increase by 1.6% per year to 97 million tonnes, representing 75% of the world total, which is a much higher share than the estimated 71% in 2008-09. Countries with largest projected rise in their imports include Zambia, Tanzania, China, Iran, Indonesia, and Turkey.

Stocks and prices

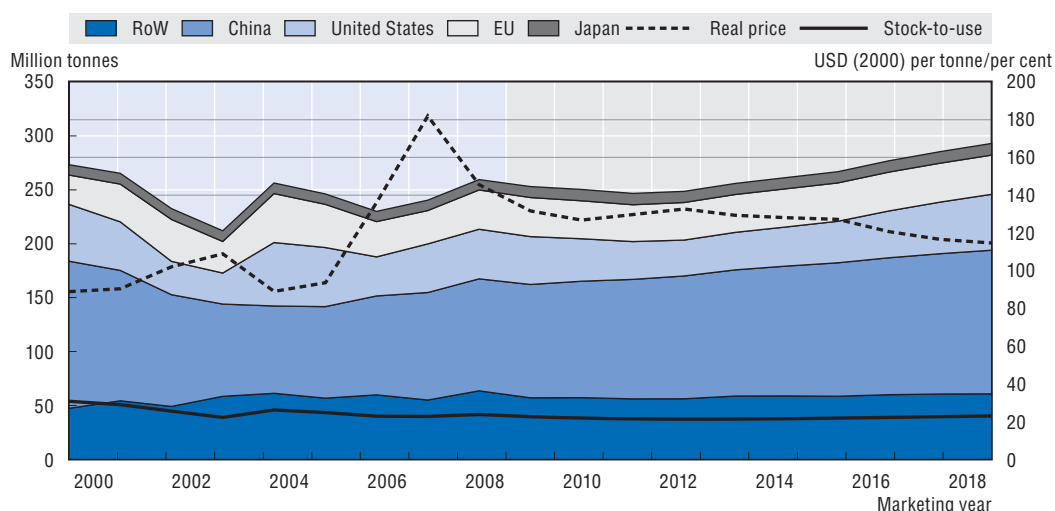
Wheat and coarse grain stocks, having fallen to very low levels in 2007 and 2006, are both expected to increase over the projection period (Figures 6.8 and 6.9). The stock-to-use ratio for wheat is expected to increase slightly, but to stay in the 30% range in the later projection years while that for coarse grain is not expected to improve before the middle of the projection period as global use expands more rapidly than production in the early years of this baseline, particularly as a result of growth in the US.

The price of US wheat (No. 2 Hard Red Winter, f.o.b. Gulf) is projected to fall by almost 17% compared to its still elevated level in 2008 – or by 29% in real terms when adjusted for inflation. In consequence, real wheat prices resume their long-term decline albeit from a higher level and at somewhat slower rates. Furthermore, as the quoted reference price is largely representative of the high quality milling wheat, the projected growing abundance of feed wheat supplies (from the Black Sea region in particular) is likely to lead to increasing price differentials between various qualities/types of wheat. This could result in an even slower increase in the average world traded wheat prices than is currently projected for the high quality US wheat.

Figure 6.8. **Wheat stocks and real price development**



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Figure 6.9. **Coarse grains stocks and real price development**

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The price of US maize (No. 2 Yellow, Gulf), is projected to increase between 2011 and 2014, but then to fall back to USD 165 per tonne in 2018. Real coarse grain prices should resume their downward trend around 2015 when US mandates for maize-based ethanol reach their maximum level. Among the major cereals, coarse grain prices have always been more sensitive to changes in economic conditions and with the rise in the use of maize for ethanol production, the linkage with crude oil prices has become an added uncertainty. The nature of this linkage is complex, and depends also on the level of crude oil prices and biofuel policies in place. On the one hand, crude oil prices influence fertiliser and other input costs. In addition, above a certain threshold price if biofuel mandates lose their binding character, the linkage is stronger by virtue of the fact that biofuel production becomes profitable. As demonstrated in Chapter 2, current crop price projections are lower than would be with significantly higher oil prices, but given current policy settings most of this effect comes from lower crop production rather than increased use for biofuels.

Main market developments: Rice

Responding to the 2008 price spike

World rice production expanded vigorously in 2007 and 2008, supported by a combination of factors, including rising prices since late 2007, excellent growing conditions in most parts of the world and government incentives to expand the area planted to rice and the use of fertilisers and quality seeds. Trade in rice, however, dipped slightly in 2008, as high prices but also difficulties in finding open sources of supplies depressed world imports. On the export side, government restrictions largely explain both the contraction in trade volumes and soaring prices. Trade may rebound in 2009, although difficulties in accessing credit and resilient world prices may dampen the recovery. Domestic rice markets also witnessed sharp increases in prices, which caused demonstrations of social unrest in several locations. Although world prices have started to ease since mid-2008, the drops were not, or only partly, transmitted to local markets, where rice still remains substantially more expensive than in 2007. Nonetheless, average *per capita* consumption, all uses included, is estimated to have increased in 2008. In several

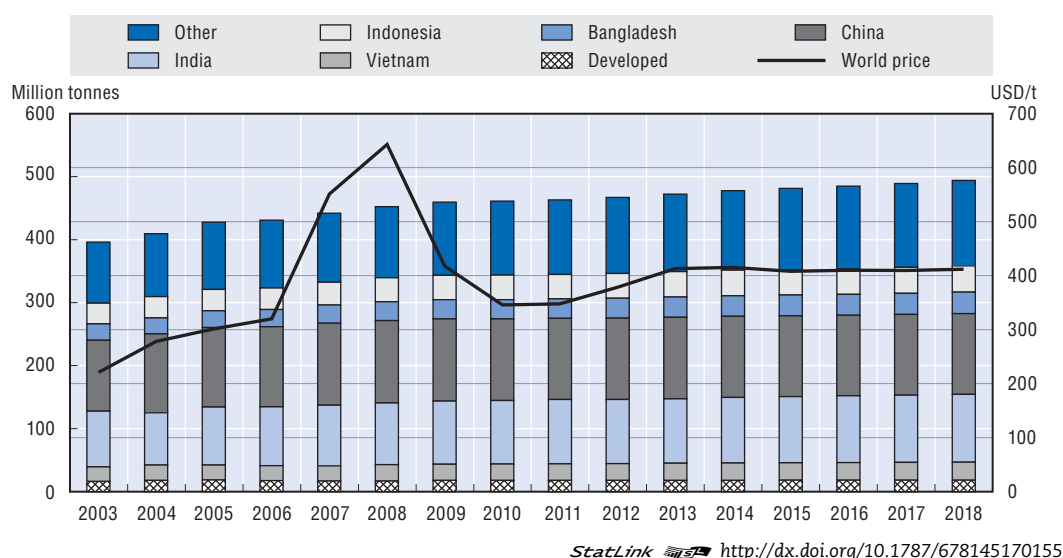
countries, especially Bangladesh, India, Indonesia or the Philippines, the gains reflected large scale public distribution at subsidised retail prices, but also a shift away from more luxurious livestock products. The abundant rice crops harvested in 2008 also allowed world rice reserves to be refurbished and to attain their highest level since 2002.

Rice production to grow at slightly slower rates

Strong prices in 2007 and 2008 along with an intensification of government support stimulated a strong expansion in paddy cultivation in 2008, a sign that the sector can quickly react to improved economic incentives when they arise. The tendency for rice plantings to expand may well continue in the next few years, especially in those countries that have renewed their commitments to rice self-sufficiency. However, in the longer term, the area under rice is expected to change little from current levels. China, India, Indonesia, Malaysia, Pakistan, the Philippines and Viet Nam may witness a contraction, with the retrenchment likely to stem from smaller holdings which practise subsistence agriculture, while rice cultivated under larger scale and modern technologies may gain ground. Plantings are, however, anticipated to keep growing in Africa, particularly in Ghana, Mozambique, Nigeria or Tanzania, where large tracks of land suitable to rice cultivation are available. Within the OECD, rice cultivation is projected to contract further in the EU27, Japan and the Republic of Korea, consistent with prevailing policies, but the drops are expected to be less pronounced than in the past decade, when most of the sectoral adjustment was made. Although the area under rice might recover in Australia, this is conditional on a return to a more normal rainfall pattern, as the recurrent drought episodes in the past few years have made rice growing a very risky enterprise.

Yields are foreseen to remain the principal engine of production growth in the near future. By 2018, they are projected to reach an average of 3.1 tonnes per hectare, about 9% more than in 2006-08. There are contrasting tendencies that could affect the pace of yield growth, in particular the dissemination of improved technological practices and rice varieties, including hybrids and genetically modified strains. On the other hand, more difficult access to fertile land, competition for water and high energy costs may all act to slowdown the process. Given recent experiences with El Nino and the prospective changes in climate, which may be already felt in 2018, the most salient feature in the next decade might well be an increase in yield variability, under more erratic weather patterns. Should policies be launched to address global warming, they could have important implications for the rice sector, which has been identified as one of the most important agriculture-related source of methane emissions. Solutions to mitigate those emissions could well require deep changes in the pattern of rice cultivation, away from fully flooded rice fields, where methane is produced from the anareobic fermentation of the submerged organic matter.

World rice production (Figure 6.10) is set to expand at rates slightly inferior to those observed in the previous decade, reaching 494 million tonnes, some 52 million tonnes more than the average of 2006-08. Almost three-quarters of the increase is projected to arise among Asian countries (Bangladesh, India, Indonesia, Cambodia, Myanmar, Thailand, etc.) despite an absolute decline in output foreseen in China, where the sector is expected to adjust to falling domestic consumption. African countries are also anticipated to record large production increases in the next ten years, as producers start tapping the opportunities offered by growing local rice markets. In several cases, this might require increased public support under the new agricultural development programmes that have

Figure 6.10. **Rice production and prices**

recently been launched. Within the region, Madagascar, Mali, Nigeria, Sudan and Uganda are projected to record large production gains, while among LAC, a sizeable expansion is foreseen in Brazil, Colombia and Peru. Although accounting for a minor share of the total, production by developed countries is projected to rebound, following a recovery in Australia and growth in the United States, reversing the fall experienced in recent years. The recovery would fail to materialise should the sector in Australia not rebound to the pre-2001 crop levels.

Per capita rice consumption to fall, influenced by changing dietary patterns in Asia

Rice remains essentially a food commodity, with only small amounts fed to animals or processed by the industry into non-food products, such as rice-based starch or soap. However, a relatively important large share of rice supplies is used for seeds or damaged after harvest. Post-harvest losses may be particularly large in countries that do not have proper storage facilities and which stockpile rice in the open.

Per capita rice consumption, all uses included, is projected to decline by 1 kg between 2006-08 and 2018 to 65.7 kg, largely induced by prospects of a 2 kg drop in Asia, as increases are projected in all the other regions, in particular Africa, but also in LAC. In Asia, consumers are expected to diversify their diets away from their traditional rice staple as their incomes grow and urbanisation proceeds. This especially concerns countries such as China, Indonesia and the Republic of Korea, where the tendency has already manifested. *Per capita* rice consumption may fall also in Bangladesh, India and Philippines, where large tracts of the population now benefit from government distribution programmes at subsidised prices. However, even in Asia, *per capita* rice intake in the poorer countries may continue increasing as incomes rise. More rice per person is projected to be consumed in 2018 in most OECD countries, consistent with previous trends, with the exception of Japan and the Republic of Korea where further cuts might be expected in the coming years.

Aggregate rice consumption at the world level is foreseen to grow by less than 1% per year to 495 million tonnes in 2018, or by an overall 46 million tonnes over the full period. Despite the projected drop in *per capita* intake, two-thirds of the increase is expected to

arise in Asia. A sizable expansion is also foreseen in Africa, sustained by a fast growing population and a continued shift of the diet away from traditional food products into rice, driven by urbanisation and strong income growth. A similar, albeit less marked tendency is expected in LAC. Slow population growth and stagnating average *per capita* consumption is likely to limit the expansion of the rice market in the OECD area.

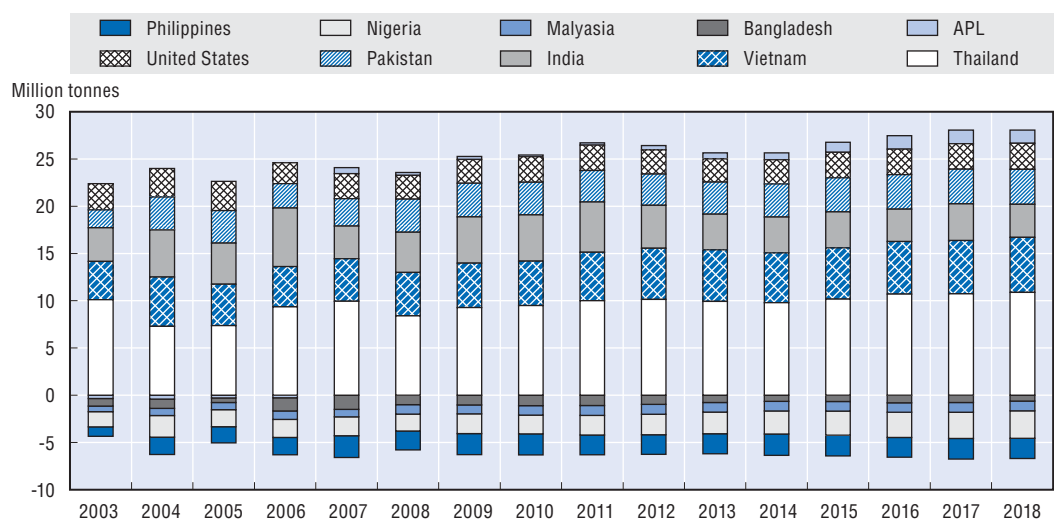
Lower incomes following a deeper recession, as outlined in Chapter 2, would only depress marginally global rice demand. If the most recent income projections are evaluated in a slow growth scenario, global rice consumption would fall only half a per cent compared with the baseline projection. Rice in most countries will likely be the last consumption item that would be adjusted for a fall in incomes, as consumers are likely to allocate more of their expenditures to the cheapest food sources, which include rice.

World rice trade to expand at slower rates than in the past

One feature that has distinguished the world rice sector from the other cereals in the past ten years has been a particularly fast pace of trade expansion (over 3% *per annum*). Much of that strength reflected a growing reliance on imports by African countries to meet fast expanding domestic consumption. The rapid trade growth has resulted in a deepening of the relatively “thin” international rice market, where 6-7% of world production was exported in 2006-08, compared with less than 4% in the early 1980s.

Trade in rice is set to rise by 1.6% per year over the next ten years, much more slowly than in the recent past, to reach 38 million tonnes by 2018 (Figure 6.11). African countries are projected to remain a major driving force, with their imports rising relatively fast, despite further gains in production. Countries in Southern and Western Africa are projected to import substantially more, and Nigeria may become to be the single largest import market by 2018. This would be facilitated by a lowering of import duties to less than half their 2007 level, as the country adopts the UEMOA Common External Tariff. Saudi Arabia, the Islamic Republic of Iran, South Africa, Malaysia and Mexico are all expected to remain among the major destinations of rice trade. Countries in Central America and the Caribbean (Cuba, Haiti, Jamaica, Honduras, Dominican Rep., etc.) and in Asia Pacific and

Figure 6.11. **Main rice traders**



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the Near East region (Iraq, Korea DPR, UAE, Oman, etc.) will also arise as growing markets. China may step up imports, to meet high quality rice demand. By contrast, the Philippines and, especially, Indonesia, which used to be among the largest markets for imported rice, are foreseen to reduce their purchases. Among OECD countries, the EU27 is projected to import substantially more by 2018, amid stagnating production and rising consumption with policy reform. An increase is also projected for the US. Imports by Japan and the Republic of Korea are projected to change little, on the assumption that WTO minimum quota provisions will continue being applied. By contrast, progress in expanding production may help the Russian Federation cut its purchases.

Few upheavals are foreseen on the export side of the market: exporters' ranking should see Thailand, Viet Nam, Pakistan, the US, India and China heading the list of shippers. The major breakthrough on the international rice market could be the growing importance of Cambodia, Myanmar and Laos as new exporters. However, as witnessed in 2008, government interventions to regulate the market will likely remain the major area of uncertainty and policies, especially of the major exporting countries, will heavily influence the pattern of international rice flows (and world prices). Exchange rate movements may also rapidly change the relative competitive edges of the single exporting countries but also influence the volume of purchases on world markets. The recent sealing of a free trade agreement, also covering rice, among ASEAN countries may have relevant implications for trade movements within the region and could require changes in domestic producer support policies in Thailand to be compatible with the new FTA.

Global rice stocks to rebound

World rice carryover stocks are expected to rebound in the coming ten years, reversing the recent trend, but without returning to the record highs reached in the late 1990s. Much of the build-up will be concentrated in Asia, in particular in China and India, which have traditionally been the two countries holding the largest rice reserves. Countries in Asia and the Pacific are also projected to raise the size of their inventories. Stock-to-use ratios will improve slightly as a result.

World rice prices to remain high compared with the historical period

A series of factors, often exogenous, pulled world rice prices to record levels in the first months of 2008. They have since weakened, but much less than for the other cereals, as government policies have helped to sustain them. Prices are foreseen to drop in 2009 and 2010 below the 2008 average of USD 643 per tonne for the benchmark Thai white rice 100% B, but are expected to remain in the order of USD 400 per tonne over the rest of the period. Rice is likely to become slightly more expensive relative to wheat in the coming ten years, with the rice to wheat price relation expected to reach a 1.87 ratio, compared with 1.60 in 2006-08.

Key issues and uncertainties

Economic growth and energy markets

From the experience of the past year, it is evident that the global cereal market is not immune to rapid changes taking shape in world economy. Therefore, how and when economic recovery resumes will have strong bearing on markets and consequently on the projection results. Cereal prices are likely to continue to move in close tandem with changes in global economic conditions, particularly given the cereal stock situation. The

gloomy economic outlook for the early years of the baseline could weigh on demand, especially from the feed sector. This could imply a continuing downward pressure on prices. Lower crop prices can cut into profit margins and hence production levels if input costs (notably energy and fertiliser) remain at their current levels or higher. From the evidence presented in Chapter 2, the cereal sector now appears more sensitive to the evolution of the energy sector, particularly as it globally affects production costs, and additionally, from its impact on biofuel feedstock demand where biofuel production and use are not bound by politically set mandates. At the same time, the evidence from simple model simulations suggests that cereal food demand, in aggregate is much more resilient to deeper recession.

A significant recovery in the world economy later in the projection period could prompt a rebounding of demand and, therefore, international prices. While production will eventually adjust, a recurrence of another major price spike like the one recently witnessed cannot be ruled out. Such a situation would likely arise if crude oil prices also rebounded to levels experienced last year, where higher costs of production could curtail supply expansion, but where higher food, feed and biofuel feedstock demand resulting from higher incomes would underpinned market tightness.

Fluctuations in energy markets will continue to influence maize and wheat markets. The importance of biofuels in this linkage has increased in recent years and with more countries promoting green energy, while new quantitative mandates, such as the US Renewable Fuels Standard (RFS) and the mandates set in the new EU Renewable Energy Directive, tend to weaken this link. However, the price of crude oil is critical, not only to the economics of further expansion of biofuel capacity, but also to the viability/adherence to mandates. Lower prices of crude oil may cause mandates to be reviewed. At the other extreme higher crude oil prices may ignite commodity price inflation. Crude oil has seen prices exceeding USD 50 per barrel recently despite the current economic slowdown context and, should a significant recovery occur in the world economy, a rebound in oil prices could directly underpin a substantial upward move in the prices of maize, wheat and oilseed and, indirectly, also those of other major crops. As was shown by several analyses, including OECD (2008), the link between energy and agricultural markets, which is already important due to fertiliser and other input costs, gets stronger with higher crude oil prices.

Consequences of the 2008 experience for importers' confidence in trade

An important issue in the medium term involves the policy response to lessons learned from the price spike between 2006 and 2008 which may have a bearing on world production and international trade in particular. The recent wave of export restrictions, put in place by so many countries, demonstrated importing countries' vulnerability to unexpected supply shocks from the global trade perspective. These developments intensified a search for alternative, but not necessary new, ways to secure supply of such important staple foods as wheat and rice.

In the rice sector, the price escalation in world markets was in fact in large part a reaction to export restrictions imposed by major rice exporting countries. The breadth of exporters' moves to restrict the volume of rice sold to world markets in 2008, while not contravening WTO rules, marked a drastic departure of the generally open trade environment that had been consolidating since 1994, when the Uruguay Round negotiations were successfully concluded. From a policy viewpoint, developments in 2008 may have important implications for the sector in the medium term, as pervasive

intervention since 2007 by governments intending to shield their populations from high international food prices substantially shattered importing countries' confidence in trade. As a result, several of them have announced their intention to reduce their reliance on imports and the launching of new strategies to enhance national food security. These include development programmes to boost production and rice self-sufficiency in the medium term (Ivory Coast, Nigeria, Senegal, Indonesia, the Philippines, Malaysia, Venezuela); the building up of strategic food reserves and the maintenance of larger buffer rice stocks (Malaysia, the Philippines, Indonesia, etc.).

As a result of the high price crisis, a number of countries have taken the step of investing in farm production outside their own territory, offering a means to significant development potential that could bear important results by the end of the projection period. From Africa to the CIS, investment by several third countries, most prominently by countries in the Middle East, may alter the pattern of trade as some countries reduce their foreign purchases (imports) from traditional suppliers and redirect purchases to countries where they are making land investments. Although not a novel feature, the rush by foreign investors/companies to invest in land development in resource-rich countries such as Cambodia, Indonesia, Myanmar, Madagascar, Mozambique or Sudan, also gained momentum in 2008 and is expected to continue in 2009.

Finally, the experience of the price spike has also created interest in several potential sources of additional production response. In pursuit of higher production in the face of ever shrinking natural resources, advancements in seed technology and adoption of GMO could provide faster growth in yields and hence output. This development may particularly interest the CIS countries as well as many countries in Sub-Saharan Africa. In Europe as well, interest is being expressed in certain GMO crops. Furthermore, there is potential for significant land expansion in some areas. In the CIS, for example, plantings could also increase more rapidly as major CIS exporters will try to expand their market share in Europe, North Africa and Asia.

References

OECD (2009), *Biofuel Support Policies – An Economic Assessment*. Organisation for Economic Co-operation and Development, Paris.

Chapter 7

Oilseeds and Oilseed Products

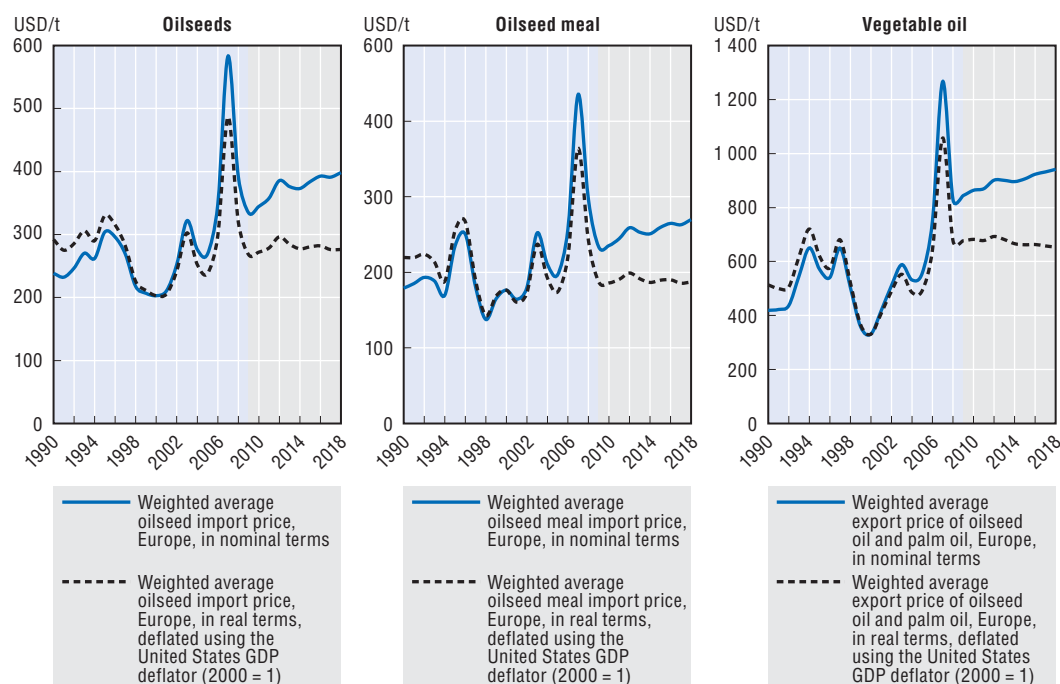
World market trends and prospects

Key market drivers

The gradual upward trend in prices for oilseeds, oils and meals that started in the 2005 marketing year accelerated during the course of the 2006 marketing year. In the first half of calendar year 2008, prices for all three product groups peaked at levels not recorded for decades, only to drop again sharply during the second half. The lingering price strength since the beginning of the 2007 marketing year reflected a tighter global supply and demand outlook for oilseeds and derived products, as well as spill-over effects from related grain markets. Stronger maize prices resulted in shifts in land allocation at the expense of soybeans which halted the rapid oilseed area expansion seen in previous years. As a result, seed-derived protein meal and oilseeds oils availability stagnated in 2007 and 2008. Because of the continued expansion of palm oil production, the oils and fats sector was less affected, yet steadily expanding food and biofuel feedstock demand resulted in tightening oil and fat markets. These developments made marked reductions in inventories of oilseeds and products inevitable, causing stock-to-use ratios for oils and meals in 2007 to fall to critical levels. Compared to the 2006 season, these developments led to an increase in international oilseed prices by almost 70% during 2007.

Growth in global oilseed production was resumed in the 2008 marketing year, as in most regions farmers responded to above average oilseed prices by expanding plantings. The stronger supply was met by a weaker demand situation with the onset of the global economic crisis. Crush demand grew only slightly in 2008. The growth in global oil and meal consumption remained below trend as worldwide economic recession on the trail of global financial crisis weakened demand. The need to replenish stocks constrained consumption further. Global oil and fats consumption remained strongly influenced by developments on world energy markets, and possible adjustments in national biofuel policies affected demand. Growth in protein meal consumption was constrained by lower livestock numbers and a general reduction in feeding profitability as well as improved availability and lower prices of feed grains. Shifting market fundamentals, macroeconomic and financial conditions put a stop to the extraordinary rally in prices for oilseeds and products around July 2008. Prices tumbled and, by December 2008, oilseeds, oils and meals were traded at values close to those recorded when prices started surging in the first half of calendar year 2007 (Figure 7.1). Prices would have fallen further, if production expansion in South America had not been constrained by adverse weather conditions and farm liquidity problems.

The projections for oilseeds and oilseed products are conditioned by to assumptions of average weather, continuation of current policy packages and the evolution of the macroeconomic environment that has been described in Chapter 4. The quantitative section in Chapter 2 presents alternative evolutions of oilseeds and oilseed products markets under more adverse assumptions for the macroeconomic environment and for changes in the crude oil price. The current chapter does not elaborate further on those quantitative results.

Figure 7.1. **Evolution of oilseeds and oilseed products prices over the projection period**

Source: OECD and FAO Secretariats.

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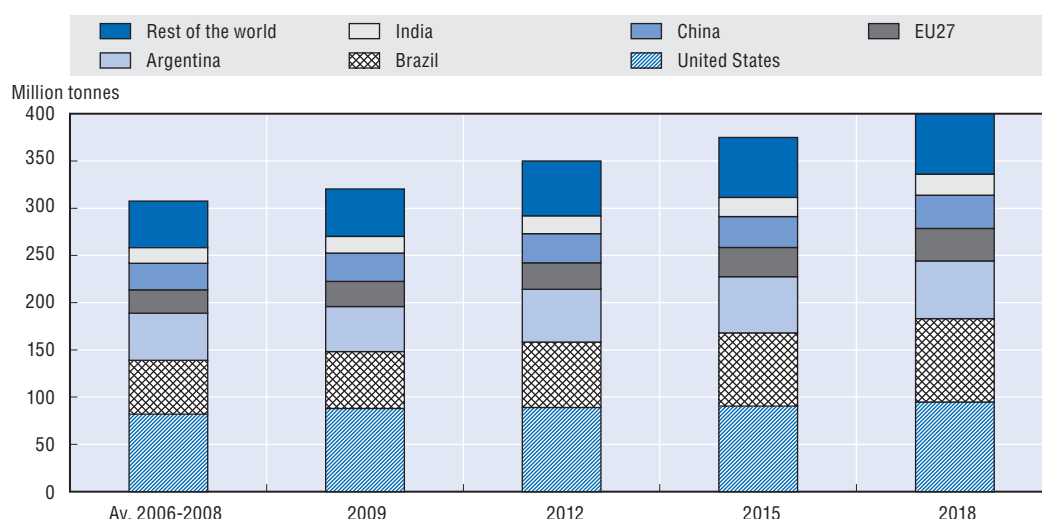
Main market developments

Oilseed production is expected to increase by 30% over the Outlook period

Under the set of assumptions used for this Outlook and described in Chapter 4, oilseeds, oilseed meal and vegetable oil markets will continue to expand over the course of the projection period. Feed demand and food demand for vegetable oil in developing countries and, to a lesser extent in developed countries, is expected to be sustained especially in the latter years (2012 and beyond) of the Outlook because of growing incomes and population. Growing vegetable oil use for biodiesel production is expected to be the second important factor behind expanding markets. This use is driven by strong biofuel mandates in a number of OECD and non-OECD countries.

In 2008, because of improved price prospects relative to cereals, oilseed acreage recovered from its unprecedented 2007 decline, which was mainly due to the diversion of land from oilseed to coarse grains in the US and in China. In 2009, world oilseeds acreage and production are expected to increase by 3% and 5% respectively, with prospects of normal weather conditions and of a more favourable price ratio between oilcrops and cereals.

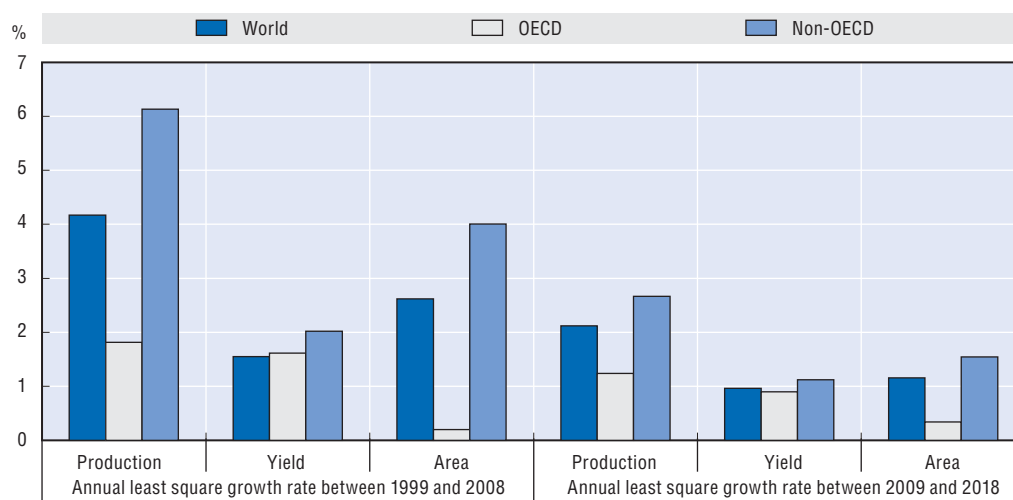
By 2018, world oilseed production is expected to exceed the average 2006-08 level by more than 30% (Figure 7.2), in a context of sustained – though lower than over the previous decade – demand for oilseed products. However, the global potential for an oilseed production increase is more constrained than it was in previous decades. This is due to limitations in yield increases and area expansion (Figure 7.3). Reduced area expansion occurs in particular in developing countries where annual growth rates drop from an

Figure 7.2. **Evolution of oilseed production over the projection period**

Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/678361810211>Figure 7.3. **Global oilseed production increase is slowing**

Comparison of average annual growth rates of oilseed production, acreage and yield between the 1999-2008 and 2009-2018 periods



Source: OECD and FAO Secretariats.

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exceptional level of 4% per year to 1.5% per year. Average yield gaps between developed and developing countries are expected to narrow further. Latin America is expected to continue to expand production, but the gains are expected to be smaller than in the previous decade.

Brazil and Argentina are expected to sustain their leading role in oilseeds supply with a combined share of global oilseed production of almost 37% in 2018, up from almost 35%, on average over the period 2006-08. They are projected to expand production at rates of almost 3.6% and 1.6% respectively per year. As over the previous decade, area expansion is the main contributor to production growth in Brazil, but at a much slower pace. Increase in yields is the main driver in Argentina.

Oilseed production in the Russian Federation is expected to increase by more than 40% compared to average production during 2006-08. This growth is driven by both area expansion and yield increases. In China, production growth (1.8% per year over the projection period) continues to be driven by yield improvements rather than area expansion. China is expected to continue to favour domestic production of coarse grains and imports of oilseeds to capture the value added from processing oilseeds into protein meals and vegetable oils. China is an example of the slowdown in the expansion of oilseed crushing industry in developing countries. Its crushing capacity is expected to continue to grow at a rate of 2.6% per year which is significantly below the previous decade. India's oilseeds import tariffs continue to be prohibitive, blocking significant imports; although, vegetable oil requirements are increasingly satisfied by imports

Within the OECD, oilseed area is expected to grow at a rate of 0.3% per year. Oilseed area expansion is expected to take place in the European Union, Canada and Australia partly due to biofuel mandates, particularly in the EU favouring the development of the biodiesel industry. After its 2008 recovery due to better price prospects for oilseeds and oilseed products, oilseed acreage during the next decade is expected to slightly decrease in the US (-0.3% per year) as area continues to be shifted into maize production. The US is, however, projected to remain the major oilseed producer over the projection period. In response to strong demand from the expanding biodiesel sector, oilseeds production in the European Union is expected to increase by 40% in the coming decade.

The combination of these factors causes stock-to-use ratios for oilseeds and oilseed products to remain low and nominal world prices to increase over the Outlook period (Figure 7.1). When corrected for inflation, prices of oilseeds, oilseed meal and vegetable oil, are expected to hold firm. Sustained biofuel demand essentially driven by mandates, is expected to add support to prices for vegetable oil and oilseeds, keeping them at or above previous levels.

Oilseed exports remain very concentrated – no change expected

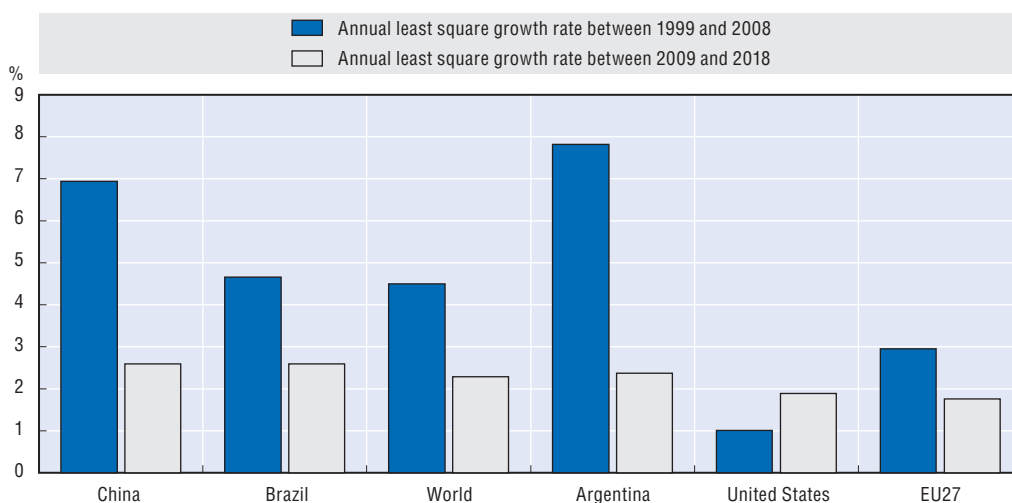
As has been the case in the past, world oilseed trade will continue to be dominated by a small number of countries. The traditional leading exporters, US, Brazil, Argentina, and Canada have been joined by Paraguay as an emerging supplier. Together they control over 90% of world oilseeds exports. Trade growth was above 5% *per annum* during the past decade, but is expected to slow to less than 2% in the coming one. Still, this means a total growth by almost 20 million tonnes over the Outlook.

US domestic demand for crushing is expected to grow at a rate of 1.9% per year over the Outlook following a contraction in 2008 caused by a slump in oilseed meal demand (Figure 7.4). Growth is sustained by solid demand for oilseed meal in the latter years of the Outlook period and increasing vegetable oil use as a biodiesel feedstock especially in the early years. This, combined with only slightly increasing oilseed production, is anticipated to lead to stable oilseed exports over the projection period, at more than 34 million tonnes on average.

Brazil's share of global exports is expected to grow from 30%, on average, during the period 2006-08 to 39% in 2018. Towards the end of the Outlook, Brazil becomes the leading oilseeds exporter surpassing the United States. However Brazilian export growth will slow down as its crushing facilities expand to meet growing domestic demand for vegetable oil because of ambitious government targets encouraging the use of biodiesel.

Figure 7.4. The expansion of crushing facilities is expected to slow down over the projection period

Comparison of average annual growth rates of oilseed crush between the 1999-2008 and 2009-2018 periods



Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/678372740702>

The differential export tax system in Argentina continues to favour domestic crushing of seeds and exporting oilseed products, rather than exporting oilseeds. It should favour even more exports of biodiesel. As a consequence, domestic crushing is expected to increase by almost 40% over the projection period and total oilseed exports should decrease from 19% of production, on average, over the period 2006-08 to just 11% in 2018.

Within the OECD, Canada remains the second largest oilseed exporter. Exports are projected to decrease, despite increasing rapeseed production. This is due to the development of the Canadian crushing industry at a rate of 3.8% per year over the projection period, associated with higher domestic demand for vegetable oil.

Paraguay's oilseeds exports stabilised in 2008 at above 5 million tonnes and are expected to continue a steady growth to more than 7 million tonnes by 2018. The sector is export oriented and only about a quarter of domestic production is processed within the country. As a landlocked country, Paraguay will ship its soybeans through Argentina or Brazil.

Oilseed imports are less concentrated overall, but China accounts for almost half

Due to the slowdown in the expansion of the Chinese oilseed crushing industry over the projection period (Figure 7.4), compared to the exceptional previous decade, the growth of Chinese oilseed imports is also expected to be slower. Chinese oilseed imports are expected to increase by almost 14 million tonnes, accounting for 70% of the global increase in imports over the projection period, when compared to the 2006-08 period. In 2018, about 58% of Chinese oilseeds consumption will be met by imports.

The European Union is assumed to increase domestic crush of oilseeds to meet the rising demand for oilseeds products generated, in particular, by a growing biodiesel industry as well as by sustained demand from the livestock sector. Despite the expansion

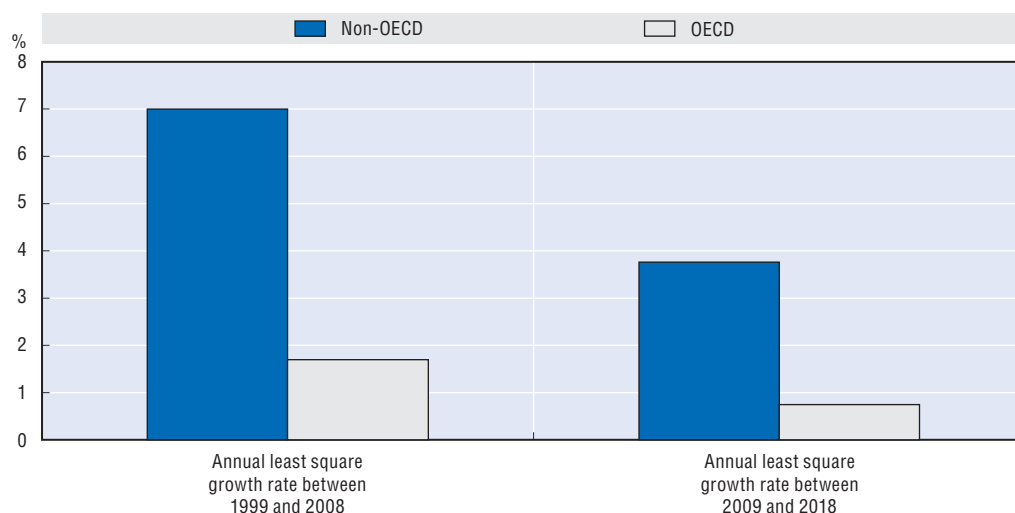
of domestic oilseed production, mainly rapeseed, the European Union should remain a strong and stable importer of oilseeds over the Outlook period.

Growth in oilseed meal use driven by non-OECD countries

In 2008, despite considerable price volatility and the uncertain economic environment, global meal consumption continued to expand, although at a slower pace than in previous years. This growth was driven by continuously rising feed demand by the livestock sector and by the decrease of oilseed meal prices after an unprecedented peak in 2007. During the Outlook, global demand for protein meals is projected to remain in line with the development of the livestock industry around the world. Annual growth in meal consumption is expected to average 3.8% in non-OECD countries and 0.7% in OECD countries, 50% lower than the previous decade (Figure 7.5).

Figure 7.5. Most of the oilseed meal demand growth will originate from non-OECD countries

Comparison of average annual growth rates of oilseed meal consumption between the period 1999-2008 and 2009-2018



Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/678377607818>

Livestock industries in developed countries have matured and reached considerably a situation of stable ration compositions, leading to insignificant growth. Emerging economies like China are engaged in an ongoing intensification of its livestock industry. Because of higher use per animal and an expanding livestock sector, China is expected to surpass the European Union as the leading oilseed meal consumer by the end of the projection period. In the US, protein meal use has dropped since 2006 as meal prices rose and more and more distiller grain, a by-product of the ethanol production, became available. Over the coming decade, dried distillers grains, are expected to replace almost 8% of oilseed meal consumption in the US, compared to 5% on average over the period 2006-08. Therefore, by 2018 meal consumption in the US will return only to the level of 2006.

India's domestic demand for protein meals has been declining for several years to the benefit of exports, but this trend is expected to reverse over the projection period on account of a low oilmeal to feedgrain price ratio and continuously expanding dairy, livestock and poultry sectors.

When domestic meal consumption is expressed in meal use per tonne of non-ruminant meat production, the average projected consumption levels in developing and LDCs remain significantly below those in developed countries. Growing meat production coupled with relatively low meal prices slowly increase the feed intensity over the Outlook, so that developing countries will increase their share of global protein meal use from 50% in 2008 to 57% in 2018. This is still small when compared to their population share of over 80%. Despite gradual improvements, LDCs account for only about 1% of global non-ruminant meat production. This level of output requires just 0.5% of total protein meal used in the world.

Growth in vegetable oil supply and demand expected to slow despite increasing non-food use

World vegetable oil production is expected to increase by almost 45% over the Outlook period. As in the past, palm oil production will be clearly dominated by two countries, Malaysia and Indonesia. The share of palm oil produced in these two countries currently amounts to about one-third of global vegetable oil output and is expected to grow further. In recent years, palm oil has surpassed soybean oil as the leading vegetable oil in terms of quantities produced and consumed.

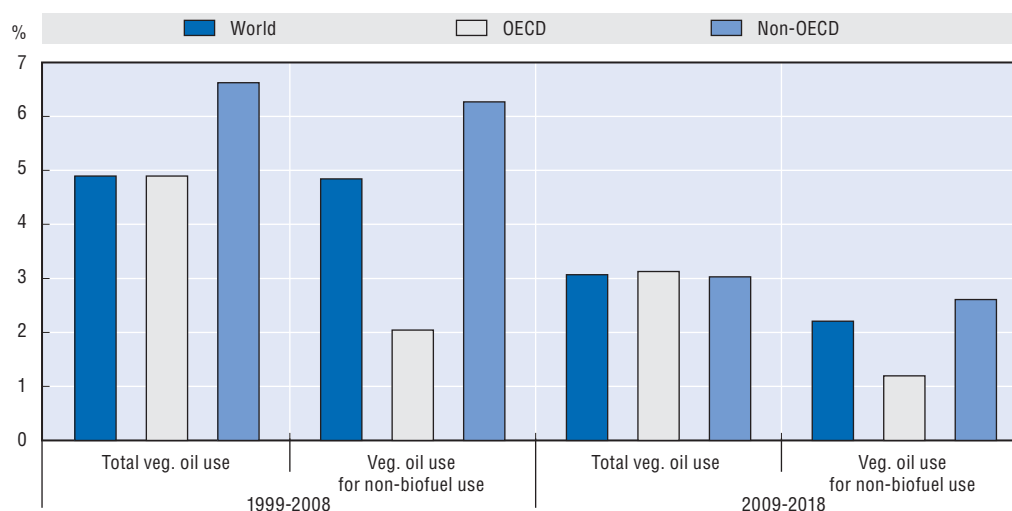
Over the course of the baseline, the combined production of Malaysia and Indonesia is expected to expand by 19 million tonnes. Growth rates are expected to be lower in the future, compared to recent years, mainly because environmental constraints will likely restrict area expansion. The expansion of EU oilseeds production and crush capacity is expected to lead to an increase in vegetable oil production of 26% over the Outlook, when compared to the level of 2006-08, yet production growth will be about 50% slower compared to the previous decade. The important developing country oilseed oil producers, Argentina, Brazil and China are all expected to reduce their production growth rates to below 3% during the Outlook as well.

In late 2008, the uncertainties associated with the end of the high-price period for commodities and the emerging economic crisis led to reduced growth in global oils and fats consumption despite the continued, mandate-induced growth of vegetable oil use for biofuel production in a certain number of OECD and non-OECD countries. Reduced food use of vegetable oil especially in developing countries, because of income constraints, has been the leading cause of this development. Slower consumption growth is expected to continue for 2009 as all economies around the world are confronted with the deepest economic crisis in decades.

Sustained demand for non-food uses of vegetable oil and rising income and population mean global vegetable oil demand is expected to rise by almost 45% in 2018, compared to the average level in 2006-08. However, saturation effects and lower income prospects together with higher vegetable oil prices driven primarily by bio-energy mandates, keep global consumption to an average annual growth of about 3% despite the biofuel mandates, which constitutes a halving compared to the previous decade (Figure 7.6). In non-OECD countries, a 3% annual demand growth is expected, more than

Figure 7.6. **Slower demand growth for vegetable oil over the projection period**

Comparison of average annual growth rates of vegetable oil consumption between the 1999-2008 and 2009-2018 periods



Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/678404683013>

75% driven by food use. Asia, and especially China, accounts for the bulk of anticipated expansion. *Per capita* oil consumption is projected to grow almost 2.3% *per annum* in China compared to almost 10% in the previous decade. Nonetheless, combined with population growth this leads to 6.9 million tonnes increase in vegetable oil use over the outlook period, about 15% of the global increase, in China alone.

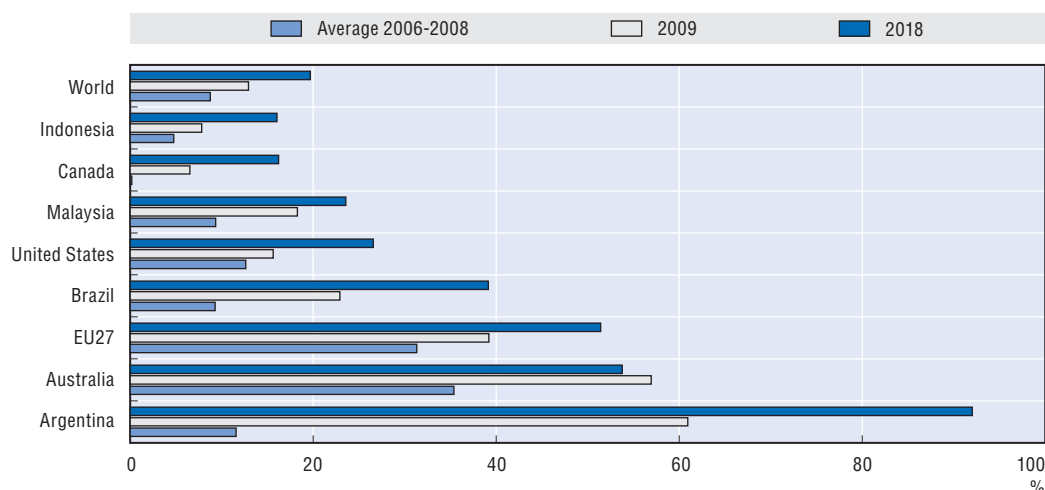
Per capita food consumption of vegetable oil in India is projected to grow by 1.2% annually. Combined with population growth this leads to a 3 million tonnes increase in food use over the outlook period. Growth in non-food use is projected to be small as biodiesel production will use non-edible oils as feedstock. In 2018, food use will amount to 98% of total vegetable oil use in India.

The divergence in average *per capita* consumption levels between developed and developing countries (in particular least developed nations), remains significant during the projection period. *Per capita* food consumption growth in least developed countries is expected to drop to about 1.5% *per annum* in the coming decade as a result of the projected higher price plateau. On average, only about 7 litres *per capita* are consumed in 2018, compared to about 27 litres in the developed world.

Driven by bioenergy mandates, global vegetable oil use for biodiesel production will increase by 21 million tonnes over the outlook period compared to the 2006-08 level. The share of vegetable oil consumption which is used for biodiesel production is expected to increase from 9% in 2006-08 to 20% in 2018 (Figure 7.7).

Given its biofuel directive, the EU is expected to remain the dominant player with its use of vegetable oil for biodiesel production reaching almost 17 million tonnes, i.e. more than 50% of domestic vegetable oil consumption and 11% of worldwide consumption, in 2018. These numbers do not take into account the vegetable oil content of imported biodiesel.

Biodiesel industries are also expected to develop in a certain number of OECD and non-OECD countries. Within the OECD, vegetable oil consumption used for biodiesel

Figure 7.7. **Share of vegetable oil consumption used for biodiesel production in selected countries**

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/678460733141>

production is expected to develop in the US, Canada and Australia. Because of the new Renewable Fuels Standard, biodiesel production in the US should increase markedly until 2012, and then more moderately over the rest of the projection period. Vegetable oil use for biodiesel production is expected to triple over the course of the Outlook, compared to the 2006-08 period. It represents slightly more than 25% of total vegetable oil use in the second part of the Outlook.

The use of vegetable oil for biodiesel production is expected to develop in non-OECD countries and should expand by more than 7.5 million tonnes over the projection period, compared to 2006-08. Argentina is projected to continue to develop a strongly export-oriented biodiesel industry throughout the early years of the Outlook. Vegetable oil use for biodiesel production is expected to reach 3.7 million tonnes in 2018. Ambitious government targets for biodiesel use are projected to foster the use of vegetable oil for non-food purposes in Brazil as well. By 2018, about 40% of domestic consumption is expected to be used for biodiesel.

The soybean oil based biofuel industries in Argentina and Brazil account for 60% of the expansion in biofuel use of vegetable oils in developing countries. In all other developing countries, the emerging biodiesel production will only use palm oil and non-edible oils like *jatropha*. The largest palm oil users for biodiesel are Indonesia, Malaysia and Thailand, significant *jatropha* plantings are expected in India only. *Jatropha*-based biodiesel developments in African countries are limited to small projects.

In South-East Asia, Malaysia and Indonesia the leading producers and exporters of palm oil, are set to develop their biodiesel industries, partly for domestic consumption and partly for export, although at a slower pace than what was once envisaged because of lower crude oil price, lack of financing new facilities, and some uncertainty in export prospects. Palm oil in Malaysia has traditionally been used as raw material input in its oleo-chemical industry. In addition, the developing biodiesel sector uses 3.4% of Malaysia's palm oil production over the Outlook. Thailand's ambitious biodiesel programme is expected to expand its use from 300 thousand tonnes to 1 million tonnes which is equivalent to almost

half of its palm oil production in 2018. Emerging biodiesel production will also increase the consumption of domestically produced vegetable oils in India with biofuel use of vegetable oil projected to expand by 1.2 million tonnes over the projection period.

Vegetable oil trade driven by consumption growth in large developing economies and biodiesel use

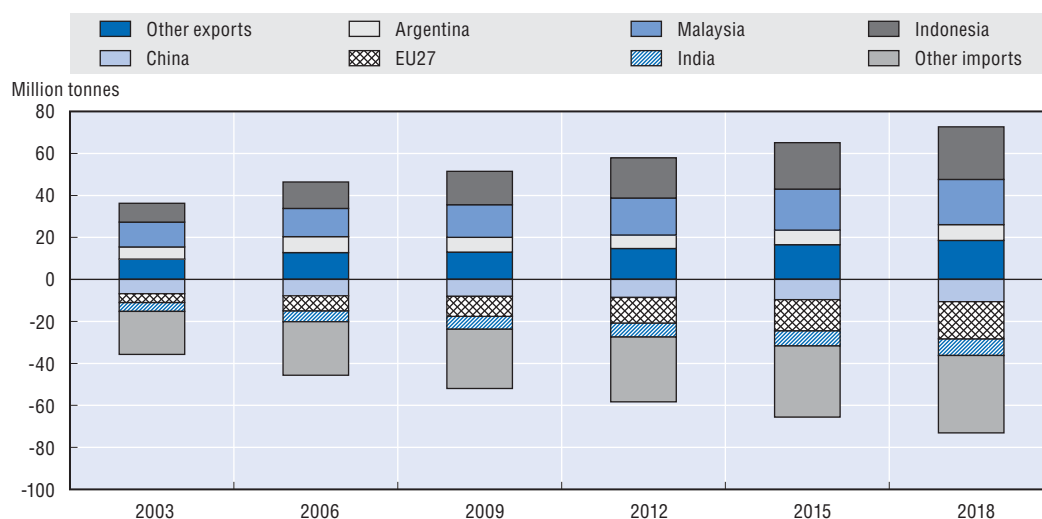
World vegetable oil trade increases because production in the main consumption regions does not keep up with demand. Trade is projected to increase by 50% over the projection period to reach 73 million tonnes in 2018. World vegetable oil exports are very concentrated with Indonesia, Malaysia and Argentina providing almost 75% of shipments, while import demand is much less concentrated. Food requirements will remain the major source of import demand for vegetable oil in developing countries. Additionally, due to binding biofuel mandates being in place in many countries, vegetable oil trade will be increasingly influenced by biofuel markets on both the exporting and the importing side.

Argentina continues to be the main exporter of oilseed vegetable oil with exports increasing at a modest rate of 1.5% per year. The export pace is slowing because the country's current tax system is expected to favour the export of biodiesel. In Brazil, biodiesel production is also expected to reduce the vegetable oil trade growth to about 3%, as opposed to 9% in the base period.

The Indonesian government used variable export taxes to shield domestic cooking oil prices from high world market prices. Despite the increasing export tax, shipments expanded in 2008 and are projected to reach 25 million tonnes in 2018 (Figure 7.8). Exports, as a share of domestic production, are expected to rise again during the Outlook, after a short period of decline because of the emerging biodiesel production in recent years.

The EU, currently the second largest vegetable oil importer, is expected to more than double its imports over the course of the Outlook to meet both industrial demand as well as traditional vegetable oil demand for food purposes. China will develop its domestic

Figure 7.8. Vegetable oil exports are dominated by three major players: Indonesia, Malaysia and Argentina, imports are less concentrated



Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/678467863700>

crushing industry slower than in the past, but demand is slowing as well. Chinese vegetable oil imports will grow only by 2.9% per year and the EU is expected to surpass China as the dominant vegetable oil importer in 2009.

Only about 30% of India's additional vegetable oil needs are projected to be supplied by domestic sources. Imports are projected to reach close to 8 million tonnes in 2018, solidifying India's position as the third largest vegetable oil importer. Inflationary pressure from high food prices led the government to initiate several drastic duty reductions on all vegetable oils, especially palm oil, as a price control measure. India is expected to continue its variable tariff policy to control domestic oil prices and imports, but after the India-Asean FTA is implemented, the leeway India has had in altering import duty on palm oils, depending on international prices, will be curtailed. Following the FTA, India may not be able to raise the import duty on crude palm oil purchased from Malaysia and Indonesia above 37.5%. However, the upper limit, or bound rate, for India's import duty on soybean oil under WTO rules is 45%. In Pakistan, the oil produced from domestically produced and imported seeds will still only cover a small percentage of the domestic vegetable oil demand and, as a consequence, vegetable oil imports are increasing.

Global oilseed meal exports grow slower, Argentina maintains dominant position

In 2008, oilseed meal trade decreased by 2%. This was due to the slowdown in oilseed meal consumption growth in both developed and developing countries. Over the Outlook, trade is expected to maintain about a 3% growth rate, significantly below previous levels. This decline is in line with the slowing of global meal use.

The differential export tax system and a small domestic market support Argentina's position as the largest oilseed meal exporter in the world, accounting for almost 50% of global exports. The US is expected to maintain its runner-up position. Oilseed meal exports originating from Brazil are expected to decrease over the course of the Outlook due to an increase in consumption from a strongly expanding and intensifying domestic livestock industry.

In 2008, the EU was the world's main buyer of meals and it is projected to keep this position over the Outlook. However, by 2018, oilseed meal imports are expected to decrease by 5%, compared to the average 2006-08 period, despite slightly increasing oilseed meal consumption. This is due to increasing domestic rapeseed meal production. In China, meal demand will be satisfied by domestically produced meal, a considerable amount of which is derived from crushing imported oilseeds, as well as through an expansion in meal imports in the latter years of the Outlook.

In 2008, India continued to strengthen its role as a supplier of oilseed meals within Asia reflecting ample domestic crops and high ocean freight rates that favoured nearby supply sources. India's domestic production is projected to expand over the Outlook, but at a slower rate than consumption, resulting in a slowing of exports growth to about 1.3% *per annum* in the coming decade. Target markets for exports remain those Asian countries with growing livestock sectors such as the Philippines, Malaysia, Saudi Arabia and Egypt where Indian oilseed meals enjoy a competitive advantage from their high protein content, biotech free status, plus low freight costs.

Key issues and uncertainties

The projections presented in this Outlook are subject to a number of uncertainties. Chapter 2 presents some quantitative assessments of uncertainties associated with the current macroeconomic environment, looking at two scenarios reflecting deeper declines in income growth rates in 2009 and 2010 and different paths towards recovery. It also illustrates how oilseeds and oilseed products' markets are related to the evolution of crude oil prices. The scenarios based on lower GDP prospects, and income growth, have only a limited impact on the oilseeds and oilseed products market projections. In both GDP scenarios, international oilseeds and oilseed products prices fall on average in 2009 and 2010 by almost 4% for oilseed meal, 2.5% for vegetable oil and slightly more than 3% for oilseeds. With slow recovery, oilseed and oilseed product prices remain 2-3% below baseline levels to 2018. A higher oil price would have a more pronounced impact than lower incomes by boosting oilseeds, meals and vegetable prices by 20-25% above the baseline level in 2018. The current section does not intend to elaborate any further on the impact of macroeconomic assumptions on the projections for oilseeds and oilseed products. There are a number of other issues and uncertainties that are embedded in the projections: the further development of biofuels; policy decisions regarding food security; the concentration of oilseeds and oilseed products markets; and, the sustainability of oilseeds and palm oil production. Obviously, all these uncertainties are inter-related and other changes will arise in light of developments in other sectors of the economy.

Development of bioenergy remains contingent on future policy decisions and crude oil prices

The last couple of years witnessed a steep expansion in crop-based biofuel production. Surging demand for vegetable oils from biodiesel producers in some countries became one of the key driving forces of the global vegetable oil market, with repercussions for the oilseed complex as a whole and strong cross-sectoral linkages (in particular in the form of competition for land with maize, another highly demanded biofuel feedstock). This development was mainly a result, of national policies in support of biofuel production and utilisation.

While assumptions on biofuel developments in the Outlook are based on the continuation of the current policy set, national biofuel policies could be subject to further reviews over the medium term. Long term utilisation targets are likely to remain in place, but a push towards second generation biofuel technologies can be expected. Provided internationally recognized biofuel specifications are put in place, international trade in biofuels can be expected to increase. Overall, uncertainties about the course of national biofuel policies and regulations, together with the future evolution of crude oil prices and the behaviour of private investors represent significant sources of uncertainty in projections for the global oilseed market.

In exporting countries in South America and South East Asia, where the private sector has invested in the production of biodiesel for export, the sector's viability is strongly dependent on the development of feedstock prices relative to crude oil prices. Government support and private sector enthusiasm to invest have been cooled by the current economic downturn. Other countries, including China and India, are moving more cautiously as they have put food security as their first objective and, thus, restricted the use of edible crops for biofuel production.

Policy responses to volatile markets cannot be excluded

During the 2007 marketing year, high international commodity prices led to lower levels of food consumption and caused food price inflation, especially in developing economies where a high portion of household income is spent on food. In particular, food importing developing countries are concerned about the social consequences of rising prices for basic food staples. To mitigate the adverse effects of high prices, governments in several countries decided in the course of the 2007 marketing year to introduce corrective policy measures. Some governments lowered tariffs and introduced other measures to stimulate imports of oilseeds and vegetable oils. Direct support to consumers, release of government stocks and other consumption policies were also introduced, sometimes coupled with increased efforts to stimulate domestic oilseed production. Conversely, some exporting countries decided to introduce or raise export tariffs on domestically produced oilseeds and derived products or to otherwise restrict exportation to ensure domestic supplies.

The sharp fall in international prices that started in mid-2008 calendar year, reversed the situation in countries that depend on exports of oilseeds and derived products and raised concerns regarding weak production incentives for farmers, while it appeared that in developing importing countries, domestic prices tended not to swiftly follow international prices, so that the problems associated with high food prices persisted. During the period of the Outlook, further strong price swings and thus new government interventions in markets cannot be ruled out. Consequently, the longer term nature of government interventions and the related impacts on national and international markets remain a strong source of uncertainty in the Outlook.

