

CHAPTER 2

BIOFUELS IN THE WORLD AND THE LATIN AMERICA (LAC) REGION

The aim of this section is to provide a comparison of the future Colombian case with its immediate neighbors within the LAC region, but also with some global examples. In summary here will be reviewed biofuels production, and use management regarding policies impacts on the environment, socioeconomic impacts, and finally food security. By doing this the reader will be able to understand the main drivers behind each particular scenario and the degree of development of such goals under those achievements reported in the literature.

2.1 POLICIES AND REGULATION FOR BIOFUELS IMPLEMENTATION AT A GLOBAL LEVEL

The Biofuel industry owes its current development and diffusion to the existence of several ambitious policies that have been government-oriented, rather than market-oriented. In most countries around the world it is evident that some kind of political support to bioenergy projects, and in consequence some economic mechanisms, emerge to underpin those initiatives. Among the main features, either qualitative or quantitative, is the presence of a combination of mandates, direct subsidies, tax exemptions, and technical specifications around biomass production, biofuel processing, bioenergy final use and international trade.

In the same way that biofuel manufacturing processes and markets have gained more ground and have become more mature, the related supporting policies have evolved along with these changes. Initially, most of the policies were basically directed to the creation of subsidies. However, nowadays the policy agenda needs to go beyond fiscal tools, and demand a more interactive and effective international market scope. Therefore, it requires a policy more focused in not only supporting domestic production, but also penetrating foreign markets. This variation of strategy obeys the high costs that are implied in a continuous subsidy program, that it is paid mostly from general public funds. In the case of mandates, most of the financial burden rests on the end user.

As these kinds of bioenergy products provide an alternative to regular fossil fuels, any attempt to define to what extent these policies are sound (from an economic perspective) depend on the current and future oil price. The lower the oil price, the higher is the cost of an economic measure in favor of bioenergy.

Additionally, some of these policy proposals have turned out to be too ambitious, so they have required revision and adjustment from the initial schemes. The majority of policies also depend on the political climate that is in place. For instance, part of the financial aid

that was directed to bioenergy initiatives had to be directed to other ends, given the crisis faced by some members of the EU which count on a profoundly reduced fiscal budget.

Nevertheless, there are a big number of both industrialized and developing nations that have implemented or are implementing different sorts of policy tools that aim to boost biofuel market development. The regulations of some countries in the EU or USA have been under revision and have undergone some modifications. For instance, the USA biofuel policy reduced the initial target of producing 100 million gallons of cellulosic ethanol, to only 6.5 million (Gibson, 2010). Amendments of this nature emerge because there is not enough domestic capacity to reach such goals under first generation technologies, and there have been several setbacks in the availability of second generation technologies, in regard to what was initially projected (Hebebrand & Laney, 2007). The discussion on targets has been permeated by the debate on the impact of biofuel production on food prices, thus a mere strategy promoting economic efficiency is not enough, and responsible criteria need to be considered. As consequence, more sustainable production is now on the current national bioenergy plans.

2.1.1 Main regulations

United States of America

The American policy framework has a long history, and different nuances, around two strategic targets: energy security and rural development. As a consequence of the oil crisis that took place in the 1970's there was an initiative to support production and use of alcohol fuel for transportation purposes. Under this scenario it was provided a 100% tax exemption on oil retailed price, which reached 1.05 cents per liter.

During the 1980's another crisis hit the USA, however, this time it was related to the agricultural sector, particularly with the corn agribusiness sector, so ethanol production was an opportunity to bring back the sector to its former prosperity. Thereafter, ethanol gained more ground due to the prohibition of lead in regular gasoline, and given favorable octane rating of alcohol. In addition, some amendments of the Clean Air Act in 1990 established a program of oxygenated fuel, where any oil product for transportation with high contents of carbon monoxide must have at least 7% of oxygen. After some other regulations, finally in the early 1990's extensive use of biofuel reached its consolidation (Dufey, 2006).

Later, came the Biomass Research and Development Act of 2000, which provided a framework to "facilitate consultations and partnerships among Federal and State

agencies, agricultural producers, industry, consumers, the research community, and other interested groups to carry out program activities relating to the Initiative” (U.S. Congress, 2006).

After this, the 2002 Farm Bill was a governmental attempt to strengthen the agricultural economy over the long term, and design a specific chapter to nurture all these biobased projects. Thus, some funding plans were created to sponsor construction of biorefineries, biomass research, biodiesel education programs. Such plans illustrate the linkage of bioenergy projects in the context of renewable energy grants (House of Representatives, 2002).

Under the American Jobs Creation Act formulated in 2004, the Volumetric Ethanol Excise Tax Credit (VEETC) was created. With this tool ethanol production was subsidized and it was worth US\$6 billion a year. This policy was highly controversial, because it became a trade barrier with other international and more competitive alcohol sources, and it was felt to be expensive by several taxpayers. It finally, after several modifications, came to an end in 2011 (Lyutse, 2011). Additionally, the USA currently has a surtax of 14.27 cents per liter on bioethanol imports over the regular ad valorem tax of 2.5% (Tyner, 2008).

Biodiesel production was favored with the VEETC policy as well. Those biodiesel manufacturers that use energy crops as feedstock (e.g. soybean) are candidates to receive a subsidy of 26.42 cents per liter, whereas those that produce biodiesel from oil waste can be granted some credits of up to 13.21 cents per liter.

The Energy Policy Act of 2005 takes a general overview about energy production, distribution and use, and the policy breaks down according to the variety of energy sources and carriers. There is a special section on renewables and for all bioenergy. Section 942 of that document also put on the table ambitious targets —on one hand to redirect renewable energy research funds to bioenergy applications, and on the other, to boost biobased product commercialization, particularly those of second generation technologies. For instance, the document mentions the production of one billion gallons of cellulosic ethanol per annum by the year 2015. Another important goal is to guarantee that by the year 2015 biofuels are cost competitive with regular fossil fuels, i.e. gasoline and diesel. Finally, there is a social goal that was not evident in former policies— It is important to “ensure that small feedstock producers and rural small businesses are full participants in the development of the cellulosic biofuels industry” (U.S. Congress., 2005). From that Energy Policy Act emerged the Renewable Fuel

Standard (RFS) and its subsequent amendments. Within it is established that every fossil fuel produced in the USA must have a minimum content of renewable fuels. It is also the milestone for the American energy security strategy in terms of biomass use for energy production. Environmental concerns for the future are also tackled in this regulation, by mandating that the volume of renewable fuel required to be blended into transportation fuel will be increased from 9 billion gallons in 2008 to 36 billion gallons by 2022 (EPA, 2010).

The direct implication of these biofuel implementations on the environment would represent a substantial mitigation of the GHG's, tested under LCAs: 20% for corn-based ethanol, 50% for advanced biofuels, except for cellulosic ethanol that will comply with a rigorous reduction of 60% of GHG's (FAO, 2008).

From this regulation structure it is evident the strong role that cellulosic biofuels play in the American energy agenda, focusing research efforts into enhancing yields and promoting the use of biorefineries.

