BIOFUELS

Market situation

Cereals, oilseeds and vegetable oil prices in 2014 continued their decrease in nominal terms. This, coupled with the strong decline in crude oil prices in the second half of the year, led to lower world ethanol[3] and biodiesel[4] prices in a context of ample supply for both products.

The policy environment around biofuels remained uncertain, with the absence of a final rulemaking by the United States Environmental Protection Agency (EPA) for policies in 2014 and 2015, and by the fact that the European Union's 2030 Framework for Climate and Energy Policies adopted in October 2014 that did not define clear targets for biofuels beyond 2020. The evolution of the crude oil price and various domestic policy signals provided incentives to the Brazilian ethanol industry.

Projection highlights

This *Outlook* assumes that ethanol use in the United States will be limited by the 10% ethanol blend wall[5] and that cellulosic ethanol will not be available on a large scale until the last years of the projection period. For the European Union, the fulfilment percentage of the Renewable Energy Directive (RED)[6] target coming from biofuels expressed in energy share is assumed to reach 7% by 2019.[7] In Brazil, the *Outlook* assumes that Brazilian retail prices of petrol over the first part of the next decade will be kept slightly above international prices.[8] Elsewhere in the world, biofuel sectors in general continue to be driven by a mix of price trends and effective policy support. Proposed production and consumption targets vary considerably across countries leading to a wide range of growth prospects for individual countries.

Decreases in crude oil and biofuel feedstock prices should lead to a strong decline in ethanol and biodiesel prices at the beginning of the projection period. Subsequently, both ethanol and biodiesel prices are expected to recover in nominal terms close to their 2014 levels (Figure 3.7).

Global ethanol and biodiesel production are both expected to expand to reach, respectively, almost 134.5 and 39 billion litres (Bln L) by 2024. Food-crop based feedstocks are expected to continue to dominate ethanol and biodiesel production over the coming decade as indicated by the lack of investment in research and development (R&D) for advanced biofuels, the size of the required investments and the lack of policies' visibility for operators. Most of the additional ethanol production is expected to take place in Brazil. Incentives based on national biofuel policies will continue to influence biodiesel production patterns. Indonesia will surpass the United States and Brazil in the latter years of the outlook period to become the second largest biodiesel producer behind the EU.

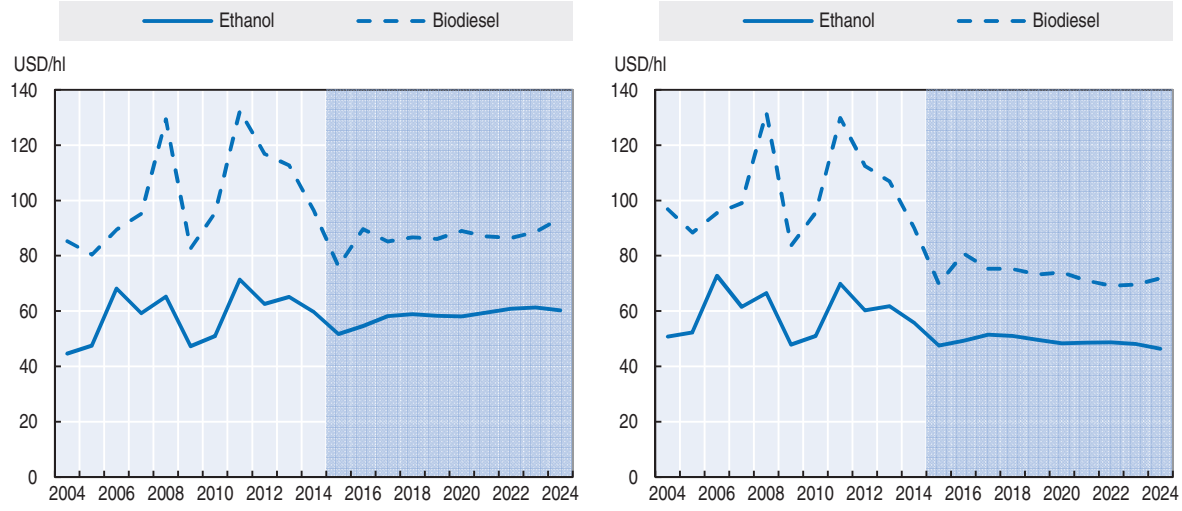
Ethanol use in the United States will be limited by the ethanol blend wall and by declining gasoline use in the latter years of the projection period. In Brazil, ethanol use expansion is linked to the high mandatory anhydrous ethanol blending requirement and to a differential taxation system that allows hydrous ethanol to compete with gasohol at least in some states. In the European Union, biodiesel use is projected to increase to its highest level in 2019 when the RED target is assumed to be met.

Ethanol and biodiesel trade in the next ten years is not expected to expand. The bilateral ethanol trade that occurred between Brazil and the United States is not expected to take place as the need for sugarcane based ethanol to fill the US advanced mandate should remain limited. Argentina and Indonesia continue to dominate biodiesel exports, the United States and EU are the only significant importers.

The future evolution of the political will to support biofuel blending in transportation fuel represents the key uncertainty to the sector. This decision process will be shaped mainly by macroeconomic developments in key countries, relative prices of feedstocks and fossil fuels, prevailing views on environmental benefits of biofuels and the global food security situation.