Market stability increasingly at risk because of continuing supply and demand concentration

The potential for further increases in the production of oilseeds and of palm oil is strongly concentrated in a few regions. The global market will depend heavily on South America (Brazil and Argentina) and Southeast Asia (Malaysia and Indonesia) for supplies. But the potential for further expansion of production in these areas could be increasingly constrained by resource and environmental limitations. In the case of Malaysia, future growth in palm oil output needs to be achieved largely through yield improvements because of limited land availability. However, past productivity improvements have been modest and the reversal of this trend will largely depend on the development and adoption of genetically improved planting material and new varieties.

Key environmental concerns facing oilseed production in the mentioned regions include the risk of soil degradation, water scarcity, loss of biodiversity and deforestation. With consumers in the more developed countries becoming more concerned about these issues and about the question of genetically modified seeds, oilseed and palm oil production and trade is likely to be confronted with new requirements in the future. First voluntary attempts to certify sustainable practices of palm oil production are being made and similar initiatives are likely to follow regarding soybean production. When and how such voluntary or mandatory schemes will impact production methods remains to be seen.

Furthermore, given the size of production and exports in the countries in question, any weather anomalies, important shocks to their economies or radical policy decisions could have huge consequences on markets and world prices for oilseeds and oilseed

products. Also on the demand side, the trend towards concentration of consumption growth in relatively few countries, especially China and India, might lead to increased market instability as any unexpected developments in these countries would strongly affect the global market for oilseeds and oilseed products.

Shift towards more sustainable production methods can affect global production and trade patterns

Concerns about the environmental sustainability of current crop production methods are voiced in many countries and involve annual and perennial oilseeds in developing and developed nations. Extensive soybean cultivation in South America and large scale palm oil plantations in Asia, for example, are faced with challenges in this regard. Recently, both policy makers and private industry started paying more attention to the problem and efforts to identify appropriate responses are increasing. An array of measures can be conceived from voluntary or compulsory production restrictions in environmentally sensitive areas to the certification and preferential treatment of sustainably produced products. When introduced on a larger scale, such measures can lead to gradual shifts in oilseeds production patterns as well as global trade flows.

To date, only a few, small-scale initiatives have been reported, most of them instigated by the private sector and applied on a voluntary basis. However, more interventions can be expected in the medium term. Environmental issues are going to play a central role in forthcoming discussions on how agriculture can contribute to mitigating climate change and on ways of adapting to it. The direction, nature and speed of future initiatives in this field are impossible to predict, and in order to anticipate possible market implications more work is required on likely adjustments within, and across, concerned commodity chains.

Chapter 8

Sugar

World market trends and prospects

Key market drivers

Improving market fundamentals to support sugar prices in the near term

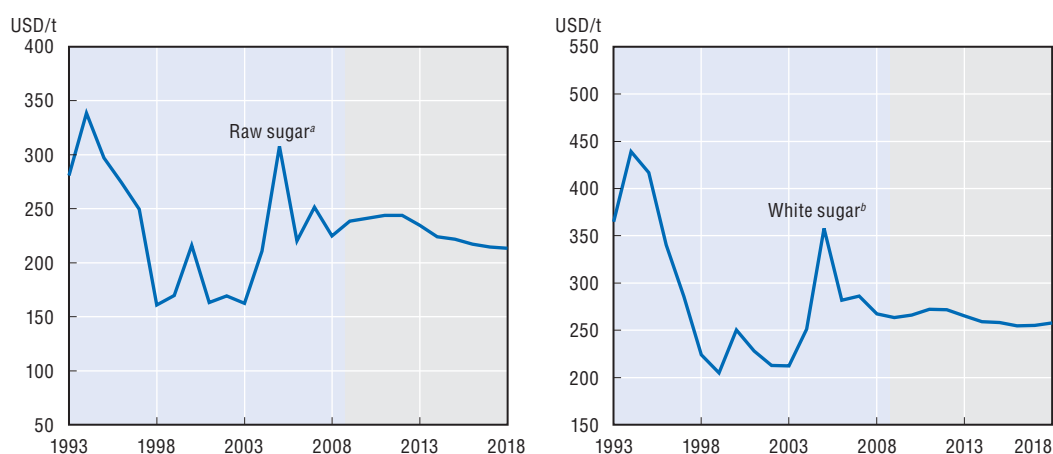
In the lead up to this year's Outlook, the world sugar market was basically out of sync with developments in other commodity markets which experienced rapidly rising prices stoked by fears of pending food shortages with permanently rising demand and tight supplies. This market psychosis also spilled over to sugar to some extent, although with adverse fundamentals of two consecutive large world crops and a large global surplus, sugar prices were outperformed by most other commodities in 2006 and 2007. The changes in sugar prices that occurred were linked by the market to mainly non-sugar factors. Since the second half of 2008, however, many of these other commodity prices have imploded by 40-50% from their mid-year peaks. In contrast, the world indicator price for raw sugar (Intercontinental Commodities Exchange No. 11, spot, f.o.b. Caribbean ports) and white sugar (Refined sugar price, London Euronext, Liffe No. 5, f.o.b., price, Europe), showed a comparatively moderate development throughout 2008, although with considerable within year volatility. In early 2009, world sugar prices have rallied with their re-connection to fundamental factors based on an emerging, medium-size, global deficit as the constructive force behind near term price changes.*

The key sugar market developments expected to shape world sugar prices over the coming decade include policy driven market and trade adjustments in the European Union and North America, the continuing sugar production cycle in India (and some neighbouring countries), and the extent of diversion of Brazilian sugar cane into ethanol production. Lower expected growth in sugar consumption and imports particularly in the developing countries, following severe global economic contraction in the near term, should see sugar prices weaken marginally before strengthening with a recovery in demand growth and some rundown in sugar stocks by the end of the projection period. The world indicator prices for raw sugar and white sugar are projected at USD 308 per tonne and USD 371 per tonne, respectively, in 2018, and to remain above the depressed levels of the late 1990s and early 2000 years.

World sugar prices continue their longer term decline in real terms, when adjusted for inflation (Figure 8.1). With a scenario of lower income growth based on a deeper recession followed by slower recovery in global activity levels and GDP, world sugar prices would be some 3-4% lower, than in the baseline, over the entire projection period.

The white sugar premium widened in 2006-07, with the demise of large subsidised white sugar exports from the EU following reform, and reached over USD 115 per tonne in April 2009. The margin narrows in the near term with increasing white sugar supplies as new refining capacity comes on stream and then widens towards the ends of the period. This reflects increasing supplies of raw sugar on the market and rising sugar refining costs which keep white supplies relatively tight (Figure 8.2).

* Unless otherwise stated, a single year mentioned in the text such as 2006 refers to the 2006-07 crop year (1 October to 30 September), 2006-08 is the average of the three crop years (2006-07 to 2008-09) and 2018 refers to the 2018-19 crop year.

Figure 8.1. **World sugar prices^c to trend down in real terms**

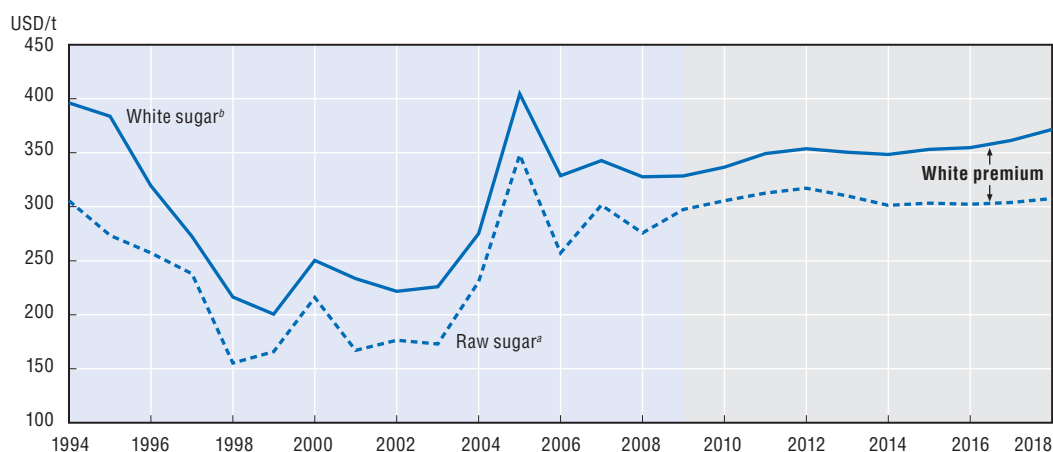
a) Raw sugar world price, ICE Inc. No. 11, f.o.b., bulk spot price, October/September.

b) Refined sugar price, No. 5, Euronext, Liffe, London, f.o.b., price, Europe.

c) World prices deflated by US GDP deflator (2000 = 1).

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/678515813804>

Figure 8.2. **Higher white sugar price and larger premium**

a) Raw sugar world price, ICE Inc. No. 11, f.o.b., bulk spot price, October/September.

b) Refined sugar price, No. 5, Euronext, Liffe, London, f.o.b., price, Europe.

Source: OECD and FAO Secretariats.

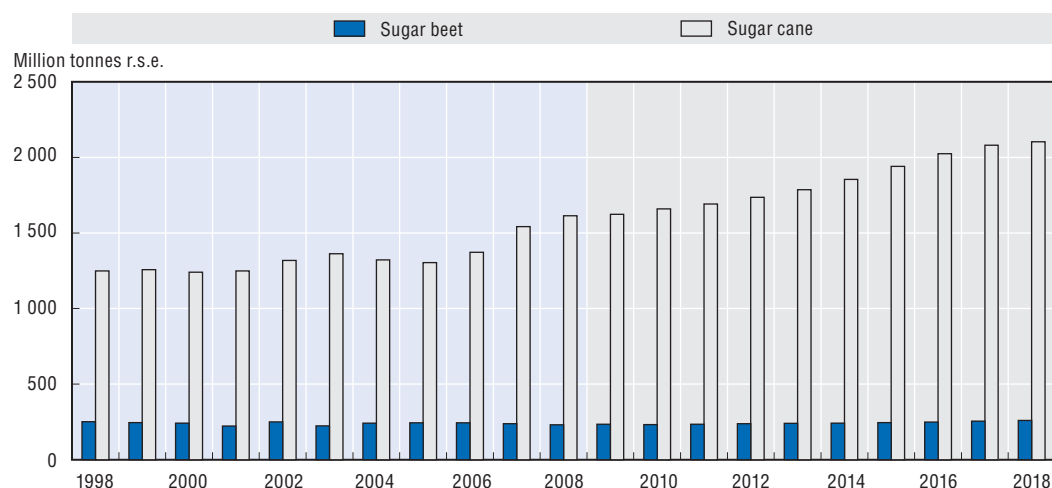
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Main market developments

Slower growth in production in the near term reduces global stocks

The world harvested area of both cane and beet sugar declined in 2008-09 due mainly to some sugar land being switched to other crops with higher returns. This situation is not expected to persist with a recovery in sugar prices. The global harvested area of sugar cane is expected to increase by 20%, compared to an increase of just 2% for the world sugar beet area by 2018, when compared to the average for 2006-08. The smaller increase in beet area is attributable to a continued contraction of area harvested in the EU, which is offset by further expansion in Russia and other countries (Figure 8.3). The adoption of improved varieties leads to rising yields of sugar cane and sugar beets over the period, despite some slowdown in overall productivity growth, when compared to the last decade.

Figure 8.3. **Larger sugar cane production accounts for most of the additional sugar output**



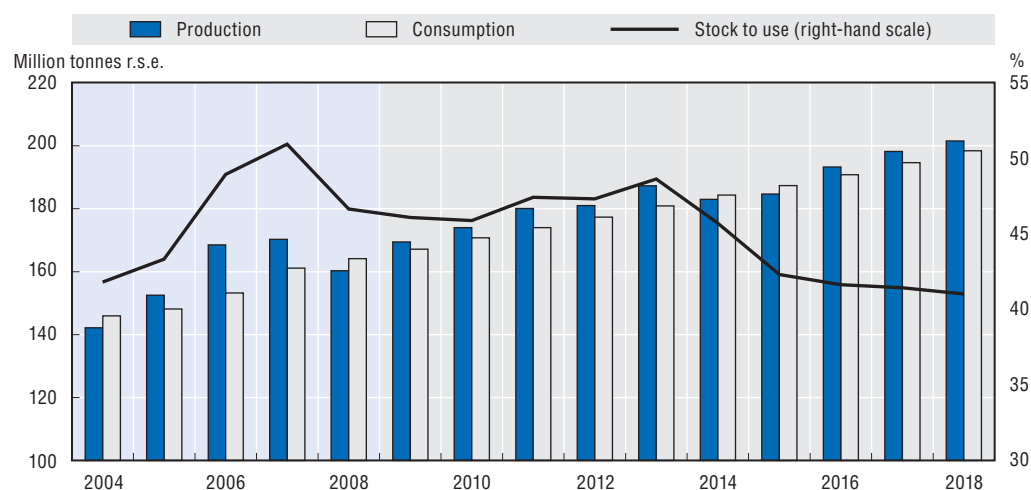
Source: OECD and FAO Secretariats.

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World sugar production is projected at nearly 202 million tonnes in 2018, some 35 million tonnes or 21% above the average level for 2006-08. The allocation of sugar cane between sugar and ethanol production in Brazil, the world's leading sugar producer and exporter, is a key determinant of world sugar production, trade volumes and prices over the Outlook.

The decline in world sugar production in 2008-09 and relatively steady growth in sugar demand implies a significant decline in stocks at the start of the Outlook. The global sugar stock-to-use ratio which averaged 49% in 2006-08, declines further in 2009-10. Beyond the near term, the ratio rises with a cyclical recovery in production in India and elsewhere in response to higher prices, and then gradually declines to 2018, as steady consumption growth eats into the surplus and more sugar cane (and beet in some countries) is allocated to ethanol production (Figure 8.4).

Figure 8.4. **Global stock-to-use ratio to fall in near term and over the longer term**



Source: OECD and FAO Secretariats.

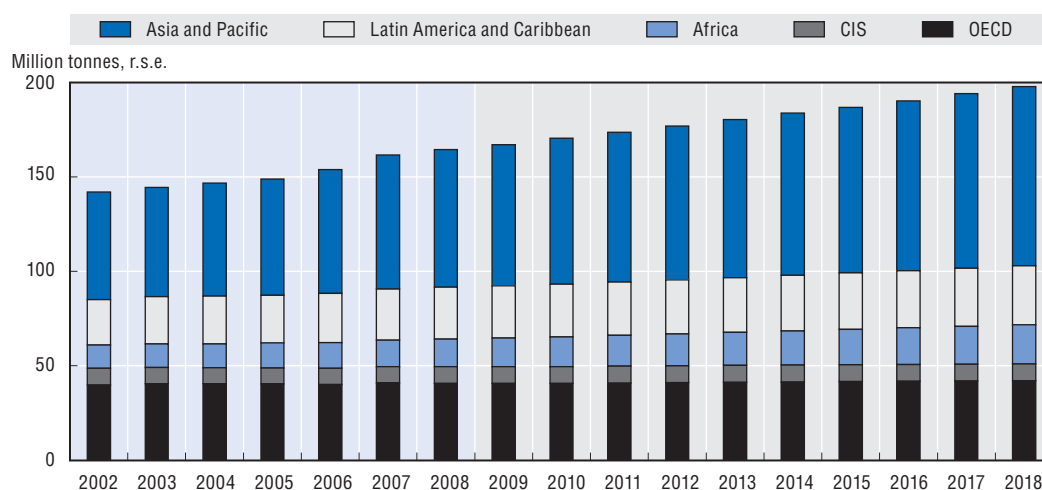
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Demand growth expected to remain resilient in face of economic downturn

Compared to many commodities, demand for sugar is relatively unresponsive to changes in world prices and incomes in the developed world, but more so in developing countries, given the larger share of food expenditures in household budgets. This is evident from periods in the past when world consumption slowed down sharply during times of recession, such as in the period of the Asian financial crisis. The current global financial turmoil, ensuing credit crunch and deepening economic contraction are leading to negative global growth in 2009. However, the resulting lower income growth is shown in the scenarios reported in Chapter 2 to have only a small impact on sugar consumption. The maximum reduction is around -1.5% per year at the global level under the slow recovery scenario, when compared to the baseline results. The drop in consumption is shown to be slightly more in the non-OECD area. World sugar consumption in the baseline is projected to grow by an average of 2% per year to 2018. This compares with much more rapid consumption growth in the past two years, that averaged over 4% per year, and of around 2.4% per year over the previous ten years to 2007-08. OECD sugar consumption is expected to remain relatively stable to 2018 due to declining population growth and dietary shifts away from sugar amid increasing health awareness and concerns with obesity being the more important drivers.

Faster consumption growth is expected in the developing countries over the coming decade which averages over 2.2% per annum, when compared to the average for 2006-08. These countries account for the major share and growth in world sugar use, due to a combination of faster population growth, changing diets and rising incomes; albeit with considerable variation between individual countries. In fact, the non-OECD countries account for virtually all the increase in world sugar production and consumption over the Outlook. Their share of global production rises from 78%, on average, in 2006-08 to 82% in 2018, and from 75% to 79% of world consumption, respectively, for the same period (Figure 8.5).

Figure 8.5. Changing regional patterns of sugar consumption to 2018



Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/678612008761>

Production set to expand in low cost producers and contract in others

Australian cane production has declined over the last four years due to a number of factors (poor returns, adverse weather conditions, smut outbreaks, urban encroachment, etc). The sharp depreciation of the Australian dollar has strongly lifted sugar and cane prices for the 2008 and 2009 seasons. This is expected to boost investment in improved practices and varieties lifting sugar recovery rates as well as leading to some farm consolidation for the largely land-locked industry, helping to offset the effects of wider use of lower yielding smut resistant cane varieties on sugar production. With average seasonal conditions, sugar production is expected to increase to around 5 million tonnes and sugar exports to 3.9 million tonnes in 2018.

For the European Union (EU27), major sugar reforms were introduced in 2006-07, necessitating a decline by 6 million tonnes, white value, in domestic sugar production in order to achieve equilibrium on the domestic market given expected rising imports, stagnant consumption and fixed exports (Figure 8.6). This policy regime will remain in place until at least 2015. To date, a voluntary quota reduction scheme, funded by a restructuring levy on production, has resulted in the renunciation of nearly 5.7 million tonnes, white value, of sugar production quota entitlements, leading to a reduction in the area sown to sugar beets for sugar to 1.64 million hectares in 2008-09 (and about 60% lower than a decade ago). EU27 sugar production is expected to decline to around 14 million tonnes, with sugar consumption increasing moderately to 18.9 million tonnes in 2018. With subsidised exports restricted to 1.3 million tonnes, import demand is projected to grow to over 5 million tonnes by 2018, to cover the internal market shortfall, making the EU the leading global sugar importer (see the *Uncertainties and issues* section for further discussion). The majority of these imports will be sourced under preferential import arrangements with the ACP countries as part of Economic Partnership Agreements (EPAs) and from the LDCs, under the EBA initiative (Figure 8.7). Imports from ACP and LDCs are duty free. In the case of the LDC group, they are also quota free from 2009 onwards. Free

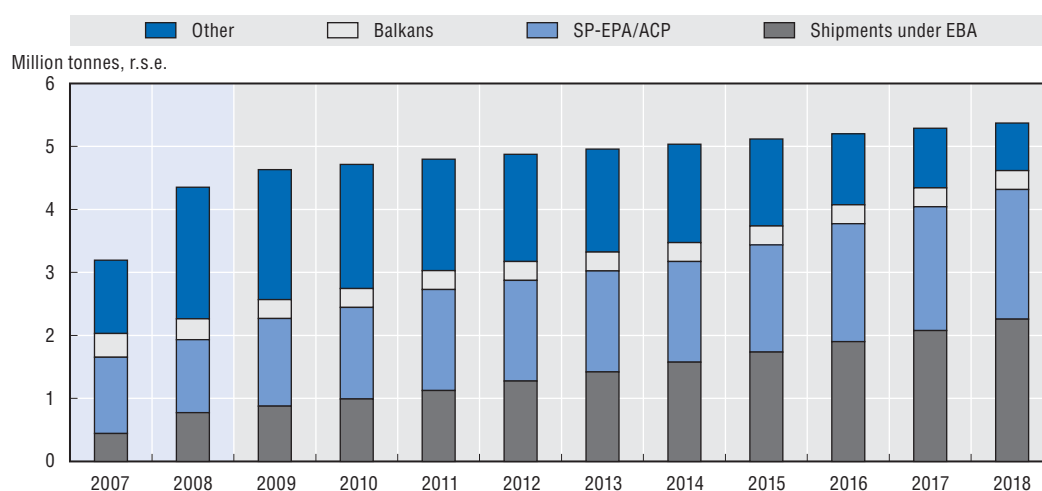
Figure 8.6. EU sugar reform leads to lower production and exports



Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/678617476572>

Figure 8.7. Increasing share of EU preferential sugar imports



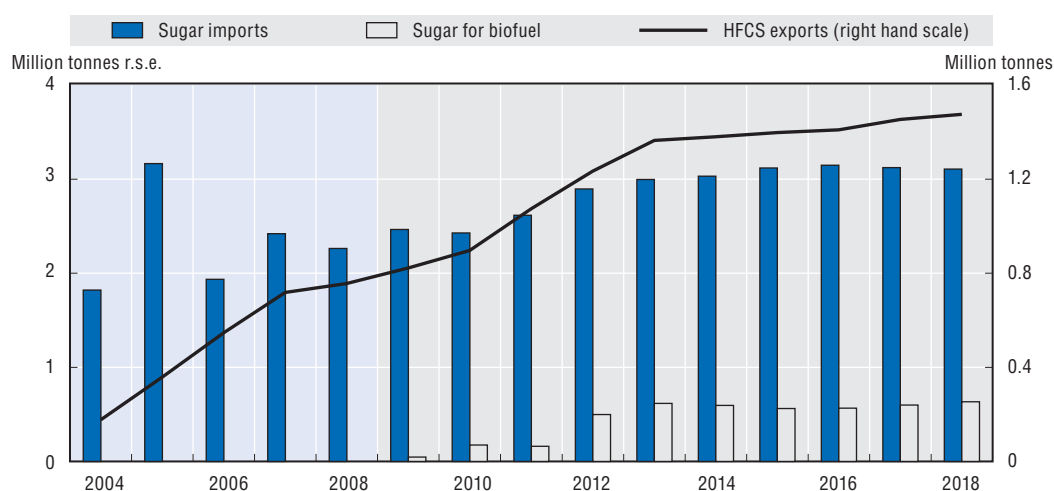
Source: OECD and FAO Secretariats.

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access to the EU market for the non LDC members of the ACP group in the EPAs will be subject to a safeguard mechanism that includes quantitative limits until 2015, and, thereafter, becomes fully liberalised. However, the level of EU preferential imports remains an important uncertainty. In this respect, a tariff rate quota mechanism has been put in place to ensure sufficient imports are available to meet EU domestic requirements at the lower reference prices should preferential imports prove insufficient. Additional volumes of sugar beets are being diverted to industrial purposes such as alcohol and ethanol production. Although not offsetting the decline in beet area for sugar production, these are expected to represent about 16% of the area sown over the coming decade.

The United States and Mexico became one fully integrated market from 1 January 2008 under the NAFTA. New Farm legislation has been passed in the US with the FCE Act taking effect from 2008. This results in higher support for the sugar industry which is designed to ensure domestic cane and beet supplies in competition with alternative crops in the US. Collectively, beet and cane sugar production are expected to increase by around 9% above the average level of production under the 2002 Farm Act, to reach about 8.4 million tonnes in 2018. Despite higher market prices, sugar consumption shows some moderate growth (with increasing population) to reach about 10.6 million tonnes in 2018, up nearly 12% on the average for the 2006-08 period. Higher sugar imports from Mexico, partly in response to increased shipments of HFCS from the US, together with imports from third countries at the minimum access level of the WTO tariff quota and under Free Trade Agreements (FTAs), rise to 3.1 million tonnes by 2018. These volumes are sufficient to put pressure on domestic sugar prices and trigger the new Feedstock Flexibility Programme (FFP) from early on in the Outlook period. As a result, surplus imported sugar is diverted from food uses to ethanol production, of around 0.6-0.7 million tonnes each year, in order to defend the US sugar loan rate price support system with domestic prices driven down to minimum loan rate levels in these years (Figure 8.8).

Partly in reaction to higher prices in the US and improvements in efficiency and costs from mill consolidation and modernisation, sugar cane output in Mexico is projected to increase with sugar production growing to 6.5 million tonnes by 2018, some 15% above the

Figure 8.8. **US imports to rise in near term and then stabilise**

Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/678835788745>

average for 2006-08. With growing substitution of US produced HFCS for sugar in Mexico's beverage industry, following free trade in sweeteners, additional sugar is expected to be released for export to the higher priced US market. Exports of sugar to the US are projected to more than double to around 1.5 million tonnes in 2018, despite some further growth in domestic sugar consumption and use over the period.

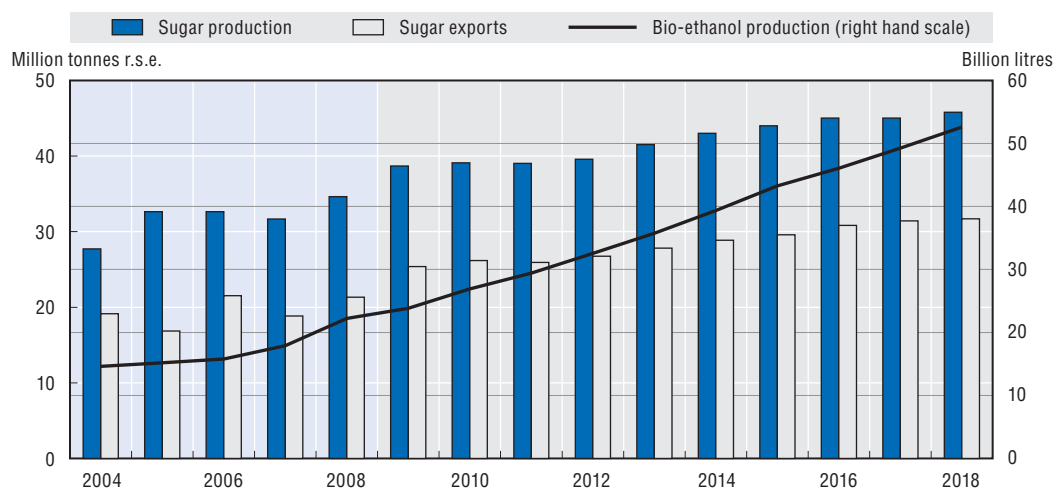
Japan remains a substantial sugar importer within the OECD area, although imports have been on a downward trend in the last two years. Japan's sugar production is projected to increase by 6%, while consumption falls by 5% by 2018, when compared to 2006-08, and this leads to slightly lower sugar imports. In the case of Korea, raw sugar is imported for processing into white sugar for domestic consumption and export. Consumption of sugar is projected to increase by 27% and imports by 22% by 2018, when compared to the average for 2006-08.

Brazil remains the market leader and to continue to expand rapidly

The supply situation in South America as well as for the world market is dominated by Brazil, the largest global sugar producer and exporter. Brazil's exports have risen rapidly between 2000 and 2008 and now accounts for around 50% of world sugar trade or one in every two tonnes of global exports. In addition, decisions taken by Brazilian sugar mills on the share of sugar cane going to ethanol or sugar production, is a leading determinant of global sugar production and a price setter in the world sugar economy. With low production costs and the potential to bring substantial additional land into production, Brazilian sugar production is expected to continue to increase over the Outlook to reach nearly 46 million tonnes in 2018, or some 39% above the average for 2006-08. The share of sugar cane going to sugar production varies each year depending on price relativities between ethanol and sugar, but is expected to fall below 40% in 2018. Brazil's sugar consumption rises to 15 million tonnes and exports reach nearly 32 million tonnes in 2018. Lower world prices of crude oil at the start of the Outlook reduce the incentive for ethanol production and exports relative to sugar. The financial crisis and credit crunch are also expected to reduce the pace of growth of investment in the development of new processing

mills (and the sector in general). However a government blending requirement of a minimum of 25% of ethanol in light transport fuel will limit the domestic price decline. Ethanol production is projected at nearly 53 billion litres in 2018, nearly doubling the average output of 2006-08, despite some slowdown in ethanol exports in the near term with lower oil prices and global economic activity (Figure 8.9).

Figure 8.9. Brazil: Most sugar cane allocated to bio-ethanol production

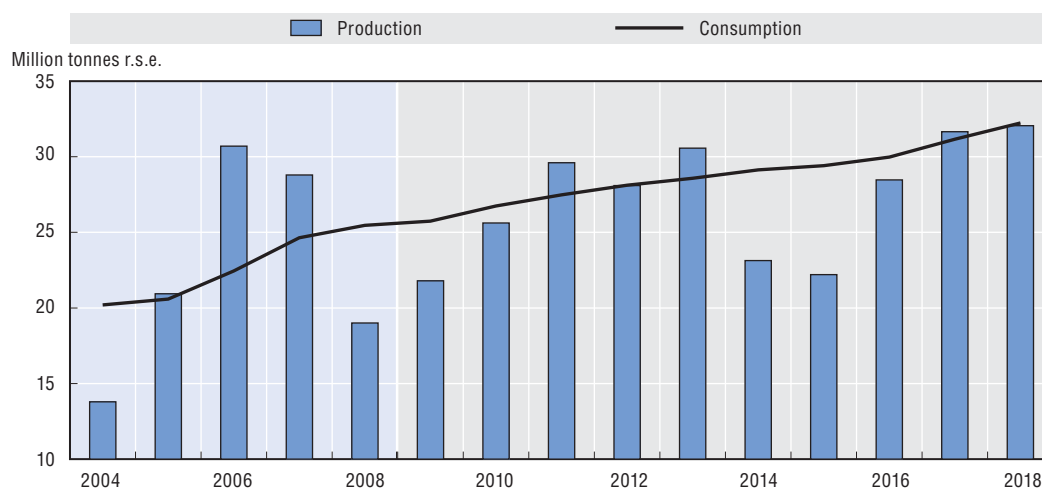


Source: OECD and FAO Secretariats.

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India is the second largest cane sugar producer after Brazil and the world's largest sugar consumer of centrifugal and semi-processed sugars (gur and khandsari or jaggery). Due mainly to lack of alignment in sugar and government controlled cane pricing policies, the industry is subject to a longstanding production cycle with the national sugar balance regularly moving from surplus to deficit and back again, resulting in periodic exports or imports, respectively (Figure 8.10). Sugar production in India is expected to decline sharply

Figure 8.10. India: A pronounced production cycle to continue



Source: OECD and FAO Secretariats.

StatLink <http://dx.doi.org/10.1787/680026657624>

in 2008-09, due to crop switching in favour of grains and oilseeds, following large arrears in cane payments to growers by sugar mills. A moderate recovery in sugar production is expected to begin in 2009 before reaching 32 million tonnes by the end of the projection period. Sugar consumption is foreseen to expand by more than 2.5% per year, driven by rising incomes and changing diets. As a result of lower production forecasted for the initial years of the Outlook, imports are expected to reach 2 million tonnes in 2009, before settling at 1.2 million tonnes by 2018.

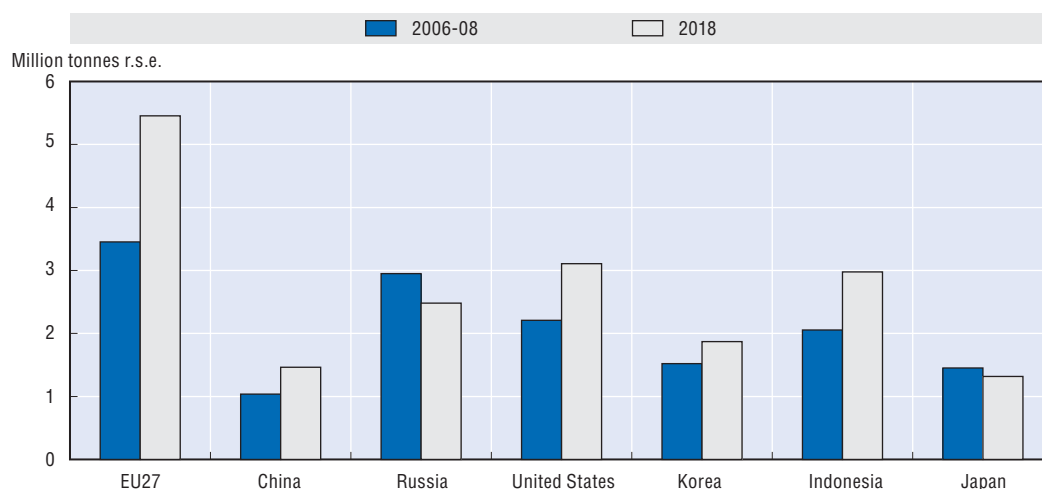
Thailand, the second largest world sugar exporter, is projected to produce 9.6 million tonnes of sugar in 2018, or 25% above the average level for 2006-08. Production has been characterised by ups and downs over the last decade, as a result of variable growing conditions, changing support policies and competition for resources from other crops such as cassava. Growth in the ethanol sub-sector is not likely to limit sugar output, as it uses molasses, a by-product of cane processing, as the main feedstock. Sugar consumption is expected to increase by 3% per year over the projection period leading to 2018, sustained by expanding use by households and the beverages industry. Sugar exports should reach 6 million tonnes, mainly in the form of raw sugar, with the bulk of the shipments likely to be directed to regional markets. Argentina's sugar production has grown rapidly in recent years and is expected to reach just over 2.9 million tonnes by 2018, some 30% above the average level for 2006-08. Despite rising consumption, the increase in output leads to higher sugar exports, that reach over 0.7 million tonnes in 2018.

Sugar imports to expand in Asian countries while contracting in Russia

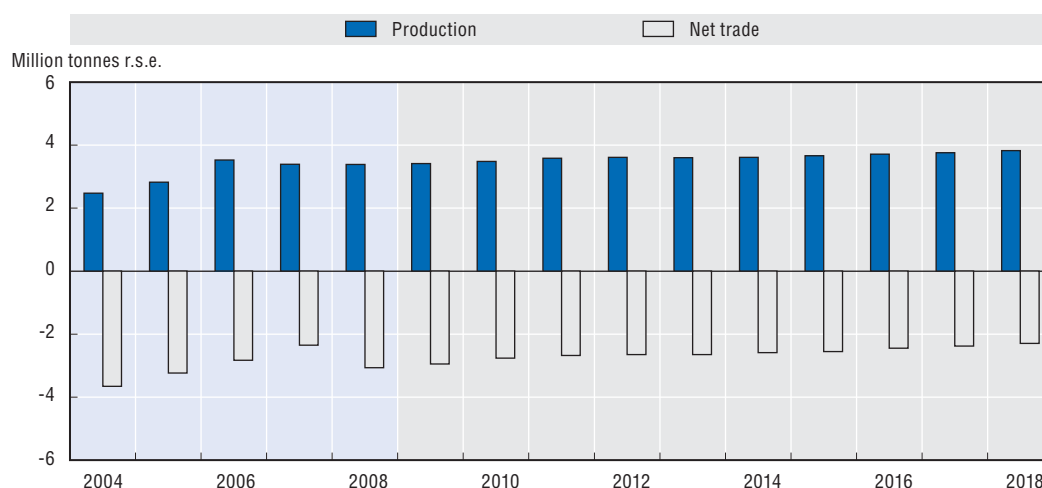
Sugar production in China has been expanding dramatically in recent years due to higher support prices and rising demand for direct food use, from relatively low per capita consumption levels as well as for food preparations and manufacturing. With some further increases in area harvested and yields, China's sugar production is expected to reach 19.8 million tonnes in 2018, some 4.7 million tonnes above the average level for 2006-08. Tightening government controls on the production and use of artificial sweeteners is expected to boost sugar consumption in China which is projected to increase by nearly 3% per year to reach around 21 million tonnes in 2018. This level of use would imply rising imports, although these remain below the established tariff rate quota of 1.95 million tonnes when China joined the WTO (Figure 8.11).

Until 2007, the Russian Federation was the world's largest sugar importer but was surpassed in that year by the EU which is undergoing substantial reform. Russia, having switched from white sugar imports in the 1990s, mainly imports raw sugar for refining by domestic mills when the sugar beet processing season is over. Rapid growth in domestic sugar beet production in Russia, stimulated by higher prices and tariff protection, is expected to lead to further growth in sugar output and import replacement over the projection period. Sugar production is projected at just over 3.8 million tonnes in 2018, and with slowing sugar consumption, raw sugar imports decline to just below 2.5 million tonnes in the same period (Figure 8.12).

On the back of moderate increases in cane plantings and sugar recovery rates, sugar production in Indonesia is expected to reach 3.5 million tonnes, or 23% above the average level for 2006-08, by the end of the projection period. The growth in output would continue to lag behind that of consumption, which is projected at 6.4 million tonnes in 2018. This level of consumption would require imports to expand by 3.6% per year between 2009

Figure 8.11. **Main sugar importers**

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/680035814555>Figure 8.12. **Russia to become more self-sufficient**

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/680056122732>

and 2018. A key determinant of the viability of the sugar sector in Indonesia is Government institutional support through sugar usage allocation and import limits.

African countries to benefit from higher demand in EU and regional markets

Aggregate sugar production in Africa is forecast to increase by 2% per year to reach 12.1 million tonnes in 2018, a reflection of production gains in South Africa, Egypt, Mozambique, Sudan and Tanzania. The expansion is driven by rising aggregate demand as a result of growing population and increasing *per capita* income. Other factors underpinning the growth of the sugar sector in Africa include the provisions in the EBA initiative of the EU which grants a number of African LDCs duty and quota free access to the EU sugar market from October 2009. In Egypt, sugar production is set to grow by 2.4% per year over the projection period and reach 2.4 million tonnes in 2018. Most of the growth

will be accounted for by expansion in the area sown to beet, which reaches about 144 thousand hectares by 2018. The beet sector is more dynamic and attracts the bulk of new investments in the sugar sector, while cane sugar production has stagnated due to limited area and water resources. Sugar consumption is projected to remain strong, sustained by population growth and rising use of sugar in food processing although to expand at a slightly lower rate than that of the previous decade.

Sugar production in South Africa is foreseen to reach 2.9 million tonnes or 16.2% above 2006-08 levels in 2018, largely driven by productivity gains and higher sugar recovery rates, as the sugar cane area is expected to decline by 0.6% per year over the projection period. Growing regional demand for sugar, particularly from member countries of the Southern African Customs Union (SACU), will limit South Africa's sugar export to around 0.9 million tonnes by 2018. Production in Africa's largest sugar importer, Nigeria, is expected to expand by 1.8% per year over the projection period to reach 0.11 million tonnes in 2018. The development of the sector reflects the strategy of the Government of Nigeria to achieve a self-sufficiency target of 70% in domestic sugar production in the near term. Despite efforts to enhance domestic supply capacity, the country will still need to import about 2.4 million tonnes by 2018, in order to meet sustained growth in the use of sugar for both direct human consumption and industrial activities, such as manufacturing soft drinks.

Key issues and uncertainties

The sugar projections discussed in this chapter are a conditional scenario based on a number of assumptions regarding the future macroeconomic environment and exchange rates, a continuation of existing agricultural policies, average weather conditions, longer term productivity trends and the absence of market shocks. Should any of these assumptions change, the resulting set of sugar projections would also be different. A number of major uncertainties remain. For this year, the impact of the global financial market turmoil and deepening economic recession are a major unknown for the Outlook. The decline in incomes associated with recession are not expected to strongly affect sugar demand, as shown in Chapter 2. Other developments in key commodities such as oil and energy prices, inflation, access to credit and impacts on investments as well as exchange rate changes can have more profound impacts on the competitive positions of national sugar industries and their trade performance. Lower oil and energy prices are likely to negatively impact the speed of market expansion of sugar-based ethanol production implying larger sugar supplies and export availabilities, while the opposite situation holds for higher crude oil prices. Box 2.1 in Chapter 2 on the resilience of agriculture to the financial crisis discusses the sensitivity of the present Outlook to changes in oil prices. Among other uncertainties are future changes in sugar policies and the eventual outcome of the current Doha Round of international trade negotiations. The extent to which the rising demand for renewable fuels will impact on sugar crops outside of Brazil is another unknown. Finally, the general outlook for different classes of investment assets and funds activity in sugar futures markets with financial market integration can be expected to continue to influence sugar prices and their volatility. As a consequence, the sugar market can be expected to undergo a period of greater price instability and uncertainty given a growing number of price determinants, in addition to traditional market fundamentals.

What does the unfolding global recession hold for sugar markets?

One enduring feature of stability in an otherwise turbulent world sugar economy has been steady, year in year out, growth in sugar consumption. World sugar use has risen, on average, at the rate of 2.4% per year over the last ten years, although somewhat lower than in the previous decade. However, much faster growth of over 4% per annum was recorded in the last two years. This was the result mainly of relatively low world sugar prices, continuing strong income and population growth, particularly in the developing world, and increasing prices of substitute sweeteners, such as HFCS with record maize prices that favoured sugar use. But circumstances have radically changed with the world now in the midst of an unprecedented global contraction, rising unemployment and falling *per capita* incomes. How much this will impact on global sugar consumption is uncertain.

An examination of the main drivers of global sugar demand can help to draw out the potential implications for sugar use. The three major factors that influence sugar demand are income, population growth and, to a lesser extent, prices. Usually, income and price changes have a proportionately greater impact in low income countries because of their higher income and price elasticities than in the developed countries of the OECD area. Sugar consumption in many parts of the OECD area is at best stable or declining as markets are generally mature, have reached saturation point and are now barely responsive to changes in income. Population growth is a major driver in the industrial countries and as this is stagnating or negative, little growth in sugar demand is expected. Other factors that are changing preferences such as increasing health consciousness and concerns about obesity tend to be stronger drivers of consumption trends than prices and incomes. For the major consuming regions of the developing world that account for over 70% of global demand, population growth will be little affected by the economic downturn in the short term and this factor will remain constructive to sugar demand. *Per capita* incomes, however, are being impacted and could act as a brake on demand for food use and in processed food products and preparations as growth slows in these countries.

The set of scenarios discussed in Chapter 2 takes into account the more pronounced reduction in global economic growth and lower *per capita* incomes on the back of the unfolding global recession as revealed in the recent macroeconomic assessments released in March 2009. The impact on sugar markets of the lower growth and income scenarios is expected to be relatively minor and largely dominated by the reduction in demand primarily for industrial usage of sugar. This is the part of the market that is made up of demand from the manufacturing and food preparations sectors, including the beverages industries. These sectors are most affected by changes in income growth and economic activity. The extent of the decline will depend on the share of industrial consumption in total sugar utilisation; the larger the share, the bigger the effect on the sugar market. Estimates for major sugar consuming countries reveal that industrial demand accounts for 68% of use in the EU, 48% in Brazil, and about 60% in India and the United States. Hence, any further deterioration in global economic performance and prospects will lead to a decrease in demand for industrial sugar and some decline in international sugar prices. The price of sugar substitutes such as HFCS relative to that of sugar is also a part of the equation that can either reinforce or partially offset the impact of lower sweetener demand changes on sugar off take. The impact on demand for sugar will also likely be cushioned by the moderate slowdown in direct household consumption, as that market segment is relatively insensitive to changes in prices and incomes.

On balance, the full impact on sugar demand, while moderate in aggregate terms, will depend on the final adjustment between relative prices in domestic market and purchasing power, especially in developing countries. On the supply side, the perennial nature of cane production (with multiple harvests taken from a single planting), which now represents the bulk of sugar crops will likely reduce producer's response to lower prices in the short term; with a larger response over the medium term through to the end of the projection period. Production incentives, however, not only depend on sugar prices but also on the input costs. Input prices may be expected to decline relative to the situation at the start of the Outlook with lower economic activity and oil and energy costs, and as the costs of fertiliser, pesticides and transportation are all pressured downwards. In sugar producing developing countries, labour costs may also be depressed, as there is a tendency for rural wages to come down as unemployment rises in the urban areas and migration back to the countryside increases. The net effect on production will depend on the dynamics of adjustment between input and sugar output prices. The scenarios of Chapter 2 reveal a relatively small impact on global sugar production of lower income growth, but larger for a change in oil prices. Apart from the impact on production, processing and distributions costs of sugar, the change in the oil price also has an effect on the production and demand incentives for bio-ethanol based on sugar cane or molasses feedstocks. If sugar prices fall much faster than the costs of production then producer's margin will be squeezed further and larger cuts in the production of sugar should be expected in the medium to longer term. In most cases, input prices tend to be 'sticky', in the sense that they do not decrease as quickly as product prices. Overall, the impact of a fall in world economic activity beyond the assumptions underlying the baseline will have moderate negative implications for sugar production and rural incomes, and more so over the medium to longer term as production responds to lower prices. The risk for the sugar market is that prices overshoot their equilibrium level in which case they may well display increased volatility.

Recent policy changes to boost US sugar imports?

The major policy changes confronting the US sugar market in recent years are the full integration of the US and Mexican sweetener markets under NAFTA from 1 January 2008 and the substantial changes made to support to the US sugar industry with the passage of the US Farm Bill formally known as the Food, Conservation and Energy Act (FCE) in June 2008 (Box 8.1 for the main sugar provisions). Prior to the NAFTA market liberalisation, the US has maintained domestic prices well above world market levels by controlling the amount of sugar that is sold domestically and this situation has changed as sugar can now enter the US without restriction from Mexico. However, the US market remains heavily insulated from the world market by prohibitive over quota tariffs and safeguard measures with imports restricted by a tariff rate quota (TRQ) set at the minimum level under the WTO and Central American Free Trade Agreement (CAFTA) to around 1.2 million tonnes per annum. Rather than reducing domestic prices to discourage imports (as in the EU reform), the US has chosen to increase support to the domestic sugar industry under the new sugar provisions of the FCE Act. These provisions raise the level of support provided to the domestic industry by increasing non-recourse loan rates for raw and beet sugar over 5 years, guaranteeing 85% of the domestic market to local producers and by adding a Feedstock Flexibility Program (FFP – a sugar to ethanol programme), to remove surplus sugar imports from the market to avoid loan forfeitures to the Commodity Credit

Box 8.1. Key US sugar programme provisions

- **Higher non-recourse loan rates:** The loan rate for raw cane sugar to increase incrementally from USD 18 cents per pound in 2008 to USD 18.75 cents per pound in 2011 and 2012. For refined beet sugar the loan rate to increase from USD 22.9 cents per pound in 2008 to USD 24.09 cents per pound in 2011 and 2012.
- **Marketing allotments:** The US sugar industry is guaranteed allotments of not less than 85% of estimated domestic consumption, irrespective of the volume of sugar imports.
- **Feedstock Flexibility Program:** to maintain domestic prices above loan rates, surplus imported sugar in the domestic market that cause the stocks-to-use ratio to exceed the target level will be removed from the market and diverted to ethanol production.
- **WTO minimum import commitments** are maintained with a tariff rate quota set at 1.256 million short tons through to 1 April each year before allowing additional imports from third country suppliers, if domestic supplies fall short of allotments.

Corporation. Some of these changes are in addition to alterations to the three basic components of longstanding US sugar policy: price support loans, marketing allotments and import quotas.

Within NAFTA, Mexico represents the logical source to supply additional sugar to the US market. However, sugar prices in Mexico have traditionally traded above US prices and the country has had only a small exportable surplus in recent years. Nevertheless, there is an expectation that Mexican prices will continue their recent fall (and may eventually trade at a discount to the US price to reflect the freight cost of shipping sugar north to the US), and exports could increase in the future in response to open access to the US market and its rising prices. Apart from the potential expansion in production, a key element in determining how much exportable surplus will be available in Mexico will be the degree to which US produced high fructose corn syrups (HFCS) displaces Mexican sugar in the local beverage market. The flow of maize-based HFCS from the US to Mexico has been growing following the removal of Mexico's beverage tax in 2006 and this has released Mexican sugar to flow in the opposite direction. The level of HFCS use in Mexico is relatively low with around one-third of beverage production using corn syrup as a sweetener rather than sugar, in comparison to the US situation. For the projections, a displacement rate of 75% of HFCS for sugar has been assumed, compared to a 95% level of substitution in the US. This, along with some growth in production, leads to exports from Mexico increasing from 0.55 million tonnes in 2008 to nearly 1.5 million tonnes by 2018. Should Mexico's HFCS use approach even closer to that of the US, sugar exports would be even higher by the close of the period. The projected level of imports into the US is sufficient to trigger the new sugar for ethanol programme (FFP) in each year, with heavier uses from 2012 onwards, and this keeps domestic prices close to US sugar support levels.

Over the longer term, it is possible that the US will rely increasingly on sugar imports; given the possibility of stable or lower overall US sugar production in the light of continuing relatively high alternative crop prices and modest growth in sugar demand. This outcome would be a return to the historical situation of a larger role for imports, similar to the evolving situation in the EU. As noted, most of the increase in imports is likely to come from Mexico with the amount shipped depending on the degree of HFCS substitution in that country. A Doha outcome in the WTO trade negotiations could also influence the

volume of imports (and conversions to ethanol) as the US has indicated a willingness to increase its existing minimum tariff rate quota for third country suppliers. Excluding this development in the absence of an actual WTO agreement, total US imports are projected to expand to 3.1 million tonnes, making the US the second largest sugar importer after the EU by 2018.

The European Union becoming increasingly dependent on sugar imports

The reform of EU sugar policy over four years since 2006 has resulted in a sharp contraction in domestic quota sugar production and a major shift in global trade. The EU has been transformed from a large net subsidised exporter of mainly white sugar to the world market to the world's largest net importer of mainly raw sugar. The effective exit of the EU from the export market also leads to a fundamental change in the composition of global sugar trade flows, with formerly fast growing white sugar shipments contracting relative to raw sugar flows. EU net imports of sugar are set to grow from an average of about 3 million tonnes in recent years to a projected level of around 5 million tonnes in 2018, in order to balance the internal market. At the same time, the composition of imports are expected to vary over time with a larger proportion of white imports as exporting countries seek to capture the value-added in refined sugar sales. As part of the reform, EU sugar producers are subject to a phased reduction in sugar reference prices of 36% over 4 years (and 40% for sugar beet producers), although prices are expected to remain well above world market levels.

These price cuts are also to be passed on to all the countries that benefit from preferential access to the EU market that comprises the majority of imports. Apart from a reduction in the price exporters receive on the EU market, a number of other changes are being made to preferential import arrangements in coming years, as mentioned previously.

Brazil, outside of this group, has access to the higher guaranteed demand of the EU market with a tariff rate quota under the Most Favoured Nation rules, amounting to about 0.7 million tonnes in 2009, including the special dispensation granted to Bulgaria and Romania on their accession to the EU to continue to import raw sugar from the world market (essentially Brazil).

While the EU market price remains well above world levels after the imposed cut, it should therefore remain an attractive destination for developing countries with access to this guaranteed market. Despite this situation, there remains some uncertainty as to the actual volume of exports that will be forthcoming from the preferential suppliers. For instance, a number of the high cost traditional suppliers will face problems in taking advantage of the improved market access because of lower EU prices, while others have the choice of giving priority to their high priced domestic and regional markets and directing supplies to alternative uses such as a feedstock for renewable fuels.

Chapter 9

Meat

World market trends and prospects

Key market drivers

Unlike cereals, oilseeds and dairy markets, meat prices did not show a spectacular development in 2008. This is partially explained by the relatively limited role meat plays as a staple and the limited storage capacities, that make panic-buying unlikely. High cereals prices translate into high feed costs in production systems where cereals play an important role as feed. However, producers have only limited ability to respond to suddenly increasing feed costs as production decisions are taken in the beginning of the production cycle and cannot respond quickly to price signals. These two factors are probably the most relevant in explaining why meat prices remained rather stable during the recent turbulent period. These high feed prices combined with moderate livestock prices represented a challenge to livestock farmers. The prices for cereals and consequently for feed have decreased significantly since the middle of 2008, easing some of the pressure on livestock farmers.

In the medium term, increasing world population along with economic growth and urbanisation are key factors driving global meat consumption. Once income growth rates recover, consumer preferences will continue to shift away from food of vegetable origin to food of animal origin. This trend is naturally most relevant for developing and emerging economies, and to a much smaller extent for OECD countries. In developing countries, increases in demand for food of animal origins have mostly been met through poultry, eggs, pigmeat, and to a lesser extent, by bovine meat consumption. Higher retail price of beef compared to pigmeat and poultry mostly explains this phenomenon. This trend is expected to continue over the next 10 years. In OECD countries, growth in meat consumption is limited by small population growth and with already high consumption levels, the incentive to consume more meat driven by increased income is limited.

Meat consumption is driven by incomes. The presence of the worst financial and economic environment in many decades will affect the outlook. In the context of a dampened economic growth projected over the outlook period for most developing regions of the world, meat prices are projected to be negatively affected with beef prices recording the biggest drop relative to other meats. Consumers are expected to substitute lower priced items for the higher priced ones trying to reduce expenditure in their food budgets.

With regards to international trade, one important driver shaping patterns of trade flows are animal diseases. The periodical re-emergence of Foot and Mouth Disease (FMD) in many parts of the world has led to a segmentation of international meat markets. Roughly, the global meat markets can be divided into trade between countries with a long standing history of being free from FMD, and into a group of countries where FMD is a recurring phenomenon. For this outlook it has been assumed that this disease-induced segmentation will continue.

Agricultural policies are another important driver shaping national and international meat markets. In the EU and in the US, policy reforms are expected to take place. In the

European Union, the decoupling of some of the remaining premiums in the beef sector underlines the continuation of the decreasing path observed in the last decade. In the case of the US Farm Bill, the Country of Origin Labelling (COOL) initiative is expected to increase costs on different segments of the supply chain. Another example of government action shaping agricultural markets is Russia, where investment into the pork sector is expected to narrow the gap between increasing consumption and production.

Main market developments

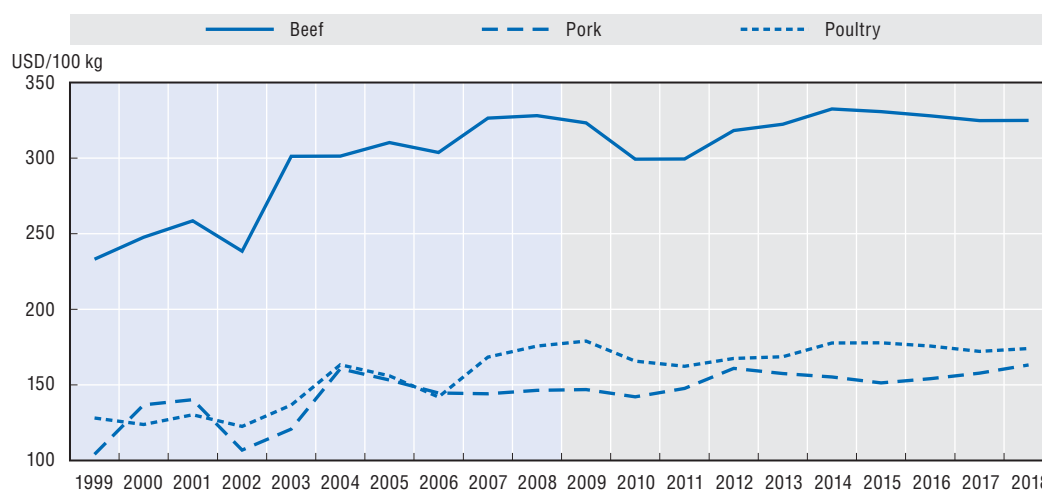
Meat prices increasing in nominal terms

World prices for beef, pork and poultry continue their increasing trend expressed in nominal dollars (Figure 9.1). Prices for beef and pork are expected to remain 12% and 13% higher when comparing the average over the projection period (2009-18) to the average of the previous decade (1999-2008), whereas poultry prices are expected to be on average 19% higher compared to the last decade.

Beef prices are projected to decrease in the first years of the projection period, despite tight supplies in some major producing countries like the US. Demand for beef slows down as a result of falling incomes more than compensating the supply adjustments. Pork prices are also expected to remain low in the first two years of the projection. This is an outcome of several factors including falling incomes that lower demand in some parts of the world while at the same time production increases in some countries and remains constant in others, again reflecting farmers' limited ability to respond to price signals in the short-term. Driven by strong global demand and continuously strong feed costs that represent a large share in the total production costs of poultry, the increase in prices is strongest for poultry meat.

Lamb prices (not shown) are expected to remain strong. This is a result of tight supplies following the drought in New Zealand and the nationwide move from sheep production into dairy production, a development that was fuelled by high prices for dairy products in the recent past. As a consequence, the sheep flock has diminished, which will

Figure 9.1. **World market prices for meat^a**



a) Beef: choice steers, US dressed weight Nebraska. Pork: barrows and gilts, No. 1-3, Iowa/South Minnesota, dressed weight. Poultry: wholesale weighted average broiler price, ready to cook, 12 cities, US.

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lead to a limited number of slaughtering in the next years. With, at the same time, firm demand for lamb and a relatively weak projected exchange rate of the New Zealand Dollar, prices are projected to remain strong over the outlook period.

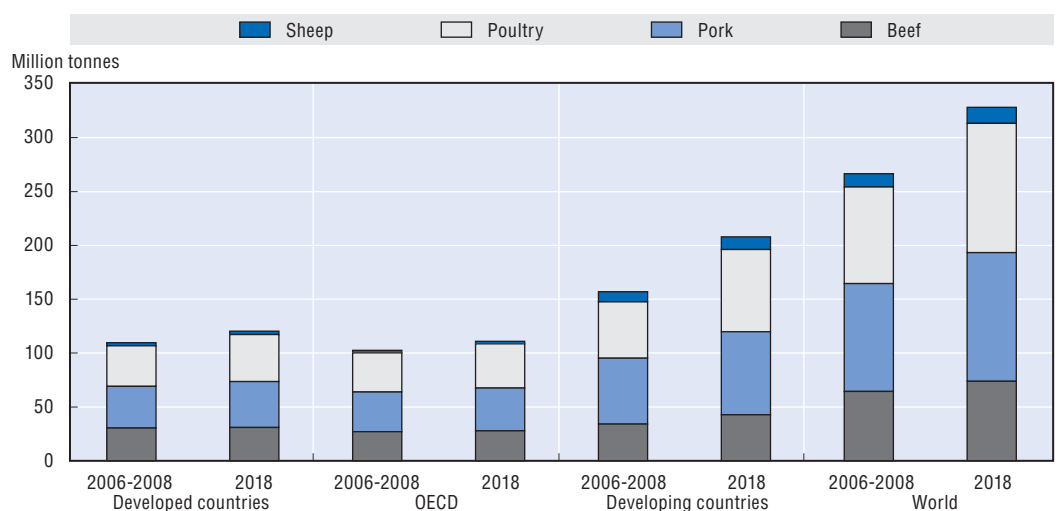
Despite dampened economic growth in the beginning of the projection period, worldwide meat consumption is increasing

Despite the slow economic growth in the beginning of the projection period, global meat consumption is projected to grow along with population growth and increasing purchasing power in most parts of the world over the medium term (Figure 9.2). Meat consumption is expected to grow at an average annual rate of almost 2% per year over the projection period, slightly less than in the previous decade. By 2018, global meat consumption is expected to increase to over 320 million tonnes, a 20% increase compared to the base period (2006-08 average).

Developing countries account for most of the additional meat consumption. This is mainly explained by a dynamically increasing population, urbanisation and growing incomes, which triggers shifts from food of vegetable origin to food of animal origin in the consumption pattern. The gap between developing and developed countries is also widened as in some developed countries, like for example Japan, aging society and decreasing population play a role in keeping meat intake relatively stable. By 2018, meat intake in developing countries is expected to be one-third higher compared to the base period. In OECD and other developed countries, meat consumption is less than 10% higher in 2018 compared to the base.

Consumption growth is not equally distributed across different types of meat. On a global level, poultry consumption is expected to exhibit the strongest growth. Between the base period and 2018, global poultry consumption is expected to increase by around one third to over 120 million tonnes, followed by sheep and pork meat consumption that are projected to increase around 20% to almost 15 and 120 million tonnes, respectively. Beef consumption is expected to increase less than 15% by 2018 compared to the base period, reaching a level of almost 74 million tonnes.

Figure 9.2. Development of meat consumption by region and type of meat



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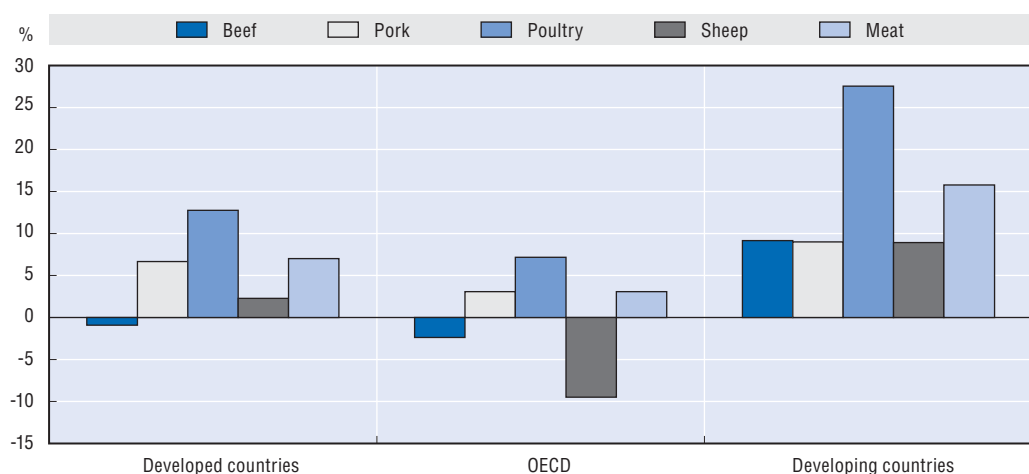
In OECD and other developed countries, this consumption pattern is repeated. Poultry meat consumption is projected to exhibit the strongest growth as consumers are expected to continue to exhibit preferences for lean and easy to cook poultry meat. Outside the OECD area, the fact that poultry is the cheapest source of meat protein explains the continuing strong demand. This is fuelled by the economic slowdown in the beginning of the projection period. Generally, poultry is projected to account for almost half of the meat consumption gains projected for the next decade for this country group.

