The Regulation of Biofuels in the United States, European Union and Canada

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Abstract

The implementation of mandatory blending targets and environmental sustainability standards for renewable fuels in the United States and the European Union (EU) directly affects Canadian producers of renewable fuels and renewable fuel feedstocks. The blending targets open up new market opportunities, but seizing these opportunities requires compliance with the environmental sustainability requirements of the respective US and EU legislation. Moreover, the American and EU renewable fuel mandates and environmental sustainability criteria are both subject to continuing controversy. A major source of contention is the appropriate model to estimate renewable fuels' greenhouse gas emissions over their lifecycle, including whether and how to estimate indirect land use changes of biofuels. Even while these domestic controversies remain unresolved, there are initiatives underway in the global arena to develop common methodologies and sustainable practices for biofuels. As a party to the latter, Canadian government and industry officials have an opportunity to create a level cross-jurisdictional playing field for producers of renewable fuels and feedstocks. Bringing Canadian public policies for renewable fuels into closer alignment with those in the US and EU would also serve to promote the Canadian renewable fuel industry.

Introduction

The implementation of mandatory targets in the European Union (EU) and the United States for blending renewable fuels, including biofuels, with the traditional fossil fuels of petroleum and diesel has spurred growth in the production of renewable fuels. EU and American consumption mandates are, however, to be met by renewable fuels that meet environmental sustainability standards that include both greenhouse gas (GHG) emission savings relative to fossil fuels, as well as restrictions on the use of particular kinds of lands, including those with high carbon stocks and biodiversity, to produce renewable fuels feedstocks.

Accompanying American and EU governments' imposition of environmental sustainability standards on renewable fuel mandates is heightened attention to the social sustainability of biofuels and renewable fuels. Social sustainability criteria consider, for example, the impact of the production of biofuels on the price and supply of food, as well as on labour force conditions, especially in developing countries. Although neither the US nor the EU has mandated social sustainability criteria of renewable fuels, there is considerable global attention to developing indicators and methodologies to measure biofuels' social and economic effects.

Unlike EU and American renewable fuels policies, the policies of the Canadian government to promote renewable fuels with targets do not require these fuels to meet environmental sustainability criteria. Nonetheless, Canadian producers of biofuels feedstocks (like canola) and renewable fuels are affected by the developments in the US, EU, and elsewhere. Most directly, Canadian exporters of biofuels and biofuels feedstocks to the United States or any of the 27 member countries of the EU must meet these importers' environmental sustainability standards if their renewable fuel is to count toward the country's targets. The economic integration of Canadian biofuels' feedstock markets with markets elsewhere, plus the global dialogue around best practices when it comes to renewable fuels' policies, make it difficult to insulate Canadian renewable fuels policies from developments elsewhere.

Understanding better the implications of American and EU renewable fuels policies for Canada is the objective of this report. The paper addresses and answers the following questions. Why have the US and the EU legislated environmental sustainability standards for mandated biofuels and renewable fuels? How do American and EU environmental sustainability standards differ? Are EU and American environmental sustainability standards a response to domestic factors—including pressures from domestic economic and social groups that stand to win or lose from renewable fuels' policies? Or should these sustainability requirements be seen as a broader global initiative—on the part of international organizations--to establish guidelines on best practices for taking into account the environmental and social impacts of the production of biofuels and other renewable fuels? Second, how robust are these standards as constraints to renewable fuels' production and consumption and as consensual standards that enjoy the political and public support necessary to prevail? And third, given answers to the above questions, what are the implications for Canada's renewable fuels policies? Is there reason to expect Canadian producers of biofuels feedstocks and biofuels to have to meet environmental and/or social sustainability standards?

To answer these questions, the paper examines consecutively US and EU renewable fuels mandates and environmental sustainability requirements before turning to Canada.

I. The United States

The United States first introduced renewable fuels targets in the 2005 *Energy Policy Act*. The renewable fuel mandates represented the success of a pro-biofuels coalition in persuading American politicians in both the Republican and Democratic parties that biofuels were a `win-win' solution to several thorny problems. Of these, the most important was that domestically produced biofuels enhance American energy security by reducing dependence on unreliable foreign energy sources. Between one half and three-fifths of oil consumed in the US between 2005 and 2009 was imported (National Academy of Sciences 2011: 1). A second rationale was that biofuel mandates would promote rural development by raising corn and oilseed prices and thus farm incomes, and creating new jobs in renewable fuel plants located in rural areas. A third rationale is that biofuels reduce greenhouse gas emissions and conventional atmospheric pollutants and thereby mitigate climate change. And yet a fourth rationale is that renewable fuel investments are a means to enhance American economic competitiveness through the development of innovative technologies.

These rationales were forcibly advanced to sympathetic Congressmen by a broad coalition that stood to gain financially from mandates to blend ethanol or biodiesel with petroleum and diesel. It included biofuels producers (including the largest, Archer Daniels Midland) and renewable energy companies and their organizations (the Renewable Fuels Association, the American Coalition for Ethanol, and the Biotechnology Industry Organization, Growth Energy).

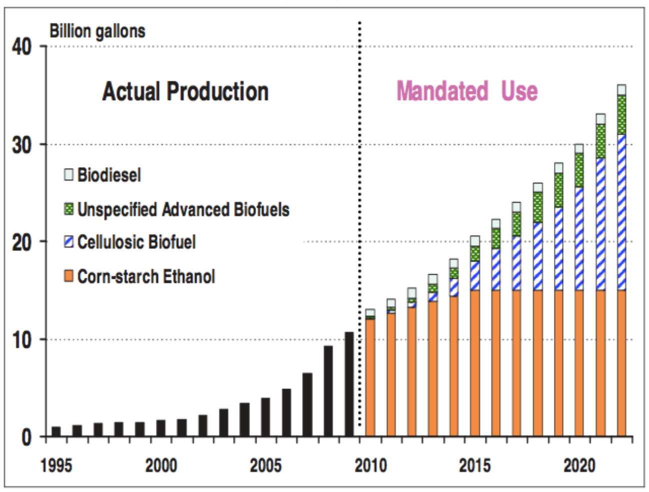
Producers of biofuels and renewable energy companies face high costs and an uncertain market relative to petroleum/natural gas producers.[1] Obligatory targets reduce this uncertainty by giving investors good reason to be confident of a lasting market for the biofuel or renewable fuel in which they invest. The pro-biofuels coalition also included farm organizations and commodity groups representing corn growers (the National Corn Growers Association and the American Corn Growers Association) and soya bean growers (the American Soybean Growers Association). Biofuels mandates have clear economic benefits for their members who produce the feedstocks (corn, oilseeds) for ethanol and biodiesel; the prices of these commodities can be expected to increase with a new (non-food) market for them.

