

EU AND U.S. POLICIES ON BIOFUELS:  
POTENTIAL IMPACTS ON  
DEVELOPING COUNTRIES

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# EU AND U.S. POLICIES ON BIOFUELS: POTENTIAL IMPACTS ON DEVELOPING COUNTRIES<sup>1</sup>

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# INTRODUCTION

The dramatic rise in energy prices, the geopolitical tensions in some oil producing regions and the uncertainties surrounding the future availability and access to nonrenewable resources have awakened a strong interest for biofuels in many parts of the world. The enthusiasm for biofuels, as an alternative to fossil fuels, can be observed not only in Brazil — the world pioneer in competitive bioethanol production — but also in the United States (U.S.) and in the European Union (EU), as well as in many developing countries.

Although international trade in biofuels is currently extremely limited, empirical evidence suggests that the flow of biofuels should increase in the coming years as countries engage in ambitious policies geared toward the diversification of energy sources. On the one hand, the demand for biofuels is expected to scale up significantly in developed countries that want to limit their consumption of fossil fuels. However, limited land availability in these countries restricts the potential increase of feedstock for biofuels production. In addition, the cost efficiency and the environmental impact of biofuels produced in developed countries are rather negative. On the other hand, tropical and subtropical developing countries have a real comparative advantage in the production of feedstock for biofuels end-use, such as cane sugar and palm oil. These raw materials can not only be produced at a lower cost but are more energy efficient than feedstock available in developed countries.

Since the supply and demand of biofuels are not originating from the same place, in theory, there should be room for significant increases in international trade flows. However, the national policies enacted by the major biofuels consumers in the developed world might seriously reduce the export opportunities for developing countries.

The objective of this paper is to analyze the impact of EU and U.S. trade policies on biofuels production and the export potential of different groups of developing countries that have engaged in the biofuels industry. In this study we will only consider the production of first-generation biofuels based on agricultural feedstock.

The first section of this paper analyzes the evolution of the EU and U.S. national policies for biofuels and assesses their potential needs for imports in the medium term. The second section is dedicated to the description of policies carried out by the developing countries that have an interest in developing biofuels industries. The third section of this study describes the current barriers put in place by developed countries that limit the biofuels export potential of developing countries. Finally, an impact evaluation of the intensification of biofuels policies in the EU and the U.S. on developing countries is provided.

*Tropical and subtropical developing countries have a real comparative advantage in the production of feedstock for biofuels end-use, such as cane sugar and palm oil. These raw materials can be produced at a lower cost and they are more energy efficient than feedstock available in developed countries.*

# 1 BIOFUELS STATE OF PLAY IN THE EU AND THE U.S.

*The non-harmonization of policies at the EU level has encouraged member states to act as free-riders and to elaborate their own action plans and instruments independently of the policies carried out in the rest of the EU.*

Country concerns over energy security and the high cost of oil have led to the search for viable alternatives to hydrocarbon-based fuels. Biofuels — especially ethanol and biodiesel — are emerging as strong contenders, with the potential added benefits of environmental friendliness and alternative uses for agricultural commodities. In recent years, a wave of enthusiasm for biofuels has been observed in the EU and U.S., and ambitious programs have been launched on both sides of the Atlantic. The main drivers behind these policies are: energy security, support for farm incomes, and environmental concerns.

This section describes the current state of play regarding biofuels in the EU and U.S., and provides an assessment of the future development of this industry over the medium term (2012), focusing on the potential import needs that could result from the expansion of biofuels policies in the two regions. The year 2012 has been chosen because it allows for a perspective over the next five years, a transition period during which no technological breakthrough is expected that would dramatically modify the current prospects for biofuels production. In addition, 2012 is the date of the last consumption target set by the U.S. government.

Because the biodiesel program in the U.S. is still in its infancy stage, it will not be considered in this study.

## 1.1 European Union

The EU policy for biofuels is part of a larger action plan that promotes the increasing use of renewable energies. The first step, enacted in a white paper released in 1997, set a goal of 12 percent of renewable energy by 2010. By adopting the directive EC 2003/30 in 2003, EU members took an additional step and committed themselves to offer 2 percent of biofuels on their transportation fuel markets by 2005 and 5.75 percent by the year 2010. The objectives set in the directive are not mandatory; however, EU members are required

to annually submit reports describing the way they implement the objectives of the directive or how they plan to do so. To foster the production of feedstock dedicated to biofuels production, the European Commission introduced, in 2003, as part of the reforms to the Common Agricultural Policy (CAP) a new payment granted to energy crops produced from set-aside areas (45 €/ha). The Commission has also authorized EU member states to grant tax relief to biofuels.

These three “minimal” measures are the total extent of European policies on biofuels. The non-harmonization of policies at the EU level has encouraged member states to act as free-riders and implement their own action plans and instruments independent of those policies carried out in the rest of the EU. This leads to very heterogeneous situations, in terms of national interest, in the production of first-generation biofuels and in the development path of biofuels projects. As shown in Table 1, this heterogeneity translates in blending percentages that are well below the directive objectives.

Despite the current disappointing incorporation rates, the European energy ministers decided in February 2007 to move the target percentage to 10 percent of biofuels blend into fossil fuels by the year 2020.

### 1.1.1 EU production and consumption of biodiesel

Unlike the other biofuels key players, the EU produces more biodiesel than bioethanol. Fully 54.6 percent of transport fuels consumed in the EU are diesel versus 45.4 percent for gasoline. However, this proportion is not reflected in the production of biofuels: biodiesel accounts for more than 80 percent of EU total biofuels production. In 2005, the EU major producers of biodiesel were Germany (52.4 percent), France (15.5 percent), and Italy (12.4 percent). The main feedstock used for the

**Table 1: Biofuels Incorporation Rates (2005)**

<b>Total EU-25</b>	<b>Around 1%</b>	Italy	0.51
Austria	0.93	Latvia	0.33
Belgium	0	Lithuania	0.72
Cyprus	0	Luxemburg	0.02
Czech Republic	0.05	Malta	0.52
Denmark*	0	Netherlands	0.02
Estonia	0	Poland	0.48
Finland*	0	Portugal	0
France	0.97	Slovakia*	0.15
Germany	3.75	Slovenia	0.35
Greece*	0	Spain	0.44
Hungary	0.07	United Kingdom	0.18
Ireland	0.05	Sweden	2.23
<b>Objective: 2%</b>			

\* 2004 data because 2005 were not communicated.  
Source: European Commission

production of biodiesel is rape oil (approximately 90 percent of the EU biodiesel production). Sunflower, palm, and soy oils are also used in very small quantities.

As a result of recent government incentives, the production of biodiesel has increased very quickly in the last five years from 1 billion liters in 2000 to 4.45 billion liters in 2005.<sup>2</sup> The expansion of biodiesel production has put pressure on the rapeseed market. The areas dedicated to the cultivation of rapeseeds and sunflower seeds for energy end-use have increased from 780,000 in 2004 to 1,634,000 hectares in 2006, representing 22 percent of the total area dedicated to both crops. This expansion is taking place in areas traditionally dedicated to food crops. Currently the EU is using

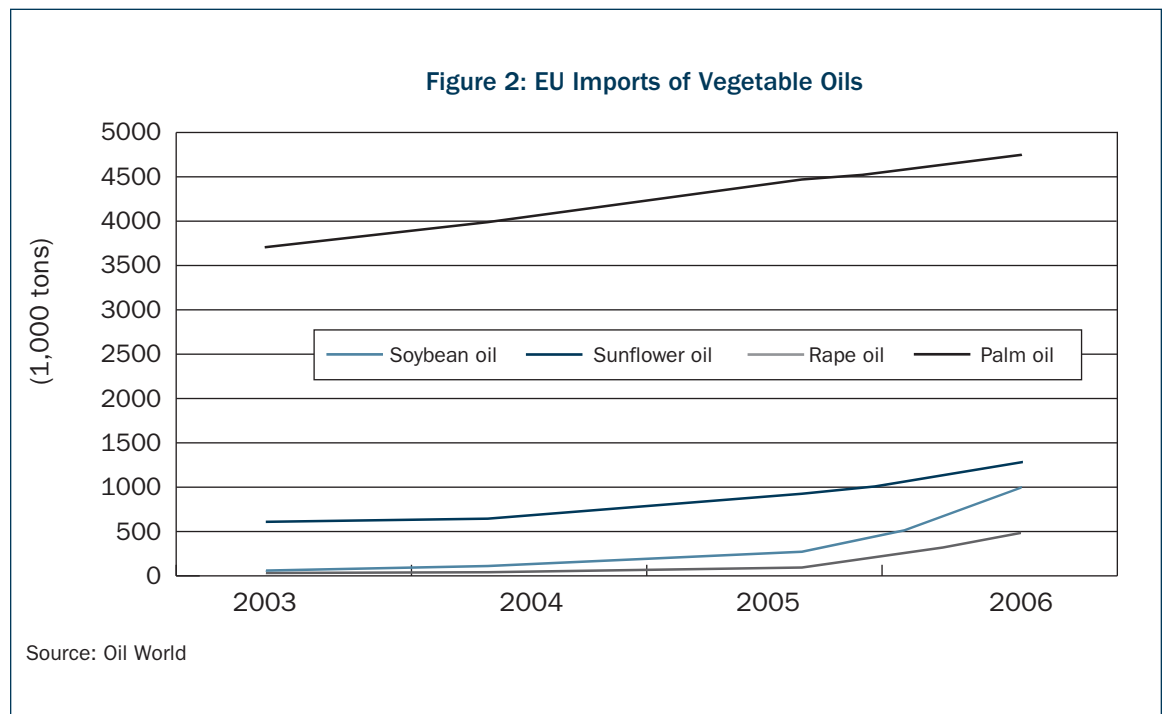
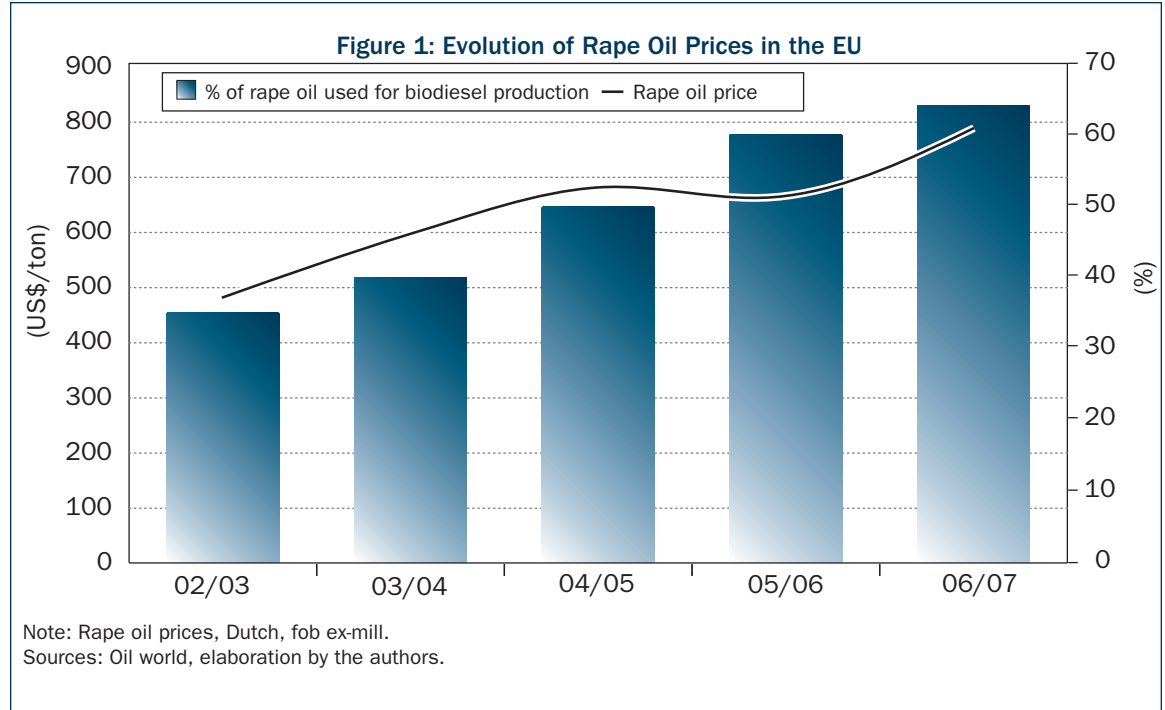
<sup>2</sup> EurObserver 2006.

