BIOFUELS

Market situation

International prices of biodiesel and ethanol stabilised in 2016. Demand for biofuels was sustained by bioenergy obligatory blending and by the surge in demand for transportation fuels due to continued weak energy prices. Unfavourable price ratios of biofuels to conventional fuels resulted in a limited demand for non-mandated use of biofuels, with the notable exception of Brazil where recent policy reforms in several states favour hydrous ethanol which can be used directly by their flex-fuel vehicle fleet. Despite low crude oil prices, policy decisions were favourable to biofuels in 2016 with developments such as mandate increases and differential taxation systems or subsidies enacted in several countries.

In the United States, the Environmental Protection Agency's (EPA) final rulemaking for 2017 increased the maximum potential access for corn ethanol under the program to the statutory limit of 15 billion gallons and specified an "advanced" mandate that is higher than it would have been if it fully reflected the reduction of the cellulosic mandate. This translates into a strong demand for ethanol and biodiesel, despite the blend wall[1] constraint. The European Commission provided a nuanced message in a July 2016 communication on the limited role that food-based biofuels would play in decarbonising the transport sector post-2020. A revision to the European legislation – the RED2 legislation[2]– was proposed in February 2017 but is not considered in these projections. It sets a limit of 3.8% for the portion of renewable energy in the transport sector coming from food and feed crops below the current 7% cap.

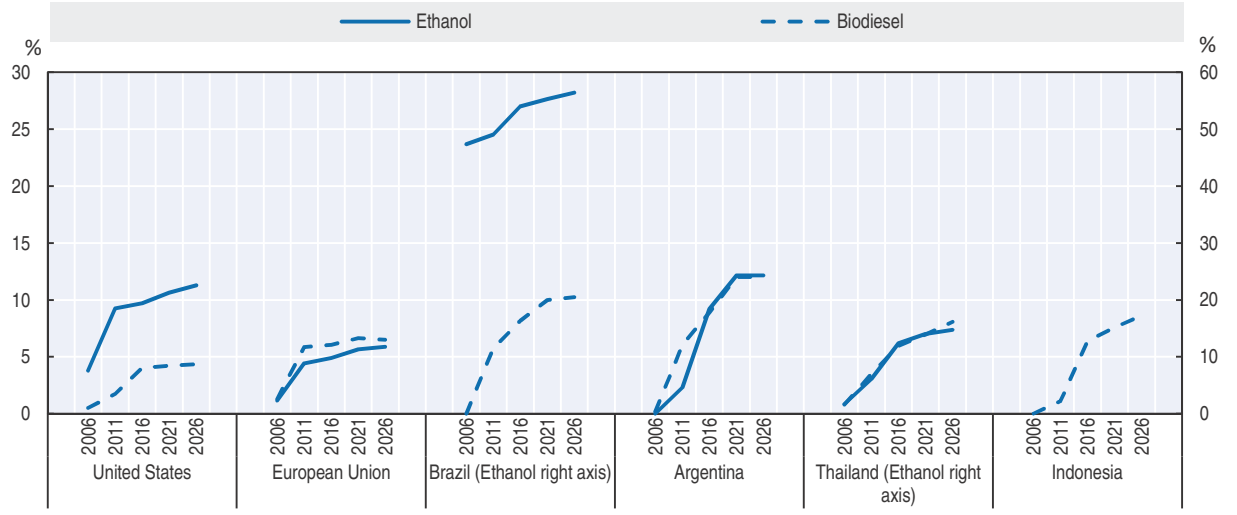
Projection highlights

International crude oil prices are expected to double in nominal terms over the baseline period. This should lower demand for gasoline and diesel fuels, especially in developed countries. Biofuel prices, similar to biofuel feedstock prices, should trend upward but at a slower pace than energy prices. The evolution of ethanol and biodiesel markets over the baseline period is expected to continue to be driven by policies. Biofuel policies are subject to uncertainty and projections; they are based in this *Outlook* on a specific set of assumptions concerning the continuation of the same policies over the next ten years.

For the United States, all mandates are assumed to remain at their announced levels for 2017 except the cellulosic mandate, which should continue to increase moderately. The ethanol blend wall is set to increase to 11.3% by 2026. This *Outlook* thus assumes a limited development of mid-blends of ethanol. In addition, biodiesel use is assumed to increase in the early years of the outlook period, above the biodiesel mandate, to meet part of the advanced mandate (Figure 3.7). The Canadian Federal program called ecoENERGY for biofuels that started in 2008 with incentives of CAD 0.10 per litre for ethanol and CAD 0.26 per litre for biodiesel is gradually phased out with payments reduced to CAD 0.03 and CAD 0.04 respectively for ethanol and biodiesel.

1. The term blend wall refers to short-term technical constraints that act as an impediment to increased ethanol use.
2. *http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0767R%2801%29*

Figure 3.7. **Evolution of ethanol blending in gasoline fuels and of biodiesel blending in diesel fuels**



Note: Shares are expressed in volume.
Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), *http://dx.doi.org/10.1787/agr-data-en*.
1 2 *http://dx.doi.org/10.1787/888933522130*

The use of biofuels in the European Union is assumed to be governed by the 2009 Renewable Energy (RED) and Fuel Quality Directives and the 2015 ILUC Directive, as well as by national legislations. The proportion of total transportation energy accounted for biofuels, including double counting for waste- and residue-based biofuels, is expected to reach 6.4% by 2020 and to remain stable thereafter. The remainder of the 10% RED target should be met from other renewable energy sources.