Continued growth in beef demand, on the other hand, is expected throughout South East Asia. Indonesia, Malaysia, the Philippines and Thailand increase consumption by expanding imports. While those economies will be affected by the economic slowdown, rising population and the subsequent income recovery will sustain growth.

Some interesting insight can be gained from the analysis of the consumption development of meat consumption on a *per capita* basis as shown in Figure 9.3. In developing countries, the overall positive development of meat consumption outpaces expected population growth. *Per capita* meat consumption is expected to increase by more than 16% from almost 24 kg to more than 27 kg, when comparing 2018 to the base period. Nevertheless, the increase in meat consumption is not homogenous within the developing region which is where the bulk of the increase in meat consumption is projected to occur. In areas of the world where religious prohibition of pigmeat consumption exist, such as in North Africa and the Middle East, the totality of the increase in total meat consumption will be through poultry and beef. In countries where pork consumption is traditionally high, such as the Asia Pacific Area, pigmeat consumption will continue to grow at a faster rate than any other type of meat. In countries where bovine production is substantial and international prices have little impact on domestic production such as in East Africa, beef consumption will remain the preferred type of meat.

In the developed countries, *per capita* consumption of meat increases by only 7% from 65 kg to 70 kg as a result of lower projected income growth rates and already high initial consumption levels. In the OECD area, *per capita* meat consumption increases even less by about 3%, from 67 kg to 69 kg comparing 2018 to the base period.

Figure 9.3. **Development of per capita consumption by region and type of meat**



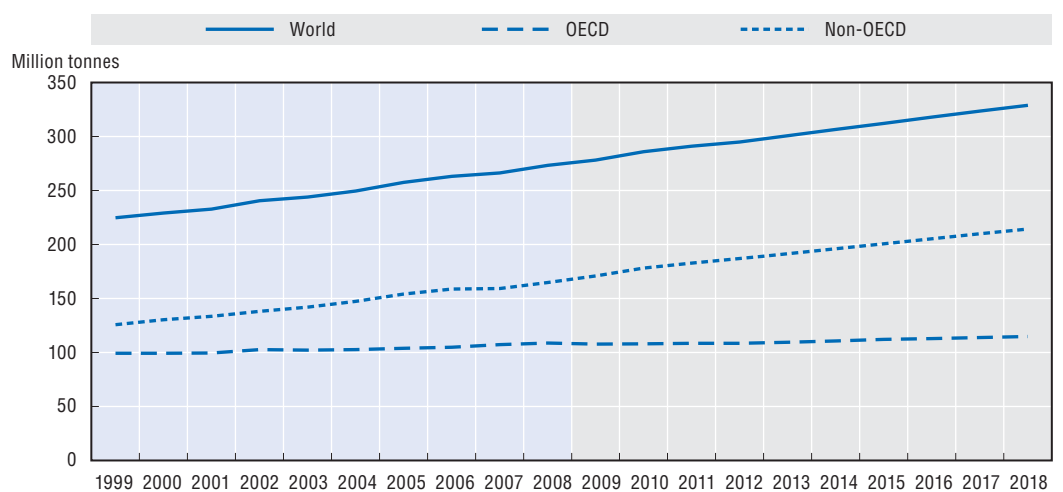
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Although *per capita* meat consumption expands, it is mainly from poultry meat, reflecting the general trend driven development. In the OECD area, *per capita* consumption of beef and sheep meat is projected to decline between the base period and 2018 as consumer shift to poultry meat.

Increasing world demand will mainly be met by production from non-OECD countries

World meat production (Figure 9.4) is expected to grow by almost 2% per year, a little less than during the previous decade. Growth in meat production is expected to take place predominantly outside the OECD area, where there are large countries with considerable scope for intensifying animal production as for example Brazil, and to some degree also China and Russia. Meat production outside the OECD area is projected to grow around 2.4% per year. In many OECD countries, animal production systems are already highly intensive, leaving little scope for improvement. Moreover, production costs are high in some OECD countries, so that along with continuing agricultural policy reforms, the incentive to raise animals is decreasing. An example of this is beef production in the EU, where with continuing policy reforms, cattle production is declining. Canada's pork industry that was growing until the middle of this decade is expected to remain stable as pork producers are leaving the sector under economic pressure. These developments lead to a production growth of less than 1% per year on average in OECD countries.

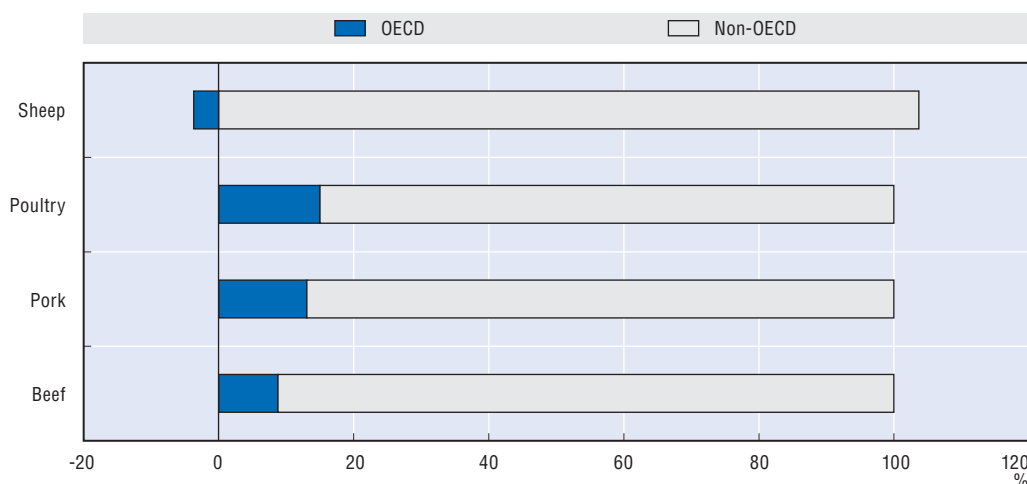
Figure 9.4. **Development of meat production**



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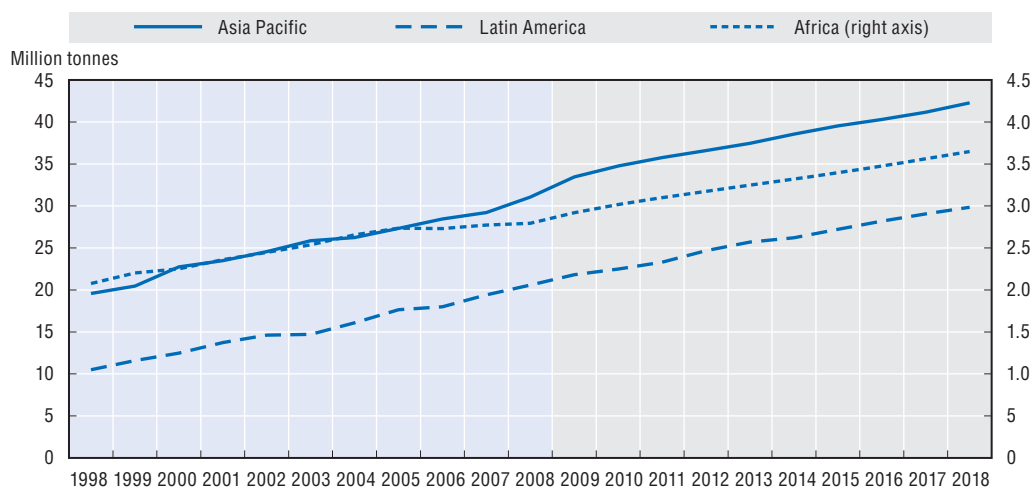
Comparing 2018 to the base period, more than 87% of the growth in global production of all meat types can be attributed to non-OECD countries, as can be seen in Figure 9.5. This is, in particular, true for sheep meat, where production in OECD countries is expected to decline and the production increases are totally attributable to non-OECD countries. Only in poultry and pork production do OECD countries account for more than 10% of the increase in global production between the base period and 2018.

Over the outlook period, developing countries increase their meat production by nearly 32% compared to the average base period. Expanding poultry production accounts for half of the increase. Additional poultry production will occur mostly in the Asian Pacific

Figure 9.5. **Regional contributions to increases in meat production**

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and Latin America regions, as shown in Figure 9.6. Nevertheless, some gains are also expected from Africa, assuming a continuation in the decline of both the number of outbreaks and countries affected by Avian Influenza (AI).

Figure 9.6. **Development of poultry production in selected developing regions**

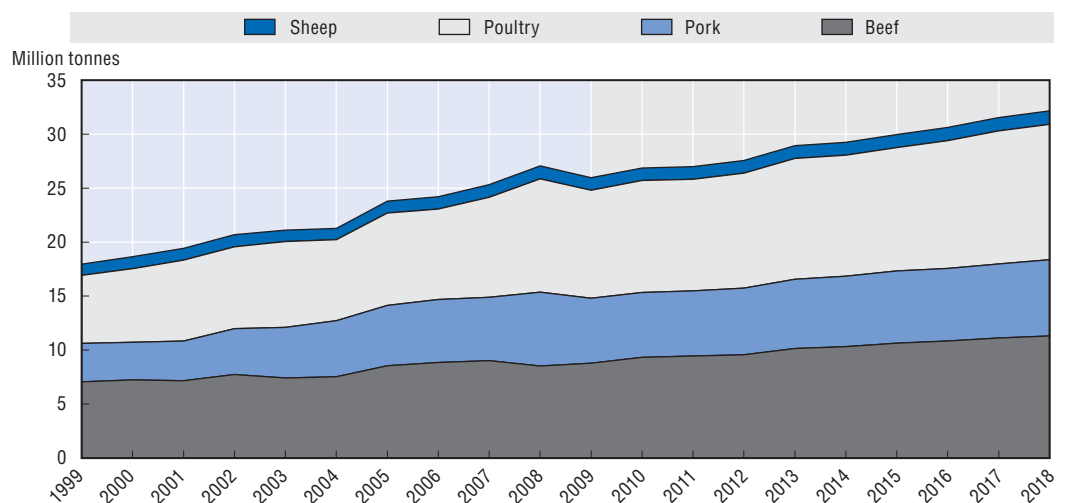
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India's increasing poultry production is expected to continue despite recent outbreaks of AI. India is following China's experience over recent decades by shifting production away from rural backyard systems to increasingly larger, intensive and integrated operations that are complemented by modern technology in order to satisfy an increasing, albeit from a low base, consumption from a rising urban middle class population. Generally in Middle and Far East Muslim countries, the growth in poultry production is expected to continue to increase in response to higher demand for low cost meat.

Further growth in world meat trade

Globally, meat exports are projected to increase by 25% by 2018 compared to the base period. This is a result of large exportable surplus becoming available in some countries, and increasing import demand in other parts of the world, as, for example, for beef in the EU and North Africa. Within the aggregate, it is predominantly trade in poultry and beef that expand rapidly, by over 30% compared to the base period. The development of meat exports is shown in Figure 9.7.

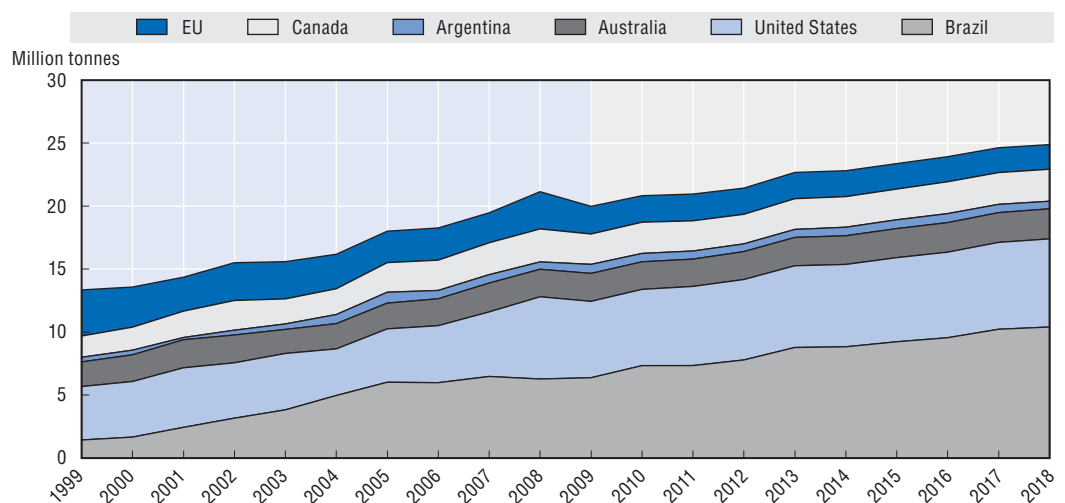
Figure 9.7. **Development of meat exports by type of meat**



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Countries are able to increase their exports of meat to a different extent (Figure 9.8). As in the case of production, additional meat exports are expected to come in large part from outside the OECD area, in particular from Brazil, where animal health and traceability related trade restrictions imposed by the EU in early 2008 are expected to be less of a

Figure 9.8. **Development of meat exports by country**



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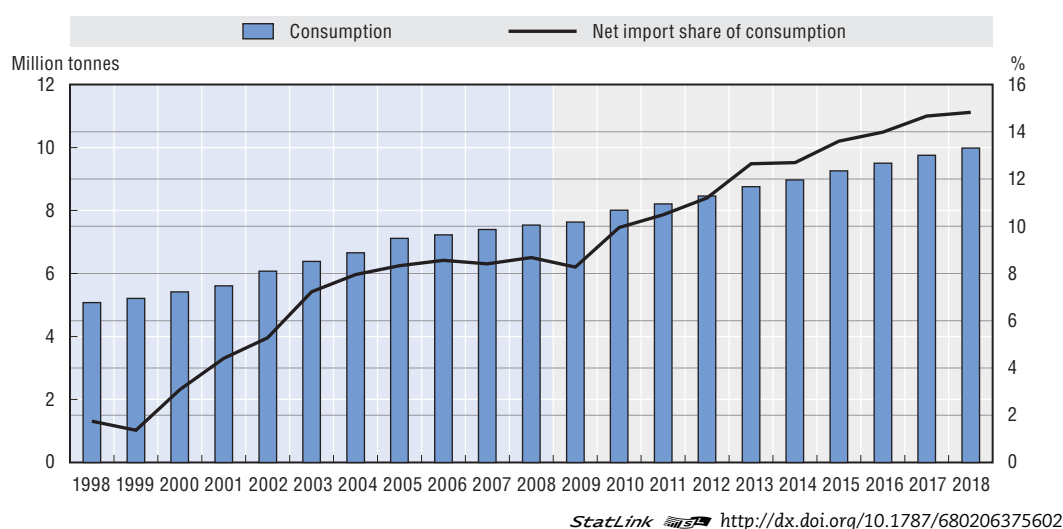
constraint and an increasing number of Brazilian farms is approved for exports to the EU. The US is another country that is expected to increase its share in international markets, as the remaining BSE related export restrictions with some Asian importing countries are gradually lifted, the free trade agreement with Korea is providing improved opportunities, and in Mexico, a large market for US meat, consumption grows faster than production.

Exports from Canada are expected to remain stable throughout the projection period. However, a shift is projected to take place from exports of live animals to meat products. Canada's main export destination, the US, is assumed to favour meat imports as opposed to live animals due to the COOL requirements. Meat exports from the EU have declined over the previous decade, and this structural readjustment is expected to continue, reinforced by policy reforms and increasing domestic consumption.

India's bovine exports are expected to increase at a much slower rate than in the previous decade. Demand by one of India's major destinations, Indonesia, is expected to decline following tighter import restrictions based on FMD country status. Thailand, despite resurgence of AI outbreaks, remains an important poultry exporting country throughout the outlook period. Thailand's exports of cooked chicken meat are expected to grow by more than 14% between 2018 and the base in anticipation of continued strong demand. Moreover, Thailand may gain market share in the Japanese market at the expense of China due to quality concerns from Japanese consumers and lower export availability from China following higher domestic demand.

LDCs¹ remain dependant on meat imports, as can be seen from Figure 9.9. For this group of countries, a small urban middle class with an expanding demand for meat is emerging. Despite growing meat production, consumption growth outpaces production gains, leading to increasing meat imports. The ratio of total meat imports over total meat consumption will increase from 9% in the base period to 15% in 2018.

Figure 9.9. **Least Developed Countries meat dependency to increase**



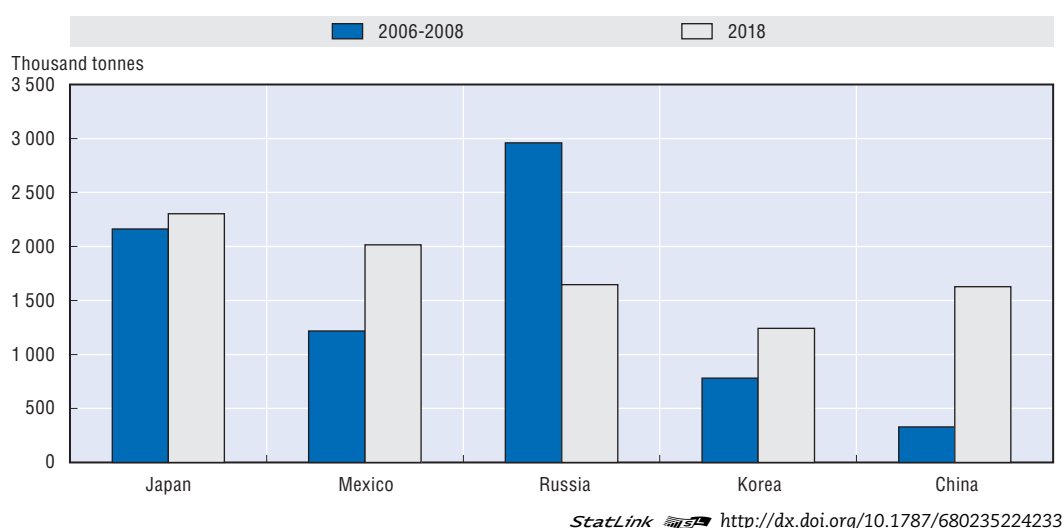
Japan to overtake Russia as the leading meat importing country

Japan is projected to become the leading net meat importing country even though imports remain relatively stable. The result is largely explained by developments related to

Russia that are expected to reduce net meat imports considerably (Figure 9.10). Russia's pork imports are expected to decrease as investment² in the pork sector increases domestic production. The same is the case for beef and poultry, but to a smaller extent. While meat consumption is expected to grow, imports are expected to be increasingly crowded out by domestically produced meat.

China is to emerge as a new important net importer of poultry. Imports are expected to increase more than three times compared to the low levels of the base period as consumption gains outpace production. Brazil is expected to make a significant amount of exportable surplus available. At the same time, China will remain a net exporter of small quantities of beef. Both Mexico and Korea are projected to increase net imports of meat, as production does not keep up with increasing demand for meat protein, fuelled by income growth in these two countries.

Figure 9.10. **Development of net meat imports for selected countries**



Key issues and uncertainties

The meat market outlook presented in this chapter is conditional on a number of assumptions. Among these are the absence of extraordinary animal disease events, continuation of agricultural policies and declared policy reforms and the macroeconomic environment. Should any of these assumptions change, this would clearly lead to a different set of projections for the various meat markets.

The turbulent macroeconomic environment raises great uncertainties. As the scenario analysis in Chapter 2 has shown, meat markets are quite sensitive to changes in income, and to some degree also to changes in the oil price, and any change in these parameters will change the global picture. A lower GDP scenario, especially in developing countries, would lead to longer term decreases in consumption of meat, or greater substitution between different types of meat. If these conditions prevail, production would be adjusted accordingly by more than what is projected here. Under the pressure of decreasing meat prices, structural adjustments could be expected to take place in the meat producing and processing sector. With increased financial and economic pressure, the concentration process in the meat industries that has been developing in many countries may pick up

speed. This could lead to economies of scale that could also eventually translate into lower prices than projected.

Another important source of uncertainty is exchange rate developments. For net meat exporting countries like Canada, a strengthening of their own currency would, all other things remaining unchanged, decrease their international competitiveness and put pressure on domestic producers. For net meat importing countries like Russia and Japan on the other hand, a strengthening of their own currency may lead to increasing net imports. New Zealand lamb production and trade, with the EU being the most important trading partner, can be expected to be directly impacted by any change in the exchange rate of the New Zealand Dollar vis-à-vis the Euro.

Sanitary and food safety concerns stemming from a recurrence of animal disease outbreaks have limited the growth in trade for meat exporting countries affected by trade bans. The possibility of future animal disease outbreaks, their duration, intensity, potential consumer reactions and new trade restrictions, introduces additional uncertainty into the present Outlook.

The rapid growth of the biofuel sectors particularly in the United States and Europe continues to affect the availability of feedstuffs used in livestock production as ethanol and livestock industries compete for grains. Though cereal prices have come down from the record highs in 2008, they are projected to remain above historic levels. At the same time, however, the increasing availability of co-products from the ethanol and biodiesel production, in particular of DDGs, pulps and oilseed meals, helps to reduce feed costs in meat production. The net impact varies by biofuel chain as well as by type of meat and requires detailed monitoring.

Domestic and trade policies remain an important determinant of meat markets. Some countries still have relatively high tariffs on meat products or regulate meat imports through the means of TRQs. At the same time, domestic policies that directly benefit animal husbandry remain in some OECD countries. Any outcome of the WTO negotiations that commits member countries to lower tariffs on meat and decrease support to animal husbandry is likely to alter the outlook. As an example, Thailand poultry exports may be higher than projected as Thailand continues to pressure major importing countries to accept the compartmentalisation practice in order to allow exports of uncooked chicken regardless of Avian Influenza country status. The same holds true for agricultural products that are an input to the livestock sector like grains, where changes in prices triggered by policy changes would affect animal production.

Production of livestock and feedstuffs is responsible for almost 80% of all agricultural greenhouse gas (GHG) emissions from sources that include enteric fermentation, manure management, land use change (deforestation, and land clearing and burning), soil, and the burning of carbon-based fuel.³ Emissions are expected to increase substantially in the coming decades as population and income growth increase global demand for food, especially for meat, dairy and other high value products. It is projected that much of the increase in agriculture-related emissions will take place in Asia, Latin America and Africa. It remains uncertain, but possible that in the medium to long term, livestock production could be subject to carbon constraints. There are large differences between regions and meat type in GHG emissions per unit of output. Pricing emissions from livestock production could potentially result in substantial shifts in production, consumption, and trade. At the global level, shifts in production would change the relative prices of meat and

promote the consumption of meat with lower associated GHG emissions such as poultry, and ultimately affect meat expenditure.

This outlook projects dynamic growth of meat production in Russia. This relies on the assumption that planned investment effectively increases the output of the sector. It is uncertain how, for example, the relatively low projected oil price and lower income in the beginning of the projection period will affect investment in the pork sector and, thus, future production capacities in Russia.

Finally, in this outlook, it has been assumed that the implementation of the COOL regulation gives an incentive to US processors to switch from importing live animals from Canada to meat, leading to increased trade of meat and decreased trade of live animals between these two countries. Due to the recent implementation of the regulation, the degree to which this may take place remains uncertain.

Notes

1. The group of LDCs comprises 49 countries and is defined by the United Nations based on economic and social criteria (www.un.org/esa/policy/devplan/profile/ldc_list08.pdf).
2. In Russia, investment into different agricultural sectors is promoted through a programme of subsidised interest rates. Among the meat markets, the programme is assumed to be especially effective for the pork sector.
3. FAO (2006): *Livestock's long shadow*, p. 112.

Chapter 10

Dairy

World market trends and prospects

Key market drivers

Strong expansion in demand and a squeeze on supply resulting from adverse weather and high production costs caused international prices to rocket in 2007. The market situation reversed dramatically in the course of 2008, to some extent a logical consequence of an unprecedented run-up in prices. Demand retreated as dairy ingredients were quickly being replaced by cheaper substitutes in food manufacturing. Overall, supply increased in reaction to strong price incentives while demand retreated, but the response on all these fronts has been stronger than anticipated and the drop-off in world demand ensuing from the global economic crises has intensified the downward pressure on dairy prices.

Over a longer horizon, international market prices seem to congregate towards a long term equilibrium determined to a large extent by the marginal costs of milk production of key exporters, except in the case when overridden by export subsidies or taxes. The depressed situation of early 2009 points more to a market over reaction – heavily nourished by the global economic crisis – rather than to the establishment of a new equilibrium. With the anticipated return to more stable economic conditions and milk supply adjustments to lower prices, world dairy prices are expected to rebound. Over the medium term milk product demand is anticipated to grow not only as a result of income and population growth, but also due to changing diets and preferences. Westernisation of diets, continuing urbanisation trends, and the increasing range and sophistication of dairy products available to consumers as ready forms of protein and energy are causing structural shifts in demand. This trend is a key driver in the future growth of the dairy sector in both developed and especially developing countries. The shift will also underpin the anticipated growth in trade which will bridge the difference between the rising appetite for increased variety of dairy products and the ability to deliver these by local dairy producers in terms of quantity, quality and price.

Despite an expected expansion in trade, dairy markets will continue to be characterised as “thin”. The small share of production that enters trade, high border protection in most countries, and the continued availability and potential use of export subsidies and taxes will contribute to the thinness of the international dairy market and future price volatility. Dairy markets will also remain exposed to demand reactions to variations in economic performance, given the fact that dairy products have relatively high income elasticity and in many developing countries are often still considered to be luxury items in food purchases. On the other hand, as export shares of market suppliers other than New Zealand are anticipated to become more evenly spread, markets may be able to better handle any production shortfalls that may occur in the future. The exception is New Zealand which is expected to considerably strengthen its dominant position on world dairy markets implying that any major reduction in production there would likely have considerable repercussions on global markets.

In the past decade, increased foreign investment in the dairy sector, at the processing level, but also at the farm level, has been a major feature of international market development. The current economic crisis and credit crunch will likely limit or suspend such activities in the short run, as uncertainty and restricted credit availability may discourage investment decisions. Such delayed investments will affect the speed of industry expansion and development, but not its ultimate realisation. Overall, assuming the economic crises to be relatively short-lived, the outlook for the dairy sector remains relatively bright over the medium term with steady demand growth being the primary feature. Dairy products are expected to remain among the agricultural commodities for which consumption exhibits the highest growth rates.

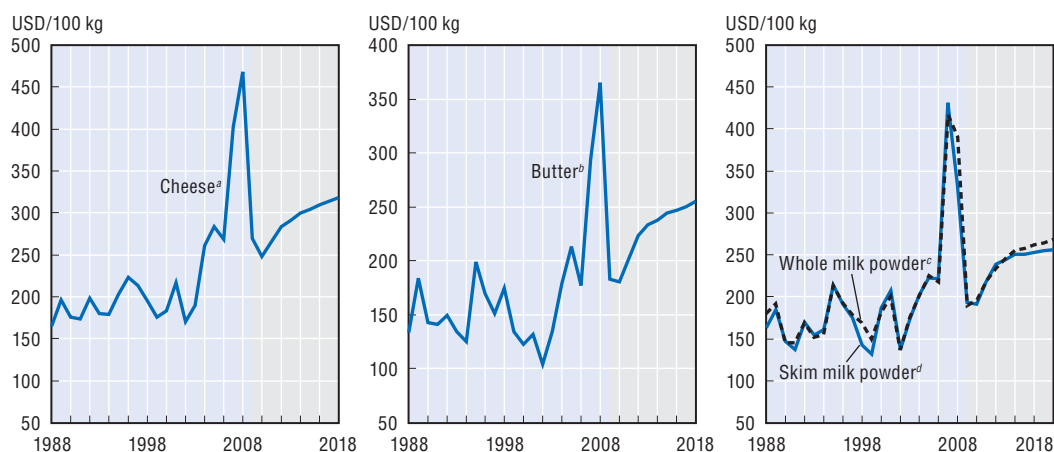
Main market developments

International prices to rebound but to remain far from recent record levels

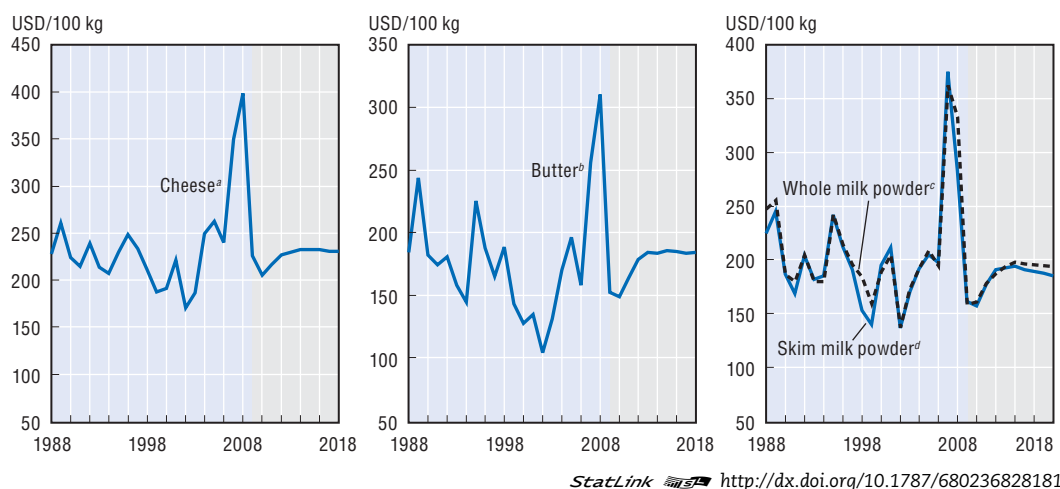
The spectacular increase in international dairy prices was followed by a rapid decline with prices falling by half to two-thirds from the record levels of mid-2007. Dairy prices fell, particularly in the second half of 2008, undermined by weaker demand, intensified by the commencement of the global economic slump and increased supplies from major exporters as they responded to earlier price rises. In the same period, melamine contamination in China may have further weakened demand and dented consumer confidence in products containing dairy ingredients. The reintroduction of export refunds by the EU is another factor that could contribute to prolonging the recovery phase for international dairy prices.

Stimulated by a return to global economic expansion and continuing population growth, world dairy prices are expected to rebound from 2011 and to increase, initially, also in real terms (Figure 10.1 and Figure 10.2). The upward pressure on prices in real terms is expected to abate in the second half of the projection period. Averaging over the outlook period, prices in real terms are expected to stay slightly above the 1997-2006 average (i.e. the decade preceding the 2007-08 peak years). Butter prices in real terms are likely to enjoy the strongest gains, staying on average 12% higher, lifted by high energy and vegetable oil prices.

Figure 10.1. **Prices to rebound from low levels but to stay far below the recent peaks**



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Figure 10.2. **Prices in real term after an initial rise to remain relatively flat**

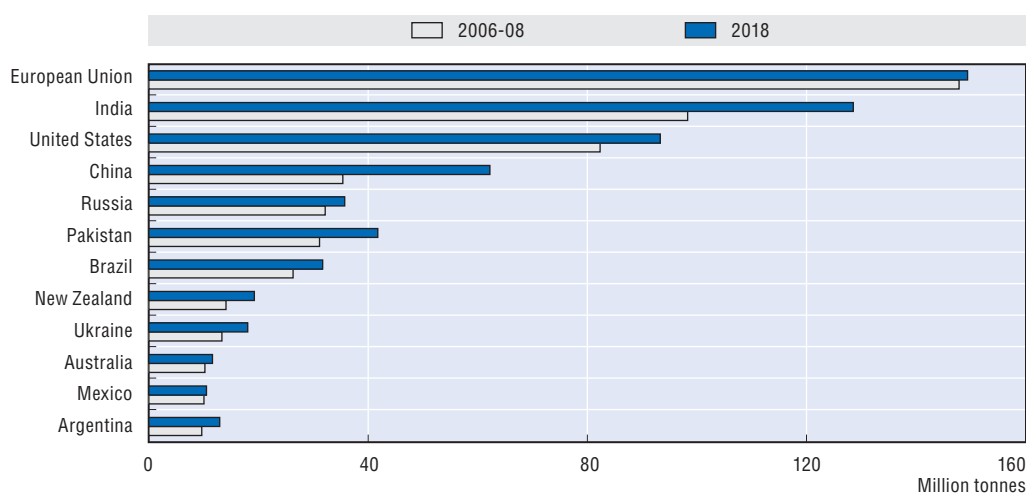
Nevertheless, as discussed in Chapter 2, all dairy prices and, in particular, butter prices are likely to be influenced by the depth of recession and the pace of economic recovery. In this respect the economic developments taking place in the Russian Federation – the world’s largest butter and cheese importer – are especially important. Given the uncertainty surrounding the impacts of the financial crisis and economic situation, the international dairy price developments remain uncertain and heavily conditioned by the unfolding global economic prospects.

After strong gains a return to more modest milk production growth rates

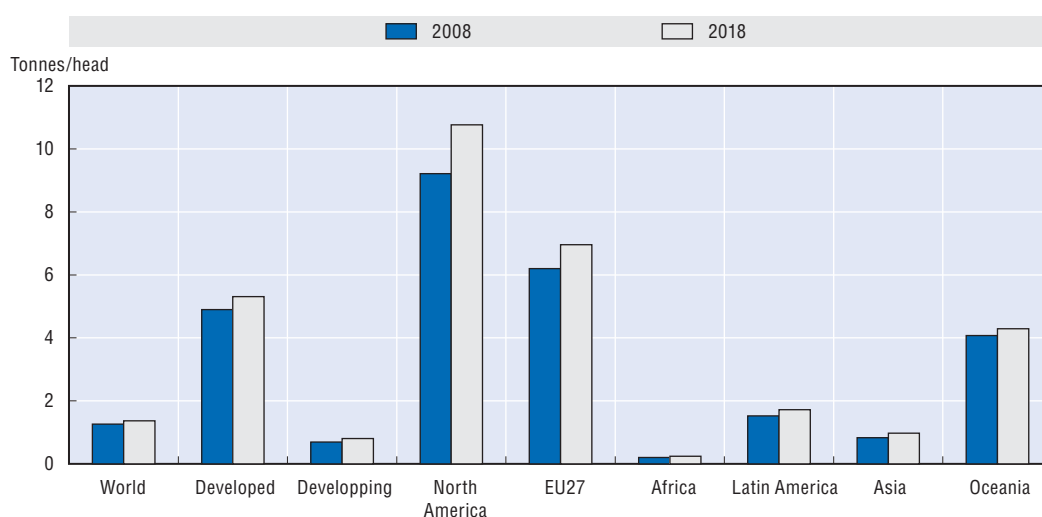
Spurred by high milk prices, world milk production rose 2.2% in 2008. On average, the annual growth rate over the projection period is expected to be lower at 1.7%, as weaker international prices (compared to 2007-08) filter through to domestic markets and moderate supply response. In absolute terms, world milk production is expected to increase by 131 million tonnes between 2008 and 2018. This growth is indeed subject to economic prospects and developments. Based on results from the lower income growth and different recovery scenarios discussed in Chapter 2, global production could be lower in 2018 by 1.4% (12 million tonnes less) in case of deeper recession and slow recovery as compared to the base projection levels.

It is certain, however, that the overwhelming majority (81%) of additional milk will be produced outside the OECD area. Asia is the primary contributor accounting for more than half of the global milk production owing to expansion mainly in India, China and Pakistan. Latin America accounts for 12% of additional world milk production by 2018 (Figure 10.3).

Cow herd expansion is assumed to be more and more limited by environmental and water constraints in many regions, so that additional milk production is anticipated to be increasingly coming from growth in per cow milk yields. Despite advances in average yields, however, high differences between regions would remain a feature of the global milk production landscape. Yields remain highest, by far, in the feed intensive dairy industries of North America, followed by Europe, Oceania, and then Latin America. Yields in most developing regions remain extremely low, and while rates of growth may be higher, not much progress in converging yield gaps is likely without substantial additional investment in milk production technologies (Figure 10.4).

Figure 10.3. **Milk production growth from 2006-08 to 2018**

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Figure 10.4. **Milk yields by region 2008, 2018**

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Longer term milk production growth potential receiving renewed interest

The extremely high prices and low dairy global stocks have refocused the attention towards supply growth. Several governments have announced plans to boost domestic milk production through improved cattle breeding and cow milk yield gains. The EU increased its milk production quota by 2% in 2008 and later in that year confirmed its plan to abolish the long standing milk production quota system in 2015. The US has confirmed support to milk producers in the 2008 US Farm Bill (FCE Act). Nevertheless, the rapidly deteriorating market situation has triggered, in several countries, short term measures intended to curb supply and stabilise prices for domestic producers.

After a strong supply response to high international prices, milk production in New Zealand is projected to increase less, by 2.2% annually, over the projection period tempered by increasing on farm costs and environmental concerns. Cow inventories in

Australia are expected to increase in 2009 for the first time in seven years. The anticipation of continuing slow rebuilding of the herd together with growth in productivity on larger and more efficient farms should result in annual growth of 1.8% on average, a growth rate that remains sensitive to water supply availability over the projection period.

The recently completed “Health Check” of the CAP abolishes the EU milk quota from 2015 and provides a soft-landing to producers via milk quota increases of 1% per year between 2009 and 2013 with Italy receiving the full 5% increase in 2009. Restrained by relatively low milk prices throughout the projection period, EU milk production is expected to increase by less than 2% to 2018, which is 0.3% annually. With a steady decrease in subsistence production, milk supply is to fall in the twelve newer members of the EU by more than 3% over the projection period, although milk deliveries are to rebound by nearly 6%.

The recent strong growth in milk production in the United States of more than 2% per year is expected to recede with lower milk prices and a return to a declining cow numbers trend. Milk production in 2009 is expected to fall partly due to increased culling of herds. The increasingly depressed situation on dairy markets also prompted the reintroduction of Commodity Credit Corporation (CCC) purchases intending to stabilise the domestic market in the short term.* Assuming a return to more “normal” economic conditions, milk production is expected to grow by 1% annually over the outlook period. This growth provides 7% of additional global milk supply and covers more than 40% of additional milk production in the OECD area.

In the last decade, China experienced double-digit growth in milk production but serious safety and quality problems have damaged the sector. In response to the melamine crisis, the Government has unveiled a plan which emphasised modernisation and increased regulations of the dairy industry. The new plan encourages the construction of modern farms and requires improvements in dairy cow genetics, milk quality and safety. The guidelines also require that 70% of processing plant output is supplied with raw milk produced on farms owned by the processing plant holders. Over the projection period, it is expected that the dairy industry overhaul would be manifested by strong yields, but relatively low cow inventory growth with milk production growing annually by 3.6%. Hence, China is expected to remain among the fastest growing milk producers but, when compared to the past, focusing more on quality instead of quantity.

After falling for more than a decade, milk production in the Russian Federation has been increasing since 2005 partly due to government efforts to revive milk production with plans to improve the quality of cattle breeding (i.e. subsidies for purchase of pedigree bulls). Stimulated by increasing cow numbers and improving yields, milk production is expected to continue growing over the projection period at an annual rate of 1.7%. This growth is, however, conditional on the economic situation in the country and continuing commitment to revive domestic milk production. The impact of the financial crises and credit availability for further investments is particularly uncertain (see Chapter 2 for further discussion).

* The CCC purchases products at support prices and stores them until they are sold into open market or to foreign governments or donated to domestic and international agencies. Given the important US export position for SMP, the CCC purchases may serve, *de facto*, as a price floor for world SMP markets (at USD 1 764 per tonne). Nevertheless, the impact of CCC stock releasing back to markets is uncertain due to different options available.

Latin America is the emerging low cost production zone for milk. Growth in the previous decade, largely led by Brazil, Chile and Peru, is expected to continue strongly. Milk production in Argentina is also expected to grow vigorously over the outlook at 2.9% annually, on average, driven by increased efficiency on farms that are to become larger and more intensive. After 10 years, Argentina is expected to erase the decline in milk production that took place following the domestic financial crisis in 2000 and surpass the historically high levels of 1999. Brazil's milk production is projected to grow by 1.7% annually, stimulated by increased productivity. Milk production is promoted through the national milk development programs, but also through financing programs of large multinational dairy companies.

Solid growth in milk production is expected in the large, traditional dairy markets of both India and Pakistan, which are, on a country basis, the first and fourth largest dairy producers in the world. Due to growth in both yields and cow numbers, production is anticipated to grow annually at 2.9% and 2.1%, respectively, consolidating their positions as leading producers. However, despite larger anticipated production, both countries will remain largely closed to world markets, although India is expected to continue to export skim milk powder at modest levels. In other countries and regions in South and Southeast Asia, dairy sectors are growing strongly as well, from a low base. However, future growth may be highly dependent on the macro economic situation, since income elasticities of demand are high and because dairy growth in the region has often relied on domestic and foreign investments in processing and contract farming. Demand in many countries of this region was stifled as a result of the melamine incident in China, as some processed milk products have been traded within the region.

Milk output growth in Africa is projected at 2.3% annually, which is down from an estimated 3.5% in the previous decade. Yield advances account for over half of expected growth. North African countries lead in milk production growth, while milk production in Sub-Saharan countries grows less quickly.

Production to increase mainly for butter and WMP

From the 2006-08 average levels, world production of WMP and butter is expected to grow by around 30%, production of cheese by 22%, and that of SMP by 12% over the outlook period. Production is expected to increase mainly outside the OECD area, reflecting increased investment in processing capacities.

More than three-quarters of the additional production of butter is expected to come from India, with Pakistan adding 5.5% as the second largest contributor. In the OECD area, butter production remains flat as gains in some countries are offset by a decline in the EU. On the other hand, 70% of additional cheese production comes from OECD countries, mainly from the EU (32%) and the United States (30%).

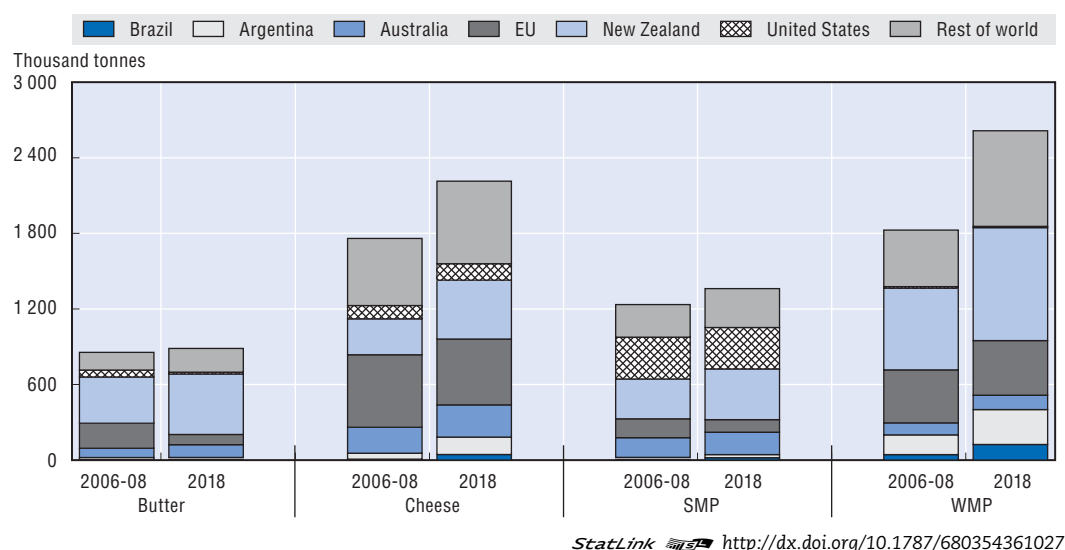
The strongest growth in WMP production is expected in emerging markets such as China and Brazil, which will provide 33% and 24% of additional WMP supply, respectively. Oceania (25%), the United States (20%), Brazil (20%) and China (15%) are responsible for nearly all the additional production of SMP over the projection period. In emerging markets, milk powders increasingly serve to balance domestic markets between surplus and deficits areas, but also across seasons.

World exports to increase but market shares of majority of traditional exporters to shrink

Global dairy exports (in milk equivalents) are expected to increase at a higher pace than global milk production, with the exception of 2009 and 2010, which are affected by the severe global economic contraction. The increase in trade reflects the need to close the supply and demand differences not only in quantity but also quality.

The shift in the composition of product portfolio on international dairy markets towards WMP and cheese is expected to accelerate and world exports are expected to grow mainly for these products (Figure 10.5). SMP and particularly butter exports would lag behind considerably. New Zealand's share of international butter markets is expected to increase from 43% to 55% as emerging exporters concentrate more on milk powder exports.

Figure 10.5. Major dairy product exporters



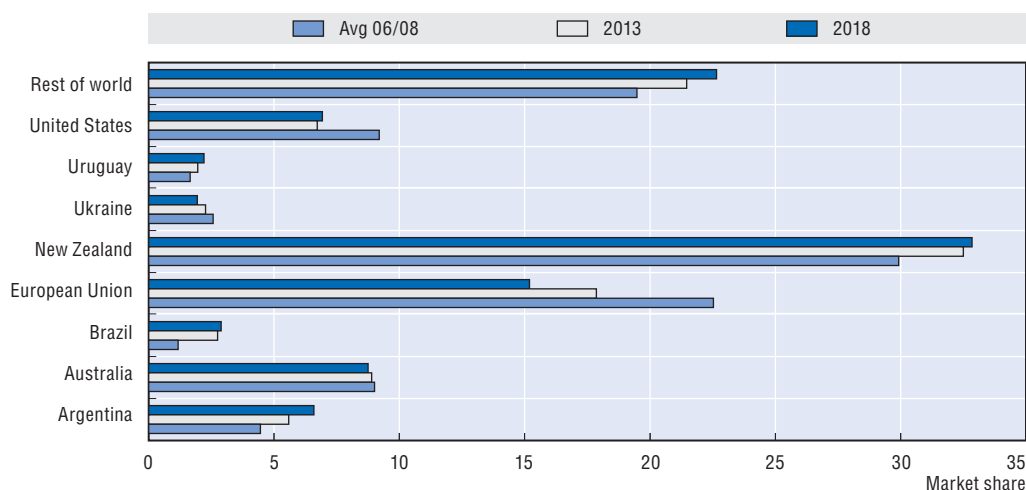
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Despite the EU quota increase and quota abolition scheduled for 2015, EU exports of dairy products stay relatively stable as production gains are offset by consumption gains for value added products, and as production falls at similar rates to consumption for bulk intervention products (SMP and butter). Argentina is emerging as an important player on the WMP market. Similarly, Brazil, which was a net importer in the past, is set to increase its exports. The WMP exports from Brazil, Argentina and Uruguay are expected to surpass the EU's WMP exports by 2018. The evolution of global dairy exports (in milk equivalents) indicates that out of the big four traditional dairy exporters, only New Zealand is able to increase its world markets share while shares of the EU, the United States and Australia are expected to decline (Figure 10.6).

Imports to remain region specific and affected by income profile

Developing countries account for 94% of world imports of WMP, and 90% of SMP, but only for 51% of butter and 40% of cheese imports. By 2018, these shares will increase to 96% (WMP), 92% (SMP), 57% (butter) and 44% (cheese). Russia remains one of the most important importing countries, especially for butter and cheese, although butter imports are projected to decline in the outlook as a result of increased domestic production. As discussed above, the Russian market is heavily weighted with uncertainty. If the ambitious

Figure 10.6. **With the exception of New Zealand traditional exporters lose market shares**

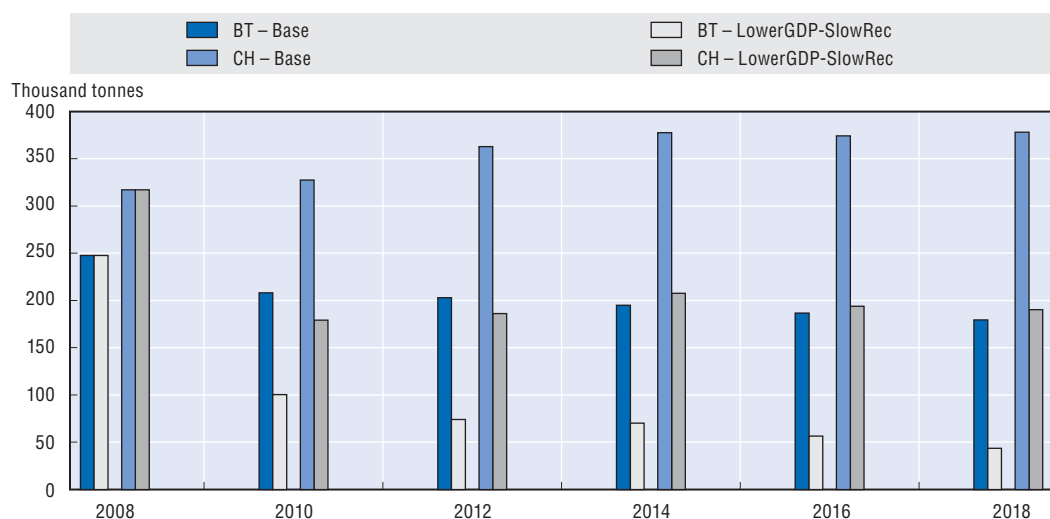


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dairy revival plan is to some extent compromised by the current economic difficulties, milk production in Russia would not be able to keep up with domestic demand and imports would increase. On the other hand, the recent much more pessimistic GDP growth projections for Russia could put a significant brake on demand in the short-term. The speed of income recovery in Russia over the medium-term, therefore, will be critical to the rebounding of imports. The lower GDP/slow recovery scenario described in Chapter 2, illustrates that in the case of a deeper recession and slow income recovery in Russia, butter and cheese imports would be strongly affected (Figure 10.7).

Japan and the United States are expected to continue to be important cheese importers and would account, along with Russia, for 40% of global cheese imports. Mexico is projected to increase substantially its SMP imports, and the Middle East and North Africa

Figure 10.7. **Russia butter and cheese imports crucial for the Outlook**



StatLink <http://dx.doi.org/10.1787/680480337136>

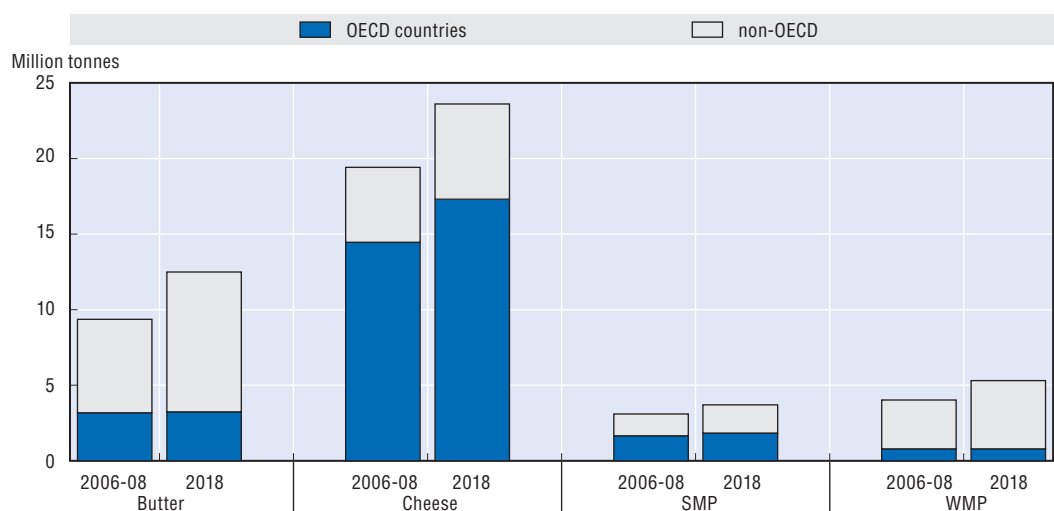
are to remain key importers of WMP. Algeria is expected to remain the most important WMP importer with an 8% share. China has recently reduced its dependence on imports and has even exported, mainly WMP. Nevertheless, it is expected that over the outlook, China would continue to be an important market for exporters as further demand for higher quality product would be only partly satisfied from domestic productions. China forms the backbone of whey trade as whey is used as a cheaper alternative to powders and an important source of protein. China's average whey imports are expected to increase by nearly 5% annually.

Dairy products remain among the agricultural commodities for which consumption exhibits the highest growth rates.

Demand for milk and milk products are expected to continue growing in developing countries at 1.2% per year on a *per capita* basis (in milk equivalents). In developed countries, milk consumption is projected to increase at half that rate annually, but from a much higher base than for developing countries. The growth in consumption will remain region specific and highly variable among products. Moreover, consumption of the various dairy products will be conditioned by income developments for which prospects remains highly uncertain in the short term. The lower GDP scenarios discussed in Chapter 2 illustrate that the market impacts of lower income is much more profound in the countries outside the OECD area.

Regional differences in the consumption of the various dairy products are affected by their income profile. OECD countries are expected to retain their dominant position in cheese consumption, maintaining a 75% share of total world use. Conversely, more than 80% of global WMP consumption occurs in non-OECD countries, and this share is expected to grow to 85% by 2018. OECD cheese consumption is expected to increase by nearly 20% over the outlook period, while that for butter remains relatively stable as a drop in the EU and Japan is compensated by increases in the US (Figure 10.8). In countries outside the OECD area, while demand growth is expected for all dairy products with WMP and butter consumption growing the strongest, fresh fluid milk will remain by far the main product for consumption.

Figure 10.8. Outlook for dairy products



StatLink <http://dx.doi.org/10.1787/680524124266>

Key issues and uncertainties

As in previous years, the dairy Outlook is conditioned by weather, the economic situation and the evolution in policies. For example, a severe drought in an important dairy producing region could have an important impact on the projections in any one year, strengthening prices. However, in this year's Outlook, it is the uncertainty of the unfolding economic situation that plays by far the prominent "risk factors" role.

This year the dairy Outlook is heavily influenced by very uncertain global prospects in the short term, but also by a very unclear GDP recovery path over the medium term. This year's report has offered two scenarios for potential GDP recovery each having quite important and different impacts on markets over the medium term. The results of these scenarios underline the importance of economic fundamentals as income growth remains one of the key drivers underpinning international dairy markets. It also highlights the continuing "thinness" of dairy markets, where a severe economic downturn in one country (i.e. the Russian Federation) could have considerable repercussions for global import demand and international prices.

It is important to note that changes in other macroeconomic variables also have important ramifications for dairy markets. Exchange rate developments of major importers and exporters impact heavily on international dairy markets. For example, the supplies of world exports depend mostly on the currencies of Oceania, Europe and South America, whereas world dairy trade is typically denominated in US dollars. A sudden exchange rate appreciation can rapidly erode a cost advantage of an emerging or established exporter. Indeed, a critical factor in the dairy outlook is how world market prices are transmitted to domestic markets, and to what extent they are affected by exchange rates, and by trade policies and border measures.

Another increasingly important variable in the Outlook is the development in crude oil prices. As discussed in Chapter 2, crude oil price impacts on the livestock sector are much less profound than for field crops. However, butter prices are relatively sensitive, influenced by vegetable oil prices that are strongly affected, by crude oil prices, and indirectly by demand for biodiesel production.

The on-going financial market turmoil and the still unfolding economic crisis have attracted a lot of attention. But focusing on the medium term, an important issue for dairy market developments is linked to the milk supply potential. In the dairy sector, the period of high prices has accelerated structural adjustment of the international dairy sector and refocused attention on domestic supply capacity. Many reports originating from dairy product importing countries have indicated that high prices have stimulated attention towards domestic supplies, creating greater interest in local dairy development. In such countries, which by and large have imported milk powders to reconstitute or enrich fluid milk products, processors have found that sourcing their requirements from local suppliers has proved to be a lower cost option. Local suppliers have also been found, in many cases, to provide higher quality products with lower risks of supply disruptions. It is uncertain how long these changes will last; to what extent they will encourage further investment in the sector and how much these activities will be impinged by the economic crises.

An important and emerging issue, particularly in developed countries, is the concern for climate change, and measures to mitigate green house gas emissions. These measures, which can affect several stages of the production process including waste management,

pastures and feed rations, may increasingly influence productivity growth and limit the expansion of milk output. In contrast, many developing countries are increasing the scale of production shifting to more intensive feeding and moving to smaller and more productive dairy animals, which should lead to increased productivity and improved competitiveness. These developments may result in a narrowing of the projected yield gap between developed and developing countries with corresponding regional impacts on output and on dairy herd numbers.

Underlined by the recent melamine contamination in China, the need to ensure the safety and quality of dairy products is expected to result in increasingly strict requirements for producers in the future. This incident raised important questions concerning the marketing and testing of milk at various stages of distribution and processing, particularly for developing regions and especially for informal markets where inspection systems are traditionally less stringent or vigilant. In developing countries like South East Asia, which is still a newly emerging dairy market, such events may deter longer term growth in milk and dairy product demand. The ability to maintain an image of dairy products as being healthy and safe is of paramount importance for the dairy industry, not only in emerging economies, but also in well established markets.

Finally, despite the current economic crisis, the underlying fundamental drivers of dairy markets remain positive. Demand growth has weakened, especially in developing countries, but is not expected to reverse. Urbanisation trends and changing demographics of local populations will continue contributing to higher *per capita* demand, particularly for the higher value-added processed dairy products.

Methodology

This section provides information on the methodological aspects of the generation of the present *Agricultural Outlook*. It discusses the main aspects in the following order: First, a general description of the agricultural baseline projections and the *Outlook* report is given. Second, the compilation of a consistent set of the assumptions on macroeconomic projections is discussed in more detail. A third part presents an important model element that has been improved for this *Outlook*, i.e., the representation of production costs in the model's supply equations.

The generation of the OECD-FAO Agricultural Outlook

The projections presented and analysed in this document are the result of a process that brings together information from a large number of sources. The use of a model jointly developed by the OECD and FAO Secretariats, based on the OECD's Aglink model and extended by FAO's Cosimo model, facilitates consistency in this process. A large amount of expert judgement, however, is applied at various stages of the *Outlook* process. The *Agricultural Outlook* presents a single, unified assessment, judged by the OECD and FAO Secretariats to be plausible given the underlying assumptions, the procedure of information exchange outlined below and the information to which they had access.

The starting point of the *Outlook* process is the reply by OECD countries (and some non-OECD countries) to an annual questionnaire circulated at mid-year. Through these questionnaires, the OECD Secretariat obtains information from these countries on future commodity market developments and on the evolution of their agricultural policies. This information is supplemented by the FAO Secretariat for its members which are not part of the OECD. External sources, such as the World Bank and the UN, are also used to complete the view of the main economic forces determining market developments. This part of the process is aimed at creating a first insight into possible market developments and at establishing the key assumptions which condition the outlook. The main economic and policy assumptions are summarised in the Macroeconomic and policy assumptions chapter and in specific commodity tables of the present report. The main macroeconomic variables assumed for the outlook period are based on the December 2008 medium term projections of the OECD's Economics Department for OECD countries, and on the Global Economic Prospects of November 2008 of the World Bank for other countries. While sometimes different from the macroeconomic assumptions provided through the questionnaire replies, it has been judged preferable to use just two consistent sources for these variables. The sources and assumptions for the macroeconomic projections are discussed in more detail further below.

As a next step, the modelling framework jointly developed by the OECD and FAO Secretariats is used to facilitate a consistent integration of this information and to derive

an initial set of global market projections (baseline). In addition to quantities produced, consumed and traded, the baseline also includes projections for nominal prices (in local currency units) for the commodities concerned. Unless otherwise stated, prices referred to in the text are also in nominal terms. The data series for the projections is drawn from OECD and FAO databases. For the most part information in these databases has been taken from national statistical sources. For further details on particular series, enquiries should be directed to the OECD and FAO Secretariats.

The model provides a comprehensive dynamic economic and policy specific representation of major world producing and trading countries for the main temperate-zone commodities as well as rice and vegetable oils. The World Sugar Model, formerly a standalone model separate from Aglink was revised during the year and fully integrated into the Aglink-Cosimo modelling system. From the integrated model, a set of long term baseline projections for world and OECD sugar markets, covering raw and white (or refined) sugar was developed. In addition, comprehensive and fully integrated biofuel models have been developed for several OECD countries as well as for a range of developing countries.* The Aglink and Cosimo country and regional modules are all developed by the OECD and FAO Secretariats in conjunction with country experts and, in some cases, with assistance from other national administrations. The initial baseline results are compared with those obtained from the questionnaire replies and issues arising are discussed in bilateral exchanges with country experts. On the basis of these discussions and of updated information, a second baseline is produced. The information generated is used to prepare market assessments for biofuels, cereals, oilseeds, meats, dairy products and sugar over the course of the outlook period, which is discussed at the annual meetings of the *Group on Commodity Markets* of the *OECD Committee for Agriculture*. Following the receipt of comments and final data revisions, a last revision is made to the baseline projections. The revised projections form the basis of a draft of the present *Agricultural Outlook* publication, which is discussed by the *Working Party on Agricultural Policies and Markets of the Committee for Agriculture*, in May 2009, prior to publication. In addition, the *Agricultural Outlook* will be used as a basis for analysis presented to the FAO's *Committee on Commodity Problems* and its various *Intergovernmental Commodity Groups*.

The Outlook process implies that the baseline projections presented in this report are conditioned by those developed by OECD countries and other participating economies. It also reconciles inconsistencies between individual country projections through the use of a formal modelling framework. The review process ensures that judgement of country experts is brought to bear on the projections and related analyses. However, the final responsibility for the projections and their interpretation rests with the OECD and FAO Secretariats.

Sources and assumptions for the macroeconomic projections

Population estimates from the 2006 Revision of the United Nations Population Prospects database provide the population data used for all countries and regional aggregates in the Outlook. For the projection period, the medium variant set of estimates was selected for use from the four alternative projection variants (low, medium, high and constant fertility). The UN Population Prospects database was chosen because it represents

* For details on the modeling of biofuels in Aglink-Cosimo and a detailed analysis of the market impacts of biofuel policies, see OECD/IEA Economic Assessment of Biofuel Support Policies (Paris, OECD).

a comprehensive source of reliable estimates which includes data for non-OECD developing countries. For consistency reasons, the same source is used for both the historical population estimates and the projection data.