Nevertheless, this experience has overestimated the capacity of research on the cellulosic front. Based on the setbacks regarding the availability of this kind of fuel, the USA government decided to reduce the cellulosic ethanol production target from 100 million gallons to 6.5 million of equivalent bioethanol (Gibson, 2010).

European Union

The EU was experiencing a decline in the agricultural sector during the 1980's and the rural livelihood was starting to have a crisis. At the same time the energy needs of Europe were soaring, thus, these conditions together were the main drivers to promote biofuels production in the EU, particularly biodiesel.

Notwithstanding, it was only in the late 1990's when the biodiesel market was fully developed. Similar to the American case, in Europe the policies were formed by a combination of mandates, subsidies and trade barriers. Biofuel regulation in Europe has evolved as a result of changing targets, technologies and market opportunities, hence the set of norms, laws and standards have been moving along with the current and potential circumstances that bioenergy has faced until now, and the possible scenarios that they would have to deal with (Johnson & Roman, 2008).

Among all the regulations within the EU there are three pillars that define the great extent the European Bioenergy guidelines. The first one is Directive 2003/30/EC

about the promotion of the use of biofuels or other renewable fuels for transport. In the first place, this directive recognizes the potential of biomass material for bioenergy purposes, using agricultural and forestry products, and residues and waste from forestry and agrifoodstuffs industries. It also calls attention to the share (30%) that transportation takes from the final energy consumption total, and biofuels implication in the reduction of carbon dioxide emissions and energy security enhancement. The directive reminds us of the initial purpose set on the Green Paper “Towards a European strategy for energy security” where it is established that by the year 2020 20% of the conventional fuels used in road transport should be substituted by alternative fuels, but competitiveness and availability need to be guaranteed. Finally it sets a reference goal of using a blend of at least 2%³⁷ of biofuels with conventional fuels for all the members of the EU. This target was due on 2005. Later on the target was raised to 5.75% and it was supposed to be reached by 2010 (EC, 2003d).

The second milestone in the bioenergy biofuel policy is Directive 2003/96/EC, which stresses the field of taxation of energy products and electricity. The document recognizes the importance of taxes in the conformation of energy prices, and the impact of the latter in transport and environmental policies. The directive acknowledges that although taxation is necessary, it is an important support to alternative energy sources and for that reason it is recommended to implement discretionary tax exemptions or reductions per country for renewable forms of energy (EC, 2003b). Under this directive specific actions were established by France, Italy and the United Kingdom. The French government asked for permission to apply reductions in excise duties from 2003 to 2009: these reductions “shall not exceed EUR 35.06/hl or EUR 396.64/t for vegetable oil esters, and EUR 50.23/hl or EUR 297.35/t for ethyl alcohol derivatives used in the mixtures”. However, these reductions can be revised at any time to avoid extreme market distortions.

In a similar way, Italy decided to apply for differentiated rates of the excise duty on mixtures used as motor fuels containing 5% or 25% of biodiesel until 30 June 2004. Like the French case, Italy left the door open about a possible revision and adjustments.

The British case, just like the Italian one, is aimed at the biodiesel industry. The UK applied for differentiated rates of excise duty for road fuel containing biodiesel and biodiesel used as pure road fuel, until 31 March 2007. Finally, the third pillar on the bioenergy policy is represented in Directive 2003/17/EC, which refers to the quality of petrol and diesel fuels. The document establishes a limit of at least 5% bioethanol content in regular gasoline due to environmental reasons, however that measure is being reviewed to be raised to 10% (EC, 2003c).

Those directives became the backbone of European bioenergy policy, but they were reinforced by a set of other instruments as explained below. Biofuels were supported by the Common Agricultural Policy (CAP) from the European Union. This plan, formulated in 2003, is an incentive to those that possess energy dedicated crops. Under the CAP appears a figure of “carbon credit”, which pays EU\$45/ha to those that use crops for energy purposes and have a land extension no greater than 1.5 million hectares. This credit is available to any kind of agricultural crop, except for sugarbeet and hemp, if, and only if, they are employed in approved energy uses and are under a production contract that benefits such a purpose. Any new energy crop harvested in former agricultural production land is not eligible for carbon credit. (EC, 2003a) Another form of support received by the bioenergy industry was the Renewable Energies Directive (RED), which was approved in 2008. This directive establishes an ambitious target, where by it mandates by the year 2020 the general energy consumption of the EU, is to be supplied by renewable energy sources, and in addition the share of this kind of energy for road transport purposes should be at least 10% (in the mixes of both gasoline and diesel) (Johnson, 2011). Later on, in 2009, such target had to be modified because of environmental concerns and questions on food security issues, if first generation technologies were to be implemented to great extent. Thus, Directive 2009/28/EC established that the initial goals were to be implemented but under two special conditions:

1. biofuels were to be produced following sustainable standards,
2. second generation biofuels has to be commercially available.

This directive started to work as a sustainable filter, because some minimal criteria were established to those biofuels produced either domestically or imported. Specifically, it was demanded that biofuels must guarantee a reduction of GHG's emissions of 35% and energy crops cannot be located in forestlands or wetlands (EC, 2009).

The entire European policy framework institutes a reference target for the region; however, every member has the discretion to choose the corresponding strategy to achieve it. In some cases, national targets go beyond these general goals, as occurs in Germany. Nevertheless, the reality of the market is a boundary that holds back these ambitious targets in terms of economic feasibility or sustainability soundness, and that is the reason why sometimes plans need to be restructured as was shown before.

2.1.2 Trends in biofuel policies and regulation in Latin American and Caribbean countries

Except for the Brazilian case, and other isolated cases including to a minor extent the countries that belong to the Caribbean Basin Initiative (CBI), the modern bioenergy, and in particular, biofuel development has been relatively recent among LAC countries. As a matter of fact, based on the successful Brazilian experience and the continuous upsurge of oil prices (predominantly the alarming escalation exhibited between 2004 and 2008 where the crude oil price more than tripled from a price of US\$34/barrel to more than US\$133/barrel) the LAC region started to rapidly and aggressively develop a biofuel industry with the aim of tackling energy security issues, reduce fuel import as a fiscal strategy, and agricultural promotion.

All these efforts have been shaped as indicative or mandatory targets, using cases just like the former American and European examples, i.e. introductory mixtures of regular fossil fuels with biofuels, along with other sorts of incentives. Nonetheless, it is quite important to understand that there is no such thing as a regional policy on this topic. Every country has designed its own strategy and tool set in approach to this energy option.

The next section has an overview of the LAC region policy framework, with the exception of the Colombian case, which was explained in chapter I and it will be reviewed in the following chapters.

Argentina

The biofuel sector started to be promoted in 2006, with the production and use of alcohol fuel, biodiesel and biogas. The strategic bioenergy product in the Argentinian case is biodiesel (Mathews & Goldsztein, 2008; Dominik Rutz et al., 2008). The Biofuel sector is framed under the Law 26.093 of 2006. This Law has been entitled “Régimen de Regulación y Promoción para la Producción y Uso Sustentables de Biocombustibles” (Law of regulation and promotion for sustainable biofuel production and use) and it establishes a 15 year plan to regulate and promote the biofuels industry, including the description of taxation benefits. Within this law was created the National Advisor Biofuel Commission and it was comprised of several representatives from rural sectors, technology and innovation developers, small and medium enterprises delegates, sustainability experts and envois from the treasury department at a national level. The commission is an open to local authorities as well, so Federal Councils can take part in the project management and auditory process (Argentinian Congress, 2006).

