Chapter 5

Oilseeds and oilseed products

This chapter describes the market situation and the latest set of quantitative medium-term projections for global and national oilseed, protein meal and vegetable oil markets for the ten-year period, 2014-23. The discussion covers the developments expected in world and national prices, production, use (human consumption, industrial and feed use), trade (imports and exports) and stocks. The quantitative projections are developed with the aid of the partial equilibrium Aglink-Cosimo model of world agriculture. The chapter also includes a box that explains policy options for biofuel in Indonesia. It concludes with a discussion of main issues and uncertainties concerning the medium-term outlook for oilseeds. These include biodiesel policies, and specific market developments influencing production, consumption and trade of oilseeds and oilseed products.

Market situation

Recently the United States and Brazil[1] were affected by significant droughts which contributed to high prices of oilseeds and other crops. Farmers in many parts of the world responded to these higher prices, by strongly increasing oilseed production in 2013.[2] As a consequence, the global area under oilseeds cultivation and oilseed production reached new records. World coarse grain production also reached a new record. The large increase in crop production led to a significant decline in most crop prices, particularly in coarse grains, due to the large production increase in the United States. As a result, a shift in land to oilseeds is expected in the 2014 crop year which should lead to another record crop and further declines in the prices of the oilseed complex.

The lower oilseed prices will improve the crushing margin and lead to large expansion in crush and in oilseed meals and oils production. Global palm oil production is anticipated to continue to grow in the short term. Increases in income, population and biodiesel production are contributing to higher vegetable oil demand. This will avert large price declines for vegetable oil following the anticipated large increase in supply. Demand for protein meal will not be as strong due to a slowdown in world meat production in 2013 and 2014, resulting from the high feed prices since 2010.

The record crops of 2013 and 2014 will replenish oilseeds stock to levels that should buffer most unanticipated shortfalls in production in the short term.

Projection highlights

- World production of oilseeds has increased in marketing year 2013 and, in the absence of climate incidents, is expected to stay at this high level in 2014. These two large crops will significantly reduce international oilseeds and products prices. After this reduction, prices are expected to increase slowly, based on strong food and fuel demand for vegetable oil and a solid demand for protein meal once meat production grows stronger again.
- Relative profitability of coarse grains versus oilseeds is expected to favour the allocation of land toward oilseeds and lead to a 26%[3] increase in world production when combined with yield gains. With 91% of global exports in 2023, the Americas will continue to be the oilseeds basket of the world. China is expected to further solidify its position as the leading oilseeds importer, but its share of world oilseeds crush is expected to stabilise at 25% of world total.
- The share of palm oil production in total vegetable oil output is projected to continue to increase in the first seven years of the outlook period but to stabilise at almost 36% thereafter. World vegetable oil production will remain very concentrated in the coming decade as growth originates in the main producing regions of Indonesia and Malaysia. Demand of vegetable oils for food remains strong as global incomes and population grow, and the use of vegetable oils as fuel is supported by consumption mandates.

- Global protein meal output is projected to increase by 27% or 74 Mt. Almost two-thirds of this additional output comes from four countries: Argentina, Brazil, China and the United States. Compared to the past decade, consumption growth of protein meal slows down significantly, reflecting both slower absolute growth in global livestock production and slower growth in the share of protein meal in feed rations. This last phenomenon reflects the recent achievement of optimum use of protein meal in feed ration by commercial farms in some important developing countries.

