Working Party on Agricultural Policies and Markets

THE OECD-FAO AGRICULTURAL OUTLOOK, 2007-2016
FOREWORD

This is the third occasion that the Agricultural Outlook report has been prepared jointly by the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) of the United Nations. The report draws on the commodity, policy and country expertise of both organisations in providing a medium term assessment of future prospects in the major world agricultural commodity markets. The report is published annually, as part of a continuing effort to promote informed discussion of emerging market and policy issues. This edition of the Agricultural Outlook offers an assessment of agricultural markets covering cereals, oilseeds, sugar, meats, milk and dairy products over the period 2007 to 2016. It takes account of the enlargement of the European Union, from twenty-five to twenty-seven Member states and for the first time includes explicitly assumptions on bio-fuel production. The market assessments are based on a set of projections that are conditional on specific assumptions regarding macroeconomic conditions, agricultural and trade policies and production technologies; it also assumes average weather conditions. Using the underlying assumptions, the Agricultural Outlook presents a plausible scenario for the evolution of agricultural markets over the next decade and provides a yardstick or benchmark for the analysis of agricultural market outcomes that would result from alternative assumptions.

This year’s projections are set against a backdrop of a steady global economic growth over the medium term, slowing population growth, continuing low inflation, and markets that globally are responding to the challenge of a rapidly changing bio-fuel industry. Global economic growth is propelled mainly by fast growing economies of large developing countries. In particular, the emerging economies of China, India, Brazil and Russia are key to global and agricultural market developments. Over the projection period, the countries in the non-OECD region are expected to continue to experience a much stronger increase in consumption of agricultural products than countries in the OECD area. This trend is driven by population and, above all, income growth - underpinned by rural migration to higher income urban areas. The strong growth in demand in many developing and emerging economies is also expected to spur expansion in imports and provide the impetus to the development of domestic production capacity. But exports are growing strongly in a number of developing countries as well. As a result, OECD countries as a group are projected to lose production and export shares in many commodities to non-OECD countries. Growth in the use of agricultural commodities as feedstock to a rapidly increasing biofuel industry is one of the main drivers in the outlook and one of the reasons for international commodity prices to attain a significantly higher plateau over the outlook period than has been reported in the previous reports. However, new production technologies, changes in biofuel policies, or unexpected price changes in crude oil and feedstock prices could significantly alter market developments in the future.

The projections and assessments provided in this report are the result of close co-operation between the OECD and FAO Secretariats and national experts in member countries, and thus reflect the combined knowledge and expertise of this wide group of participants. As a result of FAO participation in the Outlook, the country coverage of the projections has been considerably extended to a larger number of developing countries and developing country regions. A jointly developed modelling system, based on the OECD's Aglink and FAO’s Cosimo models, facilitated the assurance of consistency in the projections. The fully documented outlook database, including historical data and projections, is available through the OECD-FAO joint internet site www.agri-outlook.org. Within the OECD, this publication is prepared by
the Trade and Agriculture Directorate, while at FAO, the Trade and Markets Division was responsible for the report.
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## ACRONYMS AND ABBREVIATIONS

### Acronyms and abbreviations

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<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACP</td>
<td>African, Caribbean and Pacific countries</td>
</tr>
<tr>
<td>AMAD</td>
<td>Agricultural Market Access Database</td>
</tr>
<tr>
<td>AI</td>
<td>Avian Influenza</td>
</tr>
<tr>
<td>BSE</td>
<td>Bovine Spongiform Encephalopathy</td>
</tr>
<tr>
<td>CAFTA</td>
<td>Central American Free Trade Agreement</td>
</tr>
<tr>
<td>CAP</td>
<td>Common Agricultural Policy (EU)</td>
</tr>
<tr>
<td>CCC</td>
<td>Commodity Credit Corporation</td>
</tr>
<tr>
<td>CET</td>
<td>Common External Tariff</td>
</tr>
<tr>
<td>CBS</td>
<td>Commonwealth of Independent States</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer Price Index</td>
</tr>
<tr>
<td>CRP</td>
<td>Conservation Reserve Program of the United States</td>
</tr>
<tr>
<td>CMO</td>
<td>Common Market Organisation for sugar (EU)</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>Cts/lb</td>
<td>Cents per pound</td>
</tr>
<tr>
<td>Cwe</td>
<td>Carcass weight equivalent</td>
</tr>
<tr>
<td>DBES</td>
<td>Date-based Export Scheme</td>
</tr>
<tr>
<td>DDA</td>
<td>Doha Development Agenda</td>
</tr>
<tr>
<td>DDG</td>
<td>Dried Distiller’s Grains</td>
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<tr>
<td>Dw</td>
<td>Dressed weight</td>
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<tr>
<td>EBA</td>
<td>Everything-But-Arms Initiative (EU)</td>
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<tr>
<td>ECOWAP</td>
<td>West Africa Regional Agricultural Policy</td>
</tr>
<tr>
<td>ECOWAS</td>
<td>Economic Community of West African States</td>
</tr>
<tr>
<td>EPAs</td>
<td>Economic Partnership Agreements (between EU and ACP countries)</td>
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<tr>
<td>ERS</td>
<td>Economic Research Service of the US Department for Agriculture</td>
</tr>
<tr>
<td>Est</td>
<td>Estimate</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EU-15</td>
<td>Fifteen member states of the European Union</td>
</tr>
<tr>
<td>EU-10</td>
<td>Ten new member states of the European Union from May 2004</td>
</tr>
<tr>
<td>EU-27</td>
<td>Twenty seven member states of the European Union (including Bulgaria and Romania from 2007)</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation of the United Nations</td>
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<tr>
<td>FOB</td>
<td>Free on board (export price)</td>
</tr>
<tr>
<td>FSRI ACT</td>
<td>Farm Security and Rural Investment Act (US) of 2002</td>
</tr>
<tr>
<td>FTA</td>
<td>Free Trade Agreement</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>G-10</td>
<td>Group of 10 countries (see Glossary)</td>
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<td>G-20</td>
<td>Group of 20 developing countries (see Glossary)</td>
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<tr>
<td>GDPD</td>
<td>Gross Domestic Product Deflator</td>
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<td>GM</td>
<td>Genetically modified</td>
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<tr>
<td>HFCS</td>
<td>High Fructose Corn Syrup</td>
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<tr>
<td>HS</td>
<td>Harmonised Commodity Description and Coding System</td>
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<tr>
<td>Kt</td>
<td>Thousand tonnes</td>
</tr>
<tr>
<td>LAC</td>
<td>Latin America and the Caribbean</td>
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<tr>
<td>LDC’s</td>
<td>Least developed countries</td>
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<tr>
<td>LICOSA</td>
<td>Leche Industrializada</td>
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<tr>
<td>Lw</td>
<td>Live weight</td>
</tr>
<tr>
<td>MERCOSUR</td>
<td>Common Market of the South</td>
</tr>
<tr>
<td>MFN</td>
<td>Most Favoured Nation</td>
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<tr>
<td>Mha</td>
<td>Million hectares</td>
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<tr>
<td>MPS</td>
<td>Market Price Support</td>
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<tr>
<td>Mt</td>
<td>Million tonnes</td>
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<tr>
<td>MTBE</td>
<td>Methyl Tertiary Butyl Ether</td>
</tr>
<tr>
<td>NAFTA</td>
<td>North American Free Trade Agreement</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<tr>
<td>OIE</td>
<td>World Organisation for Animal Health</td>
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<tr>
<td>PCE</td>
<td>Private Consumption Expenditure</td>
</tr>
<tr>
<td>PROCAMPO</td>
<td>Mexican Farmers Direct Support Programme</td>
</tr>
<tr>
<td>PPP</td>
<td>Purchasing Power Parity</td>
</tr>
<tr>
<td>PSE</td>
<td>Producer Support Estimate</td>
</tr>
<tr>
<td>Pw</td>
<td>Product weight</td>
</tr>
<tr>
<td>Rse</td>
<td>Raw sugar equivalent</td>
</tr>
<tr>
<td>Rtc</td>
<td>Ready to cook</td>
</tr>
<tr>
<td>RFS</td>
<td>Renewable Fuels Standard in the US, which as part of the Energy Policy Act of 2005 adjusts fuel standards in favour of ethanol and other biofuels and sets increased mandated biofuel consumption quantities</td>
</tr>
<tr>
<td>Rwt</td>
<td>Retail weight</td>
</tr>
<tr>
<td>SEAC</td>
<td>Spongiform Encephalopathy Advisory Committee</td>
</tr>
<tr>
<td>SFP</td>
<td>Single Farm Payment</td>
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<td>SMP</td>
<td>Skim milk powder</td>
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</table>
Symbols

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

• Currently strong world market prices for many agricultural commodities in international trade are, in large measure, due to factors of a temporary nature, such as drought related supply shortfalls, and low stocks. But, structural changes such as increased feedstock demand for bio-fuel production, and the reduction of surpluses due to past policy reforms, may keep prices above historic equilibrium levels during the next 10 years.

• Higher commodity prices are a particular concern for net food importing developing countries as well as the poor in urban populations, and will evoke on-going debate on the “food versus fuel” issue. Furthermore, while higher bio-fuel feedstock prices support incomes of producers of these products, they imply higher costs and lower incomes for producers that use the same feedstock in the form of animal feed.

• The expectation that world market prices have attained a higher plateau may facilitate further policy reform away from price support. This would reduce the need for border protection and would provide flexibility for tariff reductions.

• Growing use of cereals, sugar, oilseeds and vegetable oils to satisfy the needs of a rapidly increasing bio-fuel industry, is one of the main drivers in the outlook. Over the outlook period, substantial amounts of maize in the US, wheat and rapeseed in the EU and sugar in Brazil will be used for ethanol and biodiesel production. This is underpinning crop prices and, indirectly through higher feed costs, the prices for livestock products as well.

• Given that in most temperate zone countries ethanol and bio-diesel production are not economically viable without support, a different combination of production technologies, biofuel policies and crude oil prices than is assumed in this Outlook could to lead to lower prices than are projected in this Outlook.

• The assumed strong growth in demand in many developing and emerging economies will spur expansion in imports as well as provide the impetus to the development of domestic production capacity. As a result, OECD countries as a group are projected to lose production and export shares in many commodities to non-OECD countries over the outlook period.

• Measured by global imports, world trade is projected to grow for all commodities reviewed in this report, without exception. By 2016, and compared to the average for 2001-05, trade expansion remains modest for SMP (7%), is situated at 13% to 17% for coarse grains and wheat respectively, but grows by between over 50% for beef, pigmeat and WMP and by close to 70% for vegetable oils.

• Imports grow more strongly in developing countries than in OECD countries for all products except vegetable oils. And for all products except wheat and coarse grains, these growing markets are increasingly satisfied through larger exports from other developing countries. Agricultural world markets are thus characterised by growing south-south trade, raising the competition for exporting countries within the OECD.

• The growing presence on export markets of Argentina and Brazil is staggering. While Brazil’s growth is mostly concentrated in sugar, oilseeds and meats, Argentina’s export performance also covers cereals and many dairy products. Other growing exporters in the developing and transition economies include Russia and the Ukraine for coarse grains, Vietnam and Thailand for rice, Indonesia and Thailand for vegetable oils, and Thailand, Malaysia, India and China for poultry.

• Import growth is much more widely spread across countries. However, China’s dominance of oilseeds and oilseed products trade is striking. By 2016 China will have become the world’s largest importer of oilseed meals and it will have further consolidated its leading position in imports of oils and oilseeds. For the latter product, its share in global imports will have risen to almost 50%.
CHAPTER I

OVERVIEW

Introduction

The Agricultural Outlook is a collaborative effort of the OECD in Paris and the Food and Agriculture Organisation (FAO) of the United Nations in Rome. Its main purpose is to produce an updated annual 10 year assessment of global commodity markets that includes analysis of recent developments and emerging issues, bringing together the commodity, policy and country expertise of both Organisations. The projections for production, consumption, stocks, trade and prices described and analysed in this report cover the years 2007 to 2016. The projections are presented in the statistical annex, and can be viewed in more detail at the website www.agr-outlook.org. They reflect many specific assumptions concerning key external factors such as macroeconomic performance, agricultural and trade policies, and trends in technologies as well as consumer preferences. The projections do not take account of weather shocks and related impacts on crop yields and livestock production, nor are changes considered to agricultural and trade policies - anticipated or otherwise - that have yet to be adopted by legislation or international agreements. Such deviations from these assumptions constitute some of the important uncertainties in the Outlook, the potential impacts of which are also assessed in this report.

The main underlying assumptions

Global economic growth may be the strongest in decades

Brightened prospects prevail in the macroeconomic climate for this year’s Outlook. Global economic growth has remained vigorous through 2006. Demand continues to be strong in OECD countries with output growth in the OECD area remaining robust and near-term prospects optimistic, in particular in OECD member countries in Europe, Australia and Asia. GDP growth for the OECD area increased to 3.2% in 2006 and is expected to remain buoyant at close to 2 1/2% throughout the outlook horizon. In per capita terms, economic growth is anticipated to be the strongest in recent times, due to, among other factors, the spread of technology and globalization of markets as well as an income dividend due to declining population growth.1

The recent downturn of activity in the United States is not expected to last beyond the short-term, and thereafter growth is assumed to remain solid. Conversely, short-term prospects are bright for Canada, the US’s main trading partner, given the stable economic climate in this country as well as expanding trade reinforced by high commodity prices. In the European Union (EU), confidence prevails now that solid growth seems to finally have taken root, even though output is assumed to moderate over the Outlook period. The recovery is also established in Japan, but with weakening potential over the longer term coming chiefly from its ageing workforce. In the short term, interest rates are expected to notch upwards in both of these latter countries while the Euro and Yen continue to appreciate against the dollar, diminishing the prospects for EU agricultural exports but boosting import demand in Japan. Activity has surged back in

1 These and other macroeconomic assumptions in this section are based on the OECD, World Bank and UN sources which are explained in detail in footnote a to Table A.1 of the Statistical Annex.
Mexico with GDP growth rates beyond 2009 expected to exceed 4%, and the dynamic economies of Korea and Turkey continue to steam ahead. In the near-term, a rebound is also expected in Australia, which, if it eventually spreads to New Zealand, will bring renewed optimism in this latter country as well after several years of declining performance.

1. Because of their growth potential, the large emerging economies of China, India, Brazil and Russia are key drivers of global economic growth. Moreover, the relative significance and growth potential of their agricultural sectors mean that they play an expanding role in world trade of agricultural commodities. Higher responsiveness of food demand to income growth imply that income gains in Russia and the high growth developing countries will translate directly into increased consumption, in particular for high value-added food items such as meat and dairy products.

Figure 1.1. Trends in output growth in selected countries

With rising investment, surging demand and expanding trade prospects, output growth is expected to remain strong in China and India over the outlook period, providing the dynamic behind activity throughout much of Asia. Export demand, in particular for agricultural commodities, is essential to continued GDP growth in the main South American economies. Exports should spur a return to solid growth in Brazil which is expected to remain strong thereafter at near 4%. In Argentina, however, the rapid growth of the past few years should slow somewhat. Likewise, economic growth in Russia, as in other CIS countries, should dampen slightly amid concerns over fiscal discipline, but growth rates in both countries are assumed to remain higher than in most OECD countries. Even though economic growth in the BRIC countries is expected to remain high by OECD standards, the assumed growth rates are nevertheless lower than they were in the recent past.

Population and income growth assumptions constitute the principal elements of the global economic outlook in that they are the key drivers in demand developments, but also because with globalisation, differences in regional growth prospects increasingly determine both the future landscape of the world agricultural markets and global trade patterns. While recent fluctuations have some impact on short term economic growth expectations, over the longer term, projected growth rates are based on broad assumptions about the trends of such diverse underlying factors as fertility, ageing, urbanisation, land use and production technology, not to mention the structure and evolution of labour and capital markets. In general, these factors change slowly over time, and in any case they are not specifically taken into account in the present projections.
Growth in developing countries should increase potential for south-south agricultural trade

As illustrated in Table 1.1, income growth is closely related to population growth. The regions where income growth is the highest, like Africa, Asia and Latin America, are also those where population growth is the highest, at rates close to or exceeding 4% on average over the next decade. Countries in these regions often have a comparative advantage in the production of labour-intensive agricultural commodities such as fruits and vegetables due to a substantial supply of low-cost labour and relatively limited resources of arable land. Nevertheless, available crop land in these countries is usually utilised for year-round cultivation of products such as sugar and rice or other staples. As shown later in this section in the review of historical patterns of agricultural trade flows, exports of semi-processed and processed agricultural and horticultural product have been much larger in lower middle-income countries than they have in low-income countries. For higher value agricultural commodities such as meat and dairy products, demand is more responsive to the rising incomes in emerging economies than it is in the mature markets of OECD countries. In high growth developing countries this will continue to lead growth in imports not only of processed products, but also of bulk agricultural commodities destined for budding domestic processing industries.

Table 1.1. Where population and income is projected to grow

<table>
<thead>
<tr>
<th></th>
<th>Population 2006, million</th>
<th>Average annual growth over 10 year period</th>
<th>Income share, percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1.23</td>
<td>1.08</td>
<td>6530</td>
</tr>
<tr>
<td>Africa</td>
<td>2.20</td>
<td>2.04</td>
<td>923</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>1.40</td>
<td>1.17</td>
<td>564</td>
</tr>
<tr>
<td>North America</td>
<td>1.02</td>
<td>0.86</td>
<td>332</td>
</tr>
<tr>
<td>Europe</td>
<td>0.29</td>
<td>0.06</td>
<td>527</td>
</tr>
<tr>
<td>Asia</td>
<td>1.15</td>
<td>0.98</td>
<td>4150</td>
</tr>
<tr>
<td>Oceania</td>
<td>1.36</td>
<td>1.08</td>
<td>33</td>
</tr>
</tbody>
</table>

Note: Income is measured by GDP at USD 2000 market prices. Average annual growth is the least-squares growth rate (see glossary).

Much of the uncertainty in constructing a global economic outlook comes from projecting the nominal elements such as price indices and exchange rates. It is more difficult to gauge the long-term dynamics of these variables which are influenced by a wide variety of economic and political factors, particularly when in some countries their recent trends have been unstable. Interest rate differentials, unprecedented global liquidity in financial markets and high volatility commodity prices, in particular oil and energy prices, contribute to the inherent uncertainties related to making assumptions for a ten year outlook horizon.

Inflation is assumed to remain low in OECD countries, despite high commodity prices

Inflation expectations remain low in most developed countries, as governments are assumed to enforce low inflation targets through the use of appropriate monetary policies. Throughout the OECD, consumer prices have shown substantial resilience over recent years to oil price movements despite being

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2 There appears to be an income threshold beyond which entry into export markets becomes more feasible. This in turn implies that the benefits from globalisation may depend on income levels.
subjected to upward pressure from strong commodity price increases. Nevertheless, in most OECD countries consumer price inflation is anticipated to remain below 3%, and in many is closer to 2% in the medium-term. For the OECD as a whole, inflation was contained at 2.4% in 2006; it is assumed to fall and to remain below 2% by 2010. In the recent past, monetary policy responses in major OECD countries have been swift as inflation measures neared the upper thresholds of established targets. Although several years of sustained tightening in the United States have ended, interest rates in the euro area and Britain have risen over the past year and seem to have contained price pressures. Even in Japan, positive but low inflation at the end of 2006 has led to the Bank of Japan to abandon its five-year long zero interest rate policy. The observed effectiveness of these measures in developed OECD economies has led to longer-term expectations that prices will remain under control in these countries.

Food price inflation is an increasing concern in emerging economies

Conversely, in many rapidly growing developing countries, inflation has become more and more of a concern over the past year. Whereas large increases in the prices of non-agricultural commodities have widely been attributed to the strong demand and accelerating growth in these emerging economies, more and more, price pressure is being felt in markets through increased demand for food products. This pressure can be either direct, through growing demand and changes in consumption patterns as incomes rise, or indirect as alternative uses of food crops, such as inputs for biofuels, have led to higher domestic prices. As energy prices have subsided over the past year, food price inflation has been increasingly accused of driving higher headline inflation. In India, inflation rates above 6% have led to both fears of an overheating economy and concern that surging demand for wheat will continue to exceed supply. In Argentina, where beef consumption per capita is the highest in the world, beef exports were temporarily banned in an attempt to lower domestic beef prices and help cut economy-wide inflation levels. Mexico too, despite moderate inflation expectations, has experienced dramatic increases in maize flour prices.

World oil prices remain high relative to historical levels

The world benchmark Brent crude oil price assumption underlying this year’s Agricultural Outlook is based on the assumption for the (real) average price of OECD crude oil imports of the International Energy Agency’s 2006 World Energy Outlook. The nominal Brent price is assumed to decline over the medium-term to about USD 55 by 2012, rising again slowly thereafter to finish just over USD 60 by the outlook horizon. This price path is significantly higher than in last year’s outlook reflecting the sustained tightness of oil markets. Price pressure has been maintained as geopolitical tensions combine with processing capacity constraints to keep global supply from the major oil producers below demand. With the easing of this tightness, the world price should decline. However, in the longer term beyond 2012, rising marginal production costs of non-OPEC producers may tend to impart market power to a small number of dominant, Middle East OPEC members whose collective investment and production policies are generally expected to push prices higher.

Increasing global focus on the exchange rates of high growth developing economies

The depreciation of the US dollar against several major currencies, including the euro, Japanese yen, the Chinese yuan and the Brazilian real that began in 2006, is not expected to persist beyond the near term. While a stronger euro may dampen the euro area’s export prospects the weaker dollar is not expected to substantially impact Brazil’s and China’s booming export markets. The renewed strength of the yen will improve the import position of Japan, a major importer of US agro-food products. Likewise, the continuing appreciation of the Korean won throughout the outlook period, in the context of strong domestic growth and rising incomes, would help drive an expansion in Korean agricultural imports.
With the expansion of global trade opportunities, there is an increasing importance placed on the exchange rates of developing countries vis-à-vis the US dollar because of their prime influence on global terms of trade and external imbalances. Of particular interest is the Chinese yuan, which has appreciated by almost 5% since the adoption of a more flexible management system in July 2005 and is expected to appreciate further over the outlook period. In strong growth countries like Argentina, Brazil, India, Mexico and Russia, export markets are expanding solidly. Yet over the longer term to 2016, projected inflation rates are higher than in the United States, amid strong demand growth, in particular for imports. This constitutes a depreciating influence on the exchange rate vis-à-vis the dollar.

**Domestic support and trade policies affect agricultural markets**

Agricultural and trade policies play an important role in both domestic and international agricultural markets, directly affecting the levels of production and consumption of agricultural commodities and food products. More and more, agricultural policies are directed towards achieving specific objectives (e.g., environmental performance or biofuel development) and beneficiaries (e.g., specific groups of farmers) within broader goals with respect to national, regional or global concerns (e.g., domestic and trade policy reform, income inequality, food quality and safety, global warming, etc.). At the same time, non-agricultural policies, such as energy, environment and rural development policies, have a growing impact on the agri-food sector. Policies influence the composition and levels of both production and consumption, thereby creating (or sometimes correcting) market distortions and influencing prices.

No conjecture as to the future outcome of negotiations for the completion of the Doha Development Agenda is incorporated in the Outlook projections and consequently, it is assumed that trade policies as agreed in the Uruguay Round Agreement on Agriculture (URAA) will hold for the entire period to 2016. As noted later in this chapter in the review of trade flows, despite the URAA, trade in agricultural products continues to be dominated by a relatively small number of countries. 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), the Everything But Arms (EBA) initiative of the European Union and the Mercosur agreement between Argentina, Brazil, Paraguay and Uruguay. The policy assumptions of the Outlook take into account the provisions of these agreements, in addition to 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 modeling system but allowance for such agreements has been made where they are expected to have an impact on growth in trade. This is the case for both the Central American Free Trade Agreement (CAFTA) and the Australia-US FTA, which is expected to have a substantial impact on Pacific region beef trade.

This Outlook makes no anticipation of changes to agricultural policies which may be part of forthcoming farm legislation in the United States. Although current legislation is slated for expiry in 2007, the programmes and provisions of the Farm Security and Rural Investment Act (FSRI) of 2002 are assumed to continue for the entire Outlook period and moreover, no changes are anticipated in crop loan rates which are extended at constant levels through to 2016. The requirements of the Renewable Fuels Standard (the Energy Policy Act of 2003, modified 2005) have been taken into account, as discussed later in this section under the assumptions related to biofuel production. The main policy elements of the EU Common Agricultural Policy Reform of 2003, as described in previous editions of the Outlook, are assumed to remain unchanged. 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 2016.

For sugar, projections take into account the EU sugar reform implemented as of 1 July 2006, which includes a progressive cut in price support of 36% over four years and the reduction of EU sugar
subsidised exports from the current level of 7.6 Mt to the agreed URAA limit of 1.4 Mt. The provisions also include a progressive reduction of duties followed by unrestricted sugar exports to the EU from LDC countries under the EBA Initiative from 2009. Another important development which has been taken into account in the sugar projections is the resolution of a long standing sweetener dispute between the US and Mexico under NAFTA which has resulted in an elimination of both the consumption tax on Mexican beverages manufactured with HFCS and, from 2008, of export restrictions and duties which should spur exports of Mexican sugar to the US.

Assumptions related to evolving biofuel production

World markets for cereals, sugar and, increasingly, oilseeds and palm oil, are strongly influenced by developments in biofuels. Production of renewable energy, in general, and biofuels in particular, has risen rapidly to the top of the policy agendas in many countries and have become a major issue for markets. There are numerous motives behind political support for biofuels and the composition and priorities of objectives differ across countries. Most of the objectives can be grouped within three broad categories. First, concerns about future energy supplies; in particular expectations of finite availability of crude oil and increasing reliance on oil imports from countries considered as less reliable suppliers; second, environmental concerns - most notably the increased emissions of carbon dioxide (CO2) as one of the main causes for climate change; and finally, the development of new markets for agricultural produce and hence increased revenues for farmers.

This Outlook does not analyse the developments in the biofuels sector, but treats biofuel production through implicit and exogenous assumptions in a number of countries. In particular these include the US, the EU, Canada and China, while ethanol production in Brazil is an explicit part of the sugar baseline.

US

The US is assumed to substantially increase its ethanol production, which predominantly is based on domestic maize. Ethanol output and corresponding maize use is assumed to grow by almost 50% in 2007, and while growth rates are assumed to decline thereafter, US ethanol production is still assumed to double between 2006 and 2016 (Figure 1.2). This expansion would exceed the requirements stated in the Renewable Fuel Standard (RFS) by far. In consequence, maize use for fuel production, which has doubled from 2003, would increase from some 55 Mt or one-fifth of maize production in 2006 to 110 Mt or 32% at the end of the projection period.
Biodiesel production, in contrast, is assumed to remain relatively limited in the US, due to lower profitability caused by high feedstock costs. Soya oil use for biodiesel production is expected to reach 2 Mt in 2007 and to further increase to 2.3 Mt in 2011, with no growth assumed for the remaining projection years.

**EU**

Biofuel production and use in the EU was historically for biodiesel based on oilseeds, mostly rapeseed. Increasingly it is assumed that ethanol, made mostly from wheat and maize, will become important on EU markets. Despite growth in total biofuel use by some 170% between 2006 and 2010, however, it is assumed that the share of biofuels in total transport fuel consumption will not exceed 3.3% in energy terms, rather than the 5.75% target envisaged by the EU Biofuels Directive. Further growth is, however, expected throughout the projection period (Figure 1.3).

Despite some increased imports of biofuels, this growth in biofuel markets translates in strongly increased demand for feedstock products. Use of wheat in particular is set to increase twelve-fold and to reach some 18 million tonnes by 2016. Growth in the use of oilseeds (largely rapeseed) and maize is less dramatic, but would still reach 21 Mt and 5.2 Mt by 2016, respectively.
Figure 1.3. Ethanol and biodiesel use in the EU to increase – based on wheat, rapeseed and imports

Note: Ethanol and biodiesel data before 2006 refer to production, from 2006 to 2016 to consumption.

Source: EU Commission, OECD Secretariat.

Canada

Compared to both the US and the EU, biofuel production in Canada (a country with large fossil-based energy resources) is small in absolute terms. In 2006, ethanol production doubled and biodiesel production commenced. In addition to this, the Canadian government announced its intention to regulate biofuel by mandating a 5% ethanol blend in gasoline by 2010 and a 2% biodiesel blend in on-road diesel and heating-oil by 2012. In these projections it is assumed that these mandates are met. In compliance with the 5% target, ethanol production, based to a larger extent on maize and to a smaller part on wheat, is assumed to grow by another 150% in 2007 to reach almost 1.9 billion litres in 2009, compared to 550 million litres in 2006. Little growth following the increased gasoline use is assumed for the remainder of the projection period. Biodiesel production is assumed to see an even stronger growth in relative terms, though at much lower levels. Standing at 70 million litres in 2006, biodiesel production is assumed to reach 600 million litres by 2012, with little growth thereafter (Figure 1.4).