The other macroeconomic series used in the Aglink-Cosimo model are real GDP, the GDP deflator, the private consumption expenditure (PCE) deflator, the Brent crude oil price (in US dollars per barrel) and exchange rates expressed as the local currency value of 1 USD. Historical data for these series in OECD countries are consistent with those published in the *OECD Economic Outlook* No. 84, December 2008 and in the *OECD Main Economic Indicators*. Assumptions made about the future paths of all these variables apart from exchange rates, are based on the recent (December 2008) medium term macroeconomic projections of the OECD Economics Department and extended from 2015 by holding the 2014 to 2015 annual growth rate constant for the remaining years to 2018. Exchange rates for OECD countries were extended to 2018 from the 2009 projections using the simple assumption of constant rates in real terms.

For non-member economies, historical and projection data for these macroeconomic series were obtained from the World Bank 2009 Global Economic Prospects of November 2008.

The model uses indices for real GDP, consumer prices (PCE deflator) and producer prices (GDP deflator) which are constructed with the base year 2000 value being equal to 1. The assumption of constant real exchange rates implies that a country with higher (lower) inflation relative to the United States (as measured by the US GDP deflator) will have a depreciating (appreciating) currency and therefore an increasing (decreasing) exchange rate over the projection period, since the exchange rate is measured as the local currency value of 1 USD.

Normally, the oil price used to generate the *Outlook* is based on information from the *OECD Economic Outlook*. For this year however, the short term oil price projections did not fully reflect the most recent market developments. Hence, for the first two years of the *Outlook* the oil price is from the US Energy Information Agency. For subsequent years, the oil price assumptions remain those of the *OECD Economic Outlook*.

The representation of production costs in Aglink-Cosimo

Changes in production costs are an important variable for farmers' decisions on crop and livestock production quantities, in addition to output returns and, if applicable, policy measures.

While supply in Aglink-Cosimo is largely determined by gross returns, production costs are represented in the model in the form of a cost index used to deflate gross production revenues. In other words, supply equations in the model in most cases depend on gross returns per unit of activity (such as returns per hectare or the meat price) relative to the overall production cost level as expressed by the index. Consequently, equations for harvested areas in crop production and for livestock production quantities take the following general forms:

$$AH = f\left(\frac{RH}{CPCI}\right); \quad QP = f\left(\frac{PP}{CPCI}\right)$$

with:

AH area harvested (crop production)

RH returns per hectare (crop production)

- CPCI commodity production cost index
 QP production quantity (livestock production)
 PP producer price (livestock production)

Among others, energy prices, increased by rising crude oil prices, have fostered attention to agricultural production costs in agricultural commodity models. Energy prices can significantly impact on international markets for agricultural products as production costs for both crops and livestock products are highly dependent on energy costs. Fuels for tractors and other machinery, as well as heating and other forms of energy are directly used in the production process. In addition, other inputs such as fertilisers and pesticides, have a high energy content, and costs for these inputs are driven to a significant extent by energy prices. It is therefore important to explicitly consider energy prices in the representation of production costs.

The production cost indices employed in Aglink-Cosimo – one each for crops and for livestock products, respectively, to account for the different shares of input groups in total production costs – is constructed from three sub-indices representing non-tradable inputs, energy inputs, and other tradable inputs, respectively. While the non-tradable sub-index is approximated by the domestic GDP deflator, the energy sub-index is affected by changes in the world crude oil price and the country's exchange rate. Finally, the tradable sub-index is linked to global inflation (approximated by the US GDP deflator) and the country's exchange rate. This relationship is shown in the following equation:

$$CPCI_{r,t}^I = CPCS_{r,t}^{NT,I} * GDPD_{r,t} + CPCS_{r,t}^{EN,I} * \left(\frac{XP_t^{OIL} * XR_{r,t}}{XP_{bas}^{OIL} * XR_{r,bas}} \right) + \left(1 - CPCS_{r,t}^{NT,I} - CPCS_{r,t}^{EN,I} \right) * \frac{XR_{r,t}}{XR_{r,bas}} * GDPD_{USA,t}$$

with:

- CPCI^I commodity production cost index for commodity group I
 CPCS^{NT,I} share of non-tradable input in total base commodity production costs for commodity group I
 CPCS^{EN,I} share of energy in total base commodity production costs for commodity group I
 GDPD deflator for the gross domestic product
 XP^{OIL} world crude oil price
 XR nominal exchange rate with respect to the US Dollar
 I commodity group (crops, livestock products)
 r,t region and time index, respectively
 bas base year (2000) value

Detailed data on the composition of production costs are available to the OECD Secretariat for Argentina, New Zealand and the United States. These data, available from the Secretariat on request, suggest non-tradable and energy shares in crop production costs as shown in the table below. Given that detailed data on other countries are not available, the respective crop production cost shares for Argentina are applied for all non-OECD countries, those for New Zealand are applied also for Australia, and the shares found for the US are applied for all other OECD countries/regions. As no data on livestock

production shares are available for Argentina, the shares found for the US are applied to all countries/regions with the exception of New Zealand and Australia.

Production cost shares for:		Argentina	New Zealand	United States
Crop production	Non-tradable	47%	66%	67%
	Energy	43%	27%	25%
	Other tradable	10%	7%	8%
	<i>Applied for:</i>	<i>All non-OECD countries/regions</i>	<i>New Zealand, Australia</i>	<i>All other OECD countries/regions</i>
Livestock production	Non-tradable	n.a.	77%	97%
	Energy	n.a.	23%	3%
	Other tradable ¹	n.a.	1%	0%
	<i>Applied for:</i>	–	<i>New Zealand, Australia</i>	<i>All other countries/regions</i>

1. Excludes tradable feed.

ANNEX A

Assumptions Tables

Table A.1. **Economic assumptions**

Calendar year ^a			Average 2006-08 est.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
REAL GDP^b													
Australia ^c	Base	%	3.1	1.7	2.7	3.2	3.2	3.0	2.7	2.7	2.7	2.7	2.7
	Lower GDP-slow recovery		3.1	0.5	2.4	3.2	3.2	3.0	2.7	2.7	2.7	2.7	2.7
	Lower GDP-faster recovery		3.1	0.5	2.4	3.7	3.5	3.3	2.9	2.8	2.8	2.8	2.7
Canada	Base	%	2.1	-0.5	2.1	2.8	2.5	2.5	2.4	2.4	2.4	2.4	2.4
	Lower GDP-slow recovery		2.1	-3.0	0.3	2.8	2.5	2.5	2.4	2.4	2.4	2.4	2.4
	Lower GDP-faster recovery		2.1	-3.0	0.3	4.2	3.6	3.3	3.0	2.7	2.6	2.5	2.5
European Union	Base	%	2.3	-0.5	1.2	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2
	Lower GDP-slow recovery		2.3	-4.1	-0.3	2.4	2.4	2.3	2.2	2.2	2.2	2.2	2.2
	Lower GDP-faster recovery		2.3	-4.1	-0.3	4.0	3.6	3.2	2.9	2.7	2.5	2.4	2.4
Japan	Base	%	1.7	-0.1	0.6	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1
	Lower GDP-slow recovery		1.7	-6.6	-0.5	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1
	Lower GDP-faster recovery		1.7	-6.6	-0.5	3.6	3.0	2.5	2.0	1.7	1.5	1.3	1.3
Korea ^c	Base	%	4.8	2.7	4.2	4.9	4.8	4.7	4.5	4.4	4.4	4.4	4.4
	Lower GDP-slow recovery		4.8	-4.0	3.2	4.9	4.8	4.7	4.5	4.4	4.4	4.4	4.4
	Lower GDP-faster recovery		4.8	-4.0	3.2	7.4	6.7	6.0	5.5	5.0	4.8	4.6	4.6
Mexico ^c	Base	%	3.3	0.4	1.8	3.4	3.7	3.7	3.7	3.8	3.8	3.8	3.8
	Lower GDP-slow recovery		3.3	-2.0	1.8	3.4	3.7	3.7	3.7	3.8	3.8	3.8	3.8
	Lower GDP-faster recovery		3.3	-2.0	1.8	4.1	4.3	4.2	4.0	4.0	3.9	3.8	3.8
New Zealand ^c	Base	%	1.6	-0.4	1.9	2.4	3.0	2.9	2.9	2.8	2.8	2.8	2.8
	Lower GDP-slow recovery		1.6	-1.2	1.2	2.4	3.0	2.9	2.9	2.8	2.8	2.8	2.8
	Lower GDP-faster recovery		1.6	-1.2	1.2	2.9	3.4	3.2	3.0	2.9	2.9	2.9	2.9
Norway	Base	%	3.0	1.3	1.6	3.8	3.9	3.8	3.7	3.6	3.6	3.6	3.6
	Lower GDP-slow recovery		3.0	-2.1	0.5	3.8	3.9	3.8	3.7	3.6	3.6	3.6	3.6
	Lower GDP-faster recovery		3.0	-2.1	0.5	5.3	5.0	4.6	4.2	3.9	3.8	3.7	3.7
Switzerland	Base	%	2.9	-0.2	1.6	2.6	2.6	2.5	2.4	2.4	2.4	2.4	2.4
	Lower GDP-slow recovery		2.9	-1.8	1.5	2.6	2.6	2.5	2.4	2.4	2.4	2.4	2.4
	Lower GDP-faster recovery		2.9	-1.8	1.5	3.2	3.0	2.8	2.6	2.5	2.5	2.4	2.4
Turkey	Base	%	4.8	1.7	4.9	4.7	4.6	4.6	4.6	4.6	4.6	4.6	4.6
	Lower GDP-slow recovery		4.8	-2.0	1.5	4.7	4.6	4.6	4.6	4.6	4.6	4.6	4.6
	Lower GDP-faster recovery		4.8	-2.0	1.5	6.9	6.3	5.8	5.4	5.1	4.9	4.8	4.7
United States	Base	%	2.1	-0.9	1.6	2.9	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	Lower GDP-slow recovery		2.1	-4.0	0.0	2.9	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	Lower GDP-faster recovery		2.1	-4.0	0.0	4.4	4.4	4.0	3.8	3.6	3.5	3.4	3.3
Argentina	Base	%	7.9	1.5	4.0	3.5	3.6	3.4	3.4	3.3	3.3	3.2	3.1
	Lower GDP-slow recovery		7.9	-1.8	1.9	3.5	3.6	3.4	3.4	3.3	3.3	3.2	3.1
	Lower GDP-faster recovery		7.9	-1.8	1.9	5.3	4.9	4.4	4.1	3.7	3.5	3.3	3.2
Brazil	Base	%	4.8	2.8	4.6	3.8	3.5	3.5	3.5	3.4	3.4	3.4	3.4
	Lower GDP-slow recovery		4.8	-0.3	3.8	3.8	3.5	3.5	3.5	3.4	3.4	3.4	3.4
	Lower GDP-faster recovery		4.8	-0.3	3.8	5.0	4.5	4.2	3.9	3.7	3.6	3.5	3.5
China	Base	%	11.0	7.5	8.5	7.7	7.7	7.5	7.5	7.5	7.5	7.5	7.5
	Lower GDP-slow recovery		11.0	6.3	8.5	7.7	7.7	7.5	7.5	7.5	7.5	7.5	7.5
	Lower GDP-faster recovery		11.0	6.3	8.5	8.0	7.9	7.7	7.6	7.6	7.6	7.5	7.5
India	Base	%	8.3	5.8	7.7	7.0	6.9	6.9	6.8	6.8	6.8	6.8	6.8
	Lower GDP-slow recovery		8.3	4.0	7.0	7.0	6.9	6.9	6.8	6.8	6.8	6.8	6.8
	Lower GDP-faster recovery		8.3	4.0	7.0	7.8	7.5	7.3	7.1	7.0	6.9	6.9	6.9
Russian Federation	Base	%	7.2	3.0	5.0	4.3	4.5	4.9	4.8	4.7	4.6	4.5	4.5
	Lower GDP-slow recovery		7.2	-5.6	0.7	4.3	4.5	4.9	4.8	4.7	4.6	4.5	4.5
	Lower GDP-faster recovery		7.2	-5.6	0.7	8.6	7.7	7.2	6.4	5.7	5.2	4.9	4.8
South Africa	Base	%	4.6	2.8	4.4	4.1	4.2	4.3	4.3	4.3	4.3	4.3	4.3
	Lower GDP-slow recovery		4.6	1.6	3.4	4.1	4.2	4.3	4.3	4.3	4.3	4.3	4.3
	Lower GDP-faster recovery		4.6	1.6	3.4	4.7	4.7	4.7	4.6	4.5	4.4	4.4	4.4
OECD ^{d, e}	Base	%	2.3	-0.4	1.6	2.7	2.8	2.7	2.7	2.7	2.7	2.7	2.7
	Lower GDP-slow recovery		2.3	-4.0	0.1	2.7	2.8	2.7	2.7	2.7	2.7	2.7	2.7
	Lower GDP-faster recovery		2.3	-4.0	0.1	4.3	4.0	3.6	3.3	3.1	3.0	2.9	2.9

For notes, see end of the table.

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

Calendar year ^a		2008 est. (million)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
POPULATION												
Australia	%	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9
Canada	%	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8
European Union	%	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Japan	%	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3
Korea	%	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.0
Mexico	%	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8
New Zealand	%	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7
Norway	%	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Switzerland	%	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Turkey	%	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9
United States	%	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Argentina	%	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.8
Brazil	%	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9
China	%	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
India	%	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.2
Russian Federation	%	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
South Africa	%	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
OECD ^c	%	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4
World	%	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0
Calendar year ^a		Average 2006-08 est.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PCE Deflator^b												
Australia	%	3.1	3.6	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Canada	%	1.5	0.8	0.9	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0
European Union	%	2.5	1.7	1.4	1.7	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Japan	%	-0.1	-0.2	-0.3	0.1	0.5	0.7	1.0	1.0	1.0	1.0	1.0
Korea	%	3.3	3.9	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Mexico	%	4.4	5.2	3.9	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
New Zealand	%	2.7	2.3	1.1	1.7	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Norway	%	2.1	2.7	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Switzerland	%	1.3	0.6	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Turkey	%	10.0	9.0	7.0	6.6	6.6	6.6	6.6	6.0	6.0	6.0	6.0
United States	%	3.0	1.2	1.3	1.4	1.6	1.7	1.9	1.9	1.9	1.9	1.9
Argentina	%	9.3	10.8	11.0	5.0	4.9	4.7	4.6	4.5	4.4	4.3	4.1
Brazil	%	4.2	4.8	4.8	4.0	4.6	4.2	4.3	4.3	4.3	4.3	4.3
China	%	4.5	5.5	4.5	4.2	4.0	3.9	3.8	3.7	3.6	3.4	3.3
India	%	6.9	6.1	5.0	4.1	4.1	4.1	4.1	4.5	4.5	4.5	4.5
Russian Federation	%	11.9	11.0	8.0	9.2	8.1	7.7	7.3	6.9	6.6	6.3	5.9
South Africa	%	7.2	9.1	6.7	7.7	7.7	7.7	7.6	6.0	6.0	6.0	6.0
OECD ^{d, e}	%	2.9	2.1	1.8	1.9	2.2	2.3	2.4	2.3	2.3	2.4	2.4
EXCHANGE RATE												
Australia	AUD/USD	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3
Canada	CAD/USD	1.1	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1
European Union	EUR/USD	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Japan	JPY/USD	112.5	103.0	101.1	99.6	98.4	97.2	96.2	95.2	94.2	93.2	92.2
Korea	'000 KRW/USD	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Mexico	MXN/USD	11.0	11.4	11.6	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9
New Zealand	NZD/USD	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5
Argentina	ARS/USD	3.1	3.3	3.5	3.6	3.7	3.8	3.8	3.9	4.0	4.1	4.1
Brazil	BRL/USD	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.4	2.4
China	CNY/USD	7.5	6.7	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2	6.2
India	INR/USD	43.3	47.2	46.2	47.7	49.1	50.6	51.9	53.3	54.7	56.2	57.7

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

Calendar year ^a		2008 est. (million)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Russian Federation	<i>RUR/USD</i>	27.1	31.1	32.6	33.1	33.2	33.1	32.9	32.6	32.3	31.8	31.2
South Africa	<i>ZAR/USD</i>	7.3	9.0	9.2	9.6	10.0	10.5	10.9	11.4	11.8	12.3	12.8
WORLD OIL PRICE												
Brent crude oil price ^f	<i>USD/barrel</i>	79.0	43.3	54.5	60.7	61.9	63.1	64.3	65.5	66.7	67.9	69.1

a) For OECD member countries, historical data for population, real GDP, private consumption expenditure deflator and exchange rate were obtained from the *OECD Economic Outlook* No. 84, December 2008. For non-member economies, historical macroeconomic data were obtained from the World Bank, November 2008. Assumptions for the projection period draw on the recent medium term macroeconomic projections of the OECD Economics Department, projections of the World Bank, responses to a questionnaire sent to member country agricultural experts and for population, projections from the United Nations World Population Prospects Database, 2006 Revision (medium variant). Data for the European Union are for the euro area aggregates.

b) Annual per cent change. The price index used is the private consumption expenditure deflator.

c) Not available from ECO department. of OECD. Using World Bank short term update (31-03-2009).

d) Excludes Iceland.

e) Annual weighted average real GDP and CPI growth rates in OECD countries are based on weights using 1995 GDP and purchasing power parities (PPPs).

f) Short term update for crude oil price from the Energy Information Administration.

Source: OECD and FAO Secretariats.

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Table A.2. **Main policy assumptions for cereal markets**

Crop year ^a		Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
ARGENTINA												
Crops export tax	%	22	27	27	27	27	27	27	27	27	27	27
Rice export tax	%	10	10	10	10	10	10	10	10	10	10	10
CANADA												
Tariff-quotas ^b												
Wheat	kt	350	350	350	350	350	350	350	350	350	350	350
In-quota tariff	%	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Out-of-quota tariff	%	62	62	62	62	62	62	62	62	62	62	62
Barley	kt	399	399	399	399	399	399	399	399	399	399	399
In-quota tariff	%	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Out-of-quota tariff	%	58	58	58	58	58	58	58	58	58	58	58
EUROPEAN UNION^{c, d}												
Cereal support price ^e	EUR/t	101	101	101	101	101	101	101	101	101	101	101
Cereal compensation ^{f, g}	EUR/ha	31	31	31	31	31	31	31	31	31	31	31
Rice support price ^h	EUR/t	150	150	150	150	150	150	150	150	150	150	150
Compulsory set-aside rate	%	7	0	0	0	0	0	0	0	0	0	0
Set-aside payment ^g	EUR/ha	31	31	31	31	31	31	31	31	31	31	31
Direct payment for rice	EUR/ha	470	470	470	470	0	0	0	0	0	0	0
Wheat tariff-quota ^b	kt	3 780	3 780	3 780	3 780	3 780	3 780	3 780	3 780	3 780	3 780	3 780
Coarse grain tariff-quota ^b	kt	3 469	3 469	3 469	3 469	3 469	3 469	3 469	3 469	3 469	3 469	3 469
Subsidised export limits ^b												
Wheat	mt	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4
Coarse grains ⁱ	mt	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
JAPAN												
Wheat tariff-quota	kt	5 740	5 740	5 740	5 740	5 740	5 740	5 740	5 740	5 740	5 740	5 740
In-quota tariff	'000 JPY/t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Out-of-quota tariff	'000 JPY/t	55	55	55	55	55	55	55	55	55	55	55
Barley tariff-quota	kt	1 369	1 369	1 369	1 369	1 369	1 369	1 369	1 369	1 369	1 369	1 369
In-quota tariff	'000 JPY/t	0	0	0	0	0	0	0	0	0	0	0
Out-of-quota tariff	'000 JPY/t	39	39	39	39	39	39	39	39	39	39	39
Rice tariff-quota ^j	kt	682	682	682	682	682	682	682	682	682	682	682
In-quota tariff	'000 JPY/t	0	0	0	0	0	0	0	0	0	0	0
Out-of-quota tariff	'000 JPY/t	341	341	341	341	341	341	341	341	341	341	341
KOREA												
Wheat tariff	%	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Maize tariff-quota	kt	6 102	6 102	6 102	6 102	6 102	6 102	6 102	6 102	6 102	6 102	6 102
In-quota tariff	%	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Out-of-quota tariff	%	404	404	404	404	404	404	404	404	404	404	404
Barley tariff-quota	kt	54	54	54	54	54	54	54	54	54	54	54
In-quota tariff	%	23	23	23	23	23	23	23	23	23	23	23
Out-of-quota tariff	%	359	359	359	359	359	359	359	359	359	359	359
Rice quota ^j	kt	205	205	205	205	205	205	205	205	205	205	205
In-quota tariff	%	5	5	5	5	5	5	5	5	5	5	5

For notes, see end of the table.

Table A.2. **Main policy assumptions for cereal markets (cont.)**

Crop year ^a		Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
MERCOSUR												
Wheat tariff	%	10	10	10	10	10	10	10	10	10	10	10
Coarse grain tariff	%	8	8	8	8	8	8	8	8	8	8	8
Rice tariff	%	10	10	10	10	10	10	10	10	10	10	10
MEXICO												
Wheat NAFTA tariff	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maize tariff-quota	kt	2 501	2 501	2 501	2 501	2 501	2 501	2 501	2 501	2 501	2 501	2 501
In-quota tariff	%	50	50	50	50	50	50	50	50	50	50	50
Out-of-quota tariff	%	194	194	194	194	194	194	194	194	194	194	194
Barley tariff-quota	kt	5	5	5	5	5	5	5	5	5	5	5
In-quota tariff	%	50	50	50	50	50	50	50	50	50	50	50
Out-of-quota tariff	%	115	115	115	115	115	115	115	115	115	115	115
UNITED STATES												
ACRE participation rate												
Wheat	%	0	10	10	10	10	10	10	10	10	10	10
Coarse grains	%	0	10	10	10	10	10	10	10	10	10	10
Rice	%	0	10	10	10	10	10	10	10	10	10	10
Wheat loan rate	USD/t	101	101	108	108	108	108	108	108	108	108	108
Maize loan rate	USD/t	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8	76.8
Prod. flex. contract payment												
Wheat	USD/t	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9
Maize	USD/t	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
CRP areas ^k												
Wheat	mha	3.6	3.5	3.3	3.2	3.1	3.1	3.2	3.3	3.3	3.3	3.3
Coarse grains	mha	3.4	3.3	3.0	2.9	2.9	2.9	2.9	3.0	3.1	3.1	3.1
Subsidised export limits ^b												
Wheat	mt	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Coarse grains	mt	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Wheat EEP payment ^l	USD/t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHINA												
Wheat tariff-quota	kt	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636	9 636
In-quota tariff	%	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Out-of-quota tariff	%	65	65	65	65	65	65	65	65	65	65	65
Coarse grains tariff	%	2	2	2	2	2	2	2	2	2	2	2
Maize tariff-quota	kt	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200	7 200
In-quota tariff	%	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	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320	5 320
In-quota tariff	%	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Out-of-quota tariff	%	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7
INDIA												
Input subsidy rate coarse grains ^m	INR/t	1 239	1 207	1 207	1 207	1 207	1 207	1 207	1 207	1 207	1 207	1 207
Input subsidy rate rice ^m	INR/t	657	638	638	638	638	638	638	638	638	638	638
Input subsidy rate wheat ^m	INR/t	1 782	1 673	1 673	1 673	1 673	1 673	1 673	1 673	1 673	1 673	1 673
Minimum support price												
Maize	INR/t	5 400	5 400	5 400	5 400	5 400	5 400	5 400	5 400	5 400	5 400	5 400
Rice	INR/t	5 400	5 800	5 800	5 683	5 682	5 681	5 681	5 680	5 679	5 678	5 677
Wheat	INR/t	6 500	6 500	6 500	6 500	6 500	6 500	6 500	6 500	6 500	6 500	6 500
Wheat Export subsidy	INR/t	1 941	1 941	1 941	1 941	1 941	1 941	1 941	1 941	1 941	1 941	1 941
Wheat tariff	%	88	88	88	88	88	88	88	88	88	88	88
Maize tariff	%	50	50	50	50	50	50	50	50	50	50	50
Rice tariff	%	30	30	30	30	30	30	30	30	30	30	30
Barley tariff	%	100	100	100	100	100	100	100	100	100	100	100

Table A.2. **Main policy assumptions for cereal markets (cont.)**

- a) Beginning crop marketing year – see Glossary of Terms for definitions.
- b) Year beginning 1 July.
- c) Prices and payments in market Euro – see Glossary of Terms.
- d) EU farmers also benefit from the Single Farm Payment (SFP) Scheme, which provides flat-rate payments independent from current production decisions and market developments. For the new member states, payments are phased in with the assumption of maximum top-ups from national budgets up to 2013 through the Single Area Payment (SAP), and through the (SFP) from 2014. Due to modulation, an increasing share of the total SFP will go to rural development spending rather than directly to farmers.
- e) Common intervention price for soft wheat, barley, maize and sorghum.
- f) Compensatory area payments.
- g) Actual payments made per hectare based on programme yields.
- h) Subject to a purchase limit of 75 000 tonnes per year.
- i) The export volume excludes 0.4mt of exported potato starch. The original limit on subsidised exports is 10.8 mt.
- j) Husked rice basis.
- k) Includes wheat, barley, maize, oats and sorghum.
- l) Average per tonne of total exports.
- m) Indian input subsidies consist of those for electricity, fertiliser and irrigation.

Note: The source for tariffs and Tariff Rate Quotas is AMAD (Agricultural market access database). The tariff and TRQ data are based on Most Favoured Nation rates scheduled with the WTO and exclude those under preferential or regional agreements, which may be substantially different. Tariffs are simple averages of several product lines. Specific rates are converted to *ad valorem* rates using world prices in the Outlook. Import quotas are based on global commitments scheduled in the WTO rather than those allocated to preferential partners under regional or other agreements. For Mexico, the NAFTA in-quota tariff on maize and barley is zero, while the tariff-rate quota becomes unlimited in 2003 for barley and 2008 for maize.

est.: estimate.

Source: OECD and FAO Secretariats.

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Table A.3. Main policy assumptions for oilseed markets

Crop year ^a		06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
ARGENTINA												
Oilseed export tax	%	30.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Oilseed meal export tax	%	26.7	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Oilseed oil export tax	%	26.7	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
AUSTRALIA												
Tariffs												
Soybean oil	%	8	8	8	8	8	8	8	8	8	8	8
Rapeseed oil	%	8	8	8	8	8	8	8	8	8	8	8
CANADA												
Tariffs												
Rapeseed oil	%	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
EUROPEAN UNION^b												
Oilseed compensation ^{c, d}	EUR/ha	31	31	31	31	31	31	31	31	31	31	31
Compulsory set-aside rate	%	6.7	0	0	0	0	0	0	0	0	0	0
Tariffs												
Soybean oil	%	6	6	6	6	6	6	6	6	6	6	6
Rapeseed oil	%	6	6	6	6	6	6	6	6	6	6	6
JAPAN												
New output payments												
Soybeans	bn. JPY	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
Tariffs												
Soybean oil	JPY/kg	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Rapeseed oil	JPY/kg	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
KOREA												
Soybean tariff-quota	kt	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032	1 032
In-quota tariff	%	5	5	5	5	5	5	5	5	5	5	5
Out-of-quota tariff	%	487	487	487	487	487	487	487	487	487	487	487
Soybean (for food) mark up	'000 KRW/t	178	154	157	160	166	165	163	165	167	167	168
MEXICO												
Tariffs												
Soybeans	%	33	33	33	33	33	33	33	33	33	33	33
Soybean meal	%	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8	23.8
Soybean oil	%	45	45	45	45	45	45	45	45	45	45	45
UNITED STATES												
ACRE participation rate												
Soybeans	%	0.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Soybeans loan rate	USD/t	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7	183.7
CRP area												
Soybeans	mha	2.2	1.9	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8
Tariffs												
Rapeseed	%	3	3	3	3	3	3	3	3	3	3	3
Soybean meal	%	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Rapeseed meal	%	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Soybean oil	%	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Rapeseed oil	%	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Subsidised export limits												
Oilseed oils	kt	141	141	141	141	141	141	141	141	141	141	141

For notes, see end of the table.

Table A.3. **Main policy assumptions for oilseed markets (cont.)**

Crop year		Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
CHINA												
Soybeans support price	CNY/t	1 440.4	1 608.5	1 667.0	1 731.3	1 798.0	1 867.0	1 938.5	2 012.4	2 086.4	2 161.0	2 236.0
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	9	9	9	9	9	9	9	9	9	9
Vegetable oil tariff-quota	kt	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1	7 998.1
INDIA												
Input subsidy rate, oilseeds ^e	R/T	5 039	4 888.3	4 888.3	4 888.3	4 888.3	4 888.3	4 888.3	4 888.3	4 888.3	4 888.3	4 888.3
Soybean tariff	%	32	30	30	30	30	30	30	30	30	30	30
Rapeseed tariff	%	32	30	30	30	30	30	30	30	30	30	30
Sunflower tariff	%	32	30	30	30	30	30	30	30	30	30	30
Oilseed tariff	%	32	30	30	30	30	30	30	30	30	30	30
Soybean meal tariff	%	100	100	100	100	100	100	100	100	100	100	100
Rapeseed meal tariff	%	100	100	100	100	100	100	100	100	100	100	100
Sunflower meal tariff	%	100	100	100	100	100	100	100	100	100	100	100
Soybean oil tariff	%	45	45	45	45	45	45	45	45	45	45	45
Rapeseed oil tariff	%	45	45	45	45	45	45	45	45	45	45	45
Sunflower oil tariff	%	65	60	60	60	60	60	60	60	60	60	60
Palm oil tariff	%	60	50	50	50	50	50	50	50	50	50	50
Vegetables oil tariff	%	65	48	48	48	48	48	48	48	48	48	48

a) Beginning crop marketing year – see Glossary of Terms for definitions.

b) EU farmers also benefit from the Single Farm Payment (SFP) Scheme, which provides flat-rate payments independent from current production decisions and market developments. For the new member states, payments are phased in with the assumption of maximum top-ups from national budgets up to 2013 through the Single Area Payment (SAP), and through the (SFP) from 2014. Due to modulation, an increasing share of the total SFP will go to rural development spending rather than directly to farmers.

c) Compensatory area payments, before penalties.

d) Payments made per hectare based on regional yields.

e) Indian input subsidies consist of those for electricity, fertiliser and irrigation.

Note: The source for tariffs and Tariff Rate Quotas is AMAD (Agricultural market access database). The tariff and TRQ data are based on Most Favoured Nation rates scheduled with the WTO and exclude those under preferential or regional agreements, which may be substantially different. Tariffs are simple averages of several product lines. Specific rates are converted to ad valorem rates using world prices in the Outlook. Import quotas are based on global commitments scheduled in the WTO rather than those allocated to preferential partners under regional or other agreements. For Mexico, the NAFTA tariffs on soybeans, oil meals and soybean oil are zero after 2003. est.: estimate.

Source: OECD and FAO Secretariats.

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Table A.4. **Main policy assumptions for sugar markets**

Crop year ^a		Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
MAIN ASSUMPTIONS FOR SUGAR MARKETS												
ARGENTINA												
Tariff, sugar	ARS/t	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
BANGLADESH												
Tariff, white sugar	%	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5
BRAZIL												
Tariff, raw sugar	%	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Tariff, white sugar	%	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Ethanol blending ratio with gasoline	%	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
CANADA												
Tariff, raw sugar	CAD/t	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7
Tariff, white sugar	CAD/t	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9
CHINA^b												
TRQ sugar	kt	1 954	1 954	1 954	1 954	1 954	1 954	1 954	1 954	1 954	1 954	1 954
Tariff, in-quota, raw sugar	%	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Tariff, in-quota, white sugar	%	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Tariff, over-quota	%	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
EU^c												
Reference price, white sugar ^d	EUR/t	602	404	404	404	404	404	404	404	404	404	404
Effective quota ^e	kt rse	17 691	14 546	14 046	14 046	14 046	14 046	14 046	14 046	14 046	14 046	14 046
Subsidised export limits												
Quantity Limit	kt rse	1 431	1 431	1 431	1 431	1 431	1 431	1 431	1 431	1 431	1 431	1 431
Value Limit	000 EUR	534 426	534 426	534 426	534 426	534 426	534 426	534 426	534 426	534 426	534 426	534 426
Tariff, raw sugar	EUR/t	339	339	339	339	339	339	339	339	339	339	339
Tariff, white sugar	EUR/t	419	419	419	419	419	419	419	419	419	419	419
INDIA												
Intervention price, sugar cane	INR/t	750	750	750	750	750	750	750	750	750	750	750
Applied tariff, raw sugar	%	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
INDONESIA												
Tariff, white sugar	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
JAPAN												
Minimum stabilisation price, raw sugar	JPY/kg	151.8	151.8	151.8	151.8	151.8	151.8	151.8	151.8	151.8	151.8	151.8
Tariff, raw sugar	JPY/kg	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8	71.8
Tariff, white sugar	JPY/kg	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1	103.1
KOREA												
Tariff, raw sugar	%	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
MEXICO												
Mexico common external tariff, raw sugar	MXN/t	4,331	4 493	4 578	4 652	4 728	4 796	4 853	4 911	4 970	5 029	5 090
Mexico common external tariff, white sugar	MXN/t	4,331	4 493	4 578	4 652	4 728	4 796	4 853	4 911	4 970	5 029	5 090
RUSSIAN FEDERATION												
Tariff, raw sugar ^f	%	55.6	45.7	42.2	39.2	37.4	40.3	44.0	43.2	43.6	42.9	41.3
Tariff, white sugar ^f	%	46.7	48.5	45.2	40.3	38.7	39.8	40.6	38.9	38.3	35.9	32.4
UNITED STATES^c												
Loan rate, cane sugar	USD/t	396.8	402.3	407.9	413.4	413.4	413.4	413.4	413.4	413.4	413.4	413.4
Loan rate, beet sugar	USD/t	506.5	517.0	524.1	531.2	531.2	531.2	531.2	531.2	531.2	531.2	531.2
TRQ, raw sugar	kt rse	1 308	1 182	1 184	1 186	1 191	1 193	1 195	1 198	1 202	1 205	1 207
TRQ, refined sugar	kt rse	49	49	49	49	49	49	49	49	49	49	49
Raw sugar 2nd tier WTO tariff	USD/t	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6	338.6
White sugar 2nd tier WTO tariff	USD/t	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4	357.4
Raw sugar 2nd tier NAFTA tariff	USD/t	33	0	0	0	0	0	0	0	0	0	0

Table A.4. **Main policy assumptions for sugar markets**

Crop year ^a		Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
SOUTH AFRICA												
Tariff, raw sugar	%	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0
TANZANIA												
Applied tariff, white sugar	%	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
VIET NAM												
Applied tariff, white sugar	%	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

a) Beginning crop marketing year – see the Glossary of Terms for definitions.

b) Refers to mainland only.

c) In addition, price based special safeguard actions may apply.

d) Reference price for consumers.

e) Production that receives official support. Includes the 10 new member countries from May 2004, Bulgaria and Romania.

f) Assumes a wholesale price target of USD 470 per tonne as the basis for setting the floating tariff duty.

Note: The source for tariffs (except United States and Russian Federation) is AMAD. The source for Russian Federation and United States tariffs is ERS, USDA.

est: estimate.

rse : raw sugar equivalent.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/680885486787>

Table A.5. **Main policy assumptions for meat markets**

		Average 2006-08 est.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ARGENTINA												
Beef export tax	%	15	15	15	15	15	15	15	15	15	15	15
CANADA												
Beef tariff-quota	kt pw	76	76	76	76	76	76	76	76	76	76	76
In-quota tariff	%	0	0	0	0	0	0	0	0	0	0	0
Out-of-quota tariff	%	27	27	27	27	27	27	27	27	27	27	27
Poultry meat tariff-quota	kt pw	45	45	45	45	45	45	45	45	45	45	45
In-quota tariff	%	2	2	2	2	2	2	2	2	2	2	2
Out-of-quota tariff	%	197	197	197	197	197	197	197	197	197	197	197
EUROPEAN UNION^a												
Beef basic price ^{b, c, d}	EUR/kg dw	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Beef buy-in price ^d	EUR/kg dw	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Pig meat basic price ^c	EUR/kg dw	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sheep meat basic price	EUR/kg dw	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Sheep basic rate ^e	EUR/head	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Male bovine premium	EUR/head	0	0	0	0	0	0	0	0	0	0	0
Adult bovine slaughter premium	EUR/head	0	0	0	0	0	0	0	0	0	0	0
Calf slaughter premium	EUR/head	0	0	0	0	0	0	0	0	0	0	0
Suckler cow premium	EUR/head	0	0	0	0	0	0	0	0	0	0	0
Beef tariff-quota	kt pw	216	216	216	216	216	216	216	216	216	216	216
Pig meat tariff-quota	kt pw	167	167	167	167	167	167	167	167	167	167	167
Poultry meat tariff-quota	kt pw	96	96	96	96	96	96	96	96	96	96	96
Sheep meat tariff-quota	kt cwe	285	285	285	285	285	285	285	285	285	285	285
Subsidised export limits ^c												
Beef ^f	kt cwe	990	990	990	990	990	990	990	990	990	990	990
Pig meat ^f	kt cwe	588	588	588	588	588	588	588	588	588	588	588
Poultry meat	kt cwe	431	431	431	431	431	431	431	431	431	431	431
JAPAN^g												
Beef stabilisation prices												
Upper price	JPY/kg dw	1 010	1 010	1 010	1 010	1 010	1 010	1 010	1 010	1 010	1 010	1 010
Lower price	JPY/kg dw	780	780	780	780	780	780	780	780	780	780	780
Beef tariff	%	39	39	39	39	39	39	39	39	39	39	39
Pig meat stabilisation prices												
Upper price	JPY/kg dw	480	480	480	480	480	480	480	480	480	480	480
Lower price	JPY/kg dw	365	365	365	365	365	365	365	365	365	365	365
Pig meat import system ^h												
Tariff	%	4	4	4	4	4	4	4	4	4	4	4
Standard import price	JPY/kg dw	410	410	410	410	410	410	410	410	410	410	410
Poultry meat tariff	%	7	7	7	7	7	7	7	7	7	7	7

For notes, see end of the table.

Table A.5. **Main policy assumptions for meat markets (cont.)**

		2006-08 est.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
KOREA												
Beef tariff	%	40	40	40	40	40	40	40	40	40	40	40
Beef mark-up	%	0	0	0	0	0	0	0	0	0	0	0
Pig meat tariff	%	22	22	22	22	22	22	22	22	22	22	22
Poultry meat tariff	%	21	21	21	21	21	21	21	21	21	21	21
MEXICO												
Pig meat tariff	%	45	45	45	45	45	45	45	45	45	45	45
Pig meat NAFTA tariff	%	0	0	0	0	0	0	0	0	0	0	0
Poultry meat tariff-quota	kt pw	41	41	41	41	41	41	41	41	41	41	41
In-quota tariff	%	50	50	50	50	50	50	50	50	50	50	50
Out-of-quota tariff	%	228	228	228	228	228	228	228	228	228	228	228
RUSSIAN FEDERATION												
Beef tariff-quota	kt pw	468	480	480	480	480	480	480	480	480	480	480
In-quota tariff	%	15	15	15	15	15	15	15	15	15	15	15
Out-of-quota tariff	%	47	40	40	40	40	40	40	40	40	40	40
Pigmeat tariff-quota	kt pw	467	532	532	532	532	532	532	532	532	532	532
In-quota tariff	%	15	15	15	15	15	15	15	15	15	15	15
Out-of-quota tariff	%	58	40	40	40	40	40	40	40	40	40	40
Poultry meat tariff-quota	kt pw	1 171	952	952	952	952	952	952	952	952	952	952
In-quota tariff	%	25	25	25	25	25	25	25	25	25	25	25
UNITED STATES												
Beef tariff-quota	kt pw	697	697	697	697	697	697	697	697	697	697	697
In-quota tariff	%	5	5	5	5	5	5	5	5	5	5	5
Out-of-quota tariff	%	26	26	26	26	26	26	26	26	26	26	26
CHINA												
Beef tariff	%	16	16	16	16	16	16	16	16	16	16	16
Pig meat tariff	%	16	16	16	16	16	16	16	16	16	16	16
Sheep meat tariff	%	15	15	15	15	15	15	15	15	15	15	15
Poultry meat tariff	%	19	19	19	19	19	19	19	19	19	19	19
INDIA												
Beef tariff	%	100	100	100	100	100	100	100	100	100	100	100
Pig meat tariff	%	100	100	100	100	100	100	100	100	100	100	100
Sheep meat tariff	%	92	92	92	92	92	92	92	92	92	92	92
Poultry meat tariff	%	87	87	87	87	87	87	87	87	87	87	87
Eggs tariff	%	150	150	150	150	150	150	150	150	150	150	150
SOUTH AFRICA												
Sheepmeat tariff-quota	kt pw	6	6	6	6	6	6	6	6	6	6	6
In-quota tariff	%	20	20	20	20	20	20	20	20	20	20	20
Out-of-quota tariff	%	96	96	96	96	96	96	96	96	96	96	96

a) EU farmers also benefit from the Single Farm Payment (SFP) Scheme, which provides flat-rate payments independent from current production decisions and market developments. For the new member states, payments are phased in with the assumption of maximum top-ups from national budgets up to 2013 through the Single Area Payment (SAP), and through the (SFP) from 2014. Due to modulation, an increasing share of the total SFP will go to rural development spending rather than directly to farmers.

b) Price for R3 grade male cattle.

c) Year beginning 1 July.

d) Basic price for storage.

e) A supplementary payment of 7 euro per head is provided for Less Favoured Areas.

f) Includes live trade.

g) Year beginning 1 April.

h) Pig carcass imports. Emergency import procedures triggered from November 1995 to March 1996, from July 1996 to June 1997, from August 2001 to March 2002, from August 2002 to March 2003 and from August 2003 to March 2004.

est.: estimate.

Source: OECD and FAO Secretariats

StatLink  <http://dx.doi.org/10.1787/680885888325>

Table A.6. Main policy assumptions for dairy markets

Calendar year ^a		Average 2006-08 est.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ARGENTINA												
Dairy export tax	%	13	5	5	5	5	5	5	5	5	5	5
CANADA												
Milk target price ^b	CADc/litre	72	74	75	75	75	77	77	78	79	80	81
Butter support price	CAD/t	6 898	7 120	7 289	7 450	7 614	7 781	7 952	8 127	8 306	8 489	8 676
SMP support price	CAD/t	5 913	6 116	6 120	6 059	6 085	6 165	6 173	6 211	6 263	6 294	6 331
Cheese tariff-quota	kt pw	20	20	20	20	20	20	20	20	20	20	20
In-quota tariff	%	1	1	1	1	1	1	1	1	1	1	1
Out-of-quota tariff	%	246	246	246	246	246	246	246	246	246	246	246
Subsidised export limits ^c												
Cheese	kt pw	9	9	9	9	9	9	9	9	9	9	9
SMP	kt pw	45	45	45	45	45	45	45	45	45	45	45
EUROPEAN UNION^d												
Milk quota ^e	mt pw	144	148	150	151	152	154	154	0	0	0	0
Butter intervention price	EUR/t	2 566	2 462	2 462	2 462	2 462	2 462	2 462	2 462	2 462	2 462	2 462
SMP intervention price	EUR/t	1 764	1 698	1 698	1 698	1 698	1 698	1 698	1 698	1 698	1 698	1 698
Butter tariff-quota	kt pw	90	90	90	90	90	90	90	90	90	90	90
Cheese tariff-quota	kt pw	103	103	103	103	103	103	103	103	103	103	103
SMP tariff-quota	kt pw	71	71	71	71	71	71	71	71	71	71	71
Subsidised export limits ^c												
Butter	kt pw	412	412	412	412	412	412	412	412	412	412	412
Cheese	kt pw	332	332	332	332	332	332	332	332	332	332	332
SMP	kt pw	323	323	323	323	323	323	323	323	323	323	323
JAPAN												
Direct payments	JPY/kg	11	11	11	11	11	11	11	11	11	11	11
Cheese tariff ^f	%	31	31	31	31	31	31	31	31	31	31	31
Tariff-quotas												
Butter	kt pw	2	2	2	2	2	2	2	2	2	2	2
In-quota tariff	%	35	35	35	35	35	35	35	35	35	35	35
Out-of-quota tariff	%	733	733	733	733	733	733	733	733	733	733	733
SMP	kt pw	116	116	116	116	116	116	116	116	116	116	116
In-quota tariff	%	16	16	16	16	16	16	16	16	16	16	16
Out-of-quota tariff	%	210	210	210	210	210	210	210	210	210	210	210
WMP	t pw	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
In-quota tariff	%	24	24	24	24	24	24	24	24	24	24	24
Out-of-quota tariff	%	316	316	316	316	316	316	316	316	316	316	316
KOREA												
Tariff-quotas												
Butter	kt pw	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
In-quota tariff	%	40	40	40	40	40	40	40	40	40	40	40
Out-of-quota tariff	%	89	89	89	89	89	89	89	89	89	89	89
SMP	kt pw	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
In-quota tariff	%	20	20	20	20	20	20	20	20	20	20	20
Out-of-quota tariff	%	176	176	176	176	176	176	176	176	176	176	176
WMP	kt pw	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
In-quota tariff	%	40	40	40	40	40	40	40	40	40	40	40
Out-of-quota tariff	%	176	176	176	176	176	176	176	176	176	176	176

For notes, see end of the table.

Table A.6. Main policy assumptions for dairy markets (cont.)

		Average 2006-08 est.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
MEXICO												
Butter tariff	%	0	0	0	0	0	0	0	0	0	0	0
Tariff-quotas												
cheese	kt pw	9	9	9	9	9	9	9	9	9	9	9
In-quota tariff	%	50	50	50	50	50	50	50	50	50	50	50
Out-of-quota tariff	%	125	125	125	125	125	125	125	125	125	125	125
SMP	kt pw	90	90	90	90	90	90	90	90	90	90	90
In-quota tariff	%	0	0	0	0	0	0	0	0	0	0	0
Out-of-quota tariff	%	125	125	125	125	125	125	125	125	125	125	125
Liconsa social program	MXN mn	767	500	500	500	500	500	500	500	500	500	500
RUSSIAN FEDERATION												
Butter tariff	%	10	15	5	5	5	5	5	5	5	5	5
Cheese tariff	%	8	5	5	5	5	5	5	5	5	5	5
UNITED STATES^g												
Milk support price ^b	USDc/litre	22	22	22	22	22	22	22	22	22	22	22
Target price ^h	USDc/litre	37	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3
Butter support price	USD/t	2 315	2 315	2 315	2 315	2 315	2 315	2 315	2 315	2 315	2 315	2 315
SMP support price	USD/t	1 764	1 764	1 764	1 764	1 764	1 764	1 764	1 764	1 764	1 764	1 764
Butter tariff-quota	kt pw	13	13	13	13	13	13	13	13	13	13	13
In-quota tariff	%	10	10	10	10	10	10	10	10	10	10	10
Out-of-quota tariff	%	112	112	112	112	112	112	112	112	112	112	112
Cheese tariff-quota	kt pw	135	135	135	135	135	135	135	135	135	135	135
In-quota tariff	%	12	12	12	12	12	12	12	12	12	12	12
Out-of-quota tariff	%	87	87	87	87	87	87	87	87	87	87	87
Subsidised export limits ^c												
Butter	kt pw	21	21	21	21	21	21	21	21	21	21	21
SMP	kt pw	68	68	68	68	68	68	68	68	68	68	68
INDIA												
Milk tariff	%	80	80	80	80	80	80	80	80	80	80	80
Butter tariff	%	40	40	40	40	40	40	40	40	40	40	40
Cheese tariff	%	40	40	40	40	40	40	40	40	40	40	40
Whole milk powder tariff	%	20	20	20	20	20	20	20	20	20	20	20
SOUTH AFRICA												
Milk powder tariff-quota	kt pw	4	4	4	4	4	4	4	4	4	4	4
In-quota tariff	%	20	20	20	20	20	20	20	20	20	20	20
Out-of-quota tariff	%	81	81	81	81	81	81	81	81	81	81	81

a) Year ending 30 June.

b) For manufacturing milk.

c) The effective volume of cheese and SMP subsidized exports will be lower reflecting the binding nature of subsidized export limits in value terms.

d) EU farmers also benefit from the Single Farm Payment (SFP) Scheme, which provides flat-rate payments independent from current production decisions and market developments. For the new member states, payments are phased in with the assumption of maximum top-ups from national budgets up to 2013 through the Single Area Payment (SAP), and through the (SFP) from 2014. Due to modulation, an increasing share of the total SFP will go to rural development spending rather than directly to farmers

e) Total quota, EU27 starting in 1999.

f) Excludes processed cheese.

g) Year beginning 1 January.

h) The counter-cyclical payment for milk is determined as a percentage difference between the target price and the Boston class I price. The difference is set at 34% in 2007 and 2008, at 45% in 2009-2012 and 34% thereafter. The target price is adjusted by 45% of the percentage difference between the National Average Dairy Feed Rations Cost and the target cost of feed rations of 16.20USD/100kg between 2009 and 2012 and 20.94USD/100kg thereafter.

Note: The source for tariffs and Tariff Rate Quotas (except Russian Federation) is AMAD (Agricultural market access database). The tariff and TRQ data are based on Most Favoured Nation rates scheduled with the WTO and exclude those under preferential or regional agreements, which may be substantially different. Tariffs are simple averages of several product lines. Specific rates are converted to ad valorem rates using world prices in the Outlook. Import quotas are based on global commitments scheduled in the WTO rather than those allocated to preferential partners under regional or other agreements..

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681012302646>

Table A.7. **Main policy assumptions for biofuel markets**

		07/08	08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
BRAZIL													
<i>Ethanol</i>													
Import tariffs	%	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Incorporation mandate ^a	%	17.46	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.26
<i>Biodiesel</i>													
Tax concessions ^b	BRL/hl	7	7	7	7	7	7	7	7	7	7	7	7
Import tariffs	%	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
CANADA													
<i>Ethanol</i>													
Tax concessions ^b	CAD/hl	17	7	7	6	6	6	6	6	6	6	6	2
Import tariffs	CAD/hl	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Incorporation mandate ^a	%	1.34	1.34	2.89	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41
Direct support ^c													
Ontario	CAD/hl	11.00	21.00	21.00	21.00	19.00	18.00	17.00	16.00	15.00	15.00	0.00	0.00
Prairies	CAD/hl	8.94	18.94	18.94	18.94	8.00	7.00	6.00	5.00	4.00	4.00	0.00	0.00
<i>Biodiesel</i>													
Tax concessions ^b	CAD/hl	12	8	8	8	8	8	8	8	8	8	8	8
Incorporation mandate ^a	%	0.00	0.00	0.59	0.93	1.27	1.61	1.61	1.61	1.61	1.61	1.61	1.61
Direct support	CAD/hl	1.81	21.81	21.81	21.81	16.00	14.00	12.00	10.00	8.00	6.00	0.00	0.00
COLOMBIA													
<i>Ethanol</i>													
Import tariffs	%	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65
Blending target ^d	%	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
<i>Biodiesel</i>													
Blending target	%	0.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
EU													
<i>Ethanol</i>													
Tax concessions ^{b, e}	EUR/hl	30	30	30	30	30	30	30	30	30	30	30	30
Import tariffs	EUR/hl	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20	19.20
Incorporation mandate ^{a, f, g}	%	0.00	0.00	0.19	0.63	0.88	1.22	1.56	1.86	2.15	2.45	2.71	2.94
<i>Biodiesel</i>													
Tax concessions ^{b, e}	EUR/hl	34	34	34	34	34	34	34	34	34	34	34	34
Import tariffs	%	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Incorporation mandate ^{a, f, g}	%	0.94	1.84	3.43	3.95	3.97	4.00	4.02	4.05	4.07	4.07	4.06	4.06
INDONESIA													
<i>Ethanol</i>													
Import tariffs	%	26.31	26.31	26.31	26.31	26.31	26.31	26.31	26.31	26.31	26.31	26.31	26.31
Blending target	%	0.00	2.00	4.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
<i>Biodiesel</i>													
Blending target	%	2.50	5.00	7.50	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
MALAYSIA													
<i>Ethanol</i>													
Import tariffs	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blending target	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Biodiesel</i>													
Blending target	%	0.00	1.67	3.33	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
SOUTH AFRICA													
<i>Ethanol</i>													
Import tariffs	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blending target	%	0.00	0.00	0.00	0.50	1.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00
<i>Biodiesel</i>													
Import tariffs	%	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Blending target	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A.7. **Main policy assumptions for biofuel markets**

		07/08	08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
THAILAND													
Ethanol													
Import tariffs	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blending target	%	0.00	2.00	4.00	6.00	8.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Biodiesel													
Blending target	%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UNITED STATES													
Renewable Fuel Standard	<i>Mil l</i>												
Total		n.a.	34 069	42 018	49 021	52 806	57 538	62 648	68 705	77 601	84 225	90 850	98 420
of which: maize based ethanol		n.a.	34 069	39 747	45 425	47 696	49 967	52 239	54 510	56 781	56 781	56 781	56 781
of which: cellulosic ethanol		0	0	0	379	946	1 893	3 785	6 624	11 356	16 088	20 820	26 498
of which: biodiesel		0	0	1 638	2 461	3 028	3 785	3 785	3 785	3 785	3 785	3 785	3 785
Ethanol													
Import tariffs	USD/hl	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27	14.27
Import tariffs	%	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Blenders tax credit	USD/hl	13.47	13.47	11.89	11.89	11.89	11.89	11.89	11.89	11.89	11.89	11.89	11.89
Biodiesel													
Import tariffs	%	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
Blenders tax credit	USD/hl	26.42	26.42	26.42	26.42	26.42	26.42	26.42	26.42	26.42	26.42	26.42	26.42

a) Share in respective fuel type, energy equivalent.

b) Difference between tax rates applying to fossil and biogen fuels.

c) Includes direct support at federal and provincial levels.

d) Applies to cities with more than 500 000 inhabitants.

e) Tax concessions generally differ across EU Member States. Assumptions for average concession rates are based on national data received from a limited number of individual countries.

f) Note that for many countries, shares for ethanol and biodiesel are not specified individually in the legislation

g) Legislated incorporation mandates differ across EU Member States. Assumptions for average mandated shares are based on national data received from a limited number of individual countries. Additionally, the EU-wide mandate in the context of the Renewable Energy Directive (December 2008) has been taken into account – see Chapter 5 for more details.

est: estimate.

n.a.: not available.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681030058568>

ANNEX B

Commodity Tables

Table B.1. **Wheat projections**

Crop year	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	628 888	653 255	722 427	1.24	1.10	113 737	119 933	133 876	0.80	1.42	113 492	119 933	133 876	0.92	1.42
DEVELOPED	333 260	350 274	388 755	1.27	1.14	22 926	23 311	24 499	-0.71	0.57	95 690	102 851	113 596	1.29	1.30
NORTH AMERICA	82 318	86 829	89 651	0.44	0.36	3 153	3 091	3 765	2.08	2.19	46 520	44 235	46 876	0.65	0.51
Canada	24 644	27 938	28 612	0.66	0.39	24	23	23	-9.42	0.00	17 744	18 244	19 247	1.05	0.52
United States	57 674	58 891	61 040	0.33	0.35	3 130	3 069	3 742	2.35	2.20	28 776	25 992	27 629	0.36	0.50
EUROPE	136 083	137 336	160 654	0.85	1.63	8 270	8 419	8 316	1.78	-0.06	14 533	16 611	21 697	-2.52	3.77
EU(27)	131 703	133 081	155 746	0.90	1.63	6 092	6 263	6 263	1.61	0.00	14 218	16 441	21 517	-2.47	3.81
CIS	96 589	99 731	110 323	4.33	1.18	4 538	4 865	4 864	-5.67	-0.06	25 148	25 973	28 775	15.30	1.66
Russian Federation	51 465	49 800	53 910	5.07	0.95	483	829	949	-16.86	1.20	13 023	11 718	9 829	35.97	-0.08
Ukraine	17 503	21 135	23 002	3.26	0.98	154	0	0	-19.40	0.00	4 337	6 794	8 892	19.30	2.58
OCEANIA DEVELOPED	15 381	23 351	25 308	-3.90	0.93	395	385	442	7.59	1.56	9 275	15 713	15 768	-6.60	0.10
Australia	15 086	23 028	24 968	-3.95	0.93	0	0	0	0.00	0.00	9 275	15 713	15 768	-6.60	0.10
New Zealand	295	322	340	-1.87	0.60	395	385	442	7.59	1.56	0	1	1	33.04	-0.07
OTHER DEVELOPED	2 890	3 028	2 818	0.32	-0.81	6 569	6 550	7 114	1.04	0.92	214	318	480	8.98	4.56
Japan	860	851	931	3.78	0.99	5 476	5 495	5 356	-0.26	-0.29	0	0	0	0.00	0.00
South Africa	2 029	2 176	1 887	-0.94	-1.60	1 094	1 055	1 758	10.21	5.59	214	318	480	8.98	4.56
DEVELOPING	295 628	302 981	333 672	1.15	1.06	90 811	96 622	109 376	1.23	1.62	17 802	17 081	20 279	-1.44	2.11
AFRICA	20 223	20 820	25 762	5.35	2.39	28 916	31 746	34 933	1.91	1.31	831	601	531	10.76	-1.23
NORTH AFRICA	18 606	18 898	23 454	5.41	2.42	18 306	20 540	21 589	0.92	0.81	440	390	300	12.30	-2.91
Algeria	2 833	2 981	3 923	10.97	3.07	4 500	4 633	4 756	-0.79	0.76	0	0	0	0.00	0.00
Egypt	7 889	8 128	9 550	3.03	1.83	7 367	8 326	9 098	3.18	1.20	0	0	0	-22.60	0.00
SUB-SAHARAN AFRICA	1 617	1 922	2 308	4.71	2.02	10 611	11 206	13 345	3.77	2.17	391	211	231	8.60	1.44
LATIN AMERICA and CARIBBEAN	23 928	26 212	29 470	0.25	1.45	19 715	19 412	21 018	0.27	0.82	9 582	9 965	11 227	-2.61	1.67
Argentina	13 047	13 450	14 508	-3.24	1.04	0	0	0	0.00	0.00	7 613	7 835	8 745	-6.04	1.62
Brazil	4 123	5 612	7 372	8.11	2.97	6 236	5 500	5 095	-2.62	-0.75	568	309	309	119.53	0.00
Chile	1 248	1 252	1 464	-1.75	1.72	1 054	1 092	1 072	10.33	-0.21	0	0	0	0.00	0.00
Mexico	3 534	3 649	3 374	1.02	-0.43	3 297	3 288	4 251	1.93	2.00	554	734	824	2.86	1.03
Uruguay	819	1 056	1 294	15.35	2.23	18	0	0	-32.26	0.00	393	632	731	38.94	2.37
ASIA and PACIFIC	251 478	255 949	278 440	0.95	0.90	42 179	45 464	53 425	1.21	2.18	7 389	6 515	8 522	-0.35	2.98
Bangladesh	798	973	1 327	-11.45	3.18	1 815	2 118	2 381	2.67	1.78	0	0	0	-62.61	0.00
China ^c	109 014	110 380	113 719	0.80	0.31	153	126	243	-26.17	8.65	2 519	2 468	3 082	14.36	2.47
India	74 383	76 491	87 650	0.39	1.43	3 054	1 357	1 970	26.23	4.44	433	495	450	-18.32	-1.06
Indonesia	0	0	0	0.00	0.00	5 372	5 507	5 807	4.61	0.95	30	32	47	1.37	4.29
Iran, Islamic Republic of	13 000	14 807	15 453	4.71	0.46	2 367	1 419	1 720	-22.47	5.02	123	3	32	32.80	23.04
Korea	6	7	10	6.61	3.88	3 414	3 414	3 500	-1.52	0.39	11	11	11	-13.73	0.00
Malaysia	0	0	0	0.00	0.00	1 267	1 321	1 444	-0.30	1.06	87	83	20	-4.84	-15.13
Pakistan	22 124	22 128	25 017	2.17	1.38	1 530	2 348	3 323	17.17	3.40	1 433	1 500	1 000	4.65	-4.49
Saudi Arabia	2 490	2 207	1 403	3.03	-4.93	112	628	3 594	4.54	18.85	0	0	0	-23.65	0.00
Turkey	18 348	18 628	20 190	-0.51	1.01	1 752	1 931	2 118	4.28	0.70	1 133	737	1 068	-1.29	4.11
LEAST DEVELOPED COUNTRIES (LDC)	7 134	7 558	10 544	2.98	3.36	10 855	11 874	12 557	2.95	1.18	84	43	29	-19.22	-1.48
OCDE	253 075	267 327	296 141	0.26	1.10	24 283	24 582	26 450	0.71	0.68	71 792	77 952	86 145	-1.19	1.21
NON-OCDE	375 813	385 927	426 286	1.94	1.10	89 454	95 350	107 425	0.88	1.61	41 700	41 980	47 731	6.42	1.83

For notes, see end of the table.

