

# BIOFUEL LEGISLATION FOR SUSTAINABLE AND SOCIAL DEVELOPMENT: A REVIEW

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**Abstract:** Biofuels or energy derived from plant matter has been grabbing attention of the world due to rising oil prices and urgent need to reduce emissions. This has made biofuels a hot legislative and policy making topic for most nation states of the world. In order to ensure that socio-economic and environmental sustainability issues are taken into account during production and use of biofuels, there is a need for suitable regulatory and legal frameworks.

This study looks at the development of biofuel legislation, policies and institutions in three case studies, Brazil, United States of America and Canada. As world leaders in production and consumption Brazil and the United States of America have a huge body of legislation dealing with various aspects of biofuel production and consumption. Canada on the other hand has recently begun looking at biofuels as an alternate source of energy and an industry on its own right and is in its infancy in terms of biofuel legislation. This study looks at some salient legislation and bodies which regulate biofuel in these three countries aimed at sustainable development of this sector. Interesting programs to develop cellulosic biofuels and remove the burden from food crops and environmental programs have also been mentioned. This study ends with a comparison of biofuel strategy in the three cases and recommendations for development of future biofuel legislation and regulation.

All the relevant literature reviewed was from academic and technical publications – magazines and

journals –regarding biofuel/bioenergy regulations and legislation. e.g. UNEP publications on bioenergy and also papers published in international and national conferences on biofuel/bioenergy law and policy were sources of relevant literature.

The increased competition over agricultural crops for bioenergy purposes instead of food production has been highlighted as a concern for food security. Competition over the use of land and water resources for bioenergy production and for agricultural purposes increases pressures on these resources at a time where global water reserves are dwindling and potentially greater effect are feared on indigenous and local communities and small-holder farmers. All countries that have or are planning to develop a biofuel industry need to pay attention to these issues while forming biofuel legislation.

Governments see the potential for multiple benefits from domestic biofuel production programs. In addition to invigorating rural economies and increasing energy security by reducing imported oil, efficient biofuel production could contribute to goals for reducing green house gas emissions. This would also support development of the rural economy especially small scale farms producing cellulosic feedstock. (426 words)

**Keywords:** Biofuel Legislation, rural development, small business development, social development, sustainability

## INTRODUCTION

Rising fossil fuel and food prices, and increasing international pressure on climate change mitigation, have intensified the search for a renewable source of energy. A biofuel is a type of fuel whose energy is derived from biological carbon fixation. Biofuels include fuels derived from biomass conversion, as well as solid biomass, liquid fuels like ethanol, soybean oil and various biogases. Biofuels are being looked upon as not only an effective alternate energy source but also as a means of lowering green house gas (GHG) emissions.

The nature of bioenergy production and consumption brings the agriculture and energy sectors together. Bioenergy production may also cause negative environmental effects such as deforestation and loss of biodiversity. Thus the relationship between land use and the competing needs of energy and food security is a key issue in the bioenergy discussion. Thus in addition to the energy sector, bioenergy regulation is also important to agriculture, environment and trade. There is a need for suitable regulatory and legal frameworks to ensure that socio-economic and environmental sustainability issues are taken into account during production and use of biofuels.

Figure 1 illustrates the biofuel supply chain. There is a need for legislations to govern each and every step shown therein to address the related concerns. The feedstock production has issues of biofuel feedstock competing with food crops. For new cellulosic feedstocks the biggest challenge is development of sufficient demand for the crop to make it economically viable. Biofuel production facilities have raised issues of environmental safety, safe disposal of wastes, etc. Then there are regulations for blending percentages, market incentives etc. Apart from the environmental sustainability issues there are also issues of social concern. As biofuel feedstocks need to be farmed there is a heavy impact of biofuel legislation on rural economy. Additional effort is required for a more equitable development especially keeping the small farmers in mind. In the following report we are going to present salient legislation from Brazil, US and Canada which talks about these considerations. Brazil and the United States of America (USA) are the major producers and consumers of ethanol in the world. Brazil and the United States produce about 70% of the world's ethanol, which amounted to 44.7 billion litres in 2005 (PRB 0637). In the USA, where production nearly doubled between 2002 and 2005, ethanol is derived almost exclusively from corn. The 2005 Energy Policy Act (EPA Act 2005) provides subsidies to ethanol producers and requires oil companies to blend at least 4 billion

gallons (15.1 billion litres) of ethanol with gasoline annually. This baseline will increase to 7.5 billion gallons (28.4 billion litres) by 2012. Ethanol is produced primarily in the USA Corn Belt, but production is now spreading to other parts of the country (PRB 0637). Canada produces about 2.74 billion litres of ethanol annually. In Canada, ethanol is made from wheat in the western provinces, and from corn in Ontario and Quebec (PRB 0637).