Figure 3.7. **Evolution of biofuel world prices**

Expressed in nominal terms (left panel) and in real terms (right panel)



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

Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", *OECD Agriculture Statistics* (database), *http://dx.doi.org/10.1787/agr-outl-data-en.*

StatLink *http://dx.doi.org/10.1787/888933229237*

The expanded biofuels chapter is available at

http://dx.doi.org/10.1787/agr_outlook-2015-13-en

Main assumptions

Policies targeting the biofuels sector have been introduced in several countries since 2005 to achieve improvements in energy security, to reduce greenhouse gas (GHG) emission, to enhance export opportunities for high value added products as well as sometimes to foster rural development. They include support measures and also targets or mandates for biofuel use.

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 respectively at least a 20% and a 50% GHG reduction as well as the biodiesel and the cellulosic mandates that are nested within the advanced mandate. The Environmental Protection Agency (EPA) provided on an annual basis, the minimum quantities for each of the four classes of biofuels required.

In November 2013 the EPA made a proposal[2] to reduce the total, the advanced and the cellulosic mandates for 2014. This proposal was based on the fact that the production capacity for cellulosic ethanol has lagged well behind the mandated quantities specified in EISA and that the ethanol blend wall[3] issue represents a circumstance that warrants a reduction in the mandated volumes under the "inadequate domestic supply" waiver provision in the RFS2. The proposal created controversy throughout the biofuel industry resulting in the final EPA rulemaking on 2014 and 2015 mandates still not being issued.

Given the lower crude oil price levels assumed in the projection and the current difficulties encountered in supplying E15 to US consumers, it is assumed that the amount of ethanol being consumed in low blend mixes in the United States will not exceed the blend wall level of 10% over the next decade. Due to decreasing gasoline use in the United States over the projection period, limitations in the expansion of domestic ethanol use related to the blend wall issue and limited development of the flex-fuel vehicle fleet in a context of lower crude oil prices, the *Outlook* assumes the total mandate should be almost 60% lower than what is specified in RFS2 for 2024.

The *Outlook* assumes that by 2024 only 2% of the cellulosic mandate specified by EISA in 2007 will be implemented because of low investments due to the uncertainties related to the evolution of biofuel policies and the low crude oil prices and that the difference between the EISA cellulosic mandate and the assumed mandate will be entirely waived. The biodiesel mandate should remain constant. So, the need for sugarcane based ethanol imports to fill the advanced gap[4] is expected to be decreasing and limited over the outlook period. The biodiesel blender tax credit is not expected to be reinstated.

In the European Union, the 2009 RED[5] states that renewable fuels (including non-liquids) should increase to 10% of total transport fuel use by 2020 on an energy equivalent basis. In October 2014, the European Council adopted the 2030 Framework for Climate and Energy Policies[6] with targets of a 40% cut in GHG emissions by 2030 when compared to 1990 and of 27% renewable energy by 2030. The framework does not propose concrete targets for the transport sector after 2020. The European Council is expected to confirm in the course of 2015 a European Parliament's vote that reduces the amount of first generation biofuels that can be counted towards the renewable energy targets from 10% to 7% and that forces biofuels suppliers to report the estimated levels of emissions caused by Indirect Land-Use Change (ILUC). This should lower uncertainties concerning the use of first and second generation biofuels over the first part of the projection period in the European Union.

This *Outlook* assumes a continuation of actual mandates and tax reductions by EU countries. Similar to what is happening in the United States, second-generation biofuels are not expected to take-off in the European Union. When accounting for the fact that each unit of second generation biofuel consumed, including those produced from used cooking oil, counts double for the purpose of the Directive, the projection assumes that the portion coming from biofuels expressed in energy share will reach 7% by 2020. It is assumed that additional progress towards the RED target should be related to the development of other energy sources for transportation including electric cars.

In Brazil, flex-fuel vehicles can either run on gasohol – a mixture of gasoline and anhydrous ethanol – or on E100 (hydrous ethanol). The anhydrous ethanol mandatory blending requirement for gasohol is expected to remain at 27%[7] over the outlook period.

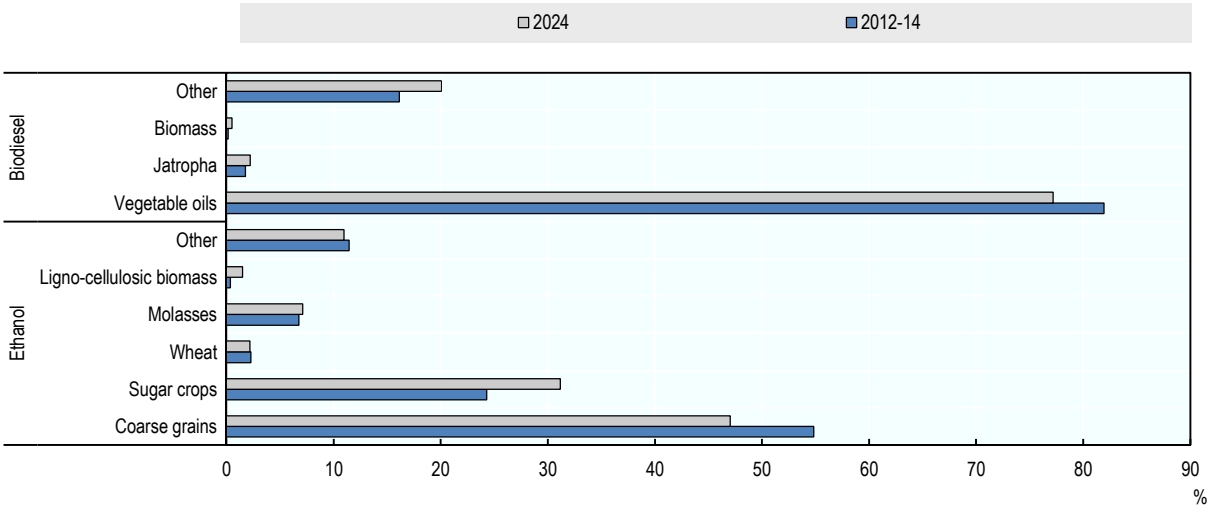
Over the past several years, the Brazilian government through Petrobras[8] kept domestic retail prices of petrol significantly below international prices in an attempt to temper inflation. Given the strong recent decrease of international crude oil prices and the need for Petrobras to recover financially, Brazilian petrol retail prices are expected to be slightly above international prices over the first part of the next decade[9]. This coupled with differentiated taxation between hydrous ethanol and gasohol as well as the increased blending requirement for anhydrous ethanol should help the Brazilian ethanol industry in the domestic market. However international opportunities will remain limited due to biofuel policy uncertainties.

