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Working Party on Agricultural Policies and Markets

THE OECD-FAO AGRICULTURAL OUTLOOK, 2009-2018
Part 2

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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

1. 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.

2. 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](image)

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

*Source: OECD Economic Outlook no84 (December 2008), World Bank Global Economic Prospects 2009 (November 2008).*

3. 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)
4. 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 is expected in the coming decade

5. 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 10 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).

6. 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.

7. 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

<table>
<thead>
<tr>
<th>Population</th>
<th>1999 - 2008</th>
<th>2009 - 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1.22</td>
<td>1.07</td>
</tr>
<tr>
<td>Africa</td>
<td>2.38</td>
<td>2.20</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>1.29</td>
<td>1.09</td>
</tr>
<tr>
<td>North America</td>
<td>1.01</td>
<td>0.87</td>
</tr>
<tr>
<td>Europe</td>
<td>0.31</td>
<td>0.09</td>
</tr>
<tr>
<td>Asia and Pacific</td>
<td>1.24</td>
<td>1.05</td>
</tr>
<tr>
<td>Oceania Developed</td>
<td>1.15</td>
<td>0.91</td>
</tr>
</tbody>
</table>

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


**Inflation should remain close to 2% across the OECD area**

8. 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.

9. 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.
Figure 4.3. Despite an increase in some countries, inflation expected to remain under control

Annual percentage growth

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


Oil price fluctuated markedly in 2008

10. Oil price is an important input in the Outlook as it reflects energy, transport and fertilizer 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.

11. 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).

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

12. 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.

13. 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 U.S. dollar against most currencies (Figure 4.5). 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.

14. 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**

15. 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.

16. 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 programs is reinforced with higher loan rates for several commodities under the Marketing Assistance Loan program and higher target prices for most commodities in the Counter-Cyclical Payments (CCPs) program. Direct payments and marketing assistance loan benefits are also reduced for producers who opt into the program. In addition, a new optional revenue based countercyclical program, 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 program 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).

17. 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.

18. 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 Least Developed Countries (LDCs) under the Everything-But-Arms (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.

19. 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

20. 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**

21. 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.

22. 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 ascribes 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**

23. Many governments with teetering economies have introduced fiscal stimulus in an attempt to revise 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 response thus far**

24. 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 the 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**

25. 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.

26. 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**

![Graph showing GDP growth rates for OECD countries]

**Note**

27. 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

![Graph showing revised short term GDP growth rates for selected non-OECD countries](image)


**What does it all mean for the Outlook?**

28. 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.

29. 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

30. 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


CHAPTER 5

BIOFUELS

World market trends and prospects

Key market drivers

31. 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.

32. 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.

33. 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 slowdown, 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.

34. 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\textsuperscript{1}, public support measures in the form of tax benefits and other subsidies, import tariffs and mandated use of biofuels will therefore drive ethanol and biodiesel production and use throughout the projection period.

**Figure 5.1. Monthly profitability estimates for US ethanol (left panel) and EU biodiesel (right panel), January 2008 – February 2009\textsuperscript{2}**

35. 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 levels\textsuperscript{3} 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**

36. 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\textsuperscript{4}, 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\textsuperscript{5}, growing by an average of 10\% per year over

\textsuperscript{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.

\textsuperscript{2} Estimated based on monthly data on crude oil and feedstock prices and the EURO/USD exchange rate.

\textsuperscript{3} A simplifying assumption which abstracts from the income elasticity of fuel demand.

\textsuperscript{4} Brazil, Sao Paolo (ex-distillery).

\textsuperscript{5} 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.
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**

![Graph showing world ethanol projections with data from 2005 to 2018](image)

37. 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 (2008) 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 - by 2018, with one in nine litres of available ethanol expected to be used in the European Union (Figure 5.3).

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

![Graph showing regional distribution of ethanol production and use in 2018](image)

**United States**

38. 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 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. 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.

Figure 5.4. US ethanol market projections

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. 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. 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

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6 Mostly Brazilian ethanol dehydrated in the Caribbean.

7 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.

8 All biofuel use shares are expressed on the basis of energy contained unless otherwise specified.
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 beet remains an important feedstock as well. Total ethanol production should increase to 14 bnl by 2018 - and thus almost tripling 2008 output.

**Figure 5.5. EU ethanol market projections**

![EU ethanol market projections](image)

**Canada**

41. 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).