About half the growth in biodiesel production is expected to be derived from oilseed oils; the remainder should be made from yellow grease and tallow. The assumed growth in ethanol production would consume significant quantities of maize and wheat. Maize use for ethanol is assumed to increase from 1 Mt or 4% or domestic production in 2006 to almost 3.4 Mt or more than 13% in 2008 before growing at a slow pace only for the rest of the projection period. Wheat use will remain less important, but with an increase to close to 1.5 Mt from 2009, ethanol production is still assumed to consume some 5.5% of domestic production by 2016.
**Figure 1.4. Canadian ethanol and biodiesel production to expand, using growing cereal quantities in particular**

Source: AAFC.

**China**

Fuel ethanol production in China is assumed to grow steadily and to reach some 3.8 billion litres by 2016, up from 1.5 billion litres in 2006. Most of the fuel ethanol is expected to be based on maize, even though other feedstocks are being used or their use is currently under exploration. Maize use for fuel ethanol should exceed 9 Mt in 2016, compared to 3.5 Mt in 2006 (Figure 1.5).

**Figure 1.5. Expanding Chinese ethanol industry to increase maize use for biofuels**

Source: ERS.
Brazil

In contrast to the other countries, ethanol production in Brazil is not based on an assumption, but explicitly projected. Ethanol production in Brazil is expected to continue its growth at increased rates, and to reach some 44 billion litres by 2016, 145% more than what was produced in 2006. As ethanol yields per tonne of sugar are expected to increase, sugar cane used in ethanol production would grow less in relative terms, but would still grow by 120% over the 10 years projected (Figure 1.6) and would represent some 60% of total sugar cane output, up from less than 50% today.

Figure 1.6. Continued growth in Brazil cane-based ethanol production

![Figure 1.6. Continued growth in Brazil cane-based ethanol production](image)

Source: OECD and FAO Secretariats.

Main trends in commodity markets

Compared with previous editions of the *Agricultural Outlook*, developments in bio-energy policy, technology, and feedstock production have become even more important factors in future outcomes for commodity markets. While the run-up in commodity prices in 2006 is only partially due to increased demand for bio-energy feedstocks, this Outlook presents projections that show some considerable changes in price projections from past reports. Agricultural markets have been reacting to higher energy prices since 2000 in that commodity production costs have increased. But increased demand for agricultural products in the form of bio-energy feedstocks, largely from sugar, maize, vegetable oils and wheat, constitute an important change from previous market situations. While the emergence of these prospects has been noted in past editions of this report, it is now a major point of discussion and analysis worldwide. What remains to be seen is whether bio-energy constitutes a lasting structural change for agricultural markets, and a change which is revealed by a higher plateau for real prices. Another question is whether there will be increased uncertainty and more price variability with higher dependence on developments in the energy market, including the policies that affect them.

Globalisation and the rising importance of key emerging economies are having diverse effects on world agricultural markets. The assumed strong growth in demand will initially spur expansion in import demand of processed products as well as agricultural raw materials. Subsequently, growing demand provides the impetus to the development of domestic production capacity, especially given the unprecedented level of global liquidity and the acceleration of foreign direct investment flows towards emerging markets. For example, investment in processing capacity is expected to be particularly strong in
India and China, and it is a shared priority of many governments in high growth developing countries to capture a larger share of the added value in domestically consumed agricultural products. Trade patterns are also changing. In the context of growing global markets, larger export shares are not only gained by displacing competitors, but more importantly by growing faster than them. Against this background, OECD countries as a whole are projected to lose export shares in many commodities to non-OECD countries over the outlook period.

These developments taken together lead to the projection of lower production and consumption growth prospects in the OECD region than in the developing and former transition countries for all of the 15 agricultural commodities listed in Table 1.2, but wheat. The largest growth differentials occur in the high value added products such as beef, pigmeat, butter and SMP, but also sugar. They affect production and consumption equally. The bulk of the global production growth for these products, and most of the consumption growth as well, will originate in developing countries and transition economies.

Table 1.2. Consumption and production annual (least squares) growth rates, 2007-2016

<table>
<thead>
<tr>
<th></th>
<th>PRODUCTION</th>
<th>CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Total OECD</td>
<td>NON-OECD</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.7 1.0 0.5</td>
<td>0.8 0.9 0.8</td>
</tr>
<tr>
<td>Rice</td>
<td>0.9 0.1 1.0</td>
<td>0.9 0.1 1.0</td>
</tr>
<tr>
<td>Coarse grains</td>
<td>1.2 1.2 1.3</td>
<td>1.2 0.9 1.5</td>
</tr>
<tr>
<td>Coarse grains used for feed</td>
<td>1.0 0.5 1.5</td>
<td>1.0 0.5 1.5</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>2.1 1.3 2.6</td>
<td>1.9 1.3 2.2</td>
</tr>
<tr>
<td>Oilseed meal</td>
<td>2.1 1.4 2.5</td>
<td>2.1 0.9 3.2</td>
</tr>
<tr>
<td>Beef</td>
<td>1.5 0.2 2.4</td>
<td>1.5 0.2 2.4</td>
</tr>
<tr>
<td>Pig meat</td>
<td>1.7 0.4 2.3</td>
<td>1.7 0.5 2.2</td>
</tr>
<tr>
<td>Poultry meat</td>
<td>1.9 1.0 2.6</td>
<td>1.9 1.1 2.4</td>
</tr>
<tr>
<td>Milk</td>
<td>1.8 0.7 2.8</td>
<td>.. .. ..</td>
</tr>
<tr>
<td>Butter</td>
<td>2.2 -0.2 3.6</td>
<td>2.3 0.0 3.4</td>
</tr>
<tr>
<td>Cheese</td>
<td>1.3 1.1 2.1</td>
<td>1.3 1.1 2.0</td>
</tr>
<tr>
<td>Skim milk powder</td>
<td>1.0 0.6 2.1</td>
<td>1.1 1.0 1.3</td>
</tr>
<tr>
<td>Whole milk powder</td>
<td>2.4 2.2 2.6</td>
<td>2.5 1.0 2.8</td>
</tr>
<tr>
<td>Vegetable oils</td>
<td>2.5 1.6 2.8</td>
<td>2.5 2.4 2.6</td>
</tr>
<tr>
<td>Sugar</td>
<td>1.8 0.3 2.2</td>
<td>1.8 0.5 2.2</td>
</tr>
</tbody>
</table>

Source: OECD and FAO Secretariats.

As a result, Table 1.3 shows that developing and transition countries will take a growing share of total world production and consumption over the outlook period - and that the share of OECD countries is consequently declining - for the majority of products. The exceptions are for wheat and coarse grains, where the OECD’s share in global production is increasing. OECD shares in milk powders are much larger for production than they are for consumption and the production shares decline initially before stabilising. The largest losses in shares over the outlook period are for butter and milk, but also for meat products, especially beef. These products have much larger growth potential in developing countries, in particular in the largest amongst them such as Brazil, China and India, than in the mature markets of the OECD. While the OECD’s coarse grains production share is increasing and the consumption share is stable, that for feed use is declining, reflecting the growing importance of biofuel use in OECD countries. Production and consumption shares are decreasing only slightly for cheese, for which OECD countries remain dominant market players.
Table 1.3. Consumption and production of OECD countries as a share of world total

<table>
<thead>
<tr>
<th></th>
<th>PRODUCTION</th>
<th>CONSUMPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>39.6</td>
<td>43.0</td>
</tr>
<tr>
<td>Rice</td>
<td>5.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Coarse grains</td>
<td>50.8</td>
<td>52.6</td>
</tr>
<tr>
<td>Coarse grains used for feed</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>42.1</td>
<td>38.5</td>
</tr>
<tr>
<td>Oilseed meal</td>
<td>40.0</td>
<td>38.6</td>
</tr>
<tr>
<td>Beef</td>
<td>41.1</td>
<td>37.7</td>
</tr>
<tr>
<td>Pig meat</td>
<td>34.9</td>
<td>32.5</td>
</tr>
<tr>
<td>Poultry meat</td>
<td>45.5</td>
<td>43.1</td>
</tr>
<tr>
<td>Milk</td>
<td>46.6</td>
<td>44.0</td>
</tr>
<tr>
<td>Butter</td>
<td>41.3</td>
<td>36.1</td>
</tr>
<tr>
<td>Cheese</td>
<td>78.4</td>
<td>77.6</td>
</tr>
<tr>
<td>Skim milk powder</td>
<td>76.7</td>
<td>73.0</td>
</tr>
<tr>
<td>Whole milk powder</td>
<td>46.1</td>
<td>43.6</td>
</tr>
<tr>
<td>Vegetable oils</td>
<td>26.0</td>
<td>25.4</td>
</tr>
<tr>
<td>Sugar</td>
<td>24.0</td>
<td>22.4</td>
</tr>
</tbody>
</table>

Source: OECD and FAO Secretariats.

Cereal markets recover from production shortfalls while bio-fuel use of maize increases

Under the assumption of a return to normal yields, and the incentive of currently higher prices, global cereal production is projected to recover from the shortfalls experienced in the past year. The unprecedented demand for maize coming from rapidly growing bio-fuel production in the United States is in the process of transforming the coarse grain market. The impact of these changes on cereal markets may gradually ease over the years, but that will much depend on the evolution of renewable fuel policies and further development of the bio-fuel industry, particularly from a technological perspective. Driven by current low stocks and high prices there will be a shift towards more area planted in cereals, either from reallocation of land from other crops in the main OECD producers (Australia, Canada and the US), from land taken out of set aside (EU) or out of CRP reserves (US) or from cultivation of new land in many developing countries, particularly in South and Latin America. Nevertheless, beyond the initial years of the outlook, much of the growth in output is expected to stem from area productivity gains as world prices decline from current highs. The bulk of wheat and coarse grain production will continue to be concentrated with the largest producers, the EU, China and the United States, along with India for wheat, dominating over half of total world output. By 2016 global production will reach 673 Mt of wheat and 1.2 billion tonnes of coarse grains.

Exports have been substantially reduced in recent years in several important countries, in particular because of severe drought in Australia, but also because of poor harvests in the EU and the United States. But global cereal trade is projected to rebound and grow at close to 1.5% annually over the outlook period. The EU is expected to surpass Canada and Australia as the second largest wheat exporter after the United States. However, the recuperation of traditional export sources will be supplemented by export expansion in Russia, the Ukraine and Argentina and in Brazil for coarse grains, while Chinese exports of both cereals are expected to diminish.
**Developing countries cereal imports set to grow**

Significant import demand for wheat will continue to develop in India, and will grow further in Brazil and Egypt as well as in an increasing number of developing countries. Although the Outlook projects expanding exports from the CIS countries and Argentina, most of the growth in import demand will be satisfied through larger shipments from OECD countries. Rising per capita incomes and developing food markets are behind the swelling demand that has outpaced domestic production capacity. More generally, growth in per capita food consumption of wheat is expected to remain modest in most countries.

Despite the prospects of increased biofuel use of maize, which will be largely grown domestically, demand growth for coarse grains in world markets will be predominantly driven by increased feed demand from thriving livestock industries in emerging economies such as China, India and Argentina. Import growth in China will augment its position as a major coarse grain importer. While the quantities of coarse grains destined for dominant importers such as Japan, South Korea, Mexico and Saudi Arabia remain broadly stable throughout the outlook, a rising share will be headed for key importers such as China, Egypt and the Islamic Republic of Iran as well as Colombia and Chile.

**Rice production set to expand**

More than cereals, rice is an essential crop for many developing countries because its cultivation is particularly suited to their climate and arable land characteristics, and consequently, rice has been a staple food in their traditional diet. While growth in wheat and coarse grain consumption is linked to increases in per capita incomes, growth in rice consumption remains tied to underlying population growth, with per capita consumption expected to rise only slightly over the outlook period, mostly because of growth in Africa. Nevertheless, rice production is set to expand, in part because of policies in many developing countries to promote rice cultivation as a means of supporting farmer incomes and limiting rural emigration, as well as both national and regional efforts to encourage food self-sufficiency, especially in Sub-Saharan Africa. Still, the largest production gains will come from the major rice producers, such as India, Indonesia, Thailand and Vietnam.

Rice stocks throughout the world have declined dramatically from their high levels of the past decade and there has been a significant increase in global rice trade. At the same time rice export prices have risen, with particularly sharp escalations in recent years. The trend in trade expansion is expected to persist, with prices climbing even higher in the short-term before beginning a gradual decline. Underlying this expansion is the higher import dependency projected for Asian producers such as China and Indonesia, along with growing demand in Turkey and in Middle East countries like Saudi Arabia. In addition, changes to trade policy in some OECD countries, like scaled back import duties in the EU and an enlarged quota in Korea, will also spur imports. In terms of exports, despite recent contractions, steady growth in the longer term will continue to be driven by the small number of dominant market players in Asia, principally Thailand, but also Vietnam and India, with only moderate export growth expected in the United States.

**Global oilseed production and oilseed meal exports to expand**

Bio-fuels are also strong drivers of oilseeds markets both directly through demand for oilseed oils in the bio-diesel production process and indirectly through the impact of the relative prices of oilseeds and maize which affect the competition for arable land between these crops, particularly in the US. Furthermore, because of rapidly rising maize prices relative to those for oilseeds, there is an increasing demand for oil meals to replace maize in livestock feed rations as a source for energy. In the current context of high cereal prices, oilseed meals are cheaper than coarse grain sourced feed - but this relative cost advantage may be short lived as maize-based ethanol production develops, feed will become available from low-cost distiller by-products, creating new sources of competition for oilseed derived protein meals,
particularly in the United States. OECD oilseed production will remain broadly stable with most of the changes taking place through crop reallocation and a geographical redistribution of production.

Oilseed production in Brazil and Argentina will intensify as arable land is diverted from pasture to oilseed crops. With Brazilian production growing by 3.9% per year on average over the outlook period, it will overtake the United States by 2009 as the world’s largest oilseed exporter. Argentina will cultivate its position as a regional hub for oilseed crushing with differential export tax enticements and investment in processing capacity contributing to promote the domestic crushing industry. This will lead to a 33% rise in protein meal exports as well as higher exports of both meal and oil to satisfy growing import demand in China. By 2016, China will have become the world’s largest importer of oilseed meals and it will have further consolidated its leading position in imports of oils and oilseeds. For the latter product, its share in global imports will have risen to almost 50%.

Increasing world livestock production will continue to drive the consumption of oilseed-derived protein meal, with most of the growth taking place in developing countries. Oilseed meal consumption in the non-OECD region will swell by over 55% with over two-thirds of the growth attributed to Brazil and China alone because of expanding livestock production. While the EU should continue to hold its position as the largest importer of oilseed meals, its import dependency will diminish as a growing proportion of the region’s protein meal consumption comes from domestically produced and crushed oilseeds, in particular rapeseed meal. The nurturing of bio-diesel production capacity will stimulate oilseed oil demand in the EU which, when combined with the growing demand for oilseed and palm oil for food use, will almost double EU imports of vegetable oils over the outlook period. Despite strong investment led growth in China’s domestic oilseed oil production capacity, expanding demand for food oils will continue to spur imports in this country as well as in India.

Largely driven by income growth, vegetable oils, both from oilseed crops and from palm, will remain the fastest growing commodity in terms of consumption covered in this Outlook. Within this overall context, growth rates of the developing countries almost double those of developed countries. Over time, increased vegetable oil consumption has made a large contribution to increased calorie consumption. Use of vegetable oils for bio-energy purposes is expected to grow strongly, and may alter trade patterns and the consumption mix in diets in some countries/regions depending on policies in place. This may be particularly the case in the EU where bio-energy use of vegetable oils has been mostly oriented to the use of rapeseed oil.

**A closer link between sugar and ethanol**

Brazil is the world’s leading sugar and ethanol producer and currently accounts for around 40% of world sugar trade. Demand for sugarcane-based ethanol by domestic motorists and for export is expected to continue to rise at a rapid rate and to account for a larger share of Brazil’s sugar cane crop. However, these developments are not expected to unduly constrain the amount of cane available for sugar production and sugar exports projected to rise strongly and to exert a moderating influence on world price prospects over the coming decade. Further production and trade growth is also expected in other leading sugar exporting countries, such as Australia and Thailand. Following reform of its sugar regime, the EU is expected to reduce production in a context of rising imports and tight controls on subsidized exports and may eventually challenge the Russian Federation for its role as the leading sugar importer. Mexican sugar exports to the US should increase when duties and restrictions are eliminated under NAFTA in 2008, although rising consumption is expected to reduce its exportable surplus. Countries in Asia are expected to experience the fastest growth in sugar consumption, with China, Indonesia, Korea and Japan remaining significant sugar importers.
Developing countries increasingly dominant the meat outlook

The global outlook for meat is increasingly characterised by rising production and consumption trends of developing countries and a more stable and mature path of development for markets of OECD countries. Still, animal disease outbreaks in recent years have affected established trade patterns for meat products, led to short-term perturbations to supply and demand in major trading countries and an increased market share of disease-free exporting countries. In response to these outbreaks, consumption decisions in OECD countries will be to a greater extent driven by quality assurances such as traceability, meat-packing requirements and processing controls which reinforce an underlying preference for premium quality meats. While per capita consumption in high income countries is expected to increase only marginally over the outlook period, rising incomes and the ensuing diversification of diets will lead to a shift towards significantly higher meat consumption in developing countries, representing more than 80% of expected world growth. Much of this expansion will take place in Asia and the Pacific region, and will reflect in particular the rise in consumption of pigmeat.

Over the outlook period, world meat production is expected to grow by 1.7% per year, mostly because of expanding markets in Brazil, China and India. As a result, the production share of major OECD producers will continue to fall, despite expectations of renewed growth in the United States. With trade recovering from the effects animal disease outbreaks, a small number of major exporters, namely Brazil, the US, Canada, Argentina and Australia, will remain dominant in world markets with export growth particularly strong in South America. By 2016, net exports of Brazil are expected to surpass those of the four others combined to take a 28% share of total world meat exports. Beef trade is continuing to recover between the US and Canada ensuring that the United States remains the world’s largest meat importer at the end of the outlook period followed by Japan and Russia.

The burgeoning economies and strong income growth in Korea, Saudi Arabia, Mexico and the Philippines will contribute to a considerable rise in meat imports in these countries, increasing their importance in regional markets. Import dependency in meat products is likewise expected to grow in many other dynamic developing countries as nascent demand surpasses the domestic capacity for meat production throughout the duration of the outlook period.

Growing importance of developing countries in dairy supply and demand

One of the most prominent trends in the Agricultural Outlook is the increasing importance of developing countries in the supply and demand for dairy products. Milk production gains over the outlook period will be overwhelmingly driven by output growth in non-OECD countries. Expansion in India, the largest individual producing country in the world, where surging demand growth will stimulate a strong increase in milk and butter production, will be especially marked. Driven by substantial yield gains, strong growth in milk production is also expected in China. This contrasts the moderate growth in the OECD area where milk production mainly increases due to gains in Oceania and the United States and is chiefly constrained by domestic production controls in many other countries.

The escalation of world dairy prices of recent years may now be regarded as symptoms of broader structural changes. First, urbanisation and higher incomes have shifted diets in emerging economies towards higher consumption of not only butter and cheese, but also to increasingly more versatile milk powders. These trends have been encouraged by growth in dairy marketing as retailing channels develop and through government programs in some countries. Second, with technological advances and wider global investment there is a shift towards higher value-added processing of dairy products. In developing countries this includes improvements in storage and processing capacity which allows the production of more fresh dairy products, but also improved processing of WMP. In the mature markets of developed countries, value-added innovation means increased convenience and a wider variety of products, in
particular cheeses and flavoured fresh dairy products, which cater to specific consumer tastes. Lastly, but indeed not least importantly, with dairy market reform, intervention stocks have broadly ceased to be systematically unloaded onto world markets while at the same time, subsidised exports have diminished significantly. Both of these distortionary policy practices, which traditionally had the effect of holding down international dairy prices, are thus likely to be much less prevalent over the outlook period than in previous years.

Dairy exports continue to be dominated by OECD countries

Nevertheless, trade in world dairy markets will continue to be dominated by the traditional OECD exporters of Australia, New Zealand and the EU, with growth expected for all products except butter. Trade remains regional, with for example, intra-EU trade larger than all remaining global trade put together. Still, non-OECD countries gain export share in butter and SMP, filling the place left by declining EU exports in light of diminished intervention stocks. Argentina’s surging milk production is behind its emergence as an up-and-coming WMP and cheese exporter. Rising exports are also expected from New Zealand, but those from the EU should remain roughly stable. Russia, Japan and the US will continue to be key cheese importers while more and more milk powders are destined for milk reconstitution in developing countries, most notably in the Middle East and North Africa but also in Mexico. China’s strong increase in consumption of dairy products will be largely met by a sharp growth in domestic production with only a marginal growth in imports, in particular of whole milk powder.

High world prices for most products at the beginning of the outlook period

Actual world prices rose much more strongly in 2006 than earlier anticipated for cereals and dairy products, and to a lesser extent also for oilseeds, but weakened markedly for sugar. Are these unexpected price developments the result of systemic changes in commodity markets, leading to longer term price strength? Or are they the result of short term factors, such as weather-related production shocks, with prices in the longer term returning to their historical equilibrium levels?

In looking at the price developments that have taken place in 2006, a number of factors have been identified as contributing to the observed price changes for the agricultural products covered by the Agricultural Outlook.

- For cereals, weather-related shortfalls in production have occurred in a number of producing countries and regions such as the US, the EU, Canada, Russia, Ukraine and most notably in Australia, where production fell by more than 50%. In a global context of low global cereal stocks in recent years, these lower supplies have been a strong factor underpinning world prices

- Reduced global stocks and production were confronted with stronger than expected demand for cereals for biofuel production, notably in North America and Europe. This additional demand compounded the already tight supply situation and contributed to further strengthening of world cereal prices. It is noteworthy, however, that the combined cereal supply shortfall in North America, Europe and Australia in 2006 of over 60 Mt was nearly four times larger than the 17 Mt increase in cereal use for ethanol in these countries.

- Growing cereal use for ethanol lead to a reduction in planted acreage to oilseeds, particularly in the US, in favour of maize. Increasing cereal prices relative to those for oilseeds caused this land reallocation. As a knock-on effect, oilseed prices then also increased as a result of tightening supplies and this price strength was enhanced by rising demand for meals as a cereal feed substitute and increasing demand for vegetable oils for biodiesel production.
World sugar prices surged in late 2005 and early 2006 to reach 25-year highs under the pressure of tight global supplies and growing linkages between international sugar and oil prices, but then fell back again later in the year. Sugar prices remained below earlier expectations for 2006-07, reflecting abundant supplies, higher stocks and an emerging global surplus. Sugar reform in the EU and the retraction of large white sugar supplies from the international market contributed to a widening white sugar premium in 2006.

Continuing solid demand for dairy products in combination with rising feed costs and reduced overall supplies, most notably in the European Union and Australia, accounted for most of the price increase for these products, particularly for milk powders. Policy reforms in the EU are behind the reduction in EU dairy surpluses and the drop in subsidised exports. This may constitute a more permanent element of price strength in world dairy markets.

World meat prices stayed in line with earlier expectations for 2006. Abundant supplies and the demand-reducing impacts of Avian Influenza continued to exert downward pressure on prices for pigmeat and poultry. A number of factors, including FMD in Brazil, drought induced slaughter in Australia, and export taxes in Argentina, offset each other to keep beef prices level. Lamb prices, however, fell more strongly than earlier expected for 2006 due to drought-induced slaughter in Australia.

**World market prices in the medium term remain above previous projections**

The foregoing would suggest that much of the observed variation between actual and projected prices in 2006 can be explained largely by short term production shocks and resulting supply/demand imbalances. But longer term influences may also be at work, even though they may have been masked by the more traditional market fundamentals. For instance, policy reform leading to lower use of export subsidies may have lifted prices for dairy products and sugar. And maize prices in the US have undoubtedly been supported by increased bio-fuel production. There is obviously growing interest in many countries in the development of renewable energy supplies based on the use of agricultural feedstocks. This link is well established in the case of the US and Brazil, and is emerging as an important additional dimension to global demand for cereals, oilseeds and sugar products over the projection period.

In a context of generally lower global stocks in recent years, this additional demand is expected to underpin prices and to lead to price levels for field crops that are, on average, higher than in past projections. Nevertheless, cereal, oilseed and sugar prices are expected to fall below current or recent peak levels. Higher average crop prices and associated feed costs, in turn, lead to higher livestock product prices over the Outlook period as well.

There are a number of uncertainties in relation to bio-fuel markets and how important they will prove to be in underpinning prices in agricultural markets in the future. These uncertainties include the nature of agricultural and trade policies that will be implemented to nurture bio-fuel production from domestic agricultural crops, the pace of technological progress in developing viable “second generation” bio-fuel production plants that utilise cellulosic feedstocks rather than food and feed crops, and the future price of oil. A different combination of these factors than is anticipated in this Outlook could lead to lower prices than are now projected.

**Cereal prices loose some of their current price strength**

Trends in nominal world indicator prices for the different commodities are shown, first for crop commodities in Figure 1.7., and then for livestock products in Figure 1.8. World cereal prices have been driven higher as the weather-related production shortfalls of the past year and dwindling global stocks have
tightened supply on world markets. They should decline towards the end of the outlook horizon, but should stay substantially higher than prices observed over the past decade because of expanding food demand in developing countries as well as budding demand for maize in ethanol production. Very similar prospects are seen in rice markets, with expanding global food demand as incomes and populations grow pushing international prices to their highest levels in a decade, before falling back gradually.

**Figure 1.7. Outlook for world crop prices to 2016 (Index of nominal prices, 1996=1)**

**Figure 1.8. Outlook for world livestock product prices to 2016 (Index of nominal prices, 1996=1)**

Source: OECD and FAO Secretariats.

**Price strength in the oilseed sector dominated by vegetable oils**

Oilseeds and oilseed meals prices will continue to rise through 2007 partly as a result of the run-up in cereal prices that have made oilseed protein meals to become a more a cost-competitive animal feed. In subsequent years however prices will gradually fall back as supply and demand adjust. For the sugar market, world indicator prices had swelled to quarter-century highs during the 2005/06 marketing year, almost doubling in the space of two years. However, their subsequent decline in 2006/07 as sugar balances moved into surplus has been equally dramatic, particularly for raw sugar which fell 27%. Sugar prices will remain under pressure throughout the outlook period, with the white sugar margin remaining substantial, particularly in the first years, as high quality EU white sugar is pulled from world markets under reforms to the EU sugar regime.
Meat prices stay above recent averages

A return to normal market conditions for meat products has brought about diminishing world prices. For beef, this trend will continue for most of the projection period, with prices moderately strengthening again during in the outer years. Pigmeat prices rally in the first years of the outlook to 2009, but thereafter remain stable. A similar trend prevails for poultry prices, although they are expected to continue to rise for a longer period before stabilising, reflecting growing demand in North and Latin America and in Europe. World prices of dairy products, which had escalated strongly in 2006 and 2007, will remain at these elevated levels throughout the outlook, partly reflecting the structural changes that reforms have brought about on world markets.

Uncertainties

Weather-related production shocks, future policy developments, animal diseases outbreaks and unstable macroeconomic performance are among the main uncertainties affecting the prospects for world agricultural markets over the medium term. The effects of recent drought in Australia attest to this degree to which such shocks may impact markets – wheat and coarse grain production fell by more than half in 2006, and in a context of global cereal production shortfalls, contributed to rising world prices. While economic growth seems to be firming up in Europe and Japan, recent years have shown that optimism about future output growth has sometimes been premature and does not necessarily mean that growth in demand, imports or exports will be forthcoming. Past experience has shown that it is very difficult to predict the future level of world oil prices, or even to correctly guess the direction in which they will move. Yet, the outlook projections are dependent upon a world oil price assumption – one that is felt to be the most consistent assumption available for the 10-year projection horizon.

Trade and domestic support policy

The future of international trade policy is a key uncertainty in this outlook. If and when the Doha Development Agenda of multinational trade negotiations come to a conclusion, the agreement will result in generally lower barriers to trade in agricultural products and diminished levels of domestic support for agricultural production. The overall outcome would be less distortion to world markets, leading to a better distribution of production according to comparative advantages, implying increased trade in agricultural commodities and generally higher world prices; but there may be downward price pressure from increased competition in some specific markets where protection has traditionally shielded producers from declining world prices. While the effects of regional trade agreements, such as CAFTA, have been implicitly incorporated in the outlook projections, it is difficult to accurately gauge the response in the diverse range of agricultural sectors to increased liberalisation, particularly during implementation periods. Similarly, there is a general trend toward more bilateral agreements, which may both reinforce existing trade patterns as well as creating new and unanticipated trade channels.

