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Guatemala

Biofuels Annual

View on Ethanol and Potential Biodiesel

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Report Highlights:
Guatemala has no law in place to promote biofuels development for domestic consumption. In 2009, Guatemala produced 250 million liters of alcohol from sugarcane byproducts, for which 95 million corresponded to dehydrated ethanol. Ethanol as a biofuel, is mainly exported to Europe. The long term potential for biodiesel is close to 135 million liters. Its main feedstock, in the short term, could be palm oil. The Ministry of Energy and Mines is still analyzing two proposed laws which favor a gradual approach for mixes and consumption with a long-term vision to eliminate Guatemala's dependence on fuels derived from petroleum. An addition of 10 percent alcohol to gasoline for domestic consumption could reduce the import bill for petroleum by US$65 million and would generate employment opportunities.

Post:
Guatemala City

Executive Summary:

Guatemala is the strongest potential biofuels producer in Central America given the high yields of sugarcane and palm oil, and efficient local industries. Guatemala is the number one producer of sugarcane in the region. During marketing year (MY) 2009, Guatemala produced 2.4 million metric tons (MT) of raw sugar, of which 1.7 million MT were exported, due to a combined milling capacity of 130,000 MT per day for the fourteen sugar mills. At present, five out of the fourteen sugar mills are also producing ethanol, whose production reached 250 million liters in calendar year (CY) 2009. On average, Guatemala is producing close to 150,000 liters of dehydrated ethanol on a daily basis. Nearly all of the ethanol is exported to Europe. The domestic market for biofuels consumption has not been yet developed. The Guatemalan sugar industry could easily supply the ethanol required for a 10% ethanol-gas mix for domestic consumption, and has the potential to supply ethanol for the whole Central American region with such a mix. However, there are several obstacles that Guatemala must overcome in order to implement a viable biofuels policy and the various involved sectors need to reach consensus.

Guatemala is already producing biodiesel from Jatropha curcas and recycled vegetables. Combined processing capacity for for these minor operations is estimated at 15,000 liters per day. Jatropha utilization looks promising to the different sectors (academic, public, and both private profit and non-profit organizations). Official assessments in Guatemala have determined a potential area of 600,000 hectares of marginal or semi-marginal land that could be devoted for Jatropha production. Guatemala could also process biodiesel from palm oil, since Guatemala is second producer in the region (after Honduras), with 135 million liters of crude oil produced in CY 2009, which was exclusively exported for the food processing industry. The challenge for supplying the local market with biodiesel is greater than for ethanol, given the incipient status of feedstock production for such purposes. Guatemala needs to produce close to 100 million liters per year to supply the local market with a 10% mix of diesel/biodiesel.

Guatemala´s inclusion in the U.S.-Brazil Biofuels Initiative, plus Inter-American Bank (IDB) funding for Guatemala to promote the development of renewable sources of energy, might encourage adoption of an effective biofuels policy and regulation. Developing the domestic market for biofuels consumption could turn out to be a key opportunity for economic development in Guatemala, providing new opportunities for the rural areas, and it would also benefit the rural and urban environment.

Policy and Programs:

Policy

Guatemala has stated that it is interested in supporting renewable energy. The Ministry of Energy and Mines (MEM), in conjunction with the National Institute for Electrification (INDE), and the Association of Renewable Energy Generators, launched a public-awareness campaign to promote the use of renewable energy. The campaign, entitled "A Light In Our Future," is designed to make Guatemalans aware of the benefits and importance of renewable energies, including solar, wind, geothermal, ethanol, and hydroelectricity. The priorities of MEM are to: ensure energy security, decrease greenhouse damaging emissions, and foster rural economic development and affordable energy availability.

In 1985, due to an increase in petroleum prices and the crisis generated by low international prices for sugar, Decree Law 17-85 was published (known as Law of the Carburant Alcohol) which sought to set gasoline mixes at percentages lower than 20 percent for anhydrous ethyl alcohol, guaranteeing a local market with defined prices and fixed quotas. MEM had the responsibility of controlling production, distribution, mix, purity and quality of the alcohol. This law established

that alcohol producers were exempted from import taxes on industrial alcohol processing machinery, equipment and intermediate goods. This decree also required a tax payment from producers equivalent to 2.5 percent of their alcohol production, calculated at sales price, and which had to be paid in advance. The sales price was to be fixed by the Technical Technical Commission of the Carburant Alcohol, with representatives from the alcohol producers and MEM, and the Ministries of Economy and Finance. Sales price fixing was considered a means to avoid affecting gasoline price.

