Economics and agricultural market impacts of growing biofuel production

Wirtschaftlichkeit von Biokraftstoffen und Auswirkungen steigender Produktionsmengen auf die Agrarmärkte

Martin von Lampe
Organisation for Economic Co-operation and Development, Paris, France

Abstract

This paper analyses the economics of biofuel production and the implications that the accelerating growth in biofuel production in many countries could have on agricultural markets. It shows that production costs of ethanol and biodiesel differ significantly across countries and feedstock crops. These costs often exceed those of fossil fuels. In consequence, the economics of biofuel production depends on public support in most countries. Similarly, land requirements for crops required to enable significant shares of biofuel production in transport fuel consumption are shown to be substantial in many countries given current technologies. An expected growth in biofuel production is, therefore, likely to have a significant increasing impact on world prices for sugar, cereals and oilseeds beyond what is caused by higher crude oil prices alone. The paper points out a number of policy issues that require attention and further analysis to facilitate a fuller discussion of biofuel policies.

Key words

biofuels; production costs; resource requirements; agricultural market impacts; biofuel policies

Zusammenfassung

Dieser Beitrag beschäftigt sich mit der Wirtschaftlichkeit der Produktion von Biokraftstoffen und den möglichen Auswirkungen des beschleunigten Wachstums der Biokraftstoffproduktion auf landwirtschaftliche Produktmärkte. Er zeigt, dass Produktionskosten von Ethanol und Biodiesel je nach Produktionsland und Rohstoff stark variieren, häufig aber höher als die für fossile Treibstoffe sind. Gleichzeitig würde ein höherer Anteil der Biokraftstoffproduktion am Gesamtverbrauch von Transporttreibstoffen zum Teil erhebliche Flächen benötigen, wenn derzeitige Technologien verwendet werden. Der derzeit erwartete Anstieg der Produktion von Biokraftstoffen wird daher eine signifikante Preissteigerung auf den internationalen Märkten für Zucker, Getreide und Ölsaaten zur Folge haben, die über die Auswirkungen gestiegener Rohölpreise hinausgehen. Der Beitrag zeigt eine Reihe von politik-relevanten Fragen auf, deren Beachtung und weitere Untersuchung für eine qualifizierte Diskussion von Politikmaßnahmen im Bereich von Biokraftstoffen erforderlich sind.

Schlüsselwörter

Biokraftstoffe; Produktionskosten; Ressourcenbedarf; landwirtschaftliche Marktwirkungen; Biokraftstoffpolitik

1. Introduction

Biofuels, which may be defined as "transportation fuels derived from biological (e.g. agricultural) sources" (IEA, 2004: 27.), play an increasingly important role in both public debate and agricultural markets. A panoply of arguments underpins the public interest in alternative sources of transport fuels, including concerns about finite availabilities of crude oil, reliance on imports from countries perceived as being politically unstable, the recent increase of petrol prices as well as environmental considerations of greenhouse gas (GHG) emissions and other pollutants from increasing fossil fuel usage. In addition, agricultural producers hope for a new market outlet for their produce as most of the current biofuels are made from commodities such as grains, sugar crops and oilseeds. As a consequence, policy makers in Europe as well as in many other countries have engaged in supporting the production and/or the use of biofuels. Notwithstanding high crude oil prices that make alternative fuels more competitive, the current growth in biofuel production is mainly driven by public support rather than by market forces. This development raises a number of policy-relevant questions that form the primary focus of this article. The next section provides a brief overview of the economics of biofuels production by looking at biofuel production costs and possible resource implications, in particular with respect to potential crop land requirements. Section three discusses the possible impacts of a further growth in biofuel production on agricultural markets. A concluding section raises a number of issues that will need further research.

