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PROSPECTS FOR A BIOFUELS INDUSTRY IN GUATEMALA

Main findings and results of the mission undertaken
by the UNCTAD Biofuels Initiative

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The views expressed in this paper are those of the authors and do not necessarily reflect the views of the United Nations.

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Contents

Introduction	3
Rationale.....	3
Previous and ongoing cooperation with international institutions	4
Main findings	5
The domestic energy market	5
Energy pricing and balance of payments	6
The domestic sugar market	6
Ethanol	8
Ethanol prices in the Guatemalan market	9
The risks of relying exclusively on the external market	11
Biodiesel.....	13
Food security	15
Environment-related considerations in the biofuels sector	16
Conclusions and recommendations	18
Annexes	
Annex I - Letter from the Permanent Mission of Guatemala.....	22
Annex II- Letter from the Ministry of the Economy.....	23

Introduction

In 2006, UNCTAD received a formal request from the Guatemalan Ministry of Economic Affairs to support the establishment of a “National Programme on Biofuels” and to support the Government’s efforts to assess the feasibility of integrating biofuels into the national energy strategy. That request was followed by two visits by H.E. Eduardo Sperisen-Yurt, Permanent Representative of Guatemala to the World Trade Organization, who reiterated Guatemala’s interest in receiving support from the UNCTAD Biofuels Initiative on this issue. Three teleconferences were organized by the Guatemalan Permanent Mission in Geneva in February and March 2007 involving the representatives of the UNCTAD Biofuels Initiative – Mr. Lucas Assunção and Ms. Simonetta Zarrilli – and the representatives of the Guatemalan ministries of Economic Affairs, and Energy and Mines. Through those contacts, it was agreed that an official visit would be undertaken in Guatemala on 28–30 March 2007 by Mr. Assunção and Ms. Zarrilli, plus two international experts – Professor José Roberto Moreira from the Brazilian Reference Center on Biomass (CENBIO), University of São Paulo, Brazil; and Professor Daniel de la Torre Ugarte, Associate Director, Agricultural Policy Analysis Center, University of Tennessee, United States.

The mission took place according to plan. The first two days were devoted to meeting Guatemalan policymakers and other stakeholders. A seminar was held during the morning of the third day to present the main findings and conclusions derived during the previous two days. A preliminary plan of action for the country was discussed with relevant staff of the concerned ministries in the afternoon of the third day. The experts held more than 20 meetings with a wide range of national stakeholders; their presence in the country facilitated the first interministerial effort to discuss the pros and cons of including biofuels in the energy strategy of Guatemala. The preliminary findings of the mission were presented to the ministers of Economic Affairs, Mines and Energy, and Agriculture and Environment during the seminar held on the last day of the mission.

Rationale

In Guatemala, growing concerns about petroleum import bills, energy independence and energy diversification, access to energy and job creation, especially in rural areas, and the adverse environmental and economic effects of climate change have drawn substantial attention to biofuels as a means of meeting the country’s growing energy demand, mitigating greenhouse gas emissions, boosting the demand for agricultural products and revitalizing rural areas. Guatemala’s position as the leading sugar producer in the region and its potential for expanding sugar cane cultivation for ethanol production provide solid bases for considering engaging in the biofuels industry.

Guatemala, like many other developing countries, is therefore considering the possibility of becoming a large-scale producer and an exporter of biofuels. The President of Guatemala, Mr. Oscar Berger, recently stated that an ethanol fuel programme, based on the Brazilian experience of manufacturing ethanol from sugar cane, could be implemented in Guatemala.

Several proposals aimed at launching biofuels production in Guatemala have been reviewed over the last few years, but none of them led to concrete results. Lack of internal coordination

among responsible public entities and absence of in-depth analysis of the specific risks and opportunities that biofuels may offer have been among the reasons for this initial stalemate.

Previous and ongoing cooperation with international institutions

Guatemala, along with other countries in Central America, benefited from the Economic Commission for Latin America and the Caribbean (ECLAC) project “Use of bioethanol to support sustainable development in Central America, Government of Italy/ECLAC”. The project produced a number of useful studies¹ primarily focused on ethanol and reached its end in September 2006.

In 2006, a project was begun in cooperation with the Inter-American Development Bank. The project aims, among other things, at complementing in the area of biodiesel the analytical work carried out by ECLAC. At the time of the UNCTAD mission, results of the project were still not available.

¹CEPAL (ECLAC) (2004). *Perspectivas de un programa de biocombustibles en América central, Proyecto uso sustentable de hidrocarburos*, LC/MEX/L.606, 22 March; CEPAL (ECLAC) (2004). *Aspectos complementarios para la definición de un programa de bioetanol en América central, Proyecto uso sustentable de hidrocarburos*, LC/MEX/R.857, 28 May; CEPAL (ECLAC) (2004) (2006). *Análisis de los aspectos legales y regulaciones vigentes en la producción de caña de azúcar en América central*, LC/MEX/L.744, 25 August; CEPAL (ECLAC) (2006). *Análisis económico de precios del bioetanol para mezclas con gasolinas*, LC/MEX/L.746, 5 September; CEPAL (ECLAC) (2006). *Costos y precios para etanol combustible en América central*, LC/MEX/L.716, 9 May 2006; CEPAL, *Evaluación de fraudes en el mercado de hidrocarburos y bioetanol: Guatemala, El Salvador y Honduras*, LC/MEX/L.730, 20 June.

Main findings

The main findings of the interviews conducted on 28–29 March 2007 are presented below, grouped according to broad topic area.

The domestic energy market

Energy consumption in Guatemala totalled 76,063 gigawatt hours in 2005. Fossil fuels represented around 50 per cent of Guatemala's energy mix. Half of fossil fuels were used for transport, but oil was also largely used to fuel power plants. Though the country is the only oil producer in Central America, it lacks refinery capacity and is therefore a net petroleum importer. In 2005, Guatemala imported 16 million barrels of petroleum products, mainly from the United States and other Latin American countries. The bill related to petroleum imports (mainly gasoline, diesel, LPG and fuel oil) has increased by 87 per cent since 2002 and oil consumption has doubled in the last 10 years.² Since 1998, when the *Ley de Liberalización del Mercado Petrolero* was enacted, petroleum prices have been deregulated.