**Figure 5.6. Canadian ethanol market projections**

![Canadian ethanol market projections](image)
Other OECD

42. 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.9

43. 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.

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

Latin America

45. 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 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.

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9 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.
46. 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 sugarcane-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).

47. Columbia has rapidly become the second most developed sugarcane-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 sugarcane 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.
48. Currently, there is no fuel ethanol production in Peru, but there are plants under construction. The primary feedstock will be sugarcane. 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.

**Asia**

49. 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.

50. 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 billion litres 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 billion litres by the end of the projection period. The strong production development still leaves an increasing surplus for export.

51. 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 sugarcane 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.

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

53. Ethanol production in India, mostly from molasses, reached 1.7 billion litres 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, 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**

54. Projections for ethanol production in African countries such as Ethiopia, Tanzania and Mozambique, based on sugarcane, cassava and molasses feedstocks, are beset by many uncertainties. In  

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10 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.
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.

55. 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 sugarcane 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

56. 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 US\textsuperscript{11}, world biodiesel prices\textsuperscript{12} 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.

\textsuperscript{11} The mandate is formally ending in 2012, but assumed to effectively stay in place throughout the projection period.

\textsuperscript{12} Producer price German net of biodiesel tariff.
57. While the implementation of the RED by EU\textsuperscript{13} 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.

58. 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\textsuperscript{14}, but could reach 3.9 bnl by 2018.

\textsuperscript{13} See footnote 7 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.

\textsuperscript{14} 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.
United States

59. 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 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

60. 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

![Canadian biodiesel market projections](image)

**Australia**

61. 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.15

**Latin America**

62. 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.

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15 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.
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.

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.

66. 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.\(^{16}\) This goal drives consumption and leaves only a very small exportable surplus.

**Africa**

67. 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**

68. 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

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\(^{16}\) 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.
(with the weight for second-generation biofuels equal to 2\(^{17}\)), 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.

69. 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.\(^{18}\) 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.

70. 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.

71. 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 favor 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.

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\(^{17}\) Article 3 paragraph 4(c) and Article 21 paragraph 2 of the adopted text, Strasbourg Dec. 17, 2008,

\(^{18}\) This corresponds to a nominal oil price of around USD 100 per barrel, assuming continued inflation at
about 1.5% per year.
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CHAPTER 6
CEREALS

World market trends and prospects

Key market drivers

Price peaks and increased volatility a feature of cereal markets

72. 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.

73. 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 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.
74. 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

75. 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

76. 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 a 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.

77. 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 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).
78. 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 United States, the EU, South Africa, most countries in Latin America, China, Indonesia, and the Philippines.

79. 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 growth in utilisation. Global wheat food consumption by 2018 may reach 508 million tonnes. At this level, per caput consumption is projected to hover just above 67 kg per person per annum, slightly below the current levels. A continuing decline in annual per caput 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.
80. 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.

Figure 6.3. Wheat consumption in OECD and developing countries

81. 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 tonne 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 include distillers dried grains (DDG) that are projected to be produced as by-products of ethanol production, particularly 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.
Trade

83. 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.
84. 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.

85. 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.

86. 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**

87. 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.

88. 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.

89. 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.

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

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

**Main market developments: rice**

*Responding to the 2008 price spike*

90. 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**

91. 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 Vietnam 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.

92. 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 tonne 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 anarcobic fermentation of the submerged organic matter.
Figure 6.10. Rice production and prices

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 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 caput 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 caput 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 urbanization proceeds. This especially concerns countries such as China, Indonesia and the Republic of Korea, where the tendency has already manifested. Per caput rice consumption may fall also in Bangladesh, India and Philippines, where large tracts of the population now benefit from government distribution programmes at subsidized prices. However, even in Asia, per caput 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.
96. 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 caput 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 caput consumption is likely to limit the expansion of the rice market in the OECD area.

97. 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 percent 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**

98. 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% to 7% of world production was exported in 2006-08, compared with less than 4% in the early 1980s.

![Figure 6.11. Main rice traders](image)

99. 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 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.

100. Few upheavals are foreseen on the export side of the market: exporters’ ranking should see Thailand, Vietnam, 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

101. 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

102. 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 2006-2008.

Key issues and uncertainties

Economic growth and energy markets

103. From the experience of the past year, it is very 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.

104. 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.

105. 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 U.S. 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/bbl 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

106. 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 necessarily new, ways to secure supply of such important staple foods as wheat and rice.