It is assumed that the Brazilian taxation system will remain favourable to hydrous ethanol rather than gasohol, which corresponds to the mandatory mix of 27% ethanol with gasoline. Brazilian ethanol demand is expected to expand by 6 blnL over the outlook period. The Brazilian biodiesel mandate should reach 10% by 2019, leading to an increase in production of more than 40% over the next ten years. In Argentina, it is assumed that the 12% blending mandate for biodiesel and ethanol will be fulfilled by 2020. Argentinean biodiesel production should be also driven by US import demand to meet the latter's advanced mandate.

Thailand is expected to be a significant player on biofuel markets, with most of its biofuel use met by domestic production. The Thai government plan to increase use of biofuels entails a differential taxation and subsidy system that is favourable to higher blends of ethanol in gasoline. The Indian government should continue to support the production of ethanol from molasses. It is assumed, however, that the observed blending share of ethanol in gasoline remains lower than the 5% mandate. The Indonesian government has a 20% biodiesel blending mandate, but this *Outlook* assumes that this mandate will not be fulfilled. The development of biodiesel production in Indonesia is related to the potential attribution of subsidies to biodiesel producers. Chinese use of ethanol should expand by about 1 blnL with mandates in place in some cities. Chinese ethanol is expected to be produced domestically from maize – thus helping to lower domestic stocks – and from cassava.

Given these expected developments, global ethanol production should expand from 120 blnL in 2016 to 137 blnL by 2026, while global biodiesel production should increase from 37 blnL in 2016 to 40.5 blnL by 2026. By 2026, 55% of global ethanol production should be based on maize and 35% on sugar crops. In 2026, about 30% of global biodiesel production should be based on waste vegetable oils. Advanced biofuels based on residues are not expected to take off over the projection period due to lack of investment in research and development.

Biofuel trade will remain limited. Potential ethanol exporters are the United States where the blend wall limits further increases in domestic demand and Brazil where ethanol could fulfil part of the US advanced ethanol mandate. Brazilian ethanol exports are not expected to expand as US ethanol is likely to remain cheaper over the outlook period. Argentina is expected to be a major biodiesel exporter with most exports directed towards the United States. The future of European biodiesel anti-dumping duties is an important uncertainty in the evolution of biodiesel trade.

The expanded biofuels chapter is available at
http://dx.doi.org/10.1787/agr_outlook-2017-13-en

BIOFUELS

Main assumptions

Since the early 2000s, the development of global biofuel markets has been driven by policies that encourage their production and use. Policies were initially motivated by a combination of factors, including the view that biofuel use would improve energy security and reduce greenhouse gas emissions (GHG). Government support for the biofuel industry takes the form of blending mandates, exemptions from taxes applied to corresponding petroleum fuels and investment support. Biofuel markets are also affected by policies that apply sustainability criteria, fuel quality standards, and import tariffs on ethanol and biodiesel. The projections presented in this *Outlook* are based on a set of assumptions concerning the evolution of biofuel policies around the world in the medium term.

In the United States, the Energy Independence and Security Act (EISA) of 2007 defined the Renewable Fuel Standard programme known as RFS2.[1] Under this programme, EISA established four quantitative annual mandates up to 2022: the total and advanced mandates that require fuels to achieve at least a 20% and a 50% GHG reduction respectively, as well as the biodiesel and the cellulosic mandates that are nested within the advanced mandate. The Environmental Protection Agency (EPA) establishes on an annual basis the minimum quantities for each of the four classes of biofuels required.

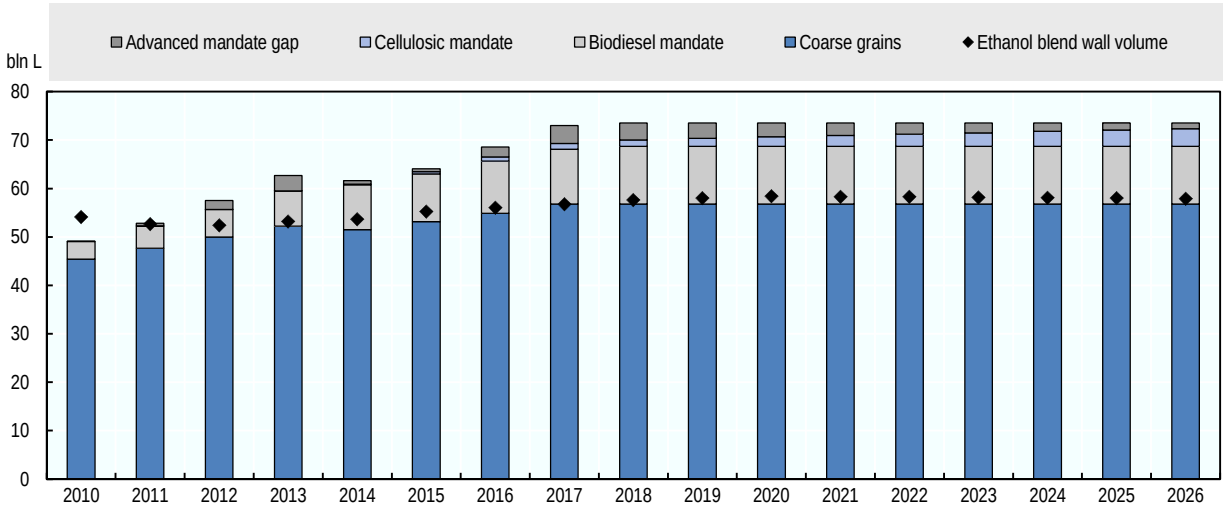
The EPA final rulemaking for 2017 and the biodiesel volume requirement for 2018 were issued in November 2017. An important part of the initial levels proposed in EISA for the total, the advanced and the cellulosic mandates was waived based on the fact that production capacity for cellulosic ethanol has not developed. Despite this, the final standards announced were set at their highest level ever; which means that the availability of higher ethanol blends at pumps should develop somehow in the short- to medium-term. At present, even if the maximum blend of ethanol for conventional petrol vehicles is set in the United States at 15% for vehicles produced in 2001 or later, E10[2] is still the most commonly available gasohol in the United States due to technical constraints that act as an impediment to increased ethanol use. These constraints are often referred as the blend wall.