One of the priority goals of Guatemala's energy policy in the field of transportation fuels is to supply the local needs at the lowest possible cost. There is a policy of no market intervention, or at least of minimizing government interventions in the market, including a free imports policy. Though a large number of companies are authorized to import petroleum products, only six do so. They usually sell the products to wholesalers who sell it to the end-users.

In the last few years, the fleet of automobiles has grown significantly, particularly in Guatemala City. To a certain extent, this growth has been fuelled by crime and insecurity prevailing along the public transportation network. In addition, growth has been made possible by remittances from Guatemalans working abroad, especially in the United States. With a larger segment of the population driving cars and security concerns making public transportation an increasingly unacceptable option, there has been growing pressure to keep the price of transportation fuels as low as possible.

It is under this general political and economic context that local production of biofuels (ethanol and biodiesel) would take place, with biofuels competing for a share of the local market. In principle, the present approach translates into an unwillingness to set any mandatory biofuel blending targets in the composition of local gasoline and diesel. It is also clear that establishing any type of subsidies is not considered an option by the Ministry of Energy and Mines. On the other hand, the ministry envisions a clear role for itself, in collaboration with responsible authorities in other Central American countries, in the development and enforcement of technical standards, especially for ethanol.

In 1985, the *Decreto Ley 17/85* allowed the blending of gasoline with ethanol up to 25 per cent. However, the voluntary nature of the blending, very limited consumer information, lack of interest from petroleum importers and distributors as well as petrol

² For more details, see the website of Ministerio de Energía y Minas, Dirección General de Hidrocarburos at: http://www.mem.gob.gt/Portal/Documents/Magazines/2007-06/480/REV_1erT_07.pdf.

stations owners, and the absence of a real commitment by the Government towards an effective biofuel policy, have resulted in the law not being implemented.

For the biofuels industry to begin and flourish, Guatemala, as any other country, needs to put in place a national strategy. Such a strategy, however, could be developed only if there were the political willingness to do so. The initiative very recently taken by the Ministries of Energy and Mines, Environment, Economic Affairs and Agriculture to set up the *Comisión Nacional de Biocombustibles* seems to indicate that there is indeed political willingness to develop a biofuels strategy for the country.

Energy pricing and balance of payments

One characteristic of the gasoline pricing system in Guatemala is the small price differential between the regular and the premium gasoline. According to the *Departamento de análisis económico de la Dirección General de Hidrocarburos*, average 2006 prices in quetzal per gallon were 25.10 for superior 98, 24.56 for superior 95 and 24.07 for regular. This type of pricing policy induces the consumption of the premium gasoline, with little benefit for most consumers or the government treasury. Moreover, it represents a missed opportunity for a targeted fiscal policy that could generate both social and environmental gains, including the support for a biofuels strategy.

There is also a very small difference between the price of gasoline and the price of diesel. While, as previously mentioned, there is social pressure to keep the price of the transportation fuels as low as possible, it appears that the Guatemalan economy has been able to absorb the trend in higher oil prices without much difficulty. This may indicate that much more could be done in terms of price policy.

It is also estimated that at current international prices, blending about 10 per cent of ethanol in the gasoline would result in price increase of the gasoline of less than \$.05 per gallon. Under a scenario of rising oil prices, the use of ethanol blends could help attenuate the increase.

Given the trends in raising oil prices and in domestic consumption of gasoline, a net gasoline importing country such as Guatemala would normally aim at reducing gasoline consumption and improving its balance of payments position. However, it seems that the current position of the balance of payments in Guatemala is not a significant concern for the Government. This could be due to the large influx in the capital account coming from Guatemalans working abroad and from sugar exports revenues. This may explain why the price of gasoline is a much larger concern for political authorities.

The domestic sugar market

Since the early 1980s, Guatemalan sugar producers have more than doubled the area of land dedicated to sugar cane production and more than tripled production levels.³ With 197,000

³ United Nations Development Programme (2005). *The Limits on Pro-Poor Agricultural Trade in Guatemala: Land, Labour and Political Power*. Human Development Report, 2005/17, at 9, found at: http://hdr.undp.org/docs/publications/background_papers/2005/HDR2005_Krznic_Roman_17.pdf.

hectares of sugar cane plantation, Guatemala is at present the largest sugar producer in Central America, the third largest producer in Latin America and the sixth largest in the world. Sugar production in Guatemala is forecast to reach 2.2 million tons in 2006/07, a modest increase over the reduced 2005/06 crop that is attributable to an expansion in cane areas.⁴ Cane yields are slightly more than 98 tons per hectare, the highest productivity rate in the region.⁵

Around three quarters of sugar production are destined for the export market, with the following breakdown in 2004/05: Far East and Oceania 47.5 per cent, North America 27.4 per cent, South America 10.6 per cent, the Caribbean 4.8 per cent, and the Indian subcontinent 3.7 per cent.⁶ Exports totalled 1.4 million tons for 2005/06 and are expected to remain stable at 1.5 million tons during 2007/08.⁷

Alcohol production in Guatemala started at the beginning of the 20th century and has always been closely linked with the development of sugar production. There are four distilleries in the country with a total production capacity of 500,000 litres of ethanol per day (around 132,000 gallons).

The Guatemalan Sugar Board (*Asociación de azucareros de Guatemala* or ASAZGUA)⁸ includes representatives from sugar cane producers and sugar mills. It also includes representatives from sugar exporters (Expogranel), from the research and training centre (Cengicaña) and from a foundation (Fundazucar). ASAZGUA is a very dynamic association, which is trying to keep the Guatemala sugar industry at the forefront of technological development. Cengicaña is a highly recognized institution for its excellence in sugar research. ASAZGUA sets sugar prices in the Guatemalan market and allocates sugar quotas for exports to the different mills. Sugar prices in the Guatemalan market are higher than export prices and the internal market is protected by import duties of 20 per cent and by a technical regulation that imposes the addition of vitamin A to sugar sold for edible uses.⁹

The sugar industry is heavily concentrated and vertically integrated,¹⁰ and as one of the key industries in the country, sugar producers have significant economic and political influence, including through ASAZGUA.