a little bit more than 40 percent of its rapeseed production and approximately 62 percent of its rape oil production for the manufacturing of biodiesel. The pressure on rapeseed areas is mainly due to the low productivity of this feedstock in terms of liters of biodiesel per hectare (2,000 liters/ha). The increasing demand for rape oil has also a strong impact on oil prices. Figure 1 shows the parallel trend between the evolution of rape oil prices and the expansion of rape oil use for biodiesel production in the EU. Between 2002–2003 and 2006–2007, rape oil prices have jumped by 63 percent.

The surge in rape oil prices and the increasing share of the oil production used for biodiesel have significant consequences on the agri-food industry that uses rape oil as a raw material for the production of bottled oil, margarine, and pastry.

*The surge in rape oil prices and the increasing share of the oil production used for biodiesel have significant consequences on the agri-food industry that uses rape oil as a raw material for the production of bottled oil, margarine, and pastry.*

If the EU decides to limit the oilseed area dedicated to biodiesel feedstock to 50 percent of the total oilseed area, the EU will need to import 4.16 million tons of vegetable oil or biodiesel.





For these industries the vegetable oil purchasing costs account for a significant share of the final product prices. The combination of these two pressures promotes the use and import of other vegetable oils. Between 2003 and 2006, EU imports of the main vegetable oils grew by more than 50 percent. Palm oil is the most requested vegetable oil, accounting for almost half of the imports. Indonesia (66 percent) and Malaysia (34 percent) are the main suppliers of the EU market. Although the majority of the imported palm oil is used by the food industry — frequently in substitution for rape oil that is becoming too expensive — it is interesting to note that the share of imports of palm oil for industrial use has been multiplied by 3.4 between 2001 and 2006. Currently palm oil accounts for 15 percent of EU total imports.

### **1.1.2 Perspectives on biodiesel production and consumption**

According to the objectives set by the EU in terms of biofuels blend,<sup>3</sup> biodiesel consumption should reach 14.4 billion liters by the year 2012 (6.6 percent of biodiesel incorporation). Assuming that biodiesel will be produced with 85 percent of rape oil and 15 percent of sunflower oil, the EU should use 84 percent of its oilseeds area (including set-areas available for oilseeds production) projected for 2012 by the European Commission in order to be able to produce the required quantities of biodiesel (see Figure 3). This would force the EU to import around 86 percent of the oilseeds needed for food purposes while 50 percent was imported in 2006. The expansion of rapeseed areas are constrained by the rotational limits reached in most of the producing regions. Sunflower oil may have a greater potential for area extension; however, yield potential is limited by constraining

<sup>3</sup> The objectives set by the EU are 5.75 percent of biofuels incorporation in 2010 and 10 percent in 2020. The incorporation rate for 2012 is derived from a flat annual increase of the incorporation rate between 2010 and 2020.

water availability in the main producing regions. Regarding non-food oilseeds set-aside area, it is expected to remain stable at around 0.8 million hectares due to constraints imposed by the Blair House Agreement (maximum of 1 million tons of soybean meal equivalent).

The required areas to reach the 2012 objective show that the production of biodiesel is unsustainable if imports do not increase. If the EU decides to limit the oilseed area dedicated to biodiesel feedstock to 50 percent of the total oilseed area, the EU will need to import 4.16 million tons of vegetable oil or biodiesel. Because EU technical norms limit the utilization of soy and palm oil blend in diesel, the majority of imports should be rapeseeds/rape oil and sunflower seeds/oil. The decision to import oilseeds or oil will depend on the investments made to significantly increase the EU crushing capacity. However, the impact of the growing consumption of biodiesel in the EU will not be limited to vegetable oils imports to be blended with diesel. Imports of vegetable oils for food consumption will also rise to substitute the quantities of oil produced in the EU that will be dedicated to biodiesel. In addition, imports of palm, soy, and sunflower oil are expected to more than double.

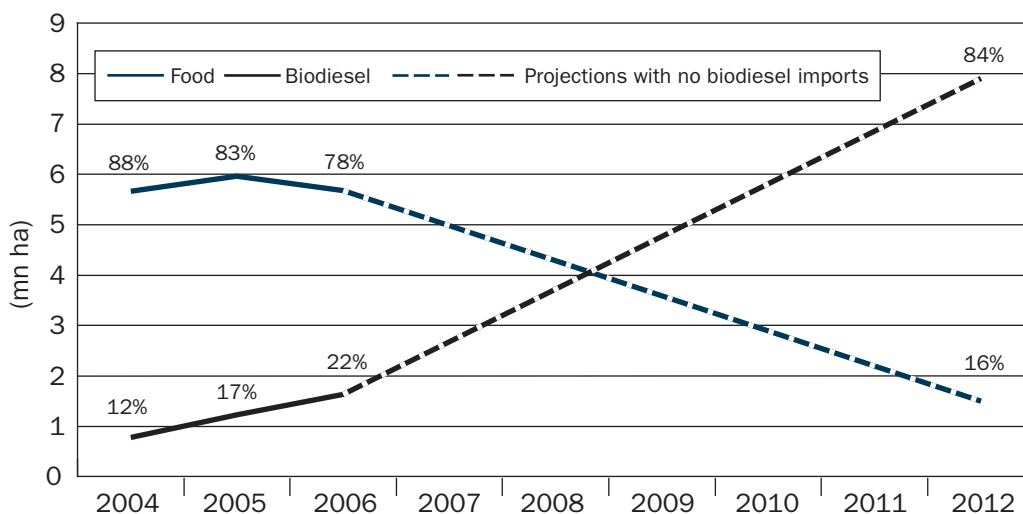
### **1.1.3 EU production and consumption of ethanol**

Although the EU is the world's fourth largest producer of ethanol, it lags far behind Brazil and the U.S. In 2006, EU ethanol production increased by 71 percent compared to 2005, but it hardly reached 1.5 billion liters. The main producers of ethanol in the EU are Germany (28 percent), Spain (26 percent), France (16 percent), Sweden (9 percent), Italy (8 percent), and Poland (8 percent).<sup>4</sup>

Contrary to the situation prevailing in Brazil and in the U.S., where ethanol is produced from a

<sup>4</sup> European Bioethanol Fuel Association (eBio), press release dated March 21, 2007.

**Figure 3: Projections of Required Oilseeds Area to Reach the 2012 Objective**



Sources: ONIGC, European Commission, projections by the authors.

single crop (cane sugar in Brazil and corn in the U.S.), a large variety of feedstock is used to produce ethanol in the EU. Cereals (wheat, corn, barley, and rye) account for the major part of the production, followed by sugar beet and wine. Sugar beet is the most efficient crop; it produces 7,250 liters of ethanol by hectare (3,125 for cereals). However, the environmental balance of ethanol produced from sugar beet is not as good as cereals-based ethanol. Currently only France produces ethanol from sugar beet, but there is significant potential for expansion. Because the production of ethanol is much smaller than biodiesel production, and because it is based on the utilization of various feedstocks — of which the EU is a net exporter of some — ethanol has no notable impact on agricultural land availability and commodity prices. On the contrary, it provides a new alternative to sugar beet growers after the reform of the sugar CMO,<sup>5</sup> adopted in February

<sup>5</sup> Common Market Organization.

2006, that reduced the beet price by almost 40 percent and limited the sugar export opportunities to the “World Trade Organization (WTO) quota” (1.3 million tons).

Although it is difficult to have precise data on ethanol imports due to the low level of desegregation of the customs nomenclature<sup>6</sup>, it appears that Brazil exported 230 million liters of ethanol to the EU in 2006 (15 percent of EU production). Countries of destination were Sweden, the United Kingdom, and Finland.<sup>7</sup>

#### 1.1.4 Perspectives on bioethanol production and consumption

To comply with EU objectives, assuming 6.6 percent rate of incorporation, the consumption

<sup>6</sup> Ethanol enters into the 220710 and 220720 tariff lines that cover denaturized and nondenaturized alcohol.

