

Source: World Factbook

## A) INTRODUCTION

Costa Rica is one of the more politically and economically stable countries in the region, which is reflected in the regulatory framework for and organization of its sugar and ethanol industries. The country relies heavily on imported petroleum, which has created a strain on its budget in light of recent high prices. The country will also need to increase its productive capacity to continue to supply ethanol to the US as well as to meet its domestic demand.

## B) GOVERNMENT POLICIES

Costa Rica's regulatory framework for biofuels production is one of the more advanced in the region. Renewable energy is not a new subject in Costa Rica. Following the ethanol production projects of the late 1970s, the country began to explore the possibility of sustainable and efficient energy use, including the production and consumption of biofuels, through legislative efforts. In 1994, *Law No. 7447 for the Regulation of the Rational Use of Energy* was established to consolidate the participation of the government in promoting efficient, environmentally-conscious uses of energy.<sup>1</sup>

In February 2003, *Presidential Decree 31818-MAG-MINAE* created a technical commission to design strategies for the development of biodiesel and committed the administration to promoting the program if the results of the commission's studies were positive.<sup>2</sup> In April 2003, Guideline No. 22 was created to promote the exploration of

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renewable sources of energy, including the elaboration of development plans and the incorporation of a mechanism which would allow for the integration of such sources into the National Interconnected System.<sup>3</sup>

In February 2004, Presidential Decree 31807-MAG-MINAE established a Technical Work Commission to design strategies for the production of ethanol as a substitute for MTBE and to create a regulatory framework for the program. Its main goals were the development of Costa Rica's agro-industrial sector and the improvement of environmental standards through the substitution of biofuels. It also put forward blend targets for both biodiesel and ethanol by January 2005.<sup>4</sup> This measure is contested and has not been fully implemented; however, a commission continues to work on the details of the decree, and a pilot project is underway.<sup>5</sup>

In April 2005, Costa Rica's government passed Expedient 15.853, a biofuels promotion law to support the research, development, generation, and use of biofuels and petrochemical derivatives. The law was a major attempt at establishing a legal framework for the development of a biofuels market in Costa Rica. It outlined general policies to augment scientific research and development, technology transfer, investment in human capital, commercialization of biofuels and private-sector participation in the industry. The objectives of this effort are to define norms, qualify projects, determine quotas, set blend percentages, and regulate the bodies involved in the process to ensure the success of the sector at a national level. The Regulatory Authority for Public Services will set the commercial price of biofuels according to the law establishing its creation in 1996, Law 7593.<sup>6</sup> Under the Ministry of Environment and Energy, the law created the National Biofuels Office (ONABI) to define those products which can be called biofuels (ethanol, biodiesel, biomethanol, biodimethyleter, synthetic biofuels, biohydrogen and pure vegetable oils) as well as to formulate and guide public policy on biofuels promotion. It also created the National Biofuels Council to act as a coordinating link between the Executive, the decentralized state institutions involved in the sector, and civil society, as well as to devise recommendations for national strategies and policies.

### CAFTA and Regional Trade Initiatives

As outlined in the overview for this region, under CAFTA, Central American countries will continue to enjoy tariff-free access to the US market almost identical to that allowed under the expanded Caribbean Basin Initiative. A specific export share has been established for Costa Rica under CAFTA: 117.3 million liters (31 million gallons) of ethanol annually. This should continue to push the development of biofuels capabilities and production in the country.

