

## THE FUTURE OF BIOFUELS: POLICY IMPLICATIONS FOR EUROPE

HUGH HENNESSY

*Senior Sophister*

*Are biofuels the solution to Europe's energy crisis? Supply concerns and renewability make them an attractive alternative to oil and natural gas. However, following a discussion of energy policy, Hugh Hennessey concludes that it may be difficult to efficiently produce these goods in European countries. Problems and environmental issues are discussed, as is the role of government policy. To conclude, it is noted that although there is undoubtedly a future for biofuels, it may not be an Irish one.*

### Introduction

Security of supply has become the dominant word in relation to energy policy. Issues like the Iraq War and Europe's over-reliance on a tenuous relationship with Russia have brought this issue to the fore. Promotion of biofuels is seen as a way of reducing security of supply concerns while simultaneously being of benefit to the environment (European Commission, 2007). Biofuels generally depend on agricultural production. How then, will policy overcome the switching costs associated with producing biofuels? The answer to this question is not straight forward, quite possibly involving the return to a CAP-like production distortionary scheme.

Biofuels have a medium- to long-term future in agricultural production. The level of economic rationale applied by regulators will determine the source of new fuel. This type of rationale provides the fundamental argument put forward throughout the essay. Initially, a brief outline will be given of the economics that drive energy policy. Next, we will turn attention to issues relating to ethanol, including its current economic viability. There will be an exploration of longer-term issues, including the discovery of cellulosic ethanol and subsequently a discussion of the problems and environmental considerations associated with biofuel production. In addition, oil (biofuel's major substitute good) will be considered, with special reference to how its price plays a major role in the economic viability of biofuels. Finally I revert back to the policy decisions

facing Irish and European agriculture and what the long-term prognosis of these decisions might be.

## Biofuel Production

Demand for energy is a derived demand, and thus as economic growth increases, so too does the demand for energy. Energy is an economic necessity, much like food, rendering demand unavoidable. It is generally accepted that there is a positive relationship between energy security and the promotion of renewable sources of energy. Fuel supply diversity is also crucial for establishing greater levels of energy security. This is part of the economic rationale for the promotion of biofuels, another form of renewable energy. An increase in the production of biofuels would reduce the dependence on foreign oil for transportation-energy needs (IEA, 2004)<sup>1</sup>. This would somewhat alleviate Europe's security of supply concerns and give a greater bargaining position with countries rich in natural resource, like Russia.

The fundamental facet of the cost of producing ethanol is its dependence on feedstock prices. This explains some reasons why ethanol production is cheaper in Brazil than in America and the EU. Feedstock prices are cheaper in Brazil, where lower labour costs and higher levels of average sunshine lead to larger yields. At present Brazil is able to produce 30% of its energy needs through biofuels (IEA, 2004). The price of ethanol is quite similar to the price of gasoline in Brazil and may actually become cheaper as efficiency gains from large-scale production are achieved. However, this does not seem to be the case in America or Europe where increased ethanol production will only serve to keep feedstock prices high.

Optional European directives have been placed upon member states with little regard for attainability or efficiency. In Europe and Ireland there is a legislative target to achieve a 5.75% share of energy consumption through biofuels by 2010 (European Commission, 2007). At the moment this is suspended around the 1% mark, effectively meaning the only way to achieve the objectives will be through high levels of biofuel importation. At present, there is still limited global trade in biofuels with many restrictions being placed on the trading of Brazilian ethanol.

What does this mean for the future of biofuels? The law of comparative advantage<sup>2</sup> would state that the production of biofuels should

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<sup>1</sup> International Energy Agency.

<sup>2</sup> This exists when a country produces a good or service at a lower opportunity cost than its trading partners.

remain pre-dominantly in Brazil<sup>3</sup> and other such developing countries. However, this may not be the case as ‘security of supply’ concerns may advocate American and European production; under-developed countries may be seen as politically unstable which would lead to supply concerns. This is the political rationale for the introduction of subsidy-driven biofuel production.

However, ethanol is not the only biofuel in production. Biodiesel, derived from rapeseed and vegetable oil, is currently more competitive in the EU than in the US (IEA, 2004). It also compares more favourably with the price of diesel than ethanol with the price of gasoline. Germany, with its large market share, is the leading producer of biodiesel.