Objectives of Decree Law 17-85 can be summarized as following:

- Reduce the importation of gas
- Diversify energy supply supported by renewable sources
- Guarantee environmental protection
- Diversify the sugar industry
- Generate employment

Various factors responsible for the failure of Decree Law 17-85 include:

- The law did not provide big enough incentives for the sugar producers
- It was almost impossible to agree on the alcohol sales price to the refineries
- When this law was published, lead was substituted by the additive methyl tert-butyl ether (MTBE) and did not stimulate the addition of alcohol since MTBE was less expensive
- In 1989, international prices for sugar rose and the natural incentives for alcohol production disappeared

Efforts by MEM to implement a cohesive national biofuels policy have failed due to concerns from domestic petroleum importers and a lack of planning and key buy-in from other stakeholders, such as former plant owners, port operators, government ministries and fuel distributors. In addition to the failure to enforce the biofuels initiative Decree 17/85 in 1985, MEM was thwarted in its attempt to implement the Law of Incentives for the Development of Projects in Renewable energy (DPRE). This law, passed in 2003, created fiscal, economic and administrative incentives for renewable use projects and mandated a biofuels blending mix. As in the case of Decree 17/85, the law was never implemented and has not been discussed since.

In the 1990s, a bill for the addition of oxygen to gasoline was presented to Congress. The proposal failed since it prohibited imports but couldn't assure enough supply for the local market. It also established maximum prices by means of a formula which included prices for sugar and corn.

MEM is discussing a proposal to promote an ethanol-gas mixture, which includes a $1 per gallon subsidy to promote its production and consumption. This proposal includes a 10 percent ethanol-gasoline mixture and the promotion of exclusive gas stations that will only sell the mixture. According to MEM, a 10 percent ethanol-gasoline mixture adopted at the national level will reduce Guatemala's petroleum bill by US$50 million. MEM technicians proposing the law were trained in Brazil.

There is substantial concern about a biofuels mandate on the part of the hydrocarbons sector in Guatemala. This sector objects to the obligatory use of domestic ethanol, thereby obstructing the freedom of consumer choice and the workings of the free market. This sector also objects to the use of government subsidies, the large initial investments, questions the positive environmental impact, and the infrastructure changes that would be required. The above concerns from the hydrocarbons sector must be weighed together with the law enforcement issues that in the long term pose a threat to the profitability of private investment of all involved sectors.

Guatemala has great potential for biofuel production and the country is currently analyzing two biofuel proposals. To implement these proposals, a number of obstacles must be overcome, such as:

- Law Enforcement: Guatemala has serious problems with law enforcement at all levels, which has affected the oil industrialists and distributors, due to misbranding. Misbranding implies tax evation, product adulteration and other problems that impose a higher level of complexity when trying to establish mandatory biofuels mixes.
- Tax Structure: At present, oil taxes represent 2-3 percent of the total public income; there is a fiscal tax (9-13 percent) and a VAT (12 percent). A 10 percent ethanol-gas mixture will reduce the government's budget.
- Investment: There is considerable investment to be done when developing a domestic market for biofuels, directly related to modifications in the whole distribution system. The oil companies are willing to make such an investment as long as no middlemen are allowed, since the latter are typically not subject to the rules of the formal economy policies.
- Price Issues: To assure a 10 percent ethanol-mix, market prices for ethanol production need to be justified, and sugar producers also need to invest in dehydrated alcohol facilities. Unless the government establishes a price formula suitable to secure such investment, ethanol supply could be jeopardized. Therefore, a steady and low priced ethanol supply should be secured (nationally), which requires an open market approach that may allow for the purchase of either local or imported dehydrated alcohol. Unfortunately, this approach is not favored by the local ethanol producers, who prefer an ensured mechanism for ethanol production investment.