### Relations with Brazil

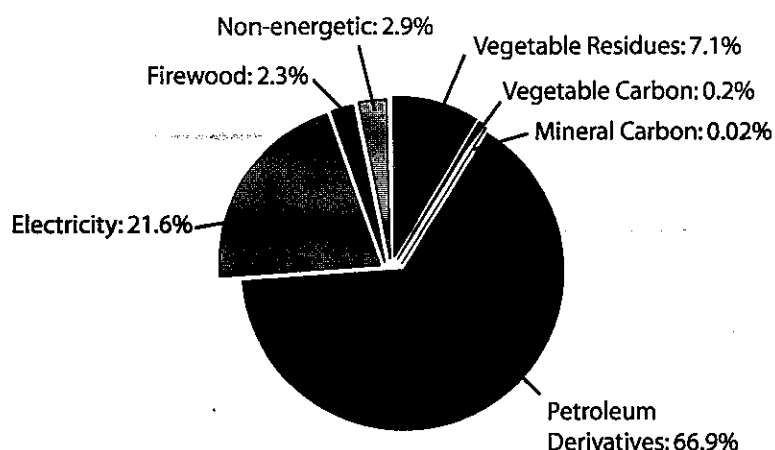
Brazil's *Protocol of Intention for Technical Cooperation in the Area of Production Techniques and the Use of Ethanol* was extended to Costa Rica in September 2005, along with a number of other countries.<sup>7</sup> The day after his inauguration in May 2006, Costa Rican president Oscar Arias met with Brazilian Vice-President José Alencar, who promised to support the improvement of Costa Rica's ethanol industry as a means to ameliorate the impact of higher oil prices.<sup>8</sup> Brazil's majority state-owned petroleum company, Petrobras, is also participating in Costa Rica's biofuels sector (see *Private Sector* for more detail).

## C) CURRENT SITUATION

### Energy Matrix

Costa Rica's total energy consumption in 2003 was 3.42 billion liters (21.5 million barrels) of oil equivalent, with 50.65% of that going to transportation.<sup>9</sup> Petroleum is also the country's major source of energy, making up nearly 67% [Chart 2.1a]. By 2015, with a total energy consumption of 5.56 billion liters (35 million barrels of oil equivalent), Costa Rica expects to have 15% of its energy come from biomass and 63% from petroleum derivatives, with 53% of that going to the transport sector.<sup>10</sup> Biofuels production and consumption is already being targeted for development to achieve this end; Costa Rica has set a target of replacing 7% of its gasoline with ethanol by the end of 2008.<sup>11</sup>

Chart 2.1a: Costa Rica's Energy Matrix (2003)



Source: Ministry of Environment and Energy<sup>12</sup>

### History

Costa Rica's first biofuels project began in 1974 with the creation of its *Program of Renewable Energies*; the goal of the program was to reduce the country's dependence on foreign energy sources. A distillery was installed at the end of 1978, and within four years, the sugar refinery in charge of production, CATSA, produced 24.6 million liters of ethanol.<sup>13</sup> Legislation has since followed to promote greater production and consumption of biofuels in Costa Rica (outlined in the *Government Policy* section).

### Current Production

Costa Rica has a land area of 5.06 million hectares, 108,000 of which are irrigated. 222,640 hectares (4.4%) are arable, and 297,022 hectares (5.87%) are used for permanent crops.<sup>14</sup> The country currently produces a considerable amount of sugar cane and sorghum, both of which can be used to produce ethanol [Table 2.1a]. Sugarcane cultivation takes up more than 40,000 hectares, and the regions of Guanacaste and Puntarenas along the country's Pacific coast are the most important.<sup>15</sup>

Table 2.1a Yield per hectare of Sugar cane and Sugar crops (tons/ha)

	2000	2001	2002	2003	2004
Costa Rica	76.27	76.46	73.67	80.80	77.31
Dominican Republic	37.89	37.88	38.81	37.18	40.79
El Salvador	74.93	82.84	76.92	76.97	92.45
Guatemala	90.95	93.05	93.86	90.63	96.77
Honduras	84.67	99.37	55.22	71.64	40.75
Nicaragua	69.08	77.44	75.90	93.67	88.91
Panama	51.92	44.40	49.35	54.48	47.14

Source: FAO STAT<sup>16</sup>

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Map 2.1a: Location of Guanacaste and Puntarenas in Costa Rica

Guanacaste



Puntarenas



Source: Wikipedia

### Ethanol Production

Costa Rica is a producer and exporter of ethanol but has not incorporated ethanol into its domestic energy matrix. This is likely to change in the short term as the country enacts further legislation to mandate biofuels blends and provides incentives for biofuels use. Costa Rica's ethanol production has been estimated at 40 - 42 million liters per year between 2003 and 2006.<sup>17</sup> As outlined below, ethanol demand is projected to increase, both domestically and on a global scale, and there will likely be a need for an increase in the country's production capabilities.