Brazil has the only ethanol industry with the scale to meet the current USA advanced fuel mandate. Both of these countries have a huge body of legislation governing many aspects of biofuels supply chain. The legal framework for biofuels is influenced by laws dealing with the environment, labour, land planning and food security. The case studies in the following sections look at some of the key pieces of legislation from the agriculture sector and legislation which aims at a more sustainable development of biofuels.

## CASE STUDIES

### Brazil

Brazil is a signatory to many international treaties and a member of many international bodies, e.g. the Convention on Biological Diversity, United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. It is also a member of the World Trade Organization (WTO) since 1995. Brazil plays an important role in climate and environmental negotiations throughout the world (FAO 102).

It is the second largest producer of biofuels – after the USA – and the largest exporter. The Brazilian history of biofuel legislation started 37 years ago when blending requirements were introduced during the first oil crisis. The National Alcohol Program, *Pró-Álcool* (Portuguese: *Programa Nacional do Álcool*), which was launched in 1974, is a nationwide program financed by the government to reduce the dependence on fossil fuel, such as gasoline, in favour of ethanol produced from sugar cane. The blending requirements have increased from 10% to 25%. Currently the government of Brazil sets the percentage of the ethanol blend according to the sugarcane harvest and production levels of ethanol from sugarcane, resulting in blend variations even within the same year.

Brazil's current bioenergy programme is one of the most sophisticated in the world. Apart from blending mandates, tax exemptions etc. it has also introduced flex-fuel automobiles in 2003 that can run on pure gasoline, pure bioethanol or a combination of the two. The availability of these new automobiles has stimulated the domestic demand for bioethanol, with more than 80% of vehicles sold in 2009 being

flex-fuel. In the decade prior to the introduction of these vehicles, domestic use of bioethanol varied between 10.5 and 13.6 billion litres per year. In 2008, only five years after the introduction of these vehicles in the market, the domestic use rose to approximately 18.9 billion litres (out of a total production of 22.5 billion litres, with the remainder being exported) (FAO 102).

Moreover, in Brazil, the plant matter left over from ethanol production (bagasse) is used to generate electricity. This is enough to power the ethanol plant and sometimes the extra energy produced is fed back into the grid. In 2008 an important part of the 4.1% of electricity in Brazil generated from biomass came from sugarcane bagasse.

Achieving near self-sufficiency in energy production has driven the Brazilian government to concentrate on other objectives for the bioenergy sector, with social and environmental sustainability goals being increasingly prioritized in recent years. The Brazilian Agroenergy Plan 2006–2011 outlines these new objectives, stating that Brazil's primary aim in this sector is to “produce and transfer knowledge and technologies that contribute to the sustainable production of energy from agriculture.”

### **Legislative Hierarchy in Brazil**

Brazil has a federal government structure comprised of 26 states and one federal district. Article 22 of the Constitution of 1988, as amended in 2005, reserves the exclusive right of the federal government to legislate on energy, international trade and transportation. Thus most biofuel policy falls under federal jurisdiction.

### **Salient Federal Biofuel Legislations**

#### ***Decree N° 76.593, 1974: National Alcohol Program (Pró-Álcool) (FAO 102)***

This program was introduced after the 1973 oil crisis to reduce the dependence on foreign imports of oil. The National Alcohol Programme used standard methods for promotion of bioethanol market: tax incentives, funding programs to producers, a blending mandate and subsidies. This led to an increase in production of sugarcane, rapid technology development for efficient conversion of sugar cane to alcohol, distilleries and development of cars – flex fuel vehicles (FFVs) – which run on ethanol.