A forthcoming United States’ farm bill may have significant implications given the relative importance of US agricultural output and its dominant position in world markets. As any new policies will be implemented as soon as 2008, only the second year of the current outlook projections, any substantial changes to domestic support payments and crop loan rates would have consequential impacts on the present projections, which are based on policy assumptions according to the 2003 FSRI Act.

The future developments in the biofuel industry – in particular in terms of policy and technological developments – are unclear, and this implies uncertainty for agricultural markets, especially those for cereals, oilseeds and sugar crops. Earlier in this section an overview of biofuel assumptions were presented which set the foundations for the current outlook. However, public support measures are necessary in a majority of countries (and in almost all OECD countries) for biofuel production to be profitable. The form
and substance of these biofuel policies can have significant implications for biofuel production but also for cereal, oilseed and sugar use, for feed prices and subsequently for livestock numbers and meat and dairy production. Moreover, most biofuel policies are new and it is not clear which measures are most effective in achieving the mix of objectives such as lower fossil fuel dependence or less greenhouse gas emissions, not to mention domestic support for farmers. It is natural to assume that these measures may be adjusted in unpredictable ways over the coming decade as biofuel production unfolds. In addition, even if this Outlook assumes crude oil prices in a range from USD 55 to USD 60, it is not excluded that lower prices may prevail, impacting on the profitability of ethanol/bio-diesel production and demand and prices for feedstocks.

**Animal disease impacts**

As previously stressed, the current outlook has been produced within the context of “normal” conditions for the meat sector, which is to say an absence of animal disease outbreaks and no explicit accounting of animal disease restrictions on production, trade or consumption. At the same time, the projections anticipate a recovery from trade disruptions resulting from recent disease outbreaks. These recent occurrences include reduced beef trade in North America due to BSE, export restrictions on beef and pigmeat following FMD in Argentina and Brazil and the effects of Avian Influenza in Asia and Europe. Any renewed occurrences would likely reduce the speed of recovery.

Since the magnitude and extent of potential epizootics is by nature unknown, the evolution of global meat markets could be dramatically different from the baseline anticipated in the outlook if either fresh outbreaks of known diseases occur or if a new epizootic of an unfamiliar disease strikes. Nevertheless, substantial international efforts have been made to limit the impacts of new outbreaks. On the supply side, these include the regionalisation of export embargoes, more stringent animal health and inspection regulations as well as implementation of vaccination policies. On the demand side, consumers have been reassured by measures to ensure early detection of infection, information on potential health risks, improved production control standards and efforts to ensure meat traceability. The implications of animal disease occurrences have been investigated in recent joint OECD-FAO work on animal disease scenarios.

**Strong growth in emerging economies**

The projections have been produced under the assumption that the strong growth in countries such as China, India and Brazil will persist, in turn spurring broader growth in Asia and South America. All three countries have a growing presence in agricultural markets, albeit India is less of a trader than the other two. However, the robust growth in these countries is a relatively recent and unprecedented phenomenon, therefore it is difficult to foresee the consequences of expansion being plagued by what are commonly referred to as downside risks.

Inflation is one of these risks. There has been increasing speculation that the economy in India is overheating and that with demand outpacing supply, imports cannot keep up. Additionally, price pressure on commodities and food products is compounded by the lack of consolidation in markets. In Brazil, with historical bouts of high inflation, there are risks that strong export growth will, as in Argentina, drive domestic prices higher. While China does not currently have significant inflation worries - indeed its projected inflation rate is lower than that of the United States - there may be some risk inherent to the future path of the Yuan-US dollar exchange rate. The assumption in this report, in the aim of consistency, implies constant exchange rates in real terms from 2008 and thus, because of the differential in inflation rate vis-à-vis the United States, there is an appreciation of the Yuan in the medium term, before depreciation over the outer years of the outlook period. The Yuan is currently under a flexible, but managed system, yet it is widely anticipated that given the current size of Chinese dollar reserves, the Yuan might appreciate, perhaps over the entire period of the outlook. If this were the case, then Chinese
agricultural imports may be even larger than projected in the outlook, and simultaneously, exports may be diminished. Lastly, past government policies in favour of self-sufficiency in both China and India have impeded the flow of imports of some agricultural commodities. While decisions in such a direction are not anticipated, further policies of this type would have an impact on the outlook for agricultural trade.

**BOX 1.1 Partial stochastic analysis: variability around deterministic projections**

The projections presented in this Outlook are deterministic in the sense that they correspond to a particular market environment that is conditioned by specific assumptions on exogenous variables. However there are uncertainties concerning that environment, notably with respect to key assumptions with regard to weather and macroeconomic conditions. Varying these assumptions would directly affect the Outlook accordingly: the question is by how much and what would be the implications for the projections. If assumptions for these variables were to be at least partly defined by a range of possible values, then projection outcomes can be assessed for the many resulting different situations. The process is then partially stochastic rather than deterministic, in the sense that the range of assumptions defines a range of projection outcomes. Thus, a set of more robust projections can be generated where uncertainty can at least be described by a range around the specific deterministic baseline.

The analysis presented in this box is carried out with the use of the Aglink-Cosimo model that has been applied in the generation of the baseline projections. Details on the process of doing partial stochastic analysis are given in the methodology section of the Outlook. To carry out the stochastic experiments, the model is calibrated to the final set of baseline projections and is then simulated 500 times under different values for yields (to allow for weather variability) and for GDP and inflation (to allow for variability in key macroeconomic variables). These simulations provide a set of 500 different outcomes for all projection variables, in particular for the evolution of world market prices, which is assessed below.

Box Figure 1.1 illustrates the process of undertaking a stochastic analysis. It presents the evolution of world oilseed yields in the 500 stochastic simulations by three lines: the average value of the 500 stochastic simulations for the focus variable, the 10% percentile value, i.e. the value below which 10% of the simulations can be found and the 90% percentile, i.e. the value below which 90% of the simulations can be found. These three lines give an overview of the projected distribution of world oilseed yields for each year in the projection period. The world oilseed yield is an aggregate measure. It summarises the yield information from all producing countries and as such is a production weighted aggregate of the different yield simulations in producing countries. The figure underlines the fact that historical deviations from trend for world oilseed yields have been globally, and at least historically, relatively modest.
Box Figure 1.1. The range of world oilseed yields in the stochastic simulations

Box Figure 1.2 presents the evolution of world oilseed prices expressed in real terms when deterministic assumptions on yields and macro economic variables are replaced by a range determined through stochastic simulations. The particular interest of Box Figure 1.2 is to see the combined effect of the different simulation assumptions on the world price of a given commodity. One first point to underline is that the evolution of the average of world oilseed prices expressed in real terms over the stochastic simulation is different from the evolution of the deterministic baseline. In 2016, the world oilseed price expressed in real terms in the deterministic baseline is 8% lower than the average of stochastic simulations. This is due to interactions between the different variables that are being shocked in the stochastic analysis in comparison to the benchmark scenario and to the non linearity of the AGLINK – COSIMO model. Another interesting point regarding the distribution of outcomes of stochastic simulations for world oilseed prices is that there is a diversity of outcomes around the average of the stochastic simulation. At the end of the projection period, half of the stochastic outcomes are within a range of -20% to +15 % around the average stochastic outcome whereas the complete range of outcomes is much wider.
Drivers for world oilseed prices expressed in real terms

What drives the uncertainty in world oilseed price projections (expressed in real terms) that have been illustrated in Box Figure 1.2? Obviously many variables as well as interactions between variables influence the evolution of world commodity prices, but the focus here is on the relation between world yields and world prices levels only.

To answer the question, a simple comparison is presented in the next four graphs. They show the respective projected distributions in 2016 of four variables: world oilseed yields, world coarse grains yields, the world maize price and the world oilseed price, both expressed in real terms. The deterministic baseline is also shown in the different figures.
Box Figure 1.3 shows that the relationship between world oilseed prices and yields is not obvious. The distribution of prices expressed in real terms and yields is fairly strongly concentrated with relatively few outliers. The deterministic baseline outcomes are within that part of the stochastic distribution that is most heavily concentrated.

Box Figure 1.4 presents the relationship between world coarse grains yields and the world maize price. The negative correlation between yields and prices seems to be more obvious and stable than in the case of oilseeds. Again, the deterministic baseline projection is in the most concentrated part of the cloud of points.
Box Figures 1.5 and 1.6 illustrate both the same point: world oilseed prices expressed in real terms are directly influenced by world coarse grain markets. If coarse grain yields are low then world maize prices tend to be high, and this in turn tends to push world oilseed prices higher too.

**Box Figure 1.5. Outcomes of stochastic simulations versus deterministic baseline in 2016:**
Relation between world oilseed price (expressed in real terms) and world coarse grains yields

**Box Figure 1.6. Outcomes of stochastic simulations versus deterministic baseline in 2016:**
Relation between world oilseed and maize prices (both expressed in real terms)
Conclusion

Partial stochastic analysis has only a partial coverage of uncertainties; this analysis focuses on exogenous uncertainties linked to climate and macroeconomic evolution. There are several other sources of uncertainty in the benchmark projections. In particular, there is an empirical uncertainty on the estimation of the parameters used in the model jointly developed by the OECD and the FAO and an endogenous uncertainty on the functioning of agricultural markets. Despite these limitations, the information that partial stochastic analysis is of interest for better assessing the evolution of agricultural commodity markets would be possible from the analysis of a deterministic baseline. This box has described how a partial stochastic analysis has been undertaken with the 2007 Agricultural Outlook projections. A number of conclusions emerge from this analysis using the Aglink-Cosimo model: first, the deterministic baseline projections differ slightly from the averages of stochastic simulations. Second, stochastic projections of world crop prices (expressed in real terms) are relatively highly concentrated around the average. And finally, the analysis underlines strong price correlations across commodities.

A short review of historical patterns in trade flows for agricultural products

The Agricultural Outlook provides an assessment of the evolution of agricultural markets and trade over the next 10 years, assuming constant policies and “normal” weather conditions. As the focus of the Outlook is on selected temperate-zone products, occasionally it is useful to review the trade developments of the entire agriculture and food sectors in the recent past to place current and future developments in perspective. This section reviews agricultural and food trade over the twenty-year period from 1985 to 2004 and puts the spotlight on agriculture as defined at the WTO, i.e. including the whole gamut of produce from farm gate to dinner plate. In order to simplify the presentation, the commodity composition of agricultural trade has been segregated into four broad sub-sectors following the classification in Regmi et al (2005). These categories are (1) bulk commodities such as wheat or coffee, (2) horticultural commodities such as bananas or cut flowers, (3) semi-processed commodities such as live animals or vegetable oils and (4) processed products, i.e. goods that require extensive transformation prior to consumption such as chocolates, beverages, and fresh or chilled meats. This classification is primarily based upon the relative dependence of production upon land and climatic conditions. While products in the first two categories depend disproportionately on land availability, geography, and climatic conditions, those in categories 3 and 4 are less dependant upon those factors and in principle, can be produced almost anywhere. A complete listing of the products and the concordance with the trade data is given in Table B1. As the period that is reviewed ends before the enlargement of the EU to 27 member states, references to aggregate EU data in this section covers members prior to 2004, that is, EU15 only.

Evolution in total agricultural and merchandise trade

During the twenty-year period 1985 to 2004, world agricultural exports (excluding intra EU trade) increased more than three-fold from USD 123 billion to USD 393 billion resulting in an annual compound growth rate averaging 6.3% a year (Table 1.4). Over the same time period however, total world merchandise exports expanded at an even faster rate, increasing more than five-fold from USD 1.1 trillion to USD 6.1 trillion, revealing an average compound growth rate of 9.6% a year. Given different growth rates in total merchandise exports and agricultural exports, the share of agricultural exports to total merchandise fell from almost 12% of the total in 1985 to about 7% of total merchandise exports in 2004 (Table 1.4).

The value of agriculture and total merchandise exports increased over the time period examined because countries exported more products and because more countries became engaged in trade (globalization). Between 1985 and 2004, the number of reporting countries or economic regions (all referred to as countries) increased from 88 to 130, with the number of reporting countries reaching 164 in

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3 See Regmi et al. (2005) for more details on the rationale for the product classification scheme.
4 All values are stated in nominal U.S. dollars. Trade data are from UN COMTRADE.
Of this number, only 74 countries are considered consistent traders, defined as countries with at least 18 years of reported exports during the sample. These countries increased their merchandise exports more than five-fold during this period growing from USD 1 trillion in 1985 (96% of total merchandise exports) to USD 5.6 trillion (these figures and all figures in the rest of the section exclude intra EU trade) in 2004 (92% of total). Agricultural exports by this group of countries grew from USD 119 billion USD 362 billion, representing 96% and 92% of total agricultural exports in 1985 and 2004 respectively.

### Table 1.4. Total Merchandise and Agriculture exports 1985 – 2004 (with and without intra EU trade)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Agricultural Exports Billion USD</th>
<th>Total merchanidise Exports Billion USD</th>
<th>Agriculture share of Total Percent</th>
<th>Data include intra EU trade</th>
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<tr>
<td>1985</td>
<td>123</td>
<td>1,071</td>
<td>11.5</td>
<td>Billion USD 1,477 Billion USD 11.9 No of countries 88</td>
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<td>594 8,032 7.4 131</td>
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<table>
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<th>Data exclude intra EU</th>
<th>Data include intra EU trade</th>
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<td>4.661 9.4 134</td>
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</tr>
<tr>
<td>2004 6.140 6.4</td>
<td>8.032 7.4 131</td>
</tr>
</tbody>
</table>

Growth rate 6.29 9.63

This information suggests that exports are relatively concentrated; although globalisation has led to more countries participating in trade, they play a relatively minor role. Which countries are the major world exporters, how has this changed over time, and what share of agricultural exports do they control? In the 1985 to 1989 period, the US was the largest agricultural exporter with an average of USD 34.3 billion in exports (about 23% of total), followed by the EU15 with almost USD 30 billion (20% of total). Australia, with an average of USD 9.7 billion was the third largest exporter followed by the Canada and Brazil. These OECD countries exported, on average, some 54% of the world total in that period. Table 1.2 shows the remaining top exporters and indicates that eight of the leading exporting countries are not OECD countries and that the leading agricultural exporting countries exported on average about 80% of the world total during this time. Among the members of the EU15, France, Germany, the Netherlands and the United Kingdom are among the top 10 exporting countries.

Twenty years later, the leading exporting countries remained basically the same, except that Colombia and Hong Kong, China were replaced by Indonesia and Spain, and even though the value of exports more than doubled, the market share of the leading exporters fell as other countries expanded their exports. The share of the leading countries listed in Table 1.5 fell to 75% of the total. In addition, individual ranking also changed. The EU15 jumped ahead of the US to become the largest exporter while...
Brazil replaced Australia as the third largest exporter with an average market share of 5.5% a year. Although most of the leading exporters are OECD countries, developing countries increased their market share and the top exporting developing countries increased their share of trade slightly to 21% of the total.

A more comprehensive representation of the relative dominance of OECD countries in world agricultural trade is shown in Figure 1.9 below. The figure breaks out world exports based on countries grouped by income and the 30 OECD countries. Based on this level of aggregation, the share of agricultural exports of OECD countries peaked in 1987-88 at almost 70% of exports but fell from this high level to around 60% in the latter years (Figure 1.9). The share of high income non-OECD countries (not shown in figure) also declined somewhat from around 4% in 1985 to 3% in 2004 and that of low income countries from around 6% in 1985 to around 4% in 2004. The declining share from OECD and high income countries has been captured by the middle income countries. The upper middle income countries increased their share from around 8% in 1985 to around 11% in 2004, while lower middle income countries increased their share from 19% to 23% of the total during this time.

Shifting the focus to the G-20 group of developing countries – countries with particularly strong views on agricultural trade in the Doha negotiations – the data reveals that total merchandise exports by this group increased almost 13 times to USD 1.3 trillion, representing 21% of world’s total in 2004. The average growth rate of 14% per year considerably outpaced that of all exporting countries. Total agricultural exports by the G-20 on the other hand increased only four-fold to USD 111 billion in 2004 or 28% of the world total. Reflecting the different growth rates of agricultural and merchandise exports, the export sector of this group of countries exhibited traits similar to all countries, namely, the share of agricultural goods to total merchandise exports declined. During the 20 years from 1985, the value of agricultural exports in total exports dropped by 19 percentage points to 9% in 2004.

**Evolution in the exports of the four agricultural sub-sectors**

Within an overall growing agricultural export trade over the 20 year period, the value of exports in each of the four sub-sectors, bulk, horticultural, semi processed and processed, also expanded, but at very different rates of growth. While exports of bulk commodities increased at an annual growth rate of 2.6% a year, the growth in exports of horticultural products was much faster at 8.6% a year. Nevertheless, the share of these two broad groups of commodities – both heavily dependant upon land and climatic conditions - in the value of total agricultural exports fell from 45% to 30% from 1985 to 2004 (Figure 1.10).

Within the group goods that are less dependent on climatic conditions, exports of semi-processed products grew at 5.9% a year to more than USD 97 billion in 2004, with a little changed share in total agricultural exports. On the other hand, exports of highly processed products increased five fold from USD 35 billion in 1985 to USD 177 billion in 2004, raising their share in total agricultural exports from 28% to 42%. The average annual growth rate of these products, 8.9% a year, is comparable to the annual average growth rate of total merchandise exports.

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5 Country classification by income is from the World Bank and is based on per capital gross national income as of 2005; http://siteresources.worldbank.org/DATASTATISTICS/Resources/CLASS.XLS

6 If intra EU trade is included, the share of OECD countries in world trade is considerably higher, averaging 74% of the total in the last four years.

7 Members of the G-20 are; Argentina, Bolivia, Brazil, Chile, China, Cuba, Egypt Arab Republic, Guatemala, India, Indonesia, Mexico, Nigeria, Pakistan, Paraguay, Philippines, South Africa, Tanzania, Thailand, Uruguay, Venezuela RB, and Zimbabwe.
OECD countries are the largest exporters of bulk commodities but their share of the total declined during the 20-year period from 61% in 1985 to 54% in 2004 (Figure 1.11). Most of this was captured by lower middle income countries whose share in total bulk product exports more than doubled during the period to 28%. Bulk exports by low and upper-middle income countries are of lesser importance but nevertheless exhibited much stronger growth than the OECD countries.

Table 1.5. Leading agro-food exporting countries (average 1985-89 and 2000-04)

<table>
<thead>
<tr>
<th>Economy</th>
<th>USD Billion</th>
<th>share (%)</th>
<th>Economy</th>
<th>USD Billion</th>
<th>share (%)</th>
</tr>
</thead>
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<td>22.80</td>
<td>(1) EU-15</td>
<td>61.78</td>
<td>18.68</td>
</tr>
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<td>(2) EU-15</td>
<td>29.86</td>
<td>19.83</td>
<td>of which France</td>
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<tr>
<td>of which France</td>
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<td>1.65</td>
<td>Spain</td>
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<td>(4) Canada</td>
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<td>4.15</td>
<td>1.25</td>
</tr>
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</table>

Total of Above 120.81 80.22 Total Above 247.02 74.67

Excludes data for the German Democratic Republic

Looking at individual countries (EU15 counting as one), the US, Canada and the EU15 are the top three exporters of bulk commodities with an annual average export value of USD 17.2 billion, USD 3.8 billion and USD 3.2 billion respectively during the 1985 to 1989 period, representing more than half of average world exports during those years (Table B.2). Even though many countries export bulk products, trade is concentrated and the top 20 exporters captured on average more than 91% of world total. But, over time, the concentration of the top 20 exporting countries declined and stood at 86% in 2000 to 2004 period. Within this overall trend, the relevance of OECD countries is declining and by 2004 there were only five OECD countries among the leading 20 exporters of bulk commodities. Thus, unlike the exports of all agricultural products where the OECD countries dominate, exports of bulk commodities that depend more on climatic conditions, and land availability has shifted more toward developing countries.

Production of horticultural commodities is also relatively location specific, i.e. relatively more dependent on land and climatic conditions. As already stated, trade in this sector has been much more
dynamic than trade in bulk products. While the **OECD** dominates horticultural exports with a total of USD 24 billion in 2004, the strongest growth was exhibited by the upper middle income countries, with an growth rate of 10.8% a year to USD 6 billion in 2004 (Figure 1.12). As a group the **G-20** exhibited a high growth rate (9.6% per year, not shown in the graph), followed by the **OECD** countries (9.4%), the lower middle income countries (8%) and the low income countries with an average annual growth of horticulture exports of 5.8%.

**Figure 1.9. Agriculture export share (excludes intra EU trade) by income group (1985-2004)**

As for bulk commodities, the leading horticultural exporting country is the **US** with an average of USD 2.2 billion a year during the 1985 to 1989 period and USD 6.2 billion a year for the 2000 to 2004 period representing 16% of the world’s total of these products during each of these periods (Table B.3). The rank ordering of the leading horticultural product exporters has changed over time, but overall and in contrast to trade in bulk commodities, the importance of **OECD** countries in horticultural products trade increased with its share of total horticultural exports growing from 46% in 1985 to 54% in 2004.

The third agricultural sub-sector, semi processed products includes products that are less dependant on climatic conditions with key inputs into their production process that are importable. This group of products as mentioned above is the second largest exported sub-sector. As a group, **OECD** countries increased their exports in this segment by 4.9% a year to USD 48.1 billion in 2004 (Figure 1.12). Nevertheless, their share in the world total fell by 10 percentage points to an average of about 50% as that of upper middle income developing countries increased by 6 percentage points to 14% of the total in 2000-04 reflecting an average growth rate of 8.2% a year. Strong export growth of 7.3% per year to USD 30 billion in 2004 was also exhibited by members of the G-20 (not shown in the figure). Exports of semi-processed products by the least developed countries (not shown in the figure) increased from
USD 166 million to USD 693 million in 2003. But with slower growth than that of other developing countries, their share in world total exports hardly changed.

Figure 1.10. Share of agriculture exports (excludes intra EU trade) by stage (1985-2004)
The EU15 and the US are the world’s largest exporters of semi-processed products, with respective shares of total world trade in 2004 of 17% and 16%. On average, the EU15 exported some USD 13.4 billion a year during 2000-04 and the US just above USD 13 billion (Table B.4).

The final group of products considered here those with the highest level of transformation or processing prior to consumption. Production of this group of products is not very location specific, is very little concerned with climatic conditions, most of the required inputs can be sourced from practically anywhere and other considerations loom more important in firms decisions as to where to locate. This group of products has the largest share of agricultural exports and has the highest growth rate. OECD exports of processed products have grown by more than 8% per year since 1985 to USD 120.4 billion in 2004 (Figure 1.12). But, although from a much lower base, exports in this segment by upper middle income and lower middle income countries grew at double digit rates, averaging respectively 13.6% and 10.7% per year, reaching respectively USD 14.1 billion and USD 34 billion in 2004.

OECD countries dominate trade in this segment: the six leading processed product exporters are all members of the OECD; the number of OECD countries in the top 20 increased to 15 by 2004; and on average these countries exported almost USD 87 billion a year or 60% of the total (Table B.5). Nevertheless, reflecting the very high growth rates in processed product exports by developing countries, these countries are increasing their share in total world trade. For instance, processed products became the most important export segment for the G-20 countries, overtaking exports of bulk or semi processed products. Their share of total world exports increased from 15% to 23% since 1985. Other developing countries (except the least developed countries) also demonstrated impressive growth rates in exporting products in this market segment.
In general, the export data reveal the extent of globalisation with the share of the leading exporting countries declining over the 1985 to 2004 period. This illustrates that more countries are contesting agricultural export markets and that more countries have entered the global markets while existing competitors below the group in the top 20 increased their competitiveness and their share of the market. Overall, the share of exports by OECD countries has declined in three of the four broad aggregates discussed (except for horticultural markets). The data also reveal that despite the policy changes that have occurred since the mid-1990s and the implementation of the URAA, agricultural trade continues to be dominated by a relatively small number of countries, with the leading 20 exporting countries controlling more than 70% of the exports in each of the four segments examined.

**Evolution of agricultural imports**

Turning our attention to the flip side of the issue, the data show that growth of agricultural trade based on imports is the same as that described above based on exports. For example, agricultural imports increased at an average growth rate of 6.5% a year, but still lagged behind that of all merchandise trade resulting in agriculture’s share of world merchandise trade based on imports declining from 10% of the total in 1985 to slightly above 6% in 2004. In terms of the composition of trade, import developments are also similar to those for exports with the share of bulk commodities in total agricultural imports falling and that for processed products increasing.

The Least Developed Countries seem to be more engaged in importing rather than exporting agricultural goods as their share of world imports during the last 10 years has been above 1% in contrast to less than 0.5% in exports. OECD countries share of imports fell from more than 74% of the total at the beginning of the period to the low-60% in the later years, while the import share of developing countries other than low income, increased from around 13% at the beginning of the period to around 26% in the later years. Demand for bulk commodities by the OECD countries has fallen particularly with its share in total world imports of bulk products falling from 72% on average during the period between 1985 and 1989 to 51% for the 2000 to 2004 period. In contrast, import demand for bulk commodities by developing countries expanded at a faster rate, increasing their share of the market. Import demand increased the
fastest among upper middle income countries, averaging 11.4% a year, followed by lower middle income countries with an annual growth rate of 9.1%.

The same trend prevailed for imports of processed products where imports by the OECD countries grew at an annual rate of 8.2% compared to double digit rates for many developing countries. Consequently, the share in world imports of processed products by OECD countries fell to 68% by 2004. Import demand by upper middle income countries increased at an average rate of 13.4% a year expanding their demand more than 10 times from USD 1.7 billion in 1985 to USD 17.9 billion in 2004. Lower middle income countries also increased their demand at a double digit rate averaging 10.2% a year. Their demand expanded more than 6 times from USD 2.8 billion in 1985 to USD 18.1 billion in 2004. Low income countries expanded their demand for this class of commodities about three-fold from USD .9 billion in 1985 to USD 2.9 billion in 2004. (Tables B2 to B5 contain a list of the leading importing countries for each of the four sub-sectors).

It is noteworthy that import demand also expanded for the G-20 countries, the group that is considered to have an export orientation at the WTO negotiations. Double digit growth in import demand by the G-20 countries was registered in each of the four sub-sectors and their total imports of agricultural products grew by more than 11% per year between 1985 and 2004, raising their share of total world imports from 10.8% during 1985-89 to 17.2% during the 2000-04 period (compared to an average share of 17.7% of world exports). This phenomenon was not confined to one or two large members, a development that would lead to misleading interpretations. Rather large import demand was exhibited by a majority of the members. Average imports for the 2000 to 2004 period by three members, China, Indonesia, and Mexico, placed them among the leading 20 importing countries, while a total of 13 members were among the top 50 agricultural importers. Furthermore, of these 13 important importers, 7 lead by Mexico, Egypt and Venezuela were on average net importers of agricultural goods during the 2000 to 2004 period. It is particularly striking that the average growth in import demand for bulk commodities by the G-20 group of countries, 11.1% a year, outpaces that of global growth or growth by OECD. Consequently, the G-20 as a group switched from being net exporters of bulk products on average during 1985-89 to being net importers during 2000-04. For the other three sub-sectors however, strong growth in imports was more than offset by an even stronger expansion in exports. As a result, the G-20 maintained their net export position in these set of commodities and in total agricultural trade.

Another group of countries that has joined ranks at the WTO negotiations is the G-10. This group of countries is thought to have more of an import orientation in the negotiations. While their agricultural imports indeed increased by 6.2% a year from 1985 to 2004, their share of total world imports declined from an average of 21.2% in the 1985-89 period to 18.4% in the 2000-04 period. And as total merchandise imports increased at an even faster rate, averaging 8.8% a year, the agriculture share of total imports by these countries fell from 11% in 1985 to 7% by 2004.

Most of the growth in agricultural imports by the G-10 has occurred in processed products. These grew at an annual average rate of 9.7%, increasing their share of agricultural imports to almost half on average during 2000-04. On the other hand, import demand for bulk commodities moderated during the 20-year period, growing by only 2.4% a year. As a result their share in total agricultural imports declined from an average of 35% of total in 1985-89 to 21% in 2000-04.

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8 Members are; Bulgaria, Chinese Taipei, Iceland, Israel, Japan, Korea Republic, Liechtenstein, Mauritania, Norway, and Switzerland.
Summary

To summarize, between 1985 and 2004 trade in agriculture products (whether measured by the value of exports or imports) increased substantially both due to an expansion in trade by existing countries and due to new countries participating in the globalisation of markets. Agricultural trade did not increase as fast as all merchandise trade, resulting in a declining share of agriculture in world trade, to less than 10% in recent years. This trend of a falling share of agriculture in total merchandise trade is persistent across all income levels and geopolitical groupings, and is consistent with a similar pattern of agriculture capturing a declining share of an economy’s income.