The opening for biofuels came when MTBE (Methyl tert-butyl ether) was discredited as an oxygenating fuel additive, having become associated with drinking water contamination and progressively recognized as a carcinogen. State bans on MTBE as early as 2002 led to a search for its substitute in order to meet the requirement of the US *Clean Air Act* for gasoline to be mixed with an oxygenating agent in certain areas in order to reduce air pollution. Ethanol became a replacement for MTBE in the early 2000s because of its oxygenating and octane-enhancing properties. The petroleum companies who produced MTBE opposed ethanol as a substitute, citing its uncertain effects as well as its higher costs. They did not prevail. Besides its chemical properties and lack of environmental controversy – at that time, ethanol had the advantage of being produced domestically—providing the incentives to do so were sufficiently strong.

The 2005 *Energy Policy Act* imposed an obligation on gasoline/petroleum fuel suppliers to blend ethanol with gasoline. The Renewable Fuel Standard (known as RFS I) required 7.5 billion gallons of renewable fuel to be blended with gasoline annually by 2012 (Environmental Protection Agency, 2010). Corn ethanol was the renewable fuel available to take advantage of these targets, and alongside other government support, its production subsequently increased five-fold: from approximately 5,000 million litres in 1991 to 25,000 million litres in 2007 (Mol, 2010: 63).

The mandatory renewable fuels target was raised in the *Energy Independence and Security Act* (EISA). Signed into law in December 2007, EISA set the new Renewable Fuel Standard (RFS II) to reach 36 billion gallons by 2022. It divided this amount among different renewable fuels: conventional biofuels from corn; advanced biofuels from sources other than corn starch, including biodiesel from vegetable oils; and cellulosic biofuels, from crop residues like straw, wood waste and chips, and fast growing algae. RFS II mandates that, by 2022, corn starch-based biofuels are to make up a maximum of 15 billion gallons; advanced biofuels, 21 billion gallons, of which 16 billion gallons are to come specifically from cellulosic biofuels.[2] Despite unfavourable conditions for ethanol production in 2008 (a rapid drop in oil prices and overproduction capacity of corn ethanol), annual biofuel production kept rising. As production levels approach the cap on corn ethanol, most additional growth in mandated volumes will have to come from advanced biofuels[3].

Figure 1. Renewable Fuels Standard (RFS2) vs. U.S. Ethanol Production Since 1995



Source: Actual ethanol production data for 1995-2008 is from Renewable Fuels Association; the RFS2 by category is from EISA (P.L. 110-140).

Unlike in 2005, when the US first established mandatory blending targets for biofuels, the 2007 renewable fuels mandates were accompanied by environmental sustainability standards. These standards require biofuels like ethanol and biodiesel, as well as more advanced renewable fuels, to demonstrate reduced GHG emissions compared to conventional oil in order to count towards renewable fuel mandates. EISA stipulated the required GHG reduction percentages as compared to the conventional petroleum-based fuels GHG emission profile of 2005: 20% for conventional biofuels; 50% for advanced biofuels; and 60% for cellulosic biofuels. EISA grandfathers existing biofuel plants and applies only to those brought on stream after the legislation was implemented (post-2008). Besides these targets and GHG standards, EISA restricts certain kinds of land—virgin lands--being used to produce biofuels.

Why were mandates for renewable fuels increased in the 2007 legislation? And why were these mandates accompanied by environmental sustainability requirements? The answer to the first question consists of bi-partisan support in Congress and the Bush Presidency for renewable fuels as a way to address issues of energy security, environmental goals, and rural economic development. The preamble to the *Energy Independence and Security Act* (EISA) lists as its aims `[to] move the United States toward greater energy independence and security, [and] to increase the production of clean renewable fuels.' In 2007, as compared to 2005, environmental considerations were stronger, in part because of the closer relationship between members of the Democratic-controlled Congress and environmental groups.

Environmental groups' influence also helps to answer the second question of why environmental sustainability standards were imposed on mandated renewable fuels/biofuels. They were part of a biofuels-sceptical coalition that also included industries whose costs rise and competitiveness drops when public policies to support biofuels drive up grain and oilseed prices: for example, livestock producers, manufacturers of industrial products based on oilseeds stocks, and food manufacturers. This coalition also included the oil industry, whose profitability was threatened by a doubling of the 2005 target by 2015 and a quadrupling of it by 2022.[4] Unlike livestock producers, food manufacturers, and the oil industry who opposed mandates for biofuels, environmental groups supported them for advanced and cellulosic fuels. Conventional biofuels, however, were another story; their environmental benefits were seriously questioned by environmental groups. Led by the Natural Resources Defence Council (NRDC)[5], environmental groups' concerns were influential with the Democratic leadership in the House of Representatives and resulted in the sustainability provisions in the EISA. As noted, these provisions entail GHG reduction emission floors for renewable fuels and a life cycle analysis to determine net GHG emissions from direct and indirect land use changes, as well as restrictions on land use change.

The manner by which sustainability criteria were inserted into the legislation was controversial. Those close to the legislative process describe those clauses in the bill as `effectively written by the NRDC in the span of a few days'[6]: a last minute addition to the legislation that occurred without debate. The statement of House representative Collin Peterson illustrates this frustration (US House, 2009: 4):

> I no longer have any confidence (…) You are going to kill off the biofuels industry before it ever gets started, and you are in bed with the oil companies. You know, why would you put indirect costs on corn and soybeans and not put it on oil? (...) You know, this stuff gets put in the middle of the night, and over our objections. (…) So I just want this message to be sent back down the Hill or down the street: that the way this thing is going on I am off the train. I will not support any kind of climate change bill. I don't care. Even if you fix this, because I don't trust anybody anymore. Okay? And I have had it.

The 'middle of the night' addition of GHG reduction standards has undermined the legitimacy of the legislation. More problematic, though, has been the controversy that surrounds the EPA's models to estimate the indirect land use changes that arise over the life cycle of biofuels. An additional source of controversy is the level of the targets for renewable fuels.

Implementing RFSII and Sustainability Criteria

Regarding land-use change restrictions, EISA requires that feedstock crops used for biofuel production be 'harvested from agricultural land cleared or cultivated at any time prior to [December 2007] that is either actively managed or fallow, and nonforested.' (Section 201(o)(1)(I)). The EPA implements this clause for biomass produced in the United States by using an 'aggregate approach' – as opposed to EU's 'chain of custody approach' (see next section). This approach leaves ample space for growth in biofuel feedstock cultivation. For biomass produced in other countries, the land clearance rule is much stricter.[7] Feedstock producers have to provide tangible evidence that the land used was not cleared after December 2007.

Regarding GHG thresholds, EISA directed the Environmental Protection Agency (EPA) to promulgate regulations to ensure the specified volumes of various renewable fuels are used. It also directed EPA, in issuing such regulations, to consider both `direct and significant indirect emissions such as significant emissions from land use changes' in determining the aggregate GHG emissions through the lifecycle of their production, distribution, delivery and use of the finished fuel.

