FOOD VS. FUEL:
A FALSE DILEMMA FOR CUBA—A SURVEY OF THE ISSUE

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The objective of this essay is broadly to assess the factors that determine whether the production of biofuels from biomass could be viable in Cuba and whether it could compete with food production. This question is important in view of the significant decreases that have occurred in Cuba's agricultural and food production during the past several decades.

In particular, shortages of staple food products have characterized the last twenty years and, although famine conditions have never materialized, the country has had to import foodstuffs it used to produce before. In 2006, according to the Communist Party official newspaper *Granma*, Cuba commercially imported nearly 85 percent of its food needs. For more than a decade, it has also depended on food donations from the United Nations World Food Program (WFP) to feed more than 700,000 families in the five eastern-most provinces.

In addition, Cuba's capacity to import the food it needs, as well as other critical goods, has severely deteriorated with the collapse of key exports sectors, particularly sugar, and the suspension of large subsidies from the former Soviet Union. Currently, capacity to import food has increased somewhat with the subsidies from Venezuela. A large portion of these food imports comes from the United States.

OVERVIEW

The potential dilemma between the production of bio fuels, based on agricultural feedstock, and food production has become a controversial issue for policy makers. In this context, biofuels include ethanol and biodiesel. Currently, strong interest in the production of biofuels derives from several factors. To wit:

First, the high price of oil prevalent during the past few years, as the result of supply limitations agreed upon by the Organization of Petroleum Exporting Countries (OPEC). In addition, the world is experiencing an apparently insatiable demand for hydrocarbons, spearheaded by countries such as China and India. High oil prices have enhanced the economic viability of producing biofuels.

Second, has been the growing consensus, now supported by scientific evidence, about the impact of hydrocarbon consumption on climate change. Indeed, most scientists now believe that continuous and increasing use of hydrocarbons is a major factor in global warming. This impact, if not abated, could have significant negative effects on the world's ecology, on agricultural productive capacity, and on food production in most countries.

This last concern is important because, according to the Food and Agriculture Organization (FAO) of the United Nations, there are an estimated 850 million people with diets well below internationally-accepted minimum norms. Widespread decreases in food production would make this situation worse. It is important to note, however, that there is consensus on the fact that poverty—lack of income—and not the level of available food supply, currently adequate, is the major cause of hunger in the world.

Third, added to the potential impact of global warming, is competition for productive land. A major concern has been that production of biofuels, based on agricultural feedstock, might divert agricultural land and feedstock into biofuel production, thus decreasing food supply and increasing the price of staples. Recently, the price of both sugar and maize, main inputs used to produce ethanol, has risen rapidly as demand for them by ethanol distillers has increased significantly. This is the core reason for the food vs. fuel potential dilemma.

Finally, economic and political vulnerability. That is, the concern, on the part of oil importing countries, particularly the United States and the European Union (EU), that continuous dependency on oil from a few, often strongly adversarial and unstable producers, is not politically advisable and could lead to political instability.

These preoccupations have resulted in government policies that emphasize the production of alternative fuels, mainly ethanol and biodiesel, which could decrease the demand for hydrocarbons. These actions have also led to governments' decisions to set mandatory levels of use of these alternative fuels in the short to medium term. Additional attention has been placed on research on the direct uses of biomass for the production of energy, a practice that has been extensively followed by the world's peasantry in their households and by many countries in some of their industries.

These issues and factors are important for Cuba. The country does not produce but one-half of the oil required to meet its current energy needs, even for an economy at a depressed level of activity. Cuba, however, has had long—albeit limited—experience in the production of ethanol from sugar and of its use as a supplement for gasoline, as well as in the direct use of biomass (sugar cane bagasse) to produce energy in the sugar mills' boilers. Because of the dismal status of the island's agriculture and food sector, the food vs. fuel dilemma could be real for Cuba, should there be a policy shift to emphasize ethanol production from sugar cane and other feeddstock.

Whether or not it is an issue would depend on a thorough assessment of suitable land availability, yields, and technologies available or used in the country or, said in simpler terms, economic feasibility of different alternatives, under different policy frameworks and organizational sectoral structures. Only such an assessment would answer the question of whether Cuba has the physical and ecological capacity to produce most of the food it requires while also producing feedstock for a biofuel industry.

TECHNOLOGY CONSIDERATIONS

Technologies used to produce ethanol from corn and cane sugar are well known and relatively straightforward. In the case of biodiesel, currently derived from oil seeds such as rapeseed, as well as from palm oil and soybeans, the technology is also simple but more costly, on a per unit basis, than that used for ethanol. For both ethanol and biodiesel production, even with oil at $70 a barrel, production is not cost competitive with hydrocarbons in most countries. Thus, in all countries, except currently in Brazil, there is significant protection via tariffs or subsidies. As the price of oil inches its way to $100 per barrel, however, cost ratios will change in favor of biofuels.