107. 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.).

108. 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.

109. 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-Sahara 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.
CHAPTER 7

OILSEEDS AND OILSEED PRODUCTS

World market trends and prospects

Key market drivers

110. 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 2007 stock-to-use ratios for oils and meals 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.

111. 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 caused by 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 the 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 could have fallen even further, if production expansion in South America had not been constrained by adverse weather conditions and farm liquidity problems.

112. The projections for oilseeds and oilseed products are subject to assumptions of average weather, continuation of current policy packages and an 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 different assumptions for the macroeconomic environment and for 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.
Main market developments

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

113. 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 period because of growing income 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.

114. In 2008, because of improved price prospects relative to cereals, oilseed acreage recovered from its unprecedented 2007 decline, which was 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 respectively by 3% and 5%, under the prospects of normal weather conditions and of a more favourable price ratio between oilcrops and cereal prices.

![Figure 7.2. Evolution of oilseed production over the projection period](image)

115. 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 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 rate drops from an 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.

116. 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 their productions at respective rates of almost 3.6% and 1.6% 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.

117. Russian oilseed production 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; vegetable oil requirements are increasingly satisfied by imports.

![Figure 7.3. Global oilseed production increase is slowing](image)

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

118. Within the OECD, oilseed area is expected to grow at a rate of 0.3% per year. Oilseed area expansion is expected to happen 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.

119. 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 due to 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**

120. As has been the case in the past, world oilseed trade will be continuously 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.

**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

![Graph showing growth rates](image)

Source: OECD and FAO Secretariats.

121. US domestic demand for crushing is expected to grow at a rate of 1.9% per year over the outlook period 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 of the outlook period. This, combined with only slightly increasing oilseed production over the projection period, is anticipated to lead to pretty stable oilseed exports over the projection period at more than 34 million tonnes on average.

122. 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 period, 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 the ambitious governmental targets encouraging the use of biodiesel.

123. 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.
124. Within the OECD, Canada remains the second largest oilseed exporter. Exports are projected to decrease despite an 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.

125. Paraguay’s oilseeds exports stabilized 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**

126. Due to the slowdown in the expansion of the Chinese 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 compared to the previous decade. 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.

127. 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**

128. In 2008, despite the commodity 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 period, 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
Livestock industries in developed countries have matured and reached stable ration compositions, resulting in the 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 is expected to reverse this trend 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 least developed countries remain significantly below those in developed countries. Growing meat production coupled with relatively low meal prices slowly increase the feed intensity over the outlook period so that developing countries will increase their share of global protein meal use from 50% in 2008 to 57% in 2018, yet still small compared to their population share of over 80%. Despite gradual improvements, least developed countries 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 period, 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 period as well.

In 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 where all economies around the world remain confronted with the deepest economic crisis in decades.
135. 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 bio-fuel 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 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.

136. 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.

137. 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.

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.

138. 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).
139. 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.

140. 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 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 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 period compared to the 2006-08 period. It represents slightly more than 25% of total vegetable oil use in the second part of the outlook.

141. 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.

142. 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.

143. 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

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

- **World**
- **Indonesia**
- **Canada**
- **Malaysia**
- **USA**
- **Brazil**
- **EU (27)**
- **Australia**
- **Argentina**

**Source:** OECD and FAO Secretariats.

142. 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.

143. 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 period. Thailand’s ambitious biodiesel program 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**

144. 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.

145. 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 vegetable oil trade growth to about 3% as opposed to 9% in the base period.

146. 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 period, after a short period of decline because of the emerging biodiesel production in recent years.

147. The EU, currently the second largest vegetable oil importer is expected to more than double its imports over the course of the projection to meet both industrial demand as well as traditional vegetable oil demand for food purposes. China will develop its domestic crushing industry slower than in the past but because 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.
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.

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 get curtailed. Following the FTA, India may not be able to hike 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 vegetable oil imports are increasing as a consequence.

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 period, trade is expected to maintain about a 3% growth rate, significantly below previous levels. The decline is in line with the slowing of global meal use.

The differential export tax system and the 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 the runner-up position. Oilseed meal exports originating from Brazil are expected to decrease over the course of the outlook period due to an increase in consumption by 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 projection period. 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 imported oilseeds, as well as through an expansion in meal imports in the latter years of the outlook period.