### **Cellulosic Ethanol: A new hope?**

Cellulosic ethanol is derived from cellulose, a major component of plants and can also be found in wood and straw. Global research is currently led by the United States, where large amounts of funding have been granted to continued technological research in this field. The reason behind this level of funding are the potential advantages that cellulosic ethanol has to offer. Rational analysis of ethanol production should quickly realise the displacement factor involved. What will be replaced to accommodate the land required for ethanol production? Land has the economic property of being fixed in supply, which raises issues over food supply. In theory, the production of cellulose does not compete with the production of food. In reality, the production of crops, which are rich in cellulose, can be undertaken on the poorest agricultural land thus lessening the impact of the substitution of food production (European Commission, 2006). Projections over the long-term economic viability of cellulosic ethanol are very encouraging. It is not dependent on feedstock prices, which should in the long-term give a cost advantage over conventional ethanol. The IEA projects that cellulosic ethanol could overtake ethanol in terms of cost effectiveness by the year 2012. This, along with most other biofuel estimates, seems rather optimistic, considering the technology has not yet been finalised. The EU has recently projected a more pessimistic outlook, where it forecasts large-scale lignocellulosic ethanol production to be viable around 2020 (ibid).

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<sup>3</sup> Brazil is also one of the most efficient sugar cane producers and transforming sugar cane into ethanol may bring down the costs of biofuels further.

## Problems with Biofuels

Transportation accounts for 40% of total energy consumption. Conventional ethanol production is at a technologically advanced stage. As a result there are limited ways of achieving cost advantages. Economies of scale will reduce costs but not to the level where it is comparable to oil, at least not in Europe and America (IEA 2004). In order to produce the desired levels of biofuels a staggering amount of agricultural land will be required. In Ireland, it is estimated that to achieve a 2% substitution of biofuels for oil, 75,000ha of tillage land (20% of total tilled area) would be required. To achieve the target of 5.75% by 2010 would completely change Ireland's agricultural landscape. This highlights a major obstacle when considering reaching biofuel targets. A similar problem is apparent with biodiesel although the relationship here is more favourable due to the yields associated with rapeseed oil.

Cellulosic ethanol is not without its problems. The technology is still at an infant stage and the reliability of the cost estimates being put forward is questionable. Huge levels of government funding are being put into the further development of this technology, especially in America. This in itself creates a problem, as scientists exude rent-seeking behaviour in order to maximise the size of their research budget. This brings into question the validity of results put forward by various scientists about the medium-term viability of cellulosic ethanol (European Commission, 2006). However, the technological question still dominates the future of this type of biofuel production.

## Environmental Issues

Evidence of climate change has given the environmental movement some impetus on the issue of controlling carbon emissions. These emissions are generally regarded as the direct cause of global warming<sup>4</sup> and fossil fuels contribute greatly to the levels of these pollutants. Conventional ethanol is estimated to reduce carbon emissions by between 20% and 50% (IEA, 2005). However, the environmental problem with conventional ethanol production is that large amounts of fossil fuel energy are required in the

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<sup>4</sup> This view has been contradicted by various scientists who claim that we are simply going through a 1500-year cycle of climate change. They argue that man has had little impact on climate change. This view has been published in a book by climate physicist Fred Singer and environmental economist Dennis Avery called 'Unstoppable Global Warming: Every 1,500 years'

production process. Some observers have estimated that this energy requirement could mean that the well-to-wheels emissions reduction could be as little as 18% of a normal gasoline car. Cellulosic ethanol production is environmentally friendly and may lead to a reduction in carbon emissions in the region of 70-90% (ibid). It is hoped that the remains of the plant, not used in cellulose production, can be used to power the ethanol plant. It has even been argued that the emissions could be greater than 100% as carbon dioxide may be absorbed in the plant growing process.

## **The Impact of Oil**

Just as the price of biofuels depends on feedstock prices, its long-term viability depends on the price of fossil fuels, in particular oil. The significant upward trend in the price of oil has awakened policymakers to the importance of fuel supply diversity. Oil producers seek to keep the price of oil artificially high by limiting production. According to the IEA<sup>5</sup> there are currently 2.6 trillion barrels of oil resources available. Including an annual rise of 2% in demand, there is still enough oil to last for another century. A startling statistic about oil production is that only 3% of all drills between 1992 and 2004 were in the Middle East, a region considered to have about 70% of the earth's oil resources. By contrast, in Canada and the US, who account for about 2% of total supply, the number of drills represents around 70% of total drills (Keenan, 2007).