GHG emissions from direct land use change are those that arise from growing a biofuel feedstock –corn, for example--for biofuels rather than for consumption as food or animal feed on an existing area of cultivated land. Indirect land use change occurs when the use of crops for biofuels causes changes *in land use elsewhere* to replace those crops. This displacement effect could result in land with high carbon stocks outside the US being converted for agriculture (and so potentially negating the GHG benefits of using biofuels in the first place by creating a ‘carbon debt’), or in land use changes that cause environmental damage or risks to food security (Ernst and Young 2011).

A full description of possible GHG effects of biofuels is provided by the American National Academy of Sciences (2011: 3):

> Many processes affect the overall greenhouse-gas emissions from the production and use of biofuels; some processes result in sequestration of greenhouse gases while others result in greenhouse-gas emissions. For example, carbon dioxide is stored in plants as they grow, but emissions are generated by fossil fuel combustion during the process of manufacturing and transporting the biofuel. Conversely, replacing an annual crop with a perennial biofuel crop could increase the amount of carbon dioxide sequestered at the site.
>
> Indirect changes in land use can also occur and affect greenhouse-gas emissions. If the increased production of biofuel crops causes decreases in the production of commodity crops, the price of commodities could increase. Farmers could respond to market signals and expand production of the displaced commodity crop by converting noncropland to cropland. If the expanded production involves removing perennial vegetation on a piece of land and replacing it with an annual commodity crop, then the land-use change would incur a one-time greenhouse-gas emission from biomass and soil that could be large enough to offset greenhouse-gas emissions benefits gained by displacing petroleum-based fuels with biofuels over subsequent years. Furthermore, such land conversion may disrupt any future potential for storing carbon in biomass and soil.

EPA’s regulatory mandate is to conduct a life cycle analysis of a renewable fuel to determine whether the conditions under which it is produced meet the GHG emission threshold for that fuel type (conventional, advanced, or cellulosic). If it does, the renewable fuel counts toward the RFS II mandate for that fuel type. EPA has the authority to lower by a maximum of 10% the GHG threshold for any of the biofuel types. EISA does not specify the methodology EPA was to use in determining lifecycle GHG emissions owing to both direct and indirect land use (ILUC) changes. As the first agency in the world to calculate direct and indirect GHG emissions for specified renewable fuels, EPA had to develop its own methodology.

In undertaking this task, EPA has had on offer models that vary substantially in their estimation of ILUC effects of different biofuels, and particularly of ethanol produced from corn. In 2008, in a presentation to a committee of the US Senate, EPA observed the following:

> Most existing work, including EPA's RFS analysis for the 2007 rulemaking, indicates a net GHG benefit from the use of biofuels. However, several recent articles (Science 2/2007) have considered the GHG impacts of land use changes that occur with the production of biofuels, and suggest that the conversion of land into crop production may negate the GHG benefits of biofuels. We will evaluate this new research and continue to refine our research on the impact of land use changes to meet EISA language requirements.

The inter-model discrepancy arises because of the inherent complexity and uncertainty that surround estimating the impact of an activity in one location on land use change elsewhere. ILUC cannot be directly measured or observed; it can only be estimated using models that make assumptions about future impacts and the interactions between different input parameters (Ernst and Young 2011: 8).

EPA's first regulation proposal on May 26, 2009, taking into account the GHG emission effects from international ILUC, would have eliminated biodiesel and corn ethanol from qualifying as mandate fuels. As required, EPA then held extensive consultations with interested parties to discuss the impact of the proposed regulation on the industry (Oge, 2009). The renewable fuel industry, represented by the Renewable Fuels Association and the American Coalition for Ethanol, had supported the inclusion of GHG reduction requirements in EISA, believing they would meet them on the basis of an existing model that they assumed EPA would adopt. EPA's proposed rule was a shock to them and they lobbied hard for it to be revised. Their efforts were opposed by environmental groups, who argued in favour of EPA's model. Running parallel to EPA's consultative process, hearings in both the House of Representatives and the Senate on issues related to biofuels provided another opportunity for conventional biofuels' advocates to garner support from Congressmen and to oppose an EPA model that excluded them on sustainability grounds.

The testimony of Brian Jennings from the American Coalition for Ethanol to the US Senate is indicative. Jennings argued that `[today], corn-based ethanol is the most effective and the primary means we have for achieving the greenhouse gas reduction objectives of the legislation.' He critiqued arguments that the utilization of corn in the US to produce ethanol provides incentives to developing countries to increase their corn production and causes land use changes (for example, clearing rain forests in Brazil) that increase greenhouse gases emissions and deforestation. Claims that greenhouse gas emissions resulting from these activities should be counted against ethanol in determining its life cycle emissions, said Jennings, are faulty. `Other elements and factors' are at play; `there is not a direct cause and effect relationship between these events' (US Senate, 2008: 48).

Following feedback on its proposed regulation, EPA revised its models of ILUC effects. Under the regulations it issued in March 26, 2010, corn-based ethanol now qualifies as meeting required GHG sustainability criteria. The possibility exists that some future conventional biofuel feedstocks may not meet GHG emission thresholds owing to ILUC effects, but a decision on whether they do so has been postponed for now.

This uncertainty, owing to scientific controversy, but also to EPA's way of calculating GHG emissions of biofuels compared to petroleum-based fuels, is a significant problem for the biofuel industry. EPA makes its regulatory decisions based on a mix of 7 models; the baseline model is Argonne National Lab's GREET model.[8] The diversity of models, combined with what industry players consider a non-transparent process, fosters considerable uncertainty as to EPA's regulatory decisions. In response, the industry has lobbied the EPA Administrator on an individual feedstock basis in an effort to ensure that biofuels continue to benefit from the policy framework in place and that business plans to produce biofuels remain commercially viable. This suboptimal situation for the biofuel industry has lead it to seek a more transparent regulatory process that provides a level playing field for businesses competing to ensure their market presence, particularly in the second-generation biofuels growth sector.

A second issue that has bedevilled the 2007 mandates are those for cellulosic ethanol. Notwithstanding the fact that there were no commercially viable plants to produce cellulosic ethanol in 2007, EISA set a mandate of 16 billion gallons of cellulosic ethanol to be blended annually by 2022. It also allowed EPA to adjust in whole or in part the total RFS. On July 2008, Texas requested a 50% waiver for the RFS II to the EPA, citing food prices as a concern (Streitfeld, 2008). The waiver was denied. Although EPA has not yet adjusted the aggregate annual RFS, insufficient cellulosic supplies have led it to adjust the cellulosic mandate volume annually. The dramatic growth in mandated volumes of cellulosic ethanol, amidst poor prospects for its successful early commercialization, have led some second-generation biofuel producers to question the merits of a specific 16 billion gallons 'carve-out' for cellulosic ethanol in the 21 billion gallons advanced biofuels mandate. Producers of algae-based and municipal waste-based fuels are openly dissatisfied with the current way RFS II is designed. Reopening RFS II has wider implicit support, according to Jim Lane, editor of Biofuels Digest (2012).