This *Outlook* assumes that all categories of mandates should remain at their recently announced levels in volume terms despite decreasing transportation fuels, with the exception of the cellulosic mandate which is assumed to increase moderately as has been the case since the latest EPA rulemakings. By the end of the projection period, it is assumed that only about 8% of the cellulosic mandate specified by EISA will be filled, mostly with renewable compressed natural gas and renewable liquefied natural gas. The ethanol blend wall is set to expand beyond 10% to reach 11.3% by 2026.

Figure 3.7.1 shows the assumed evolution of mandates in the United States post-2017 and the blend wall ethanol volume, i.e. the ethanol volume that can be consumed in the United States according to expected evolutions of gasoline use and the blend wall. In 2017, the conventional gap[3] often referred to as an implied coarse grains mandate should be slightly higher than the blend wall for ethanol volume. Given the blend wall issue and the levels of the mandates, biodiesel use is assumed to expand in the early years of the outlook period, above the biodiesel mandate, to meet part of the advanced mandate, whereas imports of sugarcane-based ethanol should remain limited. In the latter years of the projection period, the advanced mandate gap is expected to narrow. The biodiesel blender tax credit is not assumed to be reinstated over the outlook period and Argentinean soybean oil-based biodiesel should remain certified to meet the advanced mandate.

In the European Union, the policy framework concerning biofuels is determined by the 2009 Renewable Energy Directive[4] which states that renewable fuels (including non-liquids) should increase to 10% of total transport fuel use by 2020 on an energy-equivalent basis, and by the Fuel Quality Directive which requires fuel producers to reduce the GHG intensity of transport fuels by 2020. Both directives were amended in September 2015 by a new Directive referred to as the "Indirect Land Use Changes" (ILUC) Directive[5] which introduced a 7% cap on renewable energy in the transport sector coming from food and feed crops. In the longer term, the 2030 Framework for Climate and Energy Policies,[6] which targets a 40% cut in GHG emissions by 2030 compared to 1990 and for 27% renewable energy by 2030, does not propose concrete targets for the transport sector after 2020. In July 2016, the European Commission issued a communication stating that food-based biofuels would play a limited role in decarbonising the transport sector post-2020.[7] This *Outlook* assumes a continuation of current policies at the European and at member country levels. A revision to the European legislation the RED2 legislation[8] was proposed in February 2017 and is not considered in this Outlook. It sets a limit of 3.8% for the portion of renewable energy in the transport sector coming from food and feed crops.

Figure 3.7.1. Assumptions concerning the US biofuel mandates post-2017



Note: The advanced mandate gap, the gap between the advanced mandate and the sum of the biodiesel and cellulosic mandated volumes, can be met by biofuels being able to achieve a 50% greenhouse gas reduction such as cellulosic biofuels, sugar cane based ethanol or biodiesel.

Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522833

In accounting for the fact that each unit of advanced biofuel consumed, including those produced from used cooking oil and tallow, counts double for the purpose of the RED, the projection assumes that the portion coming from biofuels expressed in energy share is expected to reach 6.4% by 2020 and stable thereafter. The remainder of the 10% RED target should be met from other renewable energy sources. The portion of renewable energy in the transport sector coming from food and feed crops in the European Union should remain well below the 7% cap but above the RED2 proposition at 4.4% on average over the projection period.

In Brazil, flex-fuel vehicles can either run on gasohol – a mixture of gasoline and anhydrous ethanol – or on E100 (hydrous ethanol). Over the projection period, it is assumed that the anhydrous ethanol mandatory blending requirement for gasohol will remain at 27% and that the differentiated taxation system will continue to be favourable to hydrous ethanol rather than gasohol in key Brazilian states. The recently announced 10% biodiesel mandate is assumed to be met by 2020. Argentina's 12% biodiesel and ethanol mandates are expected to be filled by 2020. Tax exemptions should continue to boost the development of the Argentinean biodiesel industry. In 2016, Colombia was close to fulfilling the 9% ethanol mandate. Over the projection period, it is assumed that ethanol consumption will increase. Due to a rapid expansion of the gasoline demand, the ethanol volume share in gasoline is assumed to meet only 7% by 2026.