The trade data between 1985 and 2004 also show that even though there are more and more countries participating in trade, a relatively small number of countries continue to capture most of this trade whether one is referring to agriculture or non-agriculture goods. The concentration ratio of the top 4 or top 20 exporting countries, although dropping moderately over the 20-year period, is still rather high, with the top 20 exporting countries accounting for almost 80% of total merchandise exports or 73% of total agricultural exports in 2004. LDCs, the group of countries who are receiving special consideration in the Doha Development Agenda are not very big participants in the expansion of agriculture trade, accounting for less than 1% of the total. Members of the OECD continue to dominate agriculture trade although their share of the total has declined somewhat over the 20-year period. Most of the gains have been made by countries that are in the G-20 and other developing countries that are not LDCs.

The data suggest that the dynamics of agricultural trade is chiefly about trade in processed products. The growth rate for this sector (8.5% a year) is comparable to the growth rate of non-agricultural products and as a result this group of commodities has steadily increased its share of agriculture trade, to 41% of total exports (45% of total imports) in 2004. Trade in bulk products on the other hand is growing at the lowest rate (3.7% a year based on exports and 2.6% a year based on imports) among the agricultural sectors and as a result the share of bulk products in agricultural trade has declined from 37% to 19% of exports (from 34% to 21% of imports) during the 20 years since 1985.

Patterns in the exports of each of the four agriculture sub-sectors – bulk products, horticulture, semi processed products and processed products – follow those of agriculture in general. The top 4 or 20 exporters continue to dominate but their share has declined somewhat. The OECD countries continue to account for a majority of trade, and they tend to dominate trade in processed products. Nevertheless, developing countries other than LDCs have increased their importance in the trade of agricultural products in all the sub-sectors but especially for bulk commodities.

Trade developments by some groups of countries are particularly striking given the stance of these countries in the current Doha round of trade negotiation. For instance, agricultural exports for the G-20 have decreased in importance as the share of agricultural exports to total merchandise exports has declined from 28% of the total in 1985 to 9% in 2004. Members of the G-20 as a group have become net importers of bulk products while remaining overall net exporters in agriculture.

The development in agricultural trade by the G-10 group of countries is also noteworthy. This group of countries has an import orientation in the current Doha negotiation. However, both their share in world agricultural imports as the share of agricultural imports in total imports by these countries has fallen over time.
CHAPTER 2

CEREALS

World market trends and prospects

Key market drivers

International markets for wheat and coarse grains were characterised by substantial production shortfalls in 2006/07 following weather related reductions in major production areas. Australia, suffering a severe drought, has harvested 61% less wheat and 51% less coarse grains than in the previous year, causing a sharp drop in both exports and ending stocks. Production of wheat and coarse grains fell substantially in the European Union (EU) and the United States, too. Both weather-related yield reductions and a smaller cereal area harvested contributed to this. In total, Australia, the EU and the US produced some 57 Mt less wheat and coarse grains than in the previous year. While wheat production in India was in line with historical trends, the country stopped selling its large wheat stocks and had to import 6.5 Mt of wheat in 2006, up from very little in 2005. Good harvests in other countries, notably in China and some African countries, only partially offset these shortfalls.

In addition, the expansion of the US ethanol industry, which developed much more rapidly than suggested by the Renewable Fuels Standard (RFS), led to a strong additional demand for US maize, growing by about 14 Mt in 2006. In consequence, world wheat and coarse grains stocks declined by 13% and 17%, respectively, and world cereal markets saw strong price increases: within a few weeks, US export prices for maize jumped from around USD 115 per tonne to above USD 160 per tonne, and have been hovering between USD 160 and USD 180 per tonne since late 2006. Similar price increases were seen for wheat, with US export prices lingering in the USD 200 to USD 220 per tonne range since late 2006.

Following a tendency prevailing since 2000, world rice markets have continued to strengthen with prices increasing by about 50% between 2000 and 2006. Despite a small contraction in global production in 2006, rice supply and demand were in a much closer balance than was the case for wheat and coarse grains. Nonetheless, as demand outpaced supply, market conditions also tightened, triggering a 6 percent increase in export prices.

Against this background, assuming average weather conditions, continued technical progress and agricultural policies, 2007 cereal production should recover from its low levels and in fact be stimulated by

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9 All dates are on a marketing year basis (e.g. 2006 represents the 2006/07 marketing year) unless stated otherwise. While in general these are June/May for wheat, September/August for coarse grains and January/December for rice, data for individual countries may use slightly different periods.

10 The Renewable Fuels Standard, enacted first in the Energy Policy Act in 2003 and modified by the Energy Policy Act in 2005, banned the use of MTBE as an additive and oxygen enhancer to gasoline, and required the production of renewable fuels to increase from 4 billion gallons (bn gal) or about 12 Mt in 2006 to 7.5 bn gal (22.5 Mt) in 2012.
the current high prices: more land should be used for grains production, largely drawn from other crops (in particular from oilseeds) while new land is expected to be cultivated mainly in Latin America. With yields returning to trend levels, world wheat and coarse grain production should increase by 5% and 7% on a year-to-year basis, respectively. As demand remains strong, driven by both increased livestock production and the growing ethanol industry, world prices are expected to remain high and, particularly for maize, increase further in 2007. Under normal weather conditions, rice production is also expected to rebound in 2007.

In the longer run, much will depend on the growth in biofuel industries relative to expected supply responses. This outlook assumes significant further growth in US ethanol production in particular between 2006 and 2011, as well as in biofuel production of a number of countries including the EU, Canada and China. In addition, while feed efficiency should improve, livestock production is projected to rise substantially over the outlook period, driving up cereal feed use. With the area under cereals, and particularly under coarse grains, increasing throughout this baseline, and with continued advances in average yields, the outlook projects cereal prices to decline towards the end of the projection period, but to remain relatively high compared to previous projections (Figure 2.1). World wheat prices are expected at USD 183 per tonne for 2016, significantly higher than prices observed in the late 1990s and early 2000s, but 10% lower than the peak in 2007. Maize prices should end at around USD 138 per tonne, 2% lower than in 2006 and 13% below the 2007 peak.

Continued growth in global rice consumption, fueled by population growth and rising incomes in large parts of the developing world, are expected to keep international rice prices well above the levels seen over most of the past decade. Thai export prices (100% B) are projected to fall from their high of some USD 360 per tonne in 2008 to about USD 326 per tonne in 2016; 5% above the 2006 level.

Adjusted for inflation, international prices for wheat, coarse grains and rice are set to decline from their currently relatively high levels. By 2016, real export prices for wheat, maize and rice are projected to fall by 26%, 19% and 14%, respectively, when compared to 2006.

Figure 2.1. Nominal wheat and coarse grain prices to remain relatively strong, rice prices to increase

Notes:
(a) No.2 hard red winter, ordinary protein, wheat, USA, f.o.b. Gulf Ports.
(b) No.2 yellow corn, USA, f.o.b., Gulf Ports.
(c) White rice, 100% second grade, f.o.b. Bangkok.
Source: OECD and FAO Secretariats.
Main market developments: Wheat and coarse grains

Strong demand drives cereal markets

Despite expected slower population growth, demographic developments as well as increasing per capita incomes will remain major driving forces for agricultural markets in most developing countries. This is reflected in continued growth of direct food use of cereals, particularly wheat, but even more so in the projected expansion of the consumption and production of livestock products, which in turn results in growing feed use particularly of coarse grains (Figure 2.2).

Food consumption of wheat is expected to continue its growth at a slightly reduced pace, with growth rates of 0.7% p.a. compared to 1.2% over the past decade. Global per capita consumption is expected to decline by some 3% over the projection period. So on average, all of the growth in wheat food use would come from population growth. None of the OECD countries is expected to see major growth in per capita wheat consumption. Developing countries with a traditionally wheat based diet generally do not show substantial increases in per capita consumption either, while some growth is expected for non-traditional wheat consuming countries, including Tanzania, Mozambique and Zambia.

While on average food use of coarse grains is much smaller than that of wheat, coarse grains play an important role in diets of a number of countries, particularly in Mexico, South Africa, Nigeria and some other African countries. Among those, only Nigeria is expected to see substantial further increases in per capita food consumption. Globally, food use of coarse grains grows only slightly faster than the population, and is therefore only a minor driver of world market developments.

With fast growing livestock industries around the world, in particular in developing countries and most notably in China (see the chapter on meat markets), feed use of coarse grains will continue to be a major driver in world cereal markets (Figure 2.2). China alone is projected to add another 19.8 Mt of coarse grains to its use in the livestock sector, but strong growth is expected also for India, Argentina and Algeria.

![Figure 2.2. Strong growth in biofuels production drives cereal demand in OECD countries](image)

The most important driver in particular during the first years of the projection period, however, will be the developments in the biofuels industry. With ethanol production expanding rapidly in a number of countries, notably in the US, the EU and in Canada, grain use for fuel purposes is projected to see an unprecedented increase during the 2007 to 2009 period and further growth thereafter. In the US alone, this Outlook assumes maize use in the ethanol industry to accelerate further after the strong growth in 2006,
and to double between 2006 and 2016 to reach 110 Mt or 32% of the US maize production. While the US is expected to remain the leading producer of grain-based ethanol, cereal use for biofuels are assumed to increase by more than 250% by 2009 in Canada (maize and wheat) and to almost quadruple in the EU (wheat). Additional growth is projected for China, even though at much more modest rates. With support persisting at high levels, production of biofuels could increase at even faster rates if the markets for transport fuels can absorb these large quantities, and in particular if profitability would increase due to renewed strengthening of prices for fossil fuels.

**Additional coarse grain area**

Area under wheat and coarse grains has been declining over the past decade, both in the OECD area and in developing countries. Following the high cereal prices in 2006 and the strong demand particularly from the ethanol industries, however, it is expected that area under coarse grains will increase by 5% between 2006 and 2009, with continued growth at lower rates for the remaining projection period. While a large part of this land would be drawn from other crops, particularly from soyabeans and, after 2008, from wheat, some of the growth would come from new cultivation mainly in Latin America.

Most of the growth in global cereal production will, however, come from increased area productivity. Average wheat and coarse grains yields are projected to grow by 0.8% and 0.9% p.a. on average, respectively, after having recovered from the weather-related drop in 2006 (Figure 2.3). Yield growth rates for major producers largely range between 0.5% and 1.5% p.a. Yield levels are expected to remain dispersed, with average coarse grains yields in 2016 ranging from less than one tonne in some of the least developed countries of Africa and Latin America to close to 10 tonnes in the US. Wheat yields show a similar spread.

In total, global wheat production is projected to exceed 670 Mt by 2016, up from a low 596 Mt in 2006. The EU, China, India and the US are expected to remain the four largest wheat producers, with a combined share in total production of about 56%, slightly less than their current share. With almost 1.2 billion tonnes in 2016, world coarse grains production is projected to grow more rapidly than wheat at an average rate of 1.2% p.a. The US, China and the EU will remain the three largest coarse grain producers, supplying about 59% of global production.
Figure 2.3. Continued yield improvements in major producing countries

![Graph showing continued yield improvements in major producing countries](image)

**Note:** Figure shows average yield growth rates during the 2007-2016 projection period for the largest cereal producing countries in 2016, together with the global average.

**Source:** OECD and FAO Secretariats.

**Wheat stocks to recover**

Global stocks of wheat and coarse grains in 2006 have been at their lowest levels for more than a decade. With production recovering from weather related lows, world wheat stocks are projected to increase by some 9% or more than 14 Mt in 2007 and 2008, and to slowly grow further to reach 180 Mt by 2016 (Figure 2.4). Much of these additional wheat stocks will be in countries that suffered from low harvests in 2006, notably Australia, the US and the EU. Stocks are projected to increase in China, too, where wheat stocks are believed to have bottomed out in 2005.

Coarse grains stocks, in contrast, are expected to see a further modest decline in 2007 before a slow recovery is projected. Strong growth in the demand caused in particular by the increased ethanol production in the US and other countries results in production catching up with consumption only by 2008 as supply responds to the strong demand and high prices only with some time lag. Lower stocks are expected particularly for the US, where coarse grains stocks are projected to fall from 27 Mt in 2006 to 19 Mt in 2016, the lowest levels since 1995 when US coarse grains stocks fell below 15 Mt. A recovery of coarse grains stocks is expected, however, for most other countries, in particular in China where ending stocks should increase by more than 16 Mt over the baseline period.

**Prices to fall after 2007 peak, but to remain high in historical perspective**

Driven by strong demand and persistent low stock levels, world wheat and coarse grain prices are expected to remain at relatively high levels, even though below their peaks expected for 2007. US export prices for wheat are projected to peak at USD 205 in 2007 before falling to some USD 183 per tonne by
the end of the projection period. While this represents a decline by 10% relative to the average 2006 level, prices are still high when compared to two preceding decades when they were hovering within the USD 100-160 range for most of the time, with the exception of the 1995 peak.

International coarse grains prices are projected to show a similar pattern. US export prices for maize are expected to further increase from their 2006 average of USD 140 to USD 159 per tonne in 2007, before slowly declining to levels around USD 138 per tonne towards the end of the projection period. This represents an even less pronounced decline than projected for wheat, and again, at these levels, prices remain well above those seen for most of the past two decades.

In real terms, world prices for wheat and coarse grains are projected to fall by 26% and 19% respectively from their 2006 levels; a drop of around -3% p.a. over the projection period. These rates indicate a slightly stronger decline in real prices than those observed over the past 25 years, so that the developments in the biofuels sector can be seen as contributing to an upward shift in price levels while long term trends do not seem to have changed fundamentally.

**Figure 2.4. Lower stock levels support international wheat and coarse grain prices**

![Wheat and Coarse Grains Graph](image)

**Note:** Prices are deflated using the US GDP Deflator (2000 = 1); wheat: US HRW #2, fob Gulf; coarse grains: US Yellow Corn #2, fob Gulf.

Source: OECD and FAO Secretariats.

**International trade in cereals to grow at moderate rates**

Lower exports by major cereal producers have reduced world cereal trade in 2005 and, for wheat, also in 2006. Lower harvests and strongly increased domestic use in the exporting countries, but also lower imports following high prices were the main drivers behind this development. As wheat and coarse grains availability recovers and (real) prices fall, trade is expected to rebound and to grow by around 1.5% p.a. over the projection period.

Total wheat trade is projected to exceed 128 Mt by 2016, almost 20 Mt more than in 2006 when wheat trade was depressed by low harvests in major exporting countries (Figure 2.5). Almost half of the growth will come from a rebound and continued growth in Australian exports, which should exceed 19 Mt in 2016. Increasing exports are also expected for a number of other major producing countries, including the EU, Russia, Ukraine and Argentina. US exports, which fell sharply in 2006, are projected to remain low in the first years of the baseline, but to recover over the remaining projection years.

India, which as mentioned above has started to import substantial quantities of wheat in 2006, is expected to remain an important buyer from international wheat markets, and to keep import levels between 5 and 6.5 Mt throughout the projection period. Growing imports are expected for several other
countries, including China, Brazil, Egypt, Nigeria and Pakistan. Despite higher wheat prices, developing countries are expected to increase their imports by a total of about 17 Mt over the projection period to buy some 105 Mt on international wheat markets in 2016. Much of this additional import demand will be met by increased net exports from OECD countries. OECD net exports in wheat are projected to increase from just over 50 Mt in 2006 to more than 60 Mt in 2016, suggesting a growing importance of north-south trade in wheat.

Figure 2.5. Moderate increase in wheat trade

World trade in coarse grains is projected to fall in 2007 due to lower export availabilities in the US, but to increase thereafter and to end some 12 Mt higher in 2016 than in 2006 (Figure 2.6). This is driven by additional supplies in Europe, Latin America and Australia: EU coarse grain exports are projected to further decline in the first years of the baseline, but to increase from 6.1 Mt in 2008 to 12.4 Mt in 2016. The Ukraine is expected to expand coarse grain exports by 2.8 Mt to reach 9.1 Mt by the end of the projection period. Argentina and Brazil are set to expand their coarse grain exports by 3.6 Mt and 3 Mt, respectively, fuelled by strong production growth. Growth in Australian exports mainly follows the country’s recovery to normal production patterns.

One-third of the growth in trade is caused by higher imports in China, which is projected to establish itself as a consistent net importer, with coarse grain imports reaching more than 7 Mt by 2016, 5 Mt more than in 2006. Following its growth in the ethanol industry, Canada is expected to increase maize imports, while growing coarse grains imports are expected to feed the increasing meat production in the Islamic Republic of Iran. Developing countries as a group are projected to increase their coarse grain imports by more than 12 Mt to 85 Mt in 2016. This growth, however, will be largely supplied by other developing countries (south-south trade); net exports from the OECD area are expected to decline strongly during the first years of the baseline due to reduced supplies from North America. Only after 2010 are OECD net exports expected to increase, with net trade in 2016 exceeding the 2006 volume by 5.9 Mt.
Figure 2.6. Trade in coarse grains to increase after a further drop in 2007

Source: OECD and FAO Secretariats.

Main market developments: Rice

Adverse conditions depress world rice production in 2006, while government policies are mostly behind the contraction of rice trade

Global paddy production fell slightly in 2006, reflecting a series of setbacks, in the form of typhoons, drought, flooding, diseases and insect attacks. The contraction affected some of the major exporting countries, in particular India, Pakistan, Thailand and the United States. Faced with rising domestic prices, several of them reacted by imposing temporary restrictions on shipments, contributing to a four percent decline in rice trade and to a further strengthening of world prices. The disappointing outcome of the 2006 rice crops also meant that global rice reserves had to be cut back somewhat to meet consumption. Even then, local shortages in many countries became manifest through sharp increases in domestic prices, which depressed per capita rice consumption.

Despite stalling WTO Multilateral Trade Negotiations, a number of affluent countries, including Japan, the Republic of Korea and Malaysia, announced major policy reforms in 2006, mostly directed to protect farmer incomes while enhancing the competitiveness of the sector. A series of regional agreements were also launched, which may have important implications for the future of the sector in Africa and in Latin America and the Caribbean. On the other hand, concerns over the long run availability of resources, in particular, land and water were exacerbated in the past year by growing signals of climate changes, encouraging governments to lean even more forcibly on rice self-sufficiency objectives.

This stance is becoming particularly evident in Africa, where, in January 2005, 15 western African countries belonging to Economic Community of West African States (ECOWAS) agreed to harmonize their agricultural policies by adopting ECOWAP, the West Africa Regional Agricultural Policy, which gives particular prominence to food sovereignty and food security and calls for regional complementarity. Governments embracing ECOWAP agreed to devote 10% of their budget to agriculture, while relying on the private sector to promote its development. Likewise, the implementation of free trade agreements with the United States by countries in Central America and the Caribbean, under CAFTA, and by Colombia and Peru encouraged governments in those countries to establish programmes to invest in the sector. The purpose is to enhance rice competitiveness during the transition period preceding the full opening of those markets to rice from the United States. In Asia, rice has been a matter for contention in several bilateral or multilateral free trade agreements negotiated in the region, on account of its social and economic importance and the role it played for food security. This largely suggests that governments will maintain their direct involvement in the sector, through long term development plans or short-term market intervention.
Africa may benefit from a new green revolution

World rice production between 1997 and 2006 expanded at a relatively slow pace of 0.7%, influenced by downward adjustments in China, where the government removed incentives to producers to eliminate large surpluses that had accumulated in the mid-1990s. This process was concluded in 2004, and rice production growth is expected to rebound to 0.9% between 2006 and 2016, resulting in an overall increase of 44 Mt over the period. A small share of this increase would stem from increases in plantings, with the bulk originating from productivity gains, much in line with the pattern of development witnessed in the recent past. At the global level, the area under rice is estimated to grow by only 1.5 Mha, or 1% overall between 2006 and 2016 (Figure 2.7). The increase would be mostly located in Africa, where large tracks of land, especially upland and inland valleys, have been found suitable to grow the crop. This, together with renewed commitments from governments to the sector, is anticipated to foster some expansion in the rice land base in the region. The area under rice in parts of Latin America and the Caribbean (LAC) is also projected to recover to the levels of the late 1990s, although it might fall in Guyana, as incentives to produce rice for export to the EU get eroded, and in Peru, where water limitation and expectations for increased imports from the United States, could deter new investment for rice production in the eastern Selva region. Only small increases are foreseen in parts of Asia, where competition for land and water resources is intensifying. An erosion of the rice land base is anticipated in several of the major exporting countries, including China, Thailand and Vietnam, which are promoting a displacement of rice cultivation from marginal producing areas to special rice producing zones. Some area increase is also projected in importing countries such as Indonesia, Malaysia and Myanmar. For Malaysia, this would reflect a reversal of policies under the Ninth Five-Year Development Plan (2006-2010), which calls for a shift of emphasis from export-oriented agriculture to food crop production, and raises the rice self-sufficiency target from 65% to 90%. As for the high-income countries, the area under rice is likely to change little: it may recover in Australia, assuming a return to normal weather conditions, and in the United States; while the move away from rice cultivation may continue in Japan and in the Republic of Korea where recent policy changes are expected to foster a major restructuring of the sector.

Figure 2.7. Moderate growth in land under rice

Productivity gains should remain the principal factor underpinning world production until 2016. Yield growth is even expected to accelerate in the developing countries, particularly in Africa, a region that largely by-passed the first green revolution of the seventies and eighties. Reflecting the expected dissemination of improved rice varieties tailored to the needs of African farmers, the region is projected to witness a dynamic yield and production growth over the next ten years. The spreading of NERICA varieties, in particular, would boost production in Sub-Sahara Africa, where several countries have subscribed to the African Rice Initiative, launched in 2002. In addition, Nigeria is investing in building up the basic infrastructure, upstream (development of Nerica foundation seeds) and downstream (milling and storage facilities), with the stated objective of achieving rice self-sufficiency in the next few years. Projects to close the rice yield gaps also exist in LAC. In addition, a few governments in the region recently introduced new incentives to raise the competitiveness of the sector, in anticipation of the opening of their markets to the United States. In Asia, the sector will mainly rely on the dissemination of high yielding varieties, such as hybrids in Bangladesh, India, Indonesia, the Philippines and Vietnam or “super rice” in China, to boost production, especially as several of them would also face a shrinking land base. Although officially, no genetically modified rice has yet been released in the region for commercial production, governments are conducting field trials and it might not take long before they accept to grow them more extensively to overcome severe production constraints, such as saline soils, drought stress, etc.

Thus, while rice production in OECD countries is expected to rise somewhat over the projected period, it is unlikely to depart much from current levels. On the other hand, production in the developing countries is foreseen to expand more vigorously than in the past, with particular strength projected for African countries.

Per capita rice consumption to decline in many parts of Asia, in sharp contrast with an expected consolidation of rice as an important food in LAC and Africa (Figure 2.8).

Although low quality rice is often utilized as a feed ingredient or for transformation into starch and other industrial products, rice is essentially consumed as food. Because of its relatively high price, the recent surge in grain demand for bio-fuel conversion has also spared it. Rice, the major staple in Asia, is crucial to the region’s food security and several of the most populous countries, including Bangladesh, Indonesia, India and the Philippines, still run large rice public distribution programmes. Although per capita rice consumption is foreseen to remain on the rise in a number of countries in the region, it is projected to fall in most of the fast growing economies, resulting in declining per capita rice intake in the region. Much more dynamic growth is expected for Africa and LAC where rice is making large inroads in people’s diets, displacing cassava, maize and millet, traditional food crops, but also wheat in a number of countries. On average, world per capita rice utilization is set to drop from 57.8 kg in 2006 to 57.4 kg in 2016, which would contain growth in aggregate rice consumption to less than 1% per annum over the period. In the OECD, overall rice demand would largely increase in line with population as per capita demand is anticipated keep falling slowly.
Brisk expansion in world rice trade to feature prominently also in the next ten years

Rice trade only represented 7% of world production or consumption in 2006, as policies in many countries are still anchored to high self-sufficiency objectives. Since the mid-1990s, however, a rapid expansion in rice trade has figured as one of the most prominent features of the rice economy. This tendency is anticipated to continue in the coming decade, with global rice trade (including EU-intra trade) projected to expand by about 2.2% per annum, from 29.3 Mt in 2006 to 38 Mt by 2016.

Part of the expansion would originate from larger imports to the OECD countries, in particular the EU, which recently scaled back import duties, and in South Africa. However, much of the boost would originate in Asia and Africa. In Asia, China is anticipated to purchase larger quantities, mostly high quality and fragrant rice, which would convert it into a net rice importer, given that the country might be less adamant to maintain a self-sufficiency stance as dwellers consume less rice and pressure on resources augments. Larger imports are also anticipated to Indonesia, Bangladesh, the Republic of Korea (which recently committed to enlarge its WTO minimum rice import quota to 409 000 tonnes by 2014), Saudi Arabia and Turkey. On the other hand, shipments to the Islamic Republic of Iran, the Philippines and Malaysia, are expected to decline, consistent with the self-sufficiency policies pursued in those countries.

In Africa, some important rice importers, in particular Nigeria might be affected by a January 2006 decision by the ECOWAS Heads of States, to implement the Common External Tariff (CET) of those countries belonging to the West African Economic and Monetary Union (WAEMU) as of January 2008. Under the WAEMU CET, rice attracts a low 10% custom duty, which would imply a strong cut in protection for Nigeria. The impact would be lighter for the other ECOWAS countries, where rice attracts
already low rates of duty (Gambia: 0%, Ghana: 20%; Guinea: 10%; and Sierra Leone: 15%). So despite efforts to boost production, imports to Sub-Sahara Africa, and to Africa in general, are expected to continue to increase, albeit at a lower pace compared to the past 10 years. Shipments to LAC are also set to rise, especially to countries such as Cuba, the Dominican Republic, and Costa Rica.

Much of the increase in trade projected over the next ten years is foreseen to be met by surging exports from Thailand, Vietnam, and to a lesser extent India, but also from some non-traditional exporters such as Cambodia, Laos and Myanmar. Increases are also expected from Argentina, Uruguay and the United States. Shipments from Pakistan are not anticipated to divert much from the levels recorded in recent years, while, supply constraints will prevent Egypt from responding to the trade expansion. Guyana and Suriname may also cut deliveries as reforms in the EU, their traditional market, will make export less profitable.

Global rice inventories

Rice inventories by 2016 are not expected to change much from the 2006 levels (Figure 2.9), resulting in a drop of the stock-to-use ratio from 20.4% in 2006 to 18.5% in 2016. Among OECD countries, smaller reserves would be maintained in Japan, as the recent reform in rice policies is implemented. China’s stocks are expected to be downscaled somewhat, still accounting for 28% of the country’s consumption by 2016. A reduction is also predicted for Thailand and Vietnam, the two major exporting countries. By contrast, Bangladesh, Indonesia and the Philippines, where large distribution schemes are run, are foreseen to keep or even increase the size of their inventories. These may also rise in the Republic of Korea. African countries are also projected to hold larger reserves, as their food dependency on rice increases.

International prices to strengthen somewhat

World rice prices (Thai 100B) are projected to peak in 2008 at USD 360 per tonne, in nominal terms, weakening somewhat thereafter and reaching USD 326 per tonne in 2016. This would represent only a 5% increase from the base year. In real terms, rice prices are projected 14% below their 2006 levels by 2016 (Figure 2.9), which assumes productivity gains will be sufficient to offset rising costs.
Key issues and uncertainties

Biofuels create a growing dependency of agricultural markets on energy prices and on policies

Agricultural production costs have always depended on energy prices: machinery fuels, fertilisers, pesticides and other inputs are directly related to prices of energy in general, and of crude oil in particular. While this Outlook assumes crude oil prices at relatively constant levels in real terms, a further increase in energy prices would therefore result in higher production cost, lower global output and hence higher prices for agricultural commodities on national and international markets. The opposite would be true if energy prices were to fall substantially during the projection period.

The increasing production of biofuels and the growing share of this new demand for crops in general, and for cereals in particular, create an additional link between energy and agricultural markets. Current crude oil and domestic transport fuel prices at levels significantly higher than in the past decade create a strong incentive to expand the biofuel industries in some countries, most notably in the US where ethanol producers enjoy significant margins. The construction of new production capacities, and hence the additional demand for maize as the main feedstock in ethanol production, could slow down considerably should crude oil prices fall to a significant degree, while higher oil prices could generate additional incentives to increase capacity building.
At the same time, government policies are among the main drivers behind these developments. As in many countries biofuel production is not profitable without public support, growth in biofuels production is often only achieved with the help of various measures either directly increasing the demand for biofuels (e.g. via blending requirements) or through fiscal measures reducing the gap between production costs of biofuels and the prices of competing fossil fuels. Changes in such measures are likely to have significant impact on biofuel production in a number of countries, and hence on the related demand for agricultural commodities in general, and on cereals in particular.

Several recent announcements could therefore alter market outcomes in this regard. The European Union recently declared a new target of a 20% share of renewable energies in the total energy mix by 2020. In particular, this would include a 10% minimum share of biofuels in the transport fuel mix by the same year. Similarly, the “Twenty-in-Ten” Energy Security recently announced by US President Bush aims to substantially reduce fossil fuel use over the next 10 years and in particular to substitute 15% of the gasoline consumption by alternative fuels, among others by biofuels. While both plans build on the expectation that second generation biofuels, i.e. fuels from biomass other than cereals, oilseeds and sugar crops, become commercially available within the given period, and the EU target would allow for significant imports of biofuels, both programs have the potential to substantially increase the demand for cereals and other feedstock products beyond the levels assumed in this Outlook report.

