HOW VIABLE IS THE EUROPEAN UNION'S COMMITMENT TO BIOFUELS?

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Are biofuels the solution to our environmental woes? This certainly appears to be the policy being currently backed by the EU. A possible alternative to fossil fuels, biofuels have been touted as a means of reducing greenhouse emissions and providing increased energy security. David Quinn provides an objective assessment of EU biofuels policy. He notes the importance of subsidization in fuelling the current production drive, and the crucial role played by oil prices in determining relative competitiveness. He ultimately rejects biofuel policy as a sustainable long-term solution to Europe's energy requirements.

Introduction

> *'There has never been a better moment to push the case for biofuels. Crude oil prices remain high. We face stringent targets under the Kyoto Protocol, and the recent controversy over imports of Russian gas has underlined the importance of increasing Europe's energy self-sufficiency. Raw materials for biofuel production also provide a potential new outlet for Europe's farmers, who have been freed by CAP reform to become true entrepreneurs'*.[1]

We have moved past the point of legitimate dispute; climate change has finally been acknowledged as one of the greatest economic, social and environmental challenges of the 21st century. In recognizing the scope of this challenge, the nations of the world have begun to seek ways to reduce their negative environmental impact, and in particular to cut CO_2 emissions. Many activists feel

[1] Marianne Fischer Boel, European Commissioner for Agricultural and Rural Development, 8th February 2006 (European Commission, 2006)

that no economic power is doing enough to reduce these emissions and furthermore, that in the absence of a global carbon trading system, the effects on carbon reduction will be limited. One mechanism for decreasing CO_2 emissions that has been embraced by both developing and developed countries alike, is an expansion in the use of biofuels. Since 2000, global biofuel production has tripled from 4.8 billion gallons to over 16 billion gallons. Production is currently highly concentrated, with the U.S., Canada, Brazil and the EU contributing over 90% of the global supply of biofuels (OECD, 2006). In the face of unprecedented increases in oil prices, biofuels have been hailed as a key renewable substitute for oil. However, biofuels still make up only 3% of the supply of global transportation fuel, and production requires large amounts of arable cropland. These issues have raised growing concerns about the impact biofuels are having on commodity prices and the environment through increased demand pressures on agricultural land. With food prices on the rise, concerns about the ongoing viability of biofuels have entered into the public domain.

The purpose of this paper is to examine the economic viability of biofuels from a European perspective and discuss the current EU biofuels policy. The conclusion that emerges is that while biofuels do have the potential to help reduce CO_2 emissions, at current technology levels EU production is not viable. This paper begins by defining what exactly constitutes 'biofuels' and examines recent developments regarding biofuels in Europe. The next section will consider some of the recent criticisms raised against biofuels and the merits behind such criticisms will be explored. Finally, the future viability of biofuels is assessed, concentrating principally on the importance of oil prices and the potential for technological advances. The paper concludes with an outlook for the future.

What are Biofuels?

Biofuels can be defined as 'transportation fuels derived from biological (e.g. agricultural) sources' (IEA, 2004: 27). Biofuels can be produced from a variety of feedstocks, many of which are used in the agricultural food chain. They can be created in various liquid and gaseous forms. Ethanol and biodiesel are both liquid forms of biofuel. Ethanol is made from starchy and sugar crops, whereas biodiesel is made from vegetable oils derived from oilseed crops. Biofuels can also be produced from non-food organic materials including wood, cellulose, and waste materials. However, it is bioethanol and biodiesel that form the core of renewable transport fuels around the world (OECD 2006). The main advantage of these fuels is that they can be used either as pure fuels or blended with gasoline and diesel. In each case, up to 5% biofuel can be added to the mix

without any modifications to existing vehicle engines Brazil has been the world leader in bioethanol production for over 25 years. The EU currently leads the world in regard to biodiesel, which represents just under 80% of total EU biofuel production (OECD, 2006).