<sup>7</sup> Data provided by eBIO (European Bioethanol Fuel Association).

**Table 2: Projections for EU Production of Ethanol 2012**

	2006				2012			
	Ethanol production		Feedstock production		Ethanol production		Feedstock production	
	(mn liters)	Share	(mn tons)		(mn liters)	Share	(mn tons)	
<b>Total</b>	<b>1,560</b>		<b>Total</b>	<b>For ethanol</b>	<b>10,085</b>		<b>Total</b>	<b>For ethanol</b>
Wheat	504	32.3%	109.3	1.4	4,034	40%	135.9	11.2
Barley	440	28.2%	53.6	1.1	440	4%	46.1	1.1
Corn	200	12.8%	44.6	0.5	1,291	13%	51.9	3.2
Rye	200	12.8%	7.8	0.5	200	2%	9.1	0.5
Beet	88	5.6%	141.7	0.8	3,864	38%	120.7	35.2
Wine	128	8.2%	—	—	256	3%	—	—

Sources: eBIO, European Commission, calculations by the authors.

of ethanol should reach 9.2 billion liters by 2012. Because many of the EU countries have not yet started to produce ethanol, it is not easy to predict what will be the share of each feedstock in the EU ethanol production by 2012. But based on the area and production projections made by the European Commission, it can be assumed that the larger potential for expansion relies on wheat, sugar beet, and corn.

Table 2 compares the current and the potential ethanol production pattern for 2012. It can be noticed that the increased use of wheat, corn, and sugar beet is compatible with the projected level of production. In this scenario, wheat for ethanol will only account for 8.2 percent of the total EU wheat production and the quantities required will be equal to 50 percent of projected wheat exports. In the case of corn, ethanol development will involve 6.1 percent of total production. The strongest pressure will be applied to sugar beet production since 29.1 percent is expected to be used for ethanol. However, this expansion will compensate for the reduction in sugar production imposed by the 2006 reform.

The results presented in Table 2 do not reveal any significant impact of ethanol development on EU agricultural markets and show that, from the perspective purely of agricultural production, the EU will not need to import ethanol.

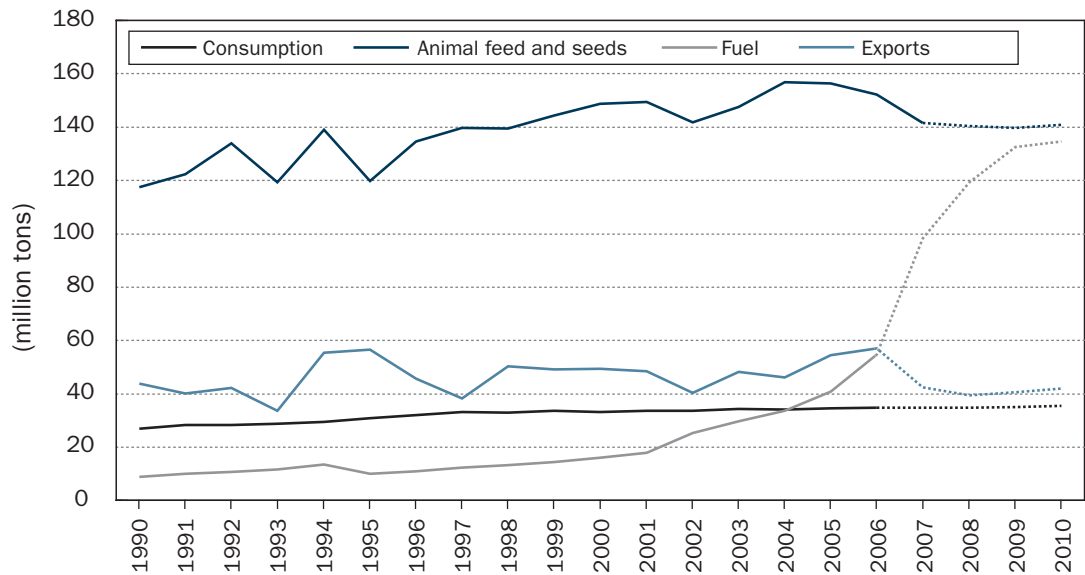
## 1.2 United States

The U.S. is the world's biggest petroleum consumer, utilizing over 3.2 billion liters (840 million gallons) of petroleum products each day. Almost half of it is gasoline used in over 200 million motor vehicles.<sup>8</sup> Although the U.S. is an oil producer, imports represent 64 percent of oil consumption.

In August 2005, President George W. Bush signed the Energy Policy Act. The legislation set a target of 28.4 billion liters consumption of renewable fuels by 2012 (Renewable Fuels Standard), it represents around 5 percent (in volume) of gasoline consumption projected for the year 2012. However,

<sup>8</sup> EIA. "Where does my Gasoline come from," Energy Information Administration Brochures, DOE/EIA X059, May 2006. Available at <http://www.eia.doe.gov/neic/brochure/gas06/gasoline.htm>. Accessed on April 5th, 2007.

Figure 4: Corn Utilization in the U.S.



Source: 1990-2006: United States Department of Agriculture (USDA); 2006-2010: projection presented by Prof. Bruce Babcock at the WWC Biofuel seminar (Feb2007).

according to the political public discourse, the U.S. might go beyond this objective. In his 2007 State of the Union Address, President Bush called for a mandatory fuel standard that will require 132.5 billion liters of renewable and alternative fuels by 2017, nearly 5 times the 2012 target now in place. It would displace 15 percent of the projected annual conventional gasoline use.<sup>9</sup>

### 1.2.1 U.S. production and consumption of ethanol

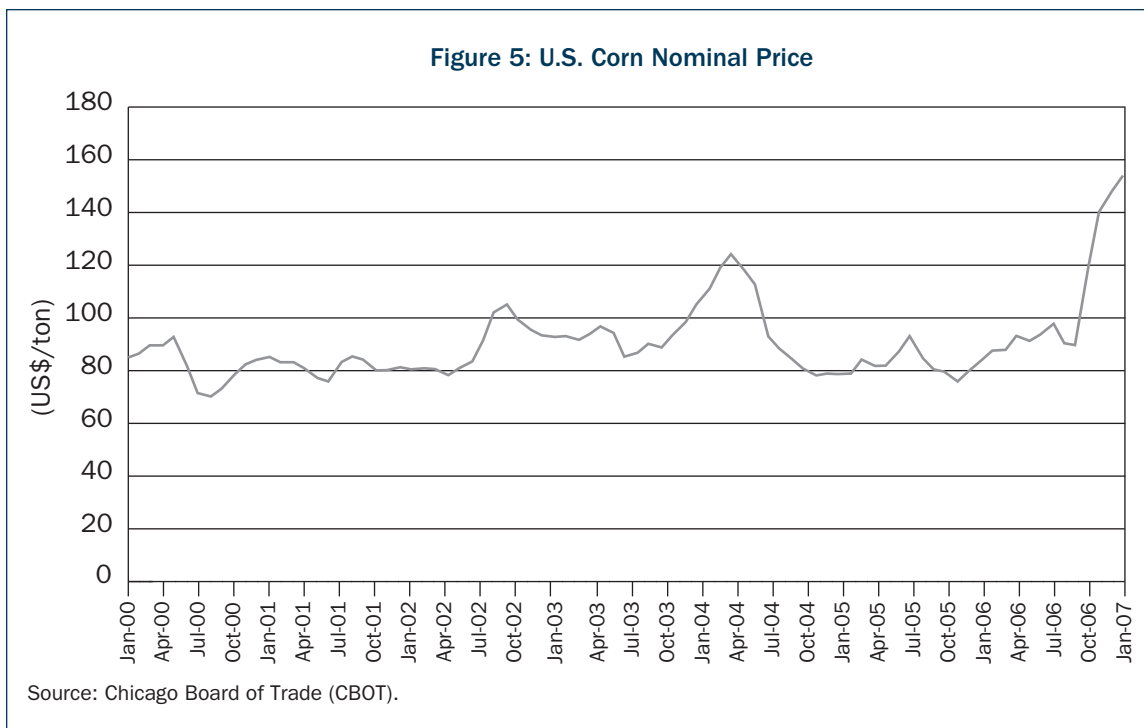
The growth rate of ethanol fuel production and consumption has been extremely elevated in the past years. Between 2002 and 2006, production increased by an annual average of 23 percent, while

<sup>9</sup> In energy equivalent. In volume it would represent around 24 percent of its light vehicles transportation fuel needs (assuming that the target would be met using only ethanol). The automobile industry in general affirms that up to 10 percent ethanol blend (in volume) in gasoline does not require any mechanical change to the fleet. Therefore, to meet Bush's target, some adaptations would be needed.

consumption has grown by 27 percent per year. As a result, ethanol blend (in volume) in gasoline rose from 1.5 percent in 2002 to 3.8 percent in 2006, representing a consumption of 20.4 billion liters.

The incredible increase in U.S. production can be attributed to governmental policies. First, the Renewable Fuel Standards (RFS) targets created a guaranteed market for the product. Second, thanks to heavy tax incentives, the U.S. has invested deeply in the development of its ethanol industry. However, this intensive development has had a strong impact on feedstock prices because the ethanol industry is entirely based on corn. Presently, around 20 percent of the country's production is dedicated to ethanol and is expected to rise (Figure 4). Corn prices reached US\$154 per ton in January 2007,<sup>10</sup> a historic record (Figure 5), and are not expected to fall in the near future.