If all of the involved sectors could collaborate on an agreement, a biofuel policy in Guatemala could be implemented in the medium term.

Programs

The Association of Renewable Fuels in Guatemala (ACRG) is promoting the use of biofuels, contrasting their environmental benefits to MTBE, which the U.S. Environmental Protection Agency identified as a major contaminant of underground water in the United States. ACRG provides statistical information for the country and the Central American region regarding biofuels potential. It has a bi-monthly publication with relevant worldwide information in the biofuels field. They support both the public and private sector in the coordination and promotion of seminars and forums.

At the international level, the following Agencies/Countries have participated in the promotion of biofuels:

- **ECLA (Mexico)/Italy**

In 2006, the Mexican Office of the Economic Council for Latin America and the Caribbean (ECLA) in cooperation with the Italian Government, launched a two year program for the utilization of bioethanol to support sustainable development in Central America. This initiative resulted in the following studies (available at http://www.eclac.org/cgi-bin/getProd.asp?/mexico/agrupadores_xml/aes190.xml&xsl=/mexico/agrupadores_xml/agrupa_listado.xsl&base=/mexico/tpl/top-bottom.xsl):

  - Perspectives for a Biofuels Program in Central America, Hydrocarbons Sustainable Use Project. May 2006. LC/MEX/L.730
  - Costs and Prices for Ethanol. May 2006. LC/MEX/L.716
  - Fraud Evaluation in the Hydrocarbons and Bioethanol Market: Guatemala, El Salvador, and Honduras. June 2006. LC/MEX/L.730.
  - Legal Aspects and Analysis of Current Regulations for Central America Sugarcane Production. August 2006. LC/MEX/L.744
  - Economic Analysis of Bioethanol for Mixtures with Gasoline. September 2006. LC/MEX/L.746
  - Specifications for the Carburant Ethanol Quality and for Gasohol (gasoline-ethanol mixture) and Technical Norms Infrastructure. September 2006. LC/MEX/L.741.

- **IDB/GTZ (Germany)**

On June 3, 2005, the Inter-American Development Bank (IDB) and Ministry of Economic and the German Development Agency (GTZ) signed a Strategic Association Agreement to promote cooperation in the renewable energy sector in Latin America and the Caribbean. On December 13, 2005, the Presidents of Central America, Colombia, Mexico, and the Dominican Republic signed the Cancun Declaration, launching the Mesoamerican Energy Integration Plan (PIEM). This is a short-term strategy to improve both energy efficiency as well as to diversify the energy supply sector at the national and Mesoamerican level.

- **Brazil**

In September 2005, Guatemala and Brazil signed a Protocol for Technical Cooperation in the production and use of bioethanol. In August 2006, a cooperation agreement was ratified to intensify training and knowledge and technology transfer on biomass and biofuels production. In 2009, President Luiz Inacio "Lula" da Silva visited Guatemala and offered support to implement adoption of alcohol-gasoline mixtures.

- **Customs Union/Central America**

In June 2006, the Central American Customs Union discussed the Central American Technical Rule for Biodiesel, proposing the biodiesel standard norm ASTM D 6751-03a. This technical rule establishes that biodiesel mixtures (B100) with diesel 2-D (petrodiesel) must comply with the 2-D Diesel specifications, and each country will define the percentage in the mixture and its specification.

- **United States**

The U.S. is also supporting biofuels initiatives and commercial development. As part of CAFTA-DR, Central American countries have duty-free access for ethanol produced from regional feedstock, consistent with previous preference programs. The Caribbean Basin Initiative (CBI) and CAFTA-DR quotas provide duty-free access for ethanol produced from non-regional feedstock. The quotas are equal to seven percent of U.S. ethanol consumption, and thus, as consumption goes up, the quota increases. For historical reference, these quotas have never been filled above 40 percent. Guatemala started ethanol exports for the biofuels market by the end of 2007.

During President Bush visit to Guatemala in March 2007, the U.S. government offered support to promote biofuels production in the country, considering increasing demand in the United States. The Foreign Agricultural Service, in August 2007 supported the “USDA Global Conference on Agriculture-Based Biofuels: The Science, Technology and Economics of the Green Fuel Revolution”, funding the participation of one government official and a research representative from Guatemala.

