

USDA Foreign Agricultural Service

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Global Agricultural Information Network

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## Guatemala

### Biofuels Annual

#### A big splash of Ethanol and a drop of Biodiesel

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**Report Highlights:**

In 2011, Guatemala increased its installed alcohol capacity to 269 million liters derived from sugarcane processing; most of Guatemala's ethanol is exported to Europe. Biodiesel production is extremely limited, reaching less than 2 million liters per year due to a lack of commercial feedstock. Guatemala's government is considering various biofuel strategies, but has not taken any specific action.

**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 its efficient well-developed local industries. Guatemala is the number one producer of sugarcane in the region. During marketing year (MY) 2011, Guatemala produced 2.0 million metric tons (mt) of raw sugar, of which 970,000 mt were exported. There are 14 sugar mills with a combined sugarcane milling capacity of 130,000 MT per day.

At present, five out of the fourteen sugar mills are also producing ethanol with an installed capacity of 269 million liters for calendar year 2011. On average, Guatemala is producing close to 850,000 liters of alcohol on a daily basis. Nearly all of the dehydrated ethanol is exported to Europe. The domestic market for biofuels consumption has not been developed.

The Guatemalan sugar industry could easily supply the ethanol required for a 10 percent ethanol-gas blend for domestic consumption. 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 different oil seeds and recycled vegetables. Combined processing capacity 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) given its adaptability to marginal and semi-marginal land areas in Guatemala, estimated at roughly 600,000 hectares. Unfortunately, recent findings regarding the growing and processing of *Jatropha* in Guatemala suggest that its potential has been overestimated. *Jatropha* oil content per hectare is at least 3.5 times lower than that of African Palm production.

Given that Guatemala is the second largest palm oil producer in the region (after Honduras), with 197,000 mt of crude palm oil produced in CY 2011 exclusively for the food processing sector, Guatemala could also produce biodiesel from palm oil. 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 5 percent blend of biodiesel.

Guatemala's inclusion in the U.S.-Brazil Biofuels Initiative, as well as Inter-American Development 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 benefiting the rural and urban environment.

## Policy

In 1985, due to an increase in petroleum prices and low international prices for sugar, Decree Law 17-85 was published (known as Law of the Carburant Alcohol) which sought to set an E5 mix (5 percentage of dehydrated ethyl alcohol in the gasoline mix), guaranteeing a local market with defined prices and fixed quotas. The Ministry of Energy and Mines (MEM) had the responsibility of controlling production, distribution, mix, purity and quality of the alcohol.

This decree also required a tax payment from producers equivalent to 2.5 percent of their alcohol production—calculated based upon sales prices—which had to be paid in advance. The sales price was to be fixed by the Technical Commission of Carburant Alcohol, with representatives from the alcohol producers and MEM, as well as the Ministries of Economy and Finance. Sales price fixing was considered a means to avoid affecting gasoline price. In addition, 2003 presidential decree known as “Incentive Law for the Development of Renewable Energy Projects” was published, establishing import tax exemptions on industrial alcohol processing machinery, equipment, and intermediate goods.

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

- Reduce the importation of gasoline
- 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, a lack of planning and little buy-in from key stakeholders, such as plant owners, port operators, government ministries and fuel distributors.

In the 1990s, a bill for the addition of oxygen to gasoline was presented to the Guatemalan Congress. The bill tried to establish maximum prices by means of a formula which included prices for sugar and corn. The proposal failed since it prohibited imports but could not assure enough supply for the local market.

In addition to the failure to enforce the biofuels initiative Decree 17-85 in 1985, MEM was thwarted,

again in 2003, when it tried to implement the Law of Incentives for the Development of Projects in Renewable Energy (DPRE). This law 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 due to domestic political infighting.

Much of the domestic concern about having a biofuels mandate comes from the existing hydrocarbons sector. This sector objects to the obligatory use of domestic ethanol. They also object to the use of government subsidies and the large initial investments needed to develop a biofuels industry. Additionally, they question the positive environmental impact and the infrastructure changes that would be required. These concerns pose a threat to the profitability of private investment in the emerging biofuel sector.