Biodiesel production is also heavily dependent on policies in palm oil producing countries, especially Indonesia. After a decline in production in 2016, the Indonesian government made a strong commitment to reach a 10% biodiesel mandate; the currently rate is around 6%. This *Outlook* foresees that biodiesel demand will expand rapidly, and by 2026 the biodiesel volume share of diesel fuels will reach 8%, well below the newly announced 20% target at the 2030 horizon.

In China, mandates are in place in several cities and the development of the transportation fleet should boost the expansion of ethanol use. The government in India is foreseen to enforce a 10% ethanol mandate. However, the current volume share of ethanol in gasoline is around 3% and, as ethanol expansion should not keep pace with the strong expected growth in gasoline demand, this share should decrease over the projection period to 2.4%. In Thailand, the government has set targets for ethanol and biodiesel use of 4.1 Bln L and 5.1 Bln L by 2036. This *Outlook* assumes targets of 3 Bln L for ethanol and 1.7 Bln L for biodiesel by 2026. The development of ethanol production should be driven by subsidies that lower the prices of high ethanol blends.

Elsewhere in the world, development of the comparatively minor biofuels markets depends on a mix of effective policy support and price trends, leading to mixed prospects across countries.

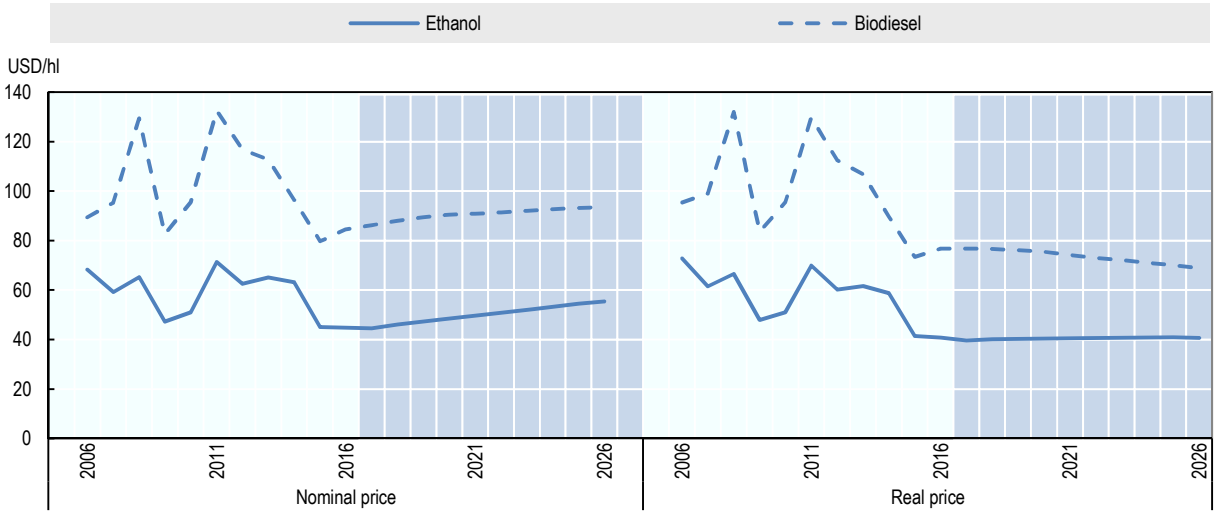
Prices

International crude oil prices are expected to double in nominal terms over the baseline period. This should lower demand for gasoline and diesel fuels in developed countries and hence mandated demand for biofuels. Demand for biofuels should remain sustained in developing countries given expected developments in the transportation fleet and policies in Brazil, Argentina, Thailand, Indonesia, India and China. The resulting upward trend in biofuels prices would also reflect the evolution of major ethanol and biodiesel feedstock prices.

In nominal terms, the world ethanol price is projected to increase by about 3%, while the world biodiesel price should increase by 11% (Figure 3.7.2). Expressed in real terms, the world ethanol price is expected to remain stable and the world biodiesel price should decrease modestly in the later years of the projection period when demand should diminish in the United States and the European Union

Figure 3.7.2. Biofuel prices to trend upward

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



Notes: Ethanol: wholesale price, US, Omaha; Biodiesel: Producer price, Germany, net of biodiesel tariff and energy tax.

Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

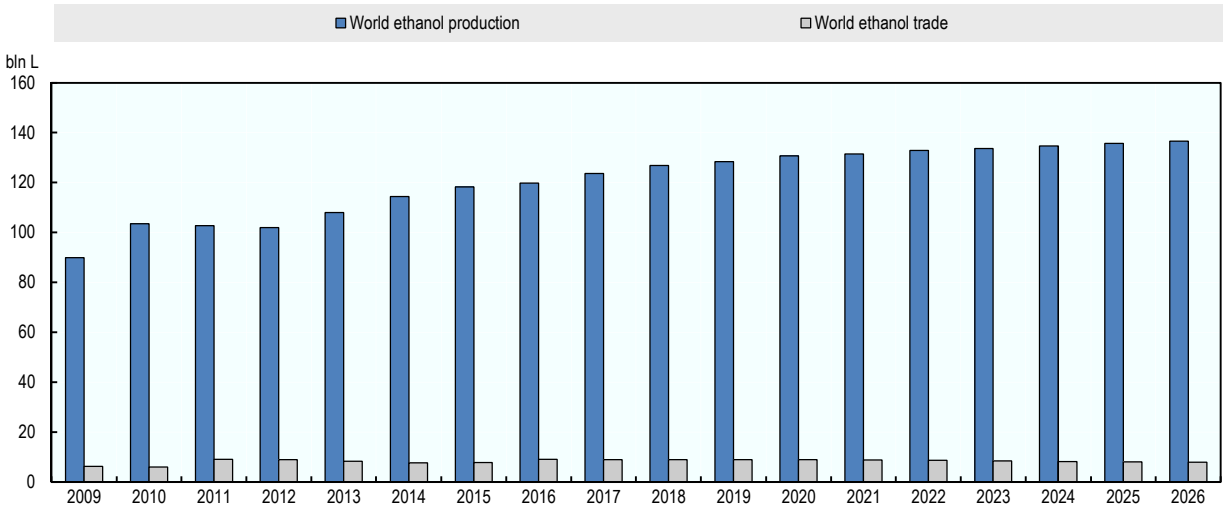
StatLink http://dx.doi.org/10.1787/888933522852

Ethanol

Production

Global ethanol production is projected to increase by 14% during the outlook period from about 120 Bln L in 2016 to nearly 137 Bln L by 2026 (Figure 3.7.3). Sixty per cent of this increase is expected to originate from Brazil, mostly to fill domestic demand. The other large contributors to the expansion in ethanol production are the United States, China and Thailand with respectively a 14%, 11% and 8% share in the global increase. The United States is expected to remain the major ethanol producer, followed by Brazil, China and the European Union.

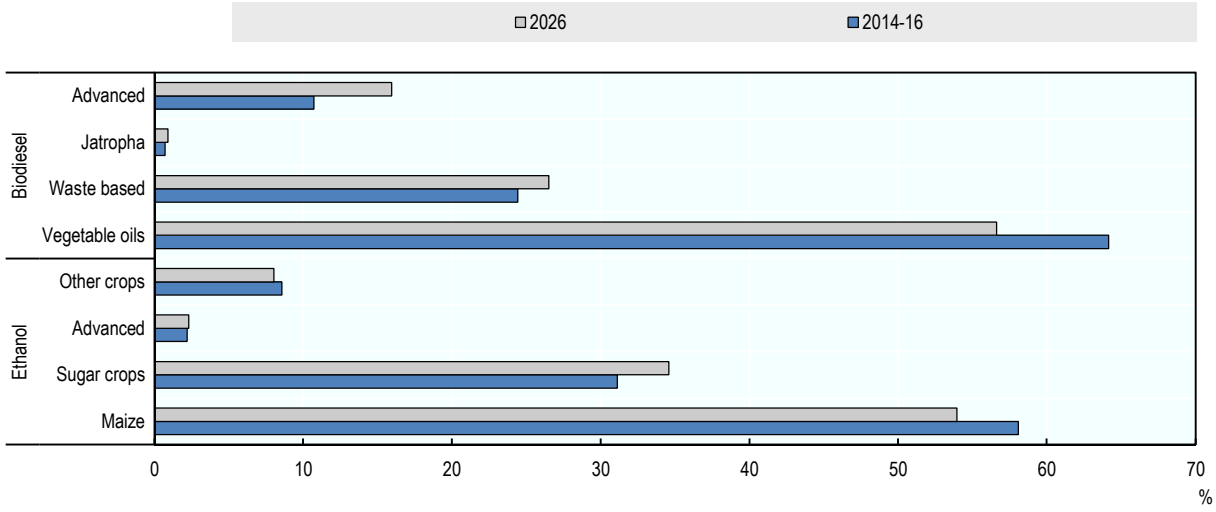
Figure 3.7.3. Development of the world ethanol market



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522871

Figure 3.7.4. Share of feedstock used for biofuel production Error! Bookmark not defined.



Note: Sugar crops include ethanol produced from sugar cane as well as sugar beets in the European Union.
Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522890

Coarse grains and sugarcane will continue to be the dominant ethanol feedstock (Figure 3.7.4). Ethanol production is expected to use 15% and 20% of global maize and sugar cane production respectively in 2026. Biomass-based ethanol is projected to account for about 0.5% of world ethanol production by 2026.

In the United States, ethanol production derived mainly from maize should increase substantially in the early years of the projection period to reach a maximum of 61.6 Bln L in 2020, due to both domestic demand linked to the conventional gap and to the higher blend wall and international demand from Canada, the European Union and Japan. In the latter years of the outlook period, US ethanol production should decrease to 60.1 Bln L with lower domestic and international needs related to decreasing gasoline demand. Ethanol markets in Brazil are expected to be driven by the assumptions concerning blending requirements for gasohol and the differential taxation system

which is favourable to hydrous ethanol. Brazilian ethanol production is thus projected to increase from 29.2 Bln L in 2016 to 36.3 Bln L in 2026.

In the European Union, ethanol production for fuel mainly from wheat, coarse grains and sugar beet is projected to stabilise at around 7.3 Bln L after 2020 despite assumptions of decreasing gasoline use. This reflects a relatively better competitive position of ethanol relative to biodiesel. The share of sugar beet used to produce European ethanol should decrease over the projection period following the expiry of the sugar quota in 2017. In fact, the expected increase in the price for industrial sugar beet after the quota abolition should make ethanol production from sugar beets less profitable than from other cereal feedstock.