In a number of emerging economies, ambitious biofuel production targets had been envisaged in recent years. Many of them are reassessed in light of the actual development in their domestic sectors and also against possible export opportunities in the future. The *Outlook* foresees a slower growth for most of the targets compared to recent years, especially in the ethanol sector. Outside of the United States, European Union and Argentina, biodiesel production is heavily dependent on policies in palm oil producing countries, especially Indonesia. Its policies support continued strong growth of its biodiesel sector in order to utilise domestic palm oil resources to replace imported diesel fuel. Increasing blending of biodiesel use has been made mandatory in transport fuel as well as for diesel used in power plants.

Prices

In conjunction with the drop in crude oil prices, the world ethanol price is projected to decrease from USD 59.7/hl in 2014 to USD 51.7/hl in 2015. It should then increase over the projection period to reach USD 60.3/hl by 2024 (Figure 3.7). Expressed in real terms, the world ethanol price is expected to be 17% lower in 2024 than its 2014 value. Several factors are expected to influence the level of ethanol prices. Price controls in Brazil will keep domestic gasoline prices, and thus also ethanol prices, above international levels at least in the short run making exports to the European Union unattractive to Brazilian producers. The world ethanol price in the latter years of the projection period is expected to remain relatively flat. Modest import demand growth from a variety of countries can be supplied by both the United States and Brazil without the need for higher prices.

Figure 3.7.2. Share of feedstocks used for biofuel production



Note: Sugar crops include ethanol produced from sugar cane as well as sugar beets in the European Union.
Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933229604

World biodiesel prices expressed in real terms are expected to decrease by 20% over the outlook period reflecting the projected evolution of the vegetable oil prices. Demand for biodiesel should be mostly driven by policies in place and not by market forces. Biodiesel trade is not expected to grow.

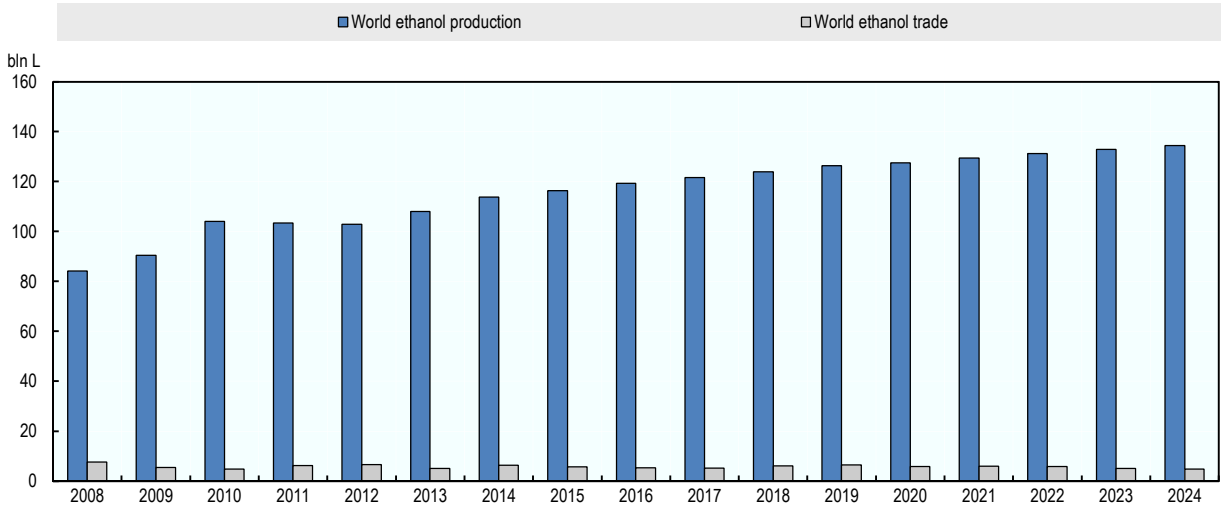
Production

Coarse grains and sugarcane will remain the dominant ethanol feedstock, while vegetable oil continues as the feedstock of choice in biodiesel production (Figure 3.7.2). Ligno-cellulosic biomass based ethanol is projected to only account for about 2% of world ethanol production by 2024. Biofuel production is expected to consume 10.5% and 13% of global coarse grains and vegetable oil production respectively in 2024. By 2024, 25% of global sugarcane production is used to produce ethanol, up from 21% in 2014. This increase is related to sustained domestic ethanol demand and to the relatively better profitability of the Brazilian ethanol industry compared to the domestic sugar industry[10].