MEM has been discussing other proposals to promote an ethanol-gas mixture. One proposal includes a \$1 per gallon subsidy to promote a 10 percent ethanol-gas mix, plus 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\$165 million annually.

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 (implies tax evasion, 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 revenues.
- **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, especially since the latter are typically not subject to the rules of the formal economy policies.
- **Price Issues:** To assure a 10 percent ethanol blend, market prices for ethanol production need to be assured, 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); something 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 investment.

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

During FY2010-2011, under a Brazil-United States Biofuels initiative, the U.S. Department of State funded the Organization of American States (OAS) to support Guatemalan adoption of a sound biofuels policy, framework law, and regulations. OAS contracted Heart Energy Consulting to carry out work to advance the discussion within Guatemala by producing a relevant study. In June 2011, after a multiple stakeholder consultation process of the political, economical, environmental, social, and technical considerations needed in order to adopt and implement a sound biofuels policy in Guatemala, Heart Energy finalized its study and provided MEM with an in-depth analysis. One of the conclusions of the study is the challenge of addressing Guatemala's concerns related to the food vs. fuel trade-off -- a concern which is largely negative towards biofuel production.

Recently, the Economic Commission for Central America and the Caribbean (ECLAC), through Inter-American Development Bank (IDB), provided a \$400,000 fund for a feasibility project on a biofuels strategy for the country.

MEM has taken no action, at present, from either of the studies carried with international funding.

## **Programs**

The Association of Renewable Fuels in Guatemala (ACRG) is promoting the use of biofuels by comparing their environmental benefits to the negative effects of methyl tertiary butyl ether (MTBE). The U.S. Environmental Protection Agency (EPA) has identified MTBE as a major contaminant of groundwater 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.

Guatemala became part of the U.S.-Brazil Biofuels initiative at the end of 2008. At the beginning of 2009, the 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 many stakeholders from the public and private sectors, including non-profit private organizations and academia. As a result, in December 2010, a complete report was published, providing guidance on: political analysis and principal actors involved in the biofuels market and regulation, market and quality standards for certification, distribution options, legal framework proposal, and next steps required for advancing biofuels adoption in Guatemala.

In April 2011, Guatemala participated in a conference held in Antigua Guatemala associated with the U.S. Department of Agriculture's (USDA) Renewable Biomass Energy Project under the Energy and Climate Partnerships of the Americas (ECPA). Through the initiative, Guatemalan researchers received training in May 2012 to learn about U.S. efforts to convert agricultural residues into biodiesel. The training was supported by Piedmont Biofuels and the University of North Carolina.

## **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 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 (CENGICANÑA), in 2011 the actual planted area was 247,000 hectares, with a country potential up to 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 crop year.

Approximately 40 percent of Guatemalan sugarcane is irrigated by either gravity flow or by motorized spray systems, 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 metric tons.

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. Any requirement for a 10 percent ethanol blend within Guatemala would probably create 7,000 new jobs under the umbrella of the sugar industry.

Six sugar mills are generating electricity utilizing the sugarcane bagasse. They are currently generating approximately 150 megawatts of electricity, which accounts for 20 percent of total electricity produced in the country.

The Guatemalan Renewable Fuels Association has reported that the Central American region would require the production of 365 million liters of ethanol to supply a 10 percent alcohol-gasoline blend. That amount of ethanol can be produced by fewer than 25 processing plants. Guatemala currently has five plants with an installed capacity of 269 million liters.

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 450,000 liters per day from the byproducts of various sugar mills. Since the local market is not developed, Bio-Ethanol S.A. products are mostly exported to Europe. An extra \$50-100 million investment might be required to dehydrate the rest of the alcohol coming from the sugarcane processing.