The possible distribution chain for ethanol would be built around the current gasoline infrastructure. Most likely, ethanol would be trucked from the ethanol refineries to the gasoline terminals, where it would be blended with gasoline and distributed to the gasoline

⁴ Food and Agricultural Organization of the United Nations (2006). *Food Outlook, Sugar*. December. Found at: <http://www.fao.org/docrep/009/j8126e/j8126e09.htm>.

⁵ Data provided by the Permanent Mission of Guatemala in Geneva in June 2007.

⁶ From ASAZGUA, found at: <http://www.azucar.com.gt/images/cifras06g.jpg>.

⁷ Reuters (2007). *Exportación azúcar Guatemala estable 1,5 mln T 2007/08: Asazgua*, 3 July. Found at: <http://latino.msn.com/noticias/articulos/ArticlePage.aspx?cp-documentid=4961397>.

⁸ See the website of ASAZGUA: <http://www.azucar.com.gt/index.html>.

⁹ See CEPAL: <http://www.eclac.org/mexico/competencia/documentos/presentaciones/Guatemala-Antonio%20EGonzalez.pdf>.

¹⁰ Guatemala has 17 mills based in plantations that provide around 80 per cent of cane production. Almost all the mills and their accompanying plantations are controlled by major landowners. The independent cane producers who supply the remaining 20 per cent to the mills are also generally large landowners. The eight largest mills account for 77 per cent of the country's sugar milling. See: UNDP, *The Limits on Pro-Poor Agricultural Trade in Guatemala: Land, Labour and Political Power*, *op. cit.*, at 9–10.

stations, and then to the end-users. While there are concerns about the quality of the product and the reliability of the system, these are no different from the ones currently affecting the distribution of gasoline and mineral diesel.

Ethanol

Sugar cane is sold to sugar mills, which produce crystallized sugar from juice as their main product, and alcohol from molasses as an additional product. The amount of ethanol obtained from molasses represents around 5 per cent of the sugar mass. Consequently, with 18 million tons of sugar cane (2005 production) and with 110 kg of theoretically recoverable sugar per ton, it is possible to produce 2 million tons of sugar and 100,000 tons of ethanol per year. This yields an amount of 130 million litres of ethanol per year or 350,000 litres per day.

Bagasse is used for electricity generation, accounting for around 22 per cent of national electricity production during summer and 12 per cent during winter.

Based on available data related to gasoline consumption in Guatemala, a 10 per cent ethanol blend would require 150,000 litres per day or 50 million gallons per year. Guatemala then produces enough ethanol to guarantee a 10 per cent blend with gasoline throughout the country.

Presently, all ethanol produced is exported to the United States at prices higher than those obtained by Brazil. The difference is mainly explained by import duties of \$0.54/gallon which are charged by the United States on Brazilian exports, but not on exports from Guatemala. Indeed, Guatemala and other Central American countries benefit from preferential tariff treatment under the United States–Central America Free Trade Agreement (CAFTA) and the Caribbean Basin Initiative (CBI). Under CBI, if produced from at least 50 per cent local (CBI) feedstocks, ethanol may be imported duty-free and quota-free into the United States. If the local feedstock content is lower, limitations apply on quantity of duty-free ethanol. Nevertheless, up to 7 per cent of the United States market may be supplied duty-free by CBI ethanol containing no local feedstocks. Due to the large increase in ethanol consumption in the United States, the 7 per cent limit represents a large quota to be filled. It is expected that by 2007 some 20 billion litres of ethanol will be consumed in the United States. 1.4 billion litres would represent the quota for CBI countries. Guatemala's total ethanol production is less than 10 per cent of that value and all other countries in Central America produce even less ethanol than Guatemala.

Duty-free ethanol imports have also played a role during the CAFTA negotiations. However, CAFTA did not introduce major changes; it does not increase overall preferential access to the United States ethanol market but it does establish country-specific shares for El Salvador and Costa Rica within the existing CBI quota. The other CAFTA countries, including Guatemala, retain existing CBI benefits on ethanol.¹¹

Gasoline is sold at the petrol station in Guatemala at 24 quetzals per gallon (corresponding to \$3.1). Of this, four quetzals represent internal taxes. Assuming an average 10 per cent profit

¹¹ *Annexo 3.3 – Notas generales – Lista Arancelaria de Estados Unidos*, para 12. Found at: <http://www.mineco.gob.gt/mineco/cafta/US%20Notas%20Generales%2005.08.pdf>.

for the petrol station, gasoline must be delivered to those stations at \$2.32 per gallon. Distribution costs are typically around 5 per cent as well as the cost of handling the large amount of imported gasoline. Thus, it is expected that gasoline is unloaded in Guatemalan ports at a price of approximately \$2 per gallon.

Assuming such crude evaluation for gasoline and ethanol prices and that a blend of 10 per cent ethanol displaces exactly 10 per cent of gasoline, ethanol can be sold in the domestic market at the same price it is exported. Ethanol export prices for Guatemalan producers were \$.30 per litre until 2005. In 2006, due to significant demand for ethanol in the international markets, the price went up to \$.43 per litre. Even at this high price, which is unlikely to persist in the future, exported ethanol provided a return of \$1.62 per gallon. This return could be easily provided by selling ethanol in the domestic market, provided oil companies are willing to cooperate, since they are selling gasoline at \$2 per gallon to the Guatemalan service stations. Obviously, it is necessary to investigate possible taxes that may inflate the price of ethanol in the domestic market.

In summary, at least during 2006, there were no economic reasons that should have pushed ethanol producers to prefer exports over internal market sales. Legally, however, there is the hurdle of lack of regulation in the country that allows ethanol to be blended with gasoline and sold in the domestic market. Another barrier is of institutional origin. Since there is no compulsory blending of ethanol with gasoline, the internal market has little chance to develop, because gasoline importers may have no interest in cooperating and consumers lack awareness and interest. Thus, based on this simple analysis, it is possible to conclude that the main step needed is a determined decision by the Government to make blending mandatory.

Successful experiences with ethanol production in other countries share some common characteristics, namely that there is a captive domestic market which usually results from mandatory blending targets, and/or that some subsidies, tax breaks and/or other incentives are used to allow the domestic industry to develop. Alternatively, a mandatory blending by itself could transfer all adjustment costs to the users and consumers, so the fiscal treasury would not be directly affected. However, neither of these instruments is currently in place in Guatemala. According to senior staff in the Ministry of Energy and Mines, granting subsidies to the biofuels industry would go beyond Guatemala's present financial capacity, and imposing blending targets could jeopardize the proper functioning of the domestic fossil fuel market. It would be challenging for Guatemala to establish and promote its domestic biofuels industry without using some of the instruments that have been used by the other countries which have embarked in the biofuels industry.