The inability to meet cellulosic mandates and the controversy around EPA's modeling of biofuels' ILUC effects have ensured that the renewable fuel mandates remain a point of contestation. Long-standing opponents, such as representatives of the petroleum and refiners industry, say they are not achievable. A mandated review of the renewable fuel mandates by National Academy of Sciences (2011: 4) concluded that the high cost of producing cellulosic biofuels compared to petroleum-based fuels and uncertainties in future biofuels markets are a key barrier to achieving the RFS.

According to biofuel industry leaders, this is a 'gridlock situation' in which mandates and government-backed loan guarantees are only part of the solution. Uncertainty of market demand reduces the incentives for producers of cellulosic and other advanced fuels to invest in production processes that would scale-up these fuels' production and presumably lower their costs. Raising capital for these investments would be significantly easier if commercialization efforts benefited from purchase agreements that would ensure market uptake, but no organization is willing to commit at the current market cost. The single largest buyer of fuel in the United States, the Department of Defense, is one of the few organizations with such commitments for its military fleets. Environmental associations are lobbying to expand such commitments to further promote development of non-food based biofuels. Airlines could also enter into purchase agreements for jet fuel, but the current high costs have prevented them from doing so. In the absence of a regional framework integrating the price of carbon emissions in the price of airline tickets, as will be the case in the EU in the next years, incentives to do so are inexistent.

More broadly, the National Academy of Sciences' (2011) report suggests the costs of the RFS are likely to outweigh its benefits. It doubts that the RFS will realize its anticipated environmental goals. The effect of biofuels on greenhouse-gas emissions, it argues, depends on how biofuels are produced and what land-use or land-cover changes occur in the process: processes that the US cannot control in other countries. Notwithstanding possible direct and indirect land use changes effects on GHG emissions, and under a policy framework that included a tax credit for corn ethanol and biodiesel that has since expired, the Congressional Budget Office has estimated the cost of reducing GHG emissions by one metric ton at $754 for corn ethanol, $276 for cellulosic ethanol and $306 for biodiesel (Congressional Budget Office, 2010:

5-15). A German study conducted in the early 2000s found that under a best case-scenario the cost of reducing a ton of carbon was about 300 € for sugar beet and wheat ethanol (Henke et al., 2003). Besides its dubious environmental benefits, the RFS is also likely to increase land prices (by creating competition among different land uses) and raise food prices (by increasing prices for agricultural commodities, food and livestock feed). Finally, regarding the energy security goals of biofuels, the Congressional Budget Office has estimated that, under the above mentioned policy framework, the cost of displacing a gallon of petroleum fuel is $1.78 for corn ethanol, $3.00 for cellulosic ethanol and $2.55 for biodiesel (Congressional Budget Office, 2010: 5-15).

II. The European Union

The European Union lagged behind the United States in implementing biofuels and renewable fuels mandates. It established indicative (voluntary) biofuels targets for member states in the 2003 *Directive to promote the Use of Biofuels or other Renewable Fuels for Transport*. Biofuels, which then amounted to .5% of EU transport fuels (Commission of the European Communities, 2007b: 7), were to constitute 5.75% of all transport petrol and diesel by 31 December 2010. In the face of evidence that these voluntary targets would not be met, the EU approved legislation in 2009 to establish legally binding mandates for biofuels and other renewable fuels. The Renewable Energy Directive was part of a broader climate and energy package that also included the Fuel Quality Directive. The latter establishes a low carbon standard for fuel and includes sustainability criteria similar to those in the Renewable Energy Directive.

The *Directive on the Promotion of the Use of Energy from Renewable Sources* (hereafter, Renewable Energy Directive) requires 20% of total energy, and 10% of transport energy, consumed in member states to come from renewable sources by 2020 (Commission of the European Communities 2007: 7). The reason for a separate mandate for transport fuel was that renewable energy already had a substantial presence in both the electricity and heating markets but not in the transport fuel market. Without legally binding targets in transport to encourage investment in transport renewable fuels, the transport sector's singular dependence on oil, and its increasing rise of GHG emissions relative to the heating and electricity markets, was unlikely to be curbed (Hodson 2010:174).

Similarly to US renewable fuel mandates, the EU's Renewable Energy Directive (RED) imposes sustainability criteria on biofuels for transport and non-transport purposes. These include greenhouse gas emissions savings, land use requirements, and cross-compliance with the environmental requirements of the Common Agricultural Policy. To count toward national renewable fuels targets and receive national support schemes, biofuels must demonstrate an initial 35% CO_2 emissions savings over fossil fuels, an amount that they can currently reach under the most economical production methods (Commission of the European Communities 2007a: 11). This 35% figure, initially higher than the US 20%, rises to 50% in 2017 and to 60% in new biofuels refineries starting in 2018.[9] As in the US, required GHG emission reductions for biofuels are over their life cycle (of cultivation, processing, and transport/distribution) and relative to the life cycle emissions of the fossil fuels they replace. Land with high biodiversity and high carbon stocks, such as primary forest and other wooded land, cannot be used to produce feedstocks that count toward targets and receive government support. Advanced renewable energy sources count more towards mandatory targets than do first generation biofuels.

As in the US, there are grandfather clauses in the EU RED. Biofuels that are produced on land converted to this use before January 23, 2008 do not have to demonstrate they meet land use sustainability criteria. For production facilities operating before this date, the required GHG reductions apply from April 2013, giving these facilities until then to improve their production processes.

Besides the higher initial GHG emission reduction threshold for conventional biofuels, the EU Renewable Energy Directive differs from the US EISA and its RFS in two other ways. First, the EU does *not* yet require GHG emissions owing to indirect land use changes to be calculated into total GHG emission savings of renewable fuels relative to fossil fuels. Rather, the Renewable Energy Directive requires the European Commission to `develop a concrete methodology to minimise greenhouse gas emissions caused by indirect land-use changes' and to do so using the best available scientific evidence, in particular, the inclusion of a factor for indirect land-use changes in the calculation of greenhouse gas emissions'. Second, the Directive requires the European Commission to report on the social sustainability of biofuels policies by measuring their impact on the availability of foodstuffs at affordable prices, in particular for people living in developing countries, and on `wider development issues' (Commission of the European Communities 2009).

What explains the EU renewable fuel mandates and their coupling with sustainability standards? The rationales for the mandates are similar to those in the US. Clause 1 of the Renewable Energy Directive says the directive is needed to reduce greenhouse gas emissions and comply with the Kyoto Protocol and other international GHG reduction commitments, as well to promote security of energy supply, technological development and innovation, and opportunities for employment and regional development, especially in rural and isolated areas. Clause 14 states that the `main purpose' of mandatory national targets is `to provide certainty for investors and to encourage continuous development of technologies which generate energy from all types of renewable sources.'

Despite similar rationales for mandates, environmental rationales appear to be more important in the EU than in the US. These rationales have figured prominently in policy documents and debates leading up to the 2009 legislation and are the result not only of the strength of environmental values among the EU public but also the legal obligations of the EU (but not the US) to reduce GHG emissions under the international Kyoto Protocol. In terms of the coupling of mandates with the high GHG emission reduction thresholds, the latter can also be explained by the need for policymakers to be responsive to biofuel sceptics' concerns about the benefits of biofuels.