#### ***Law N° 9.478 of August 6, 1997 (ANP 1997)***

Agência Nacional do Petróleo, Gás Natural e Biocombustíveis (National Petroleum Agency)

This law deals with the National Energy Policy, activities related to the oil and gas monopoly,

created the National Council for the Energy Policy (Conselho Nacional de Política Energética) and the National Petroleum Agency (Agência Nacional do Petróleo). The National Energy Policy sets out the blending limits of ethanol to gasoline while keeping in mind the economical, social and environmental impacts.

#### ***Law N° 10.438 of 26 April, 2002 (ANP 2002)***

This law deals with creating the Programme of incentives for Alternative Energy Resources (Proinfa) and the Account of Energetic Development. This law creates an electrical energy tariff program and policy on the use of substitute sources of energy.

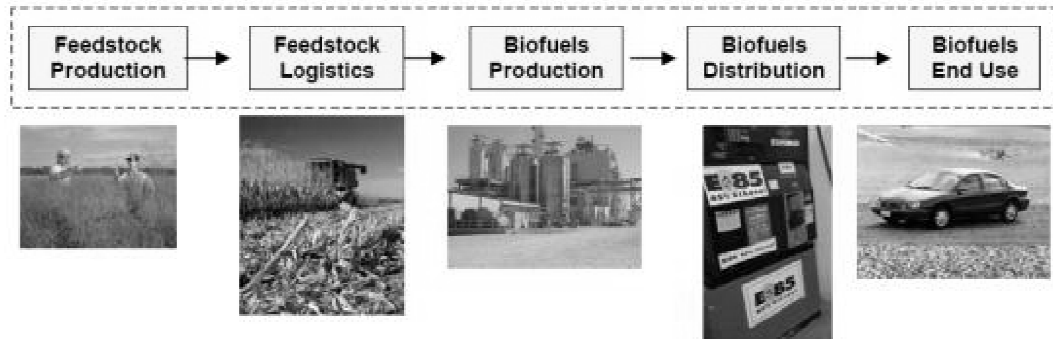
Brazilian Agroenergy Plan 2006 – 2011 (EMPRABA - The Empresa Brasileira de Pesquisa Agropecuária /Brazilian Enterprise for Agricultural Research 2006) guides bioenergy policies in Brazil. Linked to the overall policy of the Federal Government, the Ministry of Agriculture, Livestock and Food Supply has prepared a programme to meet the bioenergy needs of the country. The goal of the Brazilian Agroenergy is to ensure the competitiveness of Brazilian agribusiness and support specific public policies, such as social inclusion, regional development and environmental sustainability.

In the Brazilian Agroenergy Plan 2006-2011 the government lists the need for continual involvement at a national level. Since sugarcane production varies from season to season, but biofuels requirement remains same throughout the year. Thus to avoid periods of scarcity and abundance the government has stepped in to formulate a plan at the national level to stabilize the market. Also Brazil is a net exporter of biofuels and with more countries adopting a blending mandate, the international demand for biofuels is going to increase. A national plan is needed to handle this demand.

#### ***Social Fuel Seal N°1, of 19 February 2009 (Abhramovay & Magalhaes, FAO 102)***

This piece of legislation aims to promote the participation of smallholder farmers in biodiesel feedstock production. Biodiesel producers who get the certification are granted tax credits and preferential treatment to credit.

In order to obtain the Social Fuel Seal, biofuel producers have to purchase at least the following shares of feedstock from smallholder farmers, which varies depending on the regions of origin: (a) 10% until the 2009/2010 harvest, and 15% starting from the 2010/2011 harvest, for purchases coming from the Northern and Midwestern regions, and (b) 30% for purchases coming from the Southern, South-eastern, North-eastern and Semi-Arid regions.



**Figure 1:** Biofuel Supply Chain (EPA2012)

The social fuel seal is aimed at giving the small farmers more negotiating power with the big producers. Also aims at socio-economic development by involving the integration of small farm holders into the biodiesel production chain. The social fuel seal has been able to create more equitable development opportunities for small scale farmers as well as for farmers in the northern less developed and semi arid regions of Brazil.