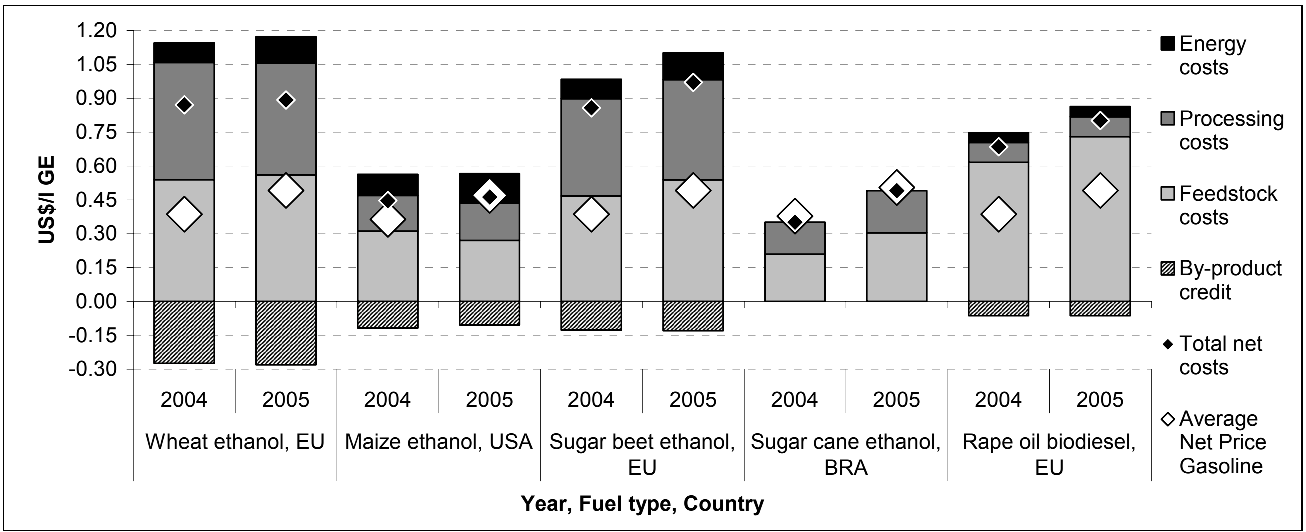
2. Economics of biofuels production

Currently there are two main biofuels available on the market, namely ethanol produced mainly from sugar crops, grains and other starchy commodities, and biodiesel, a chemically modified form of vegetable oil largely produced from oilseeds. While there are numerous other fuels made from organic matter, these generally play only a minor role at this point in time, even though they might become more important in the next decade or two. This article, therefore, predominantly looks at ethanol based on sugar crops and cereals, and biodiesel made from vegetable oils[1]. As the different feedstock commodities represent the most important element in biofuel production costs, commodity prices and biofuel extraction yields are the main determinants for production costs of biofuels. Figure 1 shows approximate production costs for ethanol and biodiesel for selected producing countries and typical feedstocks. Feedstock costs generally represent the majority of total net production costs, with most of the rest determined by processing costs.

---

[1] This article, therefore, also does not consider biodiesel produced from oilseeds other than soybeans, rapeseed and sunflower seed (palm oil is included in the analysis), even though recent developments indicate that other oilseeds could play an important role in the production of biodiesel particularly in developing countries.

Figure 1. Production costs of various biofuels, 2004 and 2005



Note: Calculations for 2004 and 2005 are based on cost data found for various years in the past, using actual data for inflation, exchange rates, feedstock and oil prices. Average crude oil prices (Brent) for 2004 and 2005 were about US$ 38 and 55 per barrel, respectively.

Source: own calculations based on OECD (2006)

Energy costs represent a significantly smaller share of production cost, particularly in the case of sugar cane based ethanol. The energy required to produce ethanol from this feedstock is often derived from burning the bagasse of the sugar cane itself. By-products derived with the production of ethanol constitute an important element in the cost calculation as well: in many cases, these represent valuable animal feeds, e.g. distillers dried grains with solubles (DDGS), corn gluten feed (CGF), corn gluten meal (CGM) and bran from grain-based ethanol production, or dried pulp from sugar-beet based ethanol production. Other by-products can be used by other industries (e.g. glycerine from biodiesel production).