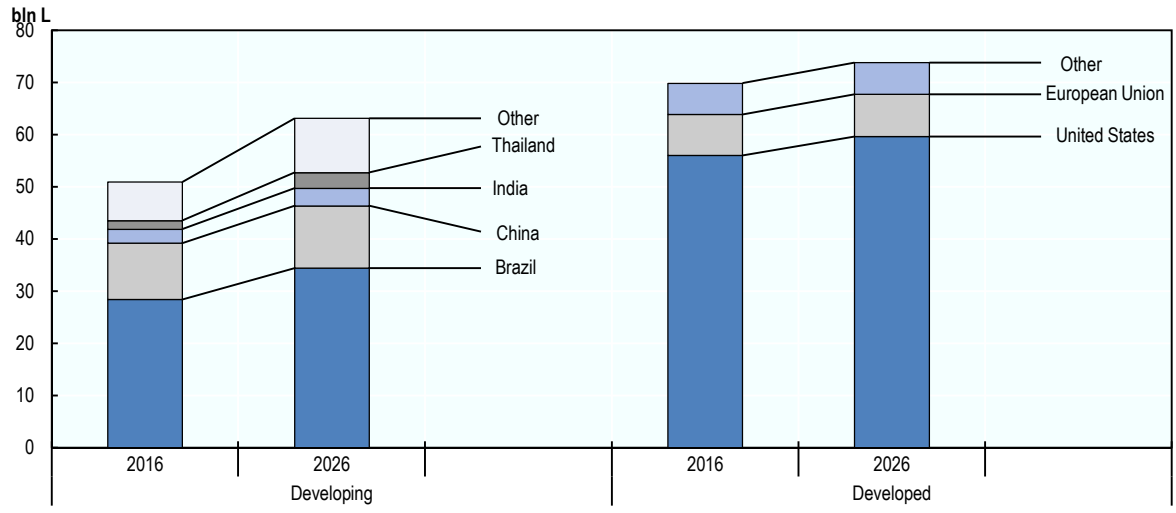
China should consolidate its role as the third leading ethanol producer. The expected 1.8 Bln L production increase over the projection period should be used to meet domestic use. Chinese ethanol is expected to be produced domestically from maize using domestic stocks and from cassava. Thailand ethanol production is foreseen to increase about 6% p.a. and based on molasses and cassava. By 2026, it should reach 3 Bln L. India is expected to increase ethanol production by 0.9 Bln L during the outlook period, with around 84% of the total production coming from molasses.

Use

Global ethanol use is projected to expand by 17 Bln L during the outlook period; 90% of this increase will take place in developing countries with Brazil, China, India and Thailand playing a key role. Ethanol use in Brazil should expand by 6 Bln L representing 35% of the global increase. The Brazilian taxation system will remain favourable to hydrous ethanol rather than gasohol, which corresponds to the mandatory mix of 27% ethanol with gasoline. In China, fuel ethanol use is expected to expand by 1 Bln L. Because of mandates in place in some provinces, the volume share of ethanol in gasoline type fuels will be around 2% over the projection period.

In the last decade, Thailand increased its ethanol fuel use by 1 Bln L. This trend is foreseen to continue and it is expected that by 2026 ethanol fuel demand will reach 2.7 Bln L. The ethanol volume share in gasoline fuels should increase from 12% in 2016 to 15% by 2026. The expansion of Thai ethanol fuel demand is driven by the subsidies to gasohol with high blends of ethanol, as well as obligatory blending for ethanol. Indian ethanol demand is foreseen to increase 2.4% p.a. for the projection period, adding a total of 0.7 Bln L by 2026 with respect to the base period. Despite this increase, the rapid growth in gasoline demand means that the volume share of ethanol in gasoline fuels in India is set to decrease over the projection period from an 3.3% to 2.4%.

Figure 3.7.5. Evolution of the regional distributions of world ethanol use



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522909

Ethanol use in the United States is linked to mandates in place and limited by a marginally expanding blend wall as well as declining petrol use prospects from 2020. The share of ethanol (expressed in volume) in gasoline type fuels should increase to 11.3% by 2026 (Figure 3.7.5), but ethanol fuel use should decrease to 58 Bln L, down from its maximum volume of 58.5 Bln L in 2020.

In the European Union, ethanol fuel use is expected to expand in the first part of the projection period to reach 6.4 Bln L by 2020 and to decrease to 5.8 Bln L by 2026. This is due to decreasing gasoline use despite a rising average volume share of ethanol in gasoline (5.9% by 2026 up from 4.9% in 2016). Whereas the RED share met by biofuels is assumed to remain stable after 2020, the increase in the average share of ethanol in gasoline should reflect a relatively better competitive position of ethanol relative to biodiesel.

Trade

Global ethanol trade is expected to remain marginal, representing 5% of global production on average. It should stagnate during the period leading to 2020 and then retract to 7.9 Bln L by 2026. Ethanol import needs from the European Union should increase from 0.5 Bln L in 2016 to reach their maximum level of 1.4 Bln L in 2020 and then decrease to 0.7 Bln L. Other countries such as Japan and Canada should diminish their import needs because of their decreasing use of transportation fuels.