Market trends and prospects

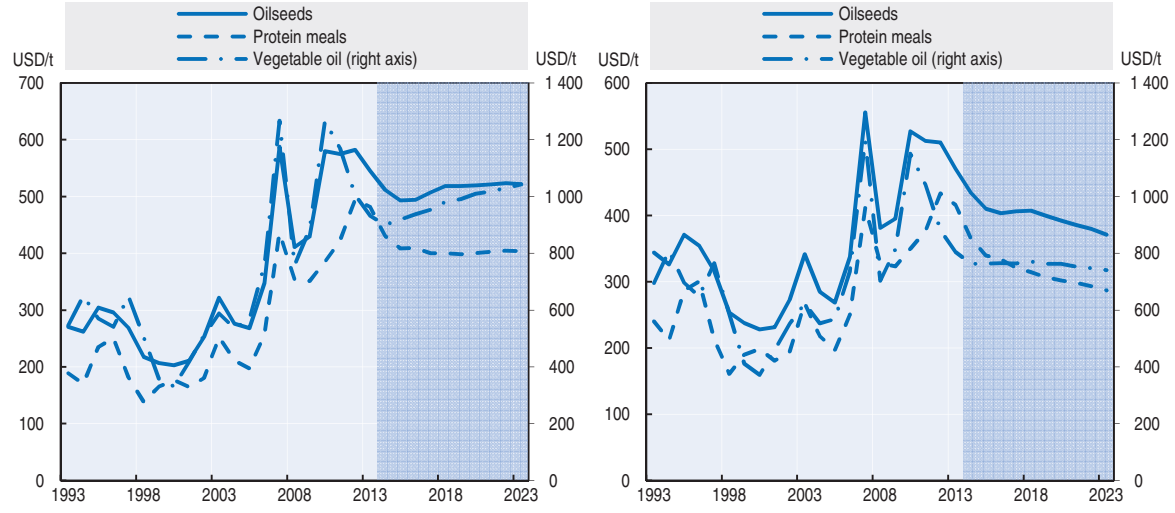
Prices

After the initial downward correction, all prices of the oilseed complex are expected to increase over the medium-term due to strong demands for vegetable oil and protein meal (Figure 5.1). The demand for protein meal is mainly driven by the growth in non-ruminant and milk production in developing countries and a greater incorporation rate of protein in feed rations in these countries. Vegetable oil demand is mainly driven by the food and biodiesel sectors. Despite the high crude oil price assumed in the projections, the bulk of global biodiesel demand will be driven by national mandates because generally biodiesel is not expected to be economically viable compared to diesel. Those mandates include the advanced biofuel mandate in the United States, which is expected to be filled partly by biodiesel in most years of the projection period.

Over the medium-term, the price of protein meal will stabilise around 5% above the average level of the period 2006-12; corresponding to the new higher price plateau. As of 2015, the price of vegetable oils is expected to increase again. Oilseed prices will increase from 2017 onwards, except in 2023 due to larger production generated by the lower coarse grains price in the two preceding years. In real terms, these prices are expected to fall but from very high levels (Figure 5.1). When compared to 2005 (i.e. before the new higher price plateau), the world price of vegetable oil, protein meal and oilseed in 2023 will be, respectively, 30%, 46% and 38% higher in real terms.

Figure 5.1. **Oilseed prices remain at a higher plateau**

Evolution of prices expressed in nominal (left) and in real terms (right)



Source: OECD and FAO Secretariats.

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The strong demand for vegetable oil drives the production of protein meals because both products are produced in fixed proportions. Despite solid meal demand from milk, pork, poultry and egg production in developing and certain developed countries, the protein meal price increases slowly because supply stays ahead of demand. Prices would be even lower if they were not supported by the high price of fishmeal, which is caused by high demand in the growing aquaculture sector and a somewhat stagnating fishmeal supply due to fishing quotas. Additionally, the prices for vegetable protein meal are strengthened by the prohibition and/or regulation in the use of meat and bone meal as farm animal feed in many countries.

Oilseed production and crush

Since maize production requires larger amounts of fertiliser and energy than oilseeds, the anticipated increase in the price of these inputs should give a cost advantage to soybean. As a result, the oilseeds' share of world area for the commodities covered in the *Outlook* is expected to grow slightly between the 2011-13 average and 2023 but at a slower pace than in the previous decade. Global area expansion of 11%, combined with yield improvements of 14%, generates a 26% increase in world oilseed production over the coming decade.

Founding countries of the *Mercado Común del Sur* (MERCOSUR, Argentina, Brazil, Paraguay and Uruguay) are expected to reach 36% of world production in 2023, compared to an average of 34% in 2011-13. In spite of a small decline, the United States remains the leading oilseeds producer, with a global share of 21% by 2023. The RUK countries (Russian Federation, Ukraine and Kazakhstan) and Canada are expected to maintain their 6.6% and 5% share, respectively, throughout the outlook period.