A comparison of net production costs of different biofuel processes shows an advantage for cane-based ethanol when compared to other feedstocks as well as to biodiesel. With a cost of 0.35 US$ per litre of gasoline equivalent[2] in 2004, cane-based ethanol from Brazil was both cheaper compared to ethanol and biodiesel produced in other countries and from other feedstocks, but also compared to the actual supply costs of fossil gasoline net of taxes. In terms of European ethanol and biodiesel fuels, these were produced at substantially higher costs, and relied on government support. In the US, production of ethanol from maize has a long history, but production costs are still higher than for cane-based ethanol in Brazil. In 2005, the costs for most biofuels have increased due to higher prices for energy and a number of feedstocks, with the exception of maize. The appreciation of the Brazil Real has additionally contributed to increased costs of cane-based ethanol in that country when expressed in US$. In all cases, however, domestic gasoline prices were higher in 2005 than in 2004 as well, thus making ethanol production in both Brazil (sugar cane) and the US (maize) slightly cheaper than net gasoline prices. In contrast, costs for both ethanol and biodiesel production in the EU remained well above tax-free gasoline prices in 2005.

Indeed, according to current estimates, European biofuels would become profitable without support only at crude oil prices substantially above current high levels. With current technology and depending on feedstock prices, oil prices would need to be reach about US$ 100 per barrel for European biofuels to be come competitive, a level of oil prices that seems unlikely in the near future despite the recent increase in crude oil quotations. Consequently, any growth of biofuel markets in Europe or in other countries with similar cost structures remain dependent on government financial support in the form of production subsidies, excise tax reductions or mandatory blending requirements with gasoline.[3]

Another element in the economic assessment of biofuel production based on agricultural commodities is the implied land allocation for increased crop production quantities to provide the supplies of needed feed stock. As current biofuels production competes with other uses of agricultural commodities, particularly for direct food and for animal feed, the question of the potential land requirement for larger biofuel production quantities is an important issue for consideration. Assuming current technologies in agriculture and biofuel production, and using data for 2004, a 10% share of biofuel production from domestic feedstock sources in total transport fuel consumption would require 43% of the land currently devoted to cereals, oilseeds and sugar crops in the case of the EU. Similar assumptions for the US

[2] Note that for comparability reasons, production costs are expressed in US$ per litre of gasoline equivalent (GE), where a litre of GE equals 1.515 litres of ethanol or 1.124 litres of biodiesel due to their lower energy content relative to gasoline.

[3] It is interesting to note the change of ethanol production costs in Brazil which is very close to the change in net gasoline prices. With a large share of sugar cane used for fuel ethanol production quickly adjusting to changes in ethanol and sugar prices, and an increasing number of vehicles that can run on any mix of ethanol and gasoline ("flex-fuel cars"), sugar prices in general and cane prices in particular are increasingly linked to fossil fuel prices.

and Canada would imply a slightly lower requirement of 36% and 30%, respectively, of available crop land in order to boost biofuels share to 10% of total transport fuel usage. Again, Brazil shows an important advantage, with the land requirement for a 10% share for biofuels in total transport fuel consumption representing only about 3% of its crop land currently under cereals, oilseeds and sugar cane. This difference is due to two main factors: on the one hand, fuel consumption per head of population is well below that of the EU and North America. On the other hand, however, with more than 4 000 l of gasoline equivalent the yield of ethanol per hectare of sugar cane is well above that of ethanol per hectare of grains (ranging from about 530 to 2 300 l, depending on the region and the type of cereals), while the yield of biodiesel per hectare of oilseeds generally is even lower with about 440 to 810 l of gasoline equivalent. In other words, it takes about five hectares of rapeseed or three hectares of wheat in the EU, or two hectares of US maize, to produce the biofuel energy grown on one hectare of sugar cane in Brazil.

While the analysis considers ethanol and biodiesel in the EU, the US, Canada and Brazil, it seems plausible that this comparative advantage for cane-based ethanol would hold for other countries as well that benefit from similar climatic and economic conditions. Among those countries, India has launched its ethanol production based on sugar cane in 2001. In 2005, India ranked fourth in the list of ethanol producers with a total of more than 2.1 million tonnes (RFA, 2006).