Brazil designed its National Climate Change Plan (NPCC 2008), which contains several targets related to bioenergy, in 2008. Along with its Agroenergy Plan 2006–2011, one of the objectives of the climate change strategy is to "encourage the sustainable increase of the share of biofuels in the national transport matrix and also to work towards the structuring of an international market for sustainable biofuels."

Another objective of the plan is to "eliminate the net loss of forest coverage in Brazil by 2015" this is also relevant for the sustainability of biofuel production.

Other legislation with a sustainability mandate: Forest code (FAO 102); this establishes permanent reservation areas to protect vegetation and determines the percentage of forest areas that may be used for productive activities setting out limitations on deforestation for agricultural and charcoal production.

Brazil has also introduced the ecological and agricultural zoning strategies like **Ecological-Economic Zoning (FAO 102) (Zonamento Ecológico-Econômico - ZEE)** regulations which are important for the sustainable land use and preservation of sensitive areas.

All biofuel production plants also require environmental assessments analysing environmental impacts of the project on the area, monitoring positive and negative impacts and a plan for mitigation.

#### **United States of America**

The USA biofuel is mostly produced from corn unlike Brazil where sugarcane is the feedstock. The first use for biofuels in the USA was generated by use of ethanol as an oxygenator additive instead of methyl tertiary butyl ether. Also increase in pollution control regulation, climate change requirements and surplus corn production are drivers of the biofuel market.

#### **Legislative hierarchy**

In the USA though the Federal government has taken the initiative for biofuel regulation and to promote biofuel individual states also have their own biofuel mandates regarding blending percentages, grants, environmental assessments.

#### **Energy Policy Act 1992 (EPAct1992)**

It was one of the first legislations to assess biofuel need and development. Under Title III of the 1992 Energy Policy Act addresses alternative fuels. It gave the U.S. Department of Energy administrative power to regulate the minimum number of light duty alternative fuel vehicles acquired in certain federal fleets beginning in fiscal year 1993.

#### **Energy Policy Act of 2005 (EPAct2005)**

It recommended new studies as well as gave Congress some more power in regulating the biofuel industry

### **Renewable Fuel Standard (RFS) (EPA2012)**

The RFS program was created under the Energy Policy Act (EPA) of 2005, and established the first renewable fuel volume mandate in the United States. As required under EPA, the original RFS program (RFS1) required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012. Under the Energy Independence and Security Act (EISA) of 2007, the RFS program was expanded in several key ways and the new RFS2 lays the foundation for achieving significant reductions of greenhouse gas emissions from the use of renewable fuels, for reducing imported petroleum, and encouraging the development and expansion of the nation's renewable fuels sector.

In the USA, the farm bill is the primary agricultural and food policy tool of the federal government. The comprehensive omnibus bill is passed every 5 years or so by the United States Congress and deals with both agriculture and all other affairs under the purview of the United States Department of Agriculture (USDA). Since the biofuel feedstocks are usually food crops agricultural legislation are an important part of biofuel legislation and regulations.

### **9th Farm Bill: Farm Security and Rural Investment Act of 2002 (Farm Bill 2002)**

This farm bill was the first one to include a separate section for energy in the language of the bill. This bill laid down a comprehensive approach to agricultural energy development and focused on biofuels.

### **10th Farm Bill: The Food, Conservation, and Energy Act of 2008 (Farm Bill 2008)**

This was the first time the word energy was used in the title indicating the importance being given to agri-energy. This bill emphasises development of alternate cellulosic feedstock for biofuels to take away the pressure on food crops.

Section 15321 of the bill establishes a new tax credit for producers of cellulosic biofuels providing \$55 million in funding to support advanced biofuel production

This bill also initiated the **Biomass Crop Assistance Program (BCAP)**, which aims at developing alternate biofuel crops. There is a cyclic problem which the program addresses. Large scale commercial bio fuel production requires a large feedstock and for profitable crop production there needs to be a large scale demand. The program achieves this by providing up to 75% of the cost of growing, collecting, harvesting, storing and transporting a perennial biofuel crop.

There were some problems associated with the implementation as early on USDA where they approved projects which involved existing biomass being diverted to biofuel production. This led to a disruption of established markets for forestry residues, distorting prices and supplies.