EU Policy

The European Union has set clear and ambitious targets for limiting CO_2 emissions. The EU has committed to a 20% reduction in greenhouse gas emissions by 2020 compared to the 1990 level, with an objective to reach a 30% international reduction through further negotiations (European Commission, 2007). Central to the success of this plan is the need to achieve a sustainable EU strategy on energy, particularly in the transport sector. The EU has set out a clear role for biofuels in achieving this goal. Biofuels contribute to EU policy objectives that include environmentally friendly security of supply, climate change commitments and the promotion of renewable energy sources (Commission of the European Communities, 2006b). Biofuels are also seen as a way to offer investment and employment opportunities for EU industries. In the agricultural sector, biofuels are expected to help smooth the sustained transition away from CAP payments. This last point is explicitly evident in CAP heavy countries, such as France, who have set even higher national biofuels targets.

The EU target for biofuels is to achieve a 5.75% share of the market for petrol and diesel in transport by 2010, with an interim target of 2% by 2005. However, these targets are not mandatory, with the EU instead opting for a review clause whereby the Commission was required to report on progress by 2006. This report estimated that in 2005 biofuels market share reached an estimate 1%, a doubling in two years (Commission of the European Communities, 2006a). While this can be deemed an impressive rate of progress, it is less than the 2% reference target, which was only reached by Germany (3.8%) and Sweden (2.2%). The report also acknowledged that it is unlikely the target for 2010 will be achieved, but indicated its desire to set a minimum target of 10% by 2020. In undertaking to reach these targets, biofuels development has been largely driven by financial incentives including subsidies, tax reductions and exemptions (Bamière et al., 2007).

While the EU should be praised for their proactive stance on CO_2 emissions, its current policy of expansion in biofuel production has raised a variety of concerns about the effect this expansion is having on agricultural land, food prices, and natural habitats. Questions have also been raised about the real reductions in CO_2 emissions that biofuels actually provide. These concerns were

acknowledged in January 2008 by the EU Environment Commissioner Stavros Dimas who commented that the EU has 'seen that the environmental problems caused by biofuels and also the social problems are bigger than we thought they were' (BBC News, 2007). The EU has indicated that it is prepared to abandon the targets if they turn out to be harmful to the environment or the disadvantaged in society. A number of the concerns that have been raised against biofuels in the recent literature are reviewed below.

Impacts of Biofuels on Climate Change

Biofuels have been presented as a key mechanism in the fight to reduce greenhouse gas (GHG) emissions within the EU. However, a number of recent studies have found that, when factoring in emissions from every stage in the supply chain, the energy balances of EU biofuels are less positive than evaluations originally suggested. These studies have estimated that the real reductions in GHG emissions may only be in the 25-30% range (Bamière et al., 2007; Farrell et al., 2006). Given that biofuels currently make up less than 1% of the EU's total energy consumption, the total effect on EU GHG emissions will be small. In addition, the current EU policies focus directly on production incentives and national supply targets, not on reducing GHG emissions. As a result, there has been no incentive to invest in the lowest GHG biofuel systems, only to raise production (Royal Society, 2008). Further concerns have also been raised about other negative environmental effects, including the effects of pesticides and nitrate pollution on water supplies, the loss of biodiversity, and increased deforestation, particularly in Brazil and Indonesia (Bamière et al., 2007).

Impacts of Biofuels on World Prices and the Poor

World feed grain prices are approaching all time highs (Kraemer & Schlegel, 2007). The International Monetary Fund calculated that world food prices increased by over 10% in 2006. This trend is expected to continue in the short and medium term. Food price increases can be attributed to factors including rising incomes, resource scarcity, lack of investment in agricultural productivity, and energy price increases. Numerous papers have documented the effect that biofuel production has had on food prices, particularly corn, wheat and soybean prices (Coyle, 2007; Bamière et al., 2007). The price of a bushel of corn has jumped from $1.86 at the end of 2005 to over $5 in 2008. Similarly, wheat is trading at over $10 a bushel, a doubling of its price in only 12 months. Futures contracts indicate that the high prices of both commodities will be maintained into the

immediate future.[2]