3. Implications of biofuel growth on agricultural markets

While in most areas biofuel production remains unprofitable even at relatively high prices for competing petroleum fuels, the production and use of both ethanol and biodiesel for transport vehicles is increasingly in the interest of public policy makers, and hence enjoys considerable support in various forms[4]. Consequently, biofuel markets are likely to further expand, with growth likely to accelerate over the next few years if planned investments in the pipeline and government announced initiatives start to bear fruit. To analyse the implications of this growth on agricultural markets, a number of model scenarios were simulated using a global agricultural trade model.

3.1 Methodological description of the model analysis

The OECD's Aglink model is a global, recursive-dynamic, partial equilibrium model for regional and world markets of temperate-zone agricultural products. Commodities represented include cereals, oilseeds and oilseed products, meat and dairy products. While the Aglink model focuses on OECD countries as well as a number of major Non-OECD economies, it has recently been complemented by the FAO's Cosimo model covering developing and transition economies in greater detail. For this analysis, the Aglink-Cosimo model has been combined with the OECD World Sugar Model, a dedicated model for the sugar markets which is similar to Aglink-Cosimo in its model structure.

In addition, the model has been expanded by biofuel modules for some major biofuel producing regions, including the USA, Canada, the EU-15 and Poland. These modules include endogenous representations of the production of grain- and sugar-based ethanol and of vegetable oil-based biodiesel, together with their respective use of agricultural products as well as the production of by-products used as feed in the livestock sector. Biofuel consumption is not considered. Instead, it is assumed that biofuel targets as established for the EU and the USA are met by domestic biofuel production. However, trade in agricultural commodities and hence in feedstock commodities used in biofuel production is explicitly taken into account. Biofuel production generally depends on the costs (driven by feedstock and energy prices as well as tax concessions) and fossil fuel prices (depending on crude oil prices).[5]

Using the projections published by OECD and FAO in 2005 (OECD/FAO, 2005)[6] as a benchmark for comparison, a number of model scenarios were simulated in order to assess the impact of biofuel growth on agricultural markets, and to estimate the effect of alternative oil price assumptions on these developments. A 'status quo' scenario with ethanol and biodiesel production exogenously fixed at their 2004 levels was used as a benchmark, to which a 'biofuel growth' scenario was compared. This scenario assumes biofuel production quantities to grow along current projections which in particular take into account policy targets established for the EU and the USA.[7] While these first two scenarios assumed crude oil prices to decline from US$ 55 per barrel in 2005 and US$ 56 per barrel in 2006 to about US$ 41 per barrel in 2014, an additional scenario assumed crude oil prices to remain at US$ 70 per barrel as of 2006.

3.2 Continued growth in biofuel production

Implications of increased ethanol and biodiesel production on agricultural markets are related to at least two elements: first, and above all, the production of ethanol and biodiesel represents an additional demand for cereals, sugar crops, and vegetable oils, which in general competes with the demand from food use and animal feed. Second, the production of grain-based ethanol generates by-products that can be used as feedstuff in livestock production, as discussed above. These compete with other feedstuffs such as feed grains and oilseed meals and hence reduce the demand for the latter.