Costa Rica's production has mostly focused on the dehydration of imported hydrous ethanol, often from the EU; for the 2001-2002 harvest period, Costa Rica imported just under 1.28 million liters of hydrous ethanol from Europe and exported an almost identical volume to the United States in anhydrous form. This volume was four times lower than that imported by Costa Rica during the 1999-2000 season, and imports since have been drastically reduced due to EU regulations.<sup>18</sup>

There are currently three major facilities in place for ethanol production: Central Azucarera del Tempisque, S.A. (CATSA), which is a sugar refinery and subsidiary of CODESA, an economic development body of the state, produces 200,000 liters of ethanol per day. Ingenio Taboga produces 150,000 liters of ethanol per day from sugar. Combined, Costa Rica has a production capacity of 350,000 liters of ethanol per day or 42 million liters during a 120-day season. The Liga Agrícola Industrial de la Caña (LAICA) has dehydration processing capacity of 110 million liters per season.<sup>19</sup> The blending of ethanol with gasoline is executed primarily through RECOPE, or the Petroleum Refining Company of Costa Rica.

### Structure of the Sugar Industry

Costa Rica's sugar industry is made up of nine major processing facilities.

Table 2.1b: Crushing Capacity of Costa Rican Sugarcane Facilities

Facility	Capacity (ton/ day)
Tobota	6,500
Catsa	6,000
El Viejo	6,000
El Palmar	4,500
El General	4,000
Quebrada Azul	3,000
Victoria	2,700
Atirro	2,200
Juan Viñas	1,700
Curtis	1,400
Costa Rica	1,200
Argentina	1,000
Providencia	800
Santa Fe	720
Porvenir	700
San Ramón	680
Total	43,100

Source: UN/CEPAL<sup>20</sup>

In May 2005, the country's sugar production was estimated at 412,000 tons per annum.<sup>21</sup>

Table 2.1c: Indicators for the Sugarcane Industry in Costa Rica

Harvest Period	Area Harvested (thousand hectares)	Crushed Cane (thousand tons)	Sugar Production (thousand tons)	Productivity (tons of cane/hectare)	(kilograms of sugar/ ton of cane)
1996-1997	42.9	3,153.3	333.1	73.5	105.6
1997-1998	44.2	3,681.9	380.5	83.3	103.2
1998-1999	46.0	3,670.0	375.5	79.8	102.2
1999-2000	46.0	3,362.9	367.0	73.1	108.8
2000-2001	47.2	3,398.3	380.0	72.0	111.8
2001-2002	48.0	472.1	376.2	72.3	108.3

Source: UN/CEPAL<sup>22</sup>

#### Biodiesel Production

The country's installed capacity for biodiesel production has the potential to achieve a 1% blend, given the total consumption of diesel in the transportation sector.<sup>23</sup> Palm oil is the crop best suited for the production of biodiesel; however, it is currently used almost exclusively for cooking oil. In 2005, the nation had 50,000 hectares of palm-oil yielding crop.<sup>24</sup> Table 2.1d illustrates Costa Rica's Palm kernel yield per hectare.

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Table 2.1d: Yield per hectare (tons/ ha) of palm kernel equivalents

	2000	2001	2002	2003	2004
Costa Rica	18.50	18.60	18.30	22.63	18.62
Dominican Republic	15.30	15.30	15.35	15.35	15.34
El Salvador	0.00	0.00	0.00	0.00	0.00
Guatemala	22.76	20.29	23.88	23.60	30.37
Honduras	18.75	19.67	16.64	23.33	25.22
Nicaragua	26.50	26.50	26.50	24.32	24.35
Panama	10.36	10.17	10.09	10.17	10.12

Source: FAO STAT<sup>25</sup>

The Technical Work Commission created by Decree No. 31087-MAG-MINAE is currently conducting studies to evaluate the economics of blending biodiesel with regular petroleum diesel. The construction of a test plant capable of producing 20,000 tons of biodiesel annually was planned for 2005. The project's anticipated cost was \$8 million, and cultivation of 2,500 to 4,000 hectares, yielding 5 to 8 tons of oil per hectare, was also incorporated into the project.<sup>26</sup>

### Competitiveness

The Tropical Agriculture Center of Research and Science, in cooperation with the University of Finland, carried out a research project to analyze the potential for developing biofuels in Costa Rica. The study concluded that there is interest in the industry, but that information is limited and key players are still dispersed. Costa Rica has not been able to consolidate a technological approach in bioenergy, and the characteristics of the market and the regulatory framework in place are significant barriers to the industry's growth. Despite this, the report concluded that Costa Rica has significant potential for further development of the industry.<sup>27</sup> Costa Rica is a competitive ethanol exporter, selling at international prices without government support.