<sup>10</sup> CBOT- Chicago Board of Trade



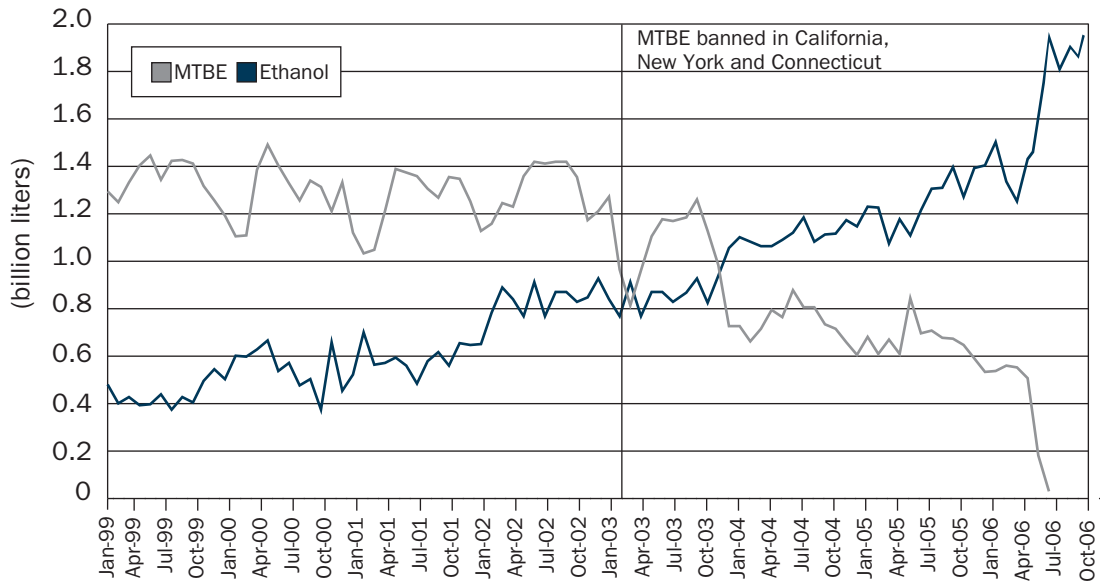
The current projected production capacity is more than sufficient to meet the goals set in the existing U.S. ethanol legislation. However, it is almost certain that consumption levels will be higher than the targets in place. The production capacity will probably not see any significant increases — at least not beyond the projects already planned and under construction — because an increase in the production capacity with no technological breakthrough (cellulosic ethanol) will continue to put an upward pressure on corn prices, affecting returns in the ethanol industry as well as the prices of corn-dependent products. As a result, it is likely that there will not be any new investment in the industry in the medium term.

Demand in the U.S. has been driven heavily by public policy. Two main policy drivers ultimately determined the level of demand. The first was the adoption of the RFS. The 2006 goal was set at 15.1 billion liters, and a minimum level demand

was created. The second was the 1995 government-established federal Reformulated Gasoline program (RFG), which required a certain level of oxygen in the content of the gasoline sold in specified areas as a means of combating air pollution. The main additive used for that purpose was Methyl Tert-Butyl Ether (MTBE). However, MTBE was found to cause serious contamination of ground water, and beginning in 2003 more and more U.S. jurisdictions instituted bans on its use (Figure 6). Ethanol was the chosen substitute. It boosted ethanol consumption and prices, and opened a window of opportunity for developing countries (mainly Brazil) that were ready to supply ethanol to the U.S. market (Figure 7). However, as new plants started operating, production increased and prices dropped to previous levels. Brazilian exports became less competitive because of the ethanol tariff. As a result, Brazilian sales to the U.S. are expected to be significantly lower in 2007 than they were in 2006.

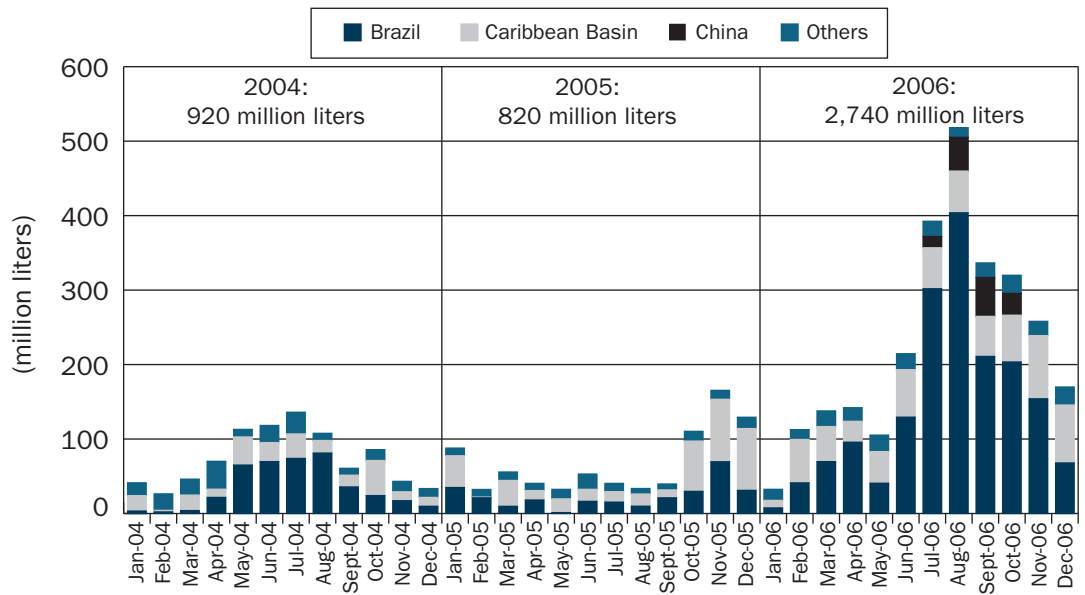
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**Figure 6: U.S. Fuel Ethanol and MTBE Consumption**



Source: Energy Information Agency (EIA), elaboration by the authors

**Figure 7: U.S. Ethanol Imports**



Source: United States International Trade Commission (USITC)

### 1.2.2 Perspectives on ethanol production and consumption

In the medium term (2012), the upper level of ethanol consumption in the U.S. is expected to be 10 percent, in volume, of the gasoline consumption. It would represent 56.6 billion liters of ethanol. Greater use would require some technical adaptations in the American fleet to allow for such a blend.

Projected installed capacity — considering only current projects — is expected to be 45.2 billion liters in 2009. If we assume an average idle capacity of 10 percent,<sup>11</sup> the U.S. would be able to produce 41.7 billion liters in 2012 (47 percent more than the Renewable Fuel Standard targets), requiring 107 million tons of corn. This represents 7.4 percent of gasoline demand. It can be assumed that this will be the lower level of consumption, if very low imports are also assumed. Some specialists

<sup>11</sup> We assume a residual increase in capacity that follows gasoline predicted growth (1.5 percent per year) and we assume new plants are 5 percent more productive than old ones.

believe national production could reach as much as 53 billion liters,<sup>12</sup> representing a 9.4 percent blend. However, an extra 2 percent substitution (going from 7.4 to 9.4 percent) would require an additional 5 million hectares and 44 million tons of corn. Given the current U.S. target, we can assume that there will not be any sharp increase in domestic production unless a new objective is set. As a consequence, future U.S. domestic consumption will probably be determined by currently planned production capacity and by the export potential of countries benefiting from duty-free access to the U.S. market.<sup>13</sup>

Table 3 summarizes the main indicators of the EU and U.S. biofuels sectors and provides elements of comparison with Brazil.

<sup>12</sup> Babcock, Bruce. "Projections of U.S. Ethanol Production and Associated Impacts on U.S. and World Agriculture," presentation made at the Woodrow Wilson Center seminar: *Global Dynamics of Biofuels*, Washington, February 22nd, 2007.

<sup>13</sup> Assuming that the costs of production in developing countries are lower than in the United States.

*Future U.S. domestic consumption will probably be determined by currently planned production capacity and by the export potential of countries benefiting from duty-free access to the U.S. market.*

**Table 3: Biofuels Overview of Brazil, the U.S. and the EU**

	<b>Brazil</b>	<b>U.S.</b>	<b>EU</b>	
	2006/07	2005/06	2005	
	<i>Ethanol</i>	<i>Ethanol</i>	<i>Ethanol</i>	<i>Biodiesel</i>
Plants in operation	335	97	32	120
Feedstocks	Sugar cane	Corn	Cereals, sugar beet, potatoes, etc.	Oil from rapeseed, sunflower, palm and soy, animal fats, frying oils etc.
Areas cultivated (mn hectares)	6.4	31.6	*Cereals: 51,5 *Sugar beet: 2,2	6
Feedstocks production (mn tons)	426	267	*Cereals: 253 *Sugar beet: 116	19.7
% of feedstocks dedicated to biofuels	48%	20%	*Cereals: 1.6% *Sugar beet: 0.6%	40% rapeseed
Yields (t/ha)	66.2	8.4	*Cereals: 6.2 *Sugar beet: 66	*Rapeseed: 3.4 *Sunflower: 1.7
Biofuels production (mn liters)	17,411	18,547	902	4,458
Productivity (liters/hectare)	6,800	3,000	*Cereals: 3 125 *Sugar beet: 7 250	*Rapeseed: 1 999 *Sunflower: 833
% of biofuels consumption in fossil fuels	40%	3.8%	0.60%	2%
Imports (mn liters)	—	2,850	250	—
Exports (mn liters)	3,028	—	—	—
Costs of production (US\$ cents/liter)	22	40	50–75	44–81
Tariffs	0%	46%	63%/39%	6.5%

Notes: 2005 production costs for Brazil and the U.S., 2004 for Europe. U.S. and Brazil data for ethanol are for the year 2006. U.S. import duty presented is the AVE (2004-2005 average) for nondenaturalized ethanol (54 cents/gallon + 2.5%). EU import duty is the AVE (2004-2005 average) for nondenaturalized ethanol (19.2 €/hl) and denaturalized ethanol (10.2€/hl).

Sources: ICONE and GEM from various sources



## 2 BIOFUELS POLICIES IN DEVELOPING COUNTRIES

Concerns about high oil prices and energy independence also affect developing countries. In many of them there is significant potential for biofuels production because tropical and subtropical feedstocks for biofuels usually have better energy and environmental balances than crops grown in countries of the Northern Hemisphere (Table 4). By developing biofuels programs, developing countries will be able to substitute part of their domestic consumption of fossil fuels and some of them will also be able to export biofuels or feedstock for biofuels production to developed countries. As a result, biofuels industries could provide new opportunities for developing countries to boost their agricultural sector and to export products with a higher added-value.