---

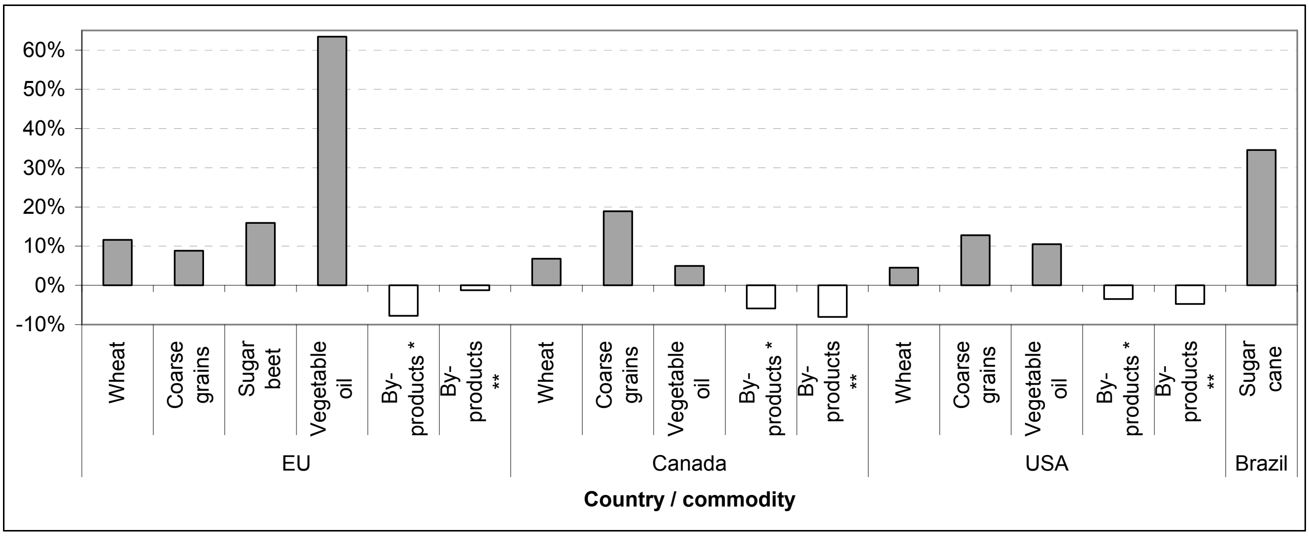
4 Among these policies, only tax concessions are considered explicitly in the model analysis below, while other support is taken into account implicitly in the projections. For details on policies measures supporting biofuels in various OECD and other countries see OECD (2006).

5 For a more detailed technical description of the modelling approach see Annex 3 of OECD (2006). Note that ethanol production in Brazil is included in the original OECD World Sugar Model.

6 Note that an updated baseline was generated using more recent price data for crude oil as used in OECD/FAO (2006).

7 Note that, as the biofuel production is endogenous to the model, the final quantities in the simulation differ slightly from those defined in the policy targets due to changes in agricultural commodity prices.

Figure 2. Additional demand and supply of agricultural commodities from biofuel production growth between 2004 and 2014, relative to total domestic use in 2004



Notes: by-products* co-production of energy-rich feed products, replacing coarse grains
by-products** co-production of protein-rich feed products, replacing oilseed meals

Source: own calculations based on OECD (2006)

Figure 2 indicates that the further growth in ethanol and biodiesel production creates substantial additional demand for agricultural commodities.[8] This is particularly the case for biodiesel in the EU: the expected growth by some 7.2 million tonnes results in an additional demand for vegetable oils equivalent to more than 60% of the EU's total consumption of vegetable oils in 2004. Similarly the expected growth in Brazil's ethanol production represents an additional demand for sugar cane equivalent to 35% of current use. Implications for cereal markets are less pronounced, particularly due to the by-products of wheat-, coarse-grains- and sugar-beet-based ethanol production replacing some of the feed demand for coarse grains. However, in the US the additional demand for grains would represent 12% of total current use, while the additional by-products would replace roughly 3% of current grains use in the US.

The co-production of an energy-rich feedstuff partly offsets the increased demand for grains. Similarly, protein rich by-products, in particular corn gluten meal (CGM) stemming from the wet milling process of ethanol production from maize, represents a net increase in protein feed supply which reduces demand for traditional oilseed meals.[9] As maize use is predominant in ethanol production in North America but relatively rare in Europe, CGM production is largely a North American phenomenon, too.

These changes in crop demand trigger effects on trade and international crop prices, with Europe, North America and Brazil being the main regions causing price changes in vegetable oils, cereals and sugar, respectively. The focus of the European biofuel industry on biodiesel is likely to require substantial additional imports of vegetable oils which could triple relative to no growth in biofuel production.[10] With the EU being the third largest importer of vegetable oils, international prices for this product group are increased by 17% by 2014 when compared to a situation with constant biofuel production (figure 3). Implications for sugar markets are even more pronounced. With Brazil accounting for 20% of global sugar production and 33% of global sugar exports, it is mainly the growth in Brazil's use of sugar cane for ethanol production rather than sugar that raises international sugar prices by an estimated 62% compared to a no-growth scenario – the production of the perennial sugar cane would only slowly respond to the market signals, with production in 2014 some 8% higher than without biofuel growth.