Global ethanol production is projected to increase during the outlook period from about 114 Bln L in 2014 to nearly 134.5 Bln L by 2024 (Figure 3.7.3). Two-thirds of this increase is expected to originate from Brazil mostly to fill domestic demand. The two major ethanol producers by far remain the United States and Brazil followed by the European Union and the People's Republic of China (Figure 3.7.4).

In the United States, the projected total biofuel production is driven by the assumptions on how the EPA will deal with the total, advanced, biodiesel and cellulosic mandates in the coming decade[11]. Both the economic recovery and low crude oil prices lead to increasing gasoline use in the United States in 2015 and 2016. The total amount of ethanol blended in regular cars should thus be slightly above the 2014 level in both years and the conventional gap[12] will reach its maximum in 2016 (52.4 Bln L) to afterwards decrease to 50 Bln L by 2024. The US ethanol supply growth over the remaining period will mostly arise from ligno-cellulosic biomass based ethanol, where growth is assumed to happen from 2020 onwards to reach 1.3 Bln L by 2024. Altogether, ethanol production in the United States is projected to modestly increase over the next ten years from 57.2 Bln L in 2014 to 56.7 Bln L by 2024.

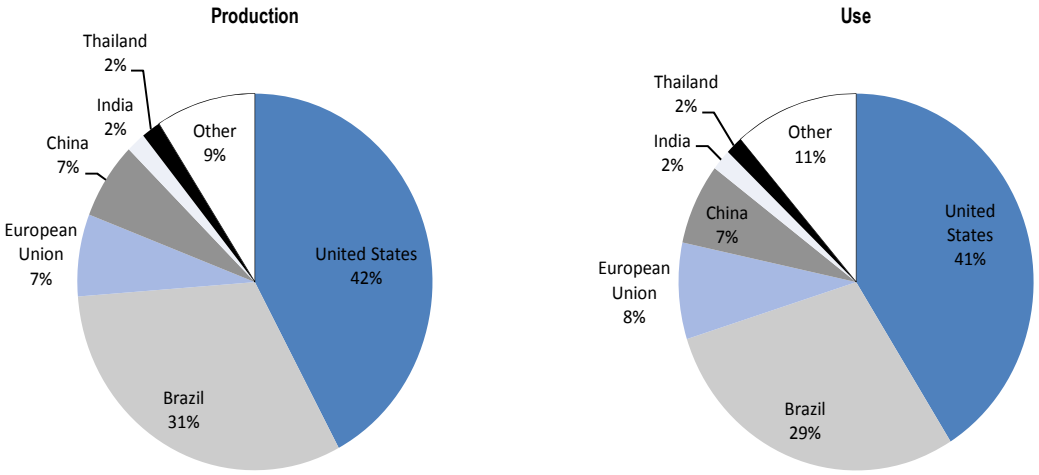
Figure 3.7.3. Development of the world ethanol market



Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933229613

Figure 3.7.4. Regional distributions of world ethanol production and use in 2024



Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933229628

Ethanol markets in Brazil are driven by increasing domestic demand for anhydrous ethanol due to the 27% blending requirement in gasohol, and the demand for hydrous ethanol by the flex-fuel vehicles fleet because of a differential taxation system that slightly favours ethanol *in relation to* gasohol in some states. Brazilian ethanol production is projected to increase by 50% from 28 Bln L in 2014 to 42.5 Bln L in 2024.

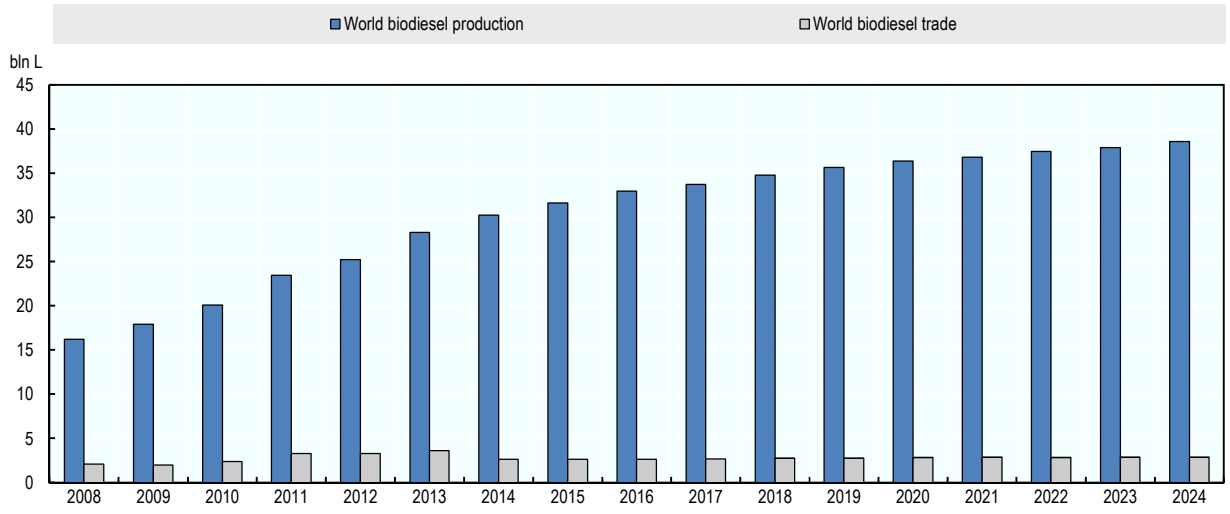
In the European Union, ethanol production for fuel (mainly from wheat, coarse grains and sugar beet) is projected to reach a maximum of almost 10 Bln L in 2019 when the RED target is assumed to be met and then to decrease to 9.5 Bln L by 2024 because of decreasing gasoline and thus ethanol use. Beginning in 2017, when the new sugar regime enters into force, it is expected that the production of ethanol from sugar beets will be less profitable than sugar production given the expected increase in the price of sugar beets. Ligno-cellulosic biomass based ethanol should remain marginal over the outlook period.