A starting point leading to a mandatory blending could be the ban on using methyl tertiary butyl ether (MTBE) as a gasoline additive. As happened in many countries, this could provide a spark to ignite domestic demand for ethanol.

Ethanol prices in the Guatemalan market

A major risk for the Government rests with the potential increase of ethanol prices in the short run, as a consequence of worldwide interest in the product. During 2006, ethanol experienced a significant price increase in the United States due to surging demand for corn (in the United

States ethanol is produced from corn).¹² In 2006, the price of corn almost doubled as compared to 2004, and there are concerns that sharp price increases may occur again in the near future, since around 30 per cent of United States-produced corn will be diverted to ethanol production. Since the beginning of 2007, the price has dropped slightly as a result of expectations that high prices would lead to more corn production. The additional planted area is expected to reach about 8 million acres in the United States alone. Price fluctuations of food products are not uncommon, and it is well known that high prices stimulate further production, which in turn brings prices down again. The only uncertainty is the size of the ethanol market. If amounts as high as 68 or 90 billion litres of ethanol should be produced by 2015 to supply the United States market, it is quite possible that corn prices will stay high over the next few years. Producing beyond 90 billion litres of ethanol from corn by 2015 is beyond current United States capacity, considering available agricultural land and reasonable prices.¹³

Even considering that tropical countries such as Brazil, Colombia and Guatemala produce ethanol from sugar cane instead of corn, strong pressure on ethanol production will increase the price of ethanol from any source, mainly because tropical countries face several limitations that hamper their ability to quickly increase their ethanol production, including lack of sufficient capital for investing in sugar mills and the fact that a certain time span is needed to substantially increase sugar cane planted areas.

On the other hand, oil prices have been above \$60 per barrel for the last two years and few experts believe that they will go down.

Such uncertainties create difficulties for the Guatemalan Government to accept an ethanol price for the internal market completely decoupled from gasoline prices. Nevertheless, the final impact of a significant increase in ethanol price, say \$3 per gallon, while gasoline is kept at \$2 per gallon, would increase the blended fuel (10 per cent ethanol) from its 2006 value of \$2 to \$2.10, a 5 per cent increase. In recent years, oil prices have increased much more than that with full repercussions on gasoline prices, and there is no evidence that Guatemalan consumers have reduced their gasoline consumption. One consideration to keep in mind is that, should a blending target be in place, the price of gasoline will be influenced by both the price of oil and the price of ethanol. The price of ethanol for at least the next two to five years will likely be driven by what is going to happen policy-wise in the United States and perhaps in the European Union.

On the other side, if ethanol prices rise to \$3 per gallon, there will be a large motivation to invest in more plantation area and in the modernization of the transformation process.

¹² Conversely, other analysts believe that the increase in ethanol demand was fueled by the large margins that high oil prices and high fix incentives to ethanol production generated. Increases in the price of corn have reduced the margin of ethanol and slow the growth of production and demand. It is important to mention that the elimination of MTBE created a total inelastic demand for ethanol, then the 10 per cent blend with gasoline (margin driven) would be reached based on the margins of ethanol (a combination of price of oil minus the price of corn and plus the tax rebate to the blenders).

¹³ The current government mandate is to reach 68 billion litres of annual production by 2015. At the same time, the long-term view of groups such as the Governors' Ethanol Coalition imply that by 2015 the annual production should be 90 billion litres. The impacts of both goals are documented in "Impacts of a 15 Billion Gallon Biofuel Use Mandate," FAPRI-MU Report #22-07 and in "Economic and Agricultural Impacts of Ethanol and Biodiesel Expansion," Daniel De La Torre Ugarte, Burton English, Kim Jensen, Chad Hellwinckel, Jamey Menard, and Brad Wilson, University of Tennessee, respectively. Both reports can be found online at the following URLs: http://www.fapri.missouri.edu/outreach/publications/2007/FAPRI_MU_Report_22_07.pdf and <http://beag.ag.utk.edu/pp/Ethanolagimpacts.pdf>.

Consequently, it is not evident that a price increase in ethanol will mean a loss for the Guatemalan society, as the positive social and economic impacts of increasing sugar and ethanol production could outweigh the higher prices of fuels. Nonetheless, the potential negative environmental impact of increasing sugar plantations should be addressed, including possible water conflicts. Additionally, social distribution of gains (from increasing ethanol production) and losses (from higher fuel prices) should be equitable, to ensure the long-term social sustainability of the industry.

The risks of relying exclusively on the external market

Frequently, countries develop capacity to manufacture a product by selling it in their own domestic market. This practice allows producers to check the quality and carry out the necessary adjustments to improve the product and meet consumers' expectations. Sales in the internal market are less cumbersome since there are fewer logistical requirements than in the international market, and small market supply capacity is not a barrier. Nevertheless, there are products designed essentially for external markets and some companies are able to create an external market even in the absence of a national market.

Ethanol in Guatemala falls in this category. Two main questions may then be asked:

- Why have Guatemalan companies been ready to face all the hurdles and barriers of exporting ethanol to foreign markets without trying to sell it in the domestic market?
- Are the problems and barriers faced in the export markets easier to overcome than the ones that Guatemalan companies would have to face in the domestic market?

To answer the first question, it is important to note that ethanol is a very simple product and Guatemalan producers have the knowledge and technological expertise to produce it according to the requirements of the markets of destination. A second point to keep in mind is that ethanol is being purchased by the United States and Europe in significant amounts, with preference for certain suppliers, including Central American countries. Demand is expected to increase in the years to come and the price paid for ethanol is much higher than that which could be obtained by exporting sugar cane molasses, which is a by-product of sugar production and the raw material for ethanol production in many countries.