Effects on cereal markets are less pronounced, but still significant. With an additional 60 million tonnes of wheat and coarse grains estimated to go into ethanol production by 2014 in the EU and in North America, and despite the 20 million tonnes of grains displaced from feed ratios by ethanol by-products, world wheat and maize prices are projected to be some 5% and 7% higher by 2014 than

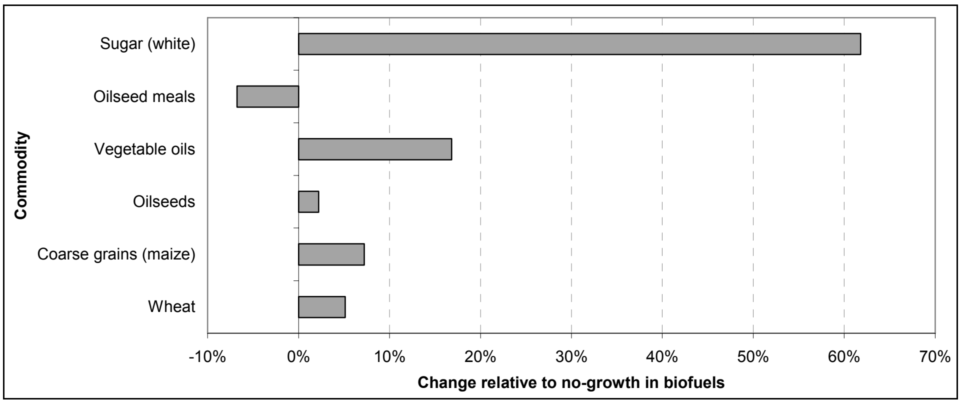
---

8 Note that a number of assumptions need to be made in this assessment. For instance, it is assumed that growth in biodiesel production in the EU would be substantially slower than that of ethanol production, with ethanol production quantities catching up with biodiesel by around 2012. Furthermore, it is assumed that, with unchanged support, the target of 5.75% biofuel share in transport fuel consumption of the EU (15) would be reached at crude oil prices at US$ 60 per barrel – lower oil prices result in an undershooting of the biofuel target. For the US, ethanol production growth is assumed consistent to corn use for ethanol as projected in the latest US Agricultural Baseline (USDA, 2006), again at crude oil prices at US$ 60 per barrel.

9 Note that apart from the reduced demand, oilseed meals supply is increased as well due to greater incentives for oilseed crush. However, this is a second-round effect which, while considered in the analysis, is not discussed in greater detail here.

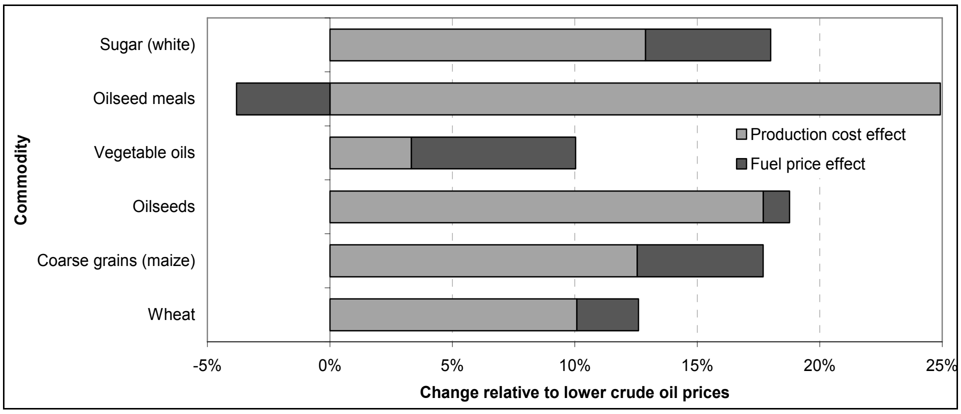
10 This assumes that biodiesel would be largely made from imported vegetable oils rather than from imported oilseeds crushed in the EU, a simplified assumption as in many cases the esterification process is linked to the crushing in the same plants. However, increased production of GM oilseeds in the Americas and the relatively cheap supplies of palm oil from south-east Asia are likely to create additional incentives to produce biodiesel in the EU from imported oils.