Global policy setting could change with successful conclusion of Doha negotiations

While currently more or less on hold, multilateral negotiations about a new trade agreement could result in significant changes in policies affecting agricultural market access, export competition and domestic support. On average in OECD countries, the share of particularly strongly distorting forms in total support to wheat and coarse grain markets is relatively low particularly when compared, for example, to dairy, beef or sugar markets. Nonetheless, a successful conclusion of the negotiations could result in policy changes that would alter the outcome of markets for the years to come as there might be noticeable indirect effects from changes in livestock and other crop markets on those for wheat and coarse grains.

Continued strong government involvement in cereal trade by China and India

The two most populous countries, China and India, are projected to import significant quantities of cereals over the Outlook period. These developments in both countries, however, strongly depend on government decisions. In the past, self-sufficiency considerations have prevented large imports by China, and while for wheat, maize and rice substantial import quotas have been agreed to the WTO, trade largely remains under the control of the central government. In consequence, imports of none of the three commodities are expected to reach the TRQ levels. This is particularly relevant to rice markets where global trade remains comparatively small: a filled TRQ by 2016 would represent an increase in imports by 3.4 Mt compared to these Outlook projections – equivalent to almost 9% of the global rice trade projected for that year.

Similarly, India is not expected to become a major player in international cereal markets despite its continued exports of rice and some imports of wheat. Small relative changes in the domestic supply and demand balance, however, or stronger public interest in international trade could result in market developments substantially different from those projected in this Outlook report.
CHAPTER 3

OILSEEDS AND OILSEED PRODUCTS

World market trends and prospects

Key market drivers

In the calendar year 2006, oilseeds markets have been characterized by considerable diversity but somewhat less dramatic price developments than other crop markets. Rapeseed prices and rapeseed oil prices have increased by almost 20% over the course of 2006. Other oilseeds and product prices have been less bullish. However, an impressive upward tendency for prices of all oilseeds and products was observed in the last quarter of the year. These price developments have been driven by the competition between oilseeds and cereals for acreage, particularly in the US. World prices of wheat and coarse grains have been driven up by reduced harvests in some countries and by booming ethanol production, in a context of declining stock levels. The oilseeds acreage - especially that for soyabeans - has been put under pressure, in turn, pushing prices up. That competition and the increasing demand for rapeseed oil for bio-diesel production have boosted demand and prices for the other vegetable oils as well. The strong increase in meal prices at the end of 2006 is also a consequence of strong cereal prices, as oilseed meal is increasingly demanded as a feed substitute for the relatively more expensive cereals. Stocks for soyabeans in the US have reached record level in 2006, underpinning the level of oilseeds stocks worldwide. Despite strong oilseeds demand and prices, high stocks level in 2006 can be explained by good harvests and the expectation of even higher oilseeds prices in 2007. Prices are expected to strengthen further in 2007 as oilseeds demand is expected to remain strong and high maize prices continue to pressure US soybean acreage.

Assumptions of average weather, unchanged policy and a stable macroeconomic environment are behind a rather smooth evolution of oilseeds and oilseed product markets over the Outlook period. Oilseeds, oilseed meal and vegetable oil markets will continue to expand, mainly because of rising demand for food and feed as incomes and populations grow especially in developing economies and as bio-diesel use expands. Possibilities of enlargement of oilseeds area are limited to few countries. In some of those countries, the competition for acreage between oilseeds and coarse grains is growing. The development of ethanol production is expected to be behind strong coarse grains prices in the first years of the Outlook period. These factors taken together lead to the expectation that prices of oilseeds and products, expressed in nominal terms, will remain firm in the near term (Figure 3.1). Behind this period, supply and demand adjustments are expected to take place for oilseeds and oilseed meal and this should reduce the pressure on prices. Over the Outlook period, the ratio between oilseeds and maize prices is expected to stabilise at a lower level than has been the case historically. Supported by high demand for both food and industrial use, prices expressed in nominal terms for vegetable oil are anticipated to remain strong.

11. All data are expressed on a marketing year basis (as defined in the glossary) unless stated otherwise. It is important to note that this discussion focuses on the following aggregates: oilseeds are rapeseed, soybean and sunflower; oilseed meals are rapeseed meal, soybean meal and sunflower meal; and vegetable oils are rapeseed oil, soybean oil, sunflower oil and palm oil.
The development of bio-fuels in many big economies with the potential spill-over effects on other commodity markets, the potential for further area expansion in South America and for further growth in palm oil production in South East Asia and the rising demand in developing countries are the central issues in the projections for oilseeds and oilseed products. OECD countries taken together, and even though they represent a lower share of global production and consumption compared to historical levels, are expected to remain key to developments in oilseeds and oilseed product markets. This is partly because of the commodity market impacts of expected rapid growth in ethanol and bio-diesel production in major oilseed producing countries in the OECD.

Main market developments

Growth in oilseeds production to slow down in the short term due to high maize prices

A feature of the oilseeds market has been the continuous expansion in production over many years. However, oilseeds production is expected to decrease in 2007 under the pressure of high maize prices. The main contributing factor is an expected decrease by almost 1% of global oilseeds acreage. The shift out of oilseeds production should primarily take place in the US where oilseeds acreage is expected to decline by more than 6% in 2007. Indeed, the US expansion of bio-fuel production which raises the demand for maize is anticipated to put further downward pressure on the oilseeds to maize price ratio. Notwithstanding this interruption, the projections show global oilseeds production rising by 25% in 2016 relative to the 2004-06 average. This is primarily due to the expansion of oilseeds production in South America, CIS countries and the EU. By the end of 2006, stocks had accumulated to record levels of about 13% of global consumption, marginally up from 12% in 2005. Stocks will be partially released over the first years of the Outlook period, to supplement tight global availability of oilseeds in a context of increasing crush demand. Oilseed meal and vegetable oil markets are the drivers of crushing demand for oilseeds. Historically, rising per-capita income and increasing population in the developing world have driven oilseed meal and vegetable oil demands. Over the course of the Outlook horizon, demand for bio-fuels appears to become a strong driver of markets for oilseeds and oilseed products. For meals, rising incomes and population are expected to continue to increase world demand for livestock products. Under the pressure of an increasing demand for protein meals in the feed rations of livestock, prices of oilseed meals are expected to remain strong in the first years of projection, but relatively cheaper than other feedstuffs. By 2016, oilseed meal consumption is expected to be about 33% above the 2004-06 average.

Figure 3.1. Oilseeds and oilseed products prices (expressed in nominal terms) to remain strong in the short term

![Figure 3.1](image)

Notes:
(a) Weighted average oilseed import price, Europe.
(b) Weighted average oilseed meal import price, Europe.
(c) Weighted average export price of oilseed oils and palm oil, Europe.

Source: OECD and FAO Secretariats.
In the course of 2006, the expansion of bio-diesel production has had an effect on vegetable oil prices especially on that for rapeseed oil. Prices for vegetable oils are anticipated to continue to increase in 2007 and to remain at higher relative levels than prices of oilseeds and oilseed meal over the rest of the Outlook period. Because of the direct demand for vegetable oil for bio-diesel use, the stimulation of rapeseed oil demand will be stronger than that for the other oilseeds and sub products. Consumption could be propelled to increase in 2016 by about 40% as compared to 2004-06 supporting a sustained rise in nominal prices. Nevertheless, over the Outlook period, average per annum growth rates of consumption of meals and oils are expected to be less than half their historical rates.

**OECD oilseeds markets influenced by bio-fuel developments**

OECD oilseeds production is projected to grow by 10% during the Outlook period. It is expected to decrease by 4% in 2007 but to return to the 2006 level in 2009 with moderate growth thereafter. The OECD area’s share of world oilseeds production will remain significant, but decrease from 43% on average in 2004-06 to 38% in 2016 (Figure 3.2). Even though global OECD oilseeds area should be relatively stable, some changes are expected in the geographical distribution of production mainly under the influence of projected oilseed demand for bio-fuels production.

Most of the reduction in oilseeds production in the OECD in 2007 will occur in the US. Indeed, in the short run, US producers are expected to increase coarse grains acreage, mainly maize, at the expense of soybeans. In a context of booming ethanol demand, returns to production are expected to continue to be favourable to maize as opposed to soybeans. As this price relationship is expected to hold over the medium term, US oilseeds area should decline in 2007 by 6% and continue to decrease, but more marginally, over the rest of the projection period. Nevertheless, by 2016, US oilseeds production is anticipated to recover to the average level of 2004-06 due to productivity increases. Although the US will retain by far the largest share in OECD oilseeds, it is expected to decline from almost 70% on average during 2004-06 to 63% in 2016.

![Figure 3.2. Oilseeds production in main OECD countries](image-url)
Oilseeds production in the European Union should increase by 50% between 2004-06 and 2016 due to both area expansion and yield improvements, and account for almost all of the global OECD area growth in the sector. This expansion in oilseeds production is driven by the development of bio-diesel derived mainly from rapeseed oil. The EU directive on energy use signed in January 2007 sets up a binding minimal objective of 10% bio-fuel use in total transportation fuel at the horizon 2020 in EU countries. The initial 2003 bio-fuel target of 5.75% bio-fuel use in total transportation fuel in 2010 is not assumed to be met, but in the context of the new EU directive, the EU bio-fuel industry is set to continue its rapid growth throughout the projection period. The rapeseed area is expected to increase in the former EU15 by almost 30%, mainly at the expense of area under pasture. Despite the encouragement of oilseeds production in the context of bio-diesel developments, high maize prices should keep the coarse grains area relatively stable. The new EU member countries are expected to contribute about 20% to the overall increase in EU oilseeds production. The projections are based on most recent market trends and on the current policy situation and thus do not take into account more stringent bio-energy policies that could be introduced in the future at the European level or in individual EU countries.

South America is the main supplier of oilseeds

Brazil and Argentina are expected to confirm their leading role in global oilseeds supply. Production in both countries is projected to increase by more than 54% and by over 31%, respectively, over the outlook period. Their share in global production should reach 38% in 2016. Total land in agriculture in Argentina is anticipated to continue its expansion but at a slower pace than in the past, with most of it being put into oilseeds. In 2016 it should be almost 12% higher than over the period 2004-06. The combination of oilseeds area expansion and slightly increasing yields should imply an average annual production growth of about 2.2% in Argentina. Brazil is expected to expand its production at a faster rate of almost 3.9% per annum. Yield increases and area expansion – driven by high oilseeds and oilseed products prices - should equally contribute to the production growth. Paraguay is a distant third among Latin American producers, but its oilseeds sector is growing steadily to above 6 Mt in 2016. The sector is mostly export oriented; the domestic crushing industry currently processes only about a quarter of the annual output. The combination of oilseeds area expansion and slightly increasing yields should imply an average annual production growth of about 2.2% in Argentina. Brazil is expected to expand its production at a faster rate of almost 3.9% per annum. Yield increases and area expansion – driven by high oilseeds and oilseed products prices - should equally contribute to the production growth. Paraguay is a distant third among Latin American producers, but its oilseeds sector is growing steadily to above 6 Mt in 2016. The sector is mostly export oriented; the domestic crushing industry currently processes only about a quarter of the annual output. Future investments into additional crushing capacity are expected, raising the share of domestic processing to about one-third of domestic seed production by 2016. Since 2004, India’s oilseeds area has stabilized at around 16 Mha and is projected to remain in this range. Production is expected to grow moderately, based on yield improvements from the application of modern biotechnology. This expectation is accompanied by a considerable degree of uncertainty as India’s commodity-specific production support policies and import measures tend to change over time, strongly affecting the relative economics of crop production, and thus the allocation of resources across different crops. India’s oilseeds import tariffs continue to be prohibitive, barring any significant imports. The country’s import requirements are satisfied by vegetable oil purchases.

The Ukraine has steadily expanded its oilseeds area over the past 10 years and has established itself as the world’s second largest sunflower seed producer, after Russia. The country is expected to continue this path in the coming decade by allocating another 1.6 Mha to oilseeds cultivation, reaching a production of 8.4 Mt in 2016. The crushing industry has developed along with seed production and is processing about 65% of the annual output. Oil and meal are largely exported.

Brazil to become the leading oilseeds exporter, surpassing the US

World oilseeds exports are expected to grow by 18 Mt over the Outlook period when compared to the period 2004-06. Brazil’s share of global exports is expected to grow from just less than 30% on average during the period 2004-06 to almost 41% in 2016. In 2009, Brazil should become the leading oilseeds exporter surpassing the United States, even though export growth is tempered by strong domestic demand.
for oilseed meal because of the development of livestock production. The oilseed and oilseed products export strategies differ between the two producing countries of Brazil and Argentina. Since 1996, Brazil has eliminated the system of differential export taxes on soyabean. However, exports of soyabean rather than soyabean oil and meal are favoured by internal fiscal policies with the crushing industry subject to a 12% production state tax. Although crushers are expected to expand their capacity, seed processing will not catch up with the growth in oilseed production.

In Argentina, the differential export tax system for oilseeds and oilseed products should continue to encourage domestic crush of seeds and exports of oilseed products. Domestic crushing is expected to increase by almost 35% over the projection period. This will not be enough to process all the expected growth in domestic production and, as a result, oilseeds exports are anticipated to continue to represent 18% of production in 2016. The Argentinean export tax for both soyabean and soybean products was increased by 4% in January 2007. This increase is meant to subsidise basic food products in a context of soaring food prices. Domestic wheat flour producers will receive subsidies to lower the cost of bread while livestock producers will receive subsidies to compensate for increasing maize feed prices. Paraguay has been strengthening its role as an oilseeds exporter over the past decade. By 2016, the country is expected to export 4 Mt annually.

US domestic demand for crushing is expected to be strong over the Outlook period and to grow at a rate of 1.3% per year. This growth is expected to be driven by sustained internal demand for soyabean meal and soyabean oil. Additional meal is anticipated to be increasingly used in livestock feed rations and some soyabean oil used for bio-diesel production. This combined with a drop in oilseeds production at the beginning of the projection period is anticipated to lead to a contraction in US oilseeds exports. The United States’ share of global exports is expected to decline from almost 40% on average over the period 2004-06 to around 29% in 2016. Canada should remain a strong oilseeds exporter. However, because of sustained internal demand, exports are expected to decrease in a context of relatively stable production. Australian oilseeds production and shipments should recover within two years of the drought-reduced 2006 oilseeds harvest and should be relatively stable over the outer years of the projection period.
Figure 3.3. Oilseeds crush to grow less in the OECD area than in developing countries

Source: OECD and FAO Secretariats.

Global oilseeds imports are boosted by China

Chinese oilseeds imports are expected to increase by more than 15 Mt, i.e. accounting for almost 85% of the global increase in imports over the projection period when compared to the 2004-06 period. This is expected to drive global oilseeds trade. This Outlook assumes that China will continue to expand its domestic oilseeds production and will keep expanding its crushing facilities to meet an increasing demand for oilseed meal and vegetable oil. The country will seek to capture the value added from processing oilseeds into protein meals and vegetable oils domestically by importing oilseeds. As a result of this development, China will consolidate its position as the world’s largest importer of oilseeds. In 2016, over 55% of Chinese oilseeds consumption should be met by imports. Modest gains in yields are expected to lead to a growth in domestic production by an average rate of about 0.7% per year. Oilseeds crush consumption is anticipated to grow but at a slower rate than in the past at around 2% per year (Figure 3.3). Because of the current policy context in China, both oilseeds and coarse grains consumption continue to be driven by demand for food security purposes.

The European Union should remain an important - but decreasing - importer of oilseeds, despite the impressive development of domestic oilseeds and in particular rapeseed production. At the beginning of the projection period, the European Union is assumed to invest in the development of crushing facilities to meet the rising demand for oilseeds generated by a growing bio-diesel industry as well as by sustained demand for vegetable oils for food and for oilseed meal. EU oilseeds imports should help to utilise more fully available crushing capacity at existing facilities. The CIS countries are anticipated to provide more oilseeds to the EU. In the OECD region, several countries like Mexico, Japan, Korea and Turkey are net importers of oilseeds. Domestic crush industries are expected to expand significantly in Turkey and Mexico to meet domestic demand for oilseed meal and vegetable oil.
Pakistan started to import oilseeds about ten years ago and in 2006 for the first time imported more than 1 Mt in the context of only moderate increases in domestic production. This amount is expected to almost double by 2016. The oil produced from these imports will still only cover a small percentage of the domestic oil demand making significant vegetable oil imports necessary. Indonesia is projected to continue to import around 1.3 Mt of oilseeds as it has in the past decade. Growth in the Indonesian livestock industry will be accommodated through additional protein meal imports.

**Oilseed meal use to expand in China and Brazil because of the development of livestock production**

Global oilseed meal consumption is expected to grow by about 33% over the Outlook period because of a worldwide increase in livestock production. The Outlook does not include any assumption on future outbreaks of animal diseases and associated changes in consumption patterns that might result from such events over the Outlook period. Despite having mature livestock industries, OECD oilseed meal demand is expected to increase by 13% over the outlook period. Nevertheless, oilseed meal consumption is anticipated to grow at a much slower rate of about 0.9% per year over the projection period compared to almost 2.8% per year over the previous decade. The OECD’s share of global oilseed meal consumption may decrease from 55% during the period 2004-06 to 47% in 2016. The impact of ethanol production in the US should be the main driver behind the 10% increase in meal consumption in the US expected over the projection period as relatively lower price ratios of oilseed meal to other feed crops are expected to intensify the use of protein meals in feed rations.

In the EU, the demand for oilseed meal is expected to increase only slightly over the projection period at 0.6% per year, compared to 3.8% per year in the previous decade. In fact, oilseed meal demand is anticipated to remain strong in the EU at the beginning of the Outlook period (stimulated by the relative lower price of oilseed meal in relation to other feed stuffs) but to increase at a much slower pace in the later years. The development of domestic rapeseed meal production should reduce the dependency of the EU on imported protein meals. The ratio of imports to consumption should decrease from 55% on average over the period 2004-06 to 47% in 2016. However, the EU should remain the leading oilseed meal importing region in the world. In Mexico and Turkey, oilseed meal utilisation in non-ruminant production is expected to intensify slightly.

Oilseed meal consumption in non-OECD countries should increase by more than 55% over the projection period (Figure 3.4). China and Brazil will account for almost 70% of this increase. In China, even if the rate of expansion is expected to slow down in comparison to the past decade, meal consumption is estimated to rise by more than 55% over the Outlook period, causing the country to become the world’s largest consumer, thus surpassing the EU. Meal demand is going to be satisfied by domestically produced meal (a considerable amount of which is derived from imported oilseeds) as well as through a sizeable expansion in meal imports. In Brazil, the livestock sector is expected to expand and production systems to become more intensive with greater use of prepared rations. This implies an increase by more than 130% of oilseed meal consumption over the Outlook period and, in turn, a slight decrease in oilseed meal exports. Argentina is expected to lead oilseed meal export expansion. A combination of factors such as investment in processing facilities, a differential export tax system and the small size of the domestic market are expected to lead to an increase in exports by more than 33% over the projection period.
India’s protein meal utilisation will expand at a higher pace than production throughout the outlook period, and as a result, annual meal exports decrease to about 3 Mt in 2016. The growing Asian import market driven by sustained growth in the livestock sectors of countries such as the Philippines, Malaysia, Saudi Arabia and Egypt is a target for Indian exports.

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 and are even falling in several least developed Asian and African countries. Because of this low feed intensity combined with small livestock sectors, developing and least developed countries use only slightly more than 50% of the total protein meal in the world, despite their livestock population share of around 80%. Feed intensity is projected to gradually increase in developing countries together with meat production in the entire developing world. These two developments are expected to gradually increase the share of protein meal consumed outside of the developed world.

Development of bio-diesel is pushing up demand for vegetable oils in OECD countries

Over the projection period, global vegetable oil demand is expected to be strong, increasing by almost 40% (Figure 3.5). In addition to the traditional drivers of vegetable oil demand - growth in global population and rising incomes - bio-diesel demand is expected to play an important role worldwide in determining outcomes for vegetable oil markets in the next ten years. About two-thirds of global vegetable oil is produced by crushing oilseeds and the remainder is harvested directly from the fruit of the palm tree.

Increasing production in the OECD region should only account for about 15% of the expected expansion in global production. The leading vegetable oil suppliers in the OECD are the US and the EU. In the US, bio-diesel production is expected to remain relatively small compared to bio-ethanol and most of
vegetable oil is used for food consumption. In Canada, bio-diesel should impact vegetable oil demand relatively more. The country has announced its intention to regulate bio-fuel by mandating a 5% ethanol blend in gasoline by 2010 and a 2% bio-diesel blend in on-road diesel and heating-oil by 2012. Although most of the expansion in bio-fuel production should be going to ethanol, some bio-diesel production capacity is expected to be developed as well. As a result, Canada’s vegetable oil use is expected to accelerate.

Significant expansion of EU oilseeds production and crush capacity is expected to lead to a sustained growth in vegetable oils production of about 2% per year on average. The increase will mostly take place in the first years of the Outlook period. Vegetable oil demand for non-food use is expected to be 130% higher in 2016 than over the period 2004-06. To meet both industrial demand as well as the traditional vegetable oil demand for food purposes, the EU is also expected to almost double its imports over the course of the projection period when compared to 2004-06. The capacity of the EU to encourage bio-diesel production and use is dependent on the policy context.

**Figure 3.5. Growth in vegetable oil demand is dominated by developing countries**

![Diagram showing growth in vegetable oil demand](image)

Source: OECD and FAO Secretariats.

**Sustained demand of vegetable oil in developing countries**

In China vegetable oil production from imported and domestically produced oilseeds is projected to increase by almost 40% over the Outlook period when compared to 2004-06. Vegetable oil imports and overall consumption are expected to increase by about the same rate. Vegetable oil consumption is expected to increase strongly in Argentina and Brazil as well. In these countries increased use should be driven mostly by food demand. However, this should not prevent these countries from continuing to be the main exporters of soyabean oil. They are anticipated to increase their vegetable oil exports at rates of 1.7% and 2.8% per annum, respectively, over the projection period. The main competitor for soyabean oil from
South America will be palm oil from Southeast Asia (Figure 3.6). These vegetable oils will compete in supplying non-OECD economies as well as the EU with vegetable oil. Two uncertainties have to be underlined for Brazilian and Argentinian vegetable oil exports. First in Brazil, bio-fuel production and use is mainly derived from sugar-cane based ethanol. If, stimulated by support policies, investments were made to develop bio-diesel producing industries then export availabilities of oilseeds and vegetable oils would be affected. Second, the differential tax system in Argentina favours the exports of soyabean oil in comparison to soybean seeds. However, the fiscal system is even more favourable for exporting bio-diesel. Significant investments in bio-diesel producing capacities in Argentina could change the market picture for oilseed oils and in particular for export supplies.

**Figure 3.6. Rapid growth is projected in vegetable oil trade**

As in the past, palm oil production will be clearly dominated by two countries, Malaysia and Indonesia. Currently, palm oil produced in these two countries accounts for almost one third of global vegetable oil output. In recent years, palm oil has surpassed soybean oil as the leading vegetable oil in terms of quantities produced and consumed. Over the last decade, palm oil became the most widely traded vegetable oil and its dominant position is expected to be solidified over the coming years. Over the course of the baseline, the combined production of Malaysia and Indonesia is expected to expand by 16 Mt. Growth rates are expected to be lower in the future compared to recent years mainly because environmental constraints will restrict area expansion. Malaysia has been the leading producer in the world for many years, but Indonesia has posted higher growth rates in recent years and has claimed the top producer spot in 2006. In 2016, Indonesia’s output is estimated to exceed that of Malaysia by 15%. More than 80% of Indonesia’s production is exported as crude palm oil. Malaysia, by contrast, is expected to further expand its oil-based chemical industry so that it can transform about 18% of its palm oil production domestically by 2016, up from 16% on average over the period 2004-2006. Both countries support domestic and foreign investments in biodiesel production capacity and several facilities are in the planning or construction stages. However, projections for Malaysia and Indonesia are characterized by a considerable degree of uncertainty. Current projections are conditioned on a stable, growth-oriented

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Source: OECD and FAO Secretariats.
political and economic environment in the region, encouraging the substantial long-term investments necessary for sustainable expansion of the industry.

In India, the world’s third largest buyer of vegetable oil, import purchases have, in recent years, accounted for close to 60% of domestic use. In the coming decade, oil consumption is projected to grow at about the same pace as domestic production sustaining the country’s dependence on imports. Based on this expectation, further growth in the volume of imports is anticipated. Although domestic production of oilseeds is expected to accelerate, the increase will not be sufficient to reduce the current deficit between domestic supply and demand of vegetable oil.

The divergence in average per capita consumption levels between developed countries, on the one hand, and developing countries (in particular least developed nations in Africa) and transitional economies, on the other, remains significant during the projection period.

Key issues and uncertainties

The present Outlook is subject to several uncertainties. First, as for other commodities, the evolution of the macroeconomic environment, changes in agricultural policies (including trade policies) and unexpected variations in weather conditions will affect the Outlook. These uncertainties may have direct or indirect (through cross-commodity effects) impacts on markets for oilseeds and oilseed products over the medium term. In what follows, a number of more specific sources of uncertainty are discussed briefly.

Potential for bio-fuel use growth not fully known

The Outlook starts in a period of soaring raw commodity prices. The strong increase in prices in the course of 2006 has been mainly driven by unusual weather and certain policy changes. Under the pressure of policy developments, bio-fuel production and demand have grown strongly and been at least partly responsible for inflating prices of coarse grains and vegetable oils even further. Similar patterns have emerged for oilseeds and oilseed meal prices. Assumptions on bio-fuel developments in the Outlook are based on the continuation of the current policy set. Bio-fuel use targets have been established in some countries; many countries have chosen to privilege one type of bio-fuels rather than another. If binding directives were to be implemented in major supplying or consuming countries, the global market picture for oilseeds and oilseed products would be affected. Key countries to watch are Brazil, Argentina, China, Malaysia, Indonesia, the US and the EU. Obviously the development of bio-fuel is subject to its commercial viability (where it is not mandatory regulated) and as such to the evolution of crude oil prices and prices for feedstock. In particular, the development of the production of bio-diesel for domestic use or exports in vegetable oil exporting countries in South America and South East Asia could have strong impacts on prices. In the EU, changes to policies in place could imply a somewhat stronger increase in oil-rich rapeseed acreage together with continued high levels of imports. In the US, the uncertainty concerns a by-product of ethanol production, dried distiller’s grains (DDG), which can be used in feed rations. An increase in the use of DDG could lower the demand for oilseed meal and thus depress prices at the domestic as well as global level. China is currently putting food security as its first objective. However, given the importance of the country on oilseeds trade, encouragement of domestic bio-fuel use could create potentially large shifts in demand for oilseeds products.

High commodity prices might change supply and demand patterns

High commodity prices have consequences on food demand especially in developing economies. Concerns are growing in many food importing developing countries about the rising prices of basic food staples. At the beginning of 2007, Mexico has been confronted by the tortilla crisis and Argentina has raised by 4% its export taxes on soyabean and soyabean products to provide subsidies that lower the cost
of flour to livestock producers. In the outer years of the Outlook projections, oilseeds and oilseed meal prices are expected to be less pressured because of supply adjustments. If such adjustments do not take place, prices would remain high, raising feed costs above what is now expected. This in turn would limit growth in meat production, lifting meat prices as well and limiting the increase in meat consumption, in particular in developing economies.

**Market outcomes for oilseeds and oilseed products is dominated by only few market players**

The potential for further increases in the production of oilseeds and of vegetable oils from palm trees is concentrated in relatively few countries. Brazil, Argentina, Malaysia and Indonesia have become giant market players, but the potential for further expansion of production in these countries is constrained by environmental concerns, among them deforestation. Given the size of production and exports in these countries, any important shock to their economies or drastic policy decisions will have huge consequences on markets and world prices for oilseeds and oilseed products. On the demand side, except for bio-fuel related effects, the situation in the OECD area should be relatively stable. The main uncertainty concerns developing countries and especially China and India that represent a large and growing share of the world’s global population and income, and thus play a crucial role in global demand for oilseeds and oilseed products.

**New concerns about nutritional and health impact of vegetable oil are likely to affect markets**

As research about specific properties of different vegetable oils advances new nutritional issues and related health considerations are emerging. Consumer awareness about these aspects is rising and, consequently, the marketing of vegetable oils and food products with these attributes is increasingly influenced by legislation that is introduced to better inform and protect consumers. The mandatory display of information on the trans fatty acid content on food product labels, as well as outright bans of those acids in food products are examples of such situations. Current evidence shows that these developments can alter the preference of consumers and food manufacturers for individual vegetable oils in a lasting manner, leading to appreciable changes in overall consumption patterns. Moreover, under certain circumstances, adjustments in the global pattern of trade can occur, in terms of changing market shares of individual products and countries. Scientific advances and the response of consumers, the industry, policy makers and of the research community itself are difficult to anticipate in terms of direction, magnitude and response time and therefore represent a significant source of uncertainty in projections.