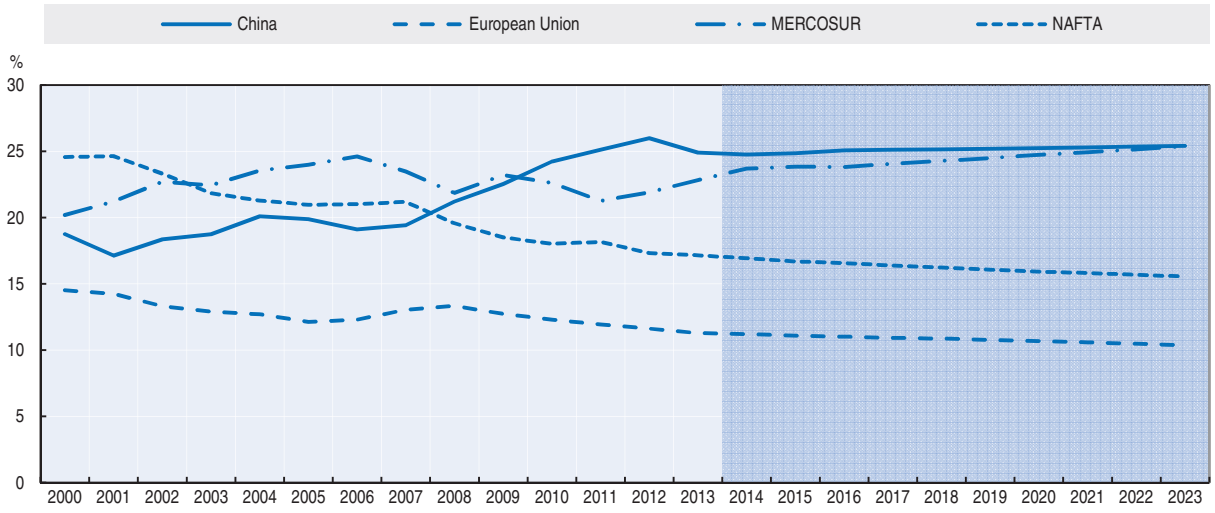
In the context of an increasing use of biodiesel to meet the Renewable Energy Directive, oilseeds production in the European Union will increase by 19% over the projection period and maintain more or less its 7% share of world total. This is mostly driven by yield increases.

Which regions of the world will crush these oilseeds depends on many factors, including transport cost, trade policies, acceptance of genetically modified crops, processing costs (e.g. labour and energy costs) and infrastructure (e.g. ports and roads). In this *Outlook*, it is anticipated that China will continue to increase oilseed crush, but its share of the world total will stabilise around 25% (Figure 5.2). However, since the bulk of the anticipated increase in crushing is expected from imported oilseeds, China's imports will reach almost 81.5 Mt in 2023.

Large production increases of oilseeds in more remote regions in MERCOSUR will enable these countries to gradually reach 25% of the world total crush by the end of the outlook period. Underpinned by its biodiesel policies, the European Union's crushing share only falls slightly over the outlook period. The downward trend in the share of the countries of North American Free Trade Agreement (NAFTA, United States, Canada and Mexico) continues but at a slower pace.

Based on the projected smaller rate of growth in global oilseed production, annual average growth in world oilseed crush is expected to be 2%, compared to 3.5% in the previous decade. This, in absolute terms, translates into an expansion of 96.5 Mt over the outlook period. The largest expansion in crush volume is projected to come from the MERCOSUR countries with 36.4 Mt, followed by China with 25 Mt.

Figure 5.2. **Share of global oilseed crush among leading regions**



Source: OECD and FAO Secretariats.

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Since there are no new stock holding policies by any major producing or consuming country, the global stock-to-use ratio is expected to fall to 8% at the end of the outlook period. This limits the capacity to compensate potential production shortfalls in a major producing region and contributes to the continued risk of price volatility in the oilseed sector.