Table B.1. **Wheat projections (cont.)**

Crop year ^a	CONSUMPTION (kt)			Growth ^b (%)		FOOD USE (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009- 2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	628 757	648 288	718 912	0.89	1.09	454 809	465 761	508 167	0.99	0.96	68.0	68.1	67.4	-0.22	-0.12
DEVELOPED	262 314	269 851	297 758	0.87	0.99	138 283	140 576	145 691	0.38	0.37	102.6	103.7	105.1	-0.01	0.13
NORTH AMERICA	39 107	42 667	44 755	-1.03	0.39	28 736	28 992	31 089	0.18	0.77	84.8	84.0	83.3	-0.83	-0.09
Canada	7 836	8 811	9 382	-0.05	0.44	3 016	2 956	3 151	0.52	0.68	91.8	88.4	87.5	-0.46	-0.14
United States	31 271	33 856	35 372	-1.27	0.38	25 719	26 035	27 937	0.14	0.78	84.1	83.5	82.8	-0.87	-0.09
EUROPE	129 969	130 964	147 201	0.82	1.21	66 625	68 298	69 366	0.63	0.14	125.8	128.5	129.5	0.33	0.05
EU(27)	123 690	124 554	140 419	0.85	1.22	62 245	63 889	64 719	0.69	0.11	126.3	129.2	129.9	0.38	0.03
CIS	76 422	78 868	86 386	1.75	0.87	32 674	32 891	34 529	-0.13	0.51	117.6	118.7	126.3	0.07	0.65
Russian Federation	39 463	39 251	44 925	1.34	1.20	15 070	14 671	14 648	-0.66	-0.23	105.8	104.0	109.3	-0.17	0.34
Ukraine	12 587	14 215	14 198	-0.33	0.08	5 800	5 925	5 918	-0.92	0.11	125.5	130.2	139.6	-0.12	0.90
OCEANIA DEVELOPED	7 618	8 013	9 973	4.75	2.40	2 132	2 141	2 327	2.06	0.94	85.5	84.3	84.4	0.91	0.03
Australia	6 946	7 307	9 192	4.96	2.51	1 770	1 773	1 925	2.31	0.92	85.3	83.8	83.6	1.16	-0.01
New Zealand	672	706	781	2.71	1.13	362	368	402	0.82	1.00	86.6	86.6	88.4	-0.32	0.23
OTHER DEVELOPED	9 198	9 338	9 443	0.37	0.15	8 118	8 255	8 380	0.72	0.19	46.0	46.7	47.5	0.38	0.23
Japan	6 278	6 352	6 284	0.01	-0.12	5 279	5 348	5 308	0.04	-0.09	41.3	41.8	42.3	-0.06	0.12
South Africa	2 920	2 986	3 159	1.18	0.71	2 839	2 907	3 072	2.07	0.70	58.5	59.3	60.4	1.10	0.30
DEVELOPING	366 443	378 438	421 154	0.90	1.17	316 526	325 185	362 476	1.27	1.20	59.3	59.3	58.9	-0.17	-0.07
AFRICA	49 262	51 986	60 044	2.98	1.66	44 643	47 157	55 017	2.77	1.79	48.7	49.1	47.0	0.39	-0.42
NORTH AFRICA	37 248	39 210	44 637	2.52	1.51	33 255	34 938	40 216	2.35	1.64	138.5	140.1	137.6	0.44	-0.12
Algeria	7 533	7 788	8 600	2.22	1.17	6 983	7 240	8 054	2.00	1.26	206.2	207.5	203.2	0.52	-0.16
Egypt	15 589	16 354	18 635	2.70	1.52	14 523	15 245	17 500	2.50	1.61	192.3	195.0	194.3	0.69	0.03
SUB-SAHARAN AFRICA	12 014	12 776	15 407	4.48	2.13	11 387	12 219	14 801	4.09	2.18	16.8	17.2	16.9	1.53	-0.17
LATIN AMERICA and CARIBBEAN	34 350	35 470	39 242	1.08	1.05	29 879	30 906	34 455	1.17	1.14	52.2	52.7	53.2	-0.11	0.05
Argentina	5 363	5 617	5 766	0.14	0.23	4 319	4 448	4 632	0.74	0.38	109.2	110.3	105.8	-0.24	-0.53
Brazil	10 088	10 470	12 160	0.40	1.49	9 424	9 811	11 456	0.32	1.54	49.1	49.9	53.0	-1.06	0.49
Chile	2 289	2 366	2 534	1.72	0.75	2 019	2 100	2 252	1.47	0.78	121.4	123.7	122.6	0.38	-0.10
Mexico	6 278	6 203	6 801	1.35	0.82	4 679	4 650	5 118	1.42	0.89	43.9	42.6	43.1	0.46	-0.05
Uruguay	477	514	558	4.51	0.90	368	375	404	2.38	0.89	110.1	111.4	116.5	2.28	0.55
ASIA and PACIFIC	282 831	290 982	321 868	0.55	1.10	242 004	247 122	273 004	1.02	1.09	62.8	62.7	63.0	-0.22	0.04
Bangladesh	2 946	3 049	3 702	-1.19	2.29	2 822	2 938	3 590	0.15	2.36	17.8	17.9	19.1	-1.69	0.84
China ^c	103 253	105 276	110 645	-0.79	0.42	87 902	86 685	88 378	-0.27	0.09	66.2	64.5	62.7	-0.92	-0.43
India	75 238	78 251	89 861	1.15	1.55	67 804	70 504	80 942	1.72	1.54	58.0	58.6	60.0	0.14	0.27
Indonesia	5 059	5 328	5 726	4.21	0.86	4 317	4 575	4 859	3.17	0.78	18.6	19.3	18.8	1.89	-0.16
Iran, Islamic Republic of	15 500	15 894	17 117	1.13	0.90	12 033	12 410	14 016	1.28	1.39	168.9	169.4	170.1	0.22	0.08
Korea	3 444	3 396	3 499	-1.43	0.40	2 424	2 365	2 423	1.05	0.27	50.3	48.7	49.2	0.62	0.12
Malaysia	1 181	1 246	1 424	0.33	1.45	997	1 026	1 169	1.24	1.45	37.5	37.4	37.4	-0.66	0.02
Pakistan	22 346	23 187	27 312	1.55	1.85	19 671	20 521	24 628	0.88	2.07	120.0	120.6	122.3	-0.95	0.19
Saudi Arabia	2 568	2 713	3 135	3.97	1.72	2 405	2 543	2 963	4.42	1.82	97.2	98.4	95.7	1.95	-0.19
Turkey	19 333	19 713	21 240	-0.15	0.85	14 433	15 013	16 376	1.42	1.00	192.8	195.5	193.7	0.07	-0.07
LEAST DEVELOPED COUNTRIES (LDC)	18 196	19 213	23 047	3.46	2.12	16 885	17 816	21 609	3.41	2.25	23.0	23.2	23.1	1.05	0.05
OCDE	207 313	212 464	234 579	0.45	1.00	121 010	123 480	128 486	0.68	0.42	98.7	99.6	99.6	0.07	-0.02
NON-OCDE	421 444	435 824	484 333	1.11	1.14	333 799	342 282	379 681	1.11	1.14	61.1	61.1	60.8	-0.25	-0.06

a) Beginning crop marketing year – see Glossary of Terms for definitions.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681050812832>

Table B.2. Coarse grain projections

Crop year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	1 056 052	1 113 059	1 283 583	2.63	1.60	119 253	117 836	127 960	1.46	0.95	120 077	117 836	127 960	0.98	0.95
DEVELOPED	584 661	626 210	719 484	1.94	1.55	39 805	35 105	31 360	1.40	-1.00	90 146	84 890	96 346	0.87	1.04
NORTH AMERICA	344 721	366 296	426 155	2.74	1.73	5 523	6 800	4 956	1.27	-2.25	65 972	56 679	64 742	1.41	1.00
Canada	26 051	26 538	27 480	1.13	0.29	2 788	4 067	2 223	2.76	-4.32	5 879	6 122	6 152	5.27	0.10
United States	318 670	339 757	398 675	2.89	1.83	2 735	2 733	2 733	1.18	0.00	60 093	50 558	58 590	1.09	1.10
EUROPE	157 136	168 268	189 368	0.10	1.26	12 128	5 956	4 904	8.03	-2.44	10 269	6 343	9 112	-6.77	1.41
EU(27)	146 009	156 680	176 920	0.02	1.29	10 861	4 873	3 874	8.29	-2.90	9 627	5 913	8 682	-7.46	1.51
CIS	63 282	68 236	76 561	3.30	1.28	841	1 076	1 285	-11.63	2.05	8 464	14 730	14 416	13.35	0.46
Russian Federation	32 108	32 718	36 007	2.03	1.06	397	816	879	-14.94	0.88	1 879	4 103	3 593	18.78	-0.67
Ukraine	19 375	22 823	23 962	5.12	0.49	34	6	0	-19.24	-9.92	5 641	9 567	8 531	16.43	-0.85
OCEANIA DEVELOPED	9 949	11 925	14 301	-0.32	1.97	135	138	217	16.39	4.52	4 366	4 426	4 694	-0.63	1.91
Australia	9 461	11 455	13 837	-0.20	2.05	0	0	1	-11.85	0.00	4 366	4 426	4 694	-0.61	1.91
New Zealand	488	471	465	-2.76	-0.14	135	138	216	18.40	4.49	0	0	0	-29.05	0.00
OTHER DEVELOPED	9 573	11 486	13 099	0.49	1.48	21 178	21 135	19 998	-0.61	-0.48	1 075	2 711	3 381	0.40	4.04
Japan	210	204	201	-1.87	-0.21	20 175	20 334	18 521	-0.75	-0.90	0	0	0	0.00	0.00
South Africa	9 363	11 281	12 898	0.54	1.50	1 003	801	1 478	2.64	6.74	1 075	2 711	3 381	0.40	4.04
DEVELOPING	471 391	486 849	564 100	3.54	1.67	79 448	82 731	96 600	1.39	1.66	29 932	32 946	31 615	1.32	0.72
AFRICA	94 286	97 656	118 379	3.93	2.16	15 169	17 035	21 432	2.43	2.61	2 941	3 392	4 930	12.36	5.89
NORTH AFRICA	22 578	22 677	27 912	4.18	2.32	11 722	12 305	13 912	2.81	1.26	400	174	990	50.64	17.91
Algeria	1 423	1 450	1 457	18.52	0.22	2 503	2 337	2 639	3.57	0.93	0	0	0	0.00	0.00
Egypt	8 003	8 269	8 786	1.22	0.68	4 563	4 811	5 609	-0.21	1.81	0	0	0	0.00	0.00
SUB-SAHARAN AFRICA	71 708	74 978	90 467	3.85	2.12	3 447	4 731	7 520	1.31	5.63	2 541	3 218	3 940	10.67	4.24
LATIN AMERICA and CARIBBEAN	124 288	134 273	151 752	3.89	1.46	24 772	25 711	26 840	1.94	0.43	22 837	26 603	23 389	6.50	-0.26
Argentina	23 717	27 617	29 999	1.66	1.30	0	0	0	0.00	0.00	13 407	16 659	17 095	1.12	0.99
Brazil	53 399	58 124	65 657	5.32	1.44	1 272	1 272	1 298	1.21	0.08	7 938	8 263	4 481	77.32	-4.05
Chile	1 870	1 955	2 074	8.69	0.69	1 768	1 521	1 849	3.72	1.68	86	74	153	3.25	8.02
Mexico	30 419	31 142	36 007	2.73	1.46	10 798	12 146	12 277	-0.44	0.39	168	252	235	35.22	0.06
Uruguay	830	1 036	878	9.04	-1.94	50	0	176	-25.98	28.20	150	365	167	9.14	-30.19
ASIA and PACIFIC	252 817	254 920	293 968	3.23	1.58	39 506	39 985	48 328	0.70	1.99	4 154	2 951	3 296	-16.39	2.17
Bangladesh	513	516	575	30.46	1.24	50	49	106	-18.90	8.04	0	0	0	0.00	0.00
China ^c	159 781	161 826	185 712	3.39	1.56	1 168	1 577	2 716	-7.75	5.65	2 239	572	626	-29.82	1.50
India	36 433	36 685	44 598	2.36	2.13	51	72	88	-19.95	2.15	958	1 634	803	76.92	-1.55
Indonesia	12 018	12 410	13 413	3.68	0.90	1 187	985	1 298	-5.24	2.25	100	102	120	4.36	1.80
Iran, Islamic Republic of	4 276	5 018	5 384	3.33	0.86	3 100	2 341	3 745	6.78	5.15	0	0	0	-5.99	0.00
Korea	320	274	258	-2.60	-0.64	8 706	8 695	9 852	-0.86	1.23	0	0	0	44.40	0.00
Malaysia	80	80	113	3.41	3.70	2 563	2 697	3 000	0.52	1.21	9	7	0	3.39	-25.06
Pakistan	3 739	3 732	4 125	7.83	1.06	21	2	37	-10.06	31.90	0	0	0	-6.00	-10.76
Saudi Arabia	376	391	367	-1.60	-0.57	8 377	8 638	9 174	3.21	0.68	0	0	0	0.00	0.00
Turkey	12 008	11 656	13 081	1.78	1.28	1 071	1 388	2 744	-6.02	7.37	96	26	134	-20.10	17.21
LEAST DEVELOPED COUNTRIES (LDC)	44 659	47 111	54 103	4.69	1.55	2 138	2 253	6 056	0.36	11.86	2 500	3 133	4 360	11.41	4.98
OCDE	545 052	579 601	668 411	1.87	1.59	57 916	55 053	53 067	0.91	-0.22	80 257	67 326	78 516	-0.07	1.07
NON-OCDE	511 000	533 458	615 173	3.49	1.62	61 337	62 784	74 893	1.90	1.86	39 820	50 511	49 444	3.76	0.80

For notes, see end of the table.

Table B.2. **Coarse grain projections (cont.)**

Crop year ^a	CONSUMPTION (kt)			Growth ^b (%)		FEED USE (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	1 051 612	1 119 512	1 276 004	2.38	1.46	632 650	645 937	715 523	1.16	1.21	30.3	31.7	32.4	0.55	0.23
DEVELOPED	538 890	580 683	650 126	2.05	1.27	353 183	356 460	378 560	0.23	0.79	30.5	32.3	31.2	-0.03	-0.40
NORTH AMERICA	287 757	317 708	362 407	2.82	1.48	168 722	164 790	171 164	-0.58	0.63	23.4	23.4	22.6	-0.48	-0.35
Canada	23 517	24 165	23 577	0.04	-0.19	19 031	18 742	18 145	-0.73	-0.27	53.3	51.1	46.6	-2.06	-1.00
United States	264 240	293 543	338 830	3.09	1.61	149 691	146 048	153 018	-0.56	0.74	20.2	20.4	20.0	0.01	-0.18
EUROPE	160 399	168 318	184 922	1.23	1.09	124 699	130 035	138 200	0.83	0.75	41.3	43.8	41.9	0.10	-0.51
EU(27)	148 449	155 815	171 875	1.28	1.12	114 645	119 365	127 207	0.83	0.77	43.3	45.9	43.9	0.12	-0.53
CIS	54 397	56 942	63 386	2.03	1.19	35 597	37 091	44 453	2.56	2.00	21.9	26.4	25.5	-0.07	-0.36
Russian Federation	29 792	30 879	33 256	1.45	0.88	19 119	19 394	22 731	1.61	1.85	26.5	35.3	34.4	0.33	-0.30
Ukraine	13 382	13 861	15 426	2.03	1.07	8 929	9 179	10 779	2.80	1.62	27.9	28.9	30.3	-0.50	0.39
OCEANIA DEVELOPED	6 384	7 629	9 817	0.23	2.09	4 976	4 951	6 114	-0.53	2.27	11.7	11.1	10.6	-0.85	-0.54
Australia	5 759	7 021	9 136	0.27	2.17	4 444	4 418	5 499	-0.59	2.36	9.5	9.8	9.9	-0.41	0.04
New Zealand	625	608	681	-0.16	1.12	532	533	616	-0.02	1.44	22.2	17.7	14.4	-2.16	-2.28
OTHER DEVELOPED	29 953	30 086	29 594	-0.03	-0.14	19 189	19 592	18 629	-0.05	-0.55	28.0	27.7	28.7	0.32	0.44
Japan	20 397	19 996	18 583	-0.49	-0.80	15 165	15 077	13 758	-0.47	-1.00	1.5	1.4	1.4	-0.58	-0.12
South Africa	9 556	10 089	11 011	0.98	1.06	4 024	4 514	4 871	1.65	0.85	97.7	96.0	95.8	-0.26	0.03
DEVELOPING	512 722	538 829	625 877	2.75	1.67	279 467	289 477	336 963	2.43	1.69	30.3	31.6	32.6	0.71	0.38
AFRICA	105 958	111 737	134 725	3.34	2.07	21 012	21 212	23 667	4.35	1.11	76.8	78.0	79.4	0.15	0.23
NORTH AFRICA	33 810	34 842	40 921	3.39	1.76	16 750	16 886	18 499	3.81	0.93	62.2	63.2	68.9	1.11	0.98
Algeria	3 776	3 803	4 127	6.46	0.71	2 967	2 976	3 191	8.22	0.52	20.0	19.9	20.3	0.22	0.21
Egypt	12 736	13 085	14 403	0.95	1.11	8 446	8 546	9 246	0.65	0.89	49.5	49.1	49.7	-0.05	0.22
SUB-SAHARAN AFRICA	72 148	76 895	93 804	3.32	2.21	4 261	4 326	5 168	6.75	1.80	82.0	83.2	83.0	-0.15	-0.01
LATIN AMERICA and CARIBBEAN	124 260	135 355	155 281	2.87	1.49	74 945	78 948	91 348	2.21	1.59	55.4	63.9	66.3	2.17	0.37
Argentina	10 176	10 934	12 876	2.05	1.73	8 217	9 082	10 902	1.98	1.92	6.8	7.2	7.7	-0.48	0.77
Brazil	45 310	52 528	62 517	3.06	1.86	34 549	37 034	44 891	3.38	2.10	28.5	49.5	50.5	-2.09	0.14
Chile	3 498	3 480	3 776	5.82	0.82	2 757	2 688	2 871	5.65	0.61	18.8	19.1	21.4	2.12	1.34
Mexico	40 912	43 246	48 043	1.80	1.15	16 176	16 523	17 336	-2.01	0.57	160.6	167.9	181.1	4.25	0.76
Uruguay	727	751	905	6.38	2.15	294	304	345	2.54	1.58	33.6	34.1	35.9	1.55	0.64
ASIA and PACIFIC	282 504	291 737	335 872	2.47	1.59	183 510	189 317	221 948	2.32	1.79	15.5	15.4	15.0	-0.18	-0.34
Bangladesh	563	564	681	11.76	2.02	267	244	315	7.02	2.58	1.9	2.0	1.9	18.42	0.04
China ^c	152 396	161 587	184 736	2.37	1.56	107 277	112 726	131 148	1.82	1.78	13.6	14.1	11.9	-1.18	-1.86
India	35 056	36 102	43 854	1.91	2.15	8 467	9 316	13 034	3.17	3.68	21.1	20.7	21.2	0.11	0.32
Indonesia	13 039	13 298	14 598	2.94	1.01	4 000	4 165	4 843	4.58	1.54	27.8	27.5	28.2	0.42	0.24
Iran, Islamic Republic of	7 409	7 363	9 137	4.93	2.42	6 994	6 982	8 747	5.10	2.53	1.4	1.4	1.3	-0.32	-0.39
Korea	9 379	8 850	10 046	-0.05	1.20	6 579	6 378	7 244	-1.06	1.06	7.7	7.6	7.7	1.35	0.22
Malaysia	2 654	2 765	3 118	0.95	1.34	2 497	2 593	2 932	1.25	1.37	1.8	1.7	1.7	-1.05	-0.10
Pakistan	3 753	3 742	4 162	7.14	1.20	1 595	1 603	1 748	14.07	0.99	9.1	8.8	8.8	-0.32	0.00
Saudi Arabia	9 086	9 067	9 585	3.72	0.58	8 874	8 856	9 363	3.80	0.59	3.9	3.7	3.4	-1.66	-0.95
Turkey	13 553	13 119	15 564	2.48	1.91	11 022	10 769	12 903	2.84	2.03	16.4	15.4	16.6	-0.09	0.65
LEAST DEVELOPED COUNTRIES (LDC)	43 487	46 494	55 533	3.71	1.98	3 745	3 847	4 529	9.04	1.75	44.6	45.3	46.1	0.28	0.20
OCDE	528 874	568 438	638 418	2.05	1.30	338 978	339 571	357 444	-0.09	0.69	39.7	41.4	42.0	1.34	0.14
NON-OCDE	522 738	551 074	637 586	2.73	1.63	293 672	306 365	358 079	2.75	1.75	28.3	29.6	30.4	0.36	0.31

a) Beginning crop marketing year - see Glossary of Terms for definitions.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681101220716>

Table B.3. Rice projections

Crop year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	442 059	459 675	494 367	1.32	0.85	31 807	33 494	38 692	3.06	1.61	30 987	32 750	37 912	3.21	1.64
DEVELOPED	17 125	17 799	18 221	-0.61	0.25	4 999	5 108	5 824	4.47	1.33	3 619	3 599	4 510	-0.99	1.95
NORTH AMERICA	6 279	6 708	7 364	-0.01	1.07	1 007	950	1 200	6.93	2.62	3 122	3 103	3 556	1.40	1.23
Canada	0	0	0	0.00	0.00	350	362	399	5.21	1.15	0	0	0	0.00	0.00
United States	6 279	6 708	7 364	-0.01	1.07	658	588	802	8.02	3.44	3 122	3 103	3 556	1.40	1.23
EUROPE	1 630	1 582	1 497	0.36	-0.60	1 529	1 696	2 105	6.70	2.20	201	254	268	-1.44	0.58
EU(27)	1 617	1 569	1 484	0.36	-0.61	1 394	1 557	1 952	6.95	2.30	200	253	267	-1.40	0.58
CIS	973	879	1 087	3.43	2.48	562	703	605	-1.01	-2.07	31	26	38	3.48	4.06
Russian Federation	451	362	505	4.51	3.72	241	319	173	-4.62	-6.66	15	10	10	0.61	0.00
Ukraine	65	69	77	4.04	1.51	103	114	147	5.84	2.63	7	8	18	51.52	8.67
OCEANIA DEVELOPED	75	555	931	-37.60	5.09	273	139	147	12.74	0.59	105	56	488	-18.82	15.29
Australia	75	555	931	-37.60	5.09	235	100	100	12.42	0.00	105	56	488	-18.82	15.29
New Zealand	0	0	0	0.00	0.00	38	39	47	3.52	1.96	0	0	0	0.00	0.00
OTHER DEVELOPED	8 168	8 075	7 342	-0.38	-1.08	1 628	1 620	1 768	2.31	0.93	160	160	160	-8.35	0.00
Japan	8 166	8 072	7 340	-0.38	-1.09	799	682	682	-0.38	0.00	160	160	160	-8.35	0.00
South Africa	2	2	2	0.00	0.11	829	938	1 086	5.59	1.58	0	0	0	0.00	0.00
DEVELOPING	424 934	441 876	476 147	1.40	0.87	26 808	28 386	32 867	2.81	1.66	27 368	29 150	33 402	3.89	1.60
AFRICA	15 298	16 186	21 645	4.03	3.22	8 847	9 690	11 952	4.65	2.38	815	716	1 093	5.04	2.71
NORTH AFRICA	4 858	4 885	5 190	2.71	0.63	336	330	550	5.29	5.57	808	708	752	5.71	-0.05
Algeria	1	1	1	0.00	-0.04	73	78	96	2.53	2.29	0	0	0	0.00	0.00
Egypt	4 837	4 864	5 166	2.72	0.63	43	20	195	22.25	22.67	808	708	752	5.71	-0.05
SUB-SAHARAN AFRICA	10 441	11 301	16 455	4.70	4.18	8 511	9 360	11 402	4.63	2.25	7	8	341	-20.06	39.09
LATIN AMERICA and CARIBBEAN	16 833	17 857	21 045	1.40	1.96	3 532	4 339	4 245	1.60	-0.71	2 020	2 075	2 538	4.70	2.21
Argentina	800	929	1 402	5.89	4.44	9	10	10	-3.61	0.00	507	615	984	8.23	5.09
Brazil	7 850	8 181	9 788	1.08	2.13	617	1 147	483	-6.16	-11.04	225	170	170	28.17	0.00
Chile	88	84	66	2.77	-2.10	99	136	179	1.96	3.79	0	1	2	0.64	9.04
Mexico	232	249	272	1.64	1.11	769	858	1 002	2.95	1.92	9	9	12	23.63	1.94
Uruguay	879	934	1 009	1.13	0.94	0	0	0	-10.18	0.00	790	771	892	1.09	1.06
ASIA and PACIFIC	392 802	407 834	433 457	1.31	0.72	14 429	14 357	16 670	2.25	1.83	24 534	26 359	29 771	3.79	1.52
Bangladesh	28 748	30 375	34 340	2.46	1.40	1 301	1 038	646	10.74	-5.65	9	12	26	27.39	8.78
China ^c	129 394	130 578	127 955	-0.18	-0.18	367	360	728	4.02	7.52	1 141	1 408	2 384	-10.74	7.26
India	95 928	100 066	107 694	1.43	0.81	50	50	50	10.35	0.00	4 682	4 946	3 553	8.50	-4.42
Indonesia	36 097	38 943	41 635	1.68	0.72	933	0	298	-19.70	43.55	0	353	0	0.31	-31.32
Iran, Islamic Republic of	1 683	1 686	2 038	2.69	2.29	1 127	1 498	1 514	2.91	1.33	0	0	0	0.00	0.00
Korea	4 571	4 634	4 761	-1.97	0.30	287	290	290	10.87	0.00	117	100	100	12.33	0.00
Malaysia	1 495	1 549	1 684	1.51	1.17	900	941	1 034	6.18	0.45	0	0	0	-8.89	0.00
Pakistan	5 845	6 590	6 925	3.35	0.79	1	0	0	-19.86	0.00	2 993	3 562	3 706	6.90	0.94
Saudi Arabia	0	0	0	0.00	0.00	1 167	1 295	1 663	4.85	2.83	0	0	0	0.00	0.00
Turkey	422	469	576	10.13	2.47	172	180	185	-7.96	-0.16	1	0	0	-27.57	5.47
LEAST DEVELOPED COUNTRIES (LDC)	63 533	67 366	81 725	3.68	2.23	6 988	7 372	7 707	5.53	0.30	1 473	1 658	3 364	14.93	9.29
OCDE	21 363	22 257	22 728	-0.89	0.22	4 786	4 744	5 560	4.43	1.71	3 713	3 681	4 583	-1.18	1.89
NON-OECD	420 697	437 418	471 640	1.44	0.88	27 021	28 750	33 132	2.82	1.59	27 274	29 069	33 329	3.95	1.61

For notes, see end of the table.

Table B.3. **Rice projections** (cont.)

Crop year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	440 391	454 842	494 835	1.10	0.91	57.3	57.4	57.3	-0.08	-0.04
DEVELOPED	18 839	18 654	19 561	0.88	0.48	13.5	13.3	13.7	0.52	0.26
NORTH AMERICA	4 341	4 433	5 051	1.04	1.46	12.8	12.8	13.5	0.03	0.59
Canada	350	362	399	5.21	1.15	10.6	10.8	11.1	4.23	0.32
United States	3 992	4 071	4 653	0.72	1.48	13.1	13.1	13.8	-0.29	0.61
EUROPE	2 959	3 020	3 328	4.18	0.99	5.6	5.7	6.2	3.87	0.90
EU(27)	2 812	2 869	3 164	4.17	0.99	5.7	5.8	6.4	3.87	0.90
CIS	1 517	1 545	1 654	1.72	0.56	5.4	5.5	6.0	1.82	0.71
Russian Federation	689	665	669	0.79	-0.13	4.8	4.7	5.0	1.27	0.44
Ukraine	162	171	206	4.70	1.84	3.4	3.7	4.8	5.55	2.67
OCEANIA DEVELOPED	400	444	579	0.35	3.02	16.1	17.5	21.0	-0.79	2.11
Australia	362	405	532	0.05	3.12	17.5	19.1	23.1	-1.10	2.18
New Zealand	38	39	47	3.52	1.96	9.1	9.2	10.3	2.38	1.19
OTHER DEVELOPED	9 621	9 213	8 949	-0.18	-0.36	51.3	49.0	47.8	-0.50	-0.31
Japan	8 777	8 317	7 863	-0.63	-0.62	64.5	61.1	58.9	-0.73	-0.41
South Africa	845	895	1 086	5.33	1.80	16.4	17.4	20.5	4.69	1.44
DEVELOPING	421 553	436 188	475 274	1.11	0.93	68.3	68.3	67.1	-0.29	-0.21
AFRICA	23 196	24 835	32 560	4.17	2.91	22.3	22.8	24.8	1.85	0.84
NORTH AFRICA	4 135	4 574	4 995	1.71	0.73	14.2	15.4	14.4	1.00	-0.98
Algeria	74	77	96	2.46	2.30	2.2	2.2	2.4	0.97	0.88
Egypt	3 816	4 248	4 617	1.56	0.68	41.0	45.0	42.6	1.04	-0.85
SUB-SAHARAN AFRICA	19 061	20 261	27 564	4.77	3.35	25.1	25.5	28.3	1.96	1.12
LATIN AMERICA and CARIBBEAN	18 981	19 938	22 725	1.78	1.39	31.6	32.3	33.6	0.58	0.35
Argentina	318	328	428	1.58	2.83	8.0	8.1	9.8	0.60	1.92
Brazil	8 769	9 158	10 102	1.28	1.02	45.7	46.6	46.7	-0.09	-0.03
Chile	181	202	245	1.87	1.97	10.6	11.6	13.1	0.77	1.13
Mexico	976	1 062	1 264	2.15	1.91	9.2	9.7	10.7	1.19	0.98
Uruguay	104	112	116	7.28	0.31	10.3	11.2	12.3	0.93	0.72
ASIA and PACIFIC	379 376	391 415	419 990	0.91	0.76	84.8	84.7	83.6	-0.30	-0.17
Bangladesh	29 640	31 283	34 862	2.97	1.20	150.9	153.7	153.0	0.91	-0.05
China ^c	127 724	128 157	126 640	-0.79	-0.12	79.1	78.0	73.6	-1.22	-0.61
India	89 163	93 242	103 845	0.94	1.11	73.5	73.0	72.6	-0.50	-0.14
Indonesia	36 714	38 744	41 928	0.38	0.87	151.7	151.7	151.2	-0.11	-0.04
Iran, Islamic Republic of	2 873	2 950	3 549	2.61	2.06	35.2	35.5	38.8	1.97	1.00
Korea	4 811	5 119	4 817	-0.92	-0.63	77.8	82.3	76.3	-1.36	-0.79
Malaysia	2 378	2 476	2 717	2.40	0.88	86.3	86.8	84.0	0.33	-0.52
Pakistan	2 786	3 005	3 221	-0.02	0.61	15.2	15.7	14.3	-1.55	-1.20
Saudi Arabia	1 210	1 288	1 662	4.98	2.84	45.9	46.7	51.1	2.80	1.00
Turkey	590	644	761	2.50	1.77	7.4	7.7	8.2	1.12	0.63
LEAST DEVELOPED COUNTRIES (LDC)	68 985	72 545	85 847	4.11	1.85	73.5	74.2	74.7	0.90	0.04
OCDE	22 794	22 977	23 602	0.38	0.30	17.3	17.2	17.1	-0.15	-0.08
NON-OCDE	417 598	431 865	471 233	1.14	0.94	66.3	66.3	65.6	-0.18	-0.14

a) Beginning crop marketing year – see Glossary of Terms for definitions.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681127202702>

Table B.4. Oilseed projections

Crop year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	307 570	336 149	406 761	4.17	2.12	85 162	90 122	104 557	5.12	1.55	84 190	89 174	103 609	5.30	1.56
DEVELOPED	140 627	154 885	179 110	2.66	1.57	27 608	27 188	27 452	0.64	-0.17	43 140	48 658	47 950	2.20	-0.33
NORTH AMERICA	95 760	103 817	112 415	1.56	0.79	1 608	1 279	1 179	4.49	-0.94	39 256	43 351	40 669	2.63	-0.94
Canada	13 688	15 687	17 460	5.69	0.98	495	490	390	-6.40	-2.68	7 637	8 185	6 767	7.84	-2.29
United States	82 072	88 130	94 955	1.01	0.75	1 114	789	789	15.95	0.00	31 619	35 166	33 902	1.67	-0.65
EUROPE	25 779	28 134	35 414	3.63	2.63	18 800	18 719	19 091	0.92	-0.09	970	1 102	1 102	-3.49	0.00
EU(27)	24 724	27 075	34 363	3.57	2.72	18 223	18 148	18 479	0.97	-0.12	947	1 080	1 080	-3.51	0.00
CIS	16 749	19 620	27 014	10.81	3.62	473	517	597	5.92	0.64	2 363	3 224	4 866	8.97	5.42
Russian Federation	7 842	8 614	11 156	9.15	2.84	245	245	297	17.67	0.71	267	302	887	-5.05	13.69
Ukraine	7 968	9 950	14 135	13.24	4.07	9	8	19	13.43	8.99	1 940	2 769	3 868	17.91	4.39
OCEANIA DEVELOPED	1 159	1 832	2 439	-7.15	2.68	26	4	4	-0.98	0.00	504	921	1 276	-14.64	2.72
Australia	1 155	1 828	2 435	-7.18	2.68	25	3	3	-0.41	0.00	503	921	1 276	-14.65	2.72
New Zealand	4	4	4	0.00	0.00	2	2	2	4.94	0.00	0	0	0	-0.21	-0.39
OTHER DEVELOPED	1 180	1 482	1 827	1.74	3.25	6 700	6 670	6 581	-1.12	-0.31	46	61	38	12.71	-5.14
Japan	228	228	232	-0.20	0.19	6 584	6 602	6 300	-1.22	-0.56	0	0	0	35.11	0.00
South Africa	952	1 254	1 595	2.10	3.77	116	67	281	6.03	9.59	46	61	38	12.75	-5.14
DEVELOPING	166 943	181 264	227 651	5.62	2.56	57 554	62 934	77 106	7.91	2.22	41 051	40 516	55 659	9.75	3.47
AFRICA	1 325	1 361	1 627	2.05	2.11	2 030	2 120	2 591	16.28	2.14	58	58	71	0.58	2.27
NORTH AFRICA	337	340	437	3.31	2.86	1 964	2 063	2 521	16.73	2.20	3	3	7	0.00	6.20
Algeria	107	110	119	0.99	0.79	48	61	66	48.78	0.79	0	0	0	0.00	0.00
Egypt	117	114	173	8.04	4.97	1 273	1 306	1 654	22.98	2.62	3	3	3	0.00	0.00
SUB-SAHARAN AFRICA	988	1 021	1 190	1.65	1.85	66	57	70	6.30	0.43	55	54	64	0.63	1.96
LATIN AMERICA and CARIBBEAN	116 829	127 710	163 300	7.37	2.76	7 417	8 032	8 888	-0.44	1.00	40 282	39 913	55 047	9.83	3.52
Argentina	49 857	53 421	61 103	7.12	1.55	852	1 060	1 600	14.04	4.56	9 665	8 690	6 626	6.63	-2.87
Brazil	56 999	63 666	88 208	7.33	3.57	129	179	3	-25.08	-47.79	24 809	24 731	40 108	10.94	5.24
Chile	80	81	83	0.57	0.62	223	228	250	8.45	0.87	7	6	6	-0.84	0.00
Mexico	105	128	170	-0.04	3.36	4 758	4 939	5 197	-1.09	0.45	0	0	0	-17.15	-0.69
Uruguay	1 060	1 199	1 617	34.19	3.58	4	6	12	19.13	7.47	792	828	1 108	48.21	3.62
ASIA and PACIFIC	48 789	52 193	62 724	2.32	2.08	48 107	52 782	65 627	9.49	2.40	711	545	541	7.01	-0.33
Bangladesh	233	238	246	-0.50	0.37	163	217	333	-1.45	4.61	0	0	0	0.00	0.00
China ^c	28 112	29 708	35 195	0.53	1.84	34 375	38 738	48 132	12.67	2.42	572	436	411	10.25	-1.00
India	16 500	18 085	22 089	6.90	2.36	98	5	5	17.35	0.00	35	5	5	8.16	0.00
Indonesia	688	715	700	-5.77	-0.15	1 249	1 238	1 449	0.18	1.65	0	0	0	0.00	0.00
Iran, Islamic Republic of	483	467	698	10.48	4.75	869	934	1 465	8.64	4.82	2	2	5	8.40	6.86
Korea	126	125	125	1.18	0.00	1 287	1 320	1 371	-2.04	0.29	0	0	0	-0.08	0.00
Malaysia	0	0	0	0.00	-0.09	652	655	671	0.27	0.27	27	28	13	-7.26	-8.24
Pakistan	536	578	747	4.92	3.07	1 086	1 183	1 839	10.53	4.58	3	2	17	6.98	23.04
Saudi Arabia	0	0	0	0.00	0.00	2	2	2	-0.14	2.50	0	0	0	26.20	0.00
Turkey	878	987	1 174	2.08	2.19	1 962	1 824	2 566	12.32	3.66	2	2	0	-11.63	-12.82
LEAST DEVELOPED COUNTRIES (LDC)	1 042	1 060	1 132	2.20	0.78	281	333	466	0.70	3.44	18	18	18	-2.96	-0.11
OCDE	123 070	134 287	151 005	1.81	1.24	34 930	34 594	35 614	0.62	0.12	40 712	45 356	43 027	1.94	-0.83
NON-OCDE	184 499	201 862	255 756	6.03	2.67	50 232	55 528	68 944	9.39	2.35	43 479	43 818	60 582	9.54	3.61

For notes, see end of the table.

Table B.4. **Oilseed projections (cont.)**

Crop year ^a	CONSUMPTION (kt)			Growth ^b (%)		DOMESTIC CRUSH (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	310 627	335 682	407 887	4.14	2.13	273 452	293 252	361 885	4.49	2.29
DEVELOPED	127 262	132 509	158 721	2.30	1.93	115 895	120 190	145 396	2.47	2.02
NORTH AMERICA	60 031	60 833	73 053	0.89	1.96	54 890	55 106	67 450	1.19	2.14
Canada	6 289	7 824	11 086	1.73	3.52	5 490	6 797	9 874	2.96	3.75
United States	53 741	53 008	61 967	0.80	1.71	49 400	48 309	57 576	1.01	1.89
EUROPE	43 968	45 707	53 386	2.68	1.64	41 255	42 971	50 587	2.97	1.72
EU(27)	42 359	44 100	51 746	2.66	1.69	40 064	41 773	49 356	2.96	1.76
CIS	14 684	16 981	22 744	11.14	3.16	12 258	14 218	18 931	10.99	3.08
Russian Federation	7 743	8 626	10 564	10.93	2.11	7 169	8 005	9 802	10.86	2.09
Ukraine	5 933	7 188	10 286	12.20	3.96	4 351	5 337	7 600	11.90	3.90
OCEANIA DEVELOPED	712	915	1 168	3.65	2.62	702	905	1 158	3.93	2.65
Australia	707	910	1 163	3.67	2.63	698	901	1 154	3.96	2.66
New Zealand	5	5	5	1.27	0.03	4	4	4	0.66	0.00
OTHER DEVELOPED	7 868	8 073	8 370	-0.70	0.43	6 790	6 990	7 270	-1.01	0.47
Japan	6 864	6 813	6 531	-0.95	-0.51	5 886	5 845	5 596	-1.32	-0.53
South Africa	1 004	1 261	1 839	1.04	4.55	904	1 144	1 674	1.04	4.62
DEVELOPING	183 365	203 173	249 166	5.58	2.26	157 557	173 062	216 489	6.20	2.47
AFRICA	3 281	3 423	4 147	8.92	2.13	2 429	2 600	3 134	10.95	2.08
NORTH AFRICA	2 282	2 400	2 952	13.64	2.29	1 947	2 048	2 465	13.72	2.05
Algeria	155	171	184	6.08	0.79	122	136	143	4.13	0.52
Egypt	1 363	1 417	1 824	20.58	2.82	1 227	1 273	1 619	20.58	2.70
SUB-SAHARAN AFRICA	999	1 023	1 195	1.96	1.75	482	552	670	3.43	2.19
LATIN AMERICA and CARIBBEAN	83 964	95 408	117 155	5.61	2.29	78 962	86 772	107 612	5.83	2.40
Argentina	41 084	45 716	56 109	7.50	2.34	40 249	44 801	55 121	7.82	2.37
Brazil	32 291	38 771	48 087	4.79	2.35	30 160	33 069	41 939	4.66	2.59
Chile	297	303	327	6.02	0.82	267	272	283	6.02	0.44
Mexico	4 863	5 065	5 365	-1.08	0.53	4 303	4 554	4 993	-0.47	0.84
Uruguay	275	377	521	25.49	3.57	233	319	453	26.82	3.88
ASIA and PACIFIC	96 120	104 342	127 864	5.47	2.24	76 166	83 690	105 743	6.46	2.56
Bangladesh	395	455	578	-0.99	2.61	356	410	513	-0.99	2.44
China ^c	61 864	67 929	83 061	5.97	2.19	50 284	55 846	70 995	6.94	2.59
India	16 580	18 037	21 999	6.86	2.28	15 230	16 560	19 999	6.82	2.18
Indonesia	1 942	1 968	2 150	-2.33	0.97	7	22	36	4.42	4.19
Iran, Islamic Republic of	1 348	1 397	2 157	9.02	4.80	1 213	1 258	1 934	9.02	4.75
Korea	1 412	1 445	1 496	-1.73	0.27	994	990	1 069	-2.05	0.63
Malaysia	626	626	658	0.71	0.54	563	564	590	0.71	0.51
Pakistan	1 566	1 786	2 568	7.48	3.91	1 409	1 621	2 387	7.48	4.17
Saudi Arabia	2	2	2	-0.50	2.65	2	2	2	-0.33	2.79
Turkey	2 820	2 809	3 740	8.26	3.18	2 075	2 101	2 734	7.28	2.93
LEAST DEVELOPED COUNTRIES (LDC)	1 303	1 375	1 580	1.93	1.51	954	1 021	1 170	1.37	1.46
OCDE	119 631	122 549	143 702	1.40	1.69	109 268	111 632	132 747	1.66	1.83
NON-OCDE	190 996	213 133	264 186	6.18	2.38	164 184	181 620	229 139	6.76	2.57

a) Beginning crop marketing year – see Glossary of Terms for definitions.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681144103220>

Table B.5. Oilseed meal projections

Marketing year	PRODUCTION (kt)			Growth ^a (%)		IMPORTS (kt)			Growth ^a (%)		EXPORTS (kt)			Growth ^a (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	196 266	209 750	258 853	4.41	2.29	58 524	65 000	80 320	4.69	2.26	63 986	70 462	85 782	6.20	2.10
DEVELOPED	79 421	81 283	97 842	2.01	1.97	32 858	35 400	35 377	3.38	-0.09	13 271	15 894	23 304	5.31	3.94
NORTH AMERICA	42 086	42 054	51 264	0.99	2.11	3 229	3 687	5 225	6.41	3.34	10 049	12 064	18 705	3.74	4.52
Canada	3 543	4 382	6 365	1.75	3.75	1 326	1 149	996	5.00	-2.32	1 938	2 589	4 322	8.07	5.30
United States	38 543	37 672	44 899	0.92	1.89	1 903	2 538	4 229	7.56	5.28	8 111	9 474	14 383	2.87	4.29
EUROPE	26 980	27 767	32 693	2.89	1.72	24 586	26 131	23 441	1.88	-1.23	744	1 066	1 066	2.18	0.00
EU(27)	26 285	27 069	31 970	2.85	1.75	23 954	25 474	22 776	1.75	-1.26	678	1 000	1 000	2.37	0.00
CIS	5 346	6 255	8 408	11.46	3.18	1 510	1 637	2 311	14.09	3.84	2 464	2 749	3 520	16.77	2.53
Russian Federation	3 152	3 545	4 412	11.38	2.27	878	878	955	15.89	1.28	905	988	962	26.18	-0.77
Ukraine	1 836	2 282	3 250	12.49	3.90	64	64	95	22.53	4.46	1 377	1 544	2 101	12.44	3.36
OCEANIA DEVELOPED	410	526	673	3.66	2.65	711	751	768	11.41	0.33	2	0	0	-2.12	0.00
Australia	407	524	671	3.67	2.66	566	606	623	11.77	0.41	2	0	0	-2.13	0.00
New Zealand	2	2	2	1.62	0.00	145	145	145	10.28	0.00	0	0	0	0.00	0.00
OTHER DEVELOPED	4 600	4 681	4 804	-1.23	0.31	2 821	3 193	3 631	9.89	1.28	13	16	13	18.67	-2.36
Japan	4 081	4 042	3 870	-1.66	-0.53	1 740	1 901	1 627	9.94	-1.77	0	0	0	17.30	0.00
South Africa	518	639	935	2.51	4.62	1 081	1 292	2 004	9.83	4.64	13	16	13	19.29	-2.36
DEVELOPING	116 845	128 467	161 010	6.33	2.49	25 666	29 600	44 943	6.56	4.59	50 715	54 567	62 477	6.48	1.50
AFRICA	1 801	1 917	2 317	11.92	2.11	2 670	3 193	4 610	5.60	4.12	35	35	28	-0.80	-2.65
NORTH AFRICA	1 457	1 528	1 845	15.07	2.09	2 425	2 913	4 152	5.40	4.00	5	6	6	3.93	0.00
Algeria	77	85	90	4.90	0.52	684	802	1 154	11.02	3.94	0	0	0	0.00	0.00
Egypt	948	983	1 250	21.32	2.70	832	1 105	1 498	-1.65	3.58	2	2	2	0.00	0.00
SUB-SAHARAN AFRICA	344	390	472	3.42	2.18	246	280	458	7.85	5.27	30	29	22	-1.53	-3.28
LATIN AMERICA and CARIBBEAN	59 549	65 317	81 009	5.81	2.40	6 001	6 942	9 899	7.16	4.09	43 207	46 101	53 447	6.20	1.64
Argentina	30 040	33 377	41 123	8.13	2.38	0	0	0	0.00	0.00	28 961	32 052	39 108	8.30	2.22
Brazil	23 104	25 277	32 004	4.39	2.58	138	152	145	0.11	-0.54	12 338	12 216	12 008	2.64	-0.26
Chile	192	194	203	6.78	0.44	887	957	1 453	8.89	4.67	6	8	11	22.26	3.41
Mexico	3 200	3 399	3 718	-0.58	0.81	279	556	581	24.05	1.95	0	0	0	-11.05	0.00
Uruguay	141	202	286	29.33	3.88	102	104	229	5.26	8.91	6	5	0	-10.49	-16.49
ASIA and PACIFIC	55 494	61 233	77 684	6.74	2.60	16 994	19 465	30 434	6.51	4.84	7 473	8 431	9 003	8.28	0.71
Bangladesh	213	246	308	-0.99	2.44	213	256	405	6.01	5.16	0	0	0	0.00	0.00
China ^b	37 408	41 751	53 412	7.35	2.66	395	395	4 602	17.66	28.81	719	706	0	-6.23	-83.58
India	10 867	11 885	14 354	6.89	2.18	2	0	0	9.89	0.00	5 838	6 734	7 393	11.39	1.26
Indonesia	3	9	15	4.35	4.19	2 512	2 927	3 547	7.38	2.12	9	10	10	0.02	0.00
Iran, Islamic Republic of	903	932	1 432	9.03	4.75	991	1 209	1 867	14.88	5.17	90	115	155	47.32	3.36
Korea	775	773	833	-2.03	0.63	2 272	2 437	2 521	4.71	0.22	0	0	0	0.00	0.00
Malaysia	444	444	465	0.71	0.51	900	1 054	1 276	7.41	2.07	21	25	20	-2.90	-2.24
Pakistan	877	1 008	1 484	7.22	4.17	390	461	877	24.80	7.48	68	73	97	8.76	3.17
Saudi Arabia	1	1	1	-0.51	0.00	697	777	983	3.21	2.62	0	0	0	0.00	0.00
Turkey	1 163	1 163	1 513	8.69	2.93	971	1 330	2 245	5.62	5.72	70	31	213	17.08	19.77
LEAST DEVELOPED COUNTRIES (LDC)	555	595	687	1.44	1.55	325	379	614	3.10	5.37	19	19	20	1.88	0.52
OCDE	78 277	79 311	94 152	1.43	1.81	33 444	36 429	36 046	3.07	-0.19	10 855	13 151	19 974	3.71	4.31
NON-OCDE	117 990	130 439	164 700	6.81	2.58	25 080	28 571	44 274	7.18	4.80	53 131	57 311	65 808	6.80	1.52

For notes, see end of the table.

Table B.5. **Oilseed meal projections (cont.)**

Marketing year	CONSUMPTION (kt)			Growth ^a (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	190 633	204 075	253 421	3.96	2.35
DEVELOPED	98 982	100 758	109 926	2.02	0.91
NORTH AMERICA	35 273	33 674	37 792	0.69	1.25
Canada	2 933	2 940	3 038	-0.23	-0.21
United States	32 340	30 734	34 755	0.78	1.38
EUROPE	50 799	52 810	55 071	2.35	0.39
EU(27)	49 537	51 522	53 750	2.26	0.40
CIS	4 377	5 139	7 198	9.78	3.74
Russian Federation	3 129	3 430	4 405	9.63	2.84
Ukraine	506	802	1 244	11.66	4.91
OCEANIA DEVELOPED	1 119	1 278	1 442	7.80	1.35
Australia	971	1 130	1 294	7.50	1.52
New Zealand	148	148	148	10.08	0.00
OTHER DEVELOPED	7 413	7 858	8 423	2.08	0.72
Japan	5 831	5 943	5 497	0.97	-0.91
South Africa	1 582	1 915	2 926	7.16	4.68
DEVELOPING	91 651	103 317	143 496	6.38	3.59
AFRICA	4 421	5 076	6 899	7.91	3.44
NORTH AFRICA	3 861	4 434	5 991	8.29	3.38
Algeria	759	887	1 243	10.23	3.65
Egypt	1 764	2 086	2 746	6.14	3.17
SUB-SAHARAN AFRICA	560	641	908	5.55	3.82
LATIN AMERICA and CARIBBEAN	22 134	26 000	37 482	5.59	4.05
Argentina	1 057	1 172	2 031	5.60	5.88
Brazil	10 752	13 207	20 146	6.91	4.64
Chile	1 078	1 142	1 644	8.46	4.07
Mexico	3 481	3 956	4 300	0.47	0.95
Uruguay	239	301	515	17.32	5.99
ASIA and PACIFIC	65 096	72 242	99 114	6.56	3.43
Bangladesh	427	502	713	1.82	3.90
China ^b	37 085	41 441	58 014	7.72	3.62
India	5 191	5 151	6 960	3.44	3.24
Indonesia	2 466	2 927	3 552	7.57	2.14
Iran, Islamic Republic of	1 777	2 022	3 140	11.12	5.08
Korea	3 034	3 187	3 357	2.47	0.35
Malaysia	1 320	1 473	1 721	5.08	1.69
Pakistan	1 195	1 397	2 264	10.73	5.37
Saudi Arabia	697	778	984	3.21	2.62
Turkey	2 086	2 462	3 546	6.96	4.01
LEAST DEVELOPED COUNTRIES (LDC)	862	955	1 281	1.99	3.24
OCDE	100 868	102 543	110 237	1.70	0.74
NON-OCDE	89 765	101 532	143 184	7.00	3.76

a) Least-squares growth rate (see glossary).

b) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

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Table B.6. Vegetable oil projections

Marketing year	PRODUCTION (kt)			Growth ^a (%)		IMPORTS (kt)			Growth ^a (%)		EXPORTS (kt)			Growth ^a (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	107 559	117 083	154 992	5.80	3.08	48 633	51 979	73 127	8.00	3.79	48 201	51 453	72 644	7.54	3.83
DEVELOPED	31 363	33 458	41 166	3.39	2.19	13 503	15 876	25 256	9.78	5.20	5 413	5 950	9 116	4.61	4.16
NORTH AMERICA	11 717	12 053	15 184	1.68	2.41	2 194	2 409	2 730	12.70	1.47	2 589	2 452	3 766	4.51	3.79
Canada	1 967	2 475	3 678	4.02	3.90	244	223	292	5.85	2.96	1 349	1 619	2 671	9.45	4.80
United States	9 749	9 578	11 505	1.24	1.98	1 951	2 185	2 439	13.78	1.30	1 240	833	1 095	0.24	1.48
EUROPE	12 653	13 473	15 897	3.42	1.74	7 905	9 912	18 095	10.91	6.75	74	76	81	-34.93	0.85
EU(27)	12 382	13 227	15 634	3.42	1.76	7 490	9 514	17 697	10.92	6.95	0	0	0	-89.32	0.00
CIS	4 901	5 681	7 573	10.80	3.09	1 673	1 815	2 380	4.63	2.92	2 360	2 999	4 733	17.56	4.73
Russian Federation	2 732	3 040	3 699	10.70	2.02	796	796	812	-0.79	0.01	635	940	1 605	24.09	5.05
Ukraine	1 877	2 294	3 266	11.53	3.90	472	579	1 044	26.00	6.50	1 654	1 977	2 988	16.50	4.51
OCEANIA DEVELOPED	275	352	450	4.18	2.66	457	484	549	12.42	1.66	37	36	36	-1.50	0.00
Australia	274	352	450	4.26	2.66	295	322	387	10.38	2.44	36	36	36	-1.51	0.00
New Zealand	0	0	0	-2.65	0.00	162	162	162	16.51	0.00	0	0	0	0.33	0.00
OTHER DEVELOPED	1 818	1 899	2 063	-0.32	0.93	1 275	1 257	1 502	6.41	1.75	353	386	500	3.87	2.82
Japan	1 569	1 575	1 589	-0.40	0.02	598	620	670	6.17	1.14	278	311	377	1.96	2.07
South Africa	249	324	474	0.05	4.62	677	637	832	6.67	2.28	75	75	123	14.50	5.45
DEVELOPING	76 196	83 625	113 826	6.93	3.42	35 129	36 103	47 870	7.38	3.11	42 788	45 503	63 528	7.96	3.78
AFRICA	2 387	2 477	2 916	2.89	1.83	5 192	5 422	8 006	6.10	4.31	436	435	911	7.53	8.22
NORTH AFRICA	403	432	513	11.23	1.89	2 590	2 663	3 920	3.92	4.27	183	188	542	18.48	11.46
Algeria	42	47	49	2.66	0.52	597	622	863	7.61	3.78	33	38	99	45.87	10.50
Egypt	230	243	307	19.42	2.64	1 255	1 295	2 039	2.76	4.93	143	147	426	16.30	11.53
SUB-SAHARAN AFRICA	1 984	2 045	2 403	1.68	1.82	2 602	2 759	4 085	8.63	4.34	253	246	369	4.08	4.62
LATIN AMERICA and CARIBBEAN	18 186	20 079	25 367	5.53	2.60	3 281	3 476	4 575	5.10	3.13	10 845	10 662	12 626	6.38	2.20
Argentina	8 488	9 468	11 609	6.52	2.34	0	0	0	0.00	0.00	7 073	7 029	7 531	5.63	1.53
Brazil	5 926	6 494	8 284	4.67	2.65	292	222	121	-0.94	-7.38	2 394	2 214	2 960	7.26	2.49
Chile	64	66	69	4.37	0.44	313	323	489	10.03	4.61	2	1	4	-2.81	12.49
Mexico	925	989	1 164	0.30	1.63	557	570	525	3.11	-0.38	42	39	39	-1.10	0.00
Uruguay	60	78	111	24.74	3.88	46	42	48	15.39	1.65	2	2	2	-9.41	1.80
ASIA and PACIFIC	55 623	61 069	85 544	7.63	3.73	26 656	27 205	35 290	7.97	2.85	31 508	34 406	49 991	8.54	4.15
Bangladesh	135	156	195	-0.99	2.44	1 182	1 219	1 764	6.57	4.12	0	0	0	0.00	0.00
China ^b	10 961	12 215	15 771	5.57	2.77	8 668	8 180	10 683	20.42	2.88	113	75	61	3.31	-2.90
India	3 961	4 304	5 186	6.53	2.15	5 820	6 137	7 935	1.55	2.79	58	0	0	22.35	0.00
Indonesia	19 112	21 233	32 277	12.29	4.64	48	54	100	10.63	6.86	14 152	15 960	25 161	14.81	5.04
Iran, Islamic Republic of	266	280	431	9.42	4.75	1 163	1 132	1 232	0.97	0.94	138	97	67	-7.05	-4.08
Korea	178	178	191	-1.99	0.60	537	534	566	5.32	0.83	5	8	32	-0.24	16.07
Malaysia	17 163	18 411	25 427	5.57	3.58	628	728	854	8.05	1.77	15 053	16 268	22 372	5.31	3.57
Pakistan	426	493	727	7.67	4.17	1 808	1 891	2 418	3.09	2.74	57	48	213	57.27	15.73
Saudi Arabia	0	0	0	-0.22	0.00	478	507	712	9.24	3.75	9	9	9	-0.30	-0.12
Turkey	722	760	990	6.18	2.93	803	887	1 156	7.03	2.72	138	172	268	20.93	4.91
LEAST DEVELOPED COUNTRIES (LDC)	806	851	968	0.97	1.43	3 912	4 139	5 979	8.53	4.08	87	89	101	3.08	1.47
OCDE	27 850	29 220	35 293	2.34	1.98	12 891	15 287	24 164	10.07	5.18	3 143	3 073	4 578	-0.65	3.63
NON-OCDE	79 709	87 863	119 699	7.25	3.42	35 742	36 692	48 962	7.32	3.16	45 058	48 379	68 066	8.33	3.84

For notes, see end of the table.

Table B.6. **Vegetable oil projections (cont.)**

Marketing year	CONSUMPTION (kt)			Growth ^a (%)		PER CAPITA (kg)			Growth ^a (%)		CONSUMPTION FOR BIOFUEL USE (kt)			Growth ^a (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	107 718	117 595	155 259	6.00	3.07	16.1	17.2	20.6	4.78	2.00	9 502	15 180	30 539	36.52	7.42
DEVELOPED	39 563	43 553	57 299	5.14	3.10	29.4	32.1	41.3	4.74	2.85	NA	NA	NA	NA	NA
NORTH AMERICA	11 472	12 113	14 150	2.80	1.89	33.9	35.1	37.9	1.79	1.02	NA	NA	NA	NA	NA
Canada	870	1 071	1 298	-1.06	2.10	26.4	32.0	36.0	-2.04	1.28	1	70	211	3.17	11.08
United States	10 602	11 042	12 852	3.17	1.87	34.7	35.4	38.1	2.15	1.00	1 337	1 725	3 417	70.65	7.49
EUROPE	20 488	23 332	33 909	6.87	4.15	38.7	43.9	63.3	6.56	4.06	NA	NA	NA	NA	NA
EU(27)	19 877	22 765	33 328	6.84	4.23	40.3	46.0	66.9	6.53	4.15	6 254	8 925	17 139	31.27	7.12
CIS	4 165	4 524	5 209	5.76	1.68	15.0	16.3	19.0	5.96	1.82	NA	NA	NA	NA	NA
Russian Federation	2 867	2 924	2 905	5.19	0.06	20.1	20.7	21.7	5.67	0.63	NA	NA	NA	NA	NA
Ukraine	673	895	1 316	8.52	4.39	14.6	19.7	31.0	9.32	5.18	NA	NA	NA	NA	NA
OCEANIA DEVELOPED	695	799	962	9.63	2.18	27.9	31.5	34.9	8.48	1.28	NA	NA	NA	NA	NA
Australia	533	637	800	8.03	2.68	25.7	30.1	34.8	6.88	1.74	202	363	431	86.80	2.01
New Zealand	162	162	162	16.23	0.00	38.8	38.1	35.6	15.09	-0.77	NA	NA	NA	NA	NA
OTHER DEVELOPED	2 743	2 785	3 069	2.11	1.00	15.5	15.7	17.4	1.78	1.04	NA	NA	NA	NA	NA
Japan	1 891	1 899	1 888	1.14	-0.01	14.8	14.8	15.1	1.04	0.20	NA	NA	NA	NA	NA
South Africa	852	886	1 181	4.60	2.85	17.5	18.1	23.2	3.63	2.46	0	1	105	0.00	31.75
DEVELOPING	68 156	74 042	97 960	6.52	3.05	12.8	13.5	15.9	5.08	1.78	NA	NA	NA	NA	NA
AFRICA	7 128	7 489	10 005	4.85	3.23	7.8	7.8	8.6	2.47	1.03	NA	NA	NA	NA	NA
NORTH AFRICA	2 795	2 931	3 887	4.23	3.17	11.6	11.8	13.3	2.32	1.41	NA	NA	NA	NA	NA
Algeria	604	632	814	6.73	2.96	17.8	18.1	20.5	5.24	1.54	NA	NA	NA	NA	NA
Egypt	1 334	1 413	1 919	3.65	3.40	17.7	18.1	21.3	1.84	1.82	NA	NA	NA	NA	NA
SUB-SAHARAN AFRICA	4 333	4 557	6 119	5.27	3.27	6.4	6.4	7.0	2.72	0.91	NA	NA	NA	NA	NA
LATIN AMERICA and CARIBBEAN	10 734	12 861	17 305	4.61	3.06	18.7	21.9	26.7	3.32	1.97	NA	NA	NA	NA	NA
Argentina	1 415	2 452	4 073	10.12	4.14	35.7	60.8	93.0	9.13	3.23	583	1 636	3 694	204.43	6.91
Brazil	3 834	4 436	5 446	2.62	2.49	20.0	22.6	25.2	1.24	1.44	368	1 015	2 131	72.33	8.99
Chile	375	388	554	8.90	3.95	22.5	22.8	30.1	7.81	3.07	NA	NA	NA	NA	NA
Mexico	1 418	1 521	1 650	1.19	0.97	13.3	13.9	13.9	0.23	0.03	NA	NA	NA	NA	NA
Uruguay	103	118	157	22.45	3.18	30.8	35.1	45.2	22.35	2.83	NA	NA	NA	NA	NA
ASIA and PACIFIC	50 294	53 692	70 649	7.21	3.02	13.1	13.6	16.3	5.97	1.97	NA	NA	NA	NA	NA
Bangladesh	1 332	1 375	1 959	5.79	3.94	8.4	8.4	10.4	3.94	2.41	NA	NA	NA	NA	NA
China ^b	19 492	20 321	26 394	10.33	2.83	14.7	15.1	18.7	9.68	2.31	NA	NA	NA	NA	NA
India	9 770	10 442	13 121	3.13	2.54	8.4	8.7	9.7	1.54	1.26	87	154	264	61.48	6.03
Indonesia	4 675	5 214	7 163	6.98	3.53	20.2	22.0	27.8	5.69	2.59	229	406	1 147	68.85	11.35
Iran, Islamic Republic of	1 264	1 310	1 590	3.26	2.15	17.7	17.9	19.3	2.19	0.84	NA	NA	NA	NA	NA
Korea	710	704	725	3.60	0.41	14.7	14.5	14.7	3.17	0.26	NA	NA	NA	NA	NA
Malaysia	2 612	2 861	3 800	7.68	3.11	98.2	104.1	121.6	5.79	1.68	255	523	896	69.35	6.02
Pakistan	2 174	2 334	2 923	2.80	2.49	13.3	13.7	14.5	0.97	0.61	NA	NA	NA	NA	NA
Saudi Arabia	457	498	703	9.24	3.81	18.5	19.3	22.7	6.77	1.80	NA	NA	NA	NA	NA
Turkey	1 418	1 494	1 871	5.56	2.46	18.9	19.5	22.1	4.21	1.39	NA	NA	NA	NA	NA
LEAST DEVELOPED COUNTRIES (LDC)	4 638	4 900	6 844	7.06	3.71	6.3	6.4	7.3	4.70	1.51	NA	NA	NA	NA	NA
OCDE	37 763	41 594	54 878	4.90	3.13	30.8	33.6	42.5	4.28	2.69	7 794	11 082	21 197	26.30	7.08
NON-OCDE	69 955	76 001	100 381	6.63	3.03	12.8	13.6	16.1	5.27	1.83	1 709	4 097	9 343	485.29	8.26

a) Least-squares growth rate (see glossary).

b) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate, n.a.: not available.