This led to the reduction of funding in 2011 for the BCAP. Then the USDA put in some checks to revive the program. Funding is only available for new crop establishment and the project needs to have a conservation plan approved under National Resource Conservation Service.

As mentioned earlier the US Energy Act 2005 sets the Renewable Fuel standards and it is the US Environmental Protection Agency (US EPA) that is in charge of setting the blending standards. The EPA does this in partnership with the USDA, U.S. Department of Energy and various other stakeholders.

The US EPA states: "The growing use of biofuels in transportation is important to achieving the national goal of reducing greenhouse gas (GHG) emissions and dependency on foreign oil."(EPA 2012)

EPA's major roles include formulating guidelines for biofuels production and qualification, preparing a mandate report for Congress every 3 years on the potential environmental and natural resource impacts of expanding the biofuel mandate. It also implements existing statutes and regulations on air, water, waste which apply to each stage of biofuel supply chain. Coordinate with different stakeholders to work on biofuel research and policy

The RFS which was first required by the 2005 Energy Policy Act, which established a national standard of 4 billion gallons per year (BGY) in 2006, increasing to 7.5 billion gallons in 2012 (EPA 2012).

In 2007, EISA created RFS2, which expanded and changed in several key ways (EPA 2012): (a) Expanded the RFS program to include diesel and off-road fuels in addition to gasoline (b) Increased volumes of renewable fuel to be blended into transportation fuel — 9 BGY in 2008, increasing to 36 BGY by 2022; (c) Established new categories of renewable fuel and set separate volume requirements for each one; (d) Required EPA to apply life cycle GHG performance threshold standards to ensure that each category of renewable fuel emits less GHG than the petroleum-based fuel that it replaces.

The main environmental provision in the RFS-2 however is still emissions control. There are no provisions for other factors, no requirement of land use protection, water or air pollution control, rural economic development etc.

The other programs to boost cellulosic biofuel production are mostly at research grant capacity.

### Canada

In Canada the 1973 oil crisis prompted the first look at alternative fuels to reduce dependence on foreign oil. In 1975, a gasoline excise tax was introduced, but propane and natural gas were exempt. In 1992, the exemption was extended to ethanol made from biomass and methanol. In 1990's the market prices of crops was below the production price, this led to the next generation of biofuel policies mainly to drive rural economic development. Since then the main drivers of biofuel policy in Canada have been rural economic development, reduction of vehicular emissions and energy diversification.

### Legislative Hierarchy

The Canadian Federal Government as well as provincial governments can make regulations and pass legislation related to biofuels. In Canada the biofuel mandates of some provinces predates the federal biofuel mandate.

### Biofuel regulation in Canada (O'Connor 2011)

As a result of the 1979 oil crises, in 1980, Manitoba introduced tax incentives for ethanol produced from biomass in Canada. This was also to promote rural economic development.

In 1988, Saskatchewan introduced incentives for ethanol production. As an agrarian economy the province of Saskatchewan was the first to have an ethanol mandate. The **Ethanol Fuel Act** of 2002 (effective from 2005) required 7.5% of ethanol blend in gasoline.

Manitoba introduced a mandate to blend 8.5% ethanol to gasoline and tied it to local production capacity. Ontario introduced a 5% blending requirement and coupled the mandate with capital incentives and a variable support program.

In 2006, the Federal government announced their Renewable Fuels strategy. It has four components (Environment Canada 2012): (a) Increasing the retail availability of renewable fuels through regulation. (b) Supporting the expansion of Canadian production of renewable fuels. (c) Assisting farmers to seize new opportunities in this sector. (d) Accelerating the commercialization of new technologies.

The drivers for the Federal strategy were: (a) Creating new economic opportunities for our farmers and agricultural sector. (b) Advancing the biobased economy. (c) Reducing GHG emissions.

In 2008 **Bill C-33** was passed by the federal

government. This made amendments to the *Canadian Environmental Protection Act, 1999* with respect to provisions for the regulation of fuels. It establishes the power to regulate minimum levels of biofuel content in gasoline, diesel fuel and heating oil to be implemented within three to five years. (Bill C33, 2007)

In December 2010, the ethanol mandate became effective and in July 2011, the renewable diesel mandate came into effect. After the Federal announcement, several provinces moved to introduce their own mandates.