Vegetable oil production and consumption

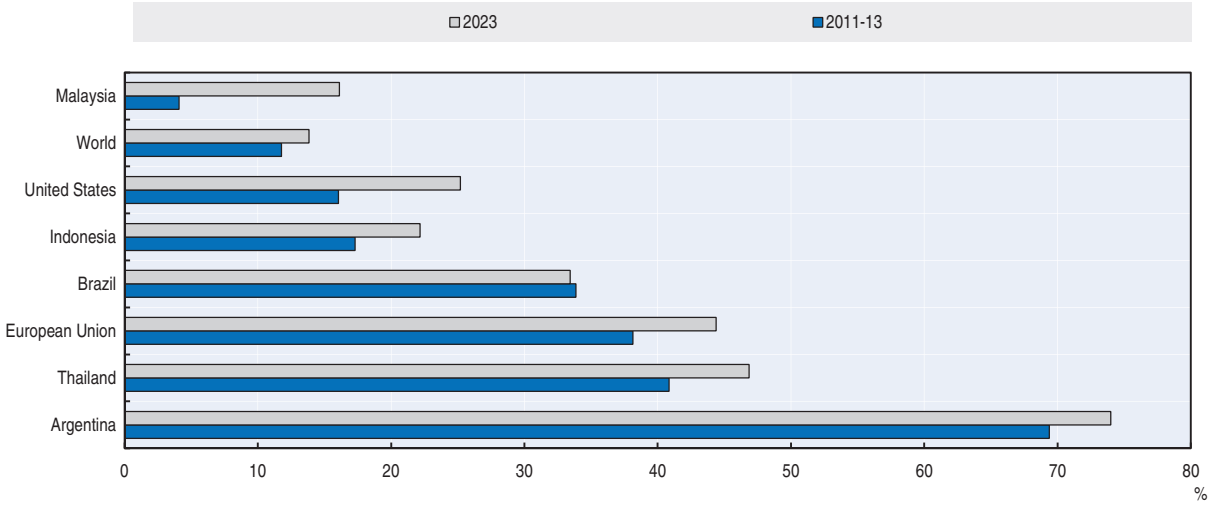
World vegetable oil production is expected to increase by 28%, or 46 Mt, over the outlook period, relative to the 2011-13 average. It is likely to remain very concentrated with eight major producers (Indonesia, Malaysia, China, the European Union, the United States, Argentina, Brazil and India) accounting for almost 77% of total production throughout the projection period. Malaysia's and Indonesia's palm oil output is projected to grow on average at about 2.9% p.a., a slower rate than in the past as land restrictions, environmental restraints and labour costs become more constraining. The share of palm oil production in total vegetable oil output is projected to continue to increase in the first seven years of the outlook period but to be at almost 36% thereafter. Based on its use of imported seeds in domestic crush, China ranks second in vegetable oil production.

Rising per capita income is expected to lead to a 1.3% p.a. increase in per capita vegetable oil consumed as food in developing economies. Annual food vegetable oil use per capita is expected to average 20.3 kg across developing countries, but no more than 9.4 kg in Least Developed Countries (LDC) by 2023. As a group, developed countries are showing a stable consumption level of 24-25 kg, but individual countries differ based on tastes and dietary preferences.

Globally, the use of edible vegetable oil for biodiesel production is expected to expand by almost 10 Mt to 28.8 Mt over the outlook period. This constitutes a 50% increase over the base period and takes up almost one-quarter of the total production growth of vegetable oil. The European Union is expected to remain the largest producer of biodiesel, stabilising at about 40% of global output after 2017. Other important producing countries are Argentina, Brazil, Indonesia and the United States.

In developed countries, continuing sustained demand for non-food uses, in particular for biodiesel production, is expected to lead to an average annual growth of vegetable oil use of 1% p.a. This rate is much slower than during previous decade when biofuel policies were taking effect. The share of vegetable oil consumption used for world biodiesel production is expected to increase from 12% in 2011-13 to 14% in 2023 (Figure 5.3).

Figure 5.3. **Biodiesel to use a large share of vegetable oil consumption**



Source: OECD and FAO Secretariats.

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Argentina is expected to maintain an export-oriented biodiesel industry: consumption of vegetable oil for biodiesel production is expected to reach 3 Mt by 2023, i.e. 74% of domestic vegetable oil use. In the European Union and Thailand, vegetable oil for biodiesel production is expected to account for 44% and 47%, respectively, of domestic vegetable oil consumption by 2023.

The use of maize oil for biodiesel production has emerged in the United States, and it is expected to amplify over the outlook period. Maize oil is extracted during the processing of maize into ethanol and sweeteners in wet milling plants. Since only about 10% of ethanol is produced in wet milling plants, the largest part of maize oil production is derived as a by-product of maize sweeteners.

Protein meal production and consumption

Global meal output is projected to increase by 27%, reaching almost 351 Mt by 2023. Production remains highly concentrated, with six producers (Argentina, Brazil, China, European Union, India and United States) accounting for almost 77% of global production. Almost two-thirds of the 74 Mt increase will come from only four countries: Argentina, Brazil, China and the United States. In China and the European Union, meal production will continue to rely on both domestically grown and imported seeds, while the others will barely import any seeds