152. 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 period, 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 the competitive advantage of high protein content, biotech free status, plus low freight costs.

**Key issues and uncertainties**

153. The projections presented in this Outlook are subject to a certain number of uncertainties. Chapter 2 of the publication 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 presents 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 certain 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 changes will arise in lights of developments in other sectors of the economy.

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

154. The last couple of years witnessed a steep expansion in crop-based biofuel production. Surging demand for vegetable oil 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 utilization.

155. While assumptions on biofuel developments in the Outlook are based on the continuation of the current policy set, over the medium term, national biofuel policies could be subject to further reviews. Long term utilization targets are likely to remain in place, but a push towards second generation 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.

156. 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 crisis. Other countries, including China and India, are moving more cautiously as they have put food security as their first objective and thus restrict the use of edible crops for biofuel production.

2. Policy responses to volatile markets cannot be excluded

157. During the 2007 marketing year, sustained high international commodity prices led to lower levels of food consumption and caused 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.

158. 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 food prices persisted. During the period of the outlook further strong price swings and thus new government interventions in markets cannot be excluded. 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.

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

159. 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.

160. 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.

161. 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.
4. Shift towards more sustainable production methods can affect global production and trade patterns

162. 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.

163. 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

164. 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 (Intercontinental Commodities Exchange No.11, spot, fob 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.19

165. 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 sugarcane 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/t and USD 371/t, respectively, in 2018, and to remain above the depressed levels of the late 1990s and early 2000 years.

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19 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.
World sugar prices continue their longer term decline in real terms, when adjusted for inflation (see 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/t 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 with increasing supplies of raw sugar on the market and as rising sugar refining costs keep white supplies relatively tight (see Figure 8.2).
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 sugarcane 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 (see Figure 8.3). The adoption of improved varieties leads to rising yields of sugarcane and sugar beets over the period, despite some slowdown in overall productivity growth, when compared to the last decade.
169. 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 sugarcane 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.

170. 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 sugarcane (and beet in some countries) is allocated to ethanol production (see Figure 8.4).
Demand growth expected to remain resilient in face of economic downturn

171. 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 is 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 with declining population growth and dietary shifts away from sugar amid increasing health awareness and concerns with obesity being the more important drivers.

172. 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 (see Figure 8.5).
Key market developments

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

173. Australian cane production has declined over the last 4 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 with sugar exports at 3.9 million tonnes, in 2018.

174. 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 (see 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). EU-27 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 African, Caribbean and Pacific (ACP) countries as part of Economic Partnership Agreements.
(EPAs) and from the Least Developed Countries (LDCs) under the Everything But Arms (EBA) initiative (see 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 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 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.

**Figure 8.6. EU Sugar reform leads to lower production and exports**

![Graph showing EU sugar production, exports, and imports from 2004 to 2018.](image)

Source: OECD and FAO Secretariats.

**Figure 8.7. Increasing share of EU preferential sugar imports**

![Graph showing the increasing share of EU preferential sugar imports from 2007 to 2018.](image)
175. 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 Program (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 (see Figure 8.8).

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

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

177. 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**

178. 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 sugarcane 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 sugarcane 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 (see Figure 8.9).

![Figure 8.9. Brazil. Most sugar cane allocated to bio-ethanol production](image)

Source: OECD and FAO Secretariats.

179. 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 (see Figure 8.10). Sugar production in India is expected to decline sharply 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.

**Figure 8.10. India: a pronounced production cycle to continue**

![Graph showing production and consumption of sugar](image)

*Source: OECD and FAO Secretariats.*

180. 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 to increase by 3% per year over the projection period leading to 2018, sustained by expanding use by households and the beverages industry. Sugar export 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**

181. 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 and 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 nearly 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 (see 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 (see Figure 8.12).

Source: OECD and FAO Secretariats.
183. 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 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**

184. 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, 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 is stagnant due to limited area and water resources. Sugar consumption is projected to remain strong, although expand at a slightly lower rate than that of the previous decade, sustained by population growth and rising use of sugar in food processing.

185. 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 sugarcane 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 require 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**

186. 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. Although the decline in incomes associated with recession are not expected to affect sugar demand strongly, 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?

187. 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.

188. 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.

189. 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 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?

190. The major policy changes confronting the US sugar market in recent years are the full integration of the US and Mexican sweetener markets under North American Free Trade Agreement (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 (FCEA) in June 2008 (see 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 FCEA. 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 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.