**Genetically Modified crops could change production context**

Another uncertainty comes from future developments regarding genetically modified crops. Past experience has shown that GM crops have the potential to modify productivity and production costs, thereby affecting competition between crops and, consequently, also the overall pattern of production, consumption and trade. In many countries the introduction and adoption of GM crops depend on policy decisions that are still evolving in response to consumer and producer concerns. And future decisions regarding the introduction of GM crops as well as further research advances remain of strategic importance for the sector in many developed and developing countries.

**Animal disease outbreaks have consequences for the oilseeds sector**

Any widespread outbreak of animal diseases would depress livestock production and feed demand in affected areas, and thereby oilseed meal prices. Yet, the actual impacts on meat production and related meal demand and prices will depend on the spread of the disease, the domestic policies taken to control and eradicate it, as well as on the extent to which the outbreak affects meat production in other countries and regions through trade and trade policy linkages.
CHAPTER 4
SUGAR

Back to surplus in the near term

World sugar prices experienced considerable volatility over the course of 2005-06, reaching a 25-year high in early 2006. Having strengthened since 2003, world prices surged in late 2005 and early 2006 under the pressure of tight global supplies and growing linkages between international sugar and oil prices, and then fell back again later in the year. As the deficit in the global sugar balance contracted throughout the remainder of 2006, world prices steadily declined. For 2006-07, the global sugar balance has moved strongly into surplus as production in both exporting and importing countries responded to higher world sugar prices in the previous marketing year. World raw sugar prices are projected to decline by nearly 27% to average around USD 11.5 cents/lb (USD 253.5/t) in 2006-07, due to abundant supplies, higher stocks and an emerging global surplus. The white sugar margin remained firm at the end of 2006 due to tighter supplies, following the withdrawal of large quantities of high quality white sugar exports from the world market with reform of the European Union sugar regime. As a consequence, white sugar prices are expected to fall in 2006-07, but at a slower pace than for raw sugar, due to delays in filling the gap in supplies left by the retraction of the EU from the world market.

Figure 4.1. World sugar prices to remain under pressure

Notes:
a) Raw sugar world price, New York Board of Trade sugar contract No 11, f.o.b., bulk spot price, September/August.
b) Refined sugar price, London No 5, f.o.b. Europe, spot price, September/August.
Source: OECD and FAO Secretariats.

12 The assistance of colleagues at the International Sugar Organisation in evaluating the projections is gratefully acknowledged.
**Bearish fundamentals to pressure prices**

Historically, world prices have tended to reflect the production costs of the most efficient producers. Over the longer term, production costs have been falling twice as rapidly for sugar from cane than from sugar beets with sugarcane producers having the lowest costs of production. Current sugar prices, though considerably lower than the levels reached one year ago, are still above the prevailing cost of production of the largest producer, Brazil. With significant ongoing investment in new processing plants and supporting infrastructure, production capacity for sugar and ethanol is expected to continue to grow in Brazil in coming years, as well as in a number of other sugar exporting countries, apart from the EU. At the same time, a number of traditional sugar importing countries, led by the Russian Federation, have taken steps to increase domestic production in recent years and increase self-sufficiency in sugar output, in part due to the growing cost of purchasing sugar from the world market.

**Figure 4.2. Real\(^3\) sugar prices to trend down**

Notes:

a) Raw sugar world price, New York Board of Trade sugar contract No 11, f.o.b., bulk spot price, September/August.

b) Refined sugar price, London No 5, f.o.b. Europe, spot price, September/August.

c) Prices deflated by USA GDP deflator (2000=1).

Source: OECD and FAO Secretariats.

These market trends are expected to support further increases in world sugar output. As a result, global sugar production should continue to exceed consumption for a few years to come, leading to further downward pressure on world market sugar values over the longer term. In reflection of these bearish fundamentals, world indicator prices for raw and white sugar are projected to fall by 12% and 10%, respectively, when compared to the average level of 2004-06, to reach USD 242/t for raw sugar and USD 309/t for white sugar in 2016-17. The margin between raw and white sugar prices should narrow over the Outlook, given expectations of higher demand for raw sugar for further refining, as an increasing number of large destination and toll refineries\(^{13}\) come on stream, in the Middle East and Asia, and with the resulting increase in supply of refined white sugar. With the demise of EU sugar exports, the size of the white sugar premium should essentially reflect the cost of further sugar refining. World sugar prices are expected to continue to decline in real terms over the projection period.

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\(^{13}\) These refineries are being established in former import markets for white sugar to process raw sugar for domestic use and in some cases for export.
Global developments

A continuing rise in sugar supplies and use

Sugar cane production currently accounts for more than 75% of global sugar output, and is projected to increase to nearly 80% by 2016-17, despite the outlook for lower international sugar prices. This growth results from continued expansion in area harvested and, in particular, higher yields in many of the major sugar producing countries. The perennial nature of sugarcane crops tends to contribute to steady increases of sugar output over time as producers increase planted area to cane in response to higher prices, and multiple harvests are usually taken from a single planting (ratooning). In contrast to the expansion in sugarcane, global sugar beet area falls by nearly 8% over the same period. This is mainly due to lower sugar beet area in the EU, following recent sugar policy reform.

Figure 4.3. Larger sugarcane production to account for most of the additional sugar output

World sugar production is expected to increase at a faster pace than global consumption in the near term and to reach 187 Mt n 2016-17, some 24% or 36 Mt above the average for the 2004-06 period. With production in the OECD area relatively stable, other countries account for virtually all the increase in global sugar production to 2016-17, with some of this growth driven by rapidly increasing demand for fuel ethanol, for which sugar crops are expected to be a major feedstock. Outside Brazil and the United States, which already have major sugarcane–based and maize-based fuel ethanol sectors, respectively, a number of sugar producing countries are currently embarking on renewable energy programmes, such as the EU, Japan, Malaysia, Indonesia, South Africa, Colombia, and the Philippines, particularly in the transport fuel sector. Further rapid growth is also expected in the United States and will involve increased use of sugar beets as a feedstock. Some of these fledgling fuel ethanol programmes, however, are expected to use molasses or starch sources such as grains and cassava, in preference to raw sugarcane juice as the preferred feedstock. In other regions, such as the EU, sugar beets use is increasing but forms a minor part of the feedstock for bio-ethanol production. With the rapid growth in demand for sugarcane-based ethanol production in Brazil, this alternative use of sugarcane has emerged as an extremely important driver of growth in global sugar output. Although increasing supplies of sugar cane are being used to produce
ethanol, particularly in Brazil, the world’s largest sugar producer and exporter and currently accounting for over 40% of world sugar trade, growing demand for ethanol is not expected to halt further expansion in sugar output either in Brazil or other producing nations.

**Steady consumption growth should underpin the market**

Steady, year in year out, consumption growth is the basic driver of the world sugar economy. Despite some slowdown in sugar consumption growth in 2005/06 in part due to exceptionally high world prices, global consumption is expected to grow by around 1.8% per year over the period to 2016-17. This will be driven mainly by higher growth in the developing and transition economies, where sugar consumption is expected to respond to rising incomes, dietary convergence, continuing urbanisation and faster population growth. Overall, the aggregate growth in sugar consumption in the developing countries is projected to be slightly lower than the past five year average of just over 2.5% per year, but to continue to grow at different rates in various parts of the developing world. Consumption in the OECD area is projected to increase at less than 1% per year, reflecting the mature status, in general, of sugar and sweetener markets in many of these countries. The more mature sugar and sweetener markets tend to be characterised by high per capita consumption levels with future growth limited by changing dietary patterns, health related concerns and slow population growth. Although non-OECD countries already account for the bulk of sugar consumption, their respective share of total global sugar disappearance is expected to further increase from 73%, on average for 2004-06, to 77% by 2016-17. The developing countries of Asia and the Far East are expected to have the fastest growth in sugar consumption.

Global sugar stocks increased in 2005-06 after three consecutive years of stock drawdown that eliminated most of the structural surplus that had previously overhung the world market and depressed prices. Some further increase in global sugar stocks is anticipated in the near term as global sugar availability increases faster than demand. Despite an expected 16% increase in total stocks by 2016-17, rising consumption is projected to lead to a global stock-to-use ratio fluctuating around 44% over the same period, slightly down on the average for the last five years.

**Figure 4.4. Global stock to use ratio to fall in near term**

![Figure 4.4. Global stock to use ratio to fall in near term](image)

Source: OECD and FAO Secretariats.
Main developments in major sugar economies

OECD countries’ global market shares continue to contract

The OECD area currently accounts for around 27% of world sugar production and consumption. These shares have been declining over the last decade given the growing importance of the developing and transition countries in the world sugar market, and are projected to fall to around 21% for production and 23% for consumption by 2016-17. Among the leading OECD producers, cyclone damage and a smut outbreak sharply reduced Australian sugar production in 2006-07. With the wider adoption of smut resistant cane varieties as replanting occurs, sugar production is projected to increase to around 5.7 Mt in 2016-17. This outcome is expected to result primarily from increasing cane yields and sugar extraction rates, rather than from growth in the sugarcane area, as environmental constraints on suitable land for cane growing are emerging. With higher production, sugar exports are projected at around 4.5 Mt by the end of the decade.

EU sugar industry expected to downsize

The largest sugar industry in the OECD area is that of the European Union. The EU sugar sector (EU27, including Bulgaria and Romania from 2007) is undergoing a period of significant downsizing following the adoption of a reform package in 2006-07. The sugar reforms over the four year transition period, 2006-09, included, inter alia, a phased 36% reduction in institutional sugar prices, a retention of quota controls on sweetener production (and some expansion of sugar and isoglucose quotas), a voluntary quota buy-back restructuring scheme with degressive payments for surrendered quota, and a sharp reduction in subsidised exports to agreed WTO limits. EU subsidised white sugar exports are projected to fall sharply from 7.9 Mt in 2005-06, the last year of the former sugar regime, to 1.6 Mt in 2006-07 and to stabilise slightly below this level through to 2016-7.

Figure 4.5. EU sugar reform leads to lower production and exports

In 2006-07, nearly 1.15 Mt of sugar production quota was surrendered under the voluntary quota buy-back scheme together with 100% of the inulin syrup quotas and some isoglucose quota. For 2007-08, sugar producers have indicated their intention to renounce 676 000 tonnes of quota, rather than the 4-5 Mt
that the EU Commission had been expecting. With insufficient quota being taken out of production, the Commission has proposed a temporary quota cut of 2 Mt for 2007-8, to follow a similar temporary cut in quota in 2006-07 averaging 13.5% across the EU27. Under the existing terms of the voluntary quota buy-back scheme, if insufficient quota is surrendered by sugar producers for payment in the four years to 2009-10, the Commission will make a permanent linear cut in the remaining quota in 2010 to reduce production in order to balance the internal market without an excessive build up in stocks. Provided that these measures are successful, EU sugar production is expected to decline by some 6 Mt to reach 15.9 Mt in 2016-17. A further factor influencing the size of production quota cuts is the expected growth in imports from LDC countries from 2009 onwards under the EBA Initiative. With growing preferential sugar imports over the next decade, total EU imports are projected to reach 4.1 Mt in 2016-17. As a result, the EU27 will have turned full circle from being a major net sugar importer at the time when the sugar regime first commenced in 1968, to a large net exporter over the years to 2005-06, followed by a return to a net sugar importer status in 2006-07. There remains the distinct possibility of the EU becoming the world’s largest sugar importer in the period to 2016-17, given projected growth in sugar imports over the coming decade.

US and Mexico to face a free market under NAFTA

The United States and Mexico resolved a longstanding sweetener dispute in July 2006. Combined with the elimination of all duties and restrictions on sugar and high fructose syrups (HFS) under the NAFTA in 2008, this signals the emergence of a fully integrated North American sweetener market. Greater use of high-fructose corn syrup (HFCS) in Mexico, given the removal of a 20% consumption tax on beverages manufactured using HFCS, is expected to lead to a higher exportable surplus of sugar directed primarily to the US in 2008. However, differences in sugar quality, product type and handling, may constrain growth in sugar exports from Mexico to US markets. Furthermore, despite an expectation of increased sugar production in Mexico over the coming decade, growth in domestic sugar consumption is expected to exceed that of output and lead to lower exportable surplus for the US market in later years of the projections period.

In the case of the US, expectations of growing sugar imports from Mexico will be in addition to the import volumes mandated under the WTO tariff rate quota (TRQ). Therefore, total imports are expected to exceed the import volume trigger established in the 2002 Farm Act for suspending the domestic marketing allotments program for sugar. Given the likelihood of further growth in domestic sugar production potentially reaching nearly 8 Mt in 2016-17, public stock purchases (by the Commodity Credit Corporation) may be required in each year out to 2016-17 in order to defend the US sugar loan rate and price support system. Only limited growth in US sugar consumption is anticipated over the Outlook period.

Japan and Korea remain significant importers of mainly raw sugar for domestic processing and consumption over the outlook period. Korean sugar imports are projected to increase strongly and to grow by some 27% to just over 2 Mt in 2016-17, whereas imports by Japan decrease slightly over the same time span in line with slowing per capita consumption.

Marketing allotments designate how much sugar can be sold by millers and processors on the 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. The overall quantity of sugar to be allotted for a crop year is determined by subtracting the sum of 1.532 million short tons, raw value (STRV) and carry-in stocks of sugar from the USDA’s estimate of sugar consumption and reasonable carryover stocks at the end of the crop year. Any sales that exceed the allocated allotment are subject to penalty rates. Marketing allotments are suspended if USDA estimates that sugar imports levels for human consumption will exceed 1.532 million STRV trigger level.
Main developments in non-OECD countries

Brazil dominates the South American and World scene

Brazil remains the largest sugar and ethanol producer as well as exporter in the world of these commodities. Sugarcane yields have increased significantly over the past two decades to accommodate the growth in production, and have lowered production costs throughout the commodity chain. Approximately 50% of total sugarcane output in Brazil is directed toward ethanol production, with the centre-south region accounting for nearly 80% of all sugarcane feedstock. Brazil has produced ethanol from sugarcane since 1974, when the Proálcool Program was introduced as a way to reduce dependence on oil imports, and currently Brazil is the only country worldwide to utilize ethanol as a primary transport fuel. Brazil is considered amongst the most competitive sugar producers in the world, with efficiencies derived from co-production of ethanol and sugar and by-product use (bagasse) in lowering processing energy costs. Reports indicate that at present sugar cane prices, ethanol output in Brazil is competitive in global markets at oil price levels as low as USD 35 per barrel.

As noted, Brazil plays a dominant role in world sugar markets. The volume of Brazilian sugar production and exports, driven by competition for domestic cane supplies between sugar and ethanol end uses, is now the principal supply factor driving movements in world sugar prices. Rising demand for sugarcane-based ethanol from a large and growing domestic fleet of flex-fuel vehicles and for export play a key role in determining the size of annual sugar output. To meet the growing demand for ethanol and sugar, sugarcane production has grown rapidly in Brazil in the past few years. Although sugarcane production will continue to increase, some slowdown in the rate of growth is projected in the period to 2016-17, to just over 5% per year, with the larger base of cane production. At the same time, more cane is expected to be used for ethanol than sugar production in the period ahead (from a 51:49 ethanol/sugar cane allocation for 2004-06 to a 60:40 split by 2016-17). Despite the greater quantity of cane going into ethanol production, sugar supplies are expected to be sufficient to meet the growth in demand. Brazilian sugar production is projected to increase to nearly 46 Mt and alcohol production to nearly 44 billion litres by 2016-17, an increase of 46% and 161%, above the level of 2004-06, respectively, to meet growing domestic and export demand. In the same period, Brazilian domestic sugar use is projected to increase to 14 Mt and exports to total nearly 30 Mt by 2016-17; with the latter representing around 50% of world sugar trade.

Figure 4.6. Faster growth in ethanol production than for sugar in Brazil

Source: OECD and FAO Secretariats.
Argentinean production has benefited from high world prices and the devaluation of the currency back in 2002. The industry is expected to undertake further investment to boost sugar production and to sustain an ethanol programme. By 2016-17, Argentinean sugar production is projected to reach 2.7 Mt, some 24% above the average for 2004-06. With increased production, sugar exports rise to just over 1 Mt in the same period. Despite recent government decisions to revitalise and provide more material support to the sugar industry, Cuban sugar production is projected to increase only slowly and with little growth in exports to 2016-17.

Figure 4.7. Brazil dominates the group of sugar exporters

An increasing role for Asia in world trade

India is the second largest sugar producer after Brazil and an intermittent sugar trader. A feature of Indian sugar production is a long established production cycle that arises from fluctuations in annual production around rapidly growing demand attributable to a combination of sugar policy, different sweetener end uses of sugarcane for sugar, gur and khandasari and the wide diversity of sugar cane growing conditions in India. The pronounced production cycle is expected to continue over the projection period with record output expected in 2006-07 as well as in 2007-08 due to increased plantings following higher prices, and eventually reaching 29 Mt in 2016-17. Years of production surges and large stock accumulations result in periodic exports over the period, with white sugar export volumes playing a potentially more important role in regional trade over time.

Rising incomes, larger urban populations and changing patterns of food consumption should lead to increased sugar use and rising per capita consumption in China, where consumption is currently well below the average for the world, and in many other countries in Asia. Another factor boosting sugar demand has been the rapid development of the food industry and food and beverage preparations. Per capita consumption of sugar has also been affected by the high use of artificial sweeteners (mainly saccharin) in China, despite efforts by the government to constrain the use of high intensity sweeteners. As government controls on artificial sweeteners continue to tighten, sugar disappearance is projected to grow to 16.8 Mt in 2016-17. This projected level of use would imply rising imports that exceed the tariff quota of 1.95 Mt by 2011-12. Sugar production has increased in recent years with increased planted area of both sugarcane (the dominant crop) and sugar beets following a rise in domestic prices. Production is projected
to grow by 1.5% per year over the Outlook to reach 13.8 Mt in 2016-17, some 3 Mt above the 2004-06 average level.

With the removal of the limit on sugarcane area, sugar production in Thailand is expected to expand steadily over the coming decade to reach 7.5 Mt in 2016-17. Sugar exports are projected at 4.6 Mt and are expected to be fairly equally divided between white and raw sugar. Sugarcane is expected to remain a minor feedstock for Thailand’s fledgling bio-fuel industry partly due to continuing uncertainties over sugarcane revenue sharing between growers and mills, with cane-based ethanol production projected to reach only around 150 million litres in 2016-17. Indonesian sugar production is projected to increase to 2.8 Mt in 2016-17, some 13% above the average for 2004-06. With domestic consumption expected to continue to grow faster than production, despite government plans for self-sufficiency by 2009, imports of sugar are projected to reach some 2.2 Mt by the end of the decade.

**Russia to become more self-sufficient in sugar**

Outside of Asia, Russia has traditionally been the world’s leading sugar importer, having switched most of its imports from white to raw sugar for domestic off-season refining in the 1990s. Rapid growth in domestic beet production, stimulated by higher prices with tariff protection and increasing investment, has been a feature of the industry in recent years. This trend is expected to continue over the medium term and to lead to further import substitution. Sugar production is projected to increase to 4.0 Mt in 2016-17, and with only small growth in sugar consumption, raw sugar imports are anticipated to decline to 2.3 Mt in the same period.

![Figure 4.8. The Russian Federation to lose its position to EU as the leading sugar importer](image)

Source: OECD and FAO Secretariats.

**Preferential trade affected by EU sugar reform**

The group of African, Caribbean and Pacific (ACP) countries that export sugar to the EU will be adversely affected by the phased cut in Community sugar prices from 2006-07 to 2009-10. Production in the ACP countries as a group is projected to decrease marginally over the projection period. EU sugar sector reform essentially reduces the value of existing preferential access to the EU market and this may lead to restructuring and downsizing of higher cost ACP sugar industries. Growth in output after 2009 by
low cost LDC producing nations within the ACP group is expected to compensate in part for the structural change and potential production declines in high cost ACP countries. Consumption in the ACP group is expected to grow by 2% per year over the projection period, largely driven by population growth, shifting dietary patterns and increased incomes. Generally, expectations of reduced exports from high cost ACP origins after 2009 may be offset by increased trade from lower cost LDC member countries, within and outside the ACP group, such as Malawi, Mozambique, Sudan and Zambia, driven by implementation of the EBA Initiative of the European Union. Sugar exports from EBA countries to the EU, following introduction of unrestricted duty-free market access to the EU in 2009, are projected to reach 1.7 Mt in 2016-17. Large destination refineries in the Gulf region may also attract increased raw sugar export volumes from competitive world suppliers, possibly from ACP or EBA origins, depending on costs and returns in comparison to shipping to the EU. However, considerable uncertainty remains as to the ability of the EBA countries to significantly increase export volumes given poor infrastructure, inefficient handling facilities and reduced price expectations with reform of the EU sugar regime.

**Figure 4.9. The non-OECD countries are the leading producers and consumers**

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

Source: OECD and FAO Secretariats.

**Some issues and uncertainties**

The sugar projections discussed in this chapter are a conditional scenario based on a number of assumptions regarding the future macroeconomic environment, a continuation of existing agricultural policy, 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. For example, the projections for the United States are based on a continuation of the provisions of the 2002 Farm Act for sugar which is due to expire in 2007. Should these provisions for sugar fundamentally change in the next Farm Bill, some significant differences would be observed in the projections for the United States. In view of the large role that agricultural and trade policies play in world sugar markets, important uncertainties for the sugar outlook are future changes in sugar policies and the eventual outcome of the current round of multilateral trade negotiations in reducing support and further opening up sugar markets. The extent to which the current upsurge in renewable energy programmes by countries around the world
will impact on future sugar crops use is another uncertainty for the outlook. Fluctuations in exchange rates against the US dollar will have implications for the export competitiveness of sugar industries. The Brazilian Real has been appreciating against the US dollar in 2006-07. Depending on the future direction of the Real/US exchange rate this will determine the level at which world sugar prices, denominated in US dollars, is supported by Brazilian costs of sugar production.

**Increasing bio-ethanol production may underpin the world sugar market**

Sugarcane is generally regarded as one of the most significant and efficient sources of biomass for bio-fuel (bio-ethanol) production. Sugarcane offers production alternatives to food, such as feed, fibre and energy, particularly co-generation of electricity and ethanol. Strong linkages between world sugar and oil prices have emerged in recent years, driven in part by the relationships between sugar as the primary ethanol feedstock in Brazil, the dominant producer and exporter of both sugar and ethanol in the world. Given expectations of rising oil prices, the significant potential for expansion of global sugarcane production as ethanol feedstock has resulted in a heightened global focus on sugar and ethanol as internationally traded commodities. Many countries have either implemented or are actively formulating policy frameworks to develop bio-energy sector in seeking ways to lessen the adverse impact of higher oil prices on national economies as well as mitigate greenhouse gas emissions on climate change.

The production of alcohol for renewable fuels from sugar crops offers the possibility of an additional and growing source of demand for sugar producers. The more sugar-based ethanol (alcohol) is produced, the greater the flexibility on the supply side, and in turn, the greater the possibility for value-addition along the commodity chain. This could also mean that sugar price peaks, as seen in the mid-1970s and beginning of the 1980s, may become less likely, as there will be enough cane available to prevent sugar values from skyrocketing. However, sugar consumers will be competing for cane and beets with motorists, which, under certain circumstances, could keep sugar prices at relatively higher levels over longer periods of time. The worst-case scenario for sugar exporters would be a sharp fall in crude oil or gasoline prices, making bio-fuel production and use unattractive and freeing large amounts of sugarcane and sugar beets for sugar production which could trigger a longer period of price depression. The stronger probability, however, is for generally higher raw and white sugar prices, on average, underpinned by growing demand for renewable bio-fuels.

**EU faces challenges in balancing its internal market**

As noted, the EU is seeking through a voluntary production quota retirement scheme to reduce sugar production in order to bring its internal market into balance in the light of the possibility of rising imports and tight limits on exports. If the voluntary retirement programme is unsuccessful in removing sufficient quota from production, the Commission retains the mechanism of a permanent linear quota cut in 2010, at the completion of the four year transition period, to achieve this objective. Apart from reducing production by 5-6 Mt, other difficulties the EU faces in bringing its internal market into balance are the severe constraint placed on sugar exports and an unknown level of future imports from LDC countries under the EBA initiative. This might also include the ACP countries if they gain additional market access under the Economic Partnership Agreements that are currently under negotiation. To some extent, a break on, or slowdown in the future supply of, EBA imports may come from the provision included within the legislative procedures for the sugar reform which requires the Commission to review exports from an individual LDC country if they increase by more than 25% above the level of the previous year. In addition, in a period of sugar surplus the “preventative withdrawal” mechanism of a temporary quota (and percentage import) cut, as employed in the 2006/07 and 2007/08 campaigns, continues to be available to the Commission to withdraw excess sugar from the market. However, a more interesting question is what happens when not enough sugar is supplied under preferential imports to meet EU requirements. Normally the EU could turn to the world market to meet its additional needs in these circumstances. However, in
periods of high world prices, this action may push world prices even higher and discourage additional preferential imports. Should supplies from EBA countries prove to be highly variable from one year to another or increase less strongly than expected, this will likely add to the problems of achieving internal balance in the EU market.
CHAPTER 5

MEAT

World market trends and prospects

Key market drivers

The standard factors influencing the meat Outlook, including exchange rate movements and the rates of income and population growth, remain key to the evolution of the markets for meat. However, many other factors condition how markets will evolve, both internationally and at national levels. Meat markets will remain heavily affected by the incidence of animal disease outbreaks, and associated increasing standards for meat safety and for animal welfare. Environmental standards will also play an increasing role in the future. Other factors include new policy initiatives by governments, the recent impact of the Australian drought, renewed competition from North American exports in the Pacific meat market, changes in disease-related trade barriers and the impact of renewable energy (bio-ethanol and bio-diesel) production on feed prices. Taken together these meat trade and price shocks will increase the complexity of trade patterns, with additional countries importing and exporting meat, as events unfold.

While in general the Outlook assumes minimal growth in market access for meat, several policy changes will play an important role in markets. For example, the implementation of bilateral or regional free trade agreements (FTA), such as the Australia-US (FTA), is expected to support trade growth in meat trade. The Australia-US FTA, which came into force on 1st January 2005, eliminated the US in-quota tariff on chilled, frozen and processed beef. Starting in 2007, the quota will also expand by 20 kt and reach 448,214 kt by 2022, a 70 kt increase over an 18-year period. The over quota tariff will also be phased out starting in 2013. This should promote increased shipments of beef from Australia to the United States over the Outlook period. Finally, the impact on EU meat markets due to the accession in 2007 of Bulgaria and Romania should mostly translate into increased EU imports of beef and poultry from third countries and a reduction of EU exports to third countries of pigmeat.

The Outlook for meats is conditioned by various assumptions, such as a continuation of current or announced changes in domestic and trade policies. While consumer and retail requirements in terms of standards and certification are evolving, it is assumed that the relative competitive position of livestock industries in developed and developing countries does not change as a result of national regulatory reforms, such as those for animal health and welfare. No major changes in food safety regulations, such as changing rules on antibiotics, decontaminants, or hormones are assumed during the projection period.

Main market developments

Prices to decline and then stabilise following the dissipation of animal disease induced price shocks

The medium term outlook for meat markets and prices is set against a background of major market instability in recent years. The meat outlook will be dominated by the effect of the expected recovery in consumption and production following disease outbreaks, including AI, BSE and FMD, which have caused
disarray in the sector for the past few years. Meat prices are expected to decline from high levels as supply shortages induced by animal diseases outbreaks and import bans are overcome and then to stabilise as demand recovers. But the supply response will also depend on the impact of rising feed prices on industry profitability as increasing ethanol demand drives up cereal and oilseed prices. Distillers grains (DDGs) by-products from maize-based ethanol production can substitute for corn in the feed ration. Also, it has been determined that these distiller grains by-products are relatively easier to incorporate in ruminant nutrition and, for the time being, are less suitable in poultry and hog rations. Therefore a larger impact of ethanol production can be expected on feed costs for the pork and poultry sectors, as in the case of ruminants, reduced maize availability is compensated for by supplies of DDGs.

After falling from record highs, poultry prices will remain strong

Over the past four years, disease outbreaks have led to reduced global exportable supplies of meat. With a resumption of normal market conditions after these animal disease induced shocks, real prices for beef and pig meat are expected to decline over the period, and by 2016 will be 19% and 9% respectively below their 2001-2005 averages. On the other hand, real poultry prices will remain strong and rise by +3% (Figure 5.1). This is consistent with a situation of projected strong real prices of feed inputs that make up a large proportion of production costs in the feed intensive poultry sector.