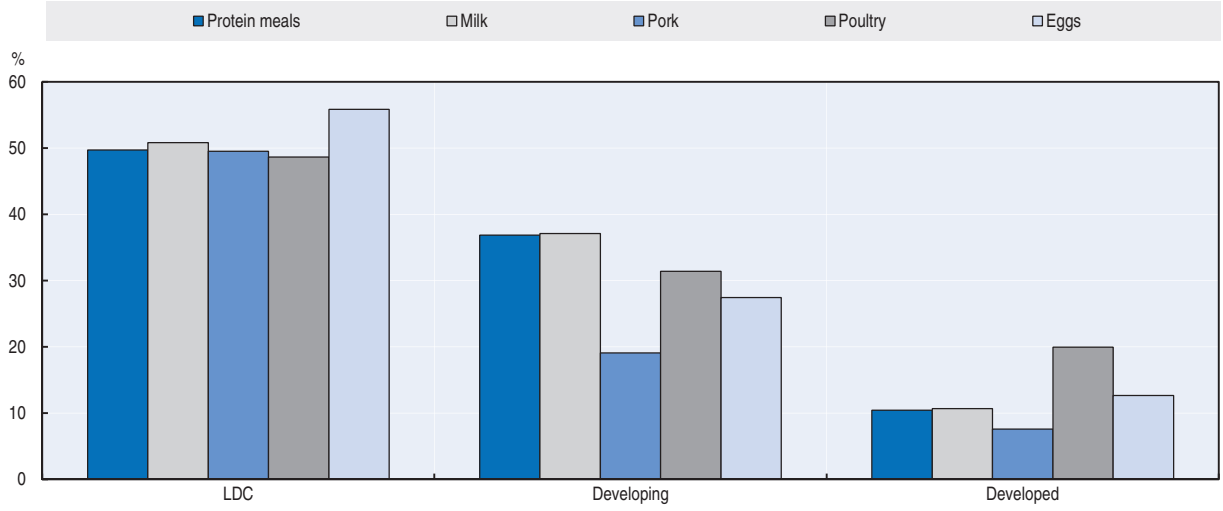
Global meal consumption is expected to rise by 27%, with developing countries accounting for 84% of the increase and reaching 66% of global consumption by 2023. Compared to the past decade, annual consumption growth is expected to slow down

markedly reflecting the lower growth of the livestock industry in developing countries and a slower growth in the inclusion of protein meal in feed rations.

In Least Developed Countries, protein meal use remains low, but its use is projected to grow faster in the coming ten years than over the previous decade because of a faster growth of livestock production and increasing feed intensity of protein meal. While this projected expansion represents a positive development for these countries, it is not a driving factor in the global protein meal market, since the increase in LDC consumption accounts for only 2.4% of the total growth. As for developed countries, growth in animal production is expected to follow the slow growth path of the past, and the penetration rate of protein meal in feed rations remains stable (Figure 5.4).

Figure 5.4. **Growth in protein meal consumption and animal production**

2011-13 vs. 2023



Source: OECD and FAO Secretariats.

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China and the European Union are expected to remain the leading protein meal consumers, followed by the United States, Brazil and India. The strong increase in demand for protein meal in China will not be entirely met by additional domestic production, which leads to 9 Mt of imports by 2023. In the United States, meal use is expected to expand, following a period of decline that was caused by rising availability of dried distillers grains (DDG). The massive increase in ethanol production in the United States led to a surge in the production of the by-product DDG which can replace, to some extent, protein meal in some feed rations. Approaching the Renewable Fuel Standard (RFS2) maximum amount of ethanol that can be produced from maize in 2015, DDG supply will eventually stabilise, contributing to rising demand for protein meal. The livestock industry in the Russian Federation is projected to increase the amount of protein meal used in the feed rations; yet, it will still remain much below the use rate of developed countries.

Trade in oilseeds and oilseed products

The average annual growth rate of world trade in oilseeds is expected to slow down considerably in the next decade, compared to the previous decade. This development is directly linked to the projected deceleration of the oilseed crush in China. The country is

expected to expand its crush by only about 25 Mt in the coming decade compared to an increase of 46 Mt in the previous decade.

Imports by the second largest importer of oilseeds, the European Union, remain stable as increased crush demand is met primarily by rising domestic production. Many smaller importers are expected to expand their imports significantly relative to the base period, but in absolute volumes these additional shipments are small. Purchases by China and the European Union account for 71% of world oilseeds imports by 2023.