191. 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 program (FFP) in each year, with heavier uses from 2012 onwards, and this keeps domestic prices close to US sugar support levels.

192. 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*

193. The reform of EU sugar policy over 4 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.

**Box 8.1. Key US sugar program 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.
194. 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).

195. 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 increasingly the choice of giving priority to their high priced domestic and regional markets and alternative uses such as a feedstock for renewable fuels.
CHAPTER 9

MEAT

World market trends and prospects

Key market drivers

196. 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 facts 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.

197. 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.

198. 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.

199. 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.

200. 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*

201. 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 (2009-2018) 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.

202. 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.

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*Figure 9.1. World market prices for meat*

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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 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 (2006-2008 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.
207. 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.

208. 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.

209. 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.

210. 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](image-url)
211. 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**

212. 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 like 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 of OECD countries.

![Figure 9.4. Development of meat production](image)

213. 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 that 10% of the increase in global production between the base period and 2018.
214. 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 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).

215. 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

216. 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, like 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

217. 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 constraint as an increasing number of Brazilian farms are 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 U.S. meat, consumption grows faster than production.

218. 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.
219. 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 restriction 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.

220. LDCs\(^\text{21}\) 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.

\(^{21}\) The group of LDCs comprises 49 countries and is defined by the United Nations based on economic and social criteria (http://www.un.org/esa/policy/devplan/profile/ldc_list08.pdf).
Japan to overtake Russia as the leading meat importing country

221. 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 investment\textsuperscript{22} 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.

222. 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

\textsuperscript{22} In Russia, investment into different agricultural sectors is promoted through a program of subsidized interest rates. Among the meat markets, the program is assumed to be especially effective for the pork sector.
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.

Key issues and uncertainties

223. 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.

224. 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
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.

225. 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.

226. 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.

227. 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.

228. 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 compartmentalization 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.

229. 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. 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.

230. 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.

231. 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.

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CHAPTER 10

DAIRY

World market trends and prospects

Key market drivers

232. 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.

233. 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. Westernization 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.

234. 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 thinnes 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.

235. 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*

236. 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.

237. 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](image)

![Figure 10.2. Prices in real term after the initial rise to remain relatively flat](image)
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).
Longer term milk production growth potential receiving renewed interest

242. 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 (FCEAct). Nevertheless, the rapidly deteriorating market situation has triggered, in several countries, short term measures intended to curb supply and stabilise prices for domestic producers.

243. Oceania – 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.

244. European Union - 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%.

245. United States – The recent strong growth in milk production 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.24 Assuming a return to more “normal”

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24 The CCC purchases products at support prices and store 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
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.

246. **China** - 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.

247. **The Russian Federation** – After falling for more than a decade, milk production 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).

248. **Latin America** – 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.

249. **South and Southeast Asia** – 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.

250. 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

251. 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.

252. 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%).

253. 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

254. 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.

255. 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.

256. 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 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).
258. 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 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 exhibit the highest growth rates.

259. Demand for milk and milk products is 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.

260. 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.
Key issues and uncertainties

261. 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.

262. 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. Russia) could have considerable repercussions for global import demand and international prices.

263. 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.

264. 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.

265. 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.

266. An important and emerging issue, particularly in developed countries is the concern for climate change, and measures to mitigate greenhouse gas emissions. These measures, which can affect several areas 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 among developed and developing countries with corresponding regional impacts on output and on dairy herd numbers.

267. 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 but also in well established markets.

268. 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.
ANNEX B. 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**

**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 in 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

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.

Country of Origin Labelling (COOL)

A provision of the 2008 US Farm Act that requires retailers to inform consumers of 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 erodable 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 soyabeans 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 feedstocks such as sugar cane and maize.

Everything-But-Arms (EBA)

The Everything-But-Arms (EBA) Initiative eliminates EU import tariffs for numerous goods, including agricultural products, from the least developed countries. The tariff elimination is scheduled in four steps from 2006/07 to
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.


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.


Gur, jaggery, khandasari  Semi-processed sugars (plantation whites) extracted from sugarcane 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: \( \ln(x_t) = a + r \times t \).

**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 program 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.
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), soyabean meal, and sunflower meal in all countries, except in Japan where it excludes sunflower meal.

**Oilseeds**

Defined as rapeseed (canola), soyabean, 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 ration 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 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 concessory 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), soyabean 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.