### Domestic consumption

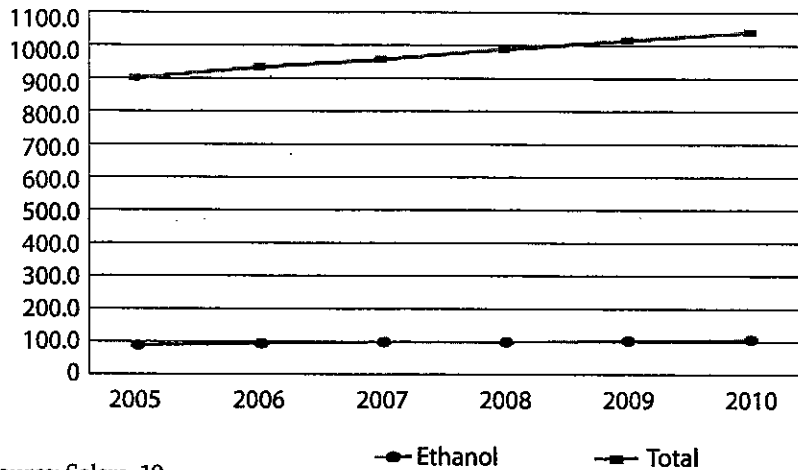
Consumption of fuel in Costa Rica is increasing [Table 2.1e], due mainly to the expansion of the automobile sector. Costa Rica consumes between 90 and 94 million liters of ethanol, and that number is projected to increase to 104.6 million liters by 2010. Currently, total gasoline demand is projected to rise at a steeper rate than ethanol demand [Chart 2.1b]. In February 2006, as part of a joint pilot project between RECOPE and Petrobras, 64 gas stations in Guanacaste and the Central Pacific region began offering E5 and E10 blended fuel. The logistical feasibility of a nation-wide offering of ethanol blends, from blending by RECOPE to commercial sale to individual customers, will be evaluated through this trial program. The project, which also aims to boost consumer confidence in ethanol through exposure to the fuel, will be completed in June 2007, with tabulation and analysis of results to follow.<sup>28</sup>

Table 2.1e: Estimated Gasoline & Ethanol Consumption in Costa Rica (Million liters)

	Regular	Super	Total	Ethanol
2005	498.8	403.6	902.4	90.2
2006	518.5	417.7	935.8	93.6
2007	538.6	423.3	961.9	96.2
2008	559.8	432.1	991.8	99.2
2009	581.8	435.9	1,017.6	101.8
2010	604.5	441.5	1,046.0	104.6

Source: FAO STAT<sup>23</sup>

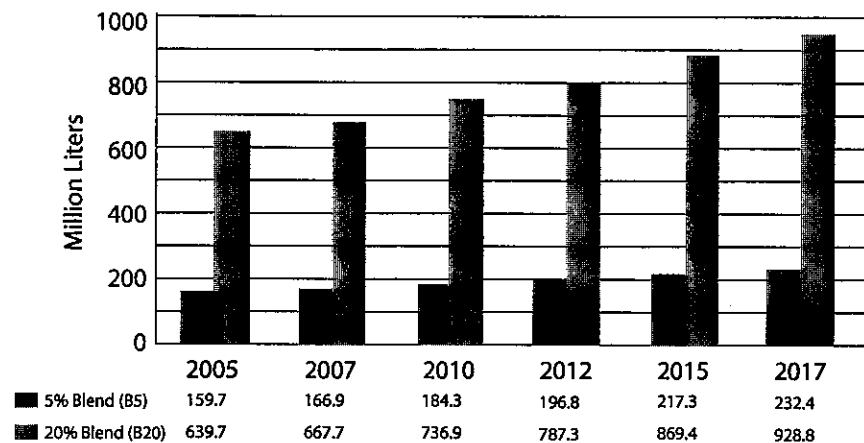
Chart 2.1b: Projected Demand for Gasoline & Ethanol



Source: Solera, 19

Demand for biodiesel is also projected to increase based on the anticipated proliferation of biodiesel blending with petroleum diesel at the 5% and 20% levels. By 2017, it is forecasted that Costa Rica will require over 930 million liters to meet demand created by a 20% diesel blend.