Source: OECD and FAO Secretariats.

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Table B.7. **Sugar projections (in raw sugar equivalent)**

Crop year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	166 362	169 452	201 534	2.54	1.73	47 440	53 080	63 792	2.56	2.15	50 191	54 828	65 536	2.93	2.08
DEVELOPED	39 906	38 483	40 508	-0.80	0.69	15 555	17 781	17 448	0.22	-0.01	7 733	7 287	6 974	-3.66	-0.51
NORTH AMERICA	7 445	8 330	8 492	-1.28	0.54	3 509	3 751	4 425	4.90	2.17	349	179	286	13.45	2.55
Canada	95	83	141	-2.95	5.07	1 301	1 283	1 315	1.22	0.32	51	59	59	14.58	0.00
United States	7 350	8 247	8 351	-1.27	0.48	2 208	2 468	3 109	7.42	3.03	297	120	227	13.21	3.47
EUROPE	17 567	15 565	15 054	-2.94	-0.19	4 496	5 661	6 443	6.52	1.43	1 822	1 667	814	-10.87	-7.48
EU(27)	16 552	14 546	14 046	-3.41	-0.19	3 455	4 720	5 456	8.11	1.60	1 287	1 162	301	-14.98	-15.00
CIS	6 349	6 048	8 068	6.99	3.07	5 736	6 428	4 856	-4.82	-2.89	900	898	1 096	1.17	2.35
Russian Federation	3 437	3 414	3 827	9.59	1.07	2 951	3 076	2 482	-7.71	-1.99	201	131	187	0.10	3.84
Ukraine	2 164	1 853	2 730	2.83	4.18	194	946	416	-18.91	-8.27	5	167	246	-50.18	4.18
OCEANIA DEVELOPED	5 147	4 996	5 033	0.04	0.08	250	259	275	0.20	0.63	3 828	3 712	3 876	0.60	0.24
Australia	5 147	4 996	5 033	0.04	0.08	8	4	5	4.20	2.88	3 807	3 693	3 857	0.60	0.24
New Zealand	0	0	0	0.00	0.00	242	256	270	0.06	0.59	21	19	19	-0.27	0.00
OTHER DEVELOPED	3 398	3 544	3 861	0.11	0.92	1 564	1 682	1 449	-1.83	-1.13	833	831	903	-5.65	1.06
Japan	892	909	949	0.71	0.47	1 453	1 548	1 316	-0.76	-1.24	5	2	2	-0.68	0.55
South Africa	2 506	2 635	2 912	-0.09	1.07	111	134	134	-11.17	0.00	829	829	901	-5.68	1.06
DEVELOPING	126 456	130 969	161 026	3.80	2.02	31 885	35 298	46 345	3.86	3.09	42 459	47 541	58 562	4.69	2.43
AFRICA	9 422	10 184	12 138	2.64	1.99	8 999	9 611	13 922	4.00	4.07	4 266	4 409	5 133	4.65	1.66
NORTH AFRICA	2 341	2 434	2 942	1.72	2.12	3 732	4 201	5 223	2.53	2.43	302	336	387	4.38	1.59
Algeria	0	0	0	0.00	0.00	1 150	1 279	1 560	2.24	2.23	53	54	54	51.35	0.00
Egypt	1 849	1 923	2 389	2.61	2.44	1 078	1 325	1 616	1.01	2.24	153	192	239	-2.55	2.44
SUB-SAHARAN AFRICA	6 746	7 373	8 790	2.97	2.00	5 154	5 290	8 347	4.97	4.99	3 893	3 997	4 584	4.77	1.49
LATIN AMERICA and CARIBBEAN	52 113	58 647	68 787	4.04	1.94	2 195	1 684	1 817	5.74	0.83	26 471	31 543	40 153	5.41	2.84
Argentina	2 244	2 323	2 920	4.50	2.37	10	0	0	24.08	0.00	450	424	675	12.04	4.72
Brazil	32 984	38 696	45 797	7.46	2.16	0	0	0	19.73	-38.24	20 573	25 375	31 693	9.97	2.72
Chile	351	393	394	-4.78	0.14	469	339	347	10.21	0.29	0	0	0	-45.97	0.00
Mexico	5 678	5 985	6 533	1.50	0.91	264	0	0	31.02	0.00	409	636	1 479	5.94	8.85
Uruguay	7	7	7	-15.01	0.00	101	106	115	-1.38	0.89	1	2	2	-7.99	0.00
ASIA and PACIFIC	64 025	61 180	78 795	3.76	2.07	20 462	23 829	30 580	3.61	2.87	11 642	11 521	13 242	3.10	1.54
China ^c	15 099	16 124	19 838	8.56	2.38	1 038	607	1 465	1.12	15.32	230	337	273	0.48	-1.44
India	26 169	21 795	32 056	2.46	2.29	401	2 000	1 200	-14.38	-5.11	1 472	185	185	13.74	0.00
Indonesia	2 802	2 981	3 457	6.64	1.69	2 055	2 139	2 978	1.73	3.64	1	1	1	-18.64	0.00
Iran, Islamic Republic of	1 022	518	793	-0.71	4.83	1 200	1 757	1 724	0.45	-0.16	250	0	0	30.91	0.00
Korea	0	0	0	0.00	0.00	1 522	1 579	1 870	0.22	1.87	381	361	426	1.42	1.95
Malaysia	46	36	30	-12.26	-1.80	1 566	1 692	2 133	2.83	2.59	312	463	587	-1.50	2.64
Pakistan	4 321	4 140	4 725	3.67	1.61	450	575	1 016	7.30	3.98	306	41	47	14.20	1.61
Saudi Arabia	0	0	0	0.00	0.00	1 329	1 335	1 688	6.61	2.61	492	479	579	13.02	2.10
Thailand	7 700	8 601	9 631	2.70	1.17	0	0	0	0.00	0.00	4 376	5 649	5 998	-0.61	0.53
Turkey	2 041	2 185	2 819	-2.21	2.59	89	169	114	22.04	-4.70	55	22	28	-32.36	2.59
LEAST DEVELOPED COUNTRIES (LDC)	4 593	5 009	6 540	5.00	2.99	5 955	6 473	10 062	4.42	4.83	2 171	2 285	2 764	8.29	2.05
OCDE	35 954	35 016	35 303	-1.69	0.24	10 927	12 248	13 764	4.29	1.47	6 322	6 102	6 428	-4.06	0.58
NON-OCDE	130 408	134 436	166 231	4.00	2.08	36 424	40 663	49 915	2.04	2.37	43 814	48 704	59 081	4.70	2.26

For notes, see end of the table.

Table B.7. **Sugar projections (in raw sugar equivalent) (cont.)**

Crop year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	159 492	167 172	198 411	2.46	1.88	23.8	24.4	26.3	1.24	0.81
DEVELOPED	47 653	48 483	50 148	0.39	0.41	35.4	35.8	36.2	-0.01	0.16
NORTH AMERICA	10 785	11 211	12 001	0.63	0.87	31.8	32.5	32.1	-0.38	0.00
Canada	1 327	1 301	1 407	0.52	0.88	40.4	38.9	39.0	-0.46	0.05
United States	9 459	9 910	10 594	0.65	0.87	30.9	31.8	31.4	-0.37	0.00
EUROPE	20 075	20 066	20 428	0.23	0.20	37.9	37.8	38.1	-0.08	0.11
EU(27)	18 587	18 608	18 947	0.15	0.20	37.7	37.6	38.0	-0.16	0.11
CIS	11 181	11 500	11 752	0.16	0.26	40.2	41.5	43.0	0.35	0.40
Russian Federation	6 338	6 351	6 121	-0.41	-0.35	44.5	45.0	45.7	0.07	0.21
Ukraine	2 352	2 564	2 825	0.87	1.02	50.9	56.3	66.7	1.66	1.81
OCEANIA DEVELOPED	1 427	1 450	1 557	2.00	0.81	57.3	57.1	56.5	0.85	-0.10
Australia	1 194	1 213	1 307	2.04	0.84	57.6	57.4	56.8	0.90	-0.09
New Zealand	233	237	251	1.77	0.64	55.8	55.7	55.1	0.62	-0.13
OTHER DEVELOPED	4 184	4 256	4 409	0.63	0.38	23.7	24.1	25.0	0.29	0.42
Japan	2 384	2 308	2 263	-0.09	-0.22	18.6	18.1	18.0	-0.19	-0.01
South Africa	1 800	1 948	2 146	1.63	1.06	37.1	39.7	42.2	0.66	0.66
DEVELOPING	111 839	118 689	148 263	3.44	2.43	20.9	21.6	24.1	2.01	1.16
AFRICA	14 088	15 185	20 804	3.19	3.47	15.4	15.8	17.8	0.81	1.27
NORTH AFRICA	5 812	6 205	7 719	2.40	2.40	24.2	24.9	26.4	0.49	0.64
Algeria	1 140	1 219	1 490	2.19	2.21	33.7	34.9	37.6	0.70	0.79
Egypt	2 768	2 985	3 738	2.68	2.47	36.7	38.2	41.5	0.88	0.89
SUB-SAHARAN AFRICA	7 893	8 561	12 489	3.63	4.17	11.7	12.1	14.2	1.07	1.82
LATIN AMERICA and CARIBBEAN	26 827	27 612	31 228	2.18	1.39	46.9	47.1	48.2	0.89	0.30
Argentina	1 845	1 931	2 295	2.78	1.94	46.7	47.9	52.4	1.79	1.03
Brazil	11 830	12 471	15 019	3.18	2.10	61.7	63.4	69.5	1.80	1.05
Chile	695	710	739	0.47	0.41	41.8	41.9	40.3	-0.62	-0.47
Mexico	5 533	5 246	5 126	1.76	-0.20	51.9	48.1	43.2	0.80	-1.14
Uruguay	108	112	121	-0.80	0.85	32.4	33.3	34.8	-0.91	0.50
ASIA and PACIFIC	69 912	74 818	94 933	4.05	2.57	18.1	19.0	21.9	2.81	1.52
China ^c	14 960	16 194	21 050	7.05	3.07	11.3	12.0	14.9	6.40	2.55
India	24 184	25 747	32 238	4.21	2.23	20.7	21.4	23.9	2.62	0.96
Indonesia	4 580	4 975	6 417	3.38	2.75	19.8	21.0	24.9	2.09	1.81
Iran, Islamic Republic of	2 075	2 257	2 533	1.37	1.27	29.1	30.8	30.7	0.30	-0.04
Korea	1 138	1 197	1 450	1.19	2.13	23.6	24.7	29.5	0.75	1.97
Malaysia	1 285	1 256	1 578	2.82	2.49	48.4	45.7	50.5	0.92	1.06
Pakistan	4 419	4 711	5 651	2.96	1.97	27.0	27.7	28.1	1.13	0.09
Saudi Arabia	789	843	1 103	3.37	2.97	31.9	32.6	35.6	0.90	0.96
Thailand	2 551	2 723	3 567	4.05	2.97	39.9	42.1	52.8	3.30	2.50
Turkey	2 172	2 323	2 872	1.90	2.28	29.0	30.3	34.0	0.55	1.21
LEAST DEVELOPED COUNTRIES (LDC)	8 204	9 063	13 722	4.08	4.58	11.2	11.8	14.7	1.72	2.38
OCDE	40 483	40 611	41 959	0.59	0.40	33.0	32.8	32.5	-0.03	-0.04
NON-OCDE	119 010	126 561	156 452	3.16	2.31	21.8	22.6	25.0	1.80	1.11

a) Beginning crop marketing year – see the Glossary of Terms for definitions.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681186458022>

Table B.8. **Beef and veal projections**

Calendar year ^a	PRODUCTION ^b (kt)			Growth ^c (%)		IMPORTS ^e (kt)			Growth ^c (%)		EXPORTS ^e (kt)			Growth ^c (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	64 914	65 871	74 229	1.31	1.30	7 112	7 165	9 449	3.62	3.04	7 612	7 953	10 591	3.43	3.16
DEVELOPED	30 097	30 287	31 254	-0.05	0.38	3 642	3 437	4 115	-0.03	1.79	3 444	3 823	4 412	-3.39	1.65
NORTH AMERICA	13 187	13 466	14 166	-0.18	0.56	1 506	1 494	1 817	-1.16	2.37	1 164	1 589	2 003	-5.36	2.32
Canada	1 731	1 636	1 687	1.67	0.20	201	292	303	-5.85	0.64	490	691	800	-0.34	1.94
United States	11 456	11 830	12 479	-0.44	0.60	1 305	1 202	1 513	-0.49	2.74	674	898	1 203	-9.05	2.61
EUROPE	8 660	8 639	8 119	-0.59	-0.60	595	402	714	3.89	4.62	163	117	55	-21.13	-7.64
EU(27)	8 239	8 209	7 648	-0.55	-0.70	513	317	602	3.54	4.97	154	110	48	-21.83	-8.42
CIS	3 996	4 037	4 563	0.30	1.35	849	844	857	6.80	0.00	107	103	177	-6.96	5.94
Russian Federation	1 736	1 762	2 028	-1.16	1.56	748	685	480	7.07	-4.01	0	0	0	-10.62	0.00
Ukraine	606	547	651	-3.15	1.94	15	40	88	34.53	8.14	23	0	0	-25.69	0.00
OCEANIA DEVELOPED	2 988	2 868	3 065	0.87	0.81	12	9	9	6.82	-0.06	2 004	2 010	2 176	1.66	1.17
Australia	2 347	2 268	2 378	0.64	0.65	6	3	3	14.93	0.00	1 486	1 527	1 603	1.52	0.96
New Zealand	641	600	687	1.73	1.39	6	6	6	1.72	-0.09	518	484	572	2.02	1.78
OTHER DEVELOPED	1 267	1 277	1 341	2.04	0.57	680	688	719	-5.61	0.48	6	4	1	-10.76	-15.12
Japan	504	516	540	-0.39	0.55	641	619	613	-5.82	-0.06	1	1	1	0.29	0.00
South Africa	763	760	801	3.95	0.59	39	68	106	-2.09	4.21	6	3	0	-11.85	-6.93
DEVELOPING	34 817	35 585	42 976	2.59	2.02	3 470	3 728	5 333	8.86	4.09	4 167	4 129	6 180	13.24	4.36
AFRICA	3 980	3 908	4 564	1.52	1.70	709	822	1 269	13.62	4.96	49	50	86	-4.31	3.97
NORTH AFRICA	1 202	1 089	1 200	1.49	1.09	489	531	823	13.48	4.89	1	1	2	9.00	7.20
Algeria	118	118	127	0.16	0.75	150	146	167	29.01	1.49	0	0	0	-19.40	29.92
Egypt	477	380	391	0.51	0.44	297	321	543	8.71	5.73	1	1	2	16.44	7.68
SUB-SAHARAN AFRICA	2 778	2 819	3 364	1.52	1.92	220	291	446	14.48	5.11	48	49	84	-4.52	3.89
LATIN AMERICA and CARIBBEAN	17 463	17 809	21 758	3.54	2.20	830	856	1 302	5.81	4.38	3 444	3 384	5 168	14.38	4.55
Argentina	3 124	3 029	3 177	2.52	0.66	4	4	4	-9.31	-4.20	511	557	588	8.77	2.36
Brazil	9 147	9 445	12 263	4.69	2.78	18	20	20	-14.13	1.79	2 183	2 041	3 399	16.95	5.08
Chile	241	247	296	1.12	2.02	250	251	370	10.78	4.38	15	18	33	58.91	6.75
Mexico	1 584	1 630	1 814	2.11	1.37	308	302	497	-0.04	4.98	30	32	33	34.19	0.12
Uruguay	537	543	699	3.65	2.79	3	4	9	46.42	8.88	378	411	712	9.85	6.05
ASIA and PACIFIC	13 374	13 868	16 653	1.76	1.88	1 931	2 049	2 762	8.85	3.59	674	696	925	10.47	3.39
Bangladesh	188	192	228	0.89	1.91	0	3	2	51.90	3.51	0	0	0	89.13	0.00
China ^d	6 054	6 361	8 022	2.48	2.26	9	12	19	-1.11	5.13	80	48	94	6.82	9.09
India	2 780	2 801	3 093	-0.29	1.12	1	0	0	86.43	0.00	531	579	741	12.08	2.83
Indonesia	404	422	500	3.10	1.89	142	105	118	16.54	1.44	0	0	0	10.76	-1.30
Iran, Islamic Republic of	368	388	496	3.69	2.78	125	127	134	14.21	0.41	0	0	1	40.05	11.19
Korea	233	222	225	-3.31	-0.05	271	290	494	0.87	6.71	0	0	0	-1.54	0.00
Malaysia	14	19	23	3.86	2.11	225	234	304	9.91	2.74	4	6	12	7.64	6.58
Pakistan	1 113	1 191	1 436	3.19	2.05	13	21	18	82.19	0.63	8	4	4	34.48	0.68
Saudi Arabia	18	21	24	-1.07	0.69	118	135	207	12.45	4.79	8	9	12	12.20	2.79
Turkey	351	366	448	0.17	2.26	0	0	0	-11.99	9.81	0	7	18	9.56	24.96
LEAST DEVELOPED COUNTRIES (LDC)	2 775	2 828	3 365	1.77	1.90	152	212	336	17.90	6.44	2	3	3	-12.05	0.53
OCDE	27 309	27 501	28 129	-0.09	0.29	3 278	3 060	4 060	-1.29	3.00	3 354	3 751	4 280	-3.13	1.54
NON-OCDE	37 605	38 370	46 100	2.42	1.96	3 834	4 105	5 389	9.68	3.06	4 257	4 202	6 311	11.97	4.40

For notes, see end of the table.

Table B.8. **Beef and veal projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^c (%)		PER CAPITA (kg)			Growth ^c (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	64 352	65 324	73 669	1.30	1.31	6.7	6.7	6.8	0.08	0.24
DEVELOPED	30 359	29 916	30 951	0.43	0.38	15.8	15.4	15.6	0.04	0.13
NORTH AMERICA	13 713	13 508	14 120	0.24	0.52	28.3	27.4	26.5	-0.77	-0.34
Canada	1 055	997	1 077	0.45	0.77	22.5	20.9	20.9	-0.53	-0.05
United States	12 658	12 512	13 043	0.22	0.50	29.0	28.1	27.1	-0.79	-0.37
EUROPE	9 105	8 937	8 774	0.53	-0.23	12.0	11.8	11.5	0.22	-0.32
EU(27)	8 556	8 379	8 165	0.56	-0.31	12.2	11.9	11.5	0.25	-0.39
CIS	4 737	4 781	5 229	1.42	1.01	11.9	12.1	13.4	1.62	1.15
Russian Federation	2 484	2 451	2 494	0.73	0.27	12.2	12.2	13.0	1.21	0.83
Ukraine	598	587	739	-0.48	2.52	9.1	9.0	12.2	0.32	3.31
OCEANIA DEVELOPED	825	728	767	0.13	0.06	23.2	20.1	19.5	-1.01	-0.84
Australia	703	610	651	0.01	0.15	23.7	20.2	19.8	-1.13	-0.79
New Zealand	122	117	115	0.79	-0.39	20.4	19.3	17.7	-0.36	-1.16
OTHER DEVELOPED	1 980	1 961	2 061	-0.75	0.56	7.9	7.8	8.2	-1.09	0.61
Japan	1 142	1 135	1 152	-3.61	0.22	6.2	6.2	6.4	-3.71	0.44
South Africa	839	826	909	4.43	1.01	12.1	11.8	12.5	3.46	0.61
DEVELOPING	33 993	35 408	42 718	2.11	2.04	4.5	4.5	4.9	0.67	0.78
AFRICA	4 672	4 772	5 899	2.81	2.41	3.6	3.5	3.5	0.43	0.21
NORTH AFRICA	1 697	1 656	2 075	3.47	2.55	4.9	4.6	5.0	1.56	0.79
Algeria	271	271	302	9.51	1.17	5.6	5.4	5.3	8.02	-0.25
Egypt	795	720	966	2.75	3.28	7.4	6.4	7.5	0.95	1.71
SUB-SAHARAN AFRICA	2 975	3 117	3 824	2.45	2.34	3.1	3.1	3.0	-0.10	-0.01
LATIN AMERICA and CARIBBEAN	14 519	15 095	17 915	1.84	1.88	17.8	18.0	19.4	0.55	0.79
Argentina	2 617	2 476	2 593	1.52	0.27	46.3	43.0	41.5	0.53	-0.64
Brazil	6 826	7 400	8 851	1.90	1.99	24.9	26.3	28.7	0.52	0.94
Chile	476	477	626	4.71	3.08	20.0	19.7	23.9	3.62	2.20
Mexico	1 704	1 752	2 174	1.95	2.48	11.2	11.2	12.8	0.99	1.54
Uruguay	148	145	170	-5.32	1.76	30.9	30.2	34.3	-5.43	1.41
ASIA and PACIFIC	14 803	15 541	18 903	2.16	2.08	2.7	2.8	3.1	0.92	1.03
Bangladesh	188	195	230	0.91	1.94	0.8	0.8	0.9	-0.94	0.41
China ^d	5 983	6 325	7 946	2.42	2.21	3.2	3.3	3.9	1.78	1.68
India	2 250	2 222	2 351	-2.08	0.64	1.3	1.3	1.2	-3.66	-0.64
Indonesia	603	645	751	5.23	1.74	1.8	1.9	2.0	3.95	0.80
Iran, Islamic Republic of	493	515	629	5.57	2.23	4.8	4.9	5.3	4.51	0.92
Korea	507	516	720	-1.39	4.16	7.4	7.4	10.2	-1.83	4.00
Malaysia	248	273	349	9.21	2.59	6.5	7.0	7.8	7.31	1.16
Pakistan	1 118	1 202	1 443	3.28	2.04	4.8	4.9	5.0	1.45	0.16
Saudi Arabia	135	151	225	9.70	4.39	3.8	4.1	5.1	7.23	2.38
Turkey	355	361	429	0.38	1.82	3.3	3.3	3.5	-0.97	0.75
LEAST DEVELOPED COUNTRIES (LDC)	2 862	2 996	3 691	2.53	2.42	2.7	2.7	2.8	0.17	0.22
OCDE	27 049	26 629	27 776	0.22	0.48	15.4	15.0	15.1	-0.40	0.04
NON-OCDE	37 303	38 694	45 893	2.13	1.85	4.8	4.8	5.1	0.77	0.64

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Gross indigenous production.

c) Least-squares growth rate (see glossary).

d) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

e) Excludes trade of live animals.

est.: estimate.

Source: OECD and FAO Secretariats.

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Table B.9. Pig meat projections

Calendar year ^a	PRODUCTION ^b (kt)			Growth ^c (%)		IMPORTS ^e (kt)			Growth ^c (%)		EXPORTS ^e (kt)			Growth ^c (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	100 496	102 148	119 941	1.58	1.70	5 356	5 401	6 424	7.77	2.13	5 705	5 564	6 799	8.18	2.29
DEVELOPED	40 249	40 390	44 602	0.90	1.08	3 157	3 139	3 212	6.35	0.64	4 421	4 283	4 965	6.73	1.71
NORTH AMERICA	11 928	12 218	13 129	2.03	1.15	580	577	810	2.36	3.57	2 708	2 884	3 495	10.94	2.17
Canada	2 263	2 148	2 212	2.74	0.37	163	205	264	11.70	2.59	1 070	1 011	1 269	7.20	2.51
United States	9 665	10 070	10 917	1.87	1.32	417	372	546	-0.16	4.05	1 638	1 873	2 226	13.93	1.98
EUROPE	23 491	22 980	24 701	0.38	0.66	194	187	206	10.66	0.80	1 558	1 179	1 073	1.68	-0.89
EU(27)	22 453	21 982	23 707	0.41	0.69	60	50	60	14.86	1.06	1 535	1 161	1 060	1.58	-0.85
CIS	3 064	3 462	5 277	1.40	4.18	1 050	883	476	13.06	-5.87	91	167	321	12.88	8.00
Russian Federation	1 747	2 072	3 229	1.81	4.20	847	657	96	11.25	-21.69	0	0	0	-11.39	0.00
Ukraine	598	640	895	-1.27	3.71	89	109	100	36.08	-1.02	0	0	0	-23.29	0.00
OCEANIA DEVELOPED	429	416	393	0.43	-0.63	241	248	313	15.62	2.68	61	52	75	0.29	2.31
Australia	382	372	341	0.38	-0.99	203	204	247	17.01	2.21	61	51	75	0.29	2.32
New Zealand	47	44	52	0.78	1.95	38	44	67	9.92	4.60	0	0	0	0.11	0.13
OTHER DEVELOPED	1 338	1 314	1 102	-0.42	-1.91	1 093	1 243	1 406	2.57	1.62	2	1	1	1.47	-0.40
Japan	1 189	1 164	943	-0.88	-2.28	1 065	1 225	1 361	2.35	1.51	0	0	0	11.99	-1.00
South Africa	149	151	158	3.99	0.61	28	18	45	14.53	6.39	2	0	0	0.47	0.81
DEVELOPING	60 247	61 758	75 339	2.04	2.08	2 199	2 262	3 212	9.70	3.85	1 284	1 282	1 834	10.55	4.08
AFRICA	681	717	987	1.81	3.26	103	77	172	11.91	7.32	6	39	5	5.37	-14.24
NORTH AFRICA	5	6	6	-1.52	0.83	1	1	2	24.29	12.70	0	0	0	33.46	13.48
Algeria	0	0	0	0.00	0.00	0	1	1	47.61	0.00	0	0	0	20.38	0.00
Egypt	2	3	4	-3.70	1.21	0	0	2	6.73	21.85	0	0	0	-51.67	20.32
SUB-SAHARAN AFRICA	676	711	981	1.83	3.28	102	76	169	11.84	7.26	6	39	5	5.20	-14.36
LATIN AMERICA and CARIBBEAN	6 045	6 295	8 037	3.41	2.65	683	671	951	9.96	3.58	770	906	1 296	20.01	4.51
Argentina	270	273	397	3.13	3.83	34	27	73	-7.29	20.92	2	3	5	0.21	6.86
Brazil	3 016	3 191	4 256	3.92	3.11	9	10	11	34.66	1.55	570	698	999	21.07	5.07
Chile	473	457	674	7.79	4.17	3	4	3	6.99	-3.07	126	129	176	27.31	2.34
Mexico	1 104	1 128	1 158	1.43	0.29	494	488	672	14.31	2.97	53	55	60	7.97	0.63
Uruguay	19	23	30	-3.53	3.02	12	11	27	5.42	9.50	1	0	1	67.94	10.54
ASIA and PACIFIC	53 521	54 746	66 315	1.91	1.99	1 413	1 514	2 089	9.28	3.73	508	336	534	4.42	3.60
Bangladesh	0	0	0	0.00	0.00	0	0	0	-42.68	0.00	0	0	0	0.00	0.00
China ^d	44 659	45 626	55 261	1.53	2.00	256	371	225	3.90	-4.16	364	170	246	9.32	4.11
India	499	500	526	0.66	-0.01	0	-1	24	44.75	22.19	2	10	0	34.24	-34.04
Indonesia	616	630	698	2.88	0.84	4	4	23	16.13	21.55	4	3	3	19.02	0.00
Iran, Islamic Republic of	0	0	0	0.00	0.00	0	0	0	-0.12	23.04	0	0	0	-3.21	23.04
Korea	909	959	1 223	-0.80	2.31	416	462	586	13.57	3.31	12	12	12	-19.84	0.00
Malaysia	225	237	304	3.84	2.64	20	9	5	5.15	-9.53	2	3	5	14.01	5.13
Pakistan	0	0	0	0.00	0.00	0	0	0	75.16	0.00	0	0	0	-17.43	0.00
Saudi Arabia	0	0	0	0.00	0.00	5	6	6	19.63	0.10	0	0	0	-42.94	5.87
Turkey	0	0	0	22.84	0.00	2	2	2	0.00	0.00	0	0	0	0.00	0.00
LEAST DEVELOPED COUNTRIES (LDC)	991	1 036	1 397	5.99	3.09	73	55	114	16.73	6.44	0	2	0	10.89	-11.69
OCDE	38 374	38 225	40 913	0.86	0.77	2 876	3 070	3 822	5.91	2.52	4 374	4 167	4 706	7.32	1.39
NON-OCDE	62 123	63 923	79 028	2.04	2.21	2 480	2 331	2 602	10.28	1.58	1 331	1 397	2 093	11.60	4.70

For notes, see end of the table.

Table B.9. **Pig meat projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^c (%)		PER CAPITA (kg)			Growth ^c (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	100 132	101 733	119 578	1.56	1.71	11.7	11.6	12.4	0.34	0.64
DEVELOPED	38 785	38 953	42 560	0.72	0.98	22.5	22.4	23.9	0.33	0.73
NORTH AMERICA	9 577	9 699	10 213	0.23	1.01	22.1	21.9	21.3	-0.78	0.14
Canada	782	875	844	-2.07	-0.34	18.5	20.4	18.3	-3.05	-1.17
United States	8 795	8 824	9 369	0.45	1.14	22.4	22.1	21.7	-0.57	0.26
EUROPE	22 094	21 933	23 780	0.34	0.74	32.5	32.2	34.6	0.03	0.65
EU(27)	20 929	20 800	22 637	0.33	0.77	33.1	32.8	35.4	0.02	0.69
CIS	4 067	4 222	5 431	3.51	2.57	11.4	11.9	15.5	3.71	2.72
Russian Federation	2 639	2 774	3 325	4.33	1.78	14.4	15.3	19.3	4.81	2.34
Ukraine	687	749	995	0.77	3.14	11.6	12.8	18.3	1.57	3.93
OCEANIA DEVELOPED	609	613	631	4.78	0.58	19.0	18.8	17.9	3.63	-0.33
Australia	524	525	513	4.88	0.01	19.7	19.4	17.4	3.73	-0.92
New Zealand	85	88	119	4.15	3.37	15.8	16.2	20.3	3.01	2.60
OTHER DEVELOPED	2 438	2 486	2 505	1.03	0.09	10.8	11.0	11.1	0.70	0.13
Japan	2 263	2 319	2 304	0.75	-0.03	13.8	14.1	14.3	0.65	0.18
South Africa	175	167	201	5.34	1.61	2.8	2.7	3.1	4.37	1.22
DEVELOPING	61 346	62 780	77 018	2.12	2.13	9.0	8.9	9.8	0.68	0.86
AFRICA	779	741	1 154	2.75	4.20	0.7	0.6	0.8	0.37	2.00
NORTH AFRICA	6	6	8	0.17	3.36	0.0	0.0	0.0	-1.74	1.60
Algeria	1	1	1	21.54	0.00	0.0	0.0	0.0	20.05	-1.42
Egypt	3	3	5	-3.06	4.90	0.0	0.0	0.0	-4.87	3.32
SUB-SAHARAN AFRICA	773	735	1 145	2.77	4.20	0.9	0.8	1.0	0.22	1.85
LATIN AMERICA and CARIBBEAN	5 988	6 086	7 724	2.81	2.47	8.2	8.1	9.3	1.52	1.37
Argentina	302	297	465	1.31	5.15	5.9	5.7	8.3	0.32	4.24
Brazil	2 454	2 503	3 269	1.82	2.57	10.0	9.9	11.8	0.45	1.52
Chile	349	331	501	4.49	4.85	16.4	15.2	21.3	3.40	3.98
Mexico	1 576	1 588	1 803	4.22	1.21	11.5	11.4	11.8	3.26	0.27
Uruguay	30	33	56	-1.08	5.46	7.1	7.7	12.5	-1.18	5.11
ASIA and PACIFIC	54 580	55 954	68 140	2.04	2.06	11.1	11.1	12.3	0.79	1.01
Bangladesh	0	0	0	-42.68	0.00	0.0	0.0	0.0	-107.39	-1.53
China ^d	44 551	45 827	55 239	1.50	1.96	26.2	26.6	30.6	0.86	1.43
India	498	490	551	0.63	1.17	0.3	0.3	0.3	-0.96	-0.10
Indonesia	599	552	699	3.00	2.01	2.0	1.8	2.1	1.71	1.07
Iran, Islamic Republic of	0	0	0	-2.20	0.00	0.0	0.0	0.0	-15.89	0.00
Korea	1 341	1 409	1 797	3.73	2.64	21.7	22.6	28.5	3.29	2.49
Malaysia	243	243	305	4.23	2.16	7.1	6.9	7.6	2.33	0.73
Pakistan	0	0	0	74.32	0.00	0.0	0.0	0.0	108.57	0.00
Saudi Arabia	5	5	5	19.61	0.00	0.2	0.2	0.1	-0.63	-2.01
Turkey	2	2	2	44.14	0.00	0.0	0.0	0.0	42.80	-1.07
LEAST DEVELOPED COUNTRIES (LDC)	1 065	1 029	1 512	6.53	3.63	1.1	1.0	1.3	4.17	1.44
OCDE	36 671	36 803	39 761	0.66	0.87	23.3	23.2	24.0	0.05	0.43
NON-OCDE	63 461	64 930	79 817	2.10	2.15	9.1	9.0	10.0	0.74	0.94

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Gross indigenous production.

c) Least-squares growth rate (see glossary).

d) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

e) Excludes trade of live animals.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681272346208>

Table B.10. Poultry meat projections

Calendar year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	89 856	97 724	120 303	3.75	2.31	9 310	9 923	12 312	4.38	2.37	9 380	10 003	12 538	4.60	2.50
DEVELOPED	38 188	39 483	44 775	2.45	1.45	3 609	3 557	3 485	4.37	0.02	4 122	4 317	4 566	1.45	0.84
NORTH AMERICA	20 296	20 441	22 803	2.21	1.42	256	271	281	7.32	0.59	3 197	3 414	3 699	2.69	1.16
Canada	1 199	1 261	1 306	1.91	0.52	222	229	249	5.73	0.89	173	196	206	4.90	0.78
United States	19 097	19 180	21 498	2.23	1.48	34	42	32	28.76	-1.39	3 025	3 219	3 492	2.58	1.19
EUROPE	11 710	12 076	12 735	1.15	0.54	928	1 001	1 087	6.73	0.95	850	828	761	-2.67	-0.91
EU(27)	11 464	11 816	12 441	1.15	0.51	792	826	889	7.79	0.83	842	811	734	-2.71	-1.09
CIS	2 818	3 403	5 044	12.19	3.94	1 732	1 690	1 553	4.57	-0.35	29	28	53	10.33	6.84
Russian Federation	1 842	2 232	3 396	11.82	4.11	1 306	1 255	1 081	3.20	-1.07	8	8	8	17.24	0.00
Ukraine	671	800	1 101	16.41	3.54	175	210	173	15.36	-2.12	9	11	25	27.93	9.28
OCEANIA DEVELOPED	1 009	1 085	1 240	4.07	1.52	0	0	0	0.00	0.00	31	31	39	2.70	2.62
Australia	855	924	1 064	3.92	1.56	0	0	0	0.00	0.00	31	31	39	2.70	2.62
New Zealand	154	161	176	4.88	1.24	0	0	0	0.00	0.00	0	0	0	0.00	0.00
OTHER DEVELOPED	2 354	2 479	2 953	2.23	1.95	693	595	563	1.09	-0.82	14	15	14	-1.82	-1.09
Japan	1 356	1 401	1 450	1.64	0.40	410	348	303	-4.10	-1.83	2	2	2	-6.02	0.00
South Africa	998	1 078	1 503	3.10	3.68	283	247	259	16.15	0.58	12	13	11	-0.81	-1.31
DEVELOPING	51 668	58 242	75 528	4.80	2.86	5 701	6 367	8 827	4.42	3.47	5 258	5 686	7 972	7.73	3.58
AFRICA	2 765	2 906	3 603	2.86	2.30	585	635	1 236	9.74	7.46	47	55	93	7.35	5.73
NORTH AFRICA	1 690	1 744	2 160	3.41	2.30	49	58	168	3.93	11.42	26	31	62	37.96	7.63
Algeria	256	255	287	1.16	1.20	7	10	10	7.85	0.85	0	0	0	14.75	0.00
Egypt	768	783	959	3.52	2.20	27	32	117	9.63	13.23	25	30	60	49.38	7.75
SUB-SAHARAN AFRICA	1 075	1 162	1 443	2.03	2.29	536	576	1 068	10.22	6.93	21	24	30	-3.01	2.53
LATIN AMERICA and CARIBBEAN	19 322	21 831	29 697	6.22	3.48	1 263	1 375	2 206	9.73	4.94	3 593	3 924	6 242	17.11	4.92
Argentina	1 239	1 448	1 986	4.33	3.49	17	0	0	-4.60	0.00	123	158	5	28.76	-27.72
Brazil	10 703	12 495	17 716	7.86	4.04	1	1	1	11.75	-2.60	3 329	3 609	5 972	17.22	5.31
Chile	616	645	787	5.08	2.20	27	34	67	55.80	7.46	84	94	148	15.03	5.22
Mexico	2 548	2 631	2 920	4.70	1.11	592	613	974	12.77	3.84	1	1	1	-18.38	0.41
Uruguay	50	55	70	-1.32	2.81	1	1	1	3.31	-2.36	2	3	3	17.38	0.88
ASIA and PACIFIC	29 580	33 505	42 228	4.12	2.49	3 853	4 357	5 385	2.42	2.19	1 618	1 707	1 637	-2.94	-0.63
Bangladesh	115	121	164	0.63	3.20	3	2	4	3.18	11.60	0	0	0	13.12	0.00
China ^c	15 711	18 572	23 013	3.37	2.29	982	1 166	2 265	2.15	6.42	474	507	540	-3.13	0.48
India	2 250	2 530	3 743	10.36	4.34	0	12	0	68.07	-13.54	4	10	39	-4.69	19.23
Indonesia	1 354	1 456	1 698	6.98	1.76	12	17	45	2.35	11.19	0	0	0	-52.65	0.00
Iran, Islamic Republic of	1 446	1 605	2 249	8.05	3.74	32	44	16	17.89	-11.19	25	49	264	15.31	17.64
Korea	447	507	517	0.78	0.36	103	96	171	-0.41	5.36	2	2	3	0.02	2.31
Malaysia	1 120	1 151	1 262	4.56	1.03	46	43	26	-2.74	-5.47	95	95	74	-1.30	-2.49
Pakistan	508	565	798	5.95	3.79	7	6	35	30.44	19.86	5	7	10	21.68	5.17
Saudi Arabia	558	582	697	2.31	1.89	480	544	780	3.47	4.10	6	4	0	-10.12	-7.42
Turkey	985	1 064	1 307	6.38	2.21	89	101	115	18.39	2.33	44	53	99	20.21	6.84
LEAST DEVELOPED COUNTRIES (LDC)	1 588	1 683	2 086	7.19	2.35	499	508	960	9.75	7.26	6	7	10	-9.80	2.92
OCDE	38 202	39 042	42 775	2.13	1.10	2 291	2 307	2 784	5.23	1.65	4 121	4 315	4 578	1.49	0.87
NON-OCDE	51 654	58 683	77 528	5.08	3.04	7 019	7 616	9 528	4.14	2.59	5 259	5 688	7 960	7.67	3.57

For notes, see end of the table.

Table B.10. **Poultry meat projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	89 793	97 687	120 231	3.74	2.31	11.8	12.6	14.0	2.52	1.24
DEVELOPED	37 663	38 755	43 692	2.73	1.38	24.6	25.2	27.7	2.34	1.14
NORTH AMERICA	17 349	17 330	19 385	2.16	1.45	45.1	44.2	45.7	1.14	0.58
Canada	1 244	1 302	1 347	2.07	0.49	33.3	34.3	32.9	1.09	-0.33
United States	16 105	16 028	18 038	2.16	1.52	46.3	45.2	47.1	1.15	0.65
EUROPE	11 788	12 248	13 061	1.83	0.66	19.6	20.3	21.5	1.53	0.57
EU(27)	11 414	11 832	12 596	1.84	0.64	20.4	21.1	22.2	1.53	0.55
CIS	4 527	5 064	6 544	8.83	2.72	14.3	16.1	21.1	9.02	2.86
Russian Federation	3 146	3 479	4 469	7.66	2.59	19.4	21.7	29.3	8.14	3.16
Ukraine	837	999	1 250	15.94	2.48	16.0	19.3	25.9	16.74	3.27
OCEANIA DEVELOPED	978	1 054	1 200	4.11	1.48	34.5	36.5	38.3	2.97	0.57
Australia	824	893	1 024	3.97	1.52	34.9	37.1	39.2	2.82	0.59
New Zealand	154	161	176	4.88	1.24	32.5	33.3	34.0	3.74	0.47
OTHER DEVELOPED	3 021	3 059	3 502	1.95	1.46	15.1	15.2	17.5	1.61	1.50
Japan	1 752	1 747	1 751	0.04	-0.04	12.0	12.0	12.3	-0.06	0.17
South Africa	1 269	1 312	1 750	5.12	3.21	23.0	23.5	30.3	4.16	2.81
DEVELOPING	52 130	58 932	76 539	4.51	2.88	8.6	9.4	11.0	3.08	1.61
AFRICA	3 304	3 486	4 747	3.76	3.38	3.2	3.2	3.6	1.38	1.17
NORTH AFRICA	1 713	1 771	2 266	3.25	2.67	6.3	6.2	6.8	1.34	0.90
Algeria	263	265	296	1.31	1.18	6.8	6.7	6.6	-0.17	-0.24
Egypt	770	785	1 015	3.26	2.78	9.0	8.8	9.9	1.45	1.21
SUB-SAHARAN AFRICA	1 590	1 715	2 481	4.34	4.07	2.1	2.1	2.5	1.78	1.71
LATIN AMERICA and CARIBBEAN	16 992	19 281	25 661	4.90	3.27	26.1	28.9	34.9	3.62	2.18
Argentina	1 132	1 290	1 981	2.71	4.71	25.2	28.2	39.8	1.72	3.80
Brazil	7 375	8 888	11 745	5.04	3.46	33.8	39.8	47.8	3.66	2.40
Chile	560	585	706	4.60	2.04	29.6	30.3	33.8	3.51	1.17
Mexico	3 138	3 243	3 892	5.91	1.71	25.9	26.2	28.8	4.95	0.78
Uruguay	49	53	68	-1.73	2.83	12.8	13.8	17.3	-1.84	2.48
ASIA and PACIFIC	31 834	36 164	46 132	4.39	2.62	7.3	8.1	9.4	3.15	1.57
Bangladesh	118	123	168	0.68	3.36	0.7	0.7	0.8	-1.16	1.83
China ^c	16 219	19 231	24 737	3.57	2.65	10.7	12.6	15.5	2.92	2.12
India	2 247	2 532	3 703	10.40	4.21	1.7	1.9	2.4	8.82	2.94
Indonesia	1 366	1 473	1 744	6.96	1.93	5.2	5.5	6.0	5.68	0.99
Iran, Islamic Republic of	1 453	1 600	2 001	8.04	2.48	17.9	19.2	21.4	6.97	1.17
Korea	548	601	685	0.45	1.39	10.0	10.9	12.2	0.01	1.24
Malaysia	1 071	1 099	1 215	4.79	1.10	35.5	35.2	34.2	2.89	-0.33
Pakistan	510	564	823	6.06	4.16	2.7	2.9	3.6	4.24	2.28
Saudi Arabia	1 032	1 123	1 477	2.96	3.03	36.7	38.2	42.0	0.49	1.03
Turkey	1 031	1 112	1 323	6.75	1.94	12.1	12.7	13.8	5.40	0.87
LEAST DEVELOPED COUNTRIES (LDC)	2 081	2 184	3 036	7.84	3.69	2.5	2.5	2.9	5.48	1.49
OCDE	36 353	37 066	40 979	2.36	1.16	26.1	26.3	28.0	1.74	0.72
NON-OCDE	53 440	60 620	79 252	4.76	2.96	8.6	9.5	11.2	3.40	1.75

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

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Table B.11. **Sheep meat projections**

Calendar year ^a	PRODUCTION ^b (kt)			Growth ^c (%)		IMPORTS ^e (kt)			Growth ^c (%)		EXPORTS ^e (kt)			Growth ^c (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	12 393	12 655	14 559	1.77	1.57	850	845	1 107	3.38	3.01	960	934	1 040	1.93	1.20
DEVELOPED	3 370	3 242	3 490	0.13	0.83	486	478	595	3.44	2.56	893	850	968	1.85	1.42
NORTH AMERICA	105	106	111	-2.81	0.43	111	111	145	5.49	2.96	6	5	5	9.88	0.18
Canada	17	22	30	3.35	3.42	24	24	32	4.93	3.20	0	0	0	5.18	2.56
United States	88	84	80	-3.78	-0.53	87	87	113	5.65	2.90	6	5	5	10.19	0.00
EUROPE	1 178	1 123	1 105	-0.72	-0.17	280	280	287	4.33	0.29	10	13	12	19.04	-0.73
EU(27)	1 083	1 025	1 008	-0.84	-0.18	269	267	274	4.33	0.30	6	8	8	27.08	0.07
CIS	620	645	819	2.65	2.72	13	13	13	17.00	0.57	1	1	1	-13.18	3.64
Russian Federation	153	169	250	1.38	4.54	13	12	12	18.75	0.00	0	0	0	-46.74	0.00
Ukraine	15	15	19	-2.18	2.39	0	0	1	39.83	30.62	0	1	0	-6.53	21.15
OCEANIA DEVELOPED	1 326	1 228	1 312	0.10	0.70	7	7	7	1.41	0.00	875	830	949	1.71	1.45
Australia	754	737	785	-0.57	0.68	0	0	0	0.00	0.00	378	398	493	1.05	2.32
New Zealand	571	491	527	1.03	0.73	7	7	7	1.41	0.00	498	432	456	2.22	0.60
OTHER DEVELOPED	141	140	143	0.06	0.24	74	68	143	-2.50	8.81	0	1	1	21.86	6.64
Japan	0	0	0	0.00	0.00	51	47	30	1.16	-4.97	0	0	0	0.00	0.00
South Africa	141	140	143	0.06	0.24	24	21	113	-8.99	18.65	0	1	1	21.86	6.64
DEVELOPING	9 023	9 413	11 069	2.44	1.82	364	367	512	3.29	3.57	67	84	72	3.30	-1.56
AFRICA	2 015	2 069	2 332	1.94	1.40	38	39	95	12.48	9.20	14	17	8	3.43	-7.79
NORTH AFRICA	626	631	683	1.53	0.91	20	19	47	16.64	9.33	5	5	6	23.00	2.01
Algeria	196	196	212	1.48	0.91	8	10	23	18.24	9.26	0	0	0	-3.78	23.04
Egypt	62	65	59	-2.87	-0.99	3	1	6	12.52	14.56	0	0	0	17.28	4.24
SUB-SAHARAN AFRICA	1 389	1 439	1 649	2.13	1.60	18	20	48	9.38	9.05	9	12	2	-1.49	-19.91
LATIN AMERICA and CARIBBEAN	352	367	414	1.07	1.39	56	58	73	0.79	2.57	22	22	23	2.46	0.59
Argentina	0	0	0	0.00	0.00	0	0	0	0.00	0.00	0	0	0	0.00	0.00
Brazil	120	124	142	1.33	1.50	7	8	9	15.45	0.83	0	0	0	56.07	0.00
Chile	17	19	19	0.20	-0.07	0	0	0	-24.34	27.05	6	8	7	3.47	-1.36
Mexico	49	51	56	5.53	0.94	33	34	33	-1.69	-0.05	0	0	0	-75.19	0.00
Uruguay	34	34	40	-5.49	1.69	0	0	0	0.00	0.00	16	13	16	4.71	2.22
ASIA and PACIFIC	6 655	6 977	8 323	2.67	1.96	270	269	345	2.93	2.62	31	44	42	4.31	-1.03
Bangladesh	198	212	229	5.83	0.87	1	2	5	35.32	6.95	0	0	0	-0.80	0.00
China ^d	3 396	3 651	4 630	3.65	2.64	9	9	8	-1.43	-1.34	9	10	8	6.19	-1.34
India	773	788	911	1.56	1.59	0	0	0	35.86	0.00	6	6	7	-4.67	2.24
Indonesia	148	152	157	7.49	0.42	1	4	11	6.59	8.59	0	0	0	22.92	0.00
Iran, Islamic Republic of	499	510	609	2.23	1.97	0	0	0	1.63	0.00	0	0	1	30.54	4.49
Korea	2	2	2	-4.83	0.00	6	6	6	6.64	0.00	0	0	0	-69.59	0.00
Malaysia	1	1	1	3.56	-0.37	17	18	23	3.10	2.62	0	0	0	37.02	83.81
Pakistan	541	548	582	2.00	0.62	0	0	0	34.73	0.00	7	22	12	23.42	-8.12
Saudi Arabia	43	41	41	9.19	-0.06	60	57	66	2.79	1.72	5	3	8	25.31	10.07
Turkey	318	321	313	-1.97	-0.20	0	0	1	40.83	2.59	0	1	-1	1.55	0.34
LEAST DEVELOPED COUNTRIES (LDC)	1 401	1 453	1 652	2.22	1.50	7	7	19	4.89	8.72	1	9	0	-25.71	-71.67
OCDE	2 915	2 767	2 835	-0.53	0.26	484	478	503	3.57	0.56	888	844	961	1.81	1.42
NON-OCDE	9 477	9 888	11 723	2.56	1.91	365	367	604	3.15	5.53	72	90	79	3.64	-1.33

For notes, see end of the table.

Table B.11. **Sheep meat projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^c (%)		PER CAPITA (kg)			Growth ^c (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	12 289	12 582	14 831	1.92	1.83	1.6	1.6	1.7	0.71	0.76
DEVELOPED	2 887	2 775	3 038	0.44	1.06	1.9	1.8	1.9	0.05	0.81
NORTH AMERICA	203	206	244	0.70	1.89	0.5	0.5	0.6	-0.31	1.02
Canada	41	45	61	4.90	3.37	1.1	1.2	1.5	3.92	2.54
United States	163	160	182	-0.19	1.44	0.5	0.5	0.5	-1.20	0.56
EUROPE	1 450	1 392	1 382	0.05	-0.07	2.4	2.3	2.3	-0.26	-0.16
EU(27)	1 346	1 284	1 274	-0.02	-0.08	2.4	2.3	2.3	-0.33	-0.16
CIS	626	641	816	2.70	2.73	2.0	2.0	2.6	2.89	2.88
Russian Federation	159	166	247	1.56	4.60	1.0	1.0	1.6	2.05	5.17
Ukraine	15	15	20	-1.98	3.48	0.3	0.3	0.4	-1.18	4.28
OCEANIA DEVELOPED	379	328	311	-1.00	-0.58	13.4	11.4	9.9	-2.15	-1.49
Australia	296	264	244	-1.02	-0.84	12.5	11.0	9.3	-2.16	-1.77
New Zealand	84	65	67	-0.97	0.41	17.6	13.4	13.0	-2.12	-0.36
OTHER DEVELOPED	229	208	285	-0.38	3.80	1.1	1.0	1.4	-0.72	3.84
Japan	51	47	30	1.16	-4.97	0.3	0.3	0.2	1.05	-4.75
South Africa	178	161	255	-0.78	5.44	3.2	2.9	4.4	-1.75	5.04
DEVELOPING	9 403	9 808	11 793	2.41	2.04	1.5	1.6	1.7	0.97	0.78
AFRICA	2 005	2 054	2 523	2.18	2.24	1.9	1.9	1.9	-0.21	0.04
NORTH AFRICA	644	653	758	1.61	1.66	2.4	2.3	2.3	-0.30	-0.10
Algeria	204	205	235	1.90	1.50	5.3	5.2	5.2	0.41	0.08
Egypt	69	75	100	-2.20	3.18	0.8	0.8	1.0	-4.00	1.61
SUB-SAHARAN AFRICA	1 361	1 401	1 765	2.45	2.50	1.8	1.7	1.8	-0.11	0.15
LATIN AMERICA and CARIBBEAN	387	402	464	0.80	1.64	0.6	0.6	0.6	-0.49	0.55
Argentina	0	0	0	0.00	0.00	0.0	0.0	0.0	0.00	0.00
Brazil	128	132	151	1.39	1.44	0.6	0.6	0.6	0.01	0.39
Chile	12	11	12	-1.10	0.67	0.6	0.6	0.6	-2.19	-0.21
Mexico	85	88	92	1.98	0.54	0.7	0.7	0.7	1.02	-0.39
Uruguay	16	16	18	-11.41	1.08	4.1	4.2	4.6	-11.52	0.73
ASIA and PACIFIC	7 010	7 351	8 806	2.57	2.01	1.6	1.6	1.8	1.33	0.96
Bangladesh	199	213	234	5.87	0.95	1.1	1.1	1.1	4.03	-0.58
China ^d	3 396	3 650	4 629	3.63	2.64	2.2	2.4	2.9	2.98	2.11
India	764	780	901	1.60	1.59	0.6	0.6	0.6	0.01	0.32
Indonesia	149	156	168	7.47	0.82	0.6	0.6	0.6	6.19	-0.12
Iran, Islamic Republic of	496	507	604	2.13	1.95	6.1	6.1	6.4	1.07	0.64
Korea	8	8	8	4.59	0.00	0.1	0.1	0.1	4.15	-0.15
Malaysia	19	20	25	3.21	2.56	0.6	0.6	0.7	1.31	1.13
Pakistan	535	525	590	1.88	1.30	2.9	2.7	2.6	0.05	-0.58
Saudi Arabia	152	161	172	0.74	0.72	5.4	5.5	4.9	-1.73	-1.29
Turkey	317	319	314	-1.86	-0.14	3.7	3.7	3.3	-3.20	-1.21
LEAST DEVELOPED COUNTRIES (LDC)	1 378	1 423	1 741	2.67	2.17	1.7	1.6	1.6	0.31	-0.03
OCDE	2 429	2 321	2 313	-0.27	-0.02	1.7	1.6	1.6	-0.89	-0.46
NON-OCDE	9 860	10 261	12 518	2.52	2.21	1.6	1.6	1.8	1.16	1.00

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Gross indigenous production.

c) Least-squares growth rate (see glossary).

d) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

e) Excludes trade of live animals.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681337081453>

Table B.12. **Butter projections**

Calendar year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	9 266	10 124	12 419	2.99	2.23	905	868	917	1.93	0.51	855	827	876	1.98	0.54
DEVELOPED	4 151	4 289	4 428	0.33	0.41	461	421	389	1.40	-0.57	768	722	762	1.37	0.30
NORTH AMERICA	776	804	875	2.29	1.08	23	16	22	-1.77	3.31	56	21	14	33.44	-4.77
Canada	80	88	87	-0.29	0.10	8	6	6	3.18	0.00	1	0	0	-26.88	0.00
United States	696	716	789	2.63	1.20	15	9	16	-3.82	4.96	55	21	14	39.41	-4.79
EUROPE	2 202	2 248	2 002	-0.39	-1.17	92	95	95	-2.69	0.04	203	175	85	-0.23	-9.86
EU(27)	2 128	2 173	1 926	-0.42	-1.22	81	85	85	-3.06	0.00	199	170	82	-0.24	-10.09
CIS	577	643	825	2.23	2.53	311	281	241	2.15	-1.22	66	74	78	5.31	1.09
Russian Federation	347	396	553	2.99	3.26	269	234	179	1.65	-2.38	3	3	3	-2.31	0.00
Ukraine	99	99	99	-3.64	0.01	0	0	0	-36.99	0.00	9	8	4	-10.55	-6.97
OCEANIA DEVELOPED	507	511	641	-1.01	2.52	17	19	23	9.20	2.39	441	451	583	-0.27	2.82
Australia	136	131	157	-4.37	2.05	17	19	23	10.12	2.39	74	76	100	-8.49	3.29
New Zealand	372	380	484	0.49	2.68	0	0	0	9.59	0.00	367	375	482	2.04	2.72
OTHER DEVELOPED	88	84	85	-1.07	0.12	17	10	8	23.48	-3.65	2	2	2	-2.45	0.78
Japan	76	74	72	-1.50	-0.26	14	6	4	43.50	-5.00	0	0	0	0.00	0.00
South Africa	12	10	12	1.81	2.66	3	4	4	3.40	-1.87	2	2	2	-2.45	0.78
DEVELOPING	5 115	5 835	7 992	5.61	3.38	445	448	529	2.57	1.40	88	105	114	8.77	2.26
AFRICA	230	248	279	2.68	1.45	107	103	112	-0.37	0.48	1	3	1	-0.37	-12.50
NORTH AFRICA	172	189	217	3.36	1.65	91	81	85	-0.71	-0.05	0	0	0	1.59	-0.30
Algeria	2	2	3	2.76	2.55	13	12	12	5.07	-0.18	0	0	0	-84.50	9.04
Egypt	125	139	165	3.72	2.04	51	48	41	-1.29	-2.24	0	0	0	3.34	3.31
SUB-SAHARAN AFRICA	57	59	62	0.80	0.77	16	21	27	1.69	2.33	1	3	0	-0.63	-15.41
LATIN AMERICA and CARIBBEAN	225	236	282	1.51	1.81	26	24	36	-3.57	2.86	41	39	56	10.09	3.90
Argentina	45	44	54	-1.11	2.18	0	0	0	-42.30	0.00	17	12	15	13.02	3.70
Brazil	82	87	109	1.85	2.16	1	1	9	-40.93	16.51	4	5	5	48.84	0.26
Chile	17	20	24	6.32	1.80	1	0	0	-1.26	24.23	2	2	1	32.56	-4.16
Mexico	14	13	14	-0.81	0.94	5	5	5	37.34	0.24	0	0	1	-7.88	16.06
Uruguay	20	21	26	3.13	2.26	0	0	0	-49.43	0.00	15	16	20	5.54	2.66
ASIA and PACIFIC	4 661	5 351	7 431	6.01	3.53	312	322	380	4.43	1.56	46	63	57	7.96	1.31
Bangladesh	20	24	27	2.08	1.73	0	0	0	-22.93	17.26	0	0	1	-79.47	82.10
China ^c	134	149	206	6.70	3.59	33	34	39	8.55	1.52	3	3	3	34.28	0.00
India	3 492	4 078	5 961	7.35	4.01	12	7	7	-5.45	0.00	7	0	0	19.81	0.00
Indonesia	0	0	0	0.00	0.13	15	17	20	3.84	1.15	0	0	0	-10.84	8.82
Iran, Islamic Republic of	157	167	195	1.15	1.78	40	38	40	13.84	-0.41	0	0	1	28.34	7.60
Korea	4	4	5	6.07	1.23	1	1	1	4.41	1.05	0	0	0	25.71	0.00
Malaysia	0	0	0	0.00	0.21	14	15	20	4.16	2.90	2	2	5	14.26	7.32
Pakistan	606	671	760	2.95	1.64	1	1	5	16.25	9.54	0	21	0	-23.51	-44.24
Saudi Arabia	5	5	6	0.97	2.05	39	36	48	6.82	3.19	3	3	8	36.55	12.26
Turkey	123	128	135	1.02	0.65	7	7	11	8.09	4.92	0	0	0	-15.47	68.10
LEAST DEVELOPED COUNTRIES (LDC)	144	150	167	1.31	1.59	11	17	22	1.09	1.97	0	2	1	-19.91	8.98
OCDE	3 684	3 765	3 726	0.06	-0.01	152	140	153	0.54	0.93	698	644	680	1.10	0.22
NON-OCDE	5 581	6 359	8 694	5.34	3.34	753	728	764	2.22	0.43	157	183	195	6.74	1.71

For notes, see end of the table.