To provide an answer to the second question, it is important to take into account that in most cases developed countries' import regulations reflect national priorities. Some lessons could be learned from the recent example of ethanol exports from Pakistan to the European Union. Pakistan, with a 20 per cent share of European Union ethanol imports, was the largest exporter under preferential trade arrangements. However, in 2006 it was graduated from preferential access to the European Union market. Moreover, in May 2005, the European Commission initiated an anti-dumping investigation against Pakistan and Guatemala for dumping of ethanol. The proceedings were officially dropped one year later when the full customs tariff was restored on Pakistani imports. There may be many explanations for this change in the European Union import regime, but Pakistani capacity to produce large amounts of ethanol at a low price may have played a key role in recent European Union decisions.

It can be argued that complying with the biofuel targets set up in the United States would require production to increase four times from now to 2015. It is also well known that 25 per

cent of United States corn production is at present used for ethanol production, and that this has already provoked a significant increase in the price of corn and other crops that can replace it for food and fodder purposes. Thus, it looks very unlikely that United States targets will be accomplished by 2015 relying exclusively on national production.

Also, ethanol from cellulosic biomass is still being developed and it is very unlikely that large amounts of “second generation” ethanol will be in the market by 2015.¹⁴

The chances for the United States to import large amounts of ethanol from other countries are also limited, since tropical countries – including Brazil – are not expanding their production at a rate that could provide even a quarter of the United States established 2015 targets. This is due to the small number of local entrepreneurs and the large volume of investment required.

A very plausible conclusion is the following: Guatemalan producers have identified the potential they have to export ethanol to the United States and have also assessed that their prospects look reliable and promising at least up to 2015. Consequently, they may have also reached the conclusion that United States’ need to import ethanol is so pressing that the country does not have an interest in putting in place too many trade barriers.

Nevertheless, there is a small likelihood that ethanol requirements could be significantly reduced in the United States during the period up to 2015. One reason that could trigger this major change in the market is that cellulosic ethanol may become commercially available earlier than expected. Contrary to “first generation” feedstock, the United States has significant land available to grow elephant grass, switch-grass, and other “second generation” energy crops. Even assuming such a development and that the amount of cellulosic ethanol available would still be limited by 2015, it could nonetheless trigger a change in United States trade policy, delaying the compliance with ethanol targets until the cellulose industry is able to significantly increase its production.

In the medium term, another potential risk could be a further expansion of the use of diesel engines, which could replace gasoline engines due to very good consumption and pollution rates. Ethanol is not used in diesel engines since it has a low cetane number. The migration from Otto-type engines to diesel-type engines could reduce ethanol demand. Even assuming that such a change will not occur very fast, it is possible that the United States targets for 2015 may change, considering the interest of consumers for diesel-powered fuels.

From a longer-term perspective, a third possibility is the association of hybrid vehicles with diesel engines. The hybrid vehicles which have been sold in the United States during the last four years use Otto-type and electric engines. However, companies manufacturing hybrid cars

¹⁴ “Second generation” biofuels are derived from lignocellulosic materials, e.g. crop residues, grasses and woody crops. They might be produced by either biological or thermochemical routes. Research and development breakthroughs are needed to improve the conversion processes and reduce costs for biological second generation biofuels. Such technologies would likely reach commercial readiness within 10 to 20 years. On the other hand, technologies for thermochemical second generation biofuels are currently available and there is practical experience in this area because of the application of such technologies to fossil fuels. What is required then is to make the necessary investments for applying existing technology to biomass conversion. Thus, thermochemical biofuel technologies could be commercially ready in five to 10 years. Even after the commercial introduction of second generation biofuels, however, production of first generation biofuels from already-established facilities would likely continue as long as running costs could be recovered from the sale (subsidized or unsubsidized) of the biofuel, considering that capital investments will likely have already been paid back.

are also investing in cars with diesel-type and electric engines which are more suitable for the European Union market. These cars, which are more efficient than the ones presently being sold in the United States, may gain a share of the United States market in the future. Finally, several car companies are making significant investments in research and development for fuel cell vehicles and some significant breakthroughs may occur and make fuel cells vehicles commercially available in the near future. Such cars could use ethanol, but most likely they would rely on methanol or pure H₂, and this would reduce ethanol demand. Obviously, those technologies, though developed in the United States, would then become available in other markets, especially in developed countries.

On the other hand, considering that the average life of cars in developing countries is more than 20 years,¹⁵ it becomes clear that new technologies will reach developing countries at least one decade after being developed in the United States. Thus, Guatemala provides a market for ethanol with significant longer life than the United States market.

The development of new technologies can wreak havoc for sugar cane. Presently, sugar cane planted area is in excess of demand in the sugar market: any reduction of demand in the ethanol market would further increase excess supply in the sugar market, pushing prices down. It is therefore important to rely on ethanol markets that can survive for a long time. This could be the case for Central American markets, including Guatemala.

In conclusion, there is a good chance that the demand for ethanol in the United States will increase in the years to come; however, some developments, such as those described above, may jeopardize it. In case demand does not follow the expected trend, trade policies in the United States may change and higher tariffs and complex quality and technical standards may be established in order to protect local producers who will face a much smaller market and who may end up producing more ethanol than the market is able to absorb. Guatemala might then have a strategic interest to supply ethanol both to the international and the domestic market in order to reduce uncertainty and risks.

Biodiesel

While Guatemala is already producing ethanol and possesses the technical capacity and the environmental conditions that would rather easily allow the country to expand its production, the situation for biodiesel is different. Limited production is already taking place in Guatemala, but a clear regulatory framework, private investments – including by foreign firms – and some kinds of incentives would be necessary to enhance the quantity and quality of local production and make biodiesel a product that can be brought to the open market. At the same time, over-regulation, in the form of taxation or high standards, would hamper the development of this nascent industry.

¹⁵ This information was extracted from DATAGRO, a well-known monthly report covering sugar and ethanol issues published by Plinio Nastari in Brazil. One frequent calculation displayed deals with the fleet of cars running on gasoline and ethanol. The publication uses car scratching curves showing that, after 15 years, half of the fleet is still in use.

The existing biodiesel facilities in Guatemala are small scale and at present processing mostly yellow greases as a feedstock. While overall the volume is not significant, it offers an economic opportunity for small users, native communities and very low-tech producers.