This section provides a description of the biofuels policies carried out in a selection of developing countries that have both an interest in and strong potential for the production of alternative fuels. The list of countries under consideration in this study is not exhaustive.

### 2.1 Developing countries with a potential for ethanol production

#### 2.1.1 Brazil

Energy security has been the driving force behind the Brazilian ethanol program, which began in the 1970s. All gasoline sold in Brazil must contain between 20 and 25 percent of ethanol blended (in volume). In 2003, Flex Fuel Vehicles (FFV) were first introduced to the auto market. Such cars can run on any blend of gasoline and ethanol. Today, they represent more than 80 percent of all new light vehicles market sales. It is estimated that by 2012, 46 percent of the entire light vehicle fleet will be FFVs. Currently ethanol represents 40 percent of the light fuels consumed (gasoline plus alcohol). With a production that reached 17.4 billion liters in 2006, Brazil is the world's second largest producer of ethanol.

There are 335 bioethanol plants in Brazil; the vast majority are capable of producing either sugar or ethanol using sugarcane as feedstock. Brazil is the world's leading sugar producer and exporter.

*Today, Flex Fuel Vehicles represent more than 80 percent of all new light vehicle market sales in Brazil.*

**Table 4: Energy and Environmental Balance of Feedstock for Biofuels**

	Ethanol	Biodiesel
<b>Energy balance*</b>	Wheat and sugarbeet ethanol: 2	Sunflower biodiesel: 3.2
	Corn ethanol: 1.5	Rapeseed biodiesel: 2.7
	Sugarcane ethanol : 8.3	Soy biodiesel : 3
<b>Environmental balance**</b>	Sugar beet ethanol: 2.17	Soy biodiesel : 2.6
	Wheat ethanol : 1.85	Rapeseed biodiesel: 1.79
	Sugarcane ethanol: 0.41	Palm biodiesel: 1.73
	Straw ethanol: 0.33	Wood biodiesel: 0.27

Notes: \*returned units of energy per each unit of nonrenewable used energy

\*\* GHG emissions per ton oil equivalent (toe), in ton equivalent CO<sub>2</sub>

Sources: ADEME, European Commission, Worldwatch Institute

*The main concern regarding sugarcane expansion in Brazil is not land availability, but has to do with logistics, which explains why the current expansion is concentrated in traditional sugarcane areas.*

In 2006, 6.45 million hectares of sugarcane were cultivated and around 3 million hectares were dedicated to ethanol production, which represents less than 1 percent of Brazil's arable land. Sugar cane for ethanol is cultivated in the southeast of the country (São Paulo region). The expansion of sugarcane plantations linked to the increase in bioethanol production will occur in areas currently dedicated to pastures (58.8 percent of arable lands), oranges, corn, and soybeans (soy represents 6.8 percent of arable lands). So, the main concern regarding sugarcane expansion in Brazil is not land availability, but has to do with logistics, which explains why the current expansion is concentrated in traditional sugarcane areas in the city of São Paulo and surrounding areas that include: west of Minas Gerais, south of Goiás and Mato Grosso do Sul, and north of Paraná. In the Amazon, expansion will not take place in the forest area since the soil and climatic conditions in the area do not make it suitable for sugarcane production.

The Brazilian biodiesel program is in its infancy, with even the issue of feedstock choice still to be determined. A nationwide 2 percent mandatory blend will be required beginning in 2008, and will be increased to 5 percent by 2013. One of the main objectives of the program is to promote social inclusion by creating jobs and increasing farm income. There are different tax exemptions for biodiesel production depending on the type of feedstock (castor seed and palm oil have a bigger exemption) and on the feedstock origin (family farm production is stimulated).

### **2.1.2 Colombia**

Colombia has probably the second most advanced biofuels program in South America, after Brazil. The government passed a bill mandating a 10 percent ethanol blend in all gasoline sold in cities with a population higher than 500,000 inhabitants. A 5 percent mandatory biodiesel blend will also be required in some selected regions

beginning in 2008 and the government has created some production incentives. For instance, in 2002 a law was passed exempting ethanol from gasoline taxes ("impuesto global," IVA, and "sobretasa"). Equipment for fuel ethanol production was also exempted from some taxes. Concerned about the impacts on sugar production, the government created a mechanism to detach the price of ethanol from that of sugar and oil. A maximum price for fuel ethanol was established.<sup>14</sup> It was first set at 977.5 pesos per litre (2004), but by July 2006 it had been raised to 1,346.4 pesos per liter.<sup>15</sup>

Colombia is a key sugarcane producer in South America. All the statistics and market analysis in Colombia divide its cane production into two categories: commercial (Caña Azúcar) and small scale (Caña Panela). The second type has extremely low yields (around 7 tons/ha) and is mainly dedicated to Panela production (a very popular low processed sweetener used in rural and poor areas). The commercial cane area reached 176 million hectares in 2005, while small scale production reached 244 million hectares.<sup>16</sup> There is a large potential for sugarcane expansion in Colombia through improvements in yields.

Sugar plantations and the recent ethanol industry are located in the Cauca Valley, in the southwest of the country, on the Pacific Coast.<sup>17</sup> There are currently five plants capable of producing either sugar or ethanol in Colombia, with a production capacity of 1 million liters a day.<sup>18</sup> All of them are located in the Cauca Valley.

<sup>14</sup> Observatorio Agrocadenas, "La cadena de azúcar en Colombia," Documento de trabajo no. 88, November 2005, p.21 and 22.

<sup>15</sup> Ministerio de Minas Y Energía, "Noticias Sectoriales: Hidrocarburos," Julio 18 de 2006.

<sup>16</sup> AGROCADENAS, Estadísticas de la cadena, available at [www.agrocadenas.gov.co/home.htm](http://www.agrocadenas.gov.co/home.htm), accessed on March 26, 2007.

<sup>17</sup> BEAR STEARNS, "Latin America: the biofuels boom," Emerging Markets Equity Strategy, December 19, 2006.

<sup>18</sup> ASOCANA, "Informe anual 2005–2006," p.17

### 2.1.3 Thailand

The Thai government has established two phases for its ethanol program. The first phase (2004–06) included the construction of three new plants, the prohibition of MTBE use, the establishment of technical specifications for E10, and a 10 percent biofuels blend used in official vehicles. The second phase (2007–12) sets a production goal of 1.1 billion liters per year (3 million liters/day) by 2011 and a 10 percent mandatory biofuels blend applied nationwide by 2012.

Thailand is the world's second largest sugar exporter, after Brazil. It has annual surpluses of 2 to 4 million tons of cassava and hundreds of thousands of tons of molasses, both suitable for conversion to ethanol.<sup>19</sup> The government will grant price support for sugar and ethanol, the last being fixed at US\$0.32 (Baht 12.75) per liter. For ethanol to be competitive, the price of molasses should be around US\$45 (Baht 1,800) per ton while it is currently at US\$80 (Baht 3,200). As a consequence, Thailand imported ethanol from India in 2005.<sup>20</sup> There are three ethanol plants in Thailand, with a production capacity of 136.9 million liters per year (0.375 million liters/day). Another three plants began operating at the end of 2006, increasing Thailand's capacity to 421.6 million liters per year (1.16 million liters/day).

A Biodiesel Promotion Program was established in 2001 with a production goal of 3.1 billion liters by 2012 (10 percent biodiesel blend).<sup>21</sup> In 2007, B5 will be introduced in Bangkok and in the south of the country. By 2011, it will be extended throughout the country. Finally, in 2012, a 10 percent blend will

<sup>19</sup> WORLD BANK, "Potential for Biofuels for transport in developing countries," 2005. p. 47.

<sup>20</sup> UNCTAD, "An Assessment of the Biofuels Industry in Thailand," 2006. p.11.

<sup>21</sup> PECC, "Pacific Food System Outlook 2006–2207: the future role of biofuels," p.23

be mandated nationwide. Such demand is expected to be supplied by: 56 percent of national palm oil, 14 percent of imported palm oil, and 29 percent of national jatropha oil.<sup>22</sup> However, no large scale biodiesel facility is operating in Thailand yet. There is a pilot plant for research purposes, and many community scale plants with a total capacity of 21.9 million liters/year (60,000 l/day).<sup>23</sup>

### 2.1.4 South Africa

The South African government released a "White Paper on Renewable Energy" in 2003. A target of 10,000 GWh of energy to be produced from renewable energy sources by 2013 has been set. In 2005, a Biofuels Task Team was created to develop the industrial strategy of the country's biofuels program. The draft was released in November 2006. It proposes a 4.5 percent use of biofuels in liquid road transport fuels (gasoline and diesel) by 2013.<sup>24</sup> The proposal should be met with the adoption of E8 and B2 mandatory blends.<sup>25</sup> The draft concludes that those requirements could be reached without excessive support, utilizing agricultural surpluses.

The government used a 30 percent tax reduction grant for biofuels with the objective to stimulate production<sup>26</sup> (currently taxes and levies represent 27 percent of the gasoline and 25 percent of the diesel price).<sup>27</sup> The draft proposes the continuation and adjustment of that support.

<sup>22</sup> UNCTAD, "An Assessment of the Biofuels Industry in Thailand," 2006. p.9 and 19.

<sup>23</sup> UNCTAD, "An Assessment of the Biofuels Industry in Thailand," 2006. p.6 and 19.

<sup>24</sup> Department Of Minerals and Energy, "Draft Biofuels Industrial Strategy of the Republic of South Africa," November 2006, p.9.

<sup>25</sup> South African Government, "An investigation into the Feasibility of Establishing a Biofuels Industry in the Republic of South Africa," October 6, 2006. p.iii.

<sup>26</sup> UNCTAD, "The Emerging of Biofuels Market: Regulatory, Trade and Development Implications," 2006. p.19.

<sup>27</sup> USDA-FAS, "South Africa: Biofuels Annual Report 2006," Gain Report no. SF6021, June 8, 2006. p. 3.