Figure 3. Impact of expected growth in biofuel production on world commodity prices in 2014



Source: Aglink/Cosimo/World Sugar Model simulation results

Figure 4. Impact of higher crude oil prices on world commodity prices in 2014



Source: Aglink/Cosimo/World Sugar Model simulation results

without the growth in biofuel production. As in the case of vegetable oil prices following the growth of biodiesel production mainly in the EU, the largest price effect can be found for some years in the middle of the projection period: due to the particularly strong growth of biofuel production in the EU (following the biofuel directive) and in North America (particularly following the RFS of the US), price effects are most pronounced in 2010.

Increased supplies of protein-rich feeds, and growing incentives to crush oilseeds, result in declining prices for oilseed meals ending some 7% lower than without biofuel growth. In consequence, average world prices for oilseeds are increased by the biofuel growth by only 2%, significantly less than grain prices or those for vegetable oils.

The results indicate that the increase in biofuel production comes at a cost paid by the users of agricultural crops – both consumers and livestock producers – apart from fuel consumers and taxpayers in countries where biofuel production relies on mandatory blending requirements and other forms of public support.

3.3 Impact of alternative assumptions on crude oil prices

As noted above, the analysis so far was based on the assumption of crude oil prices declining from their current high levels, reaching some US$ 41 per barrel. This section looks at the impact higher crude oil prices could have on biofuel production, and on agricultural markets. For this analysis, crude oil prices are assumed to remain at US$ 70 per barrel from 2006 to 2014.

Higher crude oil prices affect agricultural markets in two distinct ways. First, it increases agricultural production costs and hence reduces commodity supply. Second, higher oil prices raise fuel prices and hence the incentives to produce biofuels. This in turn creates additional demand for biofuel feedstock commodities as well as additional supplies of feedable by-products.[11]

The model applied allows for an approximation higher production costs have on agricultural markets.[12] With crude oil at US$ 70 per barrel, global production of crop commodities would be reduced by between 1% and 3%, with lower effects on sugar and vegetable oils due to the more rigid policies in a number of sugar producing countries and the lack of responsiveness to world price signals by sugar cane and palm oil production systems. Not taking into account fuel price effects this would increase world crop prices by between 10% in the case of wheat and 18% in the case of oilseeds, thus indicating the importance of crude oil or more generally energy prices for agricultural markets.

Increased fuel prices also raise the incentives for biofuel production. It is, however, difficult to assess the speed at which biofuel industries would respond to higher fuel prices. Assuming a biofuel price elasticity at a level of one, a value that is high for agricultural standards but relatively low for many industrial systems, biofuel production would be expanded by almost 6 million tonnes or 9% in 2014, resulting an a further increase in crop prices between 1.1% for oilseeds and 5.1% for sugar and coarse grains, while prices for vegetable oils would end almost 7% higher than without the increase in fuel prices.

11 A third effect of higher crude oil prices is the increased transportation costs which would increase commodity prices in importing countries while decreasing prices for exporters. This cannot be reflected in the non-spatial model applied for the present analysis.

12 Commodity production generally depends on current and/or lagged gross revenues, deflated by a commodity production cost index which includes energy prices. For more details see Annex 3 in OECD (2006).

4. Conclusions and policy issues

It is clear that the above analysis of the impacts biofuel growth can have on agricultural markets draws a limited picture only. First, the use of land not currently in the production process or in marginal areas and the possibility of international trade in biofuels will alter market responses from the projections in this paper. Second, a number of other countries, such as China and India, are engaging in the production of ethanol and biodiesel for fuel use and are likely to put significant resources in their biofuel developments, and this could further magnify the agricultural market impacts. Third, other feedstock commodities, combined with new technologies, are likely to change the feedstock-biofuel relationship in the medium term. In particular, 'second generation' biofuels such as cellulose-based ethanol and synthetic fuels from biomass, fuels that are currently under development, would require significantly less agricultural input per unit of biofuel output, and could allow for larger contribution to countries' transport energy mix at potentially much lower costs. Fourth and finally[13], biofuels represent only one component – and one that attracts substantial public attention – of bioenergy production which would also include the generation of heat and electrical power from biomass.