The Commission, under this law, is in charge of informing, monitoring, auditing, selecting, directing funds, and providing general planning to bioenergy projects. The commission must safeguard the appropriate allocation of resources and subsidies granted under this regulation, otherwise penalties may apply. Later, in 2007 Law 26.093 was complemented by the Decree 109 of 2007 (Comisión nacional asesora 2007) where the role of both the Commission and the Regulation Authority is detailed, and the proposed blends to be commercialized are specified. Specifically, biodiesel is designed to be mixed at 5% with regular diesel fuel (95%), also known as B5. However, pure biodiesel (BI100) can be commercialized as well. Something similar was established for the alcohol fuel market, where the ethanol can be distributed pure (EI100) or blended at 5% (E5) (Mathews & Goldsztein, 2008).

It was designated that all biofuel production, mixing and distribution projects must be registered for the approval of the Regulation Authority, even those that are designed to cover self-consumption. The authority also decides which projects are eligible for tax (VAT) deduction in capital investment; or for a differential payment on the tax over income.

The fundamental aspect of that law was the mandatory requirement of the blending levels (B5 and E5), established to be fulfilled by the year 2010. This decree created an estimated demand of 220 million gallons of biodiesel and 70 million gallons of ethanol. It also created a package of incentives for domestic producers in order to cover national demand; however the majority of the production is currently going overseas (D Rutz et al., 2009).

Bolivia

The Bolivian position has been cautious in terms of large scale biofuel project implementation, due to the precarious food situation that faces that nation, and the potential impact that bioenergy plans might have on food prices.

The Bolivian bioenergy policy framework is given by three pillars built in 2005: Law 3152 “Fuentes de generación de energías alternativas en el departamento de Pando” (Renewable Energy sources in Pando Department) (Bolivian National Congress, 2005), Law 3207 “Estimulos a los productores de Biodiesel” (Biodiesel incentives to biofuel producers) (Ajila & Chilingua, 2007), Law 3279 “Fuentes de generación de energías alternativas en el departamento del Beni” (Congreso Nacional de Bolivia, 2005). The first and third law pointed out the necessity of implementing alternative sources of energy in Pando and Beni which are two departments located in the northern region of

Bolivia, on the border with Brazil. These two regions together cover more than a quarter of Bolivian territory. Within these laws is set the target of achieving a blending level of BIO in a time span no longer than 10 years. Another benefits included in these laws are the total exemption of taxes (specific and direct) on payment that is charged to regular hydrocarbons and a discount of 50% of any other kind of ongoing taxation. Despite these incentives the Bolivian biofuel industry has not yet awoken.

Brazil

Sugar-cane became the first large-scale plantation at the beginning of the 16th century, soon after the plant was brought from the island of Madeira by a Portuguese expedition. This crop was as equally important as other colonial crops, such as coffee and rubber. After the colonial period, slaves provided the manual labor required by the industry, then European immigrants. After 1883 they had secured a cheap labor force for the sugarcane industry and had established it as one of the most prominent industries in the country, up to and including today.

Back in 1933, the Sugar and Alcohol Institute was founded and the first ethanol blend trial in petrol engines took place. Further efforts were made in order to enlarge the scope of the ongoing project, but it was not until 1973, during the oil crisis, when the Brazilian military government decided to fully support exclusive bioethanol development, launched 2 years after the National Alcohol Program, PROÁLCOOL (Coelho, 2005).

Under this program special engines were designed to run purely on hydrous ethanol and some voluntary blends of anhydrous ethanol were proposed. This not only boosted the demand, but also supply was greatly assisted by an economic package that included taxes and investments favoring the industry; allowing new construction and the enlargement of distilleries, at the same time that sugarcane farming underwent an important expansion. By the early 1990's direct subsidies for bioethanol were eliminated, but an elevated gasoline taxation combined with a wide supply of ethanol-based cars, created a strong incentive to consolidate the market (Coelho, 2005; José Goldemberg, Coelho, & Guardabassi, 2008). However, at the end of the decade two simultaneous events undermined the consumers' confidence: ethanol suppliers, due to a drought, struggled to provide enough fuel, and cheap oil prices put pressure on the program performance.

Under those circumstances the government decided, in 2001 to set up mandatory blends with petrol, adding between 20% and 24% of anhydrous ethanol to all gasoline. More recently, in 2003, Flex-fuel technology was developed specifically for local

conditions, allowing any combination of hydrated ethanol (E100) with a blend of gasoline with 20 to 25% anhydrous ethanol (Edward Smeets, Junginger, Faaij, Walter, & Dolzan, 2006). This has been gaining popularity among Brazilians and only small problems have manifested when pure gasoline is used, but this situation only occurs during trips to other South American countries.

Regarding biodiesel, there is a program that tried to replicate the ethanol experience, called PROBIODIESEL, which started in 2004. One year later a law was issued that mandated the use of B2 from 2007, with increasing targets of B5 and B20 by 2013 and 2020 correspondingly. There are also tax exemption schemes that cater to the small producers of feedstock (Garcez & Vianna, 2009).

There is also an incursion in 2GBf research, in some plants of PETROBRAS, with the intention of producing cellulosic ethanol from sugarcane; however, a commercial scale for this initiative is not yet available. Nowadays, bioenergy projects are mostly managed and regulated by the Agroenergy Policy Guidelines issued by the federal government.

Chile

Chile has been characterized by being a net importer of energy, due to the scarce oilfields in its territory. Neither does it count on substantial agricultural production, mostly due to the soil being arid and hard climate conditions. As a matter of fact, Chile is a net importer of food as well, thus their strategy is based on first generation biofuels, although it is still timidly developed, with the majority of the bioenergy plan resting on a future and stronger bioenergy production, based on second generation initiatives.

The Chilean legal framework mandated mixtures up to 5% of biofuels (alcohol fuel and biodiesel) with regular fossil fuels, to be fulfilled by the year 2010. This suggested level can be identified in “Proyecto de ley sobre fomento de las energías renovables y combustibles líquidos” (Bill on support to renewable energies and liquid fuels) (Senado de Chile, 2007), and the official announcement ‘Number 30’ of the Domestic Taxation Service about Tax application guidelines in the case of biodiesel and bioethanol (CNE, 2007). Within this legislation, biofuels were declared exempt from the charge that is normally applied to any other form of fossil fuel.

The Biofuel National Directory was created by the Chilean National Energy Commission (CNE). This public body is in charge of easing the communication among different domestic and foreign biofuel stakeholders. The Directory coordinates the

whole value chain in its different stages. All these stages receive networking support by the Directory, which provides information of several training courses (for the two initial stages mainly), but additionally it encourages research formation centers, and connects the stakeholders with domestic (private and public) and international financial institutions to fund partially or totally bioenergy related initiatives (Ministerio de Energía de Chile, 2012). The corresponding technical characteristics of bioenergy products distributed and commercialized within Chilean territory are expressed in the Supreme Decree “Number II” of 2008. This decree also released a study of the “Infrastructure requirements for the biofuel supply within the ongoing liquid fuel distribution network”. The main conclusions drawn out of this study were that for the biodiesel industry, the technical barriers were practically nonexistent; in contrast, the situation for bioethanol distribution was harder, especially because the storage facilities and transport equipment required further adaptation (Arriaza, 2011).