Guatemala became part of the U.S.-Brazil Biofuels initiative at the end of 2008. At the beginning of 2009, the Organization of American States (OAS) assigned a consultant to assess the main factors to be considered in developing Guatemala's domestic market for biofuels. The OAS consultant met with public and private sector, including non-profit private organizations and academia. Applicable recommendations for the short term will be available soon.

Despite Guatemala’s comparative advantage in biofuels production, its status as a future center for biofuels research and production depends greatly on the passage and implementation of clear regulatory framework. A comprehensive approach is complicated given the obstacles that need to be overcome prior to reaching the consensus of interested parties. In the second half of 2010, the OAS will implement an initiative to work with the Guatemalan stakeholders in addressing the various challenges. The expected result is a sound policy and legislation proposal that can work in favor of everyone's interests and needs.

Bioethanol and Biodiesel:

Bioethanol

According to the IDB, Guatemala currently produces over 44 percent of Central America's sugarcane-based ethanol. The top 13 processing plants in Central America, eight of which are in Guatemala, represent half of the region's total sugarcane processing capacity.

Guatemalan ethanol production continues to expand as a result of the sugar sector's increasing productivity and competitiveness. Guatemala has the highest yield per hectare of sugarcane in Central America and has annually improved on this efficiency. Currently the sector produces 10 MT of sugarcane per hectare; Guatemala generates twice the yield of Honduras and Panama and has 30 percent greater land efficiency than Nicaragua.

The sugar industry in Guatemala is owned by the private sector, and is considered to be the fourth major exporter worldwide, in terms of volume. It is the second most efficient producer in Latin America, and its efficiency is comparable to that of Australia and Brazil. According to the Guatemalan Center for Sugarcane Research (CENGICAÑA), in 2009 the planted area was 235,000 hectares, with a country potential for 350,000 hectares. Guatemala exports around 70 percent of its total sugar production, showing a steady growth of two percent annually accompanied by technical improvements in cane and sugar production. There are 14 sugar mills in the country, located in the southern part of the country (very close to Puerto Quetzal on the Pacific Coast), with a combined milling capacity of 130,000 MT per day and 2.2 million MT per year. Recently, one of the sugar mills moved close to the eastern coast.

Approximately 40 percent of Guatemalan sugarcane is irrigated by either gravity flow or aspersion, which underpin maximum sugarcane yields of 10 metric tons per hectare. Therefore, if the 350,000 hectares could be devoted to sugar production, Guatemala's total capacity of sugarcane production in a year would be 3.5 million MT.

The sugar industry generates approximately 60,000 full-time jobs, which support around 250,000 people. In addition, the sugar industry generates indirect employment for another 300,000 people, of which 33,000 are cane harvesters. A 10 percent ethanol addition to the gasoline would create 7,000 new jobs.

Six sugar mills are generating electricity utilizing the sugarcane bagasse. They are currently generating approximately 150 megawatts of electricity, which accounts for 21 percent of total electricity produced in the country.

Guatemala is using only a small portion of its potential renewable energy. According to statistics from the MEM, in 2007 Guatemala used 14 percent of its 5,000 megawatt potential in hydroelectricity and less than four percent of its 1,000 megawatt geothermic potential. In 1990, Guatemala generated 92 percent of its energy with renewable resources, with the remaining eight percent from fossil fuels. In 2007, Guatemala derived 41 percent of its energy from petroleum products and the remaining 59 percent from renewable resources.

The Guatemalan Renewable Fuels Association has reported that the Central American region would require a 365 million liter ethanol production to supply a 10 percent alcohol-gasoline mixture. That amount of ethanol can be produced by fewer than 25 processing plants. Guatemala currently has five plants with a production of 250 million liters of non dehydrated alcohol per year, and a potential of 520 million liters by 2015.

Pantaleon, Guatemala's biggest sugar mill, through its largest distillery, Bio-Ethanol, S.A., has installed dehydration

capacity. The company has invested US$15 million in a plant that has the capacity to process up to 150,000 liters per day from the byproducts of various sugar mills. Since the local market is not developed, Bio-Ethanol products are mostly exported to Europe. Bio-Ethanol, S.A. will have expanded its capacity three times by the end of 2012.