In terms of global oilseeds exports, growth over the next decade is expected to be slightly higher for developed than for developing countries. Exports from the United States should grow by 22% over the projection period. A similar growth is expected for Canada (21%) as a growing exportable surplus is generated through continued gains in canola cultivation in the Canadian prairies. Brazil's shipments of oilseeds will increase by 8%[4] over the next decade. Argentina's exports are expected to increase by 21%. Overall, world trade in oilseeds remains highly concentrated, with these four leading exporters holding an 82% market share in 2023. Additional exports by Paraguay and Uruguay, which are growing rapidly in the projection period, move this concentration ratio to 90%.

Vegetable oil imports are less concentrated than oilseeds, but there are three main market players. The European Union, China and India are expected to represent about 48% of world imports in 2023. With a projected increase in imports of 52% and 63%, China's and India's import dependency rates (imports divided by consumption) reach 36% and 64%, respectively. Imports of vegetable oil by the European Union will remain below the average of 2011-13 because of a 5.6 Mt increase in domestic oilseed crush.

The vegetable oil deficit of LDCs will continue to grow along with domestic usage. The share of domestically produced vegetable oil in this market is expected to fall from 35% to 32% over the outlook period. Their imports are expected to increase from 5.3 Mt in 2011-13 to 7.4 Mt by 2023.

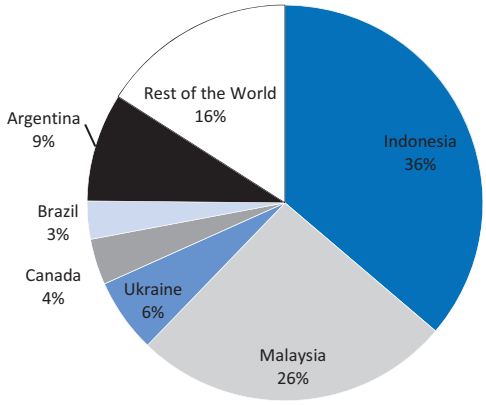
Vegetable oil exports continue to be dominated by a few players (Figure 5.5). Indonesia and Malaysia will continue to account for almost two-thirds of total vegetable oil exports during the coming decade. Argentina is expected to be the third largest exporter with a share of 9%. A share of 65% of Argentina's domestic vegetable oil production is exported in 2023, as the differential export tax system continues to favour exports of oilseed products over oilseeds.

For meal, the projections indicate a slowdown in trade expansion from 48% in the previous decade to 28% in the next decade. The deceleration of imports will be much more pronounced in developed than in developing countries. Between the average of 2011-13 and 2023, global imports are projected to increase by 22 Mt, 90% of this anticipated expansion is projected to occur in the developing world.

The large increase in meal consumption in China is anticipated to change its trade balance from a small net exporter at the beginning of the century to a net importer of about 9 Mt in 2023. The European Union's trade deficit should remain mostly stable as the additional oilseeds produced to obtain the necessary oil for biodiesel production will also increase the domestic supply of protein meal.

Argentina will remain, by far, the largest meal exporter, because it is the only country among the large oilseed meal producers with a very small consumption base. This low level of consumption is directly tied to the composition of its livestock sector which requires small amounts of protein meal. The anticipated growth in crushing in Brazil will

Figure 5.5. **Share of vegetable oil exports in 2023**



Source: OECD and FAO Secretariats.

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generate a greater surplus of protein meal. Exports will therefore grow by 38%. The five significant American producers – Argentina, Paraguay, Brazil, the United States and Canada – account for a large share of protein meal trade, reaching 74% of world exports by 2023.

Main issues and uncertainties

In addition to the issues and uncertainties common to most commodities (e.g. macroeconomic environment, crude oil prices and weather conditions), each sector has its specific supply and demand sensitivities. The low stock level at the end of the outlook period is a source of uncertainty for the stability of prices, for example, if the sector is affected by adverse weather events.

Biofuel policies in the United States, European Union and Indonesia are a source of major uncertainties in the vegetable oil sector, because they have an impact on a large share of the demand in these countries. The proposal by the European Commission to limit the amount of first generation biofuels that can be counted towards the bloc's renewable energy targets from 10% to 5% remains an uncertainty. If, contrary to what is assumed in this *Outlook*, the new policy requiring Indonesia to replace 25% of its consumption of diesel oil with domestically produced biodiesel by 2025 is successful, the impact on the vegetable oil market would be significant according to the analysis presented in Box 5.1.

Since biodiesel is considered an advanced biofuel in the United States Renewable Fuel Standard mandates, all the uncertainties related to that policy are also relevant for the vegetable oil market.