As in the US, the biofuels producers and farmers who support biofuels mandates have been opposed by the oil industry and environmental groups.[10] Europia, the organization representing the EU oil industry organization, questions the ability of biofuels to lower GHG emissions based on the energy required to produce and process them, and argues that targets for biofuels in transport mix cost up to three times conventional gasoline and diesel. Environmental groups like the World Wildlife Fund support renewable energy (like solar and wind energy) but not biofuels produced from foodstuffs like canola, corn, or vegetable oils. In their view, incentives to promote biofuels lead to more intense farming and undermine environmental goals of reducing GHG emissions and protecting biodiversity.[11] Their arguments have enjoyed support from Green Party Members of the European Parliament (MEPs). Although most MEPs have supported biofuels/renewable fuels, including targets for their use in transport and excise tax exemptions,[12] they also warn that biofuels need to demonstrate their positive environmental impacts compared to fossil fuels.[13]

The imposition of sustainability criteria in the form of GHG savings and direct land use restrictions in the 2009 Renewable Energy Directive was a necessary condition for public and parliamentary support for renewable fuel mandates. As early as the 2003 Biofuels Directive, when voluntary targets for biofuels were established, Member States were instructed to `consider the overall climate and environmental balance of the various types of biofuels and other renewable fuels' and `to give priority to those fuels showing a very good cost-effective environmental balance, while also taking into account competitiveness and security of supply' (Article 3, clause 4). This same Directive required the European Commission to report to the European Parliament and the Council on whether biofuels, over their life cycle, are climate and environmentally friendly and potentially competitive and cost-efficient. [14] The concern about the environmental benefits gained steam over the decade, and it became clear that promoting biofuels was only valid providing they reduced GHG emissions and providing biofuels feedstock production adhered to sustainable land use practices (Londo et al. 2006).[15] Public consultation also made it clear that the European Commission's proposed threshold of 10% GHG emission savings relative to fossil fuels was too low and had to be raised. It was revised to 35% in order to garner the necessary support of environmental groups, member states like Germany with growing biodiesel sectors, and the European Parliament.[16]

Differences in sustainability criteria in the US and the EU can be attributed both to the timing of the legislation that established mandatory targets, as well as to the more biofuels-sceptical role of the European Parliament as compared to the American Congress. In the US, EISA was passed in December 2007—in advance of the food versus fuel debate that unfurled in the first six months of 2008. This debate had a more appreciable impact on EU renewable fuels legislation which was introduced, debated and agreed to politically over the course of 2008. The idea that there was a social and economic trade off between biofuels and food security for the world's poorest people lent fuel to criticisms of biofuels, particularly among the Green Party in the European Parliament. One of its members chaired the parliamentary committee responsible for the RED. The influence of the Green Party and the need to secure the European Parliament's consent for the RED created pressure to add more sustainability criteria to the legislation, including a high GHG threshold for biofuels. The requirements for the European Commission to report on both ILUC and social sustainability effects of the directive were added at the insistence of the European Parliament.[17]

The Renewable Energy Directive set conservative default values for GHG savings from various biofuels and a binding methodology for calculating these values. Biofuel companies can calculate GHG values if they think their emission values are lower, but no companies have yet done so. Individual biofuel producers have to demonstrate that they meet the sustainability criteria for both GHGs and land use, and have to be independently audited. The responsibility for checking compliance with the sustainability criteria lies with member states. There are three ways to comply with the Renewable Energy Directive sustainability criteria: through national legislation, through international agreements and through voluntary certification schemes specifically approved by the European Commission. Each compliance pathway must meet standards of reliability, transparency and independent auditing. As of November 2011, only Germany and Sweden have national legislation for auditing compliance with the sustainability criteria (SGS, 2011). No international agreements yet exist, although global conversations are underway, as the next section of the paper discusses. The American Soybean Association is currently lobbying the American government for a US-EU bilateral agreement that would ensure them EU market access. As for the voluntary schemes, the EU Commission approved seven on July 19, 2011[18], some of which include social sustainability monitoring. According to the business certification and inspection consultants SGS, twenty additional schemes are currently under review by the European Commission.

While the United States administers biofuel sustainability criteria centrally via the Environmental Protection Agency, the EU uses a 'Chain of Custody' approach requiring feedstock/biomass producers and processors as well as biofuel producers to keep track of certified biomass use for auditing purposes. Different ways of monitoring traceability are implemented by the voluntary schemes: 'mass-balance systems' where certified biomass is mixed with conventional biomass, but monitored by accounting practices; 'segregated systems' where certified biomass is kept separate throughout the supply chain; and 'book and claim systems' where non-segregated biomass is monitored by a system of supplier-emitted certificates (SGS, 2011).

As noted, the Renewable Energy Directive did not require GHG savings thresholds to include indirect land use change effects. Rather, it directed the European Commission to develop a methodology to assess ILUC effects. Its report, published in December 2010 following public consultation, stated that the science on estimating ILUC impacts was inconclusive and that all the models for evaluating ILUC had significant gaps or assumptions that created uncertainty in the nature and scale of impacts calculated by the models. Nonetheless, it concluded that ILUC effects were still significant enough to consider.

The Report set out 4 policy options for ILUC and recommended a further 6 month study of the options. The options are: 1) take no action for the time being while continuing to monitor; 2) increasing the minimum greenhouse gas threshold for biofuels; 3) introducing additional sustainability requirements for certain biofuels; and 4) attributing greenhouse gas emissions to biofuels reflecting the estimated ILUC impacts. The latter is the EPA's approach.

The issue of ILUC remains unsettled in the EU but close observers believe option 1 – do nothing except monitor – is not a viable political option.[19] Inside the European Commission, there is a division of opinion within the European Commission between the two responsible directorates, Energy and Climate Action. Energy prefers option 2 (higher required GHG savings) while Climate Action prefers option 3 (additional sustainable requirements). For their part, biofuels companies and organizations that represent them argue that including ILUC effects in GHG calculations will destroy their industry. As expected, environmental groups are pressing hard for ILUC effects to be included. Adoption of any option other than option 1 would require new legislation and approval of both the European Parliament and the Council of Ministers.

The Gallagher Report (2008), commissioned by the United Kingdom government, suggested yet another approach: slow down biofuel production by lowering targets until scientific uncertainties on direct and indirect land-use changes are better understood and effective measures to mitigate these negative effects are developed.

The Renewable Fuels Directive will be reviewed in 2014, at which time the targets themselves may be modified.