The United States is expected to remain a net exporter of maize-based ethanol and a modest importer of sugarcane-based ethanol. The need for sugarcane-based ethanol imports is related to the Low Carbon Fuel Standard in place in California and to the limited filling of the advanced gap. US ethanol exports should decrease over the projection period because of a combination of strong domestic demand and weak international demand. Brazilian ethanol exports are not expected to expand over the projection period given that the Brazilian ethanol industry will mostly fill sustained domestic demand and that domestic ethanol prices are expected to remain slightly above international ones.

Biodiesel

Production

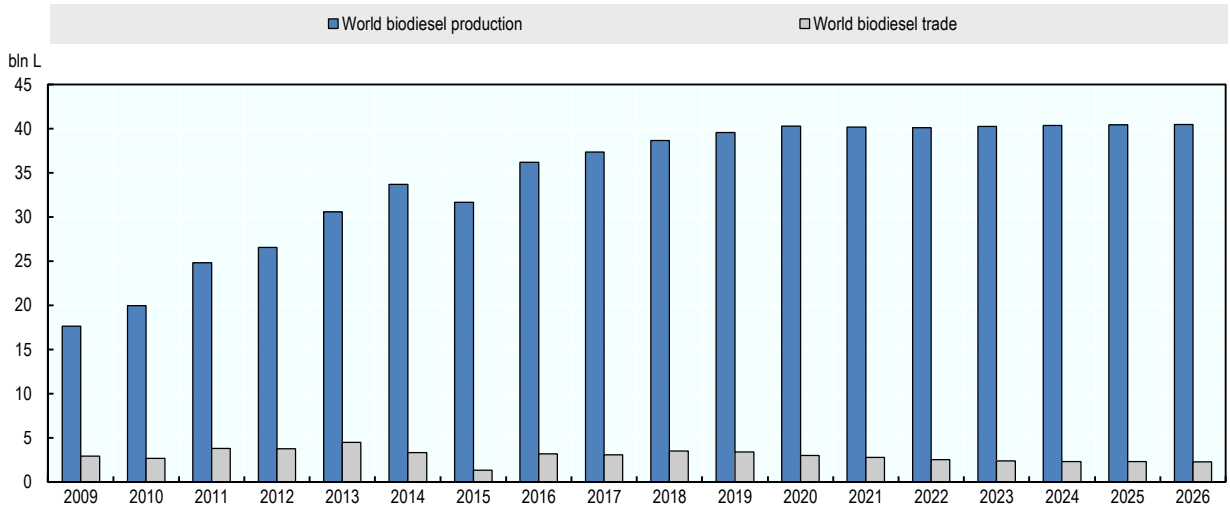
Global biodiesel production is expected to reach 40.5 Bln L by 2026 corresponding to a 12% increase from the 2016 level (Figure 3.7.6). Policy rather than market forces will continue to influence production patterns. The European Union is expected to remain by far the major producer of biodiesel. Production should reach 13 Bln L by 2026, down from 13.3 Bln L in 2016 and 14.3 Bln L in 2020 when the RED target is supposed to be met. This is related to lower diesel use prospects.

Vegetable oil continues as the feedstock of choice in biodiesel production (Figure 3.7.2). Biodiesel production based on waste oil and tallow will develop in the European Union and the United States (Figure 3.7.4).

In the United States, biodiesel production should remain stable around 7.4 Bln L. It will be used to meet the biodiesel mandate as well as part of the advanced mandate gap. Argentinean biodiesel will also help fulfil the US advanced mandate gap, especially in the early years of the projection period. Given increased domestic and international demand, Argentinean production should increase from 3.1 Bln L in 2016 to 3.7 Bln L in 2019. Lower import demand should push Argentinean production down to 2.9 Bln L by 2026. Other significant players are Brazil, Indonesia and Thailand. Brazil should contribute to 36% of the global biodiesel production expansion to meet its 8% domestic mandate and maintain its position as the third largest biodiesel producer.

After a decline in 2015 due to a shift in policies, Indonesian biodiesel production recovered in 2016, driven mainly by growing domestic demand. Although this *Outlook* foresees that exports will increase slightly over the projection period, they will become a less relevant driver for Indonesian biodiesel production. Indonesian biodiesel production should reach 4.4 Bln L by 2026. The main uncertainty surrounding this increase in biodiesel production is the viability to continue collecting the export levy on CPO (Crude Palm Oil) exports, which serves to finance the subsidy to biodiesel producers. Malaysia and Philippines will continue expanding their biodiesel production. Whereas Malaysia will export around 40% of its production, the Philippines production is mainly for domestic consumption.