Most of local biodiesel production is produced in some associative arrangements and is either used for self-consumption or for small institutional markets, where producers are distributing directly to local Governments and/or institutions. The production of biodiesel for self-consumption offers significant opportunities not only for savings in transportation fuel bills, but also in the use of this fuel for off-grid electricity purposes. This use shields local communities from the fluctuation of fossil fuels prices. While there are not yet technical and quality standards available for biodiesel, Central American countries are currently working together on the development of such standards, relying on existing biodiesel standards developed by the United States and the European Union.¹⁶

The Ministry of Agriculture is focusing its efforts on supporting the biodiesel path as a means of promoting rural development. The expansion of very dynamic crops, such as the African Palm, and new crops, such as Jatropha, are considered net additions to the agricultural sector. Biodiesel can become an engine for the development of rural areas, not only through the introduction of crops of higher value added, but through local processing and the availability of biodiesel for off-grid electricity generation. The development of the biodiesel industry is viewed as a long-term strategy that needs the involvement of all the agents in the supply chain. The Ministry of Agriculture believes that providing unquestionable proprietary rights on land to small producers would prompt a virtuous cycle: producers would become land owners, and through access to financing, they would eventually turn into entrepreneurs.

There is a significant effort in the ministry to develop an assessment of the potential of all agricultural and forest lands. This assessment would guide interventions by the ministry in the areas which enjoy the highest potential for the production of biodiesel feedstocks.

Another instrument available from the Ministry of Agriculture is rural financing to provide incentives to small and medium-sized producers in the adoption of bioenergy-dedicated crops. Additionally, the ministry has put in place an instrument for the financing of small projects in the rural areas (Guateinvierte) which could be used to stimulate biodiesel production.¹⁷

¹⁶ In the European Union, there are three existing specification standards for diesel and biodiesel fuels:

(a) EN 590 describes the physical properties that all diesel fuel must meet if it is to be sold in the European Union, Iceland, Norway or Switzerland. It allows the blending of up to 5 per cent biodiesel with “normal” DERV a 95/5 mix. In some countries such as France, all diesel sold routinely contains this 95/5 mix;

(b) DIN 51606 is a German standard for biodiesel, considered to be the highest standard currently existing. The vast majority of biodiesel produced commercially meets or exceeds this standard;

(c) EN14214 is the standard for biodiesel recently finalized by the European Standards Organization (CEN). It is broadly based on the German standard. In the United States, the American Society of Testing and Materials (ASTM) issued in 2002 fuel specification D 6751 for all biodiesel fuel bought and sold in the United States. Half of the States in the United States have adopted the ASTM D 6751 specification as part of their fuel quality regulations, and additional States plan to adopt the specification.

¹⁷ Guatemala has created Guateinvierte (*Fondo de inversión rural agrícola*) as an organization to provide financial support for small- and medium-sized grower groups. Guateinvierte is insuring crops, helping to provide market access and technical support for growers. Guateinvierte was created in April 2005 through *Acuerdo Gubernativo* No. 133-2005.

The *Instituto de Ciencia y Tecnología Agrícolas* is developing seeds and planting protocols for bioenergy-dedicated crops. Additional support provided to small farmers includes the establishment of small agricultural training schools in rural areas.

Jatropha is a crop that has attracted great attention as a feedstock for the production of biodiesel in Guatemala. It is being used on an experimental basis to produce biodiesel in Guatemala, with an average production of around 1,800 litres per hectare. Considering that the country has around 623,000 hectares of marginal land, it could use it for Jatropha plantations. However, agronomic knowledge and experience with Jatropha is quite limited both in Guatemala and in other regions, though improved seeds have been developed through traditional breeding techniques. An additional problem is that, as of yet, Jatropha has been predominately used in regions that enjoy climatic and land conditions different from those prevailing in Guatemala. Since its viability is still unclear, it is difficult for entrepreneurs in Guatemala to encourage farmers to plant Jatropha in large scale for biodiesel production. The technical research work that the Ministry of Agriculture is about to commence on the concrete prospects of Jatropha as a viable feedstock for biodiesel production and the parallel efforts carried out by the private sector in the same field could greatly facilitate strategic decisions in the biodiesel sector. It may be that only operations that integrate Jatropha production and its conversion into biodiesel may prove to be profitable. Currently, this is the route that United States Agency for International Development (USAID)-sponsored projects are supporting.

Palm oil production in Guatemala started around 20 years ago. In the last 15 years, it has grown from 54,000 to 600,000 metric tons of palm kernels equivalent. Of the 600,000 metric tons produced, about 450,000 are exported, while the rest goes into the domestic market of edible oils. This growth is very much linked to the world market for edible oils, and maybe even driven by the recent increase in demand by the European Union to import palm oil for biodiesel purposes. It is unlikely that local use for biodiesel production could attract any significant production of palm, as domestic diesel prices are not competitive enough to divert any volume from exports, mainly directed at present to El Salvador and Mexico.

Palm oil plantations have replaced banana and cotton plantations, as well as animal grazing. Production is concentrated in a very limited number of firms. Palm residues are used for energy generation and, as is the case for bagasse, could be used in the future for providing electricity to the national grid.

To a certain extent, the expansion of biodiesel seems to be dependent on the potential success of Jatropha as a feedstock. While the feedstock with the largest potential is palm, the high prices of palm oil in the export markets make any large-scale utilization of this feedstock into biodiesel unlikely.

Food security

The threat to food security in Guatemala is not coming from domestic pressure to divert land from food/feed to energy crops production, but from international markets. Higher agricultural commodity prices resulting from increasing use of biofuels in the United States and the European Union are putting pressure on the import bill of agricultural products – i.e. yellow corn, wheat and rice – and on domestic prices for food.

Moreover, higher world prices of sugar and palm oil could result in more arable land shifting to these crops with a potential increase in land, water and environmental conflicts.

In the event that the domestic production of molasses is diverted to producing ethanol, the cattle sector would have to find an alternative product to include in the animal ration. This may negatively affect, although not in a significant way, the profitability of the cattle industry. Another concern is the diversion of white corn to the Mexican market, with the consequent reduction in the effective local supply and an increase in local prices. This, however, is a pressure coming from outside Guatemala as well.

Nonetheless, higher agricultural commodity prices also present an opportunity to implement programmes to expand domestic production of these products as well as alternatives foodstuffs.