III. Global Initiatives

There are at least three initiatives underway in the global arena to develop common methodologies and sustainable practices for biofuels, undertaken by the Global Bioenergy Partnership, the Global Sustainable Bioenergy project, and the International Standards Organization. These initiatives, all of which are voluntary, are being driven by concerns about the potentially trade-restricting effects of sustainability criteria for biofuels. Zarrili (2008: 31-32) suggests that sustainability criteria, which are certifications about how goods were produced and which do not have an effect on the final characteristics of the product, fall in a 'grey zone' with regard to the WTO agreement on technical barriers to trade (TBT Agreement). There are also concerns that private certification schemes, such as those allowed by the EU's Renewable Energy Directive, could be inconsistent with member states' GATT obligations. The inconsistency with GATT law could arise if a link is established between the private certification scheme and access to publicly-funded subsidies.[20] The voluntary initiatives described below arise out of the concern of biofuels producers and their home countries to facilitate trade in biofuels via agreement on what constitute sustainable biofuels policies.

The first global initiative is the Global Bioenergy Partnership[21] (GBEP) to which Canada, the United States, and several EU Member States are parties. Launched during the 14th session of the Commission on Sustainable Development in New York on May 11th, 2006, its objective is to implement a resolution of the G8+5 Gleneagles Plan of Action in 2005 to develop a framework for sustainable biofuels development (Zarrilli, 2008: 17). The GBEP is developing sustainability indicators on 24 different environmental, social and economic indicators. Its environmental sustainability indicators include developing a common methodology for measuring lifecycle GHG emission impacts of biofuels. Amidst an abundance of models that measure sustainability of biofuels--with around 60 different models in use internationally--the GBEP is seeking to harmonize these models for biofuels that are traded internationally. It has not yet included ILUC within its set of indicators because of the scientific controversy around ILUC. The GBEP voluntary framework of international sustainability principles and indicators will not be legally binding on GBEP partners. Rather, the framework will help 'countries to assess and develop sustainable production and use of bioenergy' by 'informing decision-making'.[22]

The second global initiative on biofuel sustainability is via the International Standards Organization (ISO). Its Technical Committee 248 (TC 248) is currently working on developing best practices that would 'prevent [bioenergy] from being environmentally destructive or socially aggressive.'[23] Another major goal is to develop an international private norm (ISO 13065) that avoids technical trade barriers on bioenergy trade. The ISO norm is aiming to be 'WTO-compliant' and to be completed by the Spring of 2014.

A third initiative that is running parallel to the global *political* conversation of the GBEP and the *private industry* conversation of ISO is the global *academic and policy-oriented* conversation under the Global Sustainable Bioenergy (GSB) project.[24] It was initiated in 2009 by a group of scientists, engineers, and policy experts from universities, government agencies, and the non-profit sector. The aim of GSB is to provide guidance on the feasibility and desirability of sustainable, bioenergy-intensive futures. In 2010, GSB recommended that 1) countries move towards a more informed debate on bioenergy (including biofuels) by recognizing the contribution that positive and negative assessments can make towards envisioning a sustainable bioenergy future, 2) develop a diversified and complementary technology strategy, 3) emphasize clarity and precision in policy objectives, notably with regards to differences in feedstocks, technologies and time horizons, and 4) explore efficient 'win-win' implementation strategies with regard to energy, social and environmental sustainability goals (Linz et al., 2011). Future projects entail research and consultation on concrete means of achieving sustainable bioenergy production, and issuing recommendations on transition policies towards meeting energy demand through bioenergy, while respecting social and environmental concerns.

While the foregoing are the major multilateral initiatives to establish common cross-national performance standards for biofuels, they are by no means the only such efforts. In late 2011, the consulting firm Ernst and Young issued a Report on Biofuels and Indirect Land Use Change that had been commissioned by a consortium of industrial companies and NGOs. Stating that there is a general consensus that biofuels can have ILUC impacts (2011: 12) and that these impacts must be dealt with to shore up the political legitimacy of biofuels (Ibid: 6), it proposed incentives to encourage existing and additional sustainable biofuels production practices.

For now, biofuel sustainability standards remain within the remit of the Environmental Protection Agency in the United States, the seven organizations recognized as certified voluntary schemes by the European Commission under the RED[25], and the German and Swedish national agencies delegated to regulate biofuel sustainability in compliance with the EU RED.

IV. The Implications for Canadian Renewable Energy Policies

Building on previous federal commitment as well as on provincial commitments (Olar et al., 2004; Walburger et al., 2006), Canada adopted in September 2010 a renewable fuels blending mandate. Administered by Environment Canada, it requires an average content of 5% renewable fuels in gasoline and 2% renewable fuels in diesel since December 2010. The federal government also has a number of incentives fostering biofuel production. They include the ecoENERGY for Biofuels Program, which provides a per-litre incentive to biofuel producers over the 2008-2017 period, and the ecoAgriculture Biofuels Capital Initiative, which grants a maximum $25 million repayable contribution for biofuel production facilities projects over the 2011-2015 period. Natural Resources Canada administers the ecoENERGY for Biofuels Program, while Agri-Food Canada administers the ecoAgriculture Biofuels Capital Initiative. Finally, Sustainable Development Technology Canada (SDTC), an arm's length not-for-profit organization funded by the federal government and answerable to Natural Resources Canada, funds commercial scale demonstration projects for biofuels made from non-edible biomass sources. Those biofuels that show a better GHG reduction performance than first generation biofuels are funded via the $500 million NextGen Biofuels program. Together, these policies have helped to foster a total production capacity of 476 million gallons (Austin, 2010).

Public opinion polls show the Canadian public's support for biofuels and biofuels mandates. A 2009 poll commissioned by the Renewable Fuels Association and conducted by Praxicus Public Strategies revealed that 84% of Canadians support the promotion of renewable fuel use and 74% approved the federal blending mandate. Support is greater for second-generation biofuels, with 87% of respondents supporting federal policies that would promote their development (Austin, 2010; FOREX, 2009).

Contrary to US and EU policies, the Canadian government does not require that sustainability standards be met for biofuels producers to benefit from its policies. However, Natural Resources Canada, working with the provinces and the Canadian Renewable Fuels Association, has developed non-binding 'Guiding Principles for Sustainable Biofuels in Canada' that mention legal, environmental and social concerns.[26] One of the goals of establishing such principles is to identify and acknowledge 'areas of international best practices and Canadian strengths related to sustainable biofuels production'. Keeping with this goal, Canada participates in the relevant global conversations, both in the GBEP and the GSB projects, as well as in the development of ISO 13065.

But while international consensus on a common norm or organization regulating sustainable biofuel production remains in the making, Canadian feedstock and biofuel producers have to comply today with US and EU sustainability requirements to access these markets. Export-driven producers have already done so. In September 2011, Canadian canola was approved by EPA in September 2011 as 'sustainable biomass', meeting the 50% GHG reduction requirement for advanced biofuels and demonstrating that its production didn't increase total land under cultivation (Pratt 2011b). According to Denis Rogoza, consultant for the Canola Council of Canada, Canadian feedstock producers are well poised to get EPA approval for their renewable biomass. Canadian producers benefit from Canada having a stronger rule of law and clearer system of property rights than developing countries. This property and legal regime facilitates EPA's approval with regard to the land clearing rule, and avoids negative impacts of potential controversy around worker rights abuse, such as arise in countries like Brazil and Indonesia, where harsh labour conditions and slave labour are concerns. If production costs become commercially viable, Canadian cellulosic ethanol producers, such as Enerkem and Iogen[27], will be poised to export to the US market, benefiting from a specific cellulosic tax credit and the cellulosic 'carve-in' in the RFS II mandated volumes.