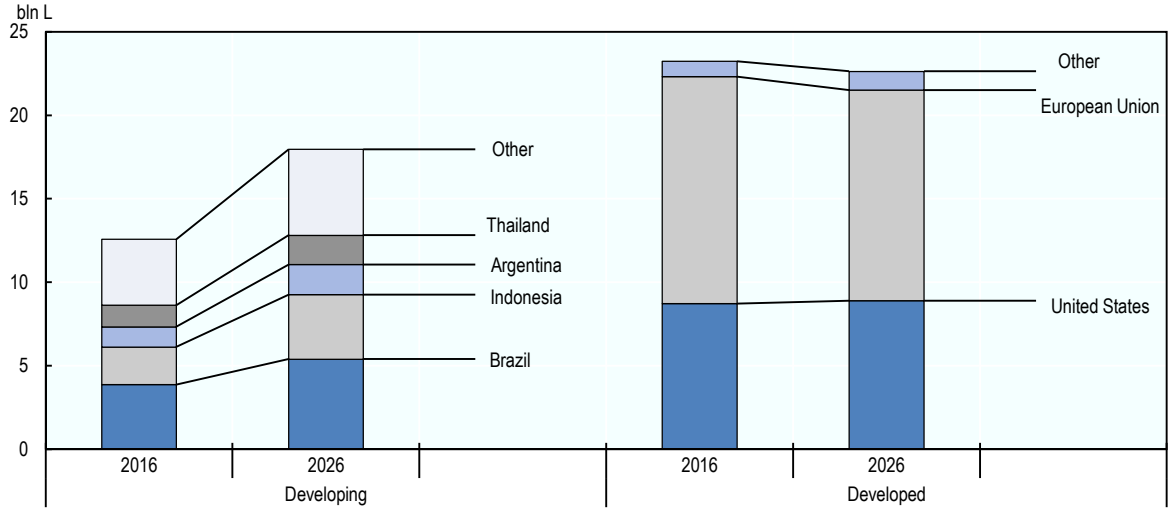
Figure 3.7.6. Development of the world biodiesel market



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522928

Figure 3.7.7. Evolution of the regional distributions of world biodiesel use



Source: OECD/FAO (2017), "OECD-FAO Agricultural Outlook", *OECD Agriculture statistics* (database), http://dx.doi.org/10.1787/agr-data-en.

StatLink http://dx.doi.org/10.1787/888933522947

Use

Global biodiesel use is expected to increase by 4.8 Bln L over the projection period (13% when compared to 2016). Biodiesel use should decrease in developed countries and expand steadily in developing countries (Figure 3.7.7).

Biodiesel use in Indonesia is foreseen to reach 3.9 Bln L in 2026. In Brazil and Argentina it is expected to rise up to 5.4 Bln L and 1.8 Bln L respectively by 2026 given recently announced increases in domestic mandates. Biodiesel blending requirements are in effect in several developing countries. Colombia, India, Malaysia, Paraguay, Thailand, and Viet Nam will also see expanding biodiesel use; most countries are starting from very low levels of consumption and their biodiesel volume share in diesel fuels will remain between 1% and 3%.

In the European Union, biodiesel use is projected to increase from 13.6 Bln L in 2016 to its highest level of 14.6 Bln L in 2020 when the RED target is met. By 2026, European biodiesel use is expected to decrease to 12.6 Bln L due to an expected strong decrease in diesel use. The average share of biodiesel in diesel type fuels should remain around 6.5% (Figure 3.7.7).

In the United States, the mandate for biodiesel is assumed to maintain the 7.9 Bln L level specified for 2018 in the 2017 RFS rulemakings over the outlook period. US biodiesel consumption is projected to reach its maximum volume of 9.25 Bln L in 2018 as biodiesel should capture a share of the advanced mandate in a period where additional ethanol use is limited by the blend wall. Biodiesel use should then decrease by about 5%, but in a context of declining diesel consumption. Biodiesel volume share in diesel type fuels is expected to increase to 4.43% by 2026.

Trade

Biodiesel trade is projected to retract by 20% or 0.9 Bln L over the next ten years as most countries with biodiesel mandate or target will fill them domestically. Argentina should remain the lead exporter followed by Indonesia. Indonesia's exports recovered in 2016 after falling to its lowest level in 2015, but this *Outlook* foresees exports to remain flat. Similarly, Malaysia's exports are projected to remain flat, at around 400 Mln L from 2016 to 2026.

Despite sustainability requirements, import needs will be significant in the European Union in the period leading up to 2020 and should decrease thereafter. The United States will import biodiesel to meet the advanced mandate and Argentina will be the supplier of choice given the EPA decision that allows Argentinean biodiesel producers to fulfil the record keeping requirements of the RFS2.

Main issues and uncertainties

The recent development of biofuel markets has been strongly related to biofuel policy packages, the macroeconomic environment, and the level of crude oil prices. In the medium term, the policy environment remains uncertain. This *Outlook* expects that most of the biofuels produced will be based on agricultural feedstock. It is thus likely that biofuel production will have direct and indirect effects on the environment, on land use, and to a certain extent on agricultural markets in the medium term.

The current low energy prices and the lack of policy signals are not in favour of investments in research and development for advanced biofuels produced from ligno-cellulosic biomass, waste or non-food feedstock. However, revisions to biofuel policies are expected in the near future. In the context of the Paris Agreement on Climate, it is likely that future biofuel policies may focus more on sustainability criteria and the potential contribution of renewable fuels to greenhouse gas mitigation.

Notes

1. www.epa.gov/OTAQ/fuels/renewablefuels/.
2. E10 refers to gasohol (i.e. the mix of gasoline and ethanol) with 10% volume of ethanol blended into petrol.
3. The conventional gap is the difference between the total and advanced mandates as defined by the Renewable Fuel Standard (RFS2).
4. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF.
5. Directive (EU) 2015/1513.
6. http://ec.europa.eu/clima/policies/2030/index_en.htm.
7. https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-501-EN-F1-1.PDF.
8. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0767R%2801%29.