Apart from Brazil, most countries in the developing world slow their production growth compared to their recent fast development and expand production levels only modestly in the coming decade. India remains a significant producer of ethanol focussing on the domestic fuel and non-fuel markets, while Thailand is poised to increase its production to meet growing regional demand in the second half of the projection period.

Global biodiesel production is expected to reach 39 Bln L by 2024 corresponding to a 27% increase from 2014 (Figure 3.7.5). The European Union is expected to be by far the major producer of biodiesel (Figure 3.7.6). Other significant players are Indonesia, the United States, Brazil, and Argentina. Policy rather than market forces will continue to influence production patterns in almost all countries.

In the European Union, biodiesel production is projected to follow a similar path as ethanol production and to reach its maximum in 2020 with 13.6 Bln L when the RED target is met. By 2024, production is expected to decline to 13.1 Bln L due to lower demand for both biodiesel and diesel. The United States is expected to lose its position as the second largest biodiesel producer in the next ten years. In fact, the end of the biodiesel blenders' tax credit means that domestic biodiesel production will remain close to but not surpass the biodiesel mandate level of 4.8 Bln L.

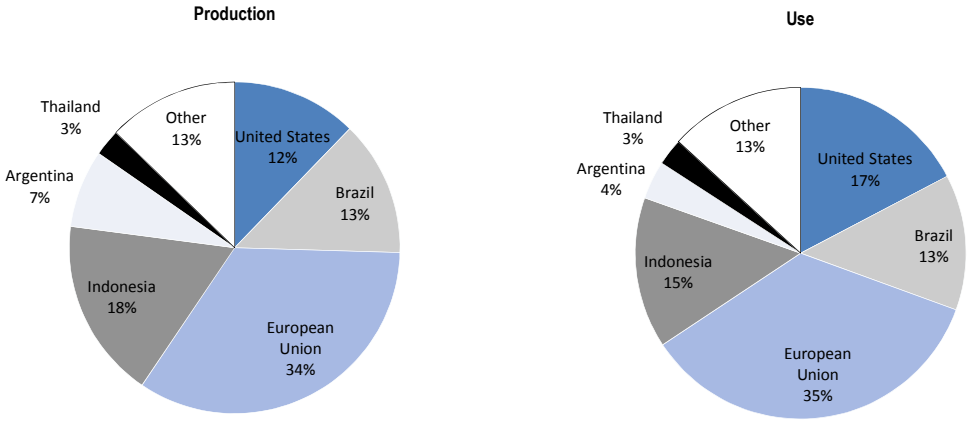
Figure 3.7.5. Development of the world biodiesel market



Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933229637

Figure 3.7.6. Regional distributions of world biodiesel production and use in 2024



Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database), http://dx.doi.org/10.1787/agr-outl-data-en.

StatLink http://dx.doi.org/10.1787/888933229645

Brazil is expected to become the third largest biodiesel producer over the projection period to meet increasing biodiesel demand boosted by the domestic mandate. The 11% increase in biodiesel production expected for Argentina should satisfy both domestic and international demand.

Biodiesel production in Indonesia is projected to continue strongly to satisfy the increasing domestic blending requirements and to maintain a significant export level. The currently installed production capacity of around 8 Bln L is already sufficient to support the estimated production level of 6.8 Bln L by 2024. Such a production level

would consume about 14% of the domestically produced palm oil and constitute 35% of the domestic use in Indonesia by end of the projection period. Production in Malaysia continues to expand as well, but levels of about 0.6 Bln L because of a small domestic market and only limited export opportunities for palm oil based biodiesel. Thailand has grown its biodiesel sector to about 1 Bln L in recent years, but is expected to remain at about this level as no growth in the domestic demand is foreseen. Colombia, another emerging biodiesel producer, may reach 1 Bln L by 2024, all for domestic consumption as well.

Use

Global ethanol use is projected to increase by 21 Bln L during the outlook period. Ethanol use in Brazil expands by 11.5 Bln L representing 55% of the global increase. This expansion is linked to the mandatory 27% anhydrous ethanol blending requirement in gasohol, to the development of the flex-fuel industry and to a differential taxation system that allows hydrous ethanol to compete with gasohol at least in some Brazilian states. Import demand for Brazilian ethanol should be relatively limited in the early years of the projection period, as domestic ethanol prices are expected to move in line with domestic gasoline prices and thus to be slightly above international prices. Given the blend wall issue and the assumed levels of the advanced, cellulosic and biodiesel mandates in the United States, it is assumed that the Brazilian sugarcane based ethanol import demand from the United States to fulfil the advanced biofuel mandate will be limited over the projection period.

Ethanol use in the United States is limited by the blend wall and the declining petrol use prospects from 2017 to the end of the projection period. The blend wall is expected to remain at 10% through the projection period. A limited development of the flex-fuel car sector is assumed given the low crude oil prices assumptions. In this context, ethanol use is expected to remain close to 55 Bln L leaving the United States in a net export position throughout the projection period.