Environment-related considerations in the biofuels sector

According to the Minister of the Environment, the development of the biofuels industry in Guatemala could not occur without the establishment of a regulatory framework and certain incentives. It would also be necessary to make a strategic assessment of the environmental impact of expanding sugar cane production, particularly because of limited water availability in the southern part of the country. The southern coast of the country is the most suitable area for agricultural production and indeed sugar cane, fruits and vegetables are produced there in lands that were previously devoted to animal grazing.

Within this context, an additional concern is that Guatemala does not have a law regulating water quality and access to water. More than 20 draft bills were presented during the last 25 years to the Congress, but none of them have ever been approved. Moreover, there is a lack of any institutional water market or water management authority. Consequently, control of water is based on the physical access to the resource. This may result in an inefficient use of water, and a deficiency in water quality and availability for downstream agricultural and non-agricultural users. Some unfortunate episodes occurred in the past, where water was overexploited by those carrying out productive activities upstream – mainly sugar mills – leaving downstream users – mainly small farmers – without access to a sufficient amount of water. Considering that about 60 per cent of the area planted with sugar cane is irrigated, access to water becomes a significant problem that could become exacerbated by the expansion of sugar cane and palm production. The environmental impacts on water quality can also be felt in the wetlands downstream from sugar cane areas. These wetlands are severely affected by the pollutants in the water resulting from agricultural production.

According to the Minister of the Environment, until the issue of access to water is settled, a rapid expansion of sugar cane and palm production meant for biofuels use could result in detrimental environmental and social consequences.

The country is also experiencing fast deforestation. 36.3 per cent – or about 3,94 million hectares – of Guatemala is forested. Of this, 49.7 per cent is classified as primary forest, the most biodiverse form of forest. Between 1990 and 2005, Guatemala lost 17.1 per cent of its

forest cover, or around 810,000 hectares.¹⁸ While there is no general agreement on the causes of forest cover change, the conflict and competition that exist between the agriculture and forestry sectors and agricultural versus forest land use seems to be the main reason.¹⁹

The continuous expansion of African Palm plantations represents another significant challenge. As the plantation area expands, it could encroach upon natural protected areas in the northern part of the country. The expansion of palm has also caused rodent plagues. This situation illustrates the need to improve the management practices in palm production.

According to the Minister of the Environment, a viable strategy to provide stability and continuity to domestic environmental policies is linking them with international initiatives and commitments, as well as including environmental considerations within sectoral domestic policies. Guatemalan companies are keener to take environmental concerns and requirements into account if they come from importers and/or consumers in the markets of destination, or if they are embedded in international commitments that Guatemala has subscribed.

¹⁸ <http://rainforests.mongabay.com/deforestation/2000/Guatemala.htm>.

¹⁹ Food and Agricultural Organization of the United Nations, Forestry Department (1999). *Annotated Bibliography Forest Cover Change Guatemala*. Found at: <http://www.fao.org/docrep/005/ac631e/AC631E03.htm#TopOfPage>.

Conclusions and recommendations

The overall objective of the UNCTAD mission was to provide an external and neutral expert input towards the formulation of a national biofuels strategy. While the mission referred often to experiences in other countries, the recommendations fully take into account Guatemala's unique circumstances. Ultimately, it is up to the relevant government authorities to select the most appropriate policy tools and the pace and sequencing in policy implementation.

Based on the reports reviewed, the information gathered, and the interviews conducted with the representatives of the public and private sectors, observations and recommendations were developed. These are:

1. Guatemala seems to have a real interest in considering the biofuels option, as it can immediately reduce dependency on petroleum imports, improve access to energy, especially for rural and isolated communities, and contribute to climate change mitigation efforts. However, a well-designed biofuel policy will be required for the whole country – and not only some segments of the population – to benefit from embarking in the biofuels industry. This will be particularly relevant if some kind of incentives will be granted to the biofuels sector and/or if a captive domestic market will be created through mandatory blending targets. Governmental interventions will likely be welcome if they bring health, environmental and economic improvements for the whole population.
2. Considering that sugar production and processing is carried out in Guatemala very efficiently, subsidies to support ethanol production may not be needed, while they seem necessary to support the very incipient biodiesel segment. If subsidies or other incentives are put in place, a sunset date should be established to phase out such support.
3. While large-scale ethanol production may become a new lucrative opportunity for large sugar producers, biodiesel production will likely become an opportunity for small producers and rural communities. Above all, it will be an opportunity for improving access to energy for small and isolated communities. Keeping a balance between the interests and goals of different segments of the population seems to be a necessary precondition for the overall acceptance of a national biofuels programme and for its successful implementation.
4. A national biofuels strategy will not likely have a chance to succeed in Guatemala without a massive information and public awareness-raising campaign that highlights its social, energy, climate change, rural development and social inclusion benefits. Guatemala seems to have the opportunity to convey a new image of itself to the world, namely the image of a small economy that opts for the sound management of its natural resources, engages in alternative ways to produce energy, is proactive in ensuring broader access to energy, and addresses in a sound manner the global climate change challenge.

5. For a national biofuels strategy to be effective, there is the need to single out a leading agency which should be ultimately responsible for the development and implementation of a national biofuels programme. The leading agency should facilitate information exchange, currently quite dispersed, and ensure greater coordination among the relevant governmental institutions. Additionally, it should be in close touch with the private sector and relevant non-governmental organizations while keeping its independence.
6. An immediate decision to establish a 10 per cent mandatory blending rate between ethanol and regular gasoline is technically viable. Ethanol supply would come from competitive domestic and foreign producers. Domestic supply to meet 10 per cent blending would not displace food production.
7. A starting point leading to a mandatory blending could be the ban to use MTBE as a gasoline additive. There has been an unjustified inertia in banning MTBE as a gasoline additive, especially since its adverse effects on public health are well known.
8. The local sugar industry has the capacity and efficiency to develop a strong ethanol industry for domestic supply and export purposes. However, relatively small quantities of ethanol are produced in Guatemala and they are exported, mainly to the United States market. Relying solely on export markets may turn out to be a risky strategy for domestic ethanol producers. Supplying the domestic market and building up export strategies – which take full advantage of preferential market access opportunities, such as the CBI – seem to be more promising alternatives from which both the country as a whole and the private sector could benefit. Such a strategy should be encouraged by the Government.
9. There is a need to review the current pricing and tax policies for gasoline. The transportation fuels price and tax policy should reflect the long-term sustainable development priorities of the country.
10. Given the small price differentials between “regular” and “premium” gasoline, it is unlikely than a voluntary blend of gasoline with 10 per cent ethanol may have a chance of success, unless the blend results in a lower price per gallon. A possible change in the gasoline tax policy could be a tax increase in “premium” gasoline, and the use of the additional income to subsidize any cost increase in the “regular” gasoline as a result of a mandatory blending target. In this scenario – where both “regular” and “premium” gasoline are blended with 10 per cent ethanol – the Government’s goal of supplying the domestic market with gasoline at the lowest consumer price would focus on “regular” gasoline. The additional tax revenue obtained through increasing the price of “premium” gasoline could also be used to promote the incipient national biodiesel industry.
11. The competent authorities should be more aggressive in enforcing quality control for gasoline. This will be of special relevance if there is a decision to mandate a blend of gasoline with ethanol. Failure to enforce quality control could jeopardize the long-term viability of the local ethanol industry.