The main uncertainties are the yearly decision by the United States Environment Protection Agency (EPA) regarding the cellulosic, advanced and total mandate. Until now, none of the reductions in the cellulosic mandate has translated into a reduction in the advanced and total mandates. As indicated in Box 3.1, the EPA's final implementation decision for 2014 is still outstanding. In November 2013, the EPA made a proposal to cut, for the first time, the total renewable fuel mandate, the total advanced biofuels mandate as well as the cellulosic mandate for 2014. This proposal is significantly below the final 2013 Renewable Fuel Standard and the initial numbers set by the Energy Independence and Security Act for 2014. The biodiesel mandate for 2014 is proposed to remain the same as in

2013. But since biodiesel is eligible to fulfil part of the other advanced gap, any decision affecting total and advanced mandates could have an impact on the biodiesel and vegetable oil sectors. An additional factor is the uncertain renewal of the biodiesel tax credit in the United States which can hugely affect the profitability of biodiesel production. The other factor affecting the incentives for blenders to use more biodiesel in the United States is the ethanol blend wall. In the *Outlook*, it is assumed that E15 blends (i.e. 15% ethanol and 85% fossil fuel) will be introduced in the market. However, this is far from being certain.

For protein meal, the European Commission announced in early 2013 that processed animal protein (PAP) from poultry and pigs would be allowed in fish farming as of 1 June 2013 (EU, 2013). There is also a possibility that the European Commission might reintroduce the use of PAP from pork and poultry to poultry and pig farming as of 2014. Both measures could affect the outlook for oilseed meal consumption in the European Union.

Box 5.1. **Policy options for biofuel in Indonesia: Implications for vegetable oil markets**

The Global Bioenergy Partnership (GBEP) is an initiative promoted by the G8 and G20 and launched in 2006 with the scope to support wider, cost effective bioenergy deployment, particularly in developing countries where biomass use is prevalent. Within this Partnership, 49 governments and 26 international organisations have agreed on a set of 24 indicators for bioenergy, designed to inform national policymaking about sustainability criteria of biofuel developments. The establishment of these indicators provides a framework that ensures the consideration of key factors related to sustainable policy decisions; however, they are not binding to pre-established thresholds, allowing individual countries to evaluate their envisioned policy goals independently.

Sustainable development is based on three pillars; economic development, social development and environmental protection. The indicators were designed to cover aspects related to all three pillars. Specifically related to the pillar of social development, one indicator assesses the impact of an emerging bioenergy sector on domestic food markets. Evaluation of this indicator involves three tiers. The first two tiers relate to qualitative assessments of the economic impacts that bioenergy could have on food prices, while the third tier is a model-based quantitative assessment of these impacts.

In Indonesia's case, the Aglink-Cosimo model was used to quantify the effects of proposed policy changes on different food product markets, with a special focus on vegetable oil. The study involved the simulation of four scenarios. The first scenario involved an ex-post simulation of a "no biodiesel" situation in Indonesia. It tested the effects of palm oil use for biofuel on domestic food prices from 2007 to 2012. Removing the biofuel use from the domestic vegetable oil demand increased vegetable oil exports proportionately leaving food demand and domestic prices unchanged.

The second scenario involved an increase in the blending requirements for biodiesel in diesel fuel from the currently achieved 1.5% to 10%, requiring approximately 1.5 billion litres of additional biodiesel by 2020, which was satisfied through a combination of significant production growth and almost complete elimination of biodiesel exports. The additional feedstock demand will be satisfied through slightly reduced exports of palm oil and a small production expansion of about 1% in 2020. No disturbance in the food sector was detected.