*Thailand is the world's second largest sugar exporter after Brazil. It has annual surpluses of 2 to 4 million tons of cassava and hundreds of thousands of tons of molasses, both suitable for conversion to ethanol.*

*South Africa has surpluses in corn and sugar production that, if used for ethanol production, could meet more than five percent of its gasoline demand.*

Biodiesel from soybean and ethanol from sugarcane and corn are viable in South Africa with a crude oil price around US\$65/bbl.<sup>28</sup> However, South Africa has only 14 percent of its total area available for arable land and irrigation consumes about 60 percent of the national water supply. But the country has surpluses in corn and sugar production that, if used for ethanol production, could meet more than 5 percent of its gasoline demand.<sup>29</sup>

The chosen raw material for the biodiesel projects is soybeans and various feasibility studies are under way. Since South Africa is a net importer of soybeans, it is hoped that the biodiesel projects will stimulate soybean production, making the local feed industry less dependent on soybean meal imports.<sup>30</sup>

#### **2.1.5 Mexico**

Today, there is no mandatory biofuels blend in Mexico. However, a recent study requested by the *Secretaría de Energía*<sup>31</sup> proposes a phased-in adoption of ethanol. The first phase (2007–2012) would have a production target of 412 million liters of ethanol per year, made mainly out of sugarcane molasses. In 2012, a nationwide 5.7 percent blend (in volume) could be achieved with the production of ethanol out of sugarcane juice and after 2012 a 10 percent mandatory blend would be required. As a result, the current area dedicated to sugarcane should double.

<sup>28</sup> South African Government, "An investigation into the Feasibility of Establishing a Biofuels Industry in the Republic of South Africa," October 6, 2006. p.iii.

<sup>29</sup> Department Of Minerals and Energy, "Draft Biofuels Industrial Strategy of the Republic of South Africa", November 2006, p.10.

<sup>30</sup> USDA-FAS, "South Africa: Biofuels Annual Report 2006," Gain Report no. SF6021, June 8, 2006. p. 4.

<sup>31</sup> SENER-BID-GTZ (edit), "Potenciales y Viabilidad del Uso de Bioetanol y Biodiesel para el Transporte em Mexico," México, November 2006.

Currently there are no full size commercial biofuels plants in Mexico.<sup>32</sup> Only 49.2 million liters of ethanol were produced in 2006.<sup>33</sup> Although biofuels policies and production are in their infancy stage, the country has great potential for developing a biofuels industry. Since the internal gasoline market is large, all the Mexican production potential could be absorbed by it.

#### **2.1.6 Guatemala**

In 2003, the Law of Incentives for the Development of Projects in Renewable Energy was approved. It created some incentives for biofuels projects such as exemption from import duties, VAT, taxes on machinery imports for the stages of pre-investment and execution, and income taxes for 10 years during commercial operation.<sup>34</sup> Currently the country has only one distillery<sup>35</sup> and production in 2006 was 64 million liters.<sup>36</sup> Guatemala produced 18.5 million tons of sugarcane in 2005 on an area of 190,000 hectares. This makes Guatemala the biggest sugarcane producer in Central America and one of the countries with the highest yield (97 tons/ha).<sup>37</sup>

#### **2.1.7 El Salvador**

The country has strong potential for ethanol production and is starting its plans to promote biofuels use. The Ministry of Economy provides low interest loans to cover payments owed to lending banks for renewable energy projects. Currently there

<sup>32</sup> USDA-FAS, "Mexico: Biofuels Annual Report 2006," Gain Report no. MX6503, June 26, 2006. p. 6

<sup>33</sup> RFA, Industry statistics. Available at: <http://www.ethanolrfa.org/industry/statistics>, accessed on April 4, 2007.

<sup>34</sup> IDB, "A Blueprint for Green Energy in the Americas," 2006. p.158

<sup>35</sup> UNCTAD, "The Emerging of Biofuels Market: Regulatory, Trade and Development Implications," 2006. p.14.

<sup>36</sup> RFA, Industry statistics. Available at: <http://www.ethanolrfa.org/industry/statistics>, accessed on April 4, 2007.

<sup>37</sup> FAO-STAT, available at <http://faostat.fao.org/default.aspx>, accessed on March 26, 2007.

is no mandatory blend; however, a bill proposal will soon be debated by the Legislative Assembly. It proposes a nationwide ethanol mandatory blend to be set between 8–10 percent. Machinery for ethanol production will be exempted from import duties for two years, as well as other goods used for its production. Revenues derived from ethanol sales will also be tax exempt.<sup>38</sup>

In 2005, El Salvador produced 4.4 million tons of sugarcane and yields were high at 81 tons/hectare.<sup>39</sup> The country also benefits from the CBI<sup>40</sup> preferential treatment to enter the U.S. market. However, in the U.S.-Central American Free Trade Agreement a specific share was established for the ethanol that is only dehydrated in the country and re-exported duty free to the U.S. A maximum quantity of 30 million liters was set for 2007.<sup>41</sup> Such quantity will increase by 4.9 million liter per year until 2020.<sup>42</sup>

## **2.2 Developing countries with a potential for biodiesel production**

### **2.2.1 Malaysia**

A National Biofuels Policy was launched in August 2005. The government is promoting B5 (B5 pumps in selected stations, establishment of standard specifications, use of biodiesel in public fleets). The blend is not compulsory yet, but it will be in the next phase of the implementation plan. Currently Malaysia has three biodiesel plants and 10 are under construction. The government has already granted licenses for 32 biodiesel plants, with a potential production capacity of 3.3 billion

liters. Malaysia produced 200 million liters of biodiesel in 2006 (consuming 1 percent of palm oil production)<sup>43</sup> and production is expected to reach 1.7 billion liters in 2007.<sup>44</sup> Malaysia is the world's largest exporter of palm oil, selling around 13.5 million tons.<sup>45</sup> The country's production may expand to the east (particularly in Sarawak); however, such growth is limited since the planted palm area already represents 57 percent of the total agricultural harvest area.<sup>46</sup>

### **2.2.2 Indonesia**

A 10 percent biofuels blend (in diesel and/or gasoline) is authorized in Indonesia; however, there is no mandate. The government has a target of 10 percent biodiesel blend by 2010. Currently, Pertamina, the petroleum state company, is selling B5 at a few gas stations in Jakarta (4 pumps) and the biodiesel price is similar to the diesel price.<sup>47</sup>

At this time, the majority of biodiesel production is concentrated in West Jakarta. There are six biodiesel plants in Indonesia with a current production of 3.3 million liters, but no full-size commercial scale plant exists.<sup>48</sup> The newborn Indonesian biofuels industry will probably be concentrated in the eastern part of the country, due to the availability of land where raw materials can be produced. There are 11 firms constructing new plants or expanding existing ones. If all the projects are completed by the end of 2007, the biofuels production capacity in 2008 would reach 3.5 billion liters, the majority being produced from palm

<sup>38</sup> IDB, "A Blueprint for Green Energy in the Americas," 2006, p.149.

<sup>39</sup> FAO-STAT, available at <http://faostat.fao.org/default.aspx>, access on March 26, 2007.

<sup>40</sup> Caribbean Basin Initiative

<sup>41</sup> Harmonized Tariff Schedule of the United States (2001) (Rev 1)

<sup>42</sup> Meaning that it will be set at 55 million liters in 2012.

<sup>43</sup> Authors' calculations based on PECC and MPOB data.

<sup>44</sup> PECC, "Pacific Food System Outlook 2006–2207: the future role of biofuels," 2006, p.22.

<sup>45</sup> Oil World Annual 2006 and PSD (21Mar2007)

<sup>46</sup> Authors' calculations based on MPOB and FAO data for 2005.

<sup>47</sup> USDA-FAS, "Indonesia Agricultural Situation: Biofuels 2006," Gain Report no. ID6010, May 26, 2006, p. 4.

<sup>48</sup> PECC, "Pacific Food System Outlook 2006–2207: the future role of biofuels," 2006, p.21.

oil.<sup>49</sup> Currently 10 ethanol plants are operating in Indonesia with a production of 200 million liters of nonfuel ethanol so far.<sup>50</sup>

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<sup>49</sup> USDA-FAS, "Indonesia Biofuels: Indonesian Biofuels set to take off? 2007," Gain Report no. ID7004, January 29, 2007. p. 2.

<sup>50</sup> PECC, "Pacific Food System Outlook 2006–2207: the future role of biofuels," 2006, p.21.

# 3 EU AND U.S. POLICIES RESTRICTING CURRENT AND POTENTIAL BIOFUELS EXPORTS FROM DEVELOPING COUNTRIES

Many developing countries that have engaged in biofuels production (or plan to do so soon) could have a real comparative advantage in biofuels production not only in terms of production cost, but also because sugarcane ethanol has a better energy and environmental balance than cereal and grain-based ethanol. In addition, biodiesel made from palm oil has a much higher energy balance than biodiesel produced with rape oil.<sup>51</sup> These factors all argue for the expansion of biofuels exports from developing countries to developed countries. However, the current national policies enacted by the major biofuels consumers in the developed world seriously reduce the export opportunities for developing countries. In fact, the EU and the U.S. have both established policies to promote and protect their national production through a variety of trade policy measures, such as tariffs and subsidies, but also by technical norms.

## 3.1 Tariffs

### 3.1.1 EU border protection

The EU's domestic ethanol market is mainly protected by tariffs. Most Favored Nation (MFN) ethanol imports (non-denaturized alcohol) face a specific tariff of €0.192/liter (63 percent<sup>52</sup> ad-valorem equivalent). Very small quantities of ethanol may also be imported under the tariff line 220720 (denaturized alcohol) where the duty is €0.102/liter (39 percent AVE).

Some countries enjoy preferential treatment when exporting ethanol to developed markets. Ethanol produced in African, Caribbean, and Pacific (ACP) countries, in least developed countries, in GSP+<sup>53</sup>

<sup>51</sup> However, the environmental balance of palm oil is almost the same than the rape oil balance.

<sup>52</sup> AVE calculated on a 2004–2005 average.

<sup>53</sup> The Generalized System of Preferences *plus* (GSP+) is granted to vulnerable developing countries that have implemented sustainable development and good governance policies.

beneficiaries such as Central American and Andean countries, and in Western Balkan countries can enter the European market duty-free. In the case of the GSP+ beneficiaries, preferences are not permanent since the current GSP system will expire at the end of 2008. In addition, these countries must meet some specific criteria. For instance, they have to demonstrate that their economies are “dependent and vulnerable.” Dependence is defined as the five largest sections of a country's GSP-covered exports to the European Community which must represent more than 75 percent of its total GSP-covered exports. GSP-covered exports from that country must also represent less than 1 percent of total EU imports under GSP.