In the European Union, ethanol fuel use is expected to expand by 3.4 Bln L over the projection period and to amount to an average volume share of 7.8% in petrol types for transport fuels by 2024. In Argentina, ethanol use is also expected to expand to 0.5 Bln L due to a domestic mandate.

Ethanol use in developing countries is divided into fuel and other uses, with non-fuel use often taking the largest share. Biofuel consumption is driven by blending targets or mandates. A number of emerging economies are using ethanol in low level blends and plan to increase the blending ratios over the next decade. Examples include India, Thailand, Colombia, Philippines, Viet Nam, and Nigeria.

Biodiesel use is expected to increase by 8.3 Bln L. In the European Union, biodiesel use is projected to increase from 12.7 Bln L in 2014 to its highest level of almost 14.8 Bln L in 2020 when the RED target is assumed to be met. Over the rest of the outlook period, biodiesel use is expected to decrease to 13.4 Bln L in 2024 because of the declining diesel use prospects, increased energy efficiency and the assumed continuation of the double counting rules under RED. The lower volume represents an average share of biodiesel in diesel type fuels of 6.4%.

Biodiesel use in Indonesia is projected to increase steadily from about 2 Bln L in 2012-14 to 5.6 Bln L in 2024. About 4.5 Bln L of this will be consumed as transport fuel and the remaining 1.1 Bln L will be used by the energy sector. On average, the share of biodiesel in all diesel fuel is estimated to grow by about 12% over ten years. Such a substitution into biofuel will add value to the domestically produced palm oil, reduce GHG emissions and provide a significant reduction of diesel imports to improve the current accounts of Indonesia.

In the United States, the mandate for biodiesel is assumed to stay constant over the projection period at 4.8 Bln L. The end of the biodiesel blenders' tax credit in 2014 implies a drop in US biodiesel use from 6.7 Bln L in 2014 to 5.5 Bln L in 2015. Given a decreasing

biodiesel to diesel consumer price ratio from 2017 onwards and the ethanol blend wall, US biodiesel consumption is projected to reach 6.6 Bln L by 2024 helping fulfil the advanced and total mandates.[13] Biodiesel should therefore capture a share of the other advanced gap, lowering the need to import sugarcane based ethanol. In a context of declining diesel consumption, biodiesel blending in diesel type fuels is expected to be 2.6% in 2024.

Biodiesel use in Brazil is expected to rise up to 5 Bln L by 2024, given a 7% domestic biodiesel blending requirement and a steady expected demand for diesel. In Argentina, the domestic mandate implies biodiesel use will reach more than 1.4 Bln L in 2024 up by a fourth over the projection period.

Biodiesel blending requirements are in effect in several developing countries. Countries that are currently using notable amounts of biodiesel are India, Colombia, Thailand, Malaysia, Pakistan and Viet Nam. Most countries are starting form very low levels of consumption and will remain at 1% – 3% blending, but a few countries are expected to reach about 10% blending by the end of the outlook period.

Trade

Global ethanol trade is set to remain stable over the outlook period. The United States is expected to remain a net exporter with about 2 Bln L of maize based ethanol exported by 2024 and also a modest importer. The need for sugarcane based ethanol imports to fill the advanced gap is expected to be limited and decreasing over the outlook period, the stable advanced mandate being filled by biodiesel and from 2020 by a modest development of cellulosic ethanol. US ethanol exports are not expected to increase much over the projection period as import demand is limited.

The bilateral trade that happened in the past few years between Brazil and the United States is not projected to occur over the next ten years. In the early years of the projection period, Brazilian exports are expected to remain low when compared to the recent past as the Brazilian ethanol industry will mostly fill sustained domestic demand and domestic ethanol prices should be slightly above international ones. Brazilian ethanol imports will remain limited due to logistical issues. In the second half of the projection period, Brazilian ethanol and gasoline prices are expected to move in line with international ones. Brazil is thus expected to expand modestly sugarcane based ethanol exports reaching about 3.5 Bln L by 2024. Altogether, developing countries are net exporters of ethanol.

Argentina is expected to develop its ethanol industry and to export 0.6 Bln L by 2024. The European Union, Japan and Canada are the major ethanol importers. Their combined import needs expand by 1.1 Bln L over the projection period. In the EU, 14% of ethanol use will be imported towards the end of the projection period.

Biodiesel trade is projected to remain stable over the next ten years, with Argentina remaining the major exporter followed by Indonesia. The export growth potential of both countries is expected to be limited due to domestic biodiesel targets and mandates as well as sustainability requirements in the European Union. With the RED target defined in 2020, net import demand in the European Union is expected to decrease to about 0.3 Bln L by 2024. The United States is expected to be a net importer of biodiesel over the projection period with the biodiesel tax credit assumed not to be reinstated and the increase in domestic biodiesel use to meet the total and advanced mandates. Argentina is expected to supply most of the imports given the EPA's decision in early 2015 to allow Argentinean biodiesel producers to fulfil the record keeping requirements of the RFS2.