Costa Rica

The Costa Rican government decided to set a bioenergy path where, as in the other LAC cases, the main focus is on ethanol (sugarcane-based) and biodiesel (palm-based). Most general guidelines (decrees 31087, 31818, 33357, 34846, and 35091) were issued to frame different strategies to develop the industry. (Contreras & Rodríguez, 2006; Meneses & Valenciano, 2007) At the beginning of 2008 the main document (Biofuel National program) was published, and it drew an ambitious 4 year plan in terms of goals to be achieved. However, most of them can be classified as voluntary participation, hence it is difficult to assess to what extent they have been fulfilled so far. As an example, the document mentions a complete enhancement of the value chain: the agricultural stage can be improved by a voluntary environmental certification process that allows a continuous enhancement of the natural conditions for agricultural production along with the development of other sources of biomass that can be used as feedstock. the industrial stage has no real strategy, apart from trying to create adequate and stable economic conditions (i.e. no taxation uncertainty and guaranteeing regular flow of equipment and feedstock). for the end use stage, the policy sought to introduce the regular blend levels for biodiesel (between 2% to 5%) and a little more ambitious opening target in the case of alcohol fuels (7.5% ethanol) (MAG-MINAE, 2008).

Ecuador

The Ecuadorian policy framework is currently in an early stage of development. Under this initial framework it has established the National Biofuel Council, which is in charge

of defining policies, plans, programs, and projects regarding biofuel production, handling, industrialization and commercialization. Furthermore, it must establish standards about quality, prices, and production volume of regular fuels and biofuels (Ortega, Cárdenas, Recalde, & Cazco, 2007).

Probably the most important milestone within the Ecuadorian policy regarding bioenergy is Law 2006-57. This law initiates the Fondo Ecuatoriano de Inversión En Los Sectores Energético E Hidrocarburífero (FEISEH) (Ecuadorian Investment Fund for the Energy and Hydrocarbon sectors). Under FEISEH US\$140 million are diverted from domestic oil extraction activities revenues and given to several projects of a strategic nature. One of them is to build an alternative infrastructure for energy distribution in the transport sector, and as part of that plan biomass-based fuels is one option to be considered. The bioenergy sector receives support under this law from several different fronts, including: establishing a trust for funding a microfinance system, and establishing a trust to provide low interest credit to small producers in the agricultural sector. Whatever income that comes from this initiative is free of taxation (Asamblea constituyente de Ecuador, 2007; Congreso de Ecuador, 2006).

The Ecuadorian “Biofuels Program”, created in 2006, sought to reach a mix target of 5% ethanol with regular gasoline. That goal was structured in two stages: The first and introductory stage was a pilot plan to be implemented in Guayaquil city (which, despite the fact it is not the capital city, is the biggest and most populated city), and presented an alcohol demand of 40,000 liters/day.

This plan was to be widened to a national level. By 2005 the domestic ethanol demand, based on the ongoing gasoline consumption (more than 13.5 million barrels/day) would reach nearly 590,000 liters/day in a proposed blend of E10 (M. González, 2006). Similar to the ethanol introduction plan, the biodiesel program was planned to be introduced as a trial run in Quito city, in a blend of B5, which would eventually require 210 barrels/day, and an extension of such a plan to national level would increase that amount approximately sevenfold, i.e. 1456 barrels/day (M. González, 2006).

El Salvador

The Salvadoran Biofuel initiatives started in 2005 with the National Plan of Bioethanol Production, thus recognizing biofuels as a key factor in future energy security, and was the trigger for a series of further studies, such as: the “Financial and Technical Pre-Feasibility Study on Sugarcane-based ethanol production” by the Getulio Vargas Foundation, the

studies carried out by the Organization of American States (OAS) “Technical and Policy Assistance for Ethanol Blending and Logistics in El Salvador”, “Feasibility Study for Distillery Expansions at Existing Sugar Mills in El Salvador” in 2009 (ME-BID, 2008).

In August of the same year the formal biofuel policy (along with a general Energy Policy) for El Salvador, was written, and was guided by the Biofuel Inter-institutional Committee. In February 2011, the Board of Directors of the National Energy Council decided to run an environmental analysis of bioenergy projects and to design the regulation framework, in order to develop the Salvadoran Biofuel industry. (Cerrato, 2011).

In general the Government of El Salvador seeks to reach a blend of E10; hence, in order to reach such a target, it has established tax exemptions to boost alcohol production and use. On the other hand, the biodiesel introduction is still in an exploratory stage and pre-feasibility studies are being carried out.

Guatemala

Most of the skeleton for the Guatemalan biofuel legislation is defined in the Law DL-17-85, and the general rules AG 240-1985. Within the LAC region the Guatemalan legislation regarding the implementation of biofuels is probably the second oldest after Brazil. The legislation sets a mandatory goal of at least 5% ethanol blended with regular gasoline. (Lorenzo de Juárez, 2011). However, to date it has not put it into practice (Mirón, 2010).

In 2010 a brief report entitled “The Ethanol fuel in Guatemala” was presented, where is stated that ethanol production in this Central American country depends mainly on molasses that comes from the sugar processing industry. Despite the existing infrastructure and the processing capacity in Guatemala (nearly 1.4 million liters/day), most of the ethanol is exported as traditional alcohol or alcohol fuel and just a small percentage is employed domestically in spirits manufacture, so there is no ethanol remaining for domestic consumption as fuel. Previous political and economic conditions have not favored the bioenergy industry in Guatemala, but the last 3 governments have tried to reactivate law DL-17-85, to build more dynamism around the sector once again. (Mirón, 2010).

Under current government plans they will try to reach a mix of E10, however, the processing capacity is only able to supply ethanol to cover a mix of just 3% of the domestic gasoline consumption. As methyl tertiary butyl ether (MTBE) is being phased

out as a gasoline additive, the opportunity for the sector is becoming more promising (Mirón, 2010).

On the other hand, the Guatemalan biodiesel industry is even less developed than most countries in the LAC region and it cannot count on a legal framework to support or regulate the sector. It is possible to find isolated efforts from the private sector, e.g. Biocombustibles de Guatemala, which is a research firm dedicated to *Jatropha Curcas* production and manufacturing, or Biopersa S.A., which is a firm that treats waste vegetable oil for biodiesel production. The reported biodiesel processing capacity in Guatemala in the Corpoica report is 4000 gallons/day (ACR, 2011; Lorenzo de Juárez, 2011)

Honduras

In 2007 the Honduran government published Law 144 (*Ley para la producción y consumo de Biocombustibles*, Law for the biofuels consumption and use). Several goals were achieved through this law: A special division (Technical Unit for Biofuels) was created to regulate, and promote biofuels production and distribution, and it was also accompanied by a set of regulations that provide financial support in terms of tax exemptions, particularly income related taxation, and taxes on imported materials and equipment required to produce biofuels. These exemptions last 12 years once the biofuel production project starts. In Honduras regular fuels are charged with a tax that is used to fund transport infrastructure, however, the law has established that biofuels will be excluded from such payment for the first 15 years of their introduction (Hernandez, 2008).