Table B.12. **Butter projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	9 365	10 155	12 493	3.12	2.20	1.4	1.5	1.7	1.90	1.13
DEVELOPED	3 890	3 978	4 087	0.52	0.28	2.9	2.9	2.9	0.13	0.03
NORTH AMERICA	736	805	882	1.30	1.13	2.2	2.3	2.4	0.29	0.27
Canada	88	91	92	0.39	0.22	2.7	2.7	2.6	-0.59	-0.60
United States	649	714	789	1.42	1.25	2.1	2.3	2.3	0.41	0.37
EUROPE	2 125	2 129	2 011	-0.24	-0.67	4.0	4.0	3.8	-0.55	-0.76
EU(27)	2 044	2 049	1 929	-0.26	-0.71	4.1	4.1	3.9	-0.57	-0.79
CIS	826	849	988	1.97	1.60	3.0	3.1	3.6	2.17	1.74
Russian Federation	616	627	729	2.34	1.59	4.3	4.4	5.4	2.82	2.15
Ukraine	90	91	95	-2.52	0.42	1.9	2.0	2.3	-1.72	1.21
OCEANIA DEVELOPED	106	100	111	0.94	0.74	4.2	3.9	4.0	-0.20	-0.17
Australia	74	68	80	1.34	1.18	3.6	3.2	3.5	0.20	0.25
New Zealand	31	31	31	0.00	-0.34	7.5	7.4	6.7	-1.14	-1.10
OTHER DEVELOPED	97	94	95	0.09	0.01	0.6	0.5	0.5	-0.25	0.05
Japan	84	83	81	-0.23	-0.23	0.7	0.6	0.6	-0.33	-0.02
South Africa	13	12	14	2.66	1.56	0.3	0.2	0.3	1.69	1.17
DEVELOPING	5 476	6 177	8 406	5.30	3.27	1.0	1.1	1.4	3.86	2.00
AFRICA	336	347	391	1.65	1.22	0.4	0.4	0.3	-0.73	-0.99
NORTH AFRICA	263	270	302	1.84	1.15	1.1	1.1	1.0	-0.07	-0.62
Algeria	15	14	15	4.72	0.26	0.4	0.4	0.4	3.23	-1.16
Egypt	176	186	206	2.07	1.04	2.3	2.4	2.3	0.26	-0.54
SUB-SAHARAN AFRICA	73	77	89	1.00	1.45	0.1	0.1	0.1	-1.56	-0.90
LATIN AMERICA and CARIBBEAN	213	220	262	-0.17	1.53	0.4	0.4	0.4	-1.45	0.44
Argentina	32	32	39	-4.23	1.65	0.8	0.8	0.9	-5.22	0.74
Brazil	79	83	113	-0.31	2.71	0.4	0.4	0.5	-1.68	1.66
Chile	16	18	22	4.69	2.05	1.0	1.1	1.2	3.60	1.17
Mexico	19	18	18	3.24	0.48	0.2	0.2	0.2	2.28	-0.46
Uruguay	4	5	6	6.89	0.91	1.3	1.5	1.6	6.78	0.56
ASIA and PACIFIC	4 926	5 610	7 754	5.88	3.44	1.3	1.4	1.8	4.64	2.39
Bangladesh	20	24	26	1.23	0.60	0.1	0.1	0.1	-0.62	-0.93
China ^c	164	180	242	6.84	3.28	0.1	0.1	0.2	6.19	2.76
India	3 497	4 085	5 968	7.32	4.00	3.0	3.4	4.4	5.74	2.73
Indonesia	15	17	20	4.01	1.12	0.1	0.1	0.1	2.72	0.18
Iran, Islamic Republic of	196	205	235	2.90	1.37	2.8	2.8	2.8	1.83	0.06
Korea	5	5	6	5.29	1.19	0.1	0.1	0.1	4.86	1.03
Malaysia	11	13	15	2.84	1.78	0.4	0.5	0.5	0.94	0.35
Pakistan	607	651	765	2.96	1.86	3.7	3.8	3.8	1.14	-0.02
Saudi Arabia	41	39	47	3.15	1.98	1.7	1.5	1.5	0.68	-0.02
Turkey	129	135	146	1.28	0.91	1.7	1.8	1.7	-0.07	-0.16
LEAST DEVELOPED COUNTRIES (LDC)	155	164	188	1.45	1.59	0.2	0.2	0.2	-0.91	-0.61
OCDE	3 181	3 251	3 231	0.22	-0.07	2.6	2.6	2.5	-0.40	-0.51
NON-OCDE	6 184	6 904	9 262	4.89	3.11	1.1	1.2	1.5	3.53	1.91

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate, n.a.: not available.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681346208447>

Table B.13. Cheese projections

Calendar year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	19 642	20 234	23 828	2.58	1.79	1 549	1 633	2 109	3.74	2.83	1 760	1 845	2 321	5.27	2.53
DEVELOPED	15 903	16 248	19 119	2.33	1.76	938	978	1 227	4.00	2.64	1 434	1 504	1 792	3.42	1.89
NORTH AMERICA	4 782	4 948	6 086	2.44	2.19	201	171	227	-1.48	3.07	116	115	138	7.66	2.61
Canada	370	378	416	1.55	0.99	21	21	21	-1.08	0.00	10	9	8	-9.43	-1.58
United States	4 412	4 570	5 670	2.52	2.28	180	150	206	-1.53	3.43	105	106	130	11.47	2.91
EUROPE	9 277	9 356	10 632	1.79	1.42	168	162	172	-1.99	0.77	648	618	589	1.54	-0.74
EU(27)	8 943	9 023	10 293	1.82	1.47	92	81	93	-6.48	1.72	576	548	522	1.95	-0.78
CIS	1 082	1 106	1 397	8.57	2.28	314	395	548	27.37	4.00	178	204	333	24.54	4.92
Russian Federation	613	596	718	5.98	1.63	287	363	378	27.43	1.26	20	25	25	29.94	0.00
Ukraine	255	272	335	15.93	2.04	10	13	134	33.20	23.12	61	73	131	24.61	3.91
OCEANIA DEVELOPED	685	758	916	1.31	2.23	54	54	60	5.68	1.08	491	565	720	1.17	2.84
Australia	365	362	423	0.26	1.80	54	54	60	6.59	1.08	206	202	255	0.51	2.87
New Zealand	319	395	493	2.53	2.62	0	0	0	-10.96	0.00	285	363	465	1.69	2.82
OTHER DEVELOPED	78	80	87	1.04	1.02	200	196	220	-0.06	1.23	1	1	11	-3.69	33.43
Japan	40	40	38	1.88	-0.61	195	192	212	-0.20	0.99	0	0	0	22.31	0.00
South Africa	37	40	49	0.20	2.47	5	4	8	6.98	10.28	1	1	11	-3.30	33.43
DEVELOPING	3 739	3 986	4 710	3.67	1.89	612	656	882	3.35	3.09	326	342	529	18.67	4.97
AFRICA	882	981	1 278	3.96	2.92	94	120	183	5.18	4.47	60	73	126	21.15	5.84
NORTH AFRICA	683	781	1 050	4.94	3.27	80	90	136	7.45	4.48	59	72	124	21.22	5.83
Algeria	2	2	2	2.27	0.00	26	28	39	5.00	3.89	0	0	1	18.78	9.04
Egypt	643	739	1 003	4.87	3.37	21	24	37	5.47	4.50	19	22	51	25.32	9.04
SUB-SAHARAN AFRICA	199	201	227	0.95	1.44	14	30	47	-3.51	4.44	1	1	1	16.49	6.54
LATIN AMERICA and CARIBBEAN	1 649	1 753	2 048	2.92	1.80	168	178	218	1.55	1.66	120	123	253	10.26	8.32
Argentina	489	512	677	1.44	3.13	2	0	0	-12.83	0.00	47	51	135	10.73	11.08
Brazil	583	651	697	3.77	0.87	5	5	8	-18.07	2.01	8	13	42	22.69	15.91
Chile	68	65	74	3.81	1.38	8	8	8	10.40	0.00	14	11	12	31.12	0.63
Mexico	152	160	176	2.05	1.13	82	86	137	6.00	5.16	4	4	5	30.54	0.14
Uruguay	42	44	63	7.96	3.80	0	0	0	-24.58	21.57	31	31	47	8.49	4.72
ASIA and PACIFIC	1 208	1 251	1 384	4.52	1.14	351	358	481	3.82	3.28	146	146	150	32.22	0.36
Bangladesh	1	1	1	0.00	1.89	0	0	0	-13.52	-1.61	0	0	0	0.00	0.00
China ^c	361	382	436	8.12	1.44	25	27	37	12.23	3.48	0	0	0	18.09	0.00
India	1	1	1	7.19	0.00	1	1	1	7.47	0.00	1	1	1	36.05	0.00
Indonesia	0	0	0	0.00	0.68	13	15	20	9.25	3.01	0	0	1	38.45	7.53
Iran, Islamic Republic of	223	227	258	0.45	1.42	0	3	4	14.60	6.72	1	1	2	34.58	7.26
Korea	26	26	31	6.52	2.13	47	44	57	7.66	2.83	0	0	0	-0.25	0.00
Malaysia	0	0	0	0.00	-0.60	9	11	16	8.85	4.48	0	0	0	2.55	-0.43
Pakistan	0	0	0	0.00	0.00	1	2	2	21.44	0.40	0	0	0	-35.33	6.83
Saudi Arabia	126	137	137	68.88	0.00	56	44	35	-3.56	-2.46	131	130	128	53.58	-0.19
Turkey	126	126	133	-0.02	0.63	2	2	0	-7.77	-16.33	2	1	0	-10.54	0.25
LEAST DEVELOPED COUNTRIES (LDC)	255	259	290	0.81	1.40	13	28	44	0.87	3.96	0	0	1	17.11	11.71
OCDE	15 013	15 339	17 932	1.96	1.71	719	680	839	-0.02	2.31	1 258	1 302	1 451	1.91	1.22
NON-OCDE	4 629	4 895	5 897	4.78	2.02	831	954	1 270	8.03	3.18	502	543	870	20.41	5.19

For notes, see end of the table.

Table B.13. **Cheese projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	19 414	20 025	23 611	2.43	1.80	2.9	2.9	3.1	1.21	0.73
DEVELOPED	15 392	15 726	18 547	2.32	1.80	11.4	11.6	13.4	1.92	1.55
NORTH AMERICA	4 856	5 009	6 169	2.23	2.20	14.3	14.5	16.5	1.22	1.33
Canada	377	387	428	1.75	1.02	11.5	11.6	11.9	0.77	0.20
United States	4 480	4 623	5 740	2.27	2.29	14.6	14.8	17.0	1.26	1.42
EUROPE	8 797	8 900	10 215	1.70	1.55	16.6	16.8	19.1	1.39	1.46
EU(27)	8 459	8 556	9 864	1.70	1.60	17.2	17.3	19.8	1.40	1.52
CIS	1 218	1 297	1 612	9.66	2.34	4.4	4.7	5.9	9.85	2.48
Russian Federation	881	934	1 071	9.53	1.52	6.2	6.6	8.0	10.01	2.09
Ukraine	204	213	338	14.53	4.72	4.4	4.7	8.0	15.33	5.52
OCEANIA DEVELOPED	244	244	256	0.97	0.40	9.8	9.6	9.3	-0.17	-0.51
Australia	216	216	228	1.10	0.47	10.4	10.2	9.9	-0.04	-0.46
New Zealand	28	28	28	0.00	-0.15	6.7	6.6	6.1	-1.14	-0.91
OTHER DEVELOPED	276	275	296	0.29	0.72	1.6	1.6	1.7	-0.05	0.77
Japan	235	232	250	0.14	0.73	1.8	1.8	2.0	0.04	0.94
South Africa	41	43	46	1.08	0.71	0.8	0.9	0.9	0.11	0.31
DEVELOPING	4 022	4 300	5 063	2.88	1.80	0.8	0.8	0.8	1.44	0.54
AFRICA	916	1 028	1 335	3.45	2.88	1.0	1.1	1.1	1.06	0.68
NORTH AFRICA	704	798	1 062	4.40	3.15	2.9	3.2	3.6	2.50	1.39
Algeria	28	29	40	4.67	3.59	0.8	0.8	1.0	3.18	2.17
Egypt	646	741	988	4.59	3.18	8.5	9.5	11.0	2.78	1.61
SUB-SAHARAN AFRICA	212	230	273	0.58	1.87	0.3	0.3	0.3	-1.97	-0.48
LATIN AMERICA and CARIBBEAN	1 693	1 809	2 013	2.32	1.17	3.0	3.1	3.1	1.04	0.08
Argentina	440	462	542	0.40	1.75	11.1	11.4	12.4	-0.58	0.84
Brazil	580	643	663	3.24	0.30	3.0	3.3	3.1	1.86	-0.75
Chile	63	61	69	1.80	1.35	3.8	3.6	3.8	0.71	0.47
Mexico	230	242	308	3.07	2.77	2.2	2.2	2.6	2.11	1.83
Uruguay	11	14	16	6.57	1.42	3.4	4.1	4.6	6.46	1.07
ASIA and PACIFIC	1 412	1 463	1 715	3.18	1.77	0.4	0.4	0.4	1.94	0.72
Bangladesh	1	1	1	-1.91	1.65	0.0	0.0	0.0	-3.75	0.12
China ^c	386	409	472	8.37	1.58	0.3	0.3	0.3	7.72	1.06
India	1	1	1	-2.55	0.00	0.0	0.0	0.0	-4.13	-1.27
Indonesia	13	15	20	8.89	2.87	0.1	0.1	0.1	7.61	1.93
Iran, Islamic Republic of	223	228	260	0.39	1.44	3.1	3.1	3.2	-0.68	0.13
Korea	72	70	88	7.62	2.58	1.5	1.4	1.8	7.19	2.42
Malaysia	9	11	16	8.80	4.50	0.3	0.4	0.5	6.90	3.07
Pakistan	1	1	1	20.84	0.00	0.0	0.0	0.0	19.01	-1.88
Saudi Arabia	51	51	45	-3.98	-1.52	2.1	2.0	1.4	-6.45	-3.53
Turkey	127	126	134	-0.03	0.64	1.7	1.6	1.6	-1.38	-0.43
LEAST DEVELOPED COUNTRIES (LDC)	267	286	333	0.81	1.68	0.4	0.4	0.4	-1.55	-0.52
OCDE	14 459	14 720	17 315	1.85	1.77	11.8	11.9	13.4	1.23	1.33
NON-OCDE	4 954	5 306	6 296	4.28	1.87	0.9	0.9	1.0	2.93	0.66

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate, n.a.: not available.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681376832083>

Table B.14. **Skim milk powder projections**

Calendar year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	3 294	3 378	3 727	-0.87	1.00	1 134	1 194	1 362	-0.72	1.44	1 235	1 194	1 362	0.25	1.44
DEVELOPED	2 777	2 803	2 951	-1.49	0.45	130	122	104	-4.82	-1.47	1 106	1 047	1 160	-0.14	1.08
NORTH AMERICA	812	861	917	1.62	0.72	4	3	4	-6.53	1.52	346	284	338	8.06	2.49
Canada	77	88	96	-0.56	1.05	3	3	4	10.85	1.52	14	8	9	-17.11	1.81
United States	735	773	821	1.87	0.68	1	0	0	-21.71	0.00	332	277	329	11.15	2.51
EUROPE	910	872	826	-4.40	-0.89	17	13	13	-15.95	0.00	158	129	101	-11.85	-3.40
EU(27)	880	841	795	-4.50	-0.93	13	8	8	-20.32	0.00	150	128	99	-12.26	-3.44
CIS	279	287	321	-5.26	1.12	65	63	49	4.93	-2.29	128	136	126	7.16	-0.76
Russian Federation	81	86	120	-16.35	3.30	55	54	39	7.11	-2.96	1	1	1	-41.79	0.00
Ukraine	129	127	127	1.62	0.00	0	0	1	-14.80	7.95	62	65	61	6.51	-0.47
OCEANIA DEVELOPED	593	606	701	1.78	1.48	4	5	5	-1.79	1.85	473	489	584	0.19	1.63
Australia	187	182	223	-4.54	2.27	4	5	5	3.08	1.85	156	149	179	-5.53	2.19
New Zealand	405	424	479	6.00	1.12	0	0	0	-1.73	0.00	316	340	405	3.97	1.39
OTHER DEVELOPED	183	176	185	-0.82	0.61	41	38	33	-5.34	-1.50	2	8	11	0.43	3.51
Japan	174	167	164	-1.08	-0.17	33	30	28	-7.12	-0.84	0	0	0	0.00	0.00
South Africa	9	9	21	4.86	9.53	8	8	5	10.22	-4.60	2	8	11	0.43	3.51
DEVELOPING	517	575	776	3.02	3.33	1 004	1 072	1 258	-0.08	1.72	128	147	202	4.23	3.71
AFRICA	3	3	3	-0.66	0.00	156	185	242	-1.49	2.89	2	2	2	-5.36	-2.17
NORTH AFRICA	0	0	0	0.00	0.00	117	139	180	-0.34	2.78	1	1	0	-5.07	-7.93
Algeria	0	0	0	0.00	0.00	70	86	107	-2.60	2.41	0	0	0	-32.68	0.00
Egypt	0	0	0	0.00	0.00	25	28	35	0.57	2.28	1	0	0	-17.50	9.48
SUB-SAHARAN AFRICA	3	3	3	-0.66	0.00	38	46	62	-4.45	3.21	1	2	2	-5.08	-0.36
LATIN AMERICA and CARIBBEAN	228	256	362	3.67	3.86	185	198	249	-3.34	2.52	41	58	88	-0.96	5.07
Argentina	25	25	27	-7.86	1.76	0	0	0	4.37	0.00	16	19	25	-6.30	2.71
Brazil	127	144	214	8.00	4.44	6	6	5	-24.03	-0.39	6	15	19	22.13	5.09
Chile	20	27	36	8.77	3.19	5	6	0	-8.47	-29.78	1	3	1	45.43	-9.43
Mexico	32	32	36	2.27	1.18	130	136	178	1.30	2.88	0	0	0	-7.90	0.00
Uruguay	18	21	41	1.46	6.93	0	0	0	-23.32	33.68	14	16	35	-1.11	8.03
ASIA and PACIFIC	286	316	412	2.57	2.90	663	689	767	1.36	1.13	86	87	113	8.70	2.88
Bangladesh	0	0	0	0.00	0.00	7	5	5	-9.22	-0.02	0	0	0	48.58	0.00
China ^c	58	64	120	0.03	6.95	52	63	81	12.63	2.76	2	1	1	10.08	0.00
India	196	216	247	3.67	1.47	0	0	0	-31.14	0.00	26	23	23	20.22	0.00
Indonesia	0	0	0	0.00	0.00	95	97	99	1.49	0.18	2	0	0	-8.19	0.00
Iran, Islamic Republic of	0	0	0	0.00	0.00	5	5	6	-3.65	0.53	1	1	0	-12.80	5.77
Korea	19	21	29	2.66	3.63	6	5	2	8.10	-11.02	0	0	0	26.60	0.00
Malaysia	0	0	0	0.00	0.00	78	85	100	2.74	1.69	9	12	21	18.81	5.81
Pakistan	0	0	0	0.00	0.00	11	11	15	24.42	3.29	0	1	1	2.36	7.65
Saudi Arabia	0	0	0	0.00	0.00	36	36	26	1.58	-3.86	14	16	6	14.08	-10.59
Turkey	0	0	0	0.00	0.00	2	1	2	-7.56	3.21	0	0	0	-23.03	28.32
LEAST DEVELOPED COUNTRIES (LDC)	0	0	0	0.00	0.00	41	42	51	-8.08	2.11	1	1	0	-4.55	-20.76
OCDE	2 539	2 559	2 673	-0.97	0.37	193	189	227	-3.27	1.98	976	902	1 023	-0.74	1.31
NON-OCDE	755	819	1 054	-0.52	2.77	942	1 005	1 135	-0.11	1.33	258	291	339	5.39	1.84

For notes, see end of the table.

Table B.14. **Skim milk powder projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	3 101	3 314	3 691	-1.25	1.07	0.5	0.5	0.5	-2.46	0.00
DEVELOPED	1 710	1 816	1 859	-2.58	0.08	1.3	1.3	1.3	-2.97	-0.17
NORTH AMERICA	464	582	586	1.91	-0.20	1.4	1.7	1.6	0.90	-1.07
Canada	69	86	91	7.31	0.85	2.1	2.6	2.5	6.33	0.03
United States	396	496	495	1.17	-0.38	1.3	1.6	1.5	0.16	-1.25
EUROPE	737	734	738	-3.60	-0.16	1.4	1.4	1.4	-3.90	-0.25
EU(27)	710	699	703	-3.78	-0.16	1.4	1.4	1.4	-4.09	-0.25
CIS	216	214	244	-7.75	1.38	0.8	0.8	0.9	-7.55	1.53
Russian Federation	135	139	158	-10.38	1.42	1.0	1.0	1.2	-9.90	1.99
Ukraine	67	63	66	-0.39	0.52	1.5	1.4	1.6	0.41	1.31
OCEANIA DEVELOPED	73	80	84	-1.41	0.50	2.9	3.1	3.0	-2.56	-0.41
Australia	38	45	49	-2.83	0.91	1.8	2.1	2.1	-3.98	-0.03
New Zealand	35	35	35	0.00	-0.05	8.4	8.2	7.6	-1.14	-0.81
OTHER DEVELOPED	220	206	207	-1.51	0.10	1.2	1.2	1.2	-1.84	0.14
Japan	205	197	192	-1.97	-0.27	1.6	1.5	1.5	-2.08	-0.06
South Africa	15	9	15	9.68	6.54	0.3	0.2	0.3	8.71	6.14
DEVELOPING	1 392	1 499	1 832	0.56	2.17	0.3	0.3	0.3	-0.88	0.91
AFRICA	156	186	243	-1.41	2.90	0.2	0.2	0.2	-3.79	0.70
NORTH AFRICA	117	139	180	-0.31	2.82	0.5	0.6	0.6	-2.22	1.05
Algeria	70	86	107	-2.60	2.41	2.1	2.5	2.7	-4.08	0.99
Egypt	24	28	35	0.90	2.46	0.3	0.4	0.4	-0.91	0.88
SUB-SAHARAN AFRICA	40	47	63	-4.16	3.16	0.1	0.1	0.1	-6.72	0.81
LATIN AMERICA and CARIBBEAN	372	395	523	-0.09	3.08	0.6	0.7	0.8	-1.38	1.98
Argentina	9	6	3	-12.82	-3.82	0.2	0.1	0.1	-13.81	-4.73
Brazil	127	135	201	2.43	4.28	0.7	0.7	0.9	1.05	3.23
Chile	23	30	35	2.82	1.71	1.4	1.8	1.9	1.73	0.83
Mexico	161	167	214	1.33	2.70	1.5	1.5	1.8	0.37	1.76
Uruguay	5	5	5	14.13	1.26	1.4	1.4	1.5	14.02	0.91
ASIA and PACIFIC	864	918	1 066	1.26	1.60	0.2	0.2	0.2	0.02	0.55
Bangladesh	7	5	5	-9.20	-0.02	0.0	0.0	0.0	-11.05	-1.55
China ^c	107	125	200	4.43	5.10	0.1	0.1	0.1	3.78	4.57
India	170	193	224	1.56	1.63	0.1	0.2	0.2	-0.03	0.36
Indonesia	93	97	99	3.57	0.18	0.4	0.4	0.4	2.28	-0.76
Iran, Islamic Republic of	4	5	6	0.20	1.77	0.1	0.1	0.1	-0.86	0.47
Korea	26	26	31	2.67	1.92	0.5	0.5	0.6	2.24	1.77
Malaysia	69	73	79	1.65	0.81	2.6	2.7	2.5	-0.25	-0.62
Pakistan	10	10	14	24.08	3.01	0.1	0.1	0.1	22.25	1.13
Saudi Arabia	21	20	20	-0.94	-0.47	0.9	0.8	0.6	-3.41	-2.48
Turkey	2	1	2	-6.46	3.23	0.0	0.0	0.0	-7.81	2.16
LEAST DEVELOPED COUNTRIES (LDC)	39	41	50	-7.88	2.30	0.1	0.1	0.1	-10.24	0.10
OCDE	1 663	1 782	1 841	-1.41	0.18	1.4	1.4	1.4	-2.03	-0.26
NON-OCDE	1 439	1 532	1 849	-1.08	2.03	0.3	0.3	0.3	-2.44	0.83

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate, n.a.: not available.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681414346370>

Table B.15. **Whole milk powder projections**

Calendar year ^a	PRODUCTION (kt)			Growth ^b (%)		IMPORTS (kt)			Growth ^b (%)		EXPORTS (kt)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	4 156	4 459	5 437	4.12	2.26	1 687	1 843	2 460	3.95	3.27	1 826	1 982	2 599	2.97	3.07
DEVELOPED	1 858	1 954	2 163	0.83	1.30	102	109	107	8.18	0.04	1 234	1 315	1 508	0.44	1.66
NORTH AMERICA	32	33	21	-8.33	-4.91	41	43	43	13.73	0.00	14	11	11	8.00	0.00
Canada	15	16	14	-1.58	-1.32	25	29	29	9.88	0.00	1	1	1	-28.79	0.00
United States	17	17	7	-11.87	-10.08	17	14	14	23.32	0.00	13	10	10	18.76	0.00
EUROPE	847	895	829	-2.08	-0.25	5	4	5	-11.45	1.15	423	473	435	-5.54	-0.20
EU(27)	823	870	804	-2.21	-0.25	2	1	1	-19.50	0.00	421	472	434	-5.59	-0.20
CIS	152	156	207	4.62	2.86	44	51	47	11.89	-0.30	50	50	56	20.48	1.49
Russian Federation	73	69	83	0.53	1.50	38	44	42	17.38	0.25	3	3	3	1.32	0.00
Ukraine	31	35	39	13.78	1.19	0	0	1	-17.46	8.16	20	21	14	28.40	-4.77
OCEANIA DEVELOPED	797	840	1 069	4.92	2.51	8	7	8	3.93	1.50	743	778	1 003	4.70	2.64
Australia	145	144	176	-2.72	2.08	8	7	8	6.49	1.50	95	85	113	-6.65	2.85
New Zealand	652	696	893	7.43	2.60	0	0	0	0.27	0.00	648	692	890	7.44	2.61
OTHER DEVELOPED	30	29	37	-0.36	2.63	4	4	4	21.07	0.64	3	4	4	-17.20	0.56
Japan	14	14	12	-3.49	-1.55	0	0	0	36.72	0.00	0	0	0	0.00	0.00
South Africa	16	15	25	3.13	5.45	4	4	4	20.64	0.64	3	4	4	-17.20	0.56
DEVELOPING	2 297	2 506	3 274	7.50	2.94	1 585	1 734	2 353	3.71	3.44	592	667	1 090	10.45	5.36
AFRICA	6	6	7	-4.54	2.12	442	485	697	8.31	4.04	11	11	17	-0.77	4.93
NORTH AFRICA	0	0	0	0.00	0.00	184	189	267	5.88	3.85	0	0	0	-8.11	0.74
Algeria	0	0	0	0.00	0.00	151	152	211	4.98	3.69	0	0	0	-41.99	10.97
Egypt	0	0	0	0.00	0.00	19	24	35	10.24	4.44	0	0	0	-13.88	-11.33
SUB-SAHARAN AFRICA	6	6	7	-4.54	2.12	258	295	430	10.52	4.16	10	10	16	-0.29	5.01
LATIN AMERICA and CARIBBEAN	1 144	1 212	1 687	4.62	3.62	326	396	404	-1.40	0.38	271	326	488	6.00	4.32
Argentina	221	245	349	0.30	3.79	1	0	0	3.70	0.00	157	175	277	3.00	4.96
Brazil	516	563	832	8.92	4.31	24	24	22	-21.73	-0.31	44	92	120	48.93	2.81
Chile	66	63	73	0.35	1.68	3	2	2	-8.45	0.15	11	5	16	8.02	12.96
Mexico	191	190	217	3.90	1.41	41	42	40	0.63	-0.39	10	10	10	-2.42	-0.07
Uruguay	44	43	66	10.73	4.43	0	0	0	-30.59	28.90	35	26	47	10.22	6.11
ASIA and PACIFIC	1 148	1 288	1 580	11.28	2.25	817	854	1 253	4.04	4.29	310	330	586	17.47	6.32
Bangladesh	0	0	0	0.00	0.00	24	27	52	2.10	7.33	0	0	0	0.00	0.00
China ^c	1 127	1 266	1 555	11.20	2.26	58	44	57	-0.87	3.19	53	30	33	29.71	0.92
India	15	15	15	39.67	0.00	0	1	1	2.65	0.00	4	4	4	47.53	0.00
Indonesia	0	0	0	0.00	0.79	58	63	96	16.12	4.68	18	20	42	20.99	8.00
Iran, Islamic Republic of	1	1	1	1.01	4.53	3	5	6	36.54	1.51	0	0	0	-6.03	7.29
Korea	4	5	7	-1.51	3.62	1	1	2	8.69	3.45	0	0	0	79.62	0.00
Malaysia	0	0	0	0.00	1.13	65	82	108	1.84	3.03	33	42	59	16.58	3.78
Pakistan	0	0	0	0.00	0.00	1	2	3	-23.38	4.48	0	0	1	-6.50	7.93
Saudi Arabia	0	0	0	0.00	0.00	93	96	144	8.66	4.51	38	47	92	71.76	7.35
Turkey	0	0	0	0.00	0.00	2	2	3	-7.65	1.21	0	0	0	20.47	7.66
LEAST DEVELOPED COUNTRIES (LDC)	0	0	0	0.00	0.00	175	217	353	10.89	5.41	7	9	19	30.57	8.40
OCDE	1 881	1 974	2 153	0.84	1.14	96	98	97	3.50	0.04	1 191	1 271	1 458	0.04	1.66
NON-OCDE	2 274	2 486	3 284	7.58	3.05	1 591	1 745	2 363	3.98	3.43	635	710	1 140	10.92	5.17

For notes, see end of the table.

Table B.15. **Whole milk powder projections (cont.)**

Calendar year ^a	CONSUMPTION (kt)			Growth ^b (%)		PER CAPITA (kg)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999-2008	2009-18	Average 2006-08 est.	2009	2018	1999-2008	2009-18
WORLD	4 016	4 320	5 298	4.60	2.32	0.6	0.6	0.7	3.38	1.25
DEVELOPED	725	748	761	2.33	0.45	0.5	0.6	0.5	1.93	0.20
NORTH AMERICA	59	66	53	-1.36	-2.19	0.2	0.2	0.1	-2.37	-3.06
Canada	39	44	43	5.66	-0.46	1.2	1.3	1.2	4.68	-1.28
United States	20	21	11	-9.47	-7.29	0.1	0.1	0.0	-10.49	-8.16
EUROPE	429	427	399	2.16	-0.28	0.8	0.8	0.7	1.85	-0.37
EU(27)	404	399	371	2.20	-0.31	0.8	0.8	0.7	1.90	-0.39
CIS	146	158	197	2.67	2.42	0.5	0.6	0.7	2.86	2.56
Russian Federation	108	110	122	3.32	1.07	0.8	0.8	0.9	3.81	1.64
Ukraine	12	15	27	3.14	6.51	0.3	0.3	0.6	3.94	7.31
OCEANIA DEVELOPED	60	69	75	6.19	0.89	2.4	2.7	2.7	5.04	-0.02
Australia	56	66	71	6.68	0.94	2.7	3.1	3.1	5.54	0.00
New Zealand	4	4	4	0.00	0.00	0.9	0.9	0.8	-1.14	-0.77
OTHER DEVELOPED	31	29	36	5.04	2.67	0.2	0.2	0.2	4.70	2.71
Japan	14	14	12	-3.32	-1.55	0.1	0.1	0.1	-3.42	-1.34
South Africa	17	15	24	21.71	5.59	0.3	0.3	0.5	20.74	5.19
DEVELOPING	3 291	3 572	4 537	5.17	2.67	0.6	0.7	0.7	3.73	1.41
AFRICA	437	480	688	8.42	4.00	0.5	0.5	0.6	6.03	1.80
NORTH AFRICA	184	189	267	5.94	3.86	0.8	0.8	0.9	4.03	2.09
Algeria	151	152	211	4.97	3.69	4.4	4.4	5.3	3.48	2.27
Egypt	19	23	35	10.85	4.48	0.3	0.3	0.4	9.05	2.90
SUB-SAHARAN AFRICA	254	291	421	10.72	4.09	0.4	0.4	0.5	8.16	1.74
LATIN AMERICA and CARIBBEAN	1 199	1 281	1 603	2.50	2.53	2.1	2.2	2.5	1.22	1.43
Argentina	65	70	72	-4.16	0.17	1.7	1.7	1.6	-5.15	-0.74
Brazil	496	494	734	3.61	4.40	2.6	2.5	3.4	2.24	3.35
Chile	58	60	59	-0.76	-0.07	3.5	3.5	3.2	-1.85	-0.95
Mexico	221	222	247	3.54	1.16	2.1	2.0	2.1	2.58	0.22
Uruguay	9	17	19	11.13	0.96	2.8	5.0	5.3	11.02	0.61
ASIA and PACIFIC	1 655	1 811	2 246	6.58	2.40	0.4	0.5	0.5	5.34	1.35
Bangladesh	24	27	52	2.10	7.33	0.2	0.2	0.3	0.25	5.81
China ^c	1 131	1 280	1 579	10.03	2.33	0.9	1.0	1.1	9.38	1.80
India	12	12	12	49.90	0.00	0.0	0.0	0.0	48.31	-1.27
Indonesia	41	43	54	16.28	2.60	0.2	0.2	0.2	15.00	1.66
Iran, Islamic Republic of	4	5	6	18.50	1.61	0.0	0.1	0.1	17.44	0.31
Korea	5	6	9	0.16	3.59	0.1	0.1	0.2	-0.28	3.43
Malaysia	32	40	49	-5.38	2.19	1.2	1.5	1.6	-7.27	0.76
Pakistan	1	1	2	-27.29	2.87	0.0	0.0	0.0	-29.11	0.99
Saudi Arabia	55	49	53	1.16	0.80	2.2	1.9	1.7	-1.31	-1.21
Turkey	2	2	2	-8.66	0.76	0.0	0.0	0.0	-10.01	-0.31
LEAST DEVELOPED COUNTRIES (LDC)	168	208	334	10.47	5.26	0.2	0.3	0.4	8.11	3.07
OCDE	785	799	791	2.38	0.12	0.6	0.6	0.6	1.76	-0.32
NON-OCDE	3 230	3 521	4 507	5.21	2.76	0.6	0.6	0.7	3.85	1.55

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate, n.a.: not available.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681531168878>

Table B.16. **Milk projections**

Calendar year ^a	PRODUCTION (kt)			Growth ^b (%)		INVENTORIES ('000 hd)			Growth ^b (%)		YIELD (ton/hd)			Growth ^b (%)	
	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18	Average 2006-08 est.	2009	2018	1999- 2008	2009-18
WORLD	668 067	694 762	814 075	2.19	1.74	533 156	544 666	595 955	1.32	1.00	1.3	1.3	1.4	0.87	0.74
DEVELOPED	355 282	360 667	392 905	0.58	0.92	73 339	73 104	73 896	-1.12	0.08	4.8	4.9	5.3	1.70	0.84
NORTH AMERICA	92 498	94 136	104 066	1.49	1.05	10 169	10 188	9 666	-0.13	-0.62	9.1	9.2	10.8	1.61	1.67
Canada	8 266	8 402	8 830	0.10	0.52	991	1 012	925	-1.39	-1.02	8.3	8.3	9.5	1.49	1.54
United States	84 232	85 734	95 236	1.63	1.10	9 179	9 177	8 741	0.02	-0.58	9.2	9.3	10.9	1.61	1.68
EUROPE	158 872	158 567	163 130	-0.12	0.34	29 448	28 395	26 864	-1.68	-0.60	5.4	5.6	6.1	1.56	0.95
EU(27)	148 252	147 714	151 548	-0.18	0.31	24 151	23 251	21 777	-1.80	-0.71	6.1	6.4	7.0	1.63	1.03
CIS	68 627	71 891	84 027	1.16	1.62	25 751	26 441	28 501	-1.26	0.73	2.7	2.7	2.9	2.42	0.89
Russian Federation	32 232	33 881	40 188	-0.18	1.67	9 360	9 444	10 139	-3.94	0.61	3.4	3.6	4.0	3.77	1.06
Ukraine	13 250	13 395	14 377	0.04	0.76	4 395	4 293	4 079	-4.78	-0.63	3.0	3.1	3.5	4.82	1.39
OCEANIA DEVELOPED	24 171	24 784	29 901	0.64	2.03	5 906	6 021	6 975	0.58	1.60	4.1	4.1	4.3	0.06	0.43
Australia	9 930	9 647	11 385	-1.41	1.84	1 765	1 634	1 870	-2.98	1.49	5.6	5.9	6.1	1.57	0.34
New Zealand	14 240	15 136	18 516	2.28	2.15	4 142	4 388	5 104	2.40	1.64	3.4	3.4	3.6	-0.12	0.51
OTHER DEVELOPED	11 115	11 290	11 780	0.06	0.49	2 064	2 058	1 891	-0.41	-0.88	5.4	5.5	6.2	0.47	1.37
Japan	8 079	8 087	7 945	-0.58	-0.22	1 098	1 056	949	-1.69	-1.20	7.4	7.7	8.4	1.11	0.98
South Africa	3 036	3 203	3 835	1.94	2.11	967	1 002	942	1.26	-0.56	3.1	3.2	4.1	0.68	2.67
DEVELOPING	312 785	334 094	421 170	4.26	2.56	459 817	471 562	522 059	1.75	1.13	0.7	0.7	0.8	2.52	1.42
AFRICA	32 033	33 360	40 865	3.49	2.27	157 328	158 631	170 937	1.96	0.87	0.2	0.2	0.2	1.53	1.40
NORTH AFRICA	11 090	11 651	14 549	2.72	2.51	31 106	31 417	33 734	2.08	0.79	0.4	0.4	0.4	0.64	1.72
Algeria	1 781	1 777	2 560	2.25	4.17	9 072	9 330	11 137	2.02	1.97	0.2	0.2	0.2	0.23	2.21
Egypt	4 607	5 005	6 468	2.54	2.87	6 462	6 593	7 355	1.02	1.19	0.7	0.8	0.9	1.52	1.68
SUB-SAHARAN AFRICA	20 942	21 709	26 317	3.91	2.14	126 222	127 214	137 202	1.93	0.90	0.2	0.2	0.2	1.98	1.25
LATIN AMERICA and CARIBBEAN	69 811	73 074	86 588	2.65	1.90	46 485	47 191	50 448	1.74	0.79	1.5	1.5	1.7	0.91	1.11
Argentina	9 948	10 606	13 733	0.27	2.86	2 128	2 159	2 405	-1.48	1.20	4.7	4.9	5.7	1.76	1.67
Brazil	26 369	27 905	32 522	4.10	1.72	21 444	22 107	23 783	2.65	0.94	1.2	1.3	1.4	1.44	0.78
Chile	2 468	2 519	3 003	2.42	1.94	2 129	2 197	2 581	2.20	1.75	1.2	1.1	1.2	0.23	0.20
Mexico	10 311	10 614	11 412	1.60	0.81	2 217	2 211	2 186	0.30	-0.14	4.7	4.8	5.2	1.29	0.95
Uruguay	1 647	1 762	2 237	1.68	2.52	946	971	1 102	1.69	1.21	1.7	1.8	2.0	-0.01	1.31
ASIA and PACIFIC	210 940	227 661	293 717	4.96	2.80	256 003	265 740	300 674	1.62	1.34	0.8	0.9	1.0	3.35	1.46
Bangladesh	2 888	3 207	4 424	4.29	3.56	29 669	32 678	44 069	5.21	3.31	0.1	0.1	0.1	-0.91	0.25
China ^c	36 435	40 231	55 845	16.43	3.60	17 288	18 240	19 417	7.10	0.69	2.1	2.2	2.9	9.33	2.91
India	102 984	110 769	144 619	3.54	2.88	75 876	80 767	93 604	2.59	1.55	1.3	1.3	1.5	1.03	1.43
Indonesia	933	956	1 172	2.79	2.33	10 178	10 792	12 229	2.84	1.51	0.1	0.1	0.1	-0.05	0.82
Iran, Islamic Republic of	7 593	8 075	9 847	3.94	2.19	35 133	35 273	35 204	-0.03	-0.10	0.2	0.2	0.3	3.97	2.29
Korea	2 188	2 210	2 310	-0.66	0.48	260	255	262	-2.36	0.32	8.4	8.7	8.8	1.70	0.16
Malaysia	47	49	63	3.34	2.68	98	102	111	1.30	0.94	0.5	0.5	0.6	2.05	1.74
Pakistan	33 234	36 849	44 029	3.71	2.08	28 030	30 029	33 989	2.73	1.46	1.2	1.2	1.3	0.97	0.62
Saudi Arabia	1 242	1 298	1 566	4.34	2.11	4 140	4 062	4 240	1.06	0.47	0.3	0.3	0.4	3.28	1.64
Turkey	12 072	12 583	15 979	3.13	2.68	17 010	17 392	19 424	-5.61	1.21	0.7	0.7	0.8	8.74	1.47
LEAST DEVELOPED COUNTRIES (LDC)	23 602	24 473	30 789	3.73	2.56	157 423	160 375	181 543	2.11	1.42	0.1	0.2	0.2	1.61	1.14
OCDE	303 143	305 796	328 829	0.54	0.80	61 731	61 248	62 076	-2.44	0.14	4.9	5.0	5.3	2.98	0.66
NON-OCDE	364 924	388 965	485 246	3.72	2.42	471 424	483 417	533 879	1.89	1.10	0.8	0.8	0.9	1.83	1.32

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only. The economies of Chinese Taipei, Hong Kong (China) and Macau (China) are included in the Other Asia Pacific aggregate.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681537745866>

Table B.17. **Whey powder and casein projections**

Calendar year ^a					Growth ^b (%)	
					Average 2006-08 est.	2009
AUSTRALIA						
Net trade, whey	kt pw	80.1	82.2	87.2	10.67	0.37
Exports, casein	kt pw	9.7	8.9	9.5	-4.13	0.42
CANADA						
Net trade, whey	kt pw	5.2	5.7	8.5	-8.73	5.14
EU(27)						
Net trade, whey	kt pw	247.2	365.4	376.9	42.18	0.67
Casein EU(15)						
Production	kt pw	144.3	153.7	192.5	-2.82	2.45
Consumption	kt pw	104.9	107.0	126.4	-3.42	1.87
Net trade	kt pw	26.3	46.7	66.1	13.10	3.65
JAPAN						
Net trade, whey	kt pw	-54.3	-61.5	-70.8	1.08	1.56
Imports, casein	kt pw	16.4	15.6	13.9	-1.13	-1.21
KOREA						
Net trade, whey	kt pw	-36.7	-37.3	-40.3	0.79	0.85
MEXICO						
Net trade, whey	kt pw	-88.9	-83.0	-84.8	5.32	-0.02
NEW ZEALAND						
Net trade, whey	kt pw	7.4	7.5	15.6	14.80	8.16
Exports, casein	kt pw	155.5	164.8	204.6	4.95	2.35
UNITED STATES						
Whey						
Production	kt pw	503.2	482.4	494.9	-0.63	0.34
Consumption	kt pw	268.9	314.9	234.7	-5.27	-3.15
Exports	kt pw	231.5	167.9	260.2	6.75	4.77
Imports, casein	kt pw	69.0	68.7	69.5	-0.21	0.21
ARGENTINA						
Net trade, whey	kt pw	20.9	41.6	64.5	36.79	4.88
BRAZIL						
Net trade, whey	kt pw	-33.8	-29.9	-29.9	2.07	0.00
CHINA ^c						
Net trade, whey	kt pw	-209.0	-228.7	-349.1	9.70	4.63
RUSSIAN FEDERATION						
Net trade, whey	kt pw	-49.0	-51.7	-63.8	34.69	2.33

a) Year ending 30 June for Australia and 31 May for New Zealand.

b) Least-squares growth rate (see glossary).

c) Refers to mainland only.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681551074528>

Table B.18. **Biofuels projections : Ethanol**

PRODUCTION (MIL L)				Growth ^a (%)	DOMESTIC USE (MIL L)				Growth ^a (%)	FUEL USE (MIL L)				Growth ^a (%)	SHARE IN GAZOLINE TYPE FUEL USE(%)				Growth ^a (%)		NET TRADE (MIL L)				Growth ^a (%)
Average 2006-08 20092018 est.				2009-18	Average 2006-08 20092018 est.				2009-18	Average 2006-08 20092018 est.				2009-18	Energy Shares			Volume Shares		Average 2006-08 20092018 est.			2009-18		
2006-08 est.	2009	2018	2009-18	2006-08 est.	2009	2018	2009-18	2006-08 est.	2009	2018	2009-18	2006-08 est.	2009	2018	2009-18	2006-08 est.	2009	2018	2009-18	2018	2006-08 est.	2009	2018	2009-18	
North America																									
Canada	822	1 541	1 639	0.53	1 170	1 987	2 568	2.04	964	1 781	2 362	2.24	1.64%	2.89%	3.41%	0.90	5.00%	-347	-446	-928	0.00				
United States	27 783	39 557	63 143	4.87	30 321	40 794	70 897	5.92	28 617	39 136	69 172	6.09	3.54%	4.65%	7.63%	5.18	10.98%	-2 538	-1 237	-7 754	0.00				
Western Europe																									
EU(27)	4 203	5 666	13 958	9.87	5 322	7 299	16 938	9.19	2 896	4 886	14 440	11.72	1.37%	2.27%	6.61%	11.49	9.56%	-1 119	-1 634	-2 981	0.00				
OCEANIA DEVELOPED																									
Australia	106	593	1 011	3.28	106	593	1 011	3.28	106	593	1 011	3.28	0.37%	2.06%	3.30%	2.59	4.85%	0	0	0	0.00				
OTHER DEVELOPED																									
Japan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-551	-809	-984	0.00				
South Africa	16	15	438	42.45	16	15	406	41.83	1	0	391	149.18	0.00%	0.00%	2.29%	148.79	3.38%	0	0	32	45.69				
Sub-Saharan Africa																									
Ethiopia	71	73	83	1.12	65	68	83	1.95	0	2	15	22.70	0.00%	0.60%	4.51%	22.03	6.59%	6	5	1	-16.21				
Mozambique	22	23	30	2.90	22	23	30	3.06	0	1	8	20.15	0.00%	0.67%	3.75%	17.98	5.50%	0	0	0	-5.33				
Tanzania	27	29	93	13.17	31	35	81	9.54	0	3	50	27.53	0.00%	0.67%	6.93%	23.38	10.00%	-4	-6	12	27.17				
Latin America and Caribbean																									
Argentina	248	330	556	4.34	140	246	496	5.28	0	94	264	6.34	0.00%	1.35%	3.41%	5.05	5.00%	109	85	60	0.07				
Brazil	18 659	23 853	52 583	8.81	14 855	19 782	40 946	7.91	13 723	18 605	39 512	8.18	33.40%	41.30%	71.64%	5.91	79.04%	3 804	4 071	11 638	12.71				
Colombia	261	370	793	7.93	261	334	434	2.13	239	331	431	2.14	3.41%	4.80%	6.93%	3.31	10.00%	0	35	360	25.58				
Mexico	57	66	88	2.99	141	172	232	2.99	0	0	0	0.00	0.00%	0.00%	0.00%	0.00	0.00%	-84	-107	-144	0.00				
Peru	17	43	192	13.22	10	10	89	11.65	0	0	79	69.19	0.00%	0.00%	5.36%	69.82	7.80%	7	33	103	39.54				
Asia and Pacific																									
China	3 717	4 108	5 728	3.68	3 494	3 937	5 561	3.84	1 749	2 274	4 552	7.66	1.74%	1.99%	2.56%	2.76	3.77%	223	171	167	-0.25				
India	1 799	2 126	3 940	4.83	1 901	2 161	4 049	6.18	224	377	2 245	16.32	1.28%	2.15%	13.58%	16.97	19.00%	-102	-35	-109	-47.90				
Indonesia	189	195	334	4.92	157	213	353	5.54	0	52	190	13.79	0.00%	0.20%	0.81%	14.80	1.20%	32	-18	-19	-23.96				
Malaysia	64	71	91	2.14	103	92	93	0.15	0	0	0	16.99	0.00%	0.00%	0.00%	17.71	0.00%	-40	-21	-2	0.00				
Philippines	76	163	534	11.73	118	377	630	4.94	33	279	532	6.19	0.40%	3.41%	6.93%	6.89	10.00%	-42	-213	-97	0.00				
Thailand	474	911	2 855	11.42	483	929	2 348	9.37	211	561	1 977	12.36	1.91%	4.92%	16.15%	11.53	22.33%	-9	-18	507	65.53				
Turkey	66	96	222	9.37	104	162	282	6.09	57	108	228	8.14	0.73%	1.42%	3.27%	9.14	4.80%	-38	-66	-60	0.00				
Viet Nam	145	150	141	-0.56	135	134	136	0.12	0	0	0	5.89	0.00%	0.00%	0.00%	6.20	0.00%	10	16	6	-11.09				
TOTAL	58 821	79 979	148 454	6.59	58 953	79 364	147 664	6.63	48 819	69 082	137 459	7.33	4.29%	5.54%	9.34%	5.46	13.32%	-683	-194	-194	0.00				

a) Least-squares growth rate (see glossary).

est.: estimate, n.a.: not available.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681583173474>

Table B.19. Biofuels projections : Biodiesel

	PRODUCTION (MIL L)			Growth ^a (%)	DOMESTIC USE (MIL L)			Growth ^a (%)	SHARE IN DIESEL TYPE FUEL USE (%)			Growth ^a (%)		NET TRADE (MIL L)			Growth ^a (%)
				2009-18				2009-18	Energy Shares			Volume Shares		Average			2009-18
	Average 2006-08 est.	2009	2018		Average 2006-08 est.	2009	2018		Average 2006-08 est.	2009	2018	2009-18	2018	Average 2006-08 est.	2009	2018	
North America																	
Canada	76	205	528	9.38	76	241	754	10.06	0.19%	0.59%	1.61%	8.53	2.00%	0	-35	-227	0.00
United States	2 236	3 198	5 230	5.31	1 218	1 638	3 785	7.07	0.39%	0.52%	1.06%	5.71	1.32%	1 018	1 560	1 445	3.14
Western Europe																	
EU(27)	6 704	9 567	18 374	7.12	7 290	10 839	22 278	8.04	2.80%	4.07%	7.39%	6.68	9.08%	-742	-1 271	-3 904	0.00
OCEANIA DEVELOPED																	
Australia	486	925	1 049	1.45	486	925	1 049	1.45	2.24%	3.98%	3.98%	0.00	4.93%	0	0	0	0.00
OTHER DEVELOPED																	
South Africa	0	1	112	31.78	0	0	0	6.59	0.00%	0.00%	0.00%	0.00	0.00%	0	1	112	31.84
Sub-Saharan Africa																	
Ethiopia	38	59	83	3.74	0	5	21	15.03	0.24%	0.40%	1.12%	11.19	1.40%	38	54	62	1.55
Mozambique	38	67	103	4.76	0	3	22	20.15	0.24%	0.80%	4.45%	17.91	5.50%	38	64	81	2.67
Tanzania	2	11	60	17.55	0	1	11	19.11	0.00%	0.80%	8.16%	23.24	10.00%	0	9	49	17.28
Latin America and Caribbean																	
Argentina	608	1 705	3 848	6.91	0	210	631	7.14	0.00%	1.61%	4.04%	5.03	5.00%	608	1 495	3 217	6.95
Brazil	520	1 186	2 947	10.11	520	1 186	2 947	10.11	0.93%	2.05%	4.00%	7.44	4.95%	0	0	0	0.00
Columbia	73	188	424	9.04	73	173	206	1.93	1.75%	4.04%	4.04%	0.00	5.00%	0	15	218	26.65
Peru	97	124	180	4.17	48	59	185	11.39	0.00%	1.61%	4.04%	8.94	5.00%	49	64	-6	-40.02
Asia and Pacific																	
India	117	443	7 170	28.16	28	394	7 126	29.19	0.24%	0.80%	15.80%	28.40	19.00%	88	48	44	-1.65
Indonesia	245	435	1 230	11.35	146	233	362	4.86	0.00%	0.00%	0.00%	0.00	0.00%	99	202	868	15.62
Malaysia	277	566	966	5.98	122	282	386	2.74	0.00%	2.01%	4.04%	3.81	5.00%	154	284	580	8.81
Philippines	144	150	241	5.28	144	152	249	5.50	0.53%	1.61%	1.61%	0.00	2.00%	0	-2	-8	0.00
Thailand	217	413	1 211	11.71	217	415	1 185	11.43	0.54%	2.09%	5.27%	10.08	6.50%	0	-2	26	32.16
Turkey	0	0	1	38.89	0	35	109	12.27	0.24%	0.40%	1.12%	11.19	1.40%	0	-35	-108	0.00
Viet Nam	5	8	9	0.65	0	0	0	6.38	0.00%	0.00%	0.00%	0.00	0.00%	5	8	9	0.65
TOTAL	11 882	19 251	43 766	8.76	10 369	16 792	41 307	9.57	1.28%	2.00%	4.25%	7.94	5.25%	1 354	2 459	2 459	0.00

a) Least-squares growth rate (see glossary).

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681583173474>

ANNEX C

World Prices and Projections

Table C.1. **World prices^a**

			Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
WHEAT													
Base	Price ^b	USD/t	269.1	211.3	197.7	206.1	215.1	218.1	216.8	217.3	218.9	219.1	219.6
Lower GDP-slow recovery			269.1	208.0	190.7	199.4	211.3	215.2	212.3	211.7	213.8	214.8	215.2
Lower GDP-faster recovery			269.1	208.0	190.7	201.0	215.1	219.7	216.4	215.9	218.4	219.7	220.1
COARSE GRAINS													
Base	Price ^c	USD/t	184.9	164.1	160.4	166.4	172.5	170.9	172.1	173.9	168.0	165.1	165.1
Lower GDP-slow recovery			184.9	158.7	149.8	158.2	168.1	165.6	165.0	166.8	161.7	159.0	158.9
Lower GDP-faster recovery			184.9	158.7	149.8	160.7	173.6	171.2	170.4	172.8	168.1	165.3	165.3
RICE													
Base	Price ^d	USD/t	504.7	417.5	345.6	347.7	378.5	412.9	415.3	408.0	409.8	409.5	411.9
Lower GDP-slow recovery			504.7	412.6	335.9	337.3	371.8	409.1	409.8	399.1	400.2	402.1	406.1
Lower GDP-faster recovery			504.7	412.6	335.8	339.5	377.5	416.2	416.0	405.3	407.3	410.1	414.1
OILSEEDS													
Base	Price ^e	USD/t	440.7	334.4	344.5	357.6	385.5	375.9	373.0	383.8	392.5	391.0	398.2
Lower GDP-slow recovery			440.7	326.9	333.3	348.6	379.3	370.3	365.8	375.6	384.8	383.9	390.9
Lower GDP-faster recovery			440.7	326.9	333.4	352.1	386.2	377.1	372.2	382.3	392.1	391.3	398.4
OILSEED MEALS													
Base	Price ^f	USD/t	329.9	234.0	235.6	244.9	259.2	253.3	251.2	259.7	265.0	263.2	270.1
Lower GDP-slow recovery			329.9	228.4	226.7	237.3	253.7	247.8	244.5	252.2	257.8	256.5	263.0
Lower GDP-faster recovery			329.9	228.4	226.7	239.6	258.7	253.0	249.7	258.1	264.4	263.2	270.0
VEGETABLE OILS													
Base	Price ^g	USD/t	948.7	844.2	863.6	869.5	901.1	900.4	895.7	905.9	923.1	931.6	941.4
Lower GDP-slow recovery			948.7	827.7	840.0	848.0	883.2	884.7	880.0	889.1	906.3	915.6	925.6
Lower GDP-faster recovery			948.7	827.7	840.5	856.6	898.3	901.9	896.9	905.8	923.3	932.7	942.8
SUGAR													
Base	Price, raw sugar ^h	USD/t	278.1	297.5	305.6	312.7	317.0	310.1	301.3	303.3	302.4	303.8	307.6
Lower GDP-slow recovery			278.1	288.8	290.6	296.5	302.4	297.7	290.1	292.3	291.6	293.2	296.6
Lower GDP-faster recovery			278.1	288.8	290.6	300.8	310.8	308.6	301.7	304.2	303.1	304.4	308.0
BEEF AND VEAL													
Base	Price, USA ⁱ	USD/100 kg dw	319.4	323.3	299.3	299.5	318.3	322.4	332.5	330.7	328.0	324.8	325.0
Lower GDP-slow recovery			319.4	292.5	271.3	282.0	303.6	311.0	323.3	321.6	318.9	316.1	316.2
Lower GDP-faster recovery			319.4	292.5	271.3	294.0	321.3	329.3	341.9	338.3	333.1	328.3	327.4
PIG MEAT													
Base	Price, USA ^j	USD/100 kg dw	145.1	146.9	142.1	147.7	160.9	157.6	155.3	151.3	154.1	157.8	163.2
Lower GDP-slow recovery			145.1	133.9	136.3	149.6	158.4	154.2	153.8	149.1	150.7	155.0	160.9
Lower GDP-faster recovery			145.1	133.9	136.3	155.8	163.6	156.3	156.8	152.2	153.3	157.7	163.9
POULTRY MEAT													
Base	Price, USA ^k	USD/100 kg rtc	162.0	179.0	165.7	162.4	167.5	168.6	177.7	177.8	175.8	172.2	174.1
Lower GDP-slow recovery			162.0	172.8	158.6	157.5	163.7	164.8	173.4	173.4	171.5	168.2	170.0
Lower GDP-faster recovery			162.0	172.8	158.6	159.9	167.5	168.8	177.7	177.8	175.9	172.5	174.3
SHEEP MEAT													
Base	Price, New Zealand ^l	NZD/100 kg dw	332.9	324.1	319.8	329.2	338.2	340.7	349.9	355.7	361.5	369.0	374.8
Lower GDP-slow recovery			332.9	324.1	319.8	329.2	338.2	340.7	349.9	355.7	361.5	369.0	374.8
Lower GDP-faster recovery			332.9	324.1	319.8	329.2	338.2	340.7	349.9	355.7	361.5	369.0	374.8
BUTTER													
Base	Price ^m	USD/100 kg	278.7	182.8	181.0	201.9	223.1	233.5	237.3	244.1	247.2	249.8	254.9
Lower GDP-slow recovery			278.7	158.3	149.3	169.5	189.1	201.0	206.2	210.6	211.3	213.2	218.5
Lower GDP-faster recovery			278.7	158.3	149.3	183.9	214.6	233.3	238.7	244.3	247.2	250.1	256.0
CHEESE													
Base	Price ⁿ	USD/100 kg	379.5	269.8	248.5	266.3	283.3	291.0	299.6	304.3	309.5	313.5	317.8
Lower GDP-slow recovery			379.5	252.1	229.5	248.4	266.5	275.8	284.2	288.4	293.5	297.2	301.5
Lower GDP-faster recovery			379.5	252.1	229.5	256.5	279.4	290.5	300.2	304.9	310.0	314.0	318.5

Table C.1. **World prices^a** (cont.)

			Average 06/07-08/09 est.	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
SKIM MILK POWDER													
Base	Price ^o	USD/100 kg	328.5	193.0	191.5	218.4	238.6	244.1	250.8	250.4	253.4	254.9	256.5
Lower GDP-slow recovery			328.5	184.7	181.3	212.8	231.9	238.1	244.3	244.1	246.9	248.9	250.3
Lower GDP-faster recovery			328.5	184.7	181.3	215.4	236.4	243.5	250.4	250.5	253.5	255.4	256.9
WHOLE MILK POWDER													
Base	Price ^p	USD/100 kg	342.2	190.3	196.2	219.7	234.5	246.4	256.0	258.4	262.0	265.0	268.6
Lower GDP-slow recovery			342.2	182.0	185.8	210.1	226.0	238.3	248.2	250.5	253.9	256.8	260.4
Lower GDP-faster recovery			342.2	182.0	185.8	214.2	233.4	247.1	257.3	259.6	262.9	265.7	269.3
ETHANOL													
Base	Price ^q	USD/hl	44.9	37.9	40.8	43.4	43.3	43.5	43.8	44.5	43.7	44.4	45.7
Lower GDP-slow recovery			44.9	37.4	39.7	42.6	43.0	43.1	43.3	44.0	43.5	44.1	45.4
Lower GDP-faster recovery			44.9	37.4	39.7	42.9	43.5	43.6	43.8	44.5	43.8	44.4	45.8
BIODIESEL													
Base	Price ^r	USD/hl	113.4	117.4	118.1	119.9	125.9	125.1	125.9	128.7	132.4	134.8	137.1
Lower GDP-slow recovery			113.4	116.8	115.9	117.4	124.1	123.6	124.4	127.1	130.8	133.3	135.6
Lower GDP-faster recovery			113.4	116.8	115.9	118.3	125.6	125.2	126.0	128.6	132.4	134.9	137.2

a) 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. 07/08 is calendar year 2007).

b) No. 2 hard red winter wheat, ordinary protein, USA f.o.b. Gulf Ports (June/May), less EEP payments where applicable.

c) No. 2 yellow corn, US f.o.b. Gulf Ports (September/August).

d) Milled, 100%, grade b, Nominal Price Quote, NPQ, f.o.b. Bangkok (August/July).

e) Weighted average oilseed price, European port.

f) Weighted average meal price, European port.

g) Weighted average price of oilseed oils and palm oil, European port.

h) Raw sugar world price, ICE Inc. No. 11, f.o.b., bulk spot price (October/September).

i) Choice steers, 1100-1300 lb lw, Nebraska – lw to dw conversion factor 0.63.

j) Barrows and gilts, No. 1-3, 230-250 lb lw, Iowa/South Minnesota – lw to dw conversion factor 0.74.

k) Wholesale weighted average broiler price 12 cities.

l) Lamb schedule price, all grade average. The price of sheep meat is an exogenous variable and does therefore not respond to any shocks.

m) f.o.b. export price, butter, 82% butterfat, Oceania.

n) f.o.b. export price, cheddar cheese, 39% moisture, Oceania.

o) f.o.b. export price, non-fat dry milk, 1.25% butterfat, Oceania.

p) f.o.b. export price, WMP 26% butterfat, Oceania.

q) Brazil, Sao Paulo (ex-distillery).

r) Producer price Germany net of biodiesel tariff.

est.: estimate.

Source: OECD and FAO Secretariats.