BC has a 5% ethanol and 5% renewable diesel requirement effective January 2010. BC also introduced a Low Carbon Fuel Requirement for 2010 to 2020. Alberta has a 5% ethanol and 2% renewable diesel requirement as of April 2011. Alberta introduced a minimum 25% GHG emission reduction requirement for qualifying renewable fuels.

Saskatchewan will have a 2% renewable diesel requirement starting in 2012. Manitoba has a 2% renewable diesel requirement as of November 2009.

Achieving these goals would affect Canadian agriculture substantially, dramatically increasing the domestic demand for corn and wheat as biofuel feedstock.

There are many programs introduced over the last decade to promote a self sufficient biofuel industry by providing support in research, technology development, feedstock development etc.

### Programs by Agriculture and Agri Food Canada (CRFA 2010)

#### *The Biofuels Opportunities for Producers Initiative (BOPI)*

BOPI was an initiative designed to help farmers and rural communities hire experts to assist in developing business proposals and feasibility and other studies that were necessary to create and expand biofuels production capacity by agricultural producers. It ended on March 31, 2008.

#### *ecoAgriculture Biofuels Capital Initiative (ecoABC)*

The ecoABC is a four year, \$200 million federal program that provides repayable contributions of up to \$25 million per project for the construction or expansion of transportation biofuel production facilities.

Funding is provided to projects that use agricultural feedstocks to produce biofuels and that have new agricultural producer equity investments in the projects equal to, at minimum, 5% of the total eligible project costs. The deadline for the construction or expansion of biofuel facilities

funded by ecoABC was extended from March 31, 2011 to September 30, 2012.

There are many federal programs to support development of new biofuel technology, development of cellulosic biofuels etc. These aim at technology development for next generation biofuels and making biofuels more economical.

### **Regulatory Requirements for Biofuel Production Facilities (O'Connor 2011)**

#### **Alberta**

(a) Permits and approvals under Environmental Protection and Enhancement Act (b) Industrial development permit from Energy Resources Conservation Board (c) Compliance with the Code of Practice for Energy Recovery (d) May require an environmental assessment (e) May require approval under Water Act if project alters or impacts water body

#### **Ontario**

(a) Certificate of Approval for discharge into air and water (b) No environmental assessment required

#### **Manitoba**

(a) Biofuels specifically identified as a Class 1 Development (b) Environmental Assessment required (c) License under Environmental Act (d) License under Biofuels Act

Federal Environmental Assessment is required when funding or approval for the project is obtained from a federal ministry or agency.

### **ANALYSIS & CONCLUSION**

Different countries have different drivers to push for bio-energy. Examples include developing an alternative to fossil fuels to reduce dependence during times of energy crises, driving rural economy, finding an alternative to surplus produce like corn and driving that market, reducing emissions as part of treaty obligations etc. However since biofuels span a lot of different areas there is need for legislation which has sustainability as one of its major goals.

The indicators Table 1 were selected to determine the sustainability of biofuel through legislative process and federal programs

Governments see the potential for multiple benefits from domestic biofuel production programs. In addition to invigorating rural economies and increasing energy security by reducing imported oil, efficient biofuel production could contribute to goals for reducing green house gas emissions. From 1975 to 2006, Brazil consumed over 275 billion litres of domestically produced bioethanol,

saving over US\$ 69 billion worth of foreign exchange by avoiding the purchase of oil from abroad (FAO 102). Also most countries especially developing nations producing biofuels consider deforestation, land tenure, water use and pollution to be important and politically delicate issues. In some countries, concern has been raised over small-farmer and indigenous land rights and loss of biodiversity.

Changes in crop varieties, farming practices, weather, prices, government policies and other variables can impact the area planted, yields and total production in a given year. Capacity for land use planning and enforcement is essential to avoid or diminish negative impact. Brazil, for example, has enacted progressive environmental protection regulations but faces many challenges in achieving compliance.