In spite of those limitations, the analysis allows to draw a number of conclusions. First, current biofuel production systems show a large variation in production costs across regions and feedstocks; even at current crude oil prices, they rely on public support in most countries as costs often exceed those of competing fossil fuels. Second, in most countries particularly in the northern hemisphere land requirements for a domestic biofuel production to replace a significant share in total transport fuel consumptions are substantial if current technologies are applied. Again, differences across countries and feedstocks are significant, and as for production costs reveal advantages for Brazil. Third, and linked to the high land requirement, the expected growth in biofuel production in the EU, North America and Brazil is likely to have a significant effect on agricultural market developments as it creates a substantial additional demand for cereals, sugar crops and vegetable oils which would be provided by agricultural producers only at higher prices. Consumers of food products in general, and food-deficit developing countries in particular, will have to pay more as biofuel industries place their demand for feedstock commodities. Fourth and finally, increasing crude oil prices are likely to further raise agricultural commodity prices both through their effects on crop production costs and through increased fuel prices and hence further growth in biofuel production. Even though the exact response of biofuel industries to higher oil prices will need further research it seems clear that both effects on agricultural markets are of significant importance.

A number of policy-relevant issues follow from these results. Given that in many countries biofuel production remains economically unviable without public support, a better understanding of policy objectives and the costs and benefits of biofuel support is needed. Energy security, environmental benefits, rural development and farm income are among the objectives for promoting biofuels, yet much work remains in identifying the exact effects biofuels have on each of those dimensions, and in analysing the cost effectiveness of such policies relative to other means of achieving political objectives. For instance, improving the vehicles' fuel efficiency may yield larger reductions in greenhouse gas (GHG) emissions at lower costs than the replacement of petrol-based fuels by biofuels, while the potential of reducing GHG emissions through better housing insulation may be even greater. Legitimate policy objectives should lead to well-targeted policy measures, yet current support for biofuels and its implications are far from being fully understood and require further in-depth analysis. In addition, with the likelihood of next-generation biofuels becoming profitable in the medium term, current technologies may become outdated relatively soon. However, necessary readjustments of policy settings might be opposed by stakeholders who based their investment decisions on current political support.

13 Of course, other caveats apply that are more general to this kind of model analysis and which are related to the fact that models are a limited representation of actual market behaviour. While this should be kept in mind when drawing conclusions as well, we do not discuss these limitations here in detail.

References

IEA (International Energy Agency) (2004): Biofuels for Transport – An International Perspective. International Energy Agency, Paris.

OECD (2006): Agricultural Market Impacts of Future Growth in the Production of Biofuels. Organisation for Economic Co-operation and Development, Paris. Available for download from the OECD website at http://www.oecd.org/dataoecd/58/62/36074135.pdf.

OECD/FAO (2005): OECD-FAO Agricultural Outlook 2005-2014. Organisation for Economic Co-operation and Development, and Food and Agriculture Organisation of the United Nations, Paris and Rome.

– (2006): OECD-FAO Agricultural Outlook 2006-2015. Organisation for Economic Co-operation and Development, and Food and Agriculture Organisation of the United Nations, Paris and Rome.

RFA (Renewable Fuels Association) (2006): Industry Statistics. Statistical data downloaded from the web in July 2006 at http://www.ethanolrfa.org/industry/statistics/.

USDA (2006): USDA Agricultural Baseline Projections to 2015. United States Department of Agriculture, Washington, D.C. Available for download from the USDA website at http://www.ers.usda.gov/publications/oce061/.

Acknowledgement

Views expressed and conclusions drawn in this article are solely those of the author and do not necessarily represent the views of the OECD or its Member Countries. The author would like to thank two anonymous reviewers for their valuable comments on an earlier draft, but retains responsibility for all remaining errors.

Autor:
DR. MARTIN VON LAMPE
Organisation for Economic Co-operation and Development (OECD),
Directorate for Trade and Agriculture,
Agro-Food Trade and Markets Division
2, rue André Pascal, 75775 Paris Cédex 16, France
Tel.: +(33)-1-45 24 96 94, Fax: +(33)-1-44-30-61-18
E-Mail: Martin.vonLampe@oecd.org