In terms of access to the EU, the Canola Council of Canada is a member of the International Sustainability and Carbon Certification (ISCC), a voluntary scheme supported by Germany's agricultural ministry and recognized under the EU RED. Individual canola producers exporting grain to the EU for use as biofuels feedstocks are currently in the process of receiving the ISCC certification. It requires minimum GHG emission savings, sustainable cultivation practices and the protection of natural habitats. Nor can the feedstock (canola) have been produced on species-rich areas, high carbon soils and peat bogs. To date, applicants reviewed by ISCC have been granted its certification without substantial administrative issues.

The policy void in Ottawa has not prevented provinces from implementing biofuels' environmental sustainability criteria. Alberta has a minimum 25% GHG reduction threshold policy [28] and British Columbia a Renewable & Low Carbon Fuel Requirement that progressively lowers carbon intensity of fuels down to 73.82 g of carbon per MJ of energy by 2020.[29]

Given the existence of provincial, EU and US environmental sustainability criteria, and in light of the significance of the United States and the European Community as major trading partners, it would make sense for the Canadian government to incorporate environmental sustainability criteria in its biofuel policy framework. Implementing a federal standard that would comply with EU and US regulations would ensure a level playing field for feedstock and biofuel producers that currently incur additional expenses to export to the US and EU biofuel markets. If policy-makers decided to implement environmental sustainability criteria, the choice of a GHG model would be paramount. As mentioned above, the biofuel industry and feedstock producers are dissatisfied with EPA's methods and support a more transparent process. Fortunately, Canadian agencies, including Natural Resources Canada and Environment Canada, are already using the GHGenius model[30], which is considered very transparent by the renewable fuel industry.

Regarding social sustainability standards, Canadian policies are not immune to potential controversy. While biofuels produced in Canada are less exposed to issues of land clearing, worker rights or land property rights, Canada does import a substantial volume of biofuels produced in Asian countries, where social and environmental sustainability are big concerns. Furthermore, there is a considerable potential for the 'Food vs Fuel' controversy to erupt again in the Canadian, American and European media. World prices for basic food staples have spiked again, rising above the 2008 level that first prompted the 'Food vs Fuel' controversy. The United Nations Food and Agriculture Organization's (FAO) composite Food Price Index[31], as well as its Cereal and Oil and Fat indexes, are all above the 200 points threshold since late 2010. US Department of Agriculture experts (Trostle et al., 2011: 15-17) have since minimized links between world food price spikes and biofuel mandates in Western countries:

> Globally, the 2002-08 increase in biofuel production—ethanol in the United States and Brazil and biodiesel production in the EU, Argentina, and Brazil—played a role in raising prices for corn, sugar, rapeseed, and soybeans, as well as for other crops. Attributing most of the rise in food commodity prices to biofuel production, however, seems unrealistic. Crop prices dropped more than 30 percent during the last half of 2008 even though biofuel production continued to increase. Further, nonagricultural prices rose more than agricultural prices, and the price of corn (an ethanol feedstock) rose less than for rice and wheat (not biofuel feedstocks). Clearly, there were other factors at play. Thus, while the expansion of biofuels was an important factor underlying the general rise of food commodity prices in 2002-06 and their movement to a higher plane, it is less clear how much additional impact biofuels had during the subsequent 2007-08 spike in prices, as evidenced by biofuels' continued and growing presence through both the upside and downside of the spike.

However, FAO experts emphasize the avoidable nature of biofuel policies' contribution to higher food prices (HLPE, 2011: 33):

> Leaving aside the biofuel boom during the 2000s, the growth of world cereal consumption and vegetable oils [for food] is actually slowing down. This is not to minimize either phenomenon but to explain that the actual acceleration of

> world consumption growth [driven by industrial uses] is not the mechanical and inevitable consequence of world economic development. It is the result of a public policy implemented by the United States and European Union governments; the result of a clear – and reversible – political choice.

While the exact level of biofuel production's contribution to rises in food price remains contested, the direction of its effect is not. Furthermore, a FAO report has suggested that biofuel policies increase food prices' volatility, and will continue to do so in the future (FAO, 2011: 12):

> [B]iofuel policies have created new linkages between the price of oil and the price of food commodities. When oil prices increase, demand for biofuels will increase, thus raising food prices, with the opposite happening when oil prices decrease.

Insofar as oil prices show no sign of dropping, the possibility remains for biofuel policies to drive a wedge between urban consumers and rural producers. Most politicians would want to avoid such a wedge. To that end, a prudent and cautious approach to stimulating biofuels production, along the lines that the Gallagher Review recommends is needed to minimize land use change effects, seems wise. Just what is the appropriate level of biofuel production is not clear. There is likely to be continuing discussion around these mandate levels, as there is on the question of whether environmental sustainability standards for biofuels should also be accompanied by similar standards for fossil fuel producers.

Conclusion

This report has addressed three questions. First, why have the United States and the European Union legislated sustainability standards for mandated biofuels and renewable fuels? How do these policies differ in their substance as well as in the political processes that led to them? Second, how robust are these standards as constraints to renewable fuels' production and consumption and as consensual standards that enjoy the political and public support necessary to prevail? Third, what are the implications for Canada's renewable fuels policies? We will answer each of these questions in turn.

The adoption of sustainability criteria in both the EU and the US results from growing scientific controversy about biofuels' capacity to meet their stated environmental goals - GHG reduction – and from doubts about their deleterious effects on land use. This growing concern was carried by environmental associations and channelled through the Green Party in the European Parliament and the Democratic House Leadership in the United States. The sustainability criteria are similar in substance – both have a ‘no land clearing’ rule and a minimum GHG threshold – though with notable differences in the level of the GHG threshold – EU’s level being higher and increasingly so in the future – and in their account of indirect land-use changes. Important differences also pertain to the implementation of these sustainability criteria. While the United States relies on a central system administered by the Environmental Protection Agency, the European Union relies primarily on voluntary private certifications schemes. Finally, no social sustainability criteria have been formally adopted in either of the policy frameworks, but the European Union legislation does contain an obligation to monitor this issue.

The absence of a dominant international norm for biofuel sustainability has created a situation of multiple criteria and methodologies for assessing sustainability. Global conversations are currently underway to remedy the problems that this situation could provoke, notably for international trade. To obtain a consensus on biofuels sustainability criteria, three main issues of division will need to be bridged. First are the effects of indirect land-use change that result from biofuel policies. Although there is an emerging consensus on the existence of ILUC, there are disagreements on the level, magnitude or modalities of its effect. Second are the methodologies and models used for calculating GHG emissions of renewable fuels relative to petroleum-based fuels. More specifically, there is a need to ensure the industry of a transparent process to gauge these effects, and of the independence of the experts making these calculations. Third is the nature and the magnitude of the effects of biofuel policies on world food prices and supply and on developing countries’ economy. Although these social sustainability issues are not formally inscribed in biofuel legislation, they affect the legitimacy of biofuel policies. Settling this controversy requires more research on the causes and consequences of increases in the volatility of food prices – and the extent to which biofuel policies contribute to this increased volatility. It also requires a better understanding of the different consequences – in the short term and the long term, and on urban and rural economies – of higher food prices for developing countries.