Regarding the impact of biodiesel promotion policy on rural development, negative impacts may be found in regions where soy monoculture displaces traditional livestock farming practices, for example, in cases where local populations, or indigenous communities, depend on cattle grazing land that falls under the legal title of other people. The effect of biofuels on global market prices for commodities like soy may increase landowners' incomes and reduce farmers' market risks. However, positive impacts could result from growing alternative crops, such as jatropha, for biofuel production in current dryland areas with high levels of poverty.

Many countries have established targets or mandates for between 2% and 10% bio-ethanol and/or bio-diesel blends with fossil fuels in coming years, in response to high crude oil prices. These targets appear to be aimed at providing investors with increased security based on assurances of local market demand. Many nations also encourage investment through reduced tariffs and tax-credit incentives. China and India appear to be taking a more cautious approach and have discouraged the use of food crops and prime farm land for biofuel production. Wheat and corn feedstock may be seen as a temporary approach that allows countries to build domestic biofuel industries and gear-up for transition to other technologies and feedstocks when they become available.

Policies prioritizing food security make it unlikely that large amounts of future corn supplies will be used for biofuel in most other countries. But producing countries with capacity to increase production may do so to fill the market niche that is expanding as USA and Canada allocate more corn to biofuel.

**Table 1:** The indicators that were selected to determine the sustainability of biofuel through legislative process and federal programs

Indicator	Brazil	USA	Canada
Support local production through mandate			
Support Cellulosic fuel through the mandate			
Support small farmers			
Protection of forests from agricultural use			
Protection of land rights of indigenous people			
Mandates linked to emissions reduction			
Environmental assessment of biofuel plants			
Research in indigenous cellulosic feedstock			
Consultation with local populations			

Western provinces in Canada currently use wheat as feedstock for ethanol. It accounted for about 20% of the national bio-ethanol production in 2006. Several new plants are planned or under construction and a study estimates that 2.5 MMt of wheat could be dedicated to ethanol in Canada by 2012. Ethanol plants allow producers to market lower quality, "downgraded" feed wheat. Given ambitious fuel-blending targets, the use of wheat for biofuel is expected to be allocated to meet domestic ethanol demand in Canada which might have disruptive effect on availability of wheat as a food source. Most Canadian programs to support alternate feedstock biofuels are currently over or at the end of their timeline. There is a need to make further investments in the market if the government wants to seriously evaluate biofuels as a future source of energy.

Since Canada is a large net exporter of energy it does not need a biofuel industry to help ensure energy security. Thus, the arguments for supporting development of a biofuel industry must rely mainly on reducing GHG and certain air pollutants, and increasing agricultural incomes and rural development. Thus one of the biggest incentives for Canada to develop biofuel industry and legislations governing would be rural development; establishment of a major biofuel industry in the rural areas of Canada certainly would provide some additional jobs in the rural areas. In Brazil, for example, it has been estimated that 700,000 jobs have been created in rural areas to support the additional sugar cane and ethanol industry.

#### RECOMMENDATIONS

The increased competition over agricultural crops

for bioenergy purposes instead of food production has been highlighted as a concern for food security. Competition over the use of land and water resources for bioenergy production and for agricultural purposes increases pressures on these resources at a time when global water reserves are dwindling and potentially greater effects are feared on indigenous and local communities and small-holder farmers. All countries that have or are planning to develop a biofuel industry need to pay attention to the following issues while forming biofuel legislation and regulations: (a) Food Security (b) Environmental Impact (c) Land use (d) Biodiversity protection (e) Socio Economic development

Some ways to address the above mentioned points are: (a) Ensuring development of small farm owners. This is especially important for agrarian economies to ensure that there is equitable socio economic development of rural population. (b) Proper land use legislation to protect forest lands, sensitive areas etc (c) Mandatory environmental assessment of biofuel production facilities. (d) Ensuring that the local population has a say in the matter especially when a large scale agricultural operation or production facility is being planned.

We did see a lot of different legislation covering different aspects of the environment, social and economic development related to biofuels. Even though a lot of laws have been formulated, many face compliance challenges. Thus compliance has to be improved.

Also an important observation while reviewing literature for the paper was the lack of economic



studies of biofuel policy and legislation. Economic data would be a very good decision making tool for framing future biofuel legislation.

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