Figure 5.1. Real world prices for poultry and sheep to remain strong

Sheep meat production increased in the major exporting region of Oceania, which supplies over 80% of global exports, due to drought-induced slaughter in Australia. These additional supplies led to a decline of nearly 15% in the New Zealand lamb schedule price in 2006 when compared to the 2001-2005 average. Given a rather steady international demand, prospects for the industry remain bright. This could give an opportunity for African suppliers, such as those in the Horn of Africa, to gain market share in the Middle East.
Figure 5.2. New Zealand lamb schedule prices remain on trend in nominal term

Notes:
(a) Choice steers, USA, dress weight Nebraska. Prices deflated by USA GDP deflator 2000=1
(b) Barrows and gilts, No.1-3 Iowa/South Minnesota, USA dress weight. Prices deflated by USA GDP deflator 2000=1
(c) Wholesale weighted average broiler price, ready to cook, 12 cities, USA. Prices deflated by USA GDP deflator 2000=1
(d) New Zealand lamb schedule price all grade average, dressed weight. Prices deflated by NZ GDP deflator 2000=1
Source: OECD and FAO Secretariats.

Over the projection period, global lamb production is expected to grow by more than 20% when compared to the 2004-2006 average. Real lamb prices are not expected to strengthen significantly over the outlook period (+2%). Nevertheless, with steady growth in global consumption, nominal price increases remain in line with the long term trend (Figure 5.2).

Continued decline of developed countries’ share of global production and consumption

Driven by income growth in developing countries, meat consumption is expected to grow by nearly 1.7% p.a., and although growth has slowed from the previous decade (2.7% p.a.), this will be sufficient to support meat markets over the outlook period (Figure 5.3). Global meat consumption is projected to reach 318 Mt by 2016. Meat consumption in developed countries is expected to increase by only 0.7% p.a., much slower than for developing countries. Per capita meat consumption in developed countries is expected to grow by 3.5 kg (rwt) and reach 67.5 kg rwt by 2016. For developing countries, per capita consumption will grow by 3 kg rwt per year and reach slightly above 27 kg rwt
The share of these consumption gains among the different meats covered in this Outlook by 2016 is led by a 42% increase for pig meat, followed by 33% for poultry, 21% for beef and a modest 4% for sheep meat. These gains are not spread evenly among the different regions of the world (Figure 5.4). Asia and the Pacific region will account for 62% of the total gain in meat consumption, with China accounting for almost three quarter of the regional gain, due to further investment in integrated and vertically coordinated livestock operations. Latin America and the Caribbean region follow with a 16% increase, of which Brazil accounts for nearly half. Africa and North America each account for 6% and 4% of the total growth in consumption respectively.
Moreover, the composition of these gains also is not spread evenly either over the different meats (Figure 5.5). In the Asia and Pacific region, pork will record the biggest increase, in Africa beef consumption is projected to increase faster while for the other selected areas poultry meat gains are the biggest.
World meat production should grow at around 1.7% per annum or 52 Mt over the projection period (Figure 5.3). This increase is driven by larger meat production in Brazil, China, India and the United States.

The developed countries’ share in world production is expected to decline from 41% on average over the period 2004-06 to 36% in 2016. As consumers in developing countries diversify their diets away from staple cereals and adopt more western diets and consumption practices, more than 80% of the growth in meat consumption is expected to occur in these regions.

**World meat net trade is expected to grow by 7 million tonnes**

On the trade side, meat exports, after witnessing an animal disease-induced cyclical pattern of declines and recoveries over the past several years, are projected to rise by 30% to 30 million tonnes by 2016 (Figure 5.3). But this result will largely depend on the pace at which animal disease-related import bans are lifted, and on steady recovery in consumption fuelled by rising incomes and population growth. If some or all of these expected developments fail to occur, trade in meat will show less growth. Furthermore, consumer’s responses to any further disease outbreaks, and their confidence in meat safety systems are, of course, key uncertainties in relation to both consumption and trade growth.

**Brazil remains the leading meat exporter**

Brazil’s share of global exports is expected to grow from 23% on average in the period 2004-06 to 28% in 2016. Brazil remains the leading meat exporter and its total meat exports are expected to increase by 3 Mt to reach a total of 8.4 Mt over the projection period (Figure 5.6). The EU27 (including Bulgaria and Romania from 2007) remains a net exporter of meat despite a constant reduction in net export
volumes, *i.e.* a loss of 300 kt, mostly of beef and poultry, during the projection period. Developed countries, despite an erosion of the EU’s market share, are set to maintain their net export position.

**Figure 5.6. Major meat net exporting countries**

Source: OECD and FAO Secretariats.

**Japan, Russia and the US are the leading meat importers in volume terms**

The net meat trade deficit status of many of the existing net importing countries is set to increase over the projection period. By 2016 the United States, Russia and Japan are expected to import 3.8, 2.7 and 2.6 Mt cwe of meat, respectively. This will comprise mostly of beef in the case of United States poultry in the case of Russia, while pork will be the leading meat imported by Japan. Countries which show important increases in imports between 2006 and 2016 include: Korea, Saudi Arabia, Japan, Mexico and Philippines (Figure 5.7). The import dependency of least developed countries is projected to rise from 9.4% in 2006 to 13% in 2016. Finally, excluding Argentina and Brazil, the net meat trade deficit of developing countries should increase from 7.6 Mt to 10.7 Mt cwe by 2016 as demand outstrips the supply capacity of these countries.
Challenges posed by food safety and animal health

Developing countries, as a group, face many challenges in responding to consumer concerns on food safety and quality standards both domestically and internationally. This is particularly true for developing countries that wish to engage in meat trade and therefore need to meet sanitary measures (SPS) and barriers in order to enter the world meat market. A risk based approach to meat hygiene is necessary, with both the OIE and FAO Codex Alimentarius providing standards that assist in developing such meat production systems. These standards and regulations include: hygiene of feedstuffs, transport of animals, review of regulatory systems, ante mortem inspection, antimicrobial treatments, plant inspection and design and water testing. Investments in livestock markets to improve standards and regulations have been made by the South American meat industries. As a result, almost 53% of the global meat export growth over the projection period will be sourced from these origins.

Traceability, as a way to assure food safety across the agri-food marketing chains, is also changing international meat markets. Whether implemented on a mandatory or voluntary basis, these costly systems are becoming increasingly necessary to respond to consumer and animal health concerns. Harmonisation of traceability systems would likely lead to more transparent transactions. In the future, participation in the global meat trade may be based on the ability to trace meat according to its different attributes. Furthermore, countries that have already invested in traceability systems have favourably positioned themselves to maintain or to gain international meat market shares.

Key issues and uncertainties

Developments in livestock markets have always been influenced by changing trade policies of partners but they are also increasingly being shaped by consumer-driven requirements that affect the cost of production and the competitive position of suppliers. The impact of some of these private sector
requirements, such as adherence to standards related to animal welfare, traceability, environmental standards, and antibiotics in feed, have not been included in the assumptions underpinning the projections. However, it is clear that they will play an increasing role in negotiations for market access.

The impact of certain country specific policy decisions also have the potential to weigh on markets. In the case of Argentina, measures such as export taxes, restrictions on beef exports, minimum slaughter weights and the recently announced decision to introduce maize subsidies were established with the objective of dampening domestic inflation by keeping down domestic beef prices. While not considered in establishing the projections, these limits have caused production and investment in the Argentinean beef sector to drop and could affect the medium term outlook if those measures were to remain in place for the projection period.

Increasing attention paid to the topic of global warming is raising challenges to the livestock sector. In particular, it is recognised that the growth of both pastoral based and industrialised livestock systems result in environmental externalities related to land degradation, climate change, air and water pollution, and loss of biodiversity. While not explicitly incorporated in the Outlook, policies related to these issues may also influence the projections.

Market recovery in the aftermath of animal disease outbreaks continues to be an uncertainty. For example, the North American path of recovery for beef exports, after the identification of less than 10 BSE infected animals over the past three years, has been slower then anticipated (Figure 5.8). The governments of Japan and South Korea, two major export markets for North American beef, decided last year to resume imports of U.S. beef but have imposed beef import restrictions linked to cow age and boneless shipments. Difficulty in adhering to these requirements has resulted in slower than expected recovery. This is not without precedent as revealed by the export ban on UK cattle, their meat and products, which has been in place since March 1996. In 1999, the ban was amended to allow de-boned beef and beef products from the UK produced under the Date-based Export Scheme (DBES) to be exported. Under the DBES, the UK could export beef and products, subject to a series of strict and limited conditions. These also included requirements linked to cow age and boneless shipments. In the case of the UK, it took nearly 10 years before all restrictions were lifted.

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15 This topic was presented in Box 1.1 Pollution from industrialised livestock production, OECD-FAO Agricultural Outlook 2006-2015.
This Outlook has assumed a similar timeline for market recovery for North American beef. As consumer’s confidence levels increase and import restrictions disappear, the demand for North American beef will expand to reach pre-BSE level in 2013, nearly ten years after the first case of BSE in North America. However, the rate of recovery is faster than the one observed in the UK mainly due to the fact that the incidence of BSE is much lower than in the UK.

Scenario analysis (undertaken in 2006\textsuperscript{16}) on three major animal diseases, namely AI, FMD, and BSE, which have been major causes of instability in meat markets and trade in recent years also support this assumption. This analysis, undertaken by FAO in collaboration with the OECD, highlights some lessons on the factors that critically influence market losses and transfer the impact of local animal disease outbreaks onto the international market.

The analysis shows that international market responses to animal disease outbreaks depend critically on the type of disease, the nature of consumer response, the size of the market affected, the availability of alternative supplies and trade linkages. Obviously, the impact of animal disease outbreaks, in the form of market losses, is highest for countries where the outbreak occurs and is in proportion to the country’s export dependence. The prevalence of disease-related market segmentation, such as those existing for beef and pigmeat, create higher international impacts for those market segments where the disease outbreak occurs.

\textsuperscript{16} The Impact of animal disease on international markets presented at the FAO Symposium on: Market and Trade Dimensions of Avian Influenza Prevention and Control, November 2006.
It also appears from the analysis that consumer reactions play an important role in determining the size of market losses associated with animal diseases. In fact, exporters from countries that are not disease infected may be significantly and adversely affected by animal disease related demand shocks in importing countries. Government policies which seek to sustain consumer confidence could mitigate market losses, thus minimizing the economic impacts, both within affected countries and globally.

Regionalization is an effective instrument to limit market losses in countries that are experiencing an animal disease outbreak and to stabilize international markets. This has proved to be the case for Brazil and Argentina, where the potential market impacts of FMD outbreaks could have been extremely severe in the absence of importer recognition of disease free regions within these two countries.

A return to market equilibrium following a significant disease outbreak varies by disease and meat product. Poultry markets rebound very quickly, given the rapid supply responses of the industry, in contrast to beef markets which may take a decade to return to equilibrium.
CHAPTER 6
DAIRY

World market trends and prospects

Key market drivers

The underlying market drivers affecting the projections for the dairy sector largely remain as reported in previous versions of this report. However, the recent surge in dairy prices, which have been already on the upswing from a trough in 2002-03, has displayed the driving forces for dairy markets with more clarity. Fundamentally, underlying economic growth in many countries, particularly in south and south-east Asia, but also in parts of South America, is increasing the demand for dairy products which are income sensitive. Demand continues to be also encouraged by the growing influence of retail chains and multinational companies which is facilitating consumer access to dairy products and in many countries also by government programs (i.e. school milk). On the other hand, reforms of dairy support policies, particularly in Europe, but also elsewhere in developed countries, have severely limited or reduced exportable surpluses from these countries. These developments are expected to underpin higher dairy product prices.

Furthermore, as lower cost, pasture based production systems have gained market share, it is to be expected that the influence of weather conditions which affect milk supply in those areas will increasingly affect international dairy product prices. The sequential droughts in Australia provide a good example of this factor which has helped to raise prices recently. Just how international markets respond to current, historically high international prices remains an important question.

In this context, an important driver affecting dairy markets, at least in the short term, is the recent run up in both higher energy costs and feed costs. These higher costs should reduce dairy supplies and support higher product prices. However, they should also affect the competitiveness of pasture versus intensive feed based systems, and may be additional factors supporting the growth in market shares of countries with relatively abundant pasture and water.

Market distortion is likely to remain a feature of international dairy markets and will continue to condition its responsiveness to external shocks. Although the supply of intervention products to world markets is projected to decline over the Outlook, high tariffs will continue to restrict market access, especially those in more affluent countries. Consequently, trade levels will remain a low share of global production, and international markets will continue to be segmented by country income profiles. However, as reforms take effect, and as income grows in many regions in combination with growing globalization of the dairy processing sector through foreign investment, linkages to international markets should very gradually improve over the longer term.

Main market developments

World dairy prices are expected to remain firm over the Outlook period

After peaking in 2005, international dairy prices stabilised and softened over most of 2006. The average prices of cheese and butter fell in 2006 by nearly 10% from their 2005 levels while prices of
skimmed and whole milk powder increased by 5% and almost 1% respectively. However, at the very end of 2006, world dairy markets have experienced a remarkable surge in international price levels, especially for milk powders. In December, milk powder prices increased by more than 30% compared to October levels. The upturn is linked mainly to continuing solid demand for dairy products in combination with a drought affected drop in production in Australia, modest milk production increases in New Zealand and production declines in the European Union. The rapidly devaluating US dollar at the end of 2006 may also have contributed to the increase in USD denominated international dairy prices.

World dairy prices are expected to remain firm in 2007 and 2008. Supply response to higher prices and reluctance of traders to buy at those prices is expected eventually to cause world prices to weaken somewhat. Nevertheless, prices are not expected to fall below the 2006 level and they are expected to resume an increasing trend in nominal terms in the second half of the ten year projection period.

Overall, world dairy prices are expected to remain firm over the entire outlook period and stay about USD 50 to USD 100 per 100 kg higher as compared to the previous decade (Figure 6.1). Compared to the level of average prices in nominal terms over the period 2001-2005, the world butter prices is to record the highest growth increasing by 42%, that of SMP by 35%, followed by cheese and WMP with a 33% increase. Prices are expected to remain firm primarily due to steady and strong demand for dairy products in important developing dairy markets such as Russia, North Africa, the Middle East and East Asia, but also in more mature markets such as those in the European Union and the United States.

**Figure 6.1. Prices to remain firm over the projection period**

Notes:
(a) F.O.B export price, cheddar cheese, 40 lb blocks, Northern Europe
(b) F.O.B export price, butter 82% butterfat, Northern Europe
(c) F.O.B export price, WMP 26%, Northern Europe
(d) F.O.B export price, not fat dry milk, extra grade, Northern Europe
Source: OECD Secretariat.

Another driver behind the price strength over the Outlook is the rapid decline in importance of intervention products on world markets. While a decade or two ago world dairy markets were characterised as a place to unload intervention dairy stocks, particularly from the European Union, such supplies and other types of subsidised exports are expected to substantially recede over the projection period. EU intervention stocks for SMP are expected to remain at zero and those for butter to gradually decline to zero over the Outlook. Consequently, EU exports of these products are to fall further over the Outlook period.

In real terms, the well-established declining trend in prices should abate somewhat with world prices falling only modestly over the Outlook with the exception of butter prices which strengthen marginally.
However, all prices, even in real terms, are to remain relatively elevated as compared to levels in the late 1990s (Figure 6.2). The relative strength of nominal and real butter prices comes partly from higher income induced steady demand in developing countries and the fact that considerably less butter is to be exported from countries such as the European Union or the United States compared to the previous decade. In addition, the logistics of butter exports are more demanding as compared to milk powders and typically require considerable investments on the part of developing countries entering world markets. For these reasons emerging exporters concentrate mainly on powder exports. Milk powder exports are also more saleable as they can be reconstituted into other dairy products.

**Figure 6.2. In real terms, prices relatively high, albeit declining with the exception of butter**

Notes:

(a) F.O.B export price, cheddar cheese, 40 lb blocks, Northern Europe, deflated by US GDP 2002=1
(b) F.O.B export price, butter 82% butterfat, Northern Europe, deflated by US GDP 2002=1
(c) F.O.B export price, WMP 26%, Northern Europe, deflated by US GDP 2002=1
(d) F.O.B export price, not fat dry milk, extra grade, Northern Europe, deflated by US GDP 2002=1

Source: OECD and FAO Secretariats

The overwhelming majority of additional global output to come from outside the OECD area

World milk production is expected to increase by 120 Mt between 2006 and 2016 with an average annual growth rate of 1.8%. The overwhelming majority, 85%, of the additional production would come from outside the OECD area where milk production is to increase by 34% over the Outlook period (Figure 6.3). India, China and Pakistan account for more than 50% of the global milk production gains.
Milk production in the OECD area will remain relatively stable given that the majority of production is contained by production control schemes. OECD milk production is expected to grow by 7% over the Outlook period mainly due to gains in Oceania and the United States. Correspondingly, only 15% of the additional global output comes from the OECD area. It follows that producers in developing countries will increase their world milk production shares, as a group, from 53% to 59%. Geographically, the shift in milk production is mainly from North to South, and more specifically from Europe and North America to Asia, Latin America and Oceania. The location of future growth in production depends very much on the market and policy context in various producing countries, the milk-feed price ratio and competition for land. In the context of increased demand for biofuels and grains, pasture based milk producing systems, such as those of Oceania and Latin America, are expected to strengthen their comparative advantage.

**Oceania’s milk production growth to recover but to grow at a slower rate than seen in 1990s**

After a couple years of decline, milk production in New Zealand rebounded in 2006 by more than 4% despite a slow start caused by severe winter conditions. After nearly doubling its world market share over the 1990s, New Zealand continues to be one of the most dynamic dairy industries of the world. However, export oriented growth in New Zealand over the 1990s was partly spurred by significant depreciation of its currency, whereas the appreciation of the last several years has eroded this advantage. Assuming a relatively strong local currency vis-à-vis the USD, combined with increasing start up costs, rising land prices and growing environmental concerns, New Zealand production is projected to increase by less than 3% annually, a lower growth rate than seen in the 1990’s despite the strong international prices (Figure 6.4).
Figure 6.4. Milk production gains for major producing regions

Australian milk production, hit by a severe drought, has plunged by 10% in 2006. It is expected to remain low for a couple of years but then to recover and to continue to grow by around 2% annually. The drought has forced farmers to dry off cows early and increase cow culling. This should leave a better quality cow herd for future seasons. Nevertheless, production is expected to return to the 2002 level only by the end of the Outlook. The assumption of normal weather remains crucial.

Growth in US milk production to slow - EU milk production to recover and to follow quota levels

In the United States, relatively high farm milk prices in recent years has encouraged expansion in milk cow numbers, which together with milk yield gains, has translated into strong increases in milk production. The growth in production over the Outlook period is expected to slow down in response to higher feed costs that reflect increased competition for grains, particularly for use in biofuels. Milk production is expected to grow by a less than 1% annually, and cow inventories are expected to resume their long term declining trend. Projected production gains would be realized by increases in milk yields, partly stimulated by the further development of large specialised operations.

Milk deliveries in the European Union have fallen by 1.5% in 2006 despite increases in quotas. The production fall results from many factors: unfavourable market conditions; structural changes resulting from CAP reform; the threat of high super-levy penalties; and, possibly the expiry of the transitional period in the EU10 region which had allowed for domestic marketing not to comply fully with EU criteria. Nevertheless, over the Outlook period, milk production is expected to recover to follow the milk reference quantities. These reference quantities will be further increased in 2007-08. Milk quantities are expected to decline after 2009 as a result of anticipated modest growth in the butterfat content of milk, to which the EU milk quota is tied, and expected reductions in subsistence production in the twelve accession countries.

Milk production growth expected in much of Latin America

In Argentina, the strong revival of milk production continues. Over the period 2003-2006 milk production has surged by 30%. The rapid growth of a leaner and more efficient sector emerging from
economic turmoil of 2000-02 is expected to slow down as herd expansion may be increasingly constrained by high land values. Although at a slower rate, milk production is expected to grow annually by 3.2% in response to favourable world prices. Domestic milk prices and output are expected to be conditional on the developments of processing capacities that allow absorption of additional milk production. Although, there has been recently a rush in investment – mainly into milk drying facilities – the continuation of this trend is a prerequisite for a stable dairy sector in Argentina. Brazil’s milk production is projected to grow by 1.9% annually, primarily due to increased productivity. Milk production is promoted through the national milk development program (Pro-Leite) aimed at increased productivity through herd improvement, milk quality and more efficient management.

In other Latin American countries, milk output is expected to increase. Growth in Uruguay and Paraguay has begun to pick up after macroeconomic problems after 2000. Growth in the next ten years should exceed that of the previous decade, as their industries recover. Milk output in Chile is also expected to continue its recent expansion. Growth of milk production in Columbia, which was remarkable in the previous decade, has slowed in the past few years and this trend is set to continue, with production matching domestic demand growth. In Central America and the Caribbean, low yielding dual-purpose cows predominate among small-holders and diversified producers, and despite increasing milk production, the region’s dependence on imports will grow.

In Asia, strong production growth will be increasingly driven by yield gains

China’s strong growth in milk production of recent years is expected to continue albeit at a lower rate. Nevertheless, China remains the fastest growing milk production country with annual growth projected at 4.7% over the Outlook period. The growth will increasingly come from yield gains. The milk sector in China has been very rapidly changing and maturing with establishments of co-operative dairy farms with typical size of five hundred cows. This trend will continue in the future and the focus is expected to be on milk quality and genetic improvements. After years of rapid expansion of cow numbers the further growth is expected to slow considerably due to increasing environmental constraints and limited feed supplies. Moreover, China’s long-term dairy policies also favour yield gains over expanding cow numbers.

India is the largest milk producing country in the world, and with growth in excess of 3% anticipated to continue over the Outlook, this position will be further consolidated. While India’s sector has been closed to world markets, increasing demand, largely as a result of population growth, urbanisation and income growth, has stimulated higher production. Recently, with high world prices for skim milk powder, India has begun to export SMP, but it is anticipated that it will not enter world markets in a significant way. Whether India will remain closed to world market developments remains a major question during the outlook period. In Pakistan, the world’s fifth largest milk producer, output is expected to grow more slowly in the next ten years compared to the previous decade. But production is still projected to grow at rates in excess of 2% per year. In Bangladesh, output is anticipated to grow modestly from a small base, and by less than growth in its domestic demand.

Large differences in dairy production developments across products and regions

Nearly three-quarters of additional global milk production is to be left in its fluid form for direct consumption or to be processed into fresh dairy products. This is not surprising given the fact that the bulk of milk production gains are coming from the developing world where milk processing is still very limited. The remaining quarter of additional milk will be processed into various dairy products. World production of WMP is expected to grow fastest, albeit from lower base level, recording 33% growth between 2004-06 and the end of the projection period. Argentina is expected to provide nearly 30% of the additional WMP production. The main driving force for whole milk powder production is its use for reconstitution in milk production deficit areas and in low-production seasons. The recent gradual shift away from reconstitution
of SMP in large plants towards more decentralised use of WMP is expected to continue to fuel WMP production and trade.

World butter production is expected to grow by 29% over the Outlook with all additional production realised in the non-OECD area. The strongest growth in production is expected in India, which accounts for about 80% of additional world butter production. OECD butter production is projected to fall by 4% over the Outlook primarily as a result of a strong 10% reduction in the European Union. The EU butter production fall in the present Outlook rests on the assumption of a continuation of strong expansion of high-value added fresh dairy products in the EU that has been observed in recent years.

World cheese production is expected to grow by more than 15% over the Outlook. The increases are expected to occur mainly in established markets with current large production volumes. The United States and the European Union are to contribute two thirds of global additional cheese production. Despite the lower overall growth, cheese remains the most important dairy product and nearly 40% of all manufactured milk is channelled for cheese production worldwide. The production of whey and whey powder, which is jointly produced with cheese, is expected to increase substantially in line with the growth in cheese production.

Production of SMP has been traditionally linked to butter production. World SMP production has recently been declining strongly mainly as a result of lower output in the European Union. It is expected to recover partly and to grow by 8% over the Outlook period mainly as a consequence of steady growth in China and Latin America. Nearly all growth in SMP production is to be realised outside the OECD area.

The tendency to shift manufacturing towards value-added products is expected to intensify. This is to be realised via new milk products (such as lactoserum or flavoured fresh dairy products) but also via improving the functionality of traditional bulk products. For example, increasingly more butter is to be produced in its “spreadable” variant, which gives butter the convenience of other spreads (such as margarines) while retaining its taste. The production technology of milk powders is also evolving continuously to improve their functional properties for processing and nutrition. Cheese producers are constantly innovating, offering new but also improved traditional varieties. New packaging methods also improve functionality and convenience of dairy products. Direct foreign investments by dairy processing firms continue to spread these technologies on a global scale.

Trade to grow modestly but the share of world milk production traded is not expected to increase

The share of world milk production traded (intra-EU trade excluded) has been recently reduced to a little over 6%. This is however, mainly a statistical reduction resulting from the enlargement of the EU. The trade share has remained constant for several years and is not expected to change over the projection period. The regional character of global dairy trade is also expected to persist. This is a result, partly of the perishable nature of milk products but also of the prevalence of high market price support and regional trade arrangements. For example trade in milk equivalent in a single region, the European Union, is larger than world trade (intra-EU trade excluded) altogether. When expressed in milk equivalents, trade will increase at the same rate as world milk production, with large differences however between individual dairy products. (Figure 6.5).
A few exporters continue to dominate world markets

Trade continues to be dominated by traditional exporters (Oceania, EU, US and Argentina) that hold around 80% of the world market share. However, other countries as a group are expected to increase progressively their share, particularly in the case of butter and SMP. Argentina is emerging as an important player on WMP and cheese markets with 22% and 8% market share respectively in 2016; more than doubling its shares of these markets since the period 2004-06 (Figure 6.5).

New Zealand remains the most significant exporter, despite the fact that its share in global milk output is merely 2.3%. With nearly 40% of all dairy trade New Zealand continues to have major influence on world markets. New Zealand is expected to increase its exports by more than 30% as compared to period 2004-06. Above all, it will increase its already dominant position on world butter and WMP markets.

Export shares of the US and particularly the EU are expected to shrink further

Milk net trade balances in the EU and the US are expected to fall by more than 10% and 30% respectively. Nevertheless, the EU is to remain an important dairy exporter and the biggest player on world cheese markets. Exports of butter and SMP are expected to decline as a consequence of lower production and market intervention for these products. Cheese and WMP exports are projected to remain relatively flat, while EU casein and whey powder exports are projected to rise moderately. The US increases exports of SMP (unsubsidised) and this can be expected to moderate world SMP price increases over the Outlook period.

Russia to strengthen its position of the most important importer of butter and cheese

Import markets will remain fragmented and differ substantially depending on the dairy product and income profile of the importing country. Russia is set to strengthen its position as the most important butter importer (Figure 6.6). The imports of Russia have been recovering recently and these increases are
projected to continue over the Outlook, although at a decreasing rate as local milk production is projected to gradually increase. As for butter, the growth of cheese imports by Russia is expected to follow a declining path. Nevertheless, Russia has recently overtaken Japan as the most important cheese importer and is expected to absorb more than 100,000 tonnes - about one-quarter - of additional world cheese imports. Cheese imports into the United States, which is the third most important cheese importer, are expected to follow the historical trend increase of 1.5% annually. Driven by increased consumption, spurred by the adoption of western style diets, imports of cheese into Korea are expected to continue to grow over the Outlook. Consequently, Korea is expected to become gradually one of the important players on cheese import markets.

**Figure 6.6. Major dairy product importers**

![Graph showing major dairy product importers](image)

Source: OECD and FAO Secretariats.

**Imports of milk powders for reconstitution to grow steadily over the Outlook**

Milk powders have traditionally been imported by developing countries for the purpose of milk reconstitution. The most important dairy importers will remain to be Algeria, Saudi Arabia, Mexico, Indonesia, Malaysia but increasingly also China (Figure 6.6). Despite a strong increase in milk production in China, demand, spurred by strong economic growth, will continue to outpace supply. The strong increase in demand will result in increased imports of WMP and, above all, whey powder. Whey powder imports are growing because whey serves as a relatively cheaper alternative to milk powders and an important source of proteins. It is assumed that about 60% of whey powder in China will be destined for feed use with the remaining 40% being used for human consumption.

**Global demand for dairy products is pulled by the non-OECD area**

The main drivers for milk and dairy product consumption remain population and income growth. But demand is also stimulated by a range of new products, expansion of cold storage facilities, improved shelf life and product marketing and packaging. In addition, consumption is encouraged by the growing influence of retail chains, multinational dairy companies and, in many countries, by government programs (i.e. school milk). In some developing countries, dairy product consumption is picking up from nearly zero
levels prompted by the increasing adoption of western style diets. The rapid spread of fast food outlets worldwide introduces milk products, particularly cheese, to new consumers.