Chart 2.1c: Projected Demand for Biodiesel



Source: RECOPE 2004/ Cruz and Charpentier<sup>29</sup>

**Exportation**

Costa Rica exported over 121 million liters of ethanol in 2005, up from nearly 116 million in 2004 and 65.6 million in 2003. Costa Rica also imported nearly 150 million liters of ethanol in 2005, up from 95 million in 2004.<sup>30</sup> Under CAFTA, Costa Rica's allowance of duty-free ethanol exports is 117.3 million liters. According to the US government, Costa Rica exceeded that limit in 2005, the year the agreement was signed, and the effects of the CAFTA quota remain to be seen.<sup>31</sup>

**D) PRIVATE SECTOR**

As discussed, Petrobras and RECOPE are involved in the promotion of ethanol blend use in more than 60 gas stations in the Pacific region of Costa Rica. Petrobras is also interested in building an ethanol plant in the country and is awaiting the necessary permits.

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### E) RESEARCH & DEVELOPMENT<sup>32</sup>

Specialists from the School of Electrical Engineering and the Department of Engineering at the University of Costa Rica have commenced work on an initiative, the Biodiesel Project, which aims to discover more efficient ways of extracting biodiesel from vegetable oil. The project targets the development of production methods, classifies the raw materials to be used, and assesses the profitability of biodiesel production given the country's characteristics. In addition, researchers in the university's Organic Chemistry Laboratory in the School of Chemistry are looking at the characteristics of palm oil, its potential alternative uses, and the microbial degradation of biodiesel made from palm. According to the university's Vice-Rector for Research, 10 projects have been completed. All but one are in the field of biofuels. They include:

- Fuel Oil from African Palm;
- Biomass Fuel;
- Synthetic Fuel with a base of Agroindustrial Products; and
- Agroindustrial Modules of Mini Ethanol Distilleries as a Base for Petroleum Substitution.

### F) CONCLUSION

Costa Rica, like a number of other countries in the region, has developed mainly as an exporter of ethanol, and domestic consumption still lags significantly. The development and implementation of a thorough biofuels law, with the addition of significant incentives and public education campaigns, will allow for the development of a robust domestic market. Costa Rica has huge potential for the development of a biofuels industry, and lessons learned from past attempts at biofuels production, coupled with above-average infrastructure and private sector know-how, will be advantageous in achieving this goal. The legal framework is positive, although clarification and successful implementation will be required to assure success.

### Endnotes

<sup>1</sup> Allan Chin Wo Cruz, *Costa Rica: Experiencia en la Utilización de Biocombustibles* (Brazil: Ministry of Environment & Energy 2006), 13.

<sup>2</sup> *Ibid*, 16.

<sup>3</sup> *Ibid*, 14.

<sup>4</sup> Luiz Augusto Horta Nogueira, *Perspectivas de un Programa de Biocombustibles en América Central: Proyecto Uso Sustentable de Hidrocarburos* (Santiago: United Nations/ CEPAL, 22 March 2004), 36.

<sup>5</sup> *Costa Rica: Experiencia en la Utilización de Biocombustibles*, 15.

<sup>6</sup> Costa Rica, Asamblea Legislativa de la República De Costa Rica, Proyecto de Ley: Para Promocionar la Investigación, Desarrollo, Generación y Uso de Biocombustibles y Derivados Oleoquímicos, Expediente No. 15.853 (San Jose: Departamento de Servicios Parlamentarios, 26 April 2005), 25-29.

<sup>7</sup> Brazil, "Atos em Vigor Assinados com a República da Costa Rica," *Ministério das Relações Exteriores*, n.d., 30 Oct. 2006 <<http://www2.mre.gov.br/dai/bicostarica.htm>>.