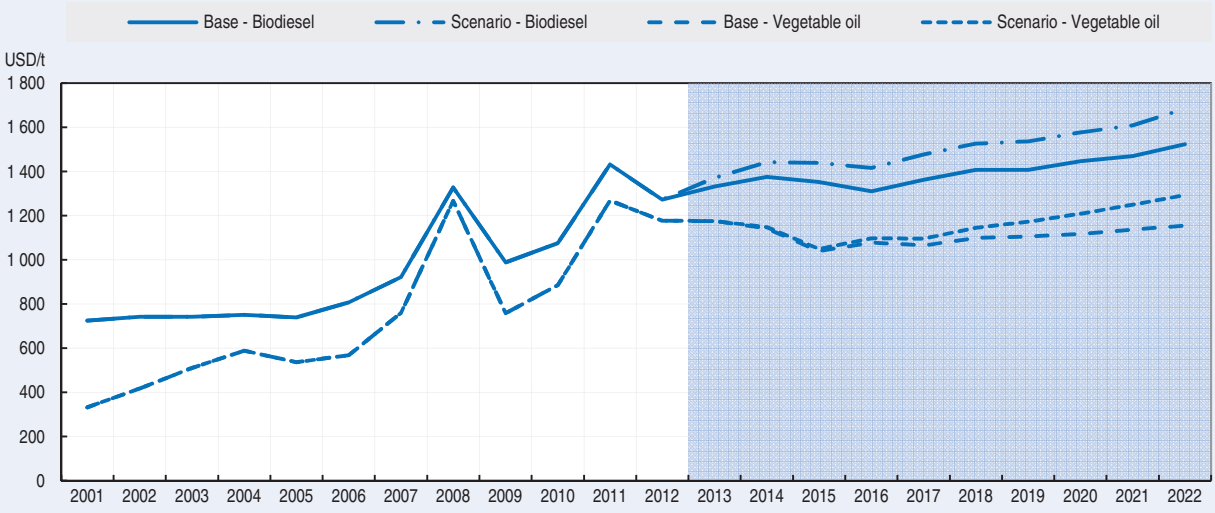
Scenario 3 involved an increase in domestic biodiesel production from 1.5 Mt to the currently installed annual processing capacity of 4.3 Mt, while maintaining the baseline blending ratio of 1.5%-3%. The effect on vegetable oil production was insignificant however as exports were reduced to supply the needed feedstock to biodiesel production.

Box 5.1. **Policy options for biofuel in Indonesia: Implications for vegetable oil markets** *(cont.)*

The policy options evaluated in the first three scenarios caused only marginal changes in vegetable oil prices. Changes to the domestic price of rice, wheat and coarse grains were also found to be minimal and vegetable oil consumption in Indonesia remained stable.[1] The impacts on the biofuel industry were mainly through minor changes in trade patterns but without significant shifts in the world market.

The fourth scenario assessed the effects of a new Indonesian policy requiring the use of 25% domestically produced biodiesel in domestically consumed diesel fuel by 2025.[2] The market impacts in this case are more significant. The domestic blending requirement implies additional production of approximately 10 bln of biodiesel and the elimination of biodiesel exports by 2020. The additional demand for biodiesel results in a 14% (approximately 3.5 Mt) reduction in vegetable oil exports. Domestic vegetable oil production increases 2.5% in response to the policy change, while domestic food consumption decreases approximately 1% by 2020. Due to Indonesia's importance within the global vegetable oil market, the projected decline in exports has global market implications. It results in an increase of 8% in the world vegetable oil price and 9% in the international biodiesel price by 2020 (Figure 5.6). As a result of the price increase, global vegetable oil food consumption decreased by 1.4% (approximately 2 Mt), while global vegetable oil production increased by 1.2% (approximately 2.3 Mt) in 2020.

Figure 5.6. **Potential influence of the National Indonesian Energy Policy (KEN) on global vegetable oil markets**



Source: FAO. 2014. Pilot Testing of GBEP Sustainability Indicators for Bioenergy in Indonesia – Indicator 10: Price and supply of a national food basket. Rome, Italy. Food and Agriculture Organization of the United Nations.

StatLink http://dx.doi.org/10.1787/888933100207

This price increase stimulated global competitors to produce an additional 1.4 Mt of vegetable oil. Malaysia provided approximately one-third of this total, while the balance was shared equally among Canada, China, the European Union and Brazil. The greatest decline in vegetable oil consumption as food was observed in China, where consumption decreased by approximately 800 Kt in 2020.

Application of the GBEP indicators in Indonesia demonstrated their contribution to sustainable development through comprehensive policy guidance at the national level. Illustration of the extent to which domestic policy changes can influence global food markets further highlights the need to provide guidelines for sustainable development on a global scale.

1. Additional information available at *www.globalbioenergy.org/*
2. For all sectors including transport, industry and commerce, and electricity generation.

Notes

1. Brazilian oilseed sector data are reported on a calendar year basis.
2. See the glossary for the definition of crop marketing years for oilseeds and products in various countries.
3. Unless specified, these comparisons are between the average 2011-13 and 2023.
4. This low growth rate is partly due to fairly high levels in the base period and a rapid increase in crush in Brazil.

Reference

European Union (2013), *Official Journal of the European Union*, EU No 56/2013 Regulations, Brussels: European Union, Brussels.