Although judged to be imperfect, sustainability criteria are nonetheless here to stay. From the perspective of the renewable fuels industry, which generally accepts the need to comply with sustainability criteria, sustainability criteria would be more acceptable if they were also applied to their direct competitors: the petroleum industry. For the renewable industry as a whole, policy instruments such as Low Carbon Fuel Standards should apply to all fuels – renewable and petroleum-based alike.

There are several implications for the Canadian renewable fuel industry and Canadian biofuel policy of American, EU, and global biofuels policy developments to date. Environmental sustainability standards in the United States and the European Union have obliged export-oriented Canadian feedstock and biofuel producers - particularly canola and potentially cellulosic ethanol producers – to take into account sustainability criteria in their production methods. So far, the costs of doing so have been incurred by individual producers. Implementing a federal standard that complies with EU and US regulations would ensure a level playing field for all feedstock and biofuel producers, and avoid additional costs for export-oriented producers. Concurrently, Canadian government and industry officials are participating in the ongoing global conversation that may lead to harmonization of norms on sustainability. Social sustainability remains a concern globally, as world food prices have spiked again above their 2008 level. Canadian producers are not immune to this concern. Canadian biofuel policy-making would benefit from being attentive to the impacts of biofuels on food price volatility and food supply.

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Endnotes

[1] In 1997, the European Commission estimated the costs of producing biofuels to then be three times the production costs of conventional fossil fuels. See European Commission (1997: 17). In 2000, it stated that the cost difference, depending upon the biofuel, varied from 1.5 (biodiesel) to 4 for other biofuels before taxes. See Commission of the European Communities (2000: 49).

[2] Renewable, including cellulosic, fuels, are also encouraged in the 2008 *Food, Conservation and Energy Act* (known as the Farm Bill). It provided funding for research and development for advanced and cellulosic biofuels research, established a new tax credit for cellulosic fuels, and reduced the ethanol tax credit for corn-based ethanol (Sanders 2008; Waage 2008).

[3] Figure taken from Schnepf and Yacobucci (2010: 5)..

[4] Petroleum companies, like Valero in the United States, and Shell elsewhere, are investing in ethanol and advanced biofuels.

[5] The need to adopt a high GHG emissions reduction standard for corn ethanol was expressed by David Waskow from *Friends of the Earth* at a hearing organized by the House of Representatives subcommittee on Energy and Environment on June 14, 2007.

[6] This information was provided to the author by several officials knowledgeable about the drafting of the legislation. They concur that the sustainability standards were `written in the office of Nancy Pelosi (Democrat, Speaker of the House) by the NRDC in the middle of the night.' Under `instructions from Speaker Pelosi,' the House quickly passed the legislation.

[7] This information is based on a presentation by Denis Rogoza at the Biofuels International Expo and Conference, Calgary, October 3, 2011. Rogoza worked with the Canola Council of Canada to get Canadian canola approved by the EPA as 'renewable biomass' for EISA purposes.

[8] http://greet.es.anl.gov/

[9] These requirements apply to biofuel installations that begin operation after January 2008 (when the proposed directive was announced); those in operation before that date have until April 2013 to show any GHG savings and until December 31 2016 to meet the 35% GHG savings threshold.

[10] Pan-European organizations representing farmers argued for EU incentives to develop biofuels to reduce EU's increasing dependence on foreign energy suppliers and to protect the environment (renewable energy produces no sulphur emissions, will reduce CO2 emissions) (Europe Energy, 20 October 1995). Their support for biofuels was also motivated by changes to the Common Agricultural Policy in 2003 which required them to set aside a percentage of their arable land in order to receive government payments. They were, however, allowed to use this set aside land to grow biofuels crops and given an acreage payment to do so.

[11] The position of the World Wildlife Federation is reported in *Agra Europe* 5 October 2001; the view of the Green MEPs can be found in *Knight News* 12 March 2003. The criticisms of Greens in the EP have been that they make no economic or ecological sense and impose high costs on

taxpayers via agricultural subsidies without producing benefits. They argue that the EU should focus on other options like public transport and smaller cars to tackle its energy supply/security problem.

[12] The European Parliament had argued in 1996 of the need for a battery of renewable fuel measures, including fiscal support and targets for renewable fuels to comprise a percentage of energy sources (European Parliament 1996).

[13] As reported in *European Report* 21 November 2001; *Agence Europe* 5 July 2002.

[14] The 1997 White Paper had also noted the need to take `particular care' to ensure that renewable fuels from biomass (like energy crops, wood and agricultural residues), `safeguard bio-diversity in the EU' and stated that strategies should be adopted that `minimise the impacts on bio-diversity' (Commission of the European Communities 1997: 37).

[15] This conclusion is supported by a public consultation conducted by the European Commission in April-May 2006 (Commission of the European Communities 2006).

[16] This conclusion is based on the feedback to the European Commission's consultation in May-June 2007 on how a biofuel sustainability system should be designed, biofuels effects on land use monitored, and the use of second generation biofuels (expected to yield higher GHG emission savings) encouraged (Commission of the European Communities, 2007c).

[17] This information was obtained in interviews undertaken in April 2011 with officials in the European Union closely involved in the drafting of the legislation. Jones (2010: 25) credits the Parliament with binding targets on member states and strict sustainability criteria for biofuels.

[18] http://ec.europa.eu/energy/renewables/biofuels/sustainability_schemes_en.htm

[19] This conclusion is based on interviews with officials in the European Commission plus representatives of biofuel industry organizations undertaken in April 2011 in Brussels.

[20] Mitchell and Tran (2010) argue the EU's directive is '*prima facie* inconsistent with EU's obligation under the GATT'.

[21] http://www.globalbioenergy.org

[22] http://www.globalbioenergy.org/news0/detail/en/news/79357/icode/

[23] http://www.iso.org/iso/pressrelease.htm?refid=Ref1282

[24] http://engineering.dartmouth.edu/gsbproject/index.html

[25] For details, see: http://ec.europa.eu/energy/renewables/biofuels/sustainability_schemes_en.htm

[26] http://oee.nrcan.gc.ca/transportation/alternative-fuels/resources/1309

[27] Enerkem (http://www.enerkem.com) and Iogen (http://www.iogen.ca/)

[28] http://www.energy.alberta.ca/BioEnergy/pdfs/GHGEmissionsStandard.pdf

[29] http://www.empr.gov.bc.ca/RET/RLCFRR/Pages/default.aspx

[30] http://www.ghgenius.ca/

[31] 100 points correspond to price averages during the 2002-2004 period. http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/