Some of the most stringent criticism of biofuels has been directed against their influence on food prices, and the knock-on effect this is likely to have on the worlds poor (Reuters, 2007; Washington Post, 2006). This argument was dramatically expressed by the UN Special Rapportuer, Jean Ziegler, who called the replacement of arable cropland with biofuels 'a crime against humanity' (BBC News, 2007). However, while rising food prices are a matter of major concern, there is another aspect of the debate that must be considered. Rising food prices may in fact offer an opportunity for low income countries to revitalise their agricultural and rural development. The agricultural policy of the developed world has had significant depressing effects on world food prices. Increases in food prices caused by biofuel production may just provide the impetus necessary to yield higher incomes and more jobs for food producers. 80% of food-insecure people live in rural areas. Given that there are powerful income and employment multiplier effects associated with agricultural-led growth, this effect could be substantial. High food prices have significant potential to reduce poverty and hunger across the world. However, policy is needed to ensure that poor families are provided with the opportunity to benefit from these high prices. This can be achieved by improving infrastructure and market coordination, encouraging contract farming and outgrower schemes, enforcing resource and land rights, and promoting competition in the marketing chain to ensure that higher prices really do benefit the poor (Matthews, 2008).

Impacts of Biofuels on Energy Security

The EU currently imports 50% of its energy needs. Without substantial domestic intervention, this is expected to rise to 70% in the next twenty to thirty years (Commission of the European Communities, 2006a). Given the uncertain nature both of oil supplies from the Middle East and gas from Russia, biofuels have been seen as key mechanism for ensuring EU energy security. However, EU analysis indicates that even if the EU biofuels policy is fully implemented, it will only provide a 3% decrease in fossil fuel imports (Commission of the European Communities, 2006b). Although this progress should be welcomed, it will not allow the EU to gain considerable self-sufficiently in terms of its energy needs. Furthermore, it is evidently unlikely that biofuel demand will be met from domestic supplies alone. While biofuel imports would allow the EU to diversify energy sources, they would not contribute to the goal of self-sufficiency.

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[2] Figures taken from Chicago Board of Trade, 18/02/2008
Corn: http://www.cbot.com/cbot/pub/page/0,3181,1213,00.html
Wheat: http://www.cbot.com/cbot/pub/page/0,3181,1322,00.html

Is the Continued Level of EU Support Viable?

Given the criticisms outlined above, how viable is the EU's continued level of support for biofuels in the long run? To date, biofuel policy has been driven largely by political will, by both policymakers and the support the general public. This has meant that biofuel development has benefited from a large degree of subsidization. It is highly questionable whether this support will be sustained, especially considering the aforementioned concerns. Even the limited production of biofuels has had a dramatic impact on food markets, and the subsidization costs to Members States budgets have become significant. Certain Member States are making the transition away from tax exemptions to mandatory incorporation targets, and thus costs will eventually be passed to final consumers. As biofuel production expands towards the 5.75% target and then the 10% target, the costs of support will increase. The key challenge for biofuel producers will be whether or not they can justify continued support, either through valuation of their actual positive externalities or more practically, by competing with fossil fuels in terms of cost. The future of biofuels rests largely on two issues; the price of oil and the enhanced potential of second-generation biofuels.

The Economics of Biofuel Production

Oil prices are the single most important factor affecting the competitiveness of biofuels. Oil prices have tripled in value since 2003. We are entering a period of sustained high oil prices. In fact, oil futures prices indicate that oil is expected to remain on or above $70 a barrel.[3] This has had a huge impact on alternative energy sources, greatly enhancing their relative competitiveness. However, higher oil prices also lead to higher biofuel production costs; both in terms of higher feedstock prices and higher energy costs. Considering feedstocks make up a significant proportion of biofuel production costs, 80% in the case of EU biodiesel from rapeseed, this effect can be significant. The interconnectedness of oil prices, biofuel production and feedstock costs makes analyzing the competitiveness of biofuel production a formidable task.