The law did not establish a mandatory blend, and depending on the discretion of the Technical Unit for Biofuels this target is still to be formulated. Any biofuel endeavor will need to obtain environmental approval in order to work, i.e. it must comply with the General Law of the Environment of Honduras (Hernandez, 2008).

Mexico

The bioenergy initiatives in Mexico are quite recent, and therefore, so is its legal framework. In February of 2008 the Law of Promotion and Development of Bioenergy products (or Law DOF 01-02-2008) was released, which announced the interest of the Mexican government in developing a biofuels industry under sustainable production. Under this law the Commission of Bioenergy products was created and as part of its duties this entity had to draw the general guidelines for the industry and create

communication mechanisms between public and private parties within the sector. It also had to define a strategy, establishing priorities in terms of public expenditure to strengthen the biofuels industry. (Cámara de Diputados, 2008; SAGARPA, 2008; Secretaría de Energía, 2009). Within this document is set, in a very broad sense, the need to support bioenergy initiatives, taking into account three different key aspects:

1. Sustainable production: there is specific emphasis in supporting small rural feedstock producers and jobs creation throughout bioenergy cropping, harvesting and general handling. In fact, the bioenergy initiatives must guarantee a participation share of at least 30% (for small landowners or co-operative firms) of the total feedstock production, and preservation of natural resources.
2. Infrastructure boosting: The bioenergy initiatives will need financial tools to be competitive, so modernization of the existing equipment, plus acquisition, fabrication and maintenance of machinery and plant will require economic policies that ease resources to support such activities.
3. Technological and Scientific research: Training and technology transfer are the two main pillars to build the Mexican bioenergy knowledge base. This knowledge must permeate from the top of the scientific and biochemical engineers to the bottom of the rural workers. It must include exploration of new materials (algae and forestry) and technologies (like new yeast developments and enzymatic treatments)(D Rutz et al., 2009).

Nevertheless, there are no concrete dispositions in this document that determine or suggest any particular feedstock or blending levels. On the contrary, in a previous study organized by the Mexican Secretary of Energy, published in 2006, it is pointed out that sugarcane ethanol might be a good choice to serve national energy needs in the short run (between 2007-2012) if a blend of 5.7% ethanol with regular gasoline is implemented. In the long run, a mix of E10 could be reached by using sugar, molasses and other feedstocks as maize and sweet sorghum. The investment required to back up such a plan would be close to US\$160 million in the short term and US\$2.25 billion beyond 2012 (Masera, Rodríguez, Lazcano, & Horta, 2006).

For biodiesel, the landscape is bleaker given the low economic competitiveness of current feedstock, in comparison with regular diesel fuel domestic prices. Despite this viewpoint the report dares to suggest that a biodiesel program can be implemented, where, in an initial stage, a mix of B2 can be reached by using waste oils or animal fats, and later on, in

a subsequent stage, it can be produced from other feedstock, such as rapeseed, soybean, jatropha, and sunflower among others (Masera et al., 2006).

Nicaragua

The main boundaries for the policy structure of biofuels in the case of Nicaragua are given by the National Policy of Agrienergy and Biofuels or PNAB (Política Nacional de Agroenergía y Biocombustibles). The PNAB seeks to widen the Nicaraguan energy matrix with a fuel with financial soundness, but also it embraces a sustainable vision of biofuels production through the implementation of social inclusion. It contains incentives for both sides of the market forces - supply and demand. The feedstock producers and biofuel processors benefit from tax exemptions related to imports, added value and property. The fuel purchasers receive a partial exemption of the selective consumption tax (ISC, Impuesto selectivo al consumo) that is charged to regular fuels and they (purchasers) are not charged any import duty on Flex-fuel vehicles. Most of the financial resources to back up this initiative are pooled in the Biofuel Production Promotion Fund and they come from a percentage of the ISC.

Panamá

The Panamanian biofuels regulation was marginally given by Law 8 of 1987 and Law 30 of 2007 that rule any activity related with the production, distribution and use of regular hydrocarbon products. Within these laws was established that the authority in charge of directing and implementing this regulation is the Ministry of Commerce and Industry. This entity initiated a study which stated the imminent need of establishing an alternative to the current fossil fuel consumption (Hoffmann, 2006). However, recently Panama formalized a bioenergy exclusive legal framework and it started with Law 42 of 2011. The law entitled “Law that provides the guidelines for the national biofuels policy and biomass-based power generation within the national territory” set a mandatory mix of E10 to be reached in 2016 in an escalation program, as follows: It will start on April 1st 2013 with a mix of E2, and will be increased annually, reaching E5 in 2014, E7 in 2015 and finally E10 in 2016. The scenario that is shown in the law is quite positive and, in fact, it contemplates the possibility of modifying the suggested mix in order to enlarge it if the technology allows, or possibly where new hydrocarbon products are available for blending with biofuels (Asamblea nacional, 2011; Secretaría de Nacional de Energía, 2012). In Law 42, biodiesel and biogas production and their use are planned for, however, any guidelines, parameters and requirements are still under consideration (Asamblea nacional, 2011).

Paraguay

This South American country counts on one of the biggest infrastructures in the world to supply energy (electricity) to the population, by using hydropower generation (approx. 9000 kWh/capita) (Lovera, 2010). However, according to a study from the Ministry of Agriculture, Paraguay is totally dependent of imports, in order to satisfy its fossil energy needs, hence, the importance of developing an alternative energy source remains at the top on their agenda (Aquino, 2006).

The legal framework in the Paraguayan case is defined by a set of regulations. The most prominent one is Law 2748 of 2005 (Law of Biofuels Promotion). This law highlights the national interest in developing a strong biofuel industry and proposes to use not only fiscal incentives (established in Law 60 of 1990 [Law of investments], and Law 2421 of 2004 [Law of administrative redistribution and fiscal arrangements]), but also any resource that can be raised throughout Clean Development Mechanisms (CDM) (Cámara de Senadores, 2005).

It also states that the Ministry of Industry and Commerce will act as application authority (D Rutz et al., 2009), in co-operation with the Ministry of Agriculture that acts as the auditing and certifying institution for feedstock source and treatment. This law is supported by the decrees 7412 of 2006, 4952 of 2010, and 12240 of 2008, which set out a program that includes all the information that a bioenergy project requires within Paraguayan territory to work legally (Cazal and Cáceres, 2006, such as blending requirements (Cazal & Cáceres, 2006), the promotion of Flex-fuel technologies, and the commitment to provide internationally-trained specialists to support biofuels development (D Rutz et al., 2009).

This legal framework does not specify directly any mix levels, however, in other documents such as resolution 162 of 2009, it is stated that an ideal target would be E24 mixed for 85 and 95 octane gasoline, while 97 octane gasoline and jet fuel do not have mix requirements (D Rutz et al., 2009). The Ministry report argues that, by 2006, in some parts of Paraguay there should be blends between E14 and E16, and there are potential conditions to reach up to E25 in some cases (Aquino, 2006).