Trade of palm oil based biodiesel remains an important export commodity for Indonesia. Volumes have dropped significantly from their peak in 2012, but are expected to rebound in 2015 to about 1.1 Bln L and to remain stable during the outlook period. Malaysia also exports about 0.3 Bln L throughout the period, but is expected to keep its focus on the export of palm oil. Tanzania and Mozambique, have developed small, export oriented sectors, they are projected to maintain these activities at about the current

levels. India has started to import small quantities of biodiesel, but no significant expansion is expected

Main issues and uncertainties

The development of biofuel markets in the recent past has been strongly related to biofuel policy packages in place, the macroeconomic environment and the level of crude oil prices. This *Outlook* differs from previous editions by the assumption of lower energy prices which do not favour short- to medium-term development of first-generation biofuels and investment in research and development (R&D) for advanced biofuels produced from ligno-cellulosic biomass, waste or non-food feedstock.

Enabling higher levels of energy security was at the centre of the initial setup of biofuel policies. With lower crude oil prices and major biofuel producing countries such as Brazil and the United States becoming less dependent on imported fossil fuels, questions related to energy security might get lower priority. A stochastic scenario on the effect of higher crude oil prices is presented in Chapter 1.

A major uncertainty is the evolution of biofuel policies around the world. It is likely that those policies will face downward revisions in the future. This was indicated by the November 2013 EPA proposal to lower the biofuels mandates in the United States and by the recent adoption of the 2030 Framework for Climate and Energy Policies with no concrete proposals for biofuels use in the European Union beyond 2020. However the biofuels industries in major producing countries might counterbalance this trend at least in the short term. This is evident in Brazil where recent policy decisions in terms of taxation and blending requirements were rather favourable to the ethanol and sugar industries and in the United States with the difficulties for the EPA to announce mandates levels for 2014 and 2015.

The uncertainties regarding the future of biofuel policies in key countries might act as an impediment to new investment decisions in R&D for advanced biofuels. The developments for the biofuel markets over the next ten years are conditional on the assumption that most of the biofuels to be produced in the next decade will be based on agricultural feedstock. Biofuel production is thus likely to have direct or indirect effects on the environment and on land use in the medium term; which in turn should be taken into account when biofuel policies are going to be revised.

Notes

1. http://www.epa.gov/OTAQ/fuels/renewablefuels/.
2. http://www.epa.gov/OTAQ/fuels/renewablefuels/documents/420f13048.pdf.
3. The blend wall term refers to short run technical constraints that act as an impediment to increased ethanol use. 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 the dispensing of E15 and E85 is still not widespread. E15 and E85 refer to gasohol with respectively 15%and 85% volume of ethanol blended into petrol. E10 is still the most commonly available gasohol in the United States.
4. The advanced gap corresponds to the difference between the advanced mandate, and the biodiesel and cellulosic mandates. It corresponds to fuels being able to achieve a 50% greenhouse gas reduction.
5. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF.
6. http://ec.europa.eu/clima/policies/2030/index_en.htm
7. This 27% blending requirement was approved by the Brazilian government in March 2015. The former level was 25%

8. Petrobras is a semi-public Brazilian multinational energy corporation.

9. A description of the Brazilian ethanol industry and its link with the level of gasoline prices is provided in Chapter 2.

10. More details are provided in Chapter 3.

11. Those assumptions have been described in the previous section.

12. The conventional gap is the difference between the total and advanced mandates as defined by the Renewable Fuel Standard (RFS2). It is often seen as an implied maize based ethanol mandate. The assumed mandate levels are based on the blend wall limit and on the evolution of gasoline use in the United States.

13. Biodiesel like sugarcane based ethanol qualifies for the advanced mandate. It is important to note that a unit of biodiesel counts for 1.5 units of advanced mandate.

Table 3.A1.8. **Biofuel projections: Ethanol**

	PRODUCTION (mln L)		Growth (%)[1]	DOMESTIC USE (mln L)		Growth (%)[1]	FUEL USE (mln L)		Growth (%)[1]	SHARE IN GASOLINE TYPE FUEL USE (%)				NET TRADE (mln L)[2]	
										Energy share		Volume share			
	Average 2012-14est	2024	2015-24	Average 2012-14est	2024	2015-24	Average 2012-14est	2024	2015-24	Average 2012-14est	2024	Average 2012-14est	2024	Average 2012-14est	2024
NORTH AMERICA															
Canada	1 853	2 039	0.08	2 880	3 034	0.52	2 880	3 034	0.52	4.7	5.1	6.8	7.4	-1 027	-996
United States	53 961	56 691	0.04	52 499	55 063	0.05	51 452	53 447	-0.07	6.7	7.2	9.7	10.4	1 416	1 621
of which second generation	0	1 273	..	..	..	..	..	..	..	..	..	..	..	..	..
EUROPE															
European Union	6 896	9 491	2.19	7 783	11 074	3.51	5 419	8 568	4.78	3.1	5.4	4.5	7.8	-887	-1 583
of which second generation	67	430	..	..	..	..	..	..	..	..	..	..	..	..	..
OCEANIA DEVELOPED															
Australia	340	348	0.05	327	347	0.05	327	347	0.05	1.0	1.0	1.4	1.5	13	0
OTHER DEVELOPED															
Japan	356	361	0.00	1 338	1 774	1.50	887	1 298	2.11	0.0	0.0	0.0	0.0	-982	-1 413
South Africa	265	466	6.53	87	263	11.22	46	222	15.53	..	..	..	..	179	203
SUB-SAHARAN AFRICA															
Mozambique	92	128	0.67	126	160	2.27	70	103	3.69	..	..	..	..	-34	-33
Tanzania	145	195	0.39	199	254	2.35	110	163	3.82	..	..	..	..	-53	-59
LATIN AMERICA AND CARRIBBEAN															
Argentina	664	1 750	6.21	598	1 130	3.65	495	1 023	4.13	4.1	7.9	5.9	11.3	65	620
Brazil	26 566	42 482	3.71	24 367	38 968	3.13	22 600	36 890	3.26	37.7	45.0	47.5	55.0	2 199	3 514
Colombia	417	536	3.01	531	695	2.96	460	621	3.33	..	..	..	..	-114	-159
Mexico	84	227	9.19	285	533	3.06	0	0	..	0.0	0.0	0.0	0.0	-200	-306
Peru	361	377	0.38	331	368	1.63	234	283	2.14	..	..	..	..	29	9
ASIA AND PACIFIC															
China	8 064	8 898	1.54	8 185	9 334	2.10	5 294	6 153	2.16	3.0	1.9	4.4	2.7	-121	-436
India	2 081	2 317	0.14	1 943	2 426	1.37	1 138	1 595	2.10	..	..	..	..	138	-109
Indonesia	197	207	0.66	156	209	1.31	108	157	1.75	..	..	..	..	41	-2
Malaysia	0	0	-0.01	0	0	1.26	0	0	2.30	..	..	..	..	0	0
Philippines	191	294	0.64	519	736	2.43	462	663	2.71	..	..	..	..	-328	-442
Thailand	1 242	2 323	5.09	1 092	2 100	4.71	984	1 980	5.08	..	..	..	..	150	223
Turkey	104	118	0.24	160	170	1.08	105	117	1.57	..	..	..	..	-55	-52
Viet Nam	448	582	2.74	357	475	2.47	254	380	3.15	..	..	..	..	91	108
TOTAL	**108 197**	**134 436**	**1.57**	**107 771**	**134 118**	**1.58**	**93 777**	**117 522**	**1.57**	**7.0**	**7.8**	**10.1**	**11.3**	**5 667**	**4 300**