La Union, S.A. has built a sugar mill with an initial capacity of 30 million liters/year. The industry is benefiting from direct foreign investment as well as industry re-investment. Guatemalan mills that previously exported non-dehydrated dehydrated ethanol for final processing at the customer's destination, are upgrading their plants with an average US$5 million investment to enhance their bottom line and benefit from the new dehydrated alcohol market for biofuels.

By the end of 2009, Guatemala was potentially producing enough alcohol to supply the local market and to export. Other mills are adding alcohol refineries as well, and the industry hopes to increase ethanol production for use as motor fuel. Guatemalan ethanol production reached 75 million liters in 2006 but more than doubled its capacity exceeding 170 million liters by 2007, finally reaching 250 million liters by the end of 2010. Dehydrated ethanol production for 2009 was 95 million liters.

Various studies state that 10 percent is the maximum amount of ethanol that can be mixed with gas, since higher amounts would require modification of the mechanical system of a vehicle and thus would be a disincentive to its application. Additionally, higher amounts would cause performance problems and damage vehicles. MEM favors a gradual approach, with a long-term vision of eliminating Guatemala's dependence on fuels derived from petroleum.

MEM also plans to initiate a pilot program in which government vehicles will use a mixture of ethanol and gas. The purpose of the program is to motivate the public and generate savings for the government. MEM recognizes that it cannot force the commercial use of ethanol; rather, it must create incentives so that those who want to produce and sell the product will do so.

Both MEM and the private sector have presented law proposals to develop the domestic market for ethanol. The private sector initiative to stimulate the use of ethanol was presented in the Guatemala Congress two years ago and is waiting to be reviewed by the Energy and Mining Commission. In contrast to MEM's proposal, the proposal calls for an initial 15 percent ethanol-gas mixture, with a long-term final mix of 85 percent in order to eliminate Guatemala's dependence on petroleum. This proposal asserts that the production of ethanol would directly generate 5,000 jobs from from the cultivation of primary materials and in the industrial processing. In the first two years, a US$ 60 million investment would be required for the installation of ethanol processing plants. Each plant would generate 120,000 daily liters and the area of sugarcane cultivation would increase to 19,000 hectares. A combined proposal of both sectors might solve different issues.

Guatemala's oil imports by fuel type suggest a sizeable potential domestic market for biodiesel. Guatemala imported 10 million barrels of diesel in 2009. This accounted for almost one third of the total petroleum imports of 1.5 billion liters. Complicating the potential blending of biodiesel with diesel is the cost differentials of the two fuels. Guatemala imports low grade, high sulfur content diesel that has little quality control oversight from the government. This affords diesel importers a low cost product, further enhanced by a tax structure for imported diesel that is lower than that of imported gasoline. Currently, biodiesel costs US $0.75/gallon more than imported diesel and a subsidy would be necessary in order to maintain the price blended products at current diesel price levels. This situation is unique to Guatemala and the subsidy requirement could be eliminated if there was governmental oversight in the quality control of imported diesel, as is the case with other Central American countries. A step approach to the introduction of a blending mandate could be an option for Guatemala, increasing the percentage of biodiesel by one percent annually, so that the resulting price increase, in the absence of a subsidy, would be minimized.

As of August 2006, Guatemala customs authorities reported 1.2 million automobiles, 1.5 percent of which (140,000 units) were for heavy transport, including trucks, containers, platforms and others. If Guatemala adopted a coherent nationally mandated biofuels consumption law that required a five percent blend, a 55 million liter domestic market would by created. A five percent mandate would significantly realign market priorities, with sixty percent of the ethanol consumed domestically and the remaining 40 percent exported to Europe and the U.S. Similarly, a 10 percent mandate would generate the need for 111 million liters, a volume which could have been supplied since 2008.

According to the IDB, Guatemala generates more than half of its energy from renewable resources. International Energy Agency statistics establish that renewable sources such as solar, geothermal, wind, hydro, liquid biofuels and waste account for 53 percent of Guatemala's energy generation followed by imported oil at 41 percent and coal at six percent. MEM states in its 2007 study "Potential for Renewable Energy in Guatemala" that only 14% of the hydro (705 MW) and 4% of the geo (40 MW) sources are used. MEM is greatly involved in regional and international cooperation projects and agreements to increase the use of renewable sources of energy.