Peru

Peru has started to change its energy mix aggressively: in 2002 nearly 70% of its energy needs were covered only by oil use, while four years later that proportion dropped to 53%, and a substantial growth of natural gas and condensates took a big bite of that

share (they climbed from 7% to 20%). But the share of renewables is important as well, and is expected to cover a third of the Peruvian energy needs in the near future, i.e. an expansion of this alternative fuel source by 10% from 2002 (Garrido, 2007).

As part of this expansion is the bioenergy sector. The first legal milestone in the Peruvian biofuels history is Law 28054 of 2003, or “Law of Biofuel Market Promotion”. Within this law, like other LAC countries, are the drivers behind an active bioenergy policy. However, in the case of Peru there is an additional element on the table: Biofuels are not a mere strategy to bring dynamism to rural areas, but they go beyond such ambitions, given that the implementation of energy crops can be used as an appealing option in the drug crops eradication incentive (Congreso de la República, 2003; D Rutz et al., 2009).

Under law 28054 the Biofuels Promotion Program was created, PROBIOCOM, which is in charge of directing an investment fund to support the bioenergy program and to raise awareness of the economic, social, and environmental benefits and achievements in the sector. There is also the creation of a Technical Commission (with the participation of 3 Ministries, and some other private and public stakeholders) that will define a schedule of implementation stages for suggested mix levels of both ethanol and biodiesel.

Later, the Peruvian biofuel policy was framed under the decrees DS 013-2005-EM, and DS 021-2007-EM (Ministerio de Energía y Minas, 2007). The first established that within national territory the commercialized kinds of gasoline will be blended with 7.8% alcohol fuel and will be considered as ecofriendly fuels. The production of ethanol and its respective mix started in 2006 in the north eastern region of the country and then, two years later was extended to the northern and central Peruvian region. Finally in 2010, in accordance with the schedule, all of Peru was permitted bioethanol production and the subsequent commercialization. Within this decree was set out the biodiesel program as well: The proposed mix levels were 2% and 5% biodiesel with the two commercial sorts of diesel found in Peru (Diesel N.1 and Diesel N.2). The production schedule began in 2008 in the northern and central region, and then full coverage was implemented 2 years afterwards (Ministerio de Minas, 2005).

Decree DS 021-2007-EM, in turn discusses the advisability of biodiesel mixes and it was decided that just Diesel N.2 is appropriate for B2, B5, and B20 manufacturing, and animal fats and used cooking oil can be used as feedstock as well. In terms of ethanol mixes the decree establishes a special nomenclature regarding the octane grade, rather than the ethanol mix (which is the same in every case 7.8%), the mix of ethanol and gasoline is named “gasohol”. Thus, four kinds of gasohol have been commercialized: Gasohol 97

plus, Gasohol 95 plus, Gasohol 90 plus, and Gasohol 84 plus. Distribution of regular fossil fuels mixed with ethanol and biodiesel is now mandatory in Peruvian territory. It started in 2010 in a few departments and then the mandate covered the entire nation by mid-2011 (Consejo de Ministros, 2007).

The strived for targets established by the Peruvian government have occasionally had feedstock and bio-product shortages. For instance, “In early 2009, 72000 barrels of biodiesel were imported by PETROPERU to meet the blending mandate. The challenge for Peru will be to import the raw material and refine it within the country instead of importing biodiesel directly” (D Rutz et al., 2009).

Dominican Republic

The strength of the Dominican biofuel production has been achieved mostly through the participation of private initiative, but it was through initial government participation that gave the Dominican Republic one of the earliest starts in the LAC region. In 1949 the Dominican Republic experienced an extreme shortage of gasoline and the government at the time made it mandatory to blend alcohol fuel and gasoline at levels between 15% and 30% under public law 2071 of the same year (DENC-SEIC, 2009). One year after the “Destilería Universal” was built and it was the official distillery in charge of producing, blending and distributing “the national fuel”. This initiative lasted for one year and was subsequently closed.

The Dominican biofuel policy remained untouched until 2000, where the interests for renewable energies returned to the government agenda. Legislation around hydrocarbon product handling and production was proclaimed, along with a new perspective regarding power generation. However, it was not until 2002 with Decrees 557-02 and 732-02 that the biofuel sector entered into the government energy strategies, as electrical power co-generator agent and as fuel alternative (DENC-SEIC, 2009).

Law 57 of 2007 establishes that all biofuel initiatives will have exemption of any kind of taxation during a time period of 10 years, if and only if, biofuels do not exceed a volume beyond 20% in the domestic transport fuel consumption (Cepeda, 2007; Gomez, 2010). Under the last legislation, biofuels will receive financial aid if the project is destined to satisfy self-consumption or if they are designed to favor communal use and are organized by social institutions (communal organizations, producers associations and co-ops). The aid will consist for financial support for the initial investment of up to 75% of the total amount. Depending on the approval of the National Energy Commission, the project

could either have full support from the government or it could have access to the lowest interest rates and payment conditions (Congreso Nacional de la República Dominicana, 2007).

Uruguay

In Uruguay, the most important policy related to biofuels was first introduced in 2002 and it was entitled Law 17567 or “Law of Production of Alternative Fuels, Renewables and Substitutes of Derivatives of Petrol Extracted from Domestic Raw Material from Vegetable or Animal Origin”. The use of “domestic raw material” denotes a very protective national policy around the agricultural sector, by guaranteeing that most of the benefits will be received by domestic suppliers, rather than processors that work with imported feedstock (Senado de Uruguay, 2002).

This regulation was bolstered with the law of biofuels or Law 18195 of 2007, which defines the rules on biofuel promotion, production, commercialization and use. This will be controlled and monitored by ANCAP (Administración Nacional de Combustibles, Alcohol y Portland [Fuel, Alcohol and Cement National Bureau]), (Senado de Uruguay, 2007).

At first, in the case of diesel, an introductory stage was established where diesel fuel could be mixed with biodiesel in order to reach B2 level before the end of 2008, but from the beginning of 2009 it became the minimum mandatory standard and gradually increased up to B5, which in turn was established as the minimum blending level from 2012 (Bittencourt & Reig, 2009).

On the other hand, ethanol fuel has received less attention regarding specifications of mix. The ongoing regulation establishes that any regular gasoline can be blended with alcohol; using a maximum of 5% of alcohol in the mix, and such norms will remain in force until the end of 2014.

The Uruguayan policy framework stresses the importance of keeping separate small productive initiatives from large in the biodiesel sector and it adapts the regulation in that regard. Small initiatives are considered those that produce less than 4000 liters of biodiesel on a daily basis, and use that product for self-consumption or for supplying a small fleet of vehicles (once Government permission is obtained to that end). In that case, there is no need for product registration with ANCAP. A large initiative is any enterprise that does not comply with the aforementioned conditions. While they can use up to 4000 liters/day for self-consumption, any level beyond that must be reported

and managed by ANCAP. The destination of the product can be for domestic use or for eventual export.