.. Not available

Note: Average 2012-14est: Data for 2014 are estimated.

1. Least-squares growth rate (see glossary).
2. For total net trade, sum of all positive net trade positions.

Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", *OECD Agriculture Statistics* (database). doi: http://dx.doi.org/10.1787/agr-outl-data-en

StatLink http://dx.doi.org/10.1787/888933229825

Table 3.A1.9. **Biofuel projections: Biodiesel**

	PRODUCTION (mln L)		Growth (%)[1]	DOMESTIC USE (mln L)		Growth (%)[1]	SHARE IN DIESEL TYPE FUEL USE (%)				NET TRADE (mln L)[2]	
							Energy share		Volume share			
	Average 2012-14est	2024	2015-24	Average 2012-14est	2024	2015-24	Average 2012-14est	2024	Average 2012-14est	2024	Average 2012-14est	2024
NORTH AMERICA												
Canada	392	486	0.33	538	794	1.56	1.9	2.1	2.1	2.3	-145	-308
United States	5 149	4 723	0.41	5 719	6 633	2.19	2.3	2.4	2.5	2.6	-570	-1 910
EUROPE												
European Union	11 599	13 120	0.27	13 014	13 452	-0.34	5.3	5.9	5.7	6.4	-1 415	-332
of which second generation	52	185	..	..	..	..	..	..	..	..	..	..
OCEANIA DEVELOPED												
Australia	63	280	11.96	72	276	11.04	0.3	1.1	0.3	1.2	-9	4
OTHER DEVELOPED												
South Africa	77	268	17.55	77	268	17.55	..	..	..	..	0	0
SUB-SAHARAN AFRICA												
Mozambique	74	78	-0.07	29	42	3.70	..	..	..	..	45	37
Tanzania	63	101	4.70	6	38	14.97	..	..	..	..	56	63
LATIN AMERICA AND CARIBBEAN												
Argentina	2 565	2 923	1.17	1 043	1 429	0.62	6.7	9.5	7.3	10.3	1 522	1 494
Brazil	3 118	5 094	1.23	3 119	5 070	1.19	4.9	6.5	5.3	7.0	-1	24
Colombia	666	968	3.34	665	968	3.37	..	..	..	..	1	0
Peru	98	108	0.03	275	272	1.57	..	..	..	..	-177	-165
ASIA AND PACIFIC												
India	300	792	12.89	433	900	8.65	..	..	..	..	-133	-108
Indonesia	2 044	6 789	7.62	1 007	5 638	9.92	..	..	..	..	1 037	1 151
Malaysia	240	619	5.42	105	294	11.28	..	..	..	..	135	325
Philippines	187	281	2.04	187	281	2.04	..	..	..	..	0	0
Thailand	944	1 001	1.01	944	1 001	1.01	..	..	..	..	0	0
Turkey	13	14	0.88	13	14	0.92	..	..	..	..	0	0
Viet Nam	28	145	10.02	28	145	10.14	..	..	..	..	0	0
TOTAL	**27 913**	**38 569**	**2.13**	**27 568**	**38 297**	**2.14**	**3.2**	**3.6**	**3.5**	**4.0**	**1 795**	**1 700**

.. Not available

Note: Average 2012-14est: Data for 2014 are estimated.

1. Least-squares growth rate (see glossary).
2. For total net trade, sum of all positive net trade positions.

Source: OECD/FAO (2015), "OECD-FAO Agricultural Outlook", *OECD Agriculture Statistics* (database). doi: http://dx.doi.org/10.1787/agr-outl-data-en

StatLink http://dx.doi.org/10.1787/888933229833