12. Given that a minimum of infrastructure would be required in the distribution system to handle the storage and blending, the Government could request the support of international financial institutions to obtain preferential lines of credit for this purpose.
13. The Government should continue to support the ongoing efforts to develop a small-scale biodiesel industry, which could have significant rural development impacts. While the emphasis on *Jatropha* has been the dominant feature thus far, it is of the utmost urgency to reach clear conclusions about the real potential of this feedstock and the conditions that would make it profitable. Only in this way can a clear and effective public policy be established.
14. Enhancing opportunities for land ownership for small producers and investing in distribution infrastructure would facilitate small producers' participation in the emerging biofuel industry and eventually turn them into entrepreneurs.
15. The need for quality standards for biodiesel should be consistent with the small steps in the development of the local biodiesel industry. While self-consumption and institutional markets are the norm, the standards of biodiesel could be left to the needs of the contracting parties.
16. Guatemala has an interest in tapping climate change benefits through biofuels. Considerable investments could be generated and attracted to the nascent biofuels sector through the Clean Development Mechanism (CDM) of the Kyoto Protocol. There are already some very promising initiatives in this field undertaken by Guatemalan palm oil producers. The designated national authority must be strengthened to effectively tap CDM investment opportunities.
17. Given the trend of increasing international agricultural prices, the Government should develop a food security strategy and especially focus on enhancing local supply of agricultural products. Managing higher international food prices may be the biggest challenge that Guatemala may face from biofuels expansion.
18. As the production of sugar and palm may expand as a result of higher international prices, the Government should pay special attention to the way these crops may expand in Guatemala. Water should be used in the most efficient manner; water availability to downstream users should be ensured and ecosystem preservation should be considered. The expansion of the area planted to sugar cane and palm needs to respect the sustainability of protected zones and fragile ecosystems. The rights of communities and small landholders should be protected. Proper legislation on access to water and water quality should be developed and a water management authority established.
19. Should a decision be taken regarding the introduction of a proactive biofuels policy – encompassing ethanol and biodiesel and the supply of domestic and export markets – potential positive and adverse environmental and social effects should be analyzed, including:
 - The potential impact on freshwater resources and on the preservation of ecosystems;

- Assessment of the most suitable land tenure regime;
- Assessment of best feedstock options;
- Opportunities for job creation;
- Governmental measures needed to support small landholders producing sugar cane and biodiesel feedstocks; and
- Access to technology.

20. Previous analytical work undertaken by CEPAL, BID and other institutions should be fully used and included among the elements to be taken into account when developing a national programme for biofuels in Guatemala.

For more information, please contact Lucas Assunção, Chief of Section, Biodiversity and Climate Change, email: lucas.assuncao@unctad.org.

Annex I

MISION PERMANENTE DE GUATEMALA

ANTE LA ORGANIZACION
MUNDIAL DEL COMERCIO -OMC-
GINEBRA-SUIZA

Ginebra, septiembre 18 de 2007
Ref.:ESY/C/249

Estimado Sr. Assuncao,

Tengo el agrado de dirigirme a Usted con el objeto de hacer de su conocimiento la comunicación adjunta que recibimos del Señor Ministro de Economía de Guatemala con relación al informe de UNCTAD sobre la visita a Guatemala del 28 al 30 de marzo de este año.

En la nota, que se explica por sí misma, el Ministro expresa su agradecimiento a la UNCTAD por el apoyo que ha venido dando a Guatemala en el tema de biocombustibles, así como su autorización para que se haga público el informe de la visita antes mencionada.

Sin más por el momento, quedo a su disposición para cualquier aclaración o ampliación de la información aquí contenida así como en la nota adjunta y, sin otro particular, me suscribo de Usted con las muestras de mi más alta consideración y estima.

Atentamente,



Eduardo Sperisen-Yurt
Embajador

**Señor
Lucas Assuncao
Jefe del Programa
Del Mercado de Carbono
UNCTAD
Ginebra, Suiza**

Annex II

MINISTERIO DE ECONOMIA

GUATEMALA, C. A.

6 de septiembre de 2007

Apreciable Señor Embajador:

Por este medio hago referencia a su consulta verbal, respecto a la posibilidad de publicar el informe sobre la visita que realizaran expertos de UNCTAD a la ciudad de Guatemala, del 28 al 30 de marzo de este año.

Sobre el particular, agradeceré si por su medio puede trasladar a la UNCTAD nuestro más sincero agradecimiento por la realización de dicha misión, así como por el informe que elaboraron, el cual nos ha sido de suma utilidad. Hoy podemos sentirnos satisfechos de haber conformado la Comisión Nacional de Biocombustibles que sirve de foro interinstitucional para las discusiones que giran en torno a este informe y el diseño de una política nacional sobre energía renovable.

Asimismo, este Despacho considera que es importante compartir la experiencia nacional de Guatemala con otros países que se encuentran igualmente analizando las implicaciones sobre la producción y comercialización de biocombustibles. Por lo que también agradecería se sirva hacer saber a UNCTAD que cuenta con nuestra autorización para publicar y distribuir el informe de la visita a Guatemala antes mencionada.

Sin más por el momento, me suscribo de usted con las muestras de mi más alta consideración y estima.



LUIS OSCAR ESTRADA
Ministro de Economía

Ingeniero
Eduardo Sperisen-Yurt
Embajador
Misión de Guatemala ante OMC
Ginebra, Suiza.