In the law there are some incentives regarding the taxation system. Firstly, it is established that any biofuel product must follow the regulation in force for any other regular fossil fuel; nevertheless the national executive power authorities are entitled to promote this industry using any means necessary, including total or partial tax exemptions; although, any suggested exoneration must be built on sound grounds approved by the Congress. This empowerment means that further modifications can be done to current proposals:

- a. for a period of ten years national biodiesel will not be charged with the Domestic Specific Tax (IMESI or Impuesto Específico interno),
- b. for a period of ten years any biodiesel or ethanol producer will be fully exonerated from commerce and industry tax payment,
- c. any biodiesel or ethanol producer will be exonerated from patrimony tax (Bittencourt & Reig, 2009).

Venezuela

Given the abundance of crude resources in this South American country there is no legislation regarding an active support to biomass-based energy initiatives. However, it does not mean that Venezuela remains isolated in bioenergy efforts. Albeit, there is not current production, there is an interest for blending and eventually producing biofuel domestically. Venezuela has set the goal of phasing out the use of MTBE to oxygenate gasoline and the alternative at hand is alcohol fuel. As a result of an alliance with Cuba some ethanol has been brought to Venezuela to run some trials (Ryan, 2006).

2.1.3 International trade protocols

There are several proposals of trade protocols that have been put on the table in order to establish some guidance in terms of production, distribution and use of bioenergy, having in mind sustainability standards. In Christodoulidis' work it has been identified at least three major proposals: (1) Bioenergy Labelling Organization (BLO) and United Nations Agreement on Bioenergy (UNAB), (2) The Biopact, and (3) Bioenergy Policy Options (Christodoulidis, 2011).

The BLO, according to Christodoulidis offers a system based on certification and progressive price premium related to the final quality of the bioenergy product. Such system establishes different levels of compliance on several criteria, a preliminary

bioenergy governance system. As the certification process is broken down in different levels, this allows the entry on different producers under a variety of circumstances. The implementation of such system would require Governments' stimuli by a) applications of covenants between governments and the industry on boosting certified bioenergy use and b) use certification schemes as a mechanism to restrict imports of non-certified bioenergy products c) implementing regulation to include costs and benefits in the final prices of energy. The latter would help to level-up the differences between no-certified and certified energy (Verdonk, Dieperink, & Faaij, 2007).

The authors of the BLO initiative anticipate that such proposal rest on an overreliance on conscious consumer, therefore it is also proposed a an United Nations Agreement on Bioenergy (UNAB), which would help to harmonize the implementation of the system and would guide the process of establishment of national covenants and regulation regarding import and production.

The second proposal is released by Mathews and it comprises a sort of regime where the OECD can act as third party between the North and the South in a bioenergy trade, in such manner that the former can secure continuous supply of bioenergy products and the latter can benefit from a stable and open market for their biofuels. The OECD would guarantee that such production has been undertaken in a sustainable way (Mathews, 2007b, 2009). Mathew's proposal is based in the latecomer advantages that can be developed by those countries in the South (low costs and implementation of technologies developed by those incumbent countries) and the future reliance of advanced countries on alternative transportation fuel (Mathews, 2007a). This pact should be negotiated between the involved parties (those countries within the OECD and some other invitees, which voluntarily take part in the deal), instead of being imposed by the strongest party (i.e. EU or US).

The proposal has some limitations as it is pointed out by Christodoulidis and Mathews himself, regarding the scope that can have the OECD to control its members and some other countries, nevertheless; it is also argued that in accordance to Mathews proposal "OECD countries would agree to generate investments in biofuel facilitation in the South and unlock the financing needed" (Mathews, 2009).

The final option mentioned by Christodoulidis is the one regarding the High-Level conference on world food security and the challenges of climate change and bioenergy held by the FAO in June 2008. Such conference puts on the table a set of 3 concrete policies for an international management of biofuels:

- The first one leads to continue in a current model where each country is responsible for designing and implementing their policies, and to adapt international regulations when they are compatible with domestic regulations. The implications to the public eye might be not as positive as expected given that is not sensed a high level of commitment regarding sustainable development.
- The second one asks for moratoria of some feedstock for biofuels production. The intention behind such proposal is to accelerate the shift to second-generation biofuels. Nevertheless, a prohibition of this sort can create negative incentives to a nascent industry in terms of investment, research and business interest and it would be difficult to enforce a governance of this nature.
- Finally, the third option is the generation of an intergovernmental consensus building which provides an ideal institution around biofuel production within a sustainable framework. Such institution could be shaped into a forum, an annex or a code of conduct and could combine the two options that have been presented formerly.

In this proposal presented by the FAO is given recognition to multi-stakeholders institutions (such as GBEP Global Bioenergy Partnership and Round Table for sustainable Biofuel) that have provided guidance to structure bioenergy policy-design, however it is questioned the scope of these organisms, given their limited numbers regarding memberships, in order to achieve a global authority to regulate international standards.

A parallel suggestion provided by Christodoulidis proposes to use the UNCTAD (United Nations Conference for Trade and Development) as a multilateral organism to propel bioenergy development. It is understood that one of the general principles of UNCTAD is to guide developed countries in helping developing countries to accelerate their economic and social progress, and to make changes in their own economies to reach such purpose. UNCTAD plays an important role in aligning goals regarding world economic state and development and designing of practical solutions to overcome disparities.

The UNCTAD Secretariat eases decision taking processes through research and data collection which is employed in project design and technical assistance, particularly to boost the development of least developed countries. This is carried out within an environment of intergovernmental consensus and autonomy of the institution itself, expecting the avoidance of biased decisions of those parties (or countries) which might exert pressure to their favor by economic.

Particularly in the area of energy it is posed by Christodoulidis that UNCTAD should participate in trade and development issues as well as trade and environment synergies. The consideration on CC is also important but it is well stressed that such efforts have to be done without duplicate ongoing actions undertaken by some other organizations in such regard. UNCTAD should provide support to those countries (particularly developing countries) in pursuing biofuels expansion in order to encourage social, technological, agricultural, trade development and the associated gains that can come with these initiatives. At the same time UNCTAD must minimize adverse effects that might emerge in the social and environmental fronts.

The main strength of UNCTAD as regulatory organism, in comparison to other institutions, is its research work and objective position. As UNCTAD has exhibited its leadership in trade and development topics, based on analytic grounds, it is a sound candidate to lead, guide and regulate international biofuels trade, in words of Christodoulidis.

Despite the fact that UNCTAD has not conducted a direct effort on producing any publication regarding sustainable energy production, commercialization and use; it is a fact that such institution can provide its vast experience and knowledge in trade and development (among a broad spectrum of topics). Based on the above, and the conjunction of the intergovernmental character, the large number of members and the by-consensus decision making framework, become this organization in a perfect candidate to guide a process where biofuels trade can be encouraged within a path of sustainable standards, but having respect for other organisms' sovereignty.