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Table C.2. **World trade projections**

Average 2006-08 est.				Bases			Lower GDP-slow recovery			Lower GDP-faster recovery		
				Average		2018	Average		2018	Average		2018
				2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
IMPORTS												
Wheat	World Trade	kt	113 737	118 820	126 131	133 876	118 514	125 619	133 438	118 522	126 029	133 967
	OECD	kt	24 283	25 115	25 935	26 450	25 160	25 986	26 496	25 160	25 945	26 441
	Developing	kt	90 811	95 388	102 069	109 376	95 049	101 525	108 915	95 060	101 957	109 467
	Least Developed Countries	kt	10 855	11 391	11 884	12 557	11 332	11 769	12 447	11 332	11 856	12 568
Coarse Grains	World Trade	kt	119 253	117 929	121 227	127 960	117 785	121 433	128 336	117 782	121 211	128 185
	OECD	kt	57 916	53 915	53 127	53 067	52 823	51 976	52 052	52 922	53 020	53 225
	Developing	kt	79 448	83 947	88 948	96 600	84 753	90 267	98 000	84 687	89 122	96 726
	Least Developed Countries	kt	2 138	2 436	4 247	6 056	2 479	4 901	6 143	2 475	4 253	6 050
Rice	World Trade	kt	31 807	34 238	36 769	38 692	33 976	36 326	38 215	34 018	36 672	38 657
	OECD	kt	4 786	4 866	5 271	5 560	4 863	5 263	5 551	4 864	5 268	5 555
	Developing	kt	26 808	29 011	31 226	32 867	28 787	30 836	32 447	28 823	31 142	32 838
	Least Developed Countries	kt	6 988	7 458	7 346	7 707	7 405	7 268	7 628	7 414	7 331	7 703
Oilseeds	World Trade	kt	85 162	92 835	99 676	104 557	92 417	98 808	103 615	92 430	99 404	104 522
	OECD	kt	34 930	35 066	35 052	35 614	34 665	34 431	34 928	34 695	34 859	35 575
	Developing	kt	57 554	65 204	72 320	77 106	65 181	72 015	76 787	65 166	72 222	77 108
	Least Developed Countries	kt	281	357	415	466	360	417	467	360	416	466
Oilseed Meals	World Trade	kt	58 524	66 775	72 869	80 320	67 110	73 273	80 771	67 092	72 927	80 342
	OECD	kt	33 444	36 994	36 312	36 046	37 268	36 468	36 197	37 256	36 314	36 049
	Developing	kt	25 666	30 715	37 387	44 943	30 629	37 516	45 118	30 642	37 431	44 960
	Least Developed Countries	kt	325	402	515	614	403	511	611	403	514	614
Vegetable Oils	World Trade	kt	48 633	54 142	64 325	73 127	54 117	64 038	72 754	54 122	64 210	73 092
	OECD	kt	12 891	16 078	20 512	24 164	16 024	20 341	23 969	16 051	20 478	24 158
	Developing	kt	35 129	37 355	42 899	47 870	37 356	42 766	47 675	37 342	42 818	47 841
	Least Developed Countries	kt	3 912	4 320	5 200	5 979	4 293	5 157	5 924	4 297	5 193	5 977
Sugar	World Trade	kt	47 440	54 050	59 742	63 792	53 714	59 188	63 199	53 766	59 636	63 795
	OECD	kt	10 927	12 296	13 290	13 764	12 254	13 253	13 707	12 260	13 294	13 763
	Developing	kt	31 885	36 480	41 968	46 345	36 767	42 139	46 478	36 736	41 977	46 350
	Least Developed Countries	kt	5 955	6 870	8 478	10 062	6 891	8 485	10 051	6 889	8 488	10 063
Beef ^a	World Trade	kt	7 112	7 516	8 684	9 449	7 261	8 372	9 168	7 262	8 571	9 453
	OECD	kt	3 278	3 219	3 679	4 060	3 087	3 444	3 804	3 094	3 610	4 053
	Developing	kt	3 470	3 901	4 754	5 333	3 999	4 732	5 260	3 986	4 710	5 314
	Least Developed Countries	kt	152	214	301	336	216	304	337	216	301	334
Pigmeat ^{a2}	World Trade	kt	5 356	5 370	5 891	6 424	5 082	5 462	5 863	5 108	5 777	6 411
	OECD	kt	2 876	3 119	3 501	3 822	2 859	3 186	3 487	2 884	3 430	3 811
	Developing	kt	2 199	2 351	2 760	3 212	2 235	2 584	2 916	2 242	2 707	3 204
	Least Developed Countries	kt	73	73	104	114	73	105	114	73	104	114
Poultry	World Trade	kt	9 310	10 148	11 258	12 312	10 343	11 428	12 572	10 320	11 263	12 308
	OECD	kt	2 291	2 452	2 710	2 784	2 737	3 089	3 227	2 718	2 798	2 788
	Developing	kt	5 701	6 649	7 661	8 827	6 798	7 765	8 817	6 791	7 667	8 819
	Least Developed Countries	kt	499	541	757	960	533	737	927	534	754	961
Butter	World Trade	kt	905	876	893	917	844	838	862	846	875	914
	OECD	kt	152	143	149	153	143	149	153	143	149	153
	Developing	kt	445	471	498	529	539	571	609	528	504	525
	Least Developed Countries	kt	11	18	18	22	22	21	28	21	18	22
Cheese	World Trade	kt	1 549	1 658	1 880	2 109	1 585	1 729	1 942	1 592	1 882	2 142
	OECD	kt	719	699	778	839	690	767	828	691	776	839
	Developing	kt	612	687	796	882	759	833	914	749	834	915
	Least Developed Countries	kt	13	32	36	44	35	38	48	34	36	44
Whole Milk Powder	World Trade	kt	1 687	1 897	2 207	2 460	1 899	2 189	2 438	1 898	2 195	2 456
	OECD	kt	96	97	97	97	98	98	98	98	97	97
	Developing	kt	1 585	1 790	2 100	2 353	1 811	2 104	2 354	1 808	2 093	2 349
	Least Developed Countries	kt	175	230	295	353	230	292	349	230	294	353
Skim Milk Powder	World Trade	kt	1 134	1 214	1 290	1 362	1 198	1 257	1 327	1 201	1 286	1 365
	OECD	kt	193	194	212	227	196	213	228	196	212	227
	Developing	kt	1 004	1 097	1 182	1 258	1 103	1 178	1 253	1 104	1 183	1 261
	Least Developed Countries	kt	41	43	46	51	43	46	50	43	46	51

For notes, see end of the table.

Table C.2. **world trade projections (cont.)**

				Base			Lower GDP-slow recovery			Lower GDP-faster recovery		
				Average		2018	Average		2018	Average		2018
				2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
EXPORTS												
Wheat	OECD	kt	71 792	78 471	83 569	86 145	76 770	81 490	83 873	76 935	83 210	86 159
	Developing	kt	17 802	17 004	18 665	20 279	17 010	18 670	20 281	17 010	18 672	20 297
	Least Developed Countries	kt	84	32	27	29	32	27	29	32	27	29
Coarse Grains	OECD	kt	80 257	71 264	72 637	78 516	72 326	73 663	79 794	72 223	72 762	78 636
	Developing	kt	29 932	30 027	31 213	31 615	29 228	30 709	30 861	29 325	31 187	31 731
	Least Developed Countries	kt	2 500	2 861	3 330	4 360	2 603	3 812	4 342	2 624	3 286	4 348
Rice	OECD	kt	3 713	4 002	4 336	4 583	4 092	4 437	4 676	4 087	4 357	4 580
	Developing	kt	27 368	29 551	31 731	33 402	29 300	31 284	32 928	29 318	31 623	33 371
	Least Developed Countries	kt	1 473	1 624	2 517	3 364	1 570	2 417	3 240	1 574	2 490	3 348
Oilseeds	OECD	kt	40 712	45 782	43 598	43 027	45 732	44 240	43 710	45 768	43 852	42 989
	Developing	kt	41 051	42 882	50 980	55 659	42 537	49 534	54 098	42 523	50 472	55 661
	Least Developed Countries	kt	18	18	18	18	18	18	18	18	18	18
Oilseeds Meals	OECD	kt	10 855	14 118	16 929	19 974	14 793	17 294	20 334	14 743	16 913	19 970
	Developing	kt	50 715	55 242	58 277	62 477	54 915	58 292	62 506	54 949	58 336	62 493
	Least Developed Countries	kt	19	19	19	20	19	19	20	19	19	20
Vegetable Oils	OECD	kt	3 143	3 373	3 581	4 578	3 452	3 583	4 571	3 444	3 568	4 583
	Developing	kt	42 788	47 137	56 348	63 528	46 934	55 932	63 030	46 956	56 220	63 487
	Least Developed Countries	kt	87	90	96	101	90	96	101	90	96	101
Sugar	OECD	kt	6 322	6 164	6 460	6 428	6 138	6 461	6 414	6 149	6 473	6 425
	Developing	kt	42 459	48 639	54 625	58 562	48 352	54 117	58 033	48 391	54 537	58 582
	Least Developed Countries	kt	2 171	2 351	2 536	2 764	2 441	2 641	2 865	2 435	2 550	2 759
Beef ^a	OECD	kt	3 354	3 800	4 026	4 280	3 748	3 846	4 079	3 742	3 945	4 266
	Developing	kt	4 167	4 466	5 569	6 180	4 299	5 457	6 120	4 300	5 535	6 197
	Least Developed Countries	kt	2	3	3	3	3	3	3	3	3	3
Pigmeat ^a	OECD	kt	4 374	4 224	4 518	4 706	3 966	4 165	4 327	3 987	4 427	4 687
	Developing	kt	1 284	1 294	1 555	1 834	1 244	1 457	1 630	1 252	1 531	1 840
	Least Developed Countries	kt	0	1	0	0	1	0	0	1	0	0
Poultry	OECD	kt	4 121	4 252	4 432	4 578	4 137	4 345	4 494	4 152	4 431	4 584
	Developing	kt	5 258	5 986	7 013	7 972	6 295	7 260	8 306	6 257	7 018	7 963
	Least Developed Countries	kt	6	7	8	10	8	8	10	8	8	10
Butter	OECD	kt	698	663	663	680	648	624	638	650	650	677
	Developing	kt	88	95	108	114	80	96	106	81	105	113
	Least Developed Countries	kt	0	1	2	1	1	1	1	1	2	1
Cheese	OECD	kt	1 258	1 310	1 398	1 451	1 291	1 329	1 374	1 292	1 379	1 445
	Developing	kt	326	358	462	529	304	387	440	311	488	564
	Least Developed Countries	kt	0	0	1	1	0	1	1	0	1	1
Whole Milk Powder	OECD	kt	1 191	1 271	1 370	1 458	1 268	1 355	1 445	1 268	1 360	1 455
	Developing	kt	592	719	927	1 090	722	923	1 080	722	925	1 088
	Least Developed Countries	kt	7	10	15	19	10	15	19	10	15	19
Skim Milk Powder	OECD	kt	976	920	967	1 023	906	937	992	909	961	1 023
	Developing	kt	128	151	182	202	146	175	194	147	183	206
	Least Developed Countries	kt	1	1	0	0	1	0	0	1	0	0
Biofuel ^b	Ethanol World Trade	Mil /	4 892	4 989	8 818	13 077	4 660	8 708	13 093	4 697	8 820	13 059
	Biodiesel World Trade	Mil /	2 096	4 034	5 533	6 711	4 051	5 538	6 726	4 051	5 537	6 717

a) Excludes trade of live animals.

b) Sum of all positive net trade positions

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681631845517>

Table C.3. **World cereal projections**

Crop year ^a			Average 2006-08 est.		Base		Lower GDP-slow recovery			Lower GDP-faster recovery		
					Average		2018	Average		2018	Average	
			2009-11	2012-2017	2009-11	2012-2017		2009-11	2012-2017			
WHEAT												
OECD^b												
Production	mt	253.1	271.6	286.2	296.1	269.7	283.7	293.7	269.8	285.7	296.3	
Consumption	mt	207.3	217.1	226.8	234.6	217.1	226.5	234.3	217.1	226.6	234.5	
Closing stocks	mt	49.8	64.7	71.5	77.5	64.7	71.0	77.1	64.7	71.2	77.5	
Non-OECD												
Production	mt	375.8	390.0	410.9	426.3	388.9	409.4	424.8	389.0	410.6	426.3	
Consumption	mt	421.4	442.9	467.1	484.3	440.3	463.5	480.4	440.6	466.3	484.1	
Closing stocks	mt	124.1	130.9	135.9	140.2	131.1	135.5	139.9	131.0	135.6	140.2	
WORLD^c												
Production	mt	628.9	661.6	697.1	722.4	658.7	693.2	718.5	658.8	696.3	722.7	
Consumption	mt	628.8	660.0	694.0	718.9	657.4	690.0	714.7	657.7	693.0	718.6	
Closing stocks	mt	174.0	195.5	207.4	217.7	195.8	206.5	217.0	195.7	206.9	217.8	
Price ^d	USD/t	269.1	205.0	217.5	219.6	199.3	213.2	215.2	199.9	217.5	220.1	
COARSE GRAINS												
OECD^b												
Production	mt	545.1	592.5	638.8	668.4	589.4	633.8	663.3	589.5	637.4	668.5	
Consumption	mt	528.9	579.1	616.8	638.4	573.7	609.8	630.9	574.2	615.3	638.3	
Closing stocks	mt	97.6	96.8	96.4	111.1	98.7	96.3	111.0	98.4	95.7	110.8	
Non-OECD												
Production	mt	511.0	542.0	585.3	615.2	538.6	580.2	609.8	538.7	584.2	615.3	
Consumption	mt	522.7	559.5	600.9	637.6	558.6	597.9	634.4	558.7	599.8	637.5	
Closing stocks	mt	145.6	153.1	169.3	181.8	153.2	168.7	181.3	153.0	169.0	181.8	
WORLD^c												
Production	mt	1056.1	1134.4	1224.1	1283.6	1128.0	1214.0	1273.1	1128.2	1221.6	1283.7	
Consumption	mt	1051.6	1138.7	1217.7	1276.0	1132.3	1207.7	1265.3	1132.9	1215.1	1275.8	
Closing stocks	mt	243.2	249.9	265.7	292.9	251.8	265.0	292.3	251.5	264.7	292.6	
Price ^e	USD/t	184.9	163.6	170.4	165.1	155.6	164.4	158.9	156.4	170.2	165.3	
RICE												
OECD^b												
Production	mt	21.4	22.4	22.5	22.7	22.5	22.6	22.8	22.5	22.6	22.7	
Consumption	mt	22.8	23.0	23.3	23.6	23.1	23.3	23.6	23.1	23.3	23.6	
Closing stocks	mt	5.7	6.2	6.8	7.4	6.1	6.8	7.4	6.1	6.9	7.5	
Non-OECD												
Production	mt	420.7	439.0	456.4	471.6	437.7	454.5	469.6	437.8	456.0	471.6	
Consumption	mt	417.6	437.2	455.5	471.2	435.9	453.6	469.1	436.1	455.1	471.0	
Closing stocks	mt	85.9	96.2	98.6	100.5	96.4	98.3	100.1	96.3	98.4	100.3	
WORLD^c												
Production	mt	442.1	461.4	478.9	494.4	460.1	477.1	492.3	460.2	478.5	494.3	
Consumption	mt	440.4	460.2	478.8	494.8	459.1	477.0	492.7	459.2	478.4	494.6	
Closing stocks	mt	91.6	102.4	105.5	107.9	102.5	105.1	107.5	102.4	105.3	107.9	
Price ^f	USD/t	504.7	370.3	405.7	411.9	361.9	398.7	406.1	362.6	405.4	414.1	

a) Beginning crop marketing year – see Glossary of Terms for definitions.

b) Excludes Iceland but includes the 8 EU members that are not members of the OECD.

c) Source of historic data is USDA.

d) No. 2 hard red winter wheat, ordinary protein, USA f.o.b. Gulf Ports (June/May), less EEP payments where applicable.

e) No. 2 yellow corn, US f.o.b. Gulf Ports (September/August).

f) Milled, 100%, grade b, Nominal Price Quote, NPQ, f.o.b. Bangkok (August/July)

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681637610250>

Table C.4. **World oilseed projections**

			Base			Lower GDP-slow recovery			Lower GDP-faster recovery		
			Average		2018	Average		2018	Average		2018
			2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
OILSEEDS (Crop Year^a)											
OECD^b											
Production	mt	123.1	136.4	142.9	151.0	135.9	142.3	150.4	135.9	142.8	151.0
Consumption	mt	119.6	125.2	134.4	143.7	124.3	132.5	141.7	124.4	133.8	143.7
crush	mt	109.3	114.5	123.6	132.7	113.6	121.9	130.9	113.7	123.1	132.7
Closing stocks	mt	16.8	15.6	15.2	15.2	15.9	15.1	15.2	15.8	15.1	15.2
Non-OECD											
Production	mt	184.5	207.4	234.8	255.8	206.3	232.5	253.4	206.3	234.1	255.8
Consumption	mt	191.0	219.2	244.3	264.2	218.5	243.3	263.2	218.6	244.1	264.2
crush	mt	164.2	187.4	210.6	229.1	186.7	209.7	228.2	186.8	210.5	229.2
Closing stocks	mt	12.3	12.8	12.2	12.1	12.9	12.2	12.1	12.9	12.2	12.1
WORLD^c											
Production	mt	307.6	343.8	377.7	406.8	342.1	374.8	403.8	342.2	377.0	406.8
Consumption	mt	310.6	344.5	378.6	407.9	342.8	375.8	404.9	342.9	377.9	407.9
crush	mt	273.5	301.9	334.2	361.9	300.4	331.6	359.1	300.5	333.6	361.9
Closing stocks	mt	29.1	28.4	27.4	27.3	28.7	27.3	27.3	28.7	27.2	27.3
Price ^d	USD/t	440.7	345.5	383.6	398.2	336.3	376.6	390.9	337.4	383.5	398.4
OILSEED MEALS (marketing year)											
OECD^b											
Production	mt	78.3	81.3	87.7	94.2	80.7	86.5	92.9	80.8	87.3	94.1
Consumption	mt	100.9	104.1	107.1	110.2	103.2	105.7	108.7	103.3	106.7	110.2
Closing stocks	mt	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Non-OECD											
Production	mt	118.0	134.6	151.4	164.7	134.1	150.7	164.0	134.2	151.2	164.7
Consumption	mt	89.8	106.3	126.5	143.2	106.2	126.1	142.7	106.2	126.4	143.2
Closing stocks	mt	5.3	5.2	5.2	5.2	5.2	5.1	5.2	5.2	5.1	5.2
WORLD^c											
Production	mt	196.3	215.9	239.0	258.9	214.8	237.2	256.9	214.9	238.5	258.8
Consumption	mt	190.6	210.4	233.6	253.4	209.4	231.7	251.5	209.5	233.1	253.4
Closing stocks	mt	6.5	6.5	6.4	6.4	6.5	6.4	6.4	6.5	6.4	6.4
Price ^e	USD/t	329.9	238.2	258.6	270.1	230.8	252.1	263.0	231.5	257.8	270.0
VEGETABLE OILS (marketing year)											
OECD^b											
Production	mt	27.9	30.1	32.8	35.3	29.8	32.3	34.8	29.8	32.6	35.3
Consumption	mt	37.8	42.8	49.7	54.9	42.4	49.0	54.2	42.5	49.5	54.9
Closing stocks	mt	2.6	2.3	2.5	2.5	2.3	2.4	2.4	2.3	2.4	2.5
Non-OECD											
Production	mt	79.7	91.5	107.3	119.7	91.1	106.7	118.9	91.1	107.1	119.6
Consumption	mt	70.0	79.0	90.7	100.4	78.8	90.2	99.8	78.8	90.5	100.3
Closing stocks	mt	6.8	7.6	8.4	9.1	7.6	8.4	9.1	7.6	8.4	9.1
WORLD^c											
Production	mt	107.6	121.6	140.1	155.0	120.9	138.9	153.7	121.0	139.8	154.9
Of which palm oil	mt	42.1	48.3	58.6	66.5	48.1	58.1	65.9	48.1	58.4	66.4
Consumption	mt	107.7	121.9	140.4	155.3	121.3	139.2	154.0	121.3	140.0	155.2
Closing stocks	mt	9.4	10.0	10.9	11.6	10.0	10.8	11.5	10.0	10.9	11.6
Oil price ^f	USD/t	948.7	859.1	909.6	941.4	838.5	893.2	925.6	841.6	909.8	942.8

a) Beginning crop marketing year - see Glossary of Terms for definitions.

b) Excludes Iceland but includes the 8 EU members that are not members of the OECD.

c) Source of historic data is USDA.

d) Weighted average oilseed price, European port.

e) Weighted average meal price, European port.

f) Weighted average price of oilseed oils and palm oil, European port.

est: estimation.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681641435358>

Table C.5. **World sugar projections (in raw sugar equivalent)**

Crop year ^a											
Average 2006-08 est.			Base			Lower GDP-slow recovery			Lower GDP-faster recovery		
			Average		2018	Average		2018	Average		2018
			2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
OECD											
Production	kt rse	35 954	34 515	35 033	35 303	34 295	34 936	35 266	34 317	35 035	35 327
Consumption	kt rse	40 483	40 637	41 413	41 959	40 063	40 870	41 456	40 126	41 331	41 981
Closing stocks	kt rse	18 833	18 247	17 327	17 176	18 829	19 359	20 344	18 790	18 395	18 310
NON-OECD											
Production	kt rse	130 408	139 996	152 875	166 231	138 339	150 676	163 770	138 513	152 466	166 215
Consumption	kt rse	119 010	130 005	144 482	156 452	128 326	142 416	154 070	128 547	144 103	156 410
Closing stocks	kt rse	59 033	61 051	65 261	64 218	61 269	65 027	63 733	61 227	65 105	64 107
WORLD											
Production	kt rse	166 362	174 511	187 908	201 534	172 634	185 612	199 035	172 830	187 500	201 542
Consumption	kt rse	159 492	170 642	185 895	198 411	168 389	183 286	195 526	168 673	185 434	198 391
Closing stocks	kt rse	77 866	79 298	82 588	81 394	80 098	84 386	84 077	80 016	83 500	82 416
Price, raw sugar ^b	USD/t	278.1	305.3	306.3	307.6	292.0	294.6	296.6	293.4	305.5	308.0
Price, white sugar ^c	USD/t	333.0	338.1	353.6	371.5	325.2	342.1	360.7	326.5	352.8	371.9

a) Beginning crop marketing year – see the Glossary of Terms for definitions.

b) Raw sugar world price, New York No. 11, f.o.b. stowed Caribbean port (including Brazil), bulk spot price, October/September.

c) Raw sugar world price, ICE Inc. No. 11, f.o.b., bulk spot price (October/September).

est: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681684451523>

Table C.6. **World meat projections**

Calendar year ^a	Average 2006-08 est.		Base		2018	Lower GDP-slow recovery		2018	Lower GDP-faster recovery		2018
			Average			Average			Average		
			2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
OECD^b											
BEEF AND VEAL											
Production	<i>kt cwe</i>	27 127	27 195	27 254	27 997	27 023	26 721	27 408	27 028	27 014	27 952
Consumption	<i>kt cwe</i>	27 049	26 612	26 907	27 776	26 360	26 319	27 132	26 378	26 677	27 739
Ending stocks	<i>kt cwe</i>	1 019	1 014	1 013	1 012	1 014	1 012	1 011	1 014	1 012	1 012
Per capita consumption	<i>kg rwt</i>	15.4	15.0	14.8	15.1	14.8	14.5	14.7	14.8	14.7	15.1
Price, EU	<i>EUR/100 kg dw</i>	305	257	276	281	248	271	277	249	277	282
Price, USA ^c	<i>USD/100 kg dw</i>	319	307	326	325	282	316	316	286	332	327
Price, Brazil ^d	<i>USD/100 kg dw</i>	211	195	196	197	184	192	194	185	198	197
PIG MEAT											
Production	<i>kt cwe</i>	38 340	38 511	39 620	40 861	37 932	38 991	40 205	37 962	39 530	40 860
Consumption	<i>kt cwe</i>	36 671	37 187	38 405	39 761	36 620	37 814	39 152	36 658	38 328	39 767
Ending stocks	<i>kt cwe</i>	917	993	974	970	990	974	968	985	977	969
Per capita consumption	<i>kg rwt</i>	23.3	23.3	23.5	24.0	22.9	23.2	23.7	22.9	23.5	24.0
Price, EU ^e	<i>EUR/100 kg dw</i>	143	131	137	136	125	132	132	126	137	136
Price, USA ^f	<i>USD/100 kg dw</i>	145	146	156	163	140	154	161	142	157	164
POULTRY MEAT											
Production	<i>kt rtc</i>	38 202	39 220	41 188	42 775	38 591	40 575	42 155	38 672	41 114	42 795
Consumption	<i>kt rtc</i>	36 353	37 435	39 465	40 979	37 205	39 318	40 886	37 252	39 480	40 998
Ending stocks	<i>kt rtc</i>	1 158	1 202	1 199	1 202	1 202	1 199	1 202	1 202	1 199	1 202
Per capita consumption	<i>kg rwt</i>	26.1	26.4	27.3	28.0	26.3	27.2	27.9	26.3	27.3	28.0
Price, EU ^g	<i>EUR/100 kg rtc</i>	115	113	112	108	111	110	107	112	111	108
Price, USA ^h	<i>USD/100 kg rtc</i>	162	169	173	174	163	169	170	164	173	174
SHEEP MEAT											
Production	<i>kt cwe</i>	2 830	2 696	2 741	2 781	2 653	2 695	2 734	2 658	2 733	2 781
Consumption	<i>kt cwe</i>	2 429	2 316	2 315	2 313	2 248	2 248	2 250	2 256	2 305	2 314
Ending stocks	<i>kt cwe</i>	527	519	498	503	519	498	503	519	498	503
Per capita consumption	<i>kg rwt</i>	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.6	1.6	1.6
Price, Australia ⁱ	<i>AUD/100 kg dw</i>	331	348	357	363	348	357	363	348	357	363
Price, Australia ^j	<i>AUD/100 kg dw</i>	149	159	153	148	159	153	148	159	153	148
Price, New Zealand ^k	<i>NZD/100 kg dw</i>	333	324	353	375	324	353	375	324	353	375
TOTAL MEAT											
Per capita consumption	<i>kg rwt</i>	66.6	66.3	67.3	68.7	65.6	66.4	67.8	65.7	67.1	68.7
Non-OECD											
BEEF AND VEAL											
Production	<i>kt cwe</i>	37 605	39 476	43 171	46 100	39 071	42 312	45 152	39 104	42 861	46 049
Consumption	<i>kt cwe</i>	37 303	39 665	43 122	45 893	39 331	42 317	45 001	39 352	42 805	45 836
Per capita consumption	<i>kg rwt</i>	4.8	4.9	5.0	5.1	4.8	4.9	5.0	4.9	5.0	5.1
Ending stocks	<i>kt cwe</i>	87	98	92	78	98	92	78	98	92	78
PIG MEAT											
Production	<i>kt cwe</i>	62 123	66 750	73 845	79 028	66 445	73 389	78 501	66 462	73 735	78 988
Consumption	<i>kt cwe</i>	63 461	67 765	74 772	79 817	67 463	74 279	79 247	67 477	74 642	79 769
Per capita consumption	<i>kg rwt</i>	9.1	9.3	9.7	10.0	9.3	9.7	9.9	9.3	9.7	10.0
Ending stocks	<i>kt cwe</i>	46	46	46	46	46	46	46	46	46	46
POULTRY MEAT											
Production	<i>kt rtc</i>	51 654	60 980	70 368	77 528	60 608	69 926	77 054	60 688	70 319	77 529
Consumption	<i>kt rtc</i>	53 440	62 709	72 019	79 252	61 937	71 111	78 250	62 051	71 882	79 254
Per capita consumption	<i>kg rwt</i>	8.6	9.7	10.6	11.2	9.6	10.4	11.0	9.6	10.5	11.2
Ending stocks	<i>kt rtc</i>	142	110	114	116	110	114	116	110	114	116

Table C.6. **World meat projections (cont.)**

Average 2006-08 est. Calendar year ^a			Base			Lower GDP-slow recovery			Lower GDP-faster recovery		
			Average		2018	Average		2018	Average		2018
			2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
SHEEP MEAT											
Production	<i>kt cwe</i>	9 477	10 080	11 017	11 723	10 048	10 960	11 661	10 050	11 001	11 722
Consumption	<i>kt cwe</i>	9 860	10 520	11 668	12 518	10 433	11 552	12 394	10 441	11 642	12 517
Per capita consumption	<i>kg rwt</i>	1.6	1.6	1.7	1.8	1.6	1.7	1.7	1.6	1.7	1.8
Ending stocks	<i>kt cwe</i>	5	5	5	5	5	5	5	5	5	5
TOTAL MEAT											
Per capita consumption	<i>kg rwt</i>	24.0	25.6	27.0	28.0	25.3	26.7	27.7	25.4	26.9	28.0

a) Year ending 30 September for New Zealand.

b) Excludes Iceland but includes the 8 EU members that are not members of the OECD. Carcass weight to retail weight conversion factors of 0.7 for beef and veal, 0.78 for pig meat and 0.88 for sheep meat. Rtc to retail weight conversion factor 0.88 for poultry meat.

c) Choice steers, 1100-1300 lb lw, Nebraska – lw to dw conversion factor 0.63.

d) Price received by producer.

e) Pig producer price.

f) Barrows and gilts, No. 1-3, 230-250 lb lw, Iowa/South Minnesota – lw to dw conversion factor 0.74.

g) Poultry producer price (lw to rtc conversion of 0.75).

h) Wholesale weighted average broiler price 12 cities.

i) Saleyard price, lamb, 16-20 kg dw.

j) Saleyard price, wethers, < 22 kg dw.

k) Lamb schedule price, all grade average.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681742147261>

Table C.7. **World dairy projections (butter and cheese)**

Calendar year ^a			Base			Lower GDP-slow recovery			Lower GDP-faster recovery		
			Average		2018	Average		2018	Average		2018
			2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
Average 2006-08 est.											
BUTTER											
OECD^b											
Production	kt pw	3 684	3 715	3 697	3 726	3 703	3 662	3 687	3 704	3 684	3 722
Consumption	kt pw	3 181	3 244	3 228	3 231	3 248	3 231	3 236	3 246	3 227	3 231
Stock changes	kt pw	-24	-20	-15	-3	-20	-15	-3	-20	-15	-3
Non-OECD											
Production	kt pw	5 581	6 672	7 772	8 694	6 599	7 670	8 590	6 603	7 745	8 701
Consumption	kt pw	6 184	7 233	8 327	9 262	7 146	8 186	9 115	7 151	8 288	9 266
WORLD											
Production	kt pw	9 266	10 387	11 469	12 419	10 303	11 332	12 278	10 307	11 429	12 423
Consumption	kt pw	9 365	10 477	11 554	12 493	10 393	11 418	12 351	10 398	11 515	12 497
Stock changes	kt pw	-32	-20	-15	-3	-20	-15	-3	-20	-15	-3
Price ^c	USD/100 kg	279	189	239	255	159	205	218	164	238	256
CHEESE											
OECD^d											
Production	kt pw	15 013	15 624	16 864	17 932	15 462	16 552	17 581	15 475	16 768	17 909
Consumption	kt pw	14 459	15 013	16 238	17 315	14 861	15 984	17 029	14 874	16 158	17 297
Stock changes	kt pw	15	1	7	6	1	7	6	1	7	6
Non-OECD											
Production	kt pw	4 629	5 014	5 473	5 897	4 984	5 407	5 828	4 983	5 446	5 897
Consumption	kt pw	4 954	5 412	5 881	6 296	5 373	5 757	6 162	5 372	5 837	6 291
WORLD											
Production	kt pw	19 642	20 638	22 337	23 828	20 446	21 959	23 409	20 458	22 214	23 806
Consumption	kt pw	19 414	20 425	22 119	23 611	20 234	21 740	23 192	20 246	21 995	23 588
Stock changes	kt pw	18	1	7	6	1	7	6	1	7	6
Price ^d	USD/100 kg	379	262	300	318	243	284	302	246	300	318

a) Year ending 30 June for Australia and 31 May for New Zealand in OECD aggregate.

b) Excludes Iceland but includes the 8 EU members that are not members of the OECD.

c) f.o.b. export price, butter, 82% butterfat, Oceania.

d) f.o.b. export price, cheddar cheese, 39% moisture, Oceania.

est.: estimate.

Source: OECD and FAO Secretariats.

StatLink  <http://dx.doi.org/10.1787/681742278336>

Table C.8. **World dairy projections (powders and casein)**

Calendar year ^a			Base			Lower GDP-slow recovery			Lower GDP-faster recovery		
			Average		2018	Average		2018	Average		2018
			2009-11	2012-2017		2009-11	2012-2017		2009-11	2012-2017	
Average 2006-08 est.											
SKIM MILK POWDER											
OECD^b											
Production	kt pw	2 539	2 584	2 618	2 673	2 576	2 588	2 641	2 578	2 609	2 672
Consumption	kt pw	1 663	1 821	1 845	1 841	1 829	1 845	1 841	1 827	1 841	1 840
Stock changes	kt pw	38	-2	-20	-2	-2	-20	-2	-2	-20	-2
Non-OECD											
Production	kt pw	755	847	963	1 054	842	956	1 044	842	961	1 053
Consumption	kt pw	1 439	1 573	1 718	1 849	1 552	1 680	1 809	1 555	1 710	1 849
WORLD											
Production	kt pw	3 294	3 432	3 582	3 727	3 418	3 544	3 686	3 419	3 570	3 725
Consumption	kt pw	3 101	3 394	3 563	3 691	3 381	3 525	3 649	3 382	3 551	3 688
Stock changes	kt pw	38	-2	-20	-2	-2	-20	-2	-2	-20	-2
Price ^c	USD/100 kg	329	201	249	257	193	242	250	194	248	257
WHOLE MILK POWDER											
OECD^b											
Production	kt pw	1 881	1 956	2 059	2 153	1 950	2 040	2 134	1 950	2 048	2 149
Consumption	kt pw	785	781	786	791	779	782	786	779	784	790
Non-OECD											
Production	kt pw	2 274	2 582	2 973	3 284	2 571	2 944	3 250	2 572	2 964	3 284
Consumption	kt pw	3 230	3 618	4 107	4 507	3 603	4 063	4 459	3 603	4 089	4 503
WORLD											
Production	kt pw	4 156	4 538	5 032	5 437	4 521	4 984	5 384	4 522	5 012	5 433
Consumption	kt pw	4 016	4 399	4 893	5 298	4 382	4 846	5 245	4 383	4 873	5 294
Price ^d	USD/100 kg	342	202	254	269	193	246	260	194	254	269
WHEY POWDER											
Non-OECD											
Wholesale price, USA ^e	USD/100 kg	87	53	59	63	50	56	59	51	59	63
CASEIN											
Price ^f	USD/100 kg	658	423	517	526	416	524	537	418	523	530

a) Year ending 30 June for Australia and 31 May for New Zealand in OECD aggregate.

b) Excludes Iceland but includes the 8 EU members that are not members of the OECD.

c) f.o.b. export price, non-fat dry milk, 1.25% butterfat, Oceania.

d) f.o.b. export price, WMP 26% butterfat, Oceania.

e) Edible dry whey, Wisconsin, plant.

f) Export price, New Zealand.

est.: estimate.

Source: OECD and FAO Secretariats.

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ANNEX D

Information on Food Price Changes

Table D.1. Information on food price changes

Country	Total CPI % change ^a		Food CPI % change				Expenditure Share of Food		Food Contribution to Total change in CPI ^b	
	feb. 07- feb. 08	feb. 08- feb. 09	feb. 07- feb. 08	feb. 08- feb. 09	Last 6 months	Last 3 months	feb. 07- feb. 08	feb. 08- feb. 09	feb. 07- feb. 08	feb. 08- feb. 09
Non-OECD										
					- % -					
Guatemala	8.04	6.5	11.6	9.28	-0.54	-1.54	38.9	38.75	4.5	3.6
Sri Lanka	19.37	7.58	25.6	5.89	-1.01	0.47	62	46.71	15.9	2.75
Botswana	7.7	11.7	18.3	21.13	9.51	2.17	21.8	21.84	4	4.61
Ghana	13.21	20.33	11.23	18.99	8.91	5.63	44.91	44.91	5.04	8.53
Rwanda	6.3	19.95	0.44	28.86	7.54	1.03	37.09	37.09	0.16	10.7
Pakistan	10.6	21.07	18.2	22.9	-0.3	-3	41.5	40.34	7.6	9.24
Niger	7.64	10.34	12.93	23.55	2.8	1.47	43.55	43.55	5.63	10.26
Burkina Faso	7.07	8.5	13.77	16.39	-5.45	-2.1	32.09	32.09	4.42	5.26
Peru	4	5.49	6.4	8.34	3.01	1.92	29.6	49.56	1.9	4.13
Senegal	5.8	1.84	10.9	2.8	-4.13	-3.73	40.3	40.32	4.4	1.13
Haiti	9.9	5.88	11.8	6.37	-2.68	-5.54	50.3	50.35	5.9	3.21
Kenya	15.4	25.09	24.6	33.93	22.71	15	50.5	50.5	12.4	17.13
Bangladesh	10.16	5.81	12.72	6.15	-2.63	-2.72	64.5	62.96	9.2	3.87
South Africa	8.6	8.7	13.6	15.8	5.35	2.32	21	15.68	2.9	2.48
China	8.7	-1.6	23.3	-1.9	-4.75	-1.31	27.8	33.6	6.5	-0.64
Indonesia	6.8	7.78	11.4	12.77	4.26	2.25	26.7	23.9	3	3.05
India	5.23	9.94	6.16	13.35	2.09	-2.01	33.4	47.13	1.9	6.29
Brazil	4.78	5.86	9.93	9.16	2.07	1.37	27.49	27.49	2.73	2.52
Israel	3.67	-1.66	11.92	-12.11	-1.96	-2.29	14.33	14.33	1.71	-1.74
Slovenia	6.52	2.1	14.52	2.9	2.06	0.96	17.4	17.4	2.53	0.5
Estonia	11.36	3.34	17.05	1.4	-1.06	-0.38	21.7	21.7	3.7	0.3
Chile	8.05	5.5	15.92	13.4	1.96	-2.11	27.24	27.24	4.34	3.65
Russian Federation	12.66	13.64	17.75	15.93	7.84	4.05	32.8	32.8	5.82	5.23
OECD										
USA	4	0.28	5.1	4.83	0.52	-0.32	9.8	9.8	0.5	0.47
France	2.8	0.86	5	2.15	1.02	0.66	16.3	16.3	0.8	0.35
Germany	2.8	1.04	7.4	0.98	0.18	1.08	10.4	10.4	0.8	0.1
UK	2.5	3.1	5.6	11.41	3.33	1.81	11.8	10.9	0.7	1.24
Japan	1	-0.1	1.4	2.86	-0.51	-0.36	19	18.95	0.3	0.54
Greece	4.4	1.67	6.6	3.63	5.57	1.47	17.8	17.82	1.2	0.65
Spain	4.4	0.64	7.1	1.5	-0.13	-0.29	21.9	21.9	1.6	0.33
Switzerland	2.4	0.19	2.2	2.35	0.92	0.28	11	11	0.2	0.26
Poland	4.3	3.46	7.1	3.62	4.78	2.52	30.4	30.4	2.2	1.1
Sweden	3.1	0.95	5.9	5.39	2.94	2.07	13.4	13.4	0.8	0.72
Italy	2.91	1.7	4.94	3.41	1.03	0.44	16.3	16.3	0.8	0.56
Mexico	3.7	6.2	5	10.5	5.13	1.87	19.9	19.9	1	2.09
Korea	3.6	4.1	1.6	10	4.53	4.15	15.9	15.9	0.25	1.59
Hungary	6.9	3	13.5	4.7	4.02	3.93	20.7	20.7	2.79	0.97
Austria	3.23	1.33	8.45	2.21	2.67	1.50	13.6	13.6	1.15	0.30
Belgium	3.64	1.93	5.62	3.63	1.50	1.19	17.38	17.38	0.98	0.63
Canada	1.81	1.43	-0.59	8.95	4.68	1.71	11.89	11.89	-0.07	1.06
Czech Republic	7.53	1.97	11.34	-1.31	-0.18	1.34	26.5	26.5	3.00	-0.35
Denmark	3.08	1.88	6.95	3.13	0.08	0.32	13	13	0.90	0.41
Finland	3.72	1.74	5.88	7.45	5.04	2.17	13.3	13.3	0.78	0.99
Iceland	6.86	17.52	-1.46	28.89	13.21	4.13	16.8	16.8	-0.25	4.85
Ireland	4.77	-1.71	8.49	0.83	0.18	-0.09	14.1	14.1	1.20	0.12
Luxembourg	3.06	1.19	5.47	2.86	0.76	0.37	14.5	14.5	0.79	0.41
Netherlands	2.25	1.96	4.14	4.29	1.90	1.31	11.1	11.1	0.46	0.48
Norway	3.74	2.54	3.68	5.37	3.05	2.96	11.9	11.9	0.44	0.64
Portugal	2.85	0.20	2.29	1.02	-1.78	-0.20	20.1	20.1	0.46	0.20
Slovak Republic	4.03	3.11	8.17	1.27	0.00	0.95	23.6	23.6	1.93	0.30
Turkey	9.10	7.73	12.93	6.16	6.97	1.97	31.09	31.09	4.02	1.92

a) Percentage change February 2007 to February 2008.

b) Contribution is column 2 x 3/100.

Expenditure shares for 07/08 equal those of 08/09

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Glossary of Terms

Average Crop Revenue Election (ACRE) program

A new programme introduced with the 2008 US FCE Act allowing farmers to chose revenue-based protection against yield and market fluctuations.

AMAD

Agricultural Market Access database. A co-operative effort between Agriculture and Agri-food Canada, EU Commission-Agriculture Directorate-General, FAO, OECD, The World Bank, UNCTAD and the United States Department of Agriculture, Economic Research Service. Data in the database is obtained from countries' schedules and notifications submitted to the WTO.

Australia-US Free Trade Agreement (AUSFTA)

A Bilateral Agreement negotiated between the United States and Australia that came into force on 1 January 2005. AUSFTA covers goods, services, investment, financial services, government procurement, standards and technical regulations, telecommunications, competition-related matters, electronic commerce, intellectual property rights, labour and the environment.

Avian influenza

Avian influenza is an infectious disease of birds caused by type A strains of the influenza virus. The disease, which was first identified in Italy more than 100 years ago, occurs worldwide. The quarantining of infected farms, destruction of infected or potentially exposed flocks, and recently inoculation are standard control measures.

Atlantic beef/pigmeat market

Beef/pigmeat trade between countries of the Atlantic Rim.

Baseline

The set of market projections used for the outlook analysis in this report and as a benchmark for the analysis of the impact of different economic and policy scenarios. A detailed description of the generation of the baseline is provided in the chapter on Methodology in this report.

Biofuels

In the wider sense defined as all solid, fluid or gaseous fuels produced from biomass. More narrowly, the term biofuels comprises those that replace petroleum-based road-transport fuels, i.e. bioethanol produced from sugar crops, cereals and other starchy crops

that can be used as an additive to, in a blend with or as a replacement of gasoline, and biodiesel produced mostly from vegetable oils, but also from waste oils and animal fats, that can be used in blends with or as a replacement of petroleum-based diesel.

Biomass

Biomass is defined as any plant matter used directly as fuel or converted into other forms before combustion. Included are wood, vegetal waste (including wood waste and crops used for energy production), animal materials/wastes and industrial and urban wastes, used as feedstocks for producing bioproducts.

Bovine Spongiform

Encephalopathy (BSE)

A fatal disease of the central nervous system of cattle, first identified in the United Kingdom in 1986. On 20 March 1996 the UK Spongiform Encephalopathy Advisory Committee (SEAC) announced the discovery of a new variant of Creutzfeldt-Jacob Disease (vCJD), a fatal disease of the central nervous system in humans, which might be linked to consumption of beef affected by exposure to BSE.

BRIICs

Refers to the emerging economies of Brazil, the Russian Federation, India, Indonesia and China.

Cereals

Defined as wheat, coarse grains and rice.

CAFTA

CAFTA is a comprehensive trade agreement between Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and the United States.

Common Agricultural Policy (CAP)

The European Union's agricultural policy, first defined in Article 39 of the Treaty of Rome signed in 1957.

CAP reform

The EU Commission has published a Communication on the Mid-Term Review on the Common Agricultural Policy in July 2002, in January 2003 the Commission adopted a formal proposal. A formal decision on the "CAP reform – a long-term perspective for sustainable agriculture" was taken by the EU farm ministers. The reform includes far-reaching amendments of current policies, including further reductions in support prices, partly offset by direct payments, and a further decoupling of most direct payments from current production.

Coarse grains

Country of Origin Labelling (COOL).

Defined as barley, maize, oats, sorghum and other coarse grains in all countries except Australia, where it includes triticale and in the European Union where it includes rye and other mixed grains.

A provision of the 2008 US Farm Act that requires retailers to inform consumers of country of origin of different commodities, among them meats.

Country of Origin Labelling (COOL)

A provision of the 2008 US Farm Act that requires retailers to inform consumers of the country of origin of different commodities, among them meats.

Conservation Reserve Program (CRP)

A major provision of the United States' Food Security Act of 1985 and extended under the Food and Agriculture Conservation and Trade Act of 1990, the Food and Agriculture Improvement and Reform Act of 1996, and the Farm Security and Rural Investment Act of 2002 is designed to reduce erosion on 40 to 45 million acres (16 to 18 million hectares) of farm land. Under the programme, producers who sign contracts agree to convert erodible crop land to approved conservation uses for ten years. Participating producers receive annual rental payments and cash or payment in kind to share up to 50% of the cost of establishing permanent vegetative cover. The CRP is part of the *Environmental Conservation Acreage Reserve Program*. The 1996 FAIR Act authorised a 36.4 million acre (14.7 million hectares) maximum under CRP, its 1995 level. The maximum area enrolled in the CRP was increased to 39.2 million acres in the 2002 FSRI Act.

Commonwealth of Independent States (CIS)

The heads of twelve sovereign states (except the Baltic states) have signed the Treaty on establishment of the Economic Union, in which they stressed that the Azerbaijan Republic, Republic of Armenia, Republic of Belarus, Republic of Georgia, Republic of Kazakhstan, Kyrgyz Republic, Republic of Moldova, Russian Federation, Republic of Tajikistan, Turkmenistan, Republic of Uzbekistan and Ukraine on equality basis established the Commonwealth of Independent States.

Common Market Organisation (CMO) for sugar

The common organisation of the sugar market (CMO) in the European Union was established in 1968 to ensure a fair income to community sugar producers and self-supply of the Community market. At present the CMO is governed by Council Regulation (EC) No. 318/2006 (the basic regulation) which establishes a restructuring fund financed by sugar producers to assist the restructuring process needed to render the industry more competitive.

Crop year, coarse grains

Refers to the crop marketing year beginning 1 April for Japan, 1 July for the European Union and New Zealand, 1 August for Canada and 1 October for Australia. The US crop year begins 1 June for barley and oats and 1 September for maize and sorghum.

Crop year, oilseeds

Refers to the crop marketing year beginning 1 April for Japan, 1 July for the European Union and New Zealand, 1 August for Canada and 1 October for Australia. The US crop year begins 1 June for rapeseed, 1 September for soybeans and for sunflower seed.

Crop year, rice

Refers to the crop marketing year beginning 1 April for Japan, Australia, 1 August for the United States, 1 September for the European Union, 1 October for Mexico, 1 November for Korea and 1 January for other countries.

Crop year, sugar

A common crop marketing year beginning 1 October and extending to 31 September, used by FO Licht.

Crop year, wheat

Refers to the crop marketing year beginning 1 April for Japan, 1 June for the United States, 1 July for the European Union and New Zealand, 1 August for Canada and 1 October for Australia.

Decoupled payments

Budgetary payments paid to eligible recipients who are not linked to current production of specific commodities or livestock numbers or the use of specific factors of production.

Direct payments

Payments made directly by governments to producers.

Doha Development Agenda

The current round of multilateral trade negotiations in the World Trade Organisation that were initiated in November 2001, in Doha, Qatar.

Domestic support

Refers to the annual level of support, expressed in monetary terms, provided to agricultural production. It is one of the three pillars of the Uruguay Round Agreement on Agriculture targeted for reduction.

Economic Partnership Agreements (EPAs)

Free trade agreements currently being negotiated between the EU and the African, Caribbean Pacific (ACP) group of developing countries to replace the Cotonou Agreement which expired in 2007.

Energy Independence and Security Act (EISA) 2007

US legislation passed in December 2007 that is designed to increase US energy security by lessening dependence on imported oil, to improve energy conservation and efficiency, expand the production of renewable fuels, and to make America's air cleaner for future generations.

Ethanol

A bio-fuel that can be used as a fuel substitute (hydrous ethanol) or a fuel extender (anhydrous ethanol) in mixes with petroleum, and which is produced from agricultural feed-stocks such as sugar cane and maize.

Everything-But-Arms (EBA) initiative

The Everything-But-Arms (EBA) initiative eliminates EU import tariffs and restrictions for numerous goods, including agricultural products, from the least developed countries. The tariff elimination is scheduled in four steps from 2006-07 to 2009-10.

Export credits (with official support)

Government financial support, direct financing, guarantees, insurance or interest rate support provided to foreign buyers to assist in the financing of the purchase of goods from national exporters.

Export restitutions (refunds)

EU export subsidies provided to cover the difference between internal prices and world market prices for particular commodities.

Export subsidies

Subsidies given to traders to cover the difference between internal market prices and world market prices, such as for example the EU export restitutions. Export subsidies are now subject to value and volume restrictions under the *Uruguay Round Agreement on Agriculture*.

FCE Act, 2008

Officially known as the Food, Conservation and Energy Act of 2008. This US farm legislation replaces the FSRI Act of 2002 and covers the period 2008-2013.

Foot and Mouth Disease (FMD)

Foot and mouth disease is a highly contagious disease, which chiefly affects cloven-hoofed animal species (cattle, sheep, goats and pigs). Its symptoms are the appearance of vesicles (aphthae) on the animals' mouths (with a consequent reduction in appetite) and feet. It is caused by a virus which may be found in the animals' blood, saliva and milk. The virus is transmitted in a number of ways, via humans, insects, most meat products, urine and faeces, feed, water or soil. Although the mortality rate in adult animals from this disease is generally low and the disease presents no risk for humans, because it is highly contagious, infected animals in a given country are generally put down and other countries place an embargo on imports of live animals and fresh, chilled or frozen meat from the country of infection; in that case, only smoked, salted or dried meat and meat preserves may be imported from the country concerned. In addition, given the possibility of contagion between different species of cloven-hoofed animals, when foot and mouth disease breaks out in one species in a given country, exports of meat from all four types of animal are suspended.

FSRI Act, 2002

Officially known as the Farm Security and Rural Investment Act of 2002. This US farm legislation replaces the FAIR Act of 1996, covering a wide range of commodity programs and policies for US agriculture for the period 2002-2007.

Gur, khandasari or jaggery

Semi-processed sugars (plantation whites) extracted from sugar cane in India.

High Fructose Corn Syrup (HFCS)

Isoglucose sweetener extracted from maize.

Industrial oilseeds

A category of oilseed production in the European Union for industrial use (i.e. biofuels).

Intervention purchases

Purchases by the EC Commission of certain commodities to support internal market prices.

Intervention purchase price

Price at which the European Commission will purchase produce to support internal market prices. It usually is below 100% of the intervention price, which is an annually decided policy price.

Intervention stocks

Stocks held by national intervention agencies in the European Union as a result of *intervention* buying of commodities subject to market price support. Intervention stocks may be released onto the internal markets if internal prices exceed intervention prices; otherwise, they may be sold on the world market with the aid of *export restitutions*.

Inulin

Inulin syrups are extracted from chicory through a process commercially developed in the 1980s. They usually contain 83 per cent fructose. Inulin syrup production in the European Union is covered by the sugar regime and subject to a production quota.

Isoglucose

Isoglucose is a starch-based fructose sweetener, produced by the action of glucose isomerase enzyme on dextrose. This isomerisation process can be used to produce glucose/fructose blends containing up to 42% fructose. Application of a further process can raise the fructose content to 55%. Where the fructose content is 42%, isoglucose is equivalent in sweetness to sugar. Isoglucose production in the European Union is covered by the sugar regime and subject to a production quota.

Least squares growth rate

The **least-squares growth rate**, r , is estimated by fitting a linear regression trend line to the logarithmic annual values of the variable in the relevant period, as follows : $\ln(xt) = a + r \cdot t$.

Loan rate

The commodity price at which the *Commodity Credit Corporation (CCC)* offers non-recourse loans to participating farmers. The crops covered by the programme are used as collateral for these loans. The loan rate serves as a floor price, with the effective level lying somewhat above the announced rate, for participating farmers in the sense that they can default on their loan and forfeit their crop to the CCC rather than sell it in the open market at a lower price.

Market access

Governed by provisions of the *Uruguay Round Agreement on Agriculture* which refer to concessions contained in the country schedules with respect to bindings and reductions of tariffs and to other minimum import commitments.

Marketing allotments (US sugar program)

Marketing allotments designate how much sugar can be sold by sugar millers and processors on the US internal market and were established by the 2002 FSRI Act as a way to guarantee the US sugar loan programme operates at no cost to the Federal Government.

Marketing year, oilseed meals

Refers to the marketing year beginning 1 October.

Marketing year, oilseed oils

Refers to the marketing year beginning 1 October.

MERCOSUR

A multilateral agreement on trade, including agricultural trade between Argentina, Brazil, Paraguay and Uruguay. The agreement was signed in 1991 and came into effect on 1 January 1995. Its main goal is to create a customs union between the four countries by 2006.

Market Price Support (MPS) Payment

Indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers arising from policy measures creating a gap between domestic market prices and *border prices* of a specific agricultural commodity, measured at the farm gate level. Conditional on the production of a specific commodity, MPS includes the transfer to producers associated with both production for domestic use and exports, and is measured by the price gap applied to current production. The MPS is net of financial contributions from individual producers through producer levies on sales of the specific commodity or penalties for not respecting regulations such as production quotas (*Price levies*), and in the case of livestock production is net of the market price support on domestically produced coarse grains and oilseeds used as animal feed (*Excess feed cost*).

Methyl Tertiary Butyl Ether (MTBE)

A chemical gasoline additive that can be used to boost the octane number and oxygen content of the fuel, but can render contaminated water undrinkable.

Milk quota scheme

A supply control measure to limit the volume of milk produced or supplied. Quantities up to a specified quota amount benefit from full *market price support*. Over-quota volumes may be penalised by a levy (as in the European Union, where the “super levy” is 115% of the target price) or may receive a lower price. Allocations are usually fixed at individual producer level. Other features, including arrangements for quota reallocation, differ according to scheme.

North American Free Trade Agreement (NAFTA)

A trilateral agreement on trade, including agricultural trade, between Canada, Mexico and the United States, phasing out tariffs and revising other trade rules between the three countries over a 15-year period. The agreement was signed in December 1992 and came into effect on 1 January 1994.

Oilseed meal

Defined as rapeseed meal (canola), soybean meal, and sunflower meal in all countries, except in Japan where it excludes sunflower meal.

Oilseeds

Defined as rapeseed (canola), soybeans, and sunflower seed in all countries, except in Japan where it excludes sunflower seed.

Pacific beef/pigmeat market

Beef/pigmeat trade between countries in the Pacific Rim where foot and mouth disease is not endemic.

Payment-In-Kind (PIK)

A programme used in the US to help dispose of public stocks of commodities. Under PIK, government payments in the form of Commodity Credit Corporation (CCC)-owned commodities are given to farmers in return for additional reductions in harvested acreage.

PROCAMPO

A programme of direct support to farmers in Mexico. It provides for direct payments per hectare on a historical basis.

Producer Support Estimate (PSE)

Indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at farm gate level, arising from policy measure, regardless of their nature, objectives or impacts on farm production or income. The PSE measure support arising from policies targeted to agriculture relative to a situation without such policies, i.e. when producers are subject only to general policies (including economic, social, environmental and tax policies) of the country. The PSE is a gross notion implying that any costs associated with those policies and incurred by individual producers are not deducted. It is also a nominal assistance notion meaning that increased costs associated with import duties on inputs are not deducted. But it is an indicator net of producer contributions to help finance the policy measure (e.g. producer levies) providing a

given transfer to producers. The PSE includes implicit and explicit payments. The percentage PSE is the ratio of the PSE to the value of total gross farm receipts, measured by the value of total production (at farm gate prices), plus budgetary support. The nomenclature and definitions of this indicator replaced the former Producer Subsidy Equivalent in 1999.

Purchasing Power Parity (PPP)

Purchasing power parities (PPPs) are the rates of currency conversion that eliminate the differences in price levels between countries. The PPPs are given in national currency units per US dollar.

Non-Recourse loan programme

Programme to be implemented under the US FAIR Act of 1996 for butter, non-fat dry milk and cheese after 1999 in which loans must be repaid with interest to processors to assist them in the management of dairy product inventories.

Renewable Energy Directive (RED)

EU directive legislating binding mandates of 20% for the share of renewable energy in all Member States' energy mix by the year 2020, with a specific mandate of 10% for the renewable energy share in transport fuels.

Renewable Fuel Standard (RFS)

A standard in the United States for the use of renewable fuel use in the transport sector in the US Energy Act.

Saccharin

A low calorie, artificial sweetener used as a substitute for sugar mainly in beverage preparations.

Scenario

A model-generated set of market projections based on alternative assumptions than those used in the baseline. Used to provide quantitative information on the impact of changes in assumptions on the outlook.

Set-aside programme

European Union programme for cereal, oilseed and protein crops that both requires and allows producers to set-aside a portion of their historical base acreage from current production. Mandatory set-aside rates for commercial producers are set at 10% until 2006.

Single Farm Payment

With the 2003 CAP reform, the EU introduced a farm-based payment largely independent of current production decisions and market developments, but based on the level of former payments received by farmers. To facilitate land transfers, entitlements are calculated by dividing the reference amount of payment by the number of eligible hectares (incl. forage area) in the reference year. Farmers receiving the new SFP are obliged to keep

their land in good agricultural and environmental condition and have the flexibility to produce any commodity on their land except fruits, vegetables and table potatoes.

SPS Agreement

WTO Agreement on Sanitary and Phyto-sanitary measures, including standards used to protect human, animal or plant life and health.

Support price

Prices fixed by government policy makers in order to determine, directly or indirectly, domestic market or producer prices. All administered price schemes set a minimum guaranteed support price or a target price for the commodity, which is maintained by associated policy measures, such as quantitative restrictions on production and imports; taxes, levies and tariffs on imports; export subsidies; and public stockholding.

Tariff-rate quota (TRQ)

Resulted from the Uruguay Round Agreement on Agriculture. Certain countries agreed to provide minimum import opportunities for products previously protected by non-tariff barriers. This import system established a quota and a two-tier tariff regime for affected commodities. Imports within the quota enter at a lower (in-quota) tariff rate while a higher (out-of-quota) tariff rate is used for imports above the concessionary access level.

Uruguay Round Agreement on Agriculture (URAA)

The terms of the URAA are contained in the section entitled the “Agreement on Agriculture” of the Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations. This text contains commitments in the areas of *market access*, domestic support, and *export subsidies*, and general provisions concerning monitoring and continuation. In addition, each country’s schedule is an integral part of its contractual commitment under the URAA. There is a separate agreement entitled the Agreement on the Application of Sanitary and Phyto-sanitary Measures. This agreement seeks establishing a multilateral framework of rules and disciplines to guide the adoption, development and the enforcement of sanitary and phyto-sanitary measures in order to minimise their negative effects on trade. See also *Phyto-sanitary regulations* and *Sanitary regulations*.

Vegetable oil

Defined as rapeseed oil (canola), soybean oil, sunflower seed oil and palm oil, except in Japan where it excludes sunflower seed oil.

Voluntary Quota Restructuring Scheme

Established as part of the reform of the European Union’s Common Market Organisation (CMO) for sugar in February 2006 to apply for four years from 1 July 2006. Under the scheme, sugar producers receive a degressive payment for permanently surrendering sugar production quota, in part or in entirety, over the period 2006-07 to 2009-10.

WTO

World Trade Organisation created by the Uruguay Round agreement.

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OECD-FAO Agricultural Outlook 2009-2018

This is the fifteenth edition of the *Agricultural Outlook* and the fifth time it has been prepared jointly by the Organisation for Economic Cooperation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO). This edition covers the outlook for commodity markets during the 2009-18 period, and brings together the commodity, policy and country expertise of both organisations. The report analyses world market trends for the main agricultural products, as well as biofuels. It provides an assessment of agricultural market prospects for production, consumption, trade, stocks and prices of the included commodities.

Looking forward, real commodity prices over the 2009-18 period are projected to remain at, or above the 1997-2006 average, the period just before the recent price hikes. An expected economic recovery, renewed food demand growth from developing countries and the emerging biofuel markets are the key drivers underpinning agricultural commodity prices and markets over the medium term. The projections and past trends are presented in the statistical annex, and can be viewed in more detail at the website www.agri-outlook.org.

This edition of the *Outlook* was prepared in a period of unprecedented financial market turmoil and rapidly deteriorating global economic prospects. Because macroeconomic conditions are changing so quickly, this report complements the standard baseline projections with an analysis of revised short-term GDP prospects and alternative GDP recovery paths. Lower GDP scenarios result in lower commodity prices, with reductions in crop and biofuel prices about one-half those for livestock products. A sensitivity analysis to highly uncertain crude oil prices shows the important links between energy and agricultural prices. The *Outlook* also reports on a survey of various actors in the agri-food chain in terms of the current impacts of the global economic crisis and credit market constraints.

The issue of food security and the capacity of the agricultural sector to meet the rising demand for food remains very high on the international political agenda. This report provides a brief overview of critical factors such as land availability, productivity gains, water usage and climate change, and suggests that agricultural production could be significantly increased, provided there is sufficient investment in research, infrastructure and technological change, particularly in developing countries.

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