The leading sugar exporters such as Brazil and Thailand that are or could be significant ethanol exporters do not receive any tariff preferences. It is also interesting to note that Mexico and South Africa, two countries that have signed free trade agreements with the EU, do not currently enjoy any tariff preferences for ethanol.

EU tariffs on biodiesel and feedstock for biodiesel production are low. MFN import duty on biodiesel is set at 6.5 percent and vegetable oils for technical or industrial uses face a MFN tariff ranging between 3.2 and 5.1 percent. The duties applied to vegetable oils for human consumption are somewhat higher, but they do not exceed 9 percent. Oilseeds have duty-free access to the EU market. Developing countries exporting vegetable oils to the EU enjoy tariff preferences under the GSP scheme. Duties on palm oils imported from Indonesia and Malaysia — the world's leading palm oil exporters — range between zero and 3.1 percent. Rape, sunflower, and soy oil exported from the world's top exporters — Argentina, Brazil, Russia, and Ukraine — face preferential tariffs oscillating between zero and 6.1 percent.

*The current national policies enacted by the major biofuels consumers in the developed world seriously reduce the export opportunities for developing countries.*

*The production of biofuels in the EU and the U.S. is heavily subsidized because the production costs of biofuels are much higher than those of fossil fuels.*

### **3.1.2 U.S. border protection**

In the U.S., the MFN customs duty on ethanol is 2.5 percent. In addition, there is a 0.14 US\$/liter<sup>54</sup> secondary tariff applying to imports (which represent an ad-valorem equivalent of 46 percent). This additional tax is scheduled to expire at the end of September 2007, but there are few doubts that it will be expanded, as it has been in the past. Although supposedly pegged to the federal excise tax exemption to offset advantages imported ethanol received through reduced taxes, the reality has not been quite so precise. For instance, although the tax credit rates have declined in recent years, the specific-rate tariff has not.<sup>55</sup>

The CBI countries enjoy preferential access to the U.S. market, where if produced from at least 50 percent local feedstocks (e.g., ethanol produced from sugarcane grown in the CBI beneficiary countries), ethanol may be imported duty-free. If the local feedstock content is lower, limitations apply on the quantity of duty-free ethanol. Nevertheless, up to 7 percent of the U.S. market may be supplied duty-free by CBI ethanol containing no local feedstock. In this case, hydrous (“wet”) ethanol produced in other countries — historically, Brazil or European countries — can be shipped to a dehydration plant in a CBI country for reprocessing. After the ethanol is dehydrated, it is imported duty-free into the U.S. In 2005, imports of dehydrated ethanol under the CBI were far below the 7 percent cap (approximately 3 percent).<sup>56</sup>

<sup>54</sup> 54 cents per gallon.

<sup>55</sup> Koplow, D. “Biofuels — At what cost? Government support for ethanol and biodiesel in the United States,” Global Subsidies Initiative, International Institute for Sustainable Development, 2006.

<sup>56</sup> Yacobucci, B.D. “Ethanol imports and the Caribbean Basin Initiative,” CRS Report for the Congress, RS 21930, March 10, 2006.

## **3.2 Subsidies**

### **3.2.1 EU programs of support for biofuels**

The production of biofuels in the EU and the U.S. is heavily subsidized because the production costs of biofuels are much higher than those of fossil fuels. Both regions provide two main types of subsidies to support the biofuels industry and foster consumption: tax exemptions on biofuels and subsidies to agricultural producers.

Since tax policy is not part of the sphere of action of the European Community, each EU member state decides on the level of taxation it considers appropriate for fossil and biofuels. This means that different rates apply in the 27 member states of the EU. Taxation on biofuels compared to excise taxes applied to fossil fuels varies from zero to 45 percent. Table 5 shows that Spain and Sweden exclude biofuels from excise taxes. Germany used to have the same policy; however, since the introduction of mandatory quotas as of January 1, 2007, tax relief is only granted on the amount of biofuels sold in excess of the quota amount, and the tax privileges are to be gradually reduced. Some EU countries — such as France, Ireland, Italy, and the Netherlands — grant tax relief only for restricted quantities of biofuels.

Feedstocks for biofuels production also receive support. The 2003 CAP reform introduced a new payment called “Energy Crop Payment” that amounts to €45/ha. This aid is intended for feedstocks grown in traditional food crop areas (it does not apply to energy crops produced in set-aside areas). However, the eligible area is limited to 2 million hectares, meaning that the expenditures under the energy crop scheme cannot be higher than €90 million. However, agricultural raw materials used for biofuel production also benefit from the substantial support granted to traditional food crops. Oilseeds producers used to receive per



**Table 5: Tax Exemptions on Biofuels in Selected Countries**

	<b>Ethanol</b>	<b>Biodiesel</b>
<b>United States (US\$/liter)</b>	0.135	
<b>European Union (€/liter)</b>		
France	0.38	0.33
Germany	0.38	0.38
Italy	0.32	0.4
Netherlands	0.51	0.31
Spain	0.4	0.27
Sweden	0.53	0.36
United Kingdom	0.33	0.33

Note: Spain and Sweden provide full tax exemption on ethanol. Italy, Spain and Sweden provide full tax exemption on biodiesel.

Sources: Rabobank (2005), for Germany data UFOP 2005/2006 (2006)

hectare compensatory payments. In 2004, total payments under this mechanism amounted to €1.3 billion. The 2003 CAP reform altered substantially the modalities of agricultural support, but the total level of subsidies has almost not been affected. Since 2005, oilseeds producers have received support through the single farm payment system.<sup>57</sup> Regarding feedstocks that can be used for the production of ethanol, cereals also used to receive per hectare compensatory payments before the reform of the CAP. In 2004, cereals producers were granted €11.9 billion. These payments are now included in the single farm payment. Cereals also benefit from market price support that is equal to €101.31/ton<sup>58</sup>. Sugar beet for ethanol production

<sup>57</sup> The amount of the single farm payment is calculated on the basis of the direct aids a farmer received in a reference period (2000–2002). In order to ensure continued land management activities throughout the EU, beneficiaries of direct payments will be obliged to keep their land in good agricultural and environmental condition.

<sup>58</sup> Rye does not benefit from a guaranteed price anymore.

has not been granted any additional direct support other than the energy crop aid.<sup>59</sup>

### **3.2.2 U.S. support programs for ethanol**

Enacted in 2004 by the JOBS Act, the Volumetric Ethanol Excise Tax Credit (VEETC) provides a US\$0.135/liter tax credit based on ethanol blended into motor fuel. The VEETC provision provides the single largest subsidy to ethanol. It is awarded without limit, and regardless of the price of gasoline, to every liter of ethanol blended in the marketplace, domestic or imported. The subsidy cost is currently rising quite fast, mirroring the rapid increase in ethanol fuel usage. In 2006, the Joint Committee on Taxation estimated that tax losses from the VEETC would average US\$ 2,220 million per year for the 2006–2010 period, likely reflecting the rapid growth in consumption of the fuel. In addition,

<sup>59</sup> Kutas, G. “EU Negotiating Room in Domestic Support after the 2003 CAP Reform and Enlargement.” São Paulo and Paris: Institute for International Trade Negotiations (ICONE) and Groupe d’Economie Mondiale (GEM), Sciences Po, June 2006.

*Corn, which is the main feedstock used in the U.S. for ethanol production, benefits from a range of support measures. In 2004, subsidies to corn amounted to US\$8.3 billion.*

small producers of ethanol receive a federal tax credit of 2.6 cents/liter on the first 56.8 million liters they produce. Tax exemptions on ethanol are also provided at the state level since fuel taxation in the U.S. depends in part on the local states.

Another way to support national production of biofuels is applying local content requirements. At least two state-level renewable fuel blending mandates link their mandates with in-state production. Both Montana and Louisiana have made blending mandates for ethanol contingent on production of ethanol within these states reaching certain minimum levels (annual rates of output of 40 million gallons in the case of Montana and 50 million gallons in the case of Louisiana).<sup>60</sup>

Corn, which is the main feedstock used in the U.S. for ethanol production, benefits from a range of support measures. In 2004, subsidies to corn amounted to US\$8.3 billion, 36 percent of the support was given through loan deficiency payments, 22 percent through countercyclical payments and 20 percent corresponds to fixed payments made under historical entitlements. The 2002 U.S. Farm bill introduced, for the first time, specific measures to support the production of renewable energy based on agricultural raw materials. This program provides grants, loans, and loan guarantees for the development of renewable energy projects and energy efficiency improvements. The construction of a biofuels plant could be an eligible project. Grants are limited to 25 percent of the costs of the

<sup>60</sup> Koplou, D. "Biofuels — At what cost? Government support for ethanol and biodiesel in the United States," Global Subsidies Initiative, International Institute for Sustainable Development, 2006.

project; loans are limited to 50 percent of the cost of the project. The 2006 budget for this program was limited to 23 million dollars and it was reduced for the year 2007.<sup>61</sup>

In the EU and in the U.S., some biofuels plants receive subsidies from local authorities in the form of local tax exemptions, operating capital grants, low rate loans for small plants, etc.

### **3.3 Technical norms**

The European Commission has published a set of guidelines in compliance with the CEN Standardization (EN 14214) in order to ensure quality and performance for biodiesel.<sup>62</sup> This EU standard limits the iodine value of the biofuel at 120 g/100g. Soybean oil has a high level of iodine; therefore, its use in the production of biodiesel in the EU will probably be limited. This standard for biofuels in the EU limits the use of soy oil to 20–25 percent.

Another limitation is temperature. Palm oil has a high cloud point,<sup>63</sup> which means that it is not as adaptable to cold weather as other oils. In fact, the biodiesel industry in the EU has also been limiting its use. However, it is a characteristic that can be overcome with some technological advances.