The consumption of dairy products in OECD countries should increase only modestly with nutrition and health concerns as the main drivers. However, the OECD area continues to dominate cheese consumption, maintaining its 75% share of the world total. OECD cheese consumption is expected to increase by more than 14% over the Outlook period while that for butter should remain stable as reduction in the EU is compensated by increases in the US. OECD SMP consumption is to increase slightly over the period 2004-06 until 2016 mainly due to a slight recovery of EU consumption and an increase in consumption in Mexico. OECD WMP consumption is expected to grow by less than 11%, from a low base, mainly as a result of milk reconstitution in Mexico.

In non-OECD countries demand growth is expected for all dairy products with butter consumption growing the strongest (50%), followed by WMP (40%) over the Outlook. Strong growth for butter comes primarily from increased demand for butter and ghee in India and recovery of butter consumption in Russia. Consumption of WMP, and its growth, is dominated by countries outside the OECD area. These countries consume more than 80% of global WMP consumption and account for nearly all additional WMP consumption over the Outlook period.

The differences in per capita consumption between developed and developing countries are narrowing for powders and butter. In the case of cheese the gap remains wide, with per capita consumption ranging from an average of 12.5 kg in developed countries to 0.8 kg in developing countries and only 0.4 kg in LDCs. Per capita growth outside the OECD is strong, for example, in China and Brazil. In these countries, consumption of milk and dairy products is promoted by governments (Figure 6.7). Per capita consumption is expected to grow steadily also in Russia, driven by higher incomes and better availability of dairy products. Comparing per capita consumption of cheese in Russia (6.7 kg per capita in 2016) with that of the European Union (18.8 kg per capita) suggests the potential for cheese consumption growth in Russia in the longer run, albeit conditional on the overall economic development in the country. Despite already high levels, per capita consumption of cheese is expected to increase even in mature markets such as those of the European Union and the United States. New packaging technology, more convenience and possible substitutability with meats help boosting cheese consumption in those markets.
Key issues and uncertainties

Macroeconomic developments represent an important uncertainty for the Outlook. The favourable global economic outlook assumed in this projection is expected to fuel global consumption and to keep dairy markets firm. A slowdown in the economic growth would moderate international prices. In addition, exchange rate developments could have an important influence as world dairy trade is typically denominated in US dollars, whereas the supplies of world exports depend mostly on the currencies of Oceania, Europe and South America.

Weather conditions remain among the main uncertainties for milk markets over the projection period, in particular for pasture based dairy industries. A recurrence of adverse weather conditions would have a major impact on markets, pushing prices to higher levels. The dairy trade and Outlook can also be expected to be influenced by policy induced changes. In this context, a key uncertainty for the Outlook is the outcome of the Doha Development Agenda negotiations. Moreover, the extent to which consumer and societal concerns, together with growing trends towards more specific product labelling, are to become “non-tariff” barriers is likely to influence the future of dairy markets.

Marketing systems and ability to adapt remain a key for dairy market developments

In the context of constantly growing import demand, a key issue is how other countries will respond to what appears to be a new international market for dairy products, with higher prices and a reduced presence of export subsidies compared to the previous decade. However, how countries respond to market growth is a function of many differing factors. For example, regional tradition, presence of foreign investment, multinational dairy companies but also retail chains are factors likely to shape industry response. In addition, marketing systems adopted in a country can be considered key to how producers are able to adapt to quickly evolving markets.

Source: OECD and FAO Secretariats.
Marketing systems vary both in terms of organization and state intervention. For much of the developing world, informal and traditional markets prevail. They are largely disconnected from international markets and are not expected to expand significantly into international markets. However, these markets are not small and many are growing. For example, the traditional sector in India is almost as large as the US market and is growing more than 3% annually. In Pakistan too, the traditional sector continues to grow strongly. It is recognized however, that under the forces of slowing population growth and urbanization, growth in traditional dairy economies will need to give way to growth in the commercial sectors of these countries.

In many countries, cooperatives and systems coordinated with the processing sector seem to be better able to respond to the rising growth of urban markets. Argentina provides a good example of an open market system that is well integrated with the processing level. Another example is China, where growth in contract dairy farming has resulted in annual growth rates in excess of 20% in recent years. At the other end of the spectrum marketing systems in some developed countries are highly regulated in terms of supply, price support and public stock holding. Examples of these include Canada, Japan and the EU, although policy reforms have been changing their marketing system framework. As a result, the presence of these countries on international markets is declining.

The environment for investment by the large processing firms can also play an important role in dairy industry developments.¹⁷ The investments of multinational dairy processing firms influence how dairy products are being produced at a global level, as firms are working within and across countries to transfer and develop new products and technologies that improve market size and reach. Figure 6.8 lists the top twenty global dairy processing firms, many of which have their origins in Europe. These firms are now investing in milk production and processing capacity, in particular of high value products, in markets overseas, to expand export potential globally. As markets develop over the next ten years, it is anticipated that these firms will increase their presence in, and possibly assistance to, developing countries to satisfy both local and growing export demand.

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¹⁷ In examining the range of marketing systems in countries of North and South America, it has been found that the rate of growth in milk supply was inversely correlated with the degree of market intervention. See presentation by A. Galetto at the Symposium on Dairy Value Chains and Comparative Marketing Systems, at http://www.fao.org/es/esc/en/20953/20999/21495/event_109568en.html.
Figure 6.8. Top twenty dairy processing firms (USD billion)

Source: Rabobank 2006.
METHODOLOGY

This section provides information on the methodological aspects of the generation of the present Agricultural Outlook. It discusses the main aspects in the following order: First, a general description of the agricultural baseline projections and the Outlook report is given. Second, the compilation of a consistent set of the assumptions on macroeconomic projections is discussed in more detail. A third part presents an important model element that has been improved for this Outlook, i.e., the representation of production costs in the model’s supply equations.

The generation of the OECD-FAO Agricultural Outlook

The projections presented and analysed in this document are the result of a process that brings together information from a large number of sources. The use of a model jointly developed by the OECD and FAO Secretariats, based on the OECD’s Aglink model and extended by FAO’s Cosimo model, facilitates consistency in this process. A large amount of expert judgement, however, is applied at various stages of the Outlook process. The Agricultural Outlook presents a single, unified assessment, judged by the OECD and FAO Secretariats to be plausible given the underlying assumptions, the procedure of information exchange outlined below and the information to which they had access to as of mid-April 2007.

The starting point of the Outlook process is the reply by OECD countries (and some non-member economies) to an annual questionnaire circulated at mid-year. Through these questionnaires, the OECD Secretariat obtains information from these countries on future commodity market developments and on the evolution of their agricultural policies. This information is supplemented by the FAO Secretariat for its members which are not part of the OECD. External sources, such as the World Bank and the UN, are also used to complete the view of the main economic forces determining market developments. This part of the process is aimed at creating a first insight into possible market developments and at establishing the key assumptions which condition the Outlook. The main economic and policy assumptions are summarised in the Overview chapter and in specific commodity tables of the present report. The main macroeconomic variables assumed for the outlook period are based on the November 2006 medium term projections of the OECD’s Economics Department for OECD countries, and on the Global Economic Prospects 2007 of the World Bank for other countries. While sometimes different from the macroeconomic assumptions provided through the questionnaire replies, it has been judged preferable to use just two consistent sources for these variables. The sources and assumptions for the macroeconomic projections are discussed in more detail further below.

As a next step, the modelling framework jointly developed by the OECD and FAO Secretariats is used to facilitate a consistent integration of this information and to derive an initial set of global market projections (baseline). In addition to quantities produced, consumed and traded, the baseline also includes projections for nominal prices (in local currency units) for the commodities concerned. Unless otherwise stated, prices referred to in the text are also in nominal terms. The data series for the projections is drawn from OECD and FAO databases. For the most part information in these databases has been taken from national statistical sources. For further details on particular series, enquiries should be directed to the OECD and FAO Secretariats.
The model provides a comprehensive dynamic economic and policy specific representation of major world producing and trading countries for the main temperate-zone commodities as well as rice and vegetable oils. A revised standalone sugar model has also been developed to produce a set of long term baseline projections for world and OECD sugar markets, covering raw and white (or refined) sugar. The modules are all developed by the OECD and FAO Secretariats in conjunction with country experts and, in some cases, with assistance from other national administrations. The initial baseline results are compared with those obtained from the questionnaire replies and issues arising are discussed in bilateral exchanges with country experts. On the basis of these discussions and of updated information, a second baseline is produced. The information generated is used to prepare market assessments for cereals, oilseeds, meats, dairy products and sugar over the course of the outlook period, which are discussed at the annual meetings of the Working Group on Meat and Dairy Products and the Working Group on Cereals, Animal Feeds and Sugar of the OECD Committee for Agriculture. Following the receipt of comments and final data revisions, a last revision is made to the baseline projections. The revised projections form the basis of a draft of the present Agricultural Outlook publication, which is discussed by the Working Party on Agricultural Policies and Markets of the Committee for Agriculture, in May 2007, prior to publication. In addition, the Outlook will be used as a basis for analysis presented to the FAO’s Committee on Commodity Problems and its various Intergovernmental Commodity Groups.

The Outlook process implies that the baseline projections presented in this report are conditioned by those developed by OECD countries and other participating economies. It also reconciles inconsistencies between individual country projections through the use of a formal modelling framework. The review process ensures that judgement of country experts is brought to bear on the projections and related analyses. However, the final responsibility for the projections and their interpretation rests with the OECD and FAO Secretariats.

Sources and assumptions for the macroeconomic projections

Population estimates from the 2004 Revision of the United Nations Population Prospects database provide the population data used for all countries and regional aggregates in the Outlook. For the projection period, the medium variant set of estimates was selected for use from the four alternative projection variants (low, medium, high and constant fertility). The UN Population Prospects database was chosen because it represents a comprehensive source of reliable estimates which includes data for non-OECD developing countries. For consistency reasons, the same source is used for both the historical population estimates and the projection data.

The other macroeconomic series used in the Aglink-Cosimo model are real GDP, the GDP deflator, the private consumption expenditure (PCE) deflator, the Brent crude oil price (in US dollars per barrel) and exchange rates expressed as the local currency value of 1 US dollar. Historical data for these series in OECD countries are consistent with those published in the OECD Economic Outlook No.80, December 2006 and in the OECD Main Economic Indicators. Assumptions made about the future paths of all these variables apart from exchange rates, are based on the recent (November 2006) medium-term macroeconomic projections of the OECD Economics Department and extended from 2013 by holding the 2012 to 2013 annual growth rate constant for the remaining years to 2016. Exchange rates for OECD countries were extended to 2016 from the 2007 projections of the Economic Outlook No.80 using the simple assumption of constant rates in real terms.

For non-member economies, historical and projection data for these macroeconomic series were obtained from the World Bank 2007 Global Economic Prospects of November 2006. The real GDP, PCE deflator and GDP deflator projections were extended from 2008 to 2016 by holding the average three year (2005 to 2008) growth rate constant. For reasons of consistency and comprehensive coverage, in some non-member economies the PCE deflator was the only inflation indicator used and therefore the GDPD
index series in these countries was set equal to the index derived from PCE deflator series. Similar to the simple assumption used for OECD countries, exchange rates were extended from 2008 by holding them constant in real terms to 2016.

The model uses indices for real GDP, consumer prices (PCE deflator) and producer prices (GDP deflator) which are constructed with the base year 2000 value being equal to 1. The assumption of constant real exchange rates implies that a country with higher (lower) inflation relative to the United States (as measured by the US GDP deflator) will have a depreciating (appreciating) currency and therefore an increasing (decreasing) exchange rate over the projection period, since the exchange rate is measured as the local currency value of 1 US dollar.

The world oil price assumption underlying this year’s agricultural outlook is based on the oil price assumption of the International Energy Agency’s 2006 World Energy Outlook. The World Energy Outlook derives a projection for the real price of OECD oil imports in 2005 dollars, a mixture of crude oil grades inferior to the Brent crude used for the Agricultural Outlook benchmark oil price (On average, typically between 1 to 5 US dollars less per barrel). The trend in the Brent premium price from 2006 has been taken from the OECD import oil price projection converted to nominal terms using assumption for the path of the US GDP deflator.

The representation of production costs in Aglink-Cosimo

Changes in production costs are an important variable for farmers’ decisions on crop and livestock production quantities, in addition to output returns and, if applicable, policy measures.

While supply in Aglink-Cosimo is largely determined by gross returns, production costs are represented in the model in the form of a cost index used to deflate gross production revenues. In other words, supply equations in the model in most cases depend on gross returns per unit of activity (such as returns per hectare or the meat price) relative to the overall production cost level as expressed by the index. Consequently, equations for harvested areas in crop production and for livestock production quantities take the following general forms:

\[
AH = f\left(\frac{RH}{CPCI}\right); \quad QP = f\left(\frac{PP}{CPCI}\right)
\]

with:

- \(AH\) area harvested (crop production)
- \(RH\) returns per hectare (crop production)
- \(CPCI\) commodity production cost index
- \(QP\) production quantity (livestock production)
- \(PP\) producer price (livestock production)

Among others, energy prices, increased by rising crude oil prices, have fostered attention to agricultural production costs in agricultural commodity models. Energy prices can significantly impact on international markets for agricultural products as production costs for both crops and livestock products are highly dependent on energy costs. Fuels for tractors and other machinery, as well as heating and other forms of energy are directly used in the production process. In addition, other inputs such as fertilisers and pesticides, have a high energy content, and costs for these inputs are driven to a significant extent by energy prices. It is therefore important to explicitly consider energy prices in the representation of production costs.

The production cost indices employed in Aglink/Cosimo – one each for crops and for livestock products, respectively, to account for the different shares of input groups in total production costs – is constructed from three sub-indices representing non-tradable inputs, energy inputs, and other tradable
inputs, respectively. While the non-tradable sub-index is approximated by the domestic GDP deflator, the energy sub-index is affected by changes in the world crude oil price and the country’s exchange rate. Finally, the tradable sub-index is linked to global inflation (approximated by the US GDP deflator) and the country’s exchange rate. This relationship is shown in the following equation:

\[
\begin{align*}
CPCI_{r,t}^I &= CPCS_{r,t}^{NT,I} \times GDPD_{r,t} \\
&+ CPCS_{r,t}^{EN,I} \times \left( XP_{r,t}^{OIL} \times XR_{r,t} \right) \left( X_{bas}^{OIL} \times XR_{bas} \right) \\
&+ \left(1 - CPCS_{r,t}^{NT,I} - CPCS_{r,t}^{EN,I}\right) \times XR_{r,t} \times XR_{bas} \times GDPD_{US,t}
\end{align*}
\]

with:
- \(CPCI^I\) commodity production cost index for commodity group \(I\)
- \(CPCS^{NT,I}\) share of non-tradable input in total base commodity production costs for commodity group \(I\)
- \(CPCS^{EN,I}\) share of energy in total base commodity production costs for commodity group \(I\)
- \(GDPD\) deflator for the gross domestic product
- \(XP^{OIL}\) world crude oil price
- \(XR\) nominal exchange rate with respect to the US Dollar
- \(r,t\) region and time index, respectively
- \(bas\) base year (2000) value

Detailed data on the composition of production costs are available to the OECD Secretariat for Argentina, New Zealand and the United States. These data, available from the Secretariat on request, suggest non-tradable and energy shares in crop production costs as shown in the table below. Given that detailed data on other countries are not available, the respective crop production cost shares for Argentina are applied for all non-OECD countries, those for New Zealand are applied also for Australia, and the shares found for the US are applied for all other OECD countries/regions. As no data on livestock production shares are available for Argentina, the shares found for the US are applied to all countries/regions with the exception of New Zealand and Australia.

<table>
<thead>
<tr>
<th>Production cost shares for:</th>
<th>Argentina</th>
<th>New Zealand</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop production</td>
<td>Non-tradable</td>
<td>47%</td>
<td>66%</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
<td>43%</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>Other tradable</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>Applied for:</td>
<td>All non-OECD countries/regions</td>
<td>New Zealand, Australia</td>
<td>All other OECD countries/regions</td>
</tr>
<tr>
<td>Livestock production</td>
<td>Non-tradable</td>
<td>n.a.</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>Energy</td>
<td>n.a.</td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>Other tradable</td>
<td>n.a.</td>
<td>1%</td>
</tr>
<tr>
<td>Applied for:</td>
<td>---</td>
<td>New Zealand, Australia</td>
<td>All other countries/regions</td>
</tr>
</tbody>
</table>

\(^{1}\) Excludes tradable feed.

**Methodology and limitations of partial stochastic analysis**

Two partial stochastic analyses have already been presented in the context of the Agricultural Outlook: a partial stochastic simulation based on yields in the 2003 OECD Outlook, a partial stochastic simulation based on macroeconomic variables in the 2004 OECD Outlook.

In the context of the 2007 OECD FAO Agricultural Outlook, partial stochastic simulations based on yields and macroeconomic variables have been undertaken. The assumptions of normal weather and stable
The macroeconomic environment are replaced by a range of yield results and macroeconomic variables constructed according to the procedure presented below.

**Limitations of partial stochastic analysis**

The results of multiple simulations are multiple outcomes for each market variable in each year. The aim of carrying such an analysis is to widen the range of relevance of Outlook results. It is of particular interest for studying markets where agricultural policies in place may have asymmetric effects. It is also useful when trying to identify at least partially the uncertainties embedded in the deterministic point projections. The analysis presented in the report takes into account the uncertainties around macroeconomic and weather assumptions and their consequences on the evolution of agricultural commodity markets in the coming decade. The evolution of markets in the future is likely to differ from the deterministic scenario because of unexpected developments or shocks in the underlying assumptions.

Partial stochastic projections aim to take into account more possibilities of evolution but obviously do not imply that one of the stochastic scenarios will be the “real” one. There are serious limitations to partial stochastic analysis that need to be well understood when looking at the results. Indeed partial stochastic analysis has only a partial coverage of uncertainties; it focuses on exogenous uncertainties linked to climate and macroeconomic evolution. There are several other sources of uncertainty in the benchmark projections. In particular, there is an empirical uncertainty on the estimation of the parameters used in the agricultural commodity model jointly developed by the OECD and the FAO and an endogenous uncertainty on the functioning of agricultural markets. Despite these limitations, the information that partial stochastic analysis brings is of interest for better assessing the evolution of agricultural commodity markets than just looking at a deterministic baseline.

**Procedure used to conduct partial stochastic simulations: simulations of yields**

The deterministic benchmark projections presented in the 2007 Agricultural Outlook are based on a “normal” weather assumption, *i.e.* no shock in crop yield due to weather shocks is taken into account and no assumption is made on possible climate change (*i.e.* variation from average weather). For the partial stochastic analysis, 500 different sets of crop yields for all crop and all countries studied in the Agricultural Outlook over the coming ten years have been simulated. For each crop, a random deviation from the deterministic baseline is generated for every year of projections and for every simulation. This random deviation takes into account long term trends in yields for the different crops and historical deviations from long term trends. This implies that for every crop, a random distribution of 500 sets of medium term projections of its associated yield is obtained. In a given year, the average yield value is equal to the yield value in the deterministic baseline and its random deviation corresponds to historical random deviations from long term yields.

**Procedure used to conduct partial stochastic simulations: simulations of macroeconomic variables**

The deterministic benchmark projections in the 2007 Agricultural Outlook are based on an assumption of a stable macroeconomic environment assumption. In the partial stochastic analysis conducted on the 2007 Outlook numbers, 500 different sets of correlated macroeconomic projections for the world oil price, exchanges rates, GDP and price indices for OECD and non-OECD economies are generated. The 500 different sets of macroeconomic variables projections are obtained thanks to the use of a simple macroeconomic model. This simple macroeconomic model explains econometrically macroeconomic variables in function of their past values and/or of the past or actual values of other macroeconomic variables in the given country or in other major economies. This model is calibrated on historical data. The macroeconomic projections are the combination of the outcomes of the calibrated model and random draws of historical deviations from the calibrated model.
**Procedure used to conduct partial stochastic simulations: stochastic outcomes**

The five hundred sets of yield and of macroeconomic variables medium term projections are put together to create five hundred sets of assumptions that are taken as input to the joint OECD FAO modelling system AGLINK COSIMO. This results in five hundred resolutions of the model to get five hundred sets of medium-term projections. The process of getting the stochastic outcomes is summarised by the following table.

<table>
<thead>
<tr>
<th>Procedure used to conduct partial stochastic analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yields</strong></td>
</tr>
<tr>
<td>1/ Identify long term trend</td>
</tr>
<tr>
<td>2/ Define historical errors</td>
</tr>
<tr>
<td>3/ 500 draws based on errors and trend</td>
</tr>
<tr>
<td>4/ Input as shocks to the model</td>
</tr>
</tbody>
</table>

500 resolutions of the model to get 500 sets of medium term projections

Interesting lessons can be drawn from partial stochastic analysis when looking at the distributions of medium term projections and at the relation between these distributions and assumptions on yields or macroeconomic variables evolution.
ANNEX B. GLOSSARY OF TERMS

**AMAD**

**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
<table>
<thead>
<tr>
<th><strong>Creutzfeldt-Jacob Disease (vCJD)</strong></th>
<th>A fatal disease of the central nervous system in humans, which might be linked to consumption of beef affected by exposure to BSE.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cereals</strong></td>
<td>Defined as wheat, coarse grains and rice.</td>
</tr>
<tr>
<td><strong>CAFTA</strong></td>
<td>CAFTA is a comprehensive trade agreement between Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and the United States.</td>
</tr>
<tr>
<td><strong>Common Agricultural Policy (CAP)</strong></td>
<td>The European Union’s agricultural policy, first defined in Article 39 of the Treaty of Rome signed in 1957.</td>
</tr>
<tr>
<td><strong>CAP reform</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Coarse grains</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Conservation Reserve Program (CRP)</strong></td>
<td>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 <em>Environmental Conservation Acreage Reserve Program</em>. 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.</td>
</tr>
</tbody>
</table>
| **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

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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 soyabean 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 September and extending to 31 August, used by FO Licht, the primary data source for sugar supply and demand balances for the OECD’s World Sugar Model.

**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)

Trade negotiations currently being negotiated between the EU and the African, Caribbean Pacific (ACP) group of developing countries. The outcome of the negotiations will be a series of new Free Trade Agreements (FTA) replacing the Lomé system of preferential access to the European market for the ACP countries from 2008.

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 2009/10.

Export credits (with official support)

Government financial support, direct financing, guarantees, insurance or interest rate support provided to foreign buyers to assist in the financing of the purchase of goods from national exporters.

Export restitutions (refunds)

EU export subsidies provided to cover the difference between internal prices and world market prices for particular commodities.

Export subsidies

Subsidies given to traders to cover the difference between internal market prices and world market prices, such as for example the EU export restitutions. Export subsidies are now subject to value and volume restrictions under the Uruguay Round Agreement on Agriculture.

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.

G-10
Members of the G-10 are: Bulgaria, Chinese Taipei, Iceland, Israel, Japan, Korea Republic, Liechtenstein, Mauritania, Norway, and Switzerland.

G-20
Members of the G-20 are: Argentina, Bolivia, Brazil, Chile, China, Cuba, Egypt Arab Republic, Guatemala, India, Indonesia, Mexico, Nigeria, Pakistan, Paraguay, Philippines, South Africa, Tanzania, Thailand, Uruguay, Venezuela RB, and Zimbabwe.

FSRI Act, 2002

Gur, khandasari
Semi-processed sugars (plantation whites) extracted from sugarcane in India.

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
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 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.

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 deficiency payments are a type of support whereby, for wheat, feed grain, upland cotton, rice and oilseeds, a producer may agree to forgo loan eligibility and receive an output subsidy, the rate of payment of which is the amount by which the applicable county's loan rate exceeds the marketing loan repayment rate. Producers may elect to apply for this payment during the loan availability period on a quantity of the programme crop not exceeding their loan-eligible production. This, combined with marketing loan gains, represent the benefits made available to US farmers when commodity prices fall relative to loan rates.

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.

A formal decision on further “CAP reform - a long-term perspective for sustainable agriculture” was taken by the EU Council of farm ministers meeting in Luxembourg on 26 June 2003. 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, such as the new single
farm payment from current production. The different elements of the reform will enter into force in 2004 and 2005. A single farm payment will enter into force in 2005. If a Member State needs a transitional period due to its specific agricultural conditions, it may apply the single farm payment from 2007 at the latest.

<table>
<thead>
<tr>
<th>Market access</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing allotments (US sugar program)</td>
<td>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.</td>
</tr>
<tr>
<td>Marketing Assistance Loan Programme</td>
<td>US loan programme, in operation since 1986 and designed to provide producers of certain crops with financial assistance when prices are low while avoiding a disadvantage of the traditional loan programme (see loan rate), i.e. the accumulation of government stocks that depress prices when disposed of. The programme effectively guarantees farmers a minimum price. Farmers can obtain payments in two ways. They can sell the crop and repay the loan at the posted county price (a USDA estimate of the local market price) and keep the difference known as “marketing gain”. They can also obtain a payment without taking out a loan – see loan deficiency payments.</td>
</tr>
<tr>
<td>Marketing year, oilseed meal</td>
<td>Refers to the marketing year beginning 1 October.</td>
</tr>
<tr>
<td>Marketing year, oilseed oil</td>
<td>Refers to the marketing year beginning 1 October.</td>
</tr>
<tr>
<td>MERCOSUR</td>
<td>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.</td>
</tr>
<tr>
<td>Market Price Support (MPS) Payment</td>
<td>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...</td>
</tr>
</tbody>
</table>
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.

**Mid-Term Review**
See Luxembourg agreement on CAP reform.

**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.

**Modulation**
A partial transfer of support from the first (support to agriculture) to the second pillar (support to other rural activities) of the EU Common Agricultural Policy (CAP). With the latest reform of the CAP, modulation was made compulsory, resulting in a gradual reduction of payments directly to farmers with the aim of boosting rural development.

**North American Free Trade Agreement (NAFTA)**
A trilateral agreement on trade, including agricultural trade, between Canada, Mexico and the United States, phasing out tariffs and revising other trade rules between the three countries over a 15-year period. The agreement was signed in December 1992 and came into effect on 1 January 1994.

**Oilseed meal**
Defined as rapeseed meal (canola), 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.

**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.

**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.

**Saccharin**

A low calorie, artificial sweetener used as a substitute for sugar mainly in beverage preparations.

**Scenario**

A model-generated set of market projections based on alternative assumptions than those used in the baseline. Used to provide quantitative information on the impact of changes in assumptions on the outlook.

**Set-aside programme**

European Union programme for cereal, oilseed and protein crops that both requires and allows producers to set-aside a portion of their historical base acreage from current production. Mandatory set-aside rates for commercial producers are set at 10% until 2006.

**Single Farm Payment**

With the 2003 CAP reform, the EU introduced a farm-based payment largely independent of current production decisions and market developments, but based on the level of former
payments received by farmers. To facilitate land transfers, entitlements are calculated by dividing the reference amount of payment by the number of eligible hectares (incl. forage area) in the reference year. Farmers receiving the new SFP are obliged to keep their land in good agricultural and environmental condition and have the flexibility to produce any commodity on their land except fruits, vegetables and table potatoes.

**SPS Agreement**

WTO Agreement on Sanitary and Phyto-sanitary measures, including standards used to protect human, animal or plant life and health.

**Support price**

Prices fixed by government policy makers in order to determine, directly or indirectly, domestic market or producer prices. All administered price schemes set a minimum guaranteed support price or a target price for the commodity, which is maintained by associated policy measures, such as quantitative restrictions on production and imports; taxes, levies and tariffs on imports; export subsidies; and public stockholding.

**Tariff-rate quota (TRQ)**

Resulted from the Uruguay Round Agreement on Agriculture. Certain countries agreed to provide minimum import opportunities for products previously protected by non-tariff barriers. This import system established a quota and a two-tier tariff regime for affected commodities. Imports within the quota enter at a lower (in-quota) tariff rate while a higher (out-of-quota) tariff rate is used for imports above the concessionary access level.

**Uruguay Round Agreement on Agriculture (URAA)**

The terms of the URAA are contained in the section entitled the “Agreement on Agriculture” of the Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations. This text contains commitments in the areas of market access, domestic support, and export subsidies, and general provisions concerning monitoring and continuation. In addition, each country’s schedule is an integral part of its contractual commitment under the URAA. There is a separate agreement entitled the Agreement on the Application of Sanitary and Phyto-sanitary Measures. This agreement seeks establishing a multilateral framework of rules and disciplines to guide the adoption, development and the enforcement of sanitary and phyto-sanitary measures in order to minimise their negative effects on trade. See also Phyto-sanitary regulations and Sanitary regulations.

**Vegetable oil**

Defined as rapeseed oil (canola), soyabean oil, sunflower seed oil and palm oil, except in Japan where it excludes sunflower seed oil.

**Voluntary Quota Restructuring**

Established as part of the reform of the European Union’s
Scheme

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.