Production costs for biofuels vary considerably across feedstocks and countries. However, the OECD (2007) estimated that Brazil has the most competitive biofuel production and can produce economically viable ethanol at around $39 a barrel. US Maize ethanol is competitive at $45 a barrel. EU production fairs less favorably, with wheat ethanol and sugar beet ethanol both competitive at just $100 a barrel. Biodiesel from rape oil fares marginally better

[3] NYMEX Crude Oil Futures, 18/02/2008. Viewed at:
http://futures.tradingcharts.com/marketquotes/index.php3?market=CL

at around $90 a barrel. At current oils prices, EU biofuel production is not competitive. This has important implications for EU biofuels policy. At current technology levels, biofuel production is simply not financially competitive.

Second-generation biofuels

Second-generation biofuels play a key role in EU biofuels policy. These are produced with ligno-cellulosic biomass, which utilises the entire plant. These second generation technologies avail of a greater amount of biomass resources from agriculture, forestry and waste materials, and are expected to achieve greater fuel production and lower GHG emissions. The most encouraging second-generation biofuel technology to date has been ligno-cellulosic processing from forest materials. Pilot schemes are currently in operation in Denmark, Spain and Sweden. Germany and Sweden are also currently piloting Fischer-Tropsch biodiesel and bioDME technology in demonstration plants (DG Agriculture, 2006)

However, these technologies are not yet commercially viable. The EU has indicated a firm commitment to research and development through its 1.75 billion 7th Framework research programme which gives high priority to research into next-generation fuels from biomass. However, there is still a great deal of technical and economic uncertainty. To date, studies assessing the impact of investment in second-generation biofuels have been inconclusive and we have no precise forecasts regarding second-generation biofuels (Bamière et al., 2007). One such study by the European Energy Agency (2006) concluded that the biomass potential is sufficient to reach the 2010 target and could increase to 16% of EU energy needs in 2030, even with strict environmental constraints. However, this investigation does not analyze the measures needed to ensure these constraints, and fails to provide an assessment of future technology requirements. Furthermore, the study makes a number of questionable assumptions about increases in productivity and agricultural liberalisation.

Conclusion

Despite the era of high oil prices, the future of biofuels remains uncertain. Current EU biofuel production is not financially or environmentally sustainable and there are lingering doubts over the economic viability of second-generation biofuels. However, biofuels currently remain the most obvious alternative to fossil fuels. As such, there is still a role for biofuel policy in the European Union. EU policy needs to shift focus away from supply-based targets towards policy that promotes the production of biofuels that are the most cost competitive and

environmentally sustainable. A reassessment of the strategic importance of first generation biofuels is necessary, and greater priority should be given to research into second-generation biofuels (Doornbosch & Steenblik, 2007). Further research is also needed to better estimate the real GHG and environmental effects of biofuel production in order to estimate the appropriate level of subsidy payments for environmental externalities.There remains a substantial need to improve current understanding of the effects that higher oil prices are going to have on biofuel production.

Developing countries may well have a key role to play in biofuel production. Greater research is required to assess the relative importance that biofuel exports might play in producing more efficient and less polluting energy sources, without damaging the ecological systems of producing nations. Efforts are required in order to lower trade barriers, and thus allow developing countries to take advantage of their comparative advantages in biofuel production (Doornbosch & Steenblik, 2007).

Finally, it is important to note that despite their promise, biofuels are only one of a wide array of policy options available for tackling climate change. Without serious global cooperation and commitment, the reduction in CO_2 emissions will be highly limited. Greater leadership is necessary in order to create market conditions that account for the real social cost of carbon. Without this, all efforts to tackle climate change will fall short. A carbon tax on energy sources that emit CO_2 pollution is perhaps the most effective option, as this would create a market system that adequately accounts for the cost of pollution. A possible consequence of this would be the encouragement and development of the most climate friendly biofuels, as well as making sectoral targets such as the percentage targets for biofuels irrelevant. As such, the EU's continued domineering focus on biofuels targets is misguided and efforts should be made to refocus on the most effective mechanisms of reducing CO_2, i.e. pricing carbon. The danger remains that the continued debate over biofuels will detract from this goal.

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