The five sugar mills currently producing alcohol in Guatemala are: Pantaleon (Bioetanol), Magdalena & Madre Tierra (Alcoholes MAG), Servicios Manufactureros, Palo Gordo, and DARSA. From these, only Pantaleon is dehydrating it for fuel purposes. Most of the alcohol is exported to the European Union (The Netherlands, Italy, and Belgium), Central America and Mexico. Other mills are adding alcohol refineries and the industry hopes to increase ethanol production for use as motor fuel. Guatemala is interested in supplying locally produced alcohol from domestic sugarcane and, potentially, might be able to provide the entire region with enough ethanol to account for a 10 percent blend with gasoline.

MEM favors a gradual approach, with a long-term vision of eliminating Guatemala's dependence on fuels derived from petroleum. Both MEM and the private sector have presented 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. The private-sector 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 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.

As of 2010, Guatemala's National Statistics Institute (INE) reported 2.0 million automobiles, 23% of which (460,000 units) were for heavy transport, including buses, pickups, trucks, containers, platforms and others. If Guatemala adopted a coherent nationally mandated biofuels consumption law that required a five percent blend, an 80 million liter domestic market would be 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 United States. Similarly, a 10 percent mandate would generate the need for 160 million liters, a volume which could have been supplied since 2008.

## **Biodiesel**

Guatemala is one of the most efficient producers of palm oil (7 MT per hectare, while the average for the rest of the world is between 3 and 4 MT per hectare). Production in 2011 was 197,000 MT. The

domestic consumption of oils and grease in Guatemala is 275,000 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 previously cultivated area or underused agricultural land, not virgin forest. Also, palm oil production in Guatemala does not involve chemical pesticides, therefore posing no threat to rural agriculture and human health. Nevertheless, environmentalists watch with fear the expansion of palm oil as it threatens biodiversity.

Given that the country is one of the most efficient producers of palm oil in Latin America, Guatemala has a significant potential for biodiesel production as well. In 2011, palm oil production consisted of roughly a total area of 110,000 hectares which produced 197,000 MT from 80,000 hectares of mature producing trees.

Palm oil planted area roughly represents seven percent of the potential area suitable for palm trees (estimated at 700,000 hectares by Ministry of Agriculture, Livestock, and Food - MAGA). At present, planted area with palms represent less than two percent of the total agricultural land in Guatemala and about four percent of the total planted crops. The industry provides 17,000 direct jobs and 45,000 indirect ones. Palm oil farms and processing plants are located in the North (Department of Petén), Northwest (Department of Izabal), and South Coast of Guatemala. 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 in energy terms, as the fruit bagasse is used as fuel for the engine motor that moves the processing facility, which in addition provides energy for the surrounding communities.

The Guatemala Palm Oil Association (GREPALMA) is interested in promoting biodiesel production and its use in Guatemala. Four million tons of production, 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. Studies have shown that palm trees can sequester 80 MT of carbon per hectare.

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, models of biodiesel plants are already being analyzed by both the private sector and private voluntary organizations (PVOs). Guatemala is actively participating in the Central American Customs Union (CACU) to develop a strategy for the production and implementation of biodiesel consumption.

Guatemala's oil imports by fuel type suggest a sizeable potential domestic market for biodiesel. Guatemala imported 10.2 million barrels of diesel in 2011. This accounted for almost one third of the total petroleum imports of 1.6 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, which is 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 of 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 in other Central American countries. A step approach to the introduction of a blending mandate could be an option for Guatemala, i.e. increasing the percentage of biodiesel by one percent annually.

### **Final Comments**

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 has 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.

Post believes that Guatemala is in a good position to produce significant quantities of biodiesel, especially since Guatemala has a well-established African palm oil industry with 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 air pollution significantly. At present the University del Valle de Guatemala (UVG) is evaluating a pickup truck run with increasing biodiesel content in the diesel mix, finding positive results, both for the vehicles performance as for the environmental impact.

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 been used to meet Guatemalan gasoline and diesel demand during the past six 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 financed a U.S. \$10 million expansion project at Puerto Quetzal, increasing the ethanol storage capacities five-fold, including an underground pipeline that connects the storage facility with the dock. That project could be used in either direction -- to export Guatemala's ethanol, or to help mix ethanol with imported gasoline to meet a federal mandate (should one ever exist).