Guatemala import volumes of petroleum have dropped almost 50 percent in the past five years. In 2004, Guatemala imported 6.8 million barrels valued at US$ 179 million; imports for 2008 were 3.7 million barrels, but valued at US$ 323 million, during a period with upward pressure on prices. Twenty eight percent of the petroleum imports are processed for gasoline. The local demand in 2007 was 7.5 million barrels (1,200 million liters), accounting for an import bill of US$ 622 million. Thirty three percent of the petroleum imports meet the demand for diesel, which was 8.9 million barrels (1,400 million liters) in 2007.

The Guatemalan Renewable Fuels Association (ACRG) has reported that the Central American region would require 365 million liters of ethanol output per year to supply a 10 percent alcohol-gasoline mixture. This volume can be produced by fewer than 25 distilling refineries throughout the region, and could easily be supplied entirely by Guatemala. Guatemala has five plants at the moment, with a production of 265 million liters per year, and a potential of 520 million liters by 2010.

Biodiesel

Besides alcohol production, Guatemala is one of the most efficient producer of palm oil (7 tons per hectare, while the average for the rest of the world is between 3 and 4 tons per hectare). Production for 2008 was 160,000 metric tons. The domestic consumption of oils and grease in Guatemala is 260,000 metric tons per year, and palm oil accounts for 93 percent of total local vegetable oil production. The environmental impact of increased production is mitigated as the new palm oil plantations plan to use cultivated area or underused agricultural land, not in virgin forest. Also, palm oil production in Guatemala does not involve chemical pesticides, therefore posing no threat to rural agriculture and human health.

Given that the country is one of the most efficient producers of African Palm oil in Latin America, Guatemala has a great potential for biodiesel production as well. Production for 2009 is estimated at 160,000 MT on a total area of 60,000 hectares, of which 32,000 hectares are already under full production. Four million tons of production would be equivalent to four percent of Guatemala's diesel consumption. The Ministry of Agriculture (MAGA) is very interested in promoting biodiesel production in the northern region of the Peten, which is highly undeveloped. Guatemala is not producing biodiesel on a large scale. At present, there is a capacity to produce 15,000 liters per day of biodiesel using oils from five distilleries processing Jatropha (producing 2,000 gallons per day) and the rest from recycled oils. MAGA has identified 600,000 hectares of marginal and semi-marginal land that could be used for the cultivation of

Jatropha curcas.

Guatemala has 60,000 hectares planted to palm trees, with 32,000 hectares under full production. Planted area roughly represents seven percent of the potential area suitable for palm trees. At present, planted area with palms represent less than 0.5 percent of the total agricultural land in Guatemala and about one percent of the total planted crops. The industry provides 10,000 direct jobs and 14,000 indirect ones. Palm oil farms and processing plants are located in the north (Peten), northwest (Izabal), and South Coast. Productivity in the South Coast is higher than in the northwest, but production costs are higher due to irrigation requirements. All palm oil processing plants are self-sustainable on energy terms, as the fruit bagasse is used for motor fuel production, and at present provides energy for the surrounding communities.

The Guatemala Palm Oil Association (GREPAGUA) is interested in promoting biodiesel production and use in Guatemala. Four million tons of products, equivalent to four percent of Guatemala's diesel consumption, could have a great impact on the environment and allow Guatemala to comply with the Kyoto Protocol. The principal barrier to biodiesel use is that the present laws do not allow for the addition of biofuels to diesel. New proposals to regulate biodiesel would have to be supported by the government. Meanwhile, European models of biodiesel plants are already being analyzed by both the private sector and private voluntary organizations (PVOs) for the technology to adopt for the oil transformation into biodiesel. Guatemala is actively participating in the Central American Customs Union to develop a strategy for the production and implementation of biodiesel consumption.