<sup>61</sup> For more details on the US federal incentives to biofuel production, see Yacobucci, B.D. "Biofuels incentives: a summary of federal programs," CRS report to the Congress, order RL 33572, Updated January 3, 2007.

<sup>62</sup> The European standard for biodiesel defines some characteristics such as: ester content, density, viscosity, flash point, carbon residue, iodine value, water content, sulphur content, etc.

<sup>63</sup> Cloud point is the temperature at which dissolved solids in the oil begin to form and separate from the oil.

# 4 IMPACT OF BIOFUELS PROGRAMS IN THE U.S. AND THE EU ON DEVELOPING COUNTRIES

## 4.1 Drivers that could foster biofuels imports in developed countries

### 4.1.1 European Union

As explained in the first section of this paper, the EU will not have the required available area, and therefore not the sufficient feedstocks, to reach a 6.6 percent biodiesel blend by 2012. To achieve that target, the EU will have to import 40 percent of its oil needs to produce biodiesel (if 50 percent of EU oilseeds areas are dedicated to biodiesel production). The EU will also need to import vegetable oils for human consumption in substitution of domestic rape oil used for biodiesel.

In addition, the costs associated with the production of biodiesel in the EU are very high. Subsidies and tax exemptions are very costly for taxpayers and governments. Finally, the intensive use of rape oil has placed an upward pressure on prices that will be unsustainable in the long term.

All these factors should promote a larger proportion of biodiesel or vegetable oil imports in the EU. However, main imports should be rape and sunflower oil because the use of soy and palm oils are restricted by EU biodiesel production standards. Rape oil is primarily exported by developed countries (Canada, the U.S.) and China. But sunflower oil might be imported from Argentina, Russia, and Ukraine (countries that are the leading exporters). Limited quantities of palm and soy oil will be imported from Indonesia, Malaysia, Argentina, and Brazil.

The EU will also need to import vegetable oils for human consumption in substitution for rape oil used for biodiesel. The major export opportunities for developing countries are probably in this category. The EU might import palm oil from Indonesia and Malaysia, soy oil from Brazil and Argentina and sunflower oil from Argentina, Ukraine, and Russia.

As far as ethanol is concerned, the EU will be able to produce the required quantities to reach the 2012

objective. So, from a purely agricultural perspective, the EU will not need to import ethanol. However, at least three factors could favor some degree of imports. First, the European Commission will provide financial and technical support to some ACP countries, members of the Sugar protocol, in compensation for the EU 2006 sugar reform. Part of this aid will probably be dedicated to the establishment of ethanol production, and there is no doubt that part of the future production could be exported to the EU if there is enough production capacity available in these countries. Second, some EU members will not be capable to produce their own ethanol because they do not have enough agricultural areas and feedstock or/and because they consider that the support that has to be provided to the biofuels industry is too costly. These countries might be willing to import ethanol from competitive countries instead of buying expensive biofuels produced in EU neighboring countries. This is what Sweden is currently doing, for example. Those countries might even press for trade policy changes. Third, as for biodiesel, public support for ethanol is very costly for taxpayers and governments; therefore, some degree of imports could help to reduce this pressure.

### 4.1.2 United States

The costs associated with ethanol production in the U.S. are already very high. Tax credits should represent an average loss of US\$2.2 billion per year for the 2006–2010 period, which is costly for the federal government. In addition, the upward pressure on corn prices has provoked disruption in the local market with strong repercussions on the meats and dairy industries. Since the U.S. exports approximately 65 percent of the corn traded in the international market, the upward trend in prices is also affecting other countries such as Mexico where the price of the “tortilla” (base of the Mexican food industry) has doubled in the last few months. Finally, the local production of feedstock in the U.S.

*For many developing countries, access to developed countries is not a barrier since they benefit from preferential tariffs. Ethanol produced in CBI countries, Mexico, and Colombia enjoys duty-free access to the U.S. market, and ACP countries, least developed countries, GSP+ beneficiaries, and Western Balkan countries can export ethanol to the EU with a zero tariff.*

will not be sufficient to reach a 10 percent ethanol blend (see Section 1 of this paper).

These factors should push the U.S. to import more ethanol over the next five years. If the current U.S. targets are not moved, the U.S. will probably only import ethanol from countries that have duty-free access to its market. Those countries are Mexico, Colombia, and the CBI countries. In fact, we expect the U.S. consumption of ethanol by 2012 to reflect the current installed production capacity plus some degree of imports from the above mentioned countries. However, if the targets increase, the U.S. will need to import from other countries such as Brazil because the available production capacity of the countries with free access to the U.S. market will probably not be sufficient to provide the required quantities for their local market in addition to the import needs of the U.S.

#### **4.2 Limitations on the export potential of developing countries**

For many developing countries, access to developed countries is not a barrier since they benefit from preferential tariffs. Ethanol produced in CBI countries, Mexico, and Colombia enjoys duty-free access to the U.S. market, and ACP countries, least developed countries, GSP+ beneficiaries, and Western Balkan countries can export ethanol to the EU with a zero tariff.

The factors limiting export flows from these countries are linked to their production capacity and competitiveness. The decision to engage in an ambitious bioethanol program depends on several factors. First, the country must have a potential for sugarcane expansion through the extension of planted areas and/or through the improvement of current yields. Second, the capacity to attract investments in the biofuels sector will depend on the development of a domestic market and incentives provided by the national government.

It is not realistic to think about the development of an industry dedicated only to exports, especially because trade in biofuels is incipient and demand in developed country markets is still uncertain. However, the positive evolution of demand in the EU and in the U.S. can be a strong driver for the expansion of production capacities in developing countries. Finally, sugar policies in developing countries should be reformed. At the present time, domestic sugar markets are strongly protected and ethanol prices will never compensate for very high sugar prices.

As it concerns biodiesel imports to the EU, access is not the problem because MFN tariffs are low on biodiesel and vegetable oils. In addition, many vegetable oil exporting countries enjoy either duty-free access to the EU market or substantial tariff preferences.

The factors restricting exports from developing countries can be attributed to the EU's technical standards for biodiesel production that limit the use of palm and soy oil. Regarding oil for human consumption, palm oil demand in the EU could be limited by the fact that this oil has a high percentage of cholesterol. In addition, EU demand could provoke an upward pressure on palm oil prices in local markets. This will be detrimental to the local population that uses palm oil as their basic cooking oil. Finally, concerns about the consequences of the expansion of palm plantations on deforestation and on peats land have emerged in the EU. Some groups in the EU parliament have even suggested banning the import of palm oil for biodiesel production. Sustainable production of feedstock is an issue and the EU will probably consider establishing a system of certification that will restrict imports to sustainable production only.

In any case, palm oil and soy oil could present higher price sensitivity in response to biofuels demand increase because the expansion possibilities for these products around the world are much more limited than for cane sugar.

More research would be needed to properly assess the production and export potential of developing countries.

Finally, some developing countries do not face the limitations mentioned above and are ready to supply developed markets. However, the exports of these countries — such as Brazil, Thailand, and South Africa — are restricted by very high tariffs

in the EU and in the U.S. Despite these high duties, imports have occurred depending on the price levels of oil and ethanol. These countries have the biggest potential for feedstock expansion and would benefit the most from higher consumption mandatory blending and market opening in developed countries.

# 5 CONCLUSIONS

*To facilitate imports that will complement domestic production and that could provide some relief from rising prices and budgetary pressure, developed countries should consider several options that will grant greater access for biofuels originating in developing countries and alleviate upward pressures on domestic feedstock prices, such as tariff reduction, implementation of tariffs associated with oil or feedstock prices, and opening of a quota based on national consumption.*

The development of ambitious and cost-efficient biofuels programs in developed and developing countries is intimately linked to the potential expansion of feedstock production and to the impact that this expansion may have on the production structures of the producing countries and on global agricultural markets. Economic synergies between energy and food markets, with agricultural production as the interface, need to be measured. More research is needed to assess the impact and the opportunity-cost of production expansion of raw materials for biofuels compared to their usage for food (e.g. expansion of sugarcane in areas of grains and cattle in Brazil, corn ethanol in areas of soy and cotton in the U.S., etc); the impacts on the price of foods (increase in the price of vegetable oils due to the biodiesel consumption programs in the EU, Brazil, Indonesia, and Malaysia; effects of the expansion of the demand for ethanol on sugar prices); and the impact of the feedstock price variations on the price of animal feed components (maize, soy meal, vegetable oils, etc.). In addition, research should be conducted to measure the environmental and social consequences that the expansion of feedstock for biofuels may have.

With regard to developed countries, the expansion of import opportunities will reduce the upward pressure on feedstock prices and on biofuels prices, benefiting consumers and fostering biofuels consumption. In addition, the diversification of sourcing will minimize the risk of market disruptions. However, imports are currently limited because the set of developing countries that have free access to developed country markets have no production capacity in the short term and the expansion of their production capacity will not be of significant magnitude. *Some* developing countries are ready to supply some degree of exports to complement EU and U.S. biofuels production; however, their access

to these markets is restricted by high tariff barriers. To facilitate imports that will complement domestic production and that could provide some relief from rising prices and budgetary pressure, developed countries should consider several options that will grant greater access for biofuels originating in developing countries and alleviate upward pressures on domestic feedstock prices, such as tariff reduction, implementation of tariffs associated with oil or feedstock prices, and opening of a quota based on national consumption. To evaluate which option provides the best answer to the current problems faced by developed countries, more research should be carried out to assess the impact of each of these trade policy options.

Variable subsidies that move in the opposite direction of petroleum prices should also be considered. This will act as a safety net for agricultural producers and will reduce the cost for taxpayers. In addition, this should avoid the explosion in corn and rape oil prices and overinvestment in ethanol plants in the U.S. every time the price of a barrel of oil passes a certain threshold.

To stimulate the controlled expansion of biofuels production in the U.S., an alternative standard could be established through a progressive fuel blend mandate (e.g., an additional 1 percent a year) until reaching 10 percent, which is a reasonable target somewhere between the current available production capacity and the targets announced by President Bush. In many countries such mandates have worked well and have stimulated the development of alternative sources of sustainable energy.

Finally, the revision of current biodiesel standards in the EU could improve developing countries' export opportunities for vegetable oils and biodiesel.



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