2.1.4 Conclusions

There is a clear intention within the LAC countries to actively develop a bioenergy legal framework that can be used to support the biofuel industry and in doing that achieving several strategic goals. In most cases, and following the global trend, what is sought through these policies is to enhance energy security and local development (as a consequence of rural job creation and investment in the sector). There is also an environmental purpose in some cases, where a reduction in pollution can be achieved with protection of nature. Countries like Brazil and Colombia have advantages in terms of commodities exports, and that situation can be encouraged with a mature biofuel sector. Finally, in some particular cases like the Colombian, Peruvian and Bolivian biofuels can be used as a viable alternative to illegal crops.

Table 2.I. Biofuels domestic policies for USA, EU and LAC region

Country	Fuel (Produced, used or to be used)	Subsidies	Tax Exemptions	Identified planned targets or mandates Timeframe given when possible
USA	EtOH and Biodiesel	X		Blending 36 billion gallons by 2022 in transport fuels
EU	EtOH and Biodiesel	X	X	Blends of at least 5.75% to be reached by 2010.
Argentina	EtOH Biogas and Biodiesel		X	E5 and B5 by 2010
Bolivia	EtOH and Biodiesel		X	Legal framework but no fuels
Brazil	EtOH and Biodiesel	X	X	E20 up to E100. B20 by 2020
Chile	EtOH and Biodiesel		X	E5 and B5 by 2010
Colombia	EtOH and Biodiesel	X	X	E10 and B5 by 2010
Costa Rica	EtOH and Biodiesel			Voluntary blends B2-B5
Ecuador	EtOH and Biodiesel	X		E10 by 2010. B5 in Quito
El Salvador	EtOH		X	Exploratory stage
Guatemala	EtOH and Biodiesel			E10 (Actual E3)
Honduras	EtOH		X	Under construction
Mexico	EtOH and Biodiesel			E10 and B2 (not implemented)
Nicaragua	EtOH and Biodiesel	X	X	NA
Panamá	EtOH Biogas and Biodiesel			E10 in 2016
Paraguay	EtOH and Biodiesel			Ideal target E24 mixed for 85 and 95 octane gasoline
Peru	EtOH and Biodiesel			E7.8 declared ecofriendly. B2 and B5
Dominican Republic	EtOH and Biodiesel	X	X	Biofuels a electrical co-generators
Uruguay	EtOH and Biodiesel		X	At least B5 by 2012. Maximum E5 by 2014.
Venezuela	EtOH			NA

All these legal initiatives are quite recent within the region and they are under a development and fine-tuning stage. Just a few cases (Brazil, Colombia and Argentina) among the LAC countries have the capability of cover their domestic needs and eventually export, by using domestic production only. In cases like the Argentinian biodiesel, this situation emerges as a consequence of the evident advantage in soybean production that already exists in this country, rather than from a deliberate effort that materialized through legislative means¹.

If a comparison is made across the policies it is possible to identify key elements within these legal frameworks:

- there are mandates with a fixed or increasing penetration target,
- there are financial aids from the governments (tax exemptions and tributary incentives) and private sector (low interests credits and incentives to buy FFV's).

¹An important table similar to the one presente here, but with a different geographical coverage can be seen in (A. Faaij, 2007).

However some timid behavior can be found as well: The Chilean proposal maintained a voluntary introductory mix level, and it was not until 2010 that it became mandatory. Nonetheless, the main policy is aiming to promote second generation biofuels, given its agricultural restrictions. Bolivia has been cautious as well, given some concerns around food security and food prices. Venezuela is probably the country in the LAC region that has acted with the least enthusiasm towards bioenergy production (understandable given its vast oil reserves). Biofuels are considered just as an eco-friendly alternative and can be used to reduce the environmental impact of traditional energy carriers.

Government policies towards a bioenergy sector as a whole, but to biofuels in particular, have had a great impact in the industry's development. The global dynamics of the sector are not explained by market forces, but by the political leverage that has been received so far. The experience of the major producer countries indicates how significant those policies are, and based on that, it is possible to foresee the key role they still have to play in this industrial progress. Currently, with exception of the Brazil, where the bioethanol production is competitive (without subsidies) in comparison with gasoline, the feasibility of the industry as a whole is inextricably linked to the existence of a legal framework. In general sense, these regulations share the same structure:

- an expression of interest in bioenergy as one of the appealing alternative energies, with all the drivers behind the initiative,
- a decision about the blending level and the nature of the mandate associated with it,
- and finally, the explanation about the tools to be used by the government and the explanation on how to have access to those benefits.

The quick pace that has faced the biofuel industry is reflected in the spread of the legal tools designed to promote it. In some cases, this rush resulted from undesirable outcomes: as a matter of illustration, for the USA and EU alike the proposed targets mentioned in the ongoing legislation have turned out to be far too ambitious, and overwhelm current domestic industrial capacities. In some other cases, initial mandates can be modified when the proposed target represent a threat to food security, or when the law does not have enough credibility among the population. An example of the first case is the Peruvian one, which despite having active and open support to the biofuel industry they experienced shortages of feedstock, hence, the need of importing biodiesel in order to fulfill the B2 mandate. In some cases, like in Argentina, it is possible to have a contradiction between the policy target and the goal achieved: the law promotes local production through small farmers' participation in order to satisfy the domestic demand, however, by 2010 all of

the production was exported, because the remuneration was better in foreign markets and the policies were not put into practice with enough thoroughness (D Rutz et al., 2009).

It is fundamental to align targets and policies in order to have a buoyant industry. Pakistani and Indian cases are the counter-examples of this, due to taxes that have been applied to alcohol sales, resulted in creating a huge disincentive to the ethanol sector (Gonsalves, 2006; Khan, Khan, & Yusuf, 2007). Another mismatch that has been referenced is when the authority that rules any bioenergy program has clashing targets and the implementation of the regulation becomes weak or poorly handled. For example, when the Ministry of Hydrocarbon products is trying to raise oil sales but at the same time is required to show good progress on the biofuel front.

Fiscal policies are under constant scrutiny because they are considered expensive by some authors (Jatzke, 1994; Saikkonen, Lankoski, & Ollikainen, 2012; Singh, 2006). Thus, the decision on whether or not to support a bioenergy project through public funds, or by applying tax exemptions, heats up the debates around cost-efficiency. During most of the PROALCOOL program Brazil maintained a tax discount on bioethanol production. Between 1975 and 1987, the Brazilian alcohol program cost US\$9000 million; however, it paid off in import savings of approx. US\$14000 million (Worldwatch Institute, 2006). But the financial feasibility of biofuel projects hinges on the international prices of crude oil. In fact, for the Brazilian case, the low price experienced during the late 1980's, in addition to an expensive sugar price, led the industry to a critical point where the program was practically cancelled.

There are several components to assess cost associated with biofuel policies. One of them is the opportunity cost of implementing such regulations. Although, countries can avoid the cost of importing fossil fuel, it is also true that the taxes behind oil import quotas are not noticed. In Brazil, the cost of this was calculated and included for the State of Sao Paulo, and the amount went up to US\$600 million during 2005. In the UK, according to Dufey, the income that the government did not receive would be around \$90 million (nearly 160 USD) if a penetration scheme were to be implemented with a blending mix of 1% (Dufey, 2006).

Moreover, in those countries where agricultural commodities are exported, like in most LAC countries, a diversion of feedstock to supply the biofuels domestic market could represent a substantial diminishment in the income from exports.