Post believes that Guatemala is in a good position to produce significant quantities of biodiesel, since Guatemala has a well-established African palm oil industry, which enjoys high yields. Moreover, it is easier and more energy-efficient to refine raw palm oil to fuel grade than it is to refine any other oil commercially produced at the moment. Biodiesel could also have a positive impact on Guatemala's air pollution problems. Much of the particulate pollution in Guatemala comes from poorly maintained diesel buses and trucks. Replacing petroleum diesel with biodiesel would reduce significantly air pollution. Studies have shown that palm trees can sequester 80 MT of carbon per hectare.

The Government of Guatemala has stated its interest in biofuels production and Ministry of Agriculture, Livestock, and Food (MAGA) is promoting the use of *Jatropha curcas*, an oilseed plant that requires less irrigation than palm and is known to grow wild in dry marginal and semi-marginal areas. The potential of *Jatropha* is under research and analysis since it might represent a great opportunity for agricultural diversification and rural development. This crop is grown on small plots, has potential high oil yields and rapid returns on investment. Both private and non-profit organizations are investing in *Jatropha* production and processing. This includes TECHNO SERVE–Guatemala, an international PVO with success stories in Africa, Nicaragua, and Peru. Texas A&M University, with USDA funding, has implemented two processsing Jatropha facilities in Escuintla. The New Rural Development Program, PRORURAL, is also considering palm oil production for its rural development strategy. Universities are involved in the identification of Jatropha lines, and are willing to support development of needed infrastructure to test biodiesel quality and standards to meet future mixing requirements.

The Guatemalan Ministry of Energy and Mines announced a proposal to build a biodiesel plant financed by the Colombian government. The cost of the plant would be US$ 400 million and would have an annual production of five million liters, roughly one quarter of the national diesel consumption. IDB has approved a concessional loan of US$ 400,000 to be invested in Guatemala's priority of renewable energy projects, part of which will be assigned to fill in the the legislative gaps needed to implement a national biofuels policy.

Although biofuels have been criticized for posing a threat to food security, this threat has been exaggerated for

Guatemala. Areas devoted to sugarcane and oil production are not necessarily suitable for food crops. Food security concerns are related to lack of opportunities in rural areas where income is less than two dollars a day. White corn production has very poor yields and crop diversification is the only opportunity for poor families to improve their quality of life. A biofuel production plot could be an invaluable opportunity for this diversification and could help alleviate extreme poverty in Guatemala.

Guatemalan diesel consumption at this moment is 1.6 billion liters. Oil producers estimate that the industry could produce up to 15 million liters of oil for biodiesel mixtures. Biodiesel could also have a positive impact on Guatemala's air pollution problems. Much of the particulate pollution in Guatemala comes from poorly maintained diesel buses and trucks.

Final Overview

As a tropical country with a well-developed sugar industry, Guatemala is in a good position to produce ethanol. According to a Brazilian study analyzing the costs and prices of ethanol in Central America, Guatemala is one of the few countries in the world that presents favorable conditions for the production and local use of ethanol. Guatemala produces sugarcane, corn, beets, potatoes, and other crops that can be used to extract fuel products.

Guatemala has a strong palm oil industry, which can be used to develop biodiesel. Jatropha, indigenous to Guatemala, also shows promise in medium to long term.

For Guatemala to meet growth projections for biofuels, in general, the country will have to improve its highways and port facilities. Guatemala's imported oil enters through Puerto Quetzal on the Pacific coast. The oil storage facilities of this port have accommodated the both gasoline and diesel consumption over the past 5 years. For Guatemala to enter the biofuels market, expansion plans at the port would have to be considered. Puerto Quetzal is located two hours by highway from most of the large ethanol producing plants. This close proximity would allow the ethanol plants to effectively manage their deliveries to coincide with tanker arrivals. The oil companies would have the option of either blending the ethanol in storage tanks or splash blending it in trucks prior to market delivery. This same scheme holds true for biodiesel, the only difference being the added driving distance of four to six hours.

The ACRG has exclusively financed a US$ 10 million expansion project at Puerto Quetzal. The project seeks to increase the ethanol handling capacity of this port by 500 percent through the expansion of current dock side space that will accommodate two ships simultaneously. The project also proposes to expand port entry access from two lanes to four, to hire more personnel, to augment on-site ethanol storage capacities five-fold and to construct an underground pipeline that will connect the storage facility with the dock. Completion date of the project is 2010.