Ethanol can also be produced from a wide variety of other feedstock. These include prairie grasses, renewable biomass and residues from forestry and agricultural cropland, and even municipal wastes. Many of these agriculture-based sources grow on marginal lands, not suitable for food crops. Therefore, their use as feedstock would not divert land from food production. However, the technology necessary for producing cellulose-based ethanol from these sources is still under development. According to rough estimates by the U.S. Energy Information Administration, the capital costs associated with cellulosic ethanol production are several times greater than those for conventional ethanol production.

LOCATION OF CURRENT BIOFUEL PRODUCTION

Brazil and the United States are the world's largest producers of ethanol, the first relying on sugar cane, and the second mostly on maize, a basic food and feedstuff. According to a recent World Bank study on trade and biofuels, prepared by its Energy Sector

Management Assistance Program (ESMAP), only Brazil's ethanol program has attained economic sustainability, as the country, after two decades, no longer uses subsidies or protection to support growth of the industry. Certain tax incentives, favoring the use of gasohol or pure ethanol as transportation fuels, remain though.

Close to 50% of the sugar Brazil produces goes into ethanol production. Parallel to this, its automotive industry has developed a variety of cars and trucks that can use a wide range of combinations of ethanol and gasoline. Ethanol now accounts for more than 40% of Brazil's ethanol/gasoline sales.

In addition to sugar cane, ethanol can be produced from other food stock such as maize, sugar beets, wheat, cassava, and other starches. Sugar, however, seems to be the most cost effective raw material. In the United States, ethanol production originates mostly from maize. This crop is heavily protected by a tariff on ethanol imports, without which ethanol production from maize would be unprofitable. It is because of this tariff, and the government-mandated use of ethanol as a supplement to gasoline, that the industry subsists and grows.

Biodiesel production, concentrated in the EU and based mostly on rapeseed oil, is still far from commercial viability and remains heavily underwritten by tax incentives and trade protection. In fact, where it is available in Europe, mainly Germany and Switzerland, the price of biodiesel at the pump is commonly lower than that of regular diesel. Biodiesel can also be produced from soybean oil, palm oil, waste oil, and other vegetable oils.

Non-EU countries, which have begun production of biodiesel, include Malaysia, Indonesia, the Philippines, and India. Brazil is assessing feasibility of producing biodiesel from soybeans and from low-quality coffee beans. In India, with millions of hectares of marginal lands, the use of jathropa, an oil seed that grows well in such land, is undergoing experimentation.

There is widespread concern that in these countries, cropland will be diverted to the production of biodiesel feedstock. Furthermore, fears abound about deforestation in the Amazon and in the Indonesian forests, in order to plant soybeans and oil palm, because that shift would increase the environmental and ecological costs of producing biofuels.

IS THE THREAT AGAINST FOOD PRODUCTION TRULY SERIOUS?

According to a study by the UN Foundation, as well as the FAO (OECD and FAO, *Agricultural Outlook, 2007–2016*), there are sufficient land areas worldwide to increase production of feedstock for biofuels without significantly affecting the adequacy of the food supply. The development of cost effective cellulosic ethanol technology would decrease pressure on cropland, as agricultural residues could then become major feedstock to the industry. For instance, agricultural residue from maize areas could be the source of ethanol without affecting the use of maize grain for food and feed.

By way of illustration, in the United States, there are about 400 million acres under cultivation. These areas consistently produce surplus food crops. However, it is estimated that one half of nation's 2.26 billion acres have some potential for biomass production. In addition, most researchers believe that increases in food crop yields will continue that will make feasible to feed more people from a given area cropped. It is also feasible to use residues from the production of ethanol from biomass as cattle feed, thus reducing the need to use maize for this purpose.

In addition, from an income standpoint, given that the major cause of hunger is poverty, increased demand for biofuels is likely to increase prices paid to producers of feedstock and/or result in more paid employment. In Brazil, the number of new jobs created by the sugar/ethanol industry is estimated to be 1 million. Thus, more people will be able to access the food they need.

There are social problems that could/will arise. For example, some NGOs in Brazil, including religious ones, submit that working conditions in many of the sugar plantations in that country are just slightly better than slavery.

THE CUBAN CASE

Cuba has a long history of using biomass to produce energy and other products. In addition to sugar, the sugar cane industry has produced ethanol for fuel as well as molasses for cattle feed, and rum. Sugar cane bagasse, the residue from the cane harvest, was traditionally used to run the sugar mill boilers, either by itself or by mixing it with bunker oil. This practice continues to this day. Bagasse was also used, during the decade of the 1950s, to produce newsprint and compressed boards. During the same decade, ethanol, mixed with gasoline at a 10/90 ratio, was sold as vehicular fuel. At the time, it was called the "national fuel." No data is available regarding what share of consumption this fuel accounted for.