How does this affect the biofuels sector? The reason to include an analysis of oil production is to highlight the precarious nature of biofuel production. With increasing cost savings, biofuels will enjoy greater substitutability with oil, which is in line with consumer choice theory. The regulation issue will be addressed later, but the economic viability of biofuels depends to a certain degree on the oil price. With more extensive drilling in the Middle East, a substantial cut in the price of oil could seriously weaken the biofuel industry. Also the optimal time for oil producers to increase supply would be when biofuels become relatively efficient i.e. are seen as a genuine alternative to oil. However as mentioned above, this analysis ignores any form of regulation where environmental concerns over climate change are apparent.

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<sup>5</sup> International Energy Agency

## Policy Issues: A subsidised future?

Government has the unique ability to stimulate demand through regulation and taxation. It has been proposed that a mandatory 10% biofuel composition be placed on fuels. This would compel fuel companies to seriously embrace the biofuel industry. The rationale for this would be environmental, as this should reduce the carbon emissions of cars. Forcing manufacturers to make more fuel efficient and lower carbon emitting cars requires strong government regulation. However, the reductions in emissions that such regulations will bring are much lower than the potential benefits from biofuels. This leads back to the question of how to encourage biofuel production.

Ethanol production in the United States is highly political. Various Farm Bills have led to the implementation of high levels of subsidy payments across the so-called 'corn-belt'. The Iowa caucus is decided on one issue; the continuation of ethanol production (The Economist, 2007). Biofuel production is not as political in the European Union but that may change in the near future. There are two main policy instruments available to the EU. As stated in an SEI<sup>6</sup> report in 2005, these policy measures are excise relief combined with subsidies for biofuel producers and obligation supported by a certificate system (SEI, 2005).

There are clear arguments against the subsidy route, which could lead to an excessive price regime, as was seen with CAP. At present, the only justification for any biofuel production is the subsidy system which makes production viable for farmers. Many crops that are suitable for biofuels do not yield an immediate harvest. Thus, agricultural producers incur sizeable switching-costs. The subsidy program is seen as a solution to this. However, these types of subsidy schemes are only short-term measures and will become unworkable in the long-term, such as in the case of CAP. This leads to the case for obligation of production, which has been introduced in Austria. It is also proposed in the Netherlands, the U.K, Slovenia and Spain.

The hope is that this type of policy will minimize the direct cost to the government and allow for the introduction of second-generation biofuels, giving producers a stronger guarantee for the long-term. This policy is designed to bring large fuel suppliers into the biofuel market (ibid). These producers will be obliged by regulation to place a certain fraction of biofuels on the Irish market. This process will be supported by the use of certificates. This policy should prove more sustainable in the future although issues over domestic supply of biofuels will persist.

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<sup>6</sup> Sustainable Energy Ireland

Ireland enjoys a comparative advantage in terms of wind and wave production and the government has proposed that 15% of our electricity needs will be served by these renewable sources of energy by 2015. However, this still does not address the energy requirement of transport. There is a strong argument that Ireland and many other European countries in the EU should not produce biofuels. However, the fact is, that the EU *are* producing biofuels and if a target of 5.75% is to be reached through domestic production, a substantial increase in production is needed. Inefficiencies with biofuel production does not equate to a cessation of biofuel production, as the Irish sugar industry<sup>7</sup> will testify to. Recent policy changes by prominent member states suggest that there is contemporary wisdom to the long-term burden a distortionary subsidy scheme may have. The future is not all bleak for biofuels, as Brazil has shown. Technological progress in cellulosic ethanol could mean a huge breakthrough in terms of a sustainable energy policy, both environmentally and economically. Climate change is becoming a huge issue and may get more political credence in the next election cycle across Europe. Conventional biofuel will still have a role to play in farming but perhaps only a complementary role with food and feed production. Biofuels certainly have a future; however their role in Ireland is at present uncertain.

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<sup>7</sup> The Irish Sugar Industry effectively ceased in 2006 when both sugar factories were closed down. Both France and Germany enjoyed higher sugar beet yields and were considered to be more efficient.

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