During the last 15 years, sugar production in Cuba has decreased precipitously. In 1959, Cuba was the world's largest exporter of sugar and literally dominated the international market, with total exports of sugar surpassing 5 million tons per annum. In contrast, the 2007 sugar harvest, at about one million tons, was the lowest in more than 100 years, sufficient only to cover local (rationed) consumption of roughly 700 thousand tons and not quite enough to fulfill export contracts with China.

After the 2002 government decision to restructure the sugar industry, the number of sugar mills decreased drastically. Only 42 mills participated in the 2007 harvest. More than half of the 161 mills active in the 1980s have been either dismantled or literally abandoned to rust. More than 200,000 workers have been released by the industry. In 2005, the government announced new investments to reactivate the sugar sector in order to take advantage of higher sugar prices. That effort, if it was carried out, seems to have produced nothing.

Agricultural yields have also decreased radically. Cuban fields now yield less than 30 tons of sugar cane per hectare compared with a world average of 63 tons per hectare. Concerning production of sugar, the Cuban government has reported that, in 2006, industrial yields averaged less than 11%, compared with the average 12.83% reached during the decade of the 1950s.

Underlining these decreases in productivity, there has been a serious deterioration in the quality of soils in sugar cane plantations. Mismanagement of harvesting machinery has resulted in widespread soil compacting and, in many areas, water-logging. Too late and haphazard harvesting of sugar cane have destroyed many of the cane plants that were traditionally able to produce for several years without replanting

Furthermore, over one million hectares of land (about 2.5 million acres), of the total 1.8 million hectares (about 4.5 million acres), formerly planted with sugar cane, have been abandoned and taken over by *marabú*, a variety of acacia, a deep-rooted bush that produces nothing of value and is very difficult to eradicate. Thus, close to 2 million hectares of land could be used in the future for an integrated sugar industry: one that could produce sugar, ethanol, paper, cattle feed, and other products without competing for foodstuff cropland, provided that a return to earlier productivity levels are achieved. The possibility of directly using sugar cane biomass to produce surplus electricity, in addition to fueling the mill during the harvest, has also been technically proven profitable.

The international market for sugar, though, has changed radically since the beginning of the Revolution. In 1959, Cuba exported more than three million tons of sugar to the United States, under a preferential quota. In 2006, total U.S. imports of sugar were lower that 1.6 million tons. The United States now produces close to 8 million tons of sugar, from both sugar cane and sugar beets. Furthermore, production and consumption of non-sugar sweeteners has exploded.

For domestic political reasons and the present allocation of import quotas, it is unlikely that U.S. domestic production would decrease to permit Cuba to become again a highly significant player in U.S. sugar imports. An additional factor is that, under the North American Free Trade Agreement (NAFTA) after 2008, Mexican sugar will have unrestricted access to the U.S. market. Other than cane sugar, however, U.S. demand for ethanol and other sugar cane-

based products could provide the new market for a renewed Cuba's sugar cane sector.

SUGAR OR ETHANOL?

I have asserted that, if former sugar cane areas are recoverable, Cuba will have close to 2 million hectares of land available to produce sugar cane. As mentioned before, the historical experience of Cuba and Brazil shows that many products can be obtained from sugar cane, in addition to sugar itself, for example molasses for cattle feed, newsprint, rum, etc. All of these products can be produced using the entire cane plant, without competing for land for food crops and using existing technology.

To achieve such goals, a truly radical restructuring of the Cuban agricultural and sugar sector will be required. This restructuring will require a drastic policy shift that can/should be rapidly implemented regardless of the government in power. There needs to be a clear government policy that establishes the goal of rescuing the sugar industry, which identifies the actions proposed to reach these goals.

In my opinion, overall, agricultural land and the sugar mills should be privately owned, the property of the producers, as individuals, cooperatives, or corporations. Foreign direct investment and join ventures in the sector should be legal, subject only to key necessary regulation and taxation. The market for labor should be free. That means that owners hire workers and pay them directly. Labor unions should be legal and independent from the state. A competitive factors' market, as well as a national financial system, should be functional. A functioning free market determining prices should be the rule. Intermediation should be legal and highly competitive. Contracts should be enforceable.

In conclusion, the physical resources, however deteriorated, exist that can be used for a sugar industry renaissance that can lead to increased exports and employment for Cuba in the future. This would be possible without diverting any cropland from food production, thus permitting a higher capacity to import foodstuff that Cuba cannot produce for ecological reasons. In this effort, the role that capital, market, and technical know-how of Cuban exiles can play cannot be overemphasized, but will require a soft touch to insure its full participation in the process.

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