<sup>8</sup> Brazil, Ministério das Relações Exteriores, Assessoria de Imprensa do Gabinete, *Visitas do Vice-Presidente da República à América Central e ao Haiti* (Brasília: Ministério das Relações Exteriores, 6 May 2006), 1 Nov. 2006 <[http://www.itamaraty.gov.br/portugues/imprensa/nota\\_detalhe.asp?ID\\_RELEASE=3718](http://www.itamaraty.gov.br/portugues/imprensa/nota_detalhe.asp?ID_RELEASE=3718)>.

<sup>9</sup> *Costa Rica: Experiencia en la Utilización de Biocombustibles*, 6.

<sup>10</sup> *Ibid*, 9.

<sup>11</sup> "The Saudis of the Southern Hemisphere," *Forbes*, 9 Oct. 2006, 1 Nov. 2006 <[http://www.forbes.com/2006/10/06/ethanol-brazil-biz-energy\\_cx\\_da\\_1009latin\\_energy06.html](http://www.forbes.com/2006/10/06/ethanol-brazil-biz-energy_cx_da_1009latin_energy06.html)>.

<sup>12</sup> *Costa Rica: Experiencia en la Utilización de Biocombustibles*, 6.

<sup>13</sup> Nogueira, *Perspectivas de un Programa de Biocombustibles en América Central: Proyecto Uso Sustentable de Hidrocarburos*, 35.

<sup>14</sup> United States, "World Factbook: Costa Rica," *Central Intelligence Agency*, Oct. 2006 <<https://www.cia.gov/cia/publications/factbook/geos/cs.html>>.

<sup>15</sup> Ibid, 29.

<sup>16</sup> United Nations, Food and Agriculture Organization, FAO STAT, 31 Oct. 2006 <<http://faostat.fao.org/site/336/DesktopDefault.aspx?PageID=336>>.

<sup>17</sup> F.O. Licht, World Ethanol Markets: the Outlook to 2015 (Kent: FO Licht, 2006), 12.

<sup>18</sup> Nogueira, Perspectivas de un Programa de Biocombustibles en América Central: Proyecto Uso Sustentable de Hidrocarburos, 31.

<sup>19</sup> Ibid, 35.

<sup>20</sup> Ibid, 29.

<sup>21</sup> Bill Lilliston, CAFTA's Impact on US Ethanol Market (Minneapolis: Institute for Agriculture & Trade Policy, June 2005), 9.

<sup>22</sup> Nogueira, Perspectivas de un Programa de Biocombustibles en América Central: Proyecto Uso Sustentable de Hidrocarburos, 30.

<sup>23</sup> Allan Chin Woo Cruz and Orlando Vega Charpentier, "Primer Informe Técnico: Perspectivas de la Producción y Uso del Biodiesel," Comisión Técnica de Trabajo para el Estudio del Biodiesel, Jan. 2006, 18.

<sup>24</sup> Comisión Técnica de Trabajo para el Estudio del Biodiesel, 15.

<sup>25</sup> United Nations, Food and Agriculture Organization, FAO STAT, 31 Oct. 2006 <<http://faostat.fao.org/site/336/DesktopDefault.aspx?PageID=336>>.

<sup>26</sup> Nogueira, Perspectivas de un Programa de Biocombustibles en América Central: Proyecto Uso Sustentable de Hidrocarburos, 36

<sup>27</sup> Oscar Coto, "Proyecto SUBBE: Uso Sostenible de Biomasa y Bioenergía en Costa Rica," Seminario de Presentación de Resultados, Centro Agronómico Tropical de Investigación y Enseñanza; University of Jyväskylä (Finland), San José, 24 May 2005.

<sup>28</sup> "Ethanol Sales Begin Today," Costa Rica Blogs - Newsfeed, 10 Feb. 2006, 1 Nov. 2006 <<http://american-european.net/blogs/costa-rica-news/business-and-economy/2006/02/10/ethanol-sales-begin-today/>>; "The age of Ethanol?" Latin Business Chronicle, 5 Oct. 2006, 1 Nov. 2006 <<http://www.latinbusinesschronicle.com/app/article.aspx?id=427>>; and "Plan Piloto de la Gasolina Regular con Etanol en Guanacaste y el Pacífico Central," RECOPE, 5 Feb. 2007 <[http://www.recope.go.cr/nuestra\\_actividad/proyectos/etanol.htm](http://www.recope.go.cr/nuestra_actividad/proyectos/etanol.htm)>.

<sup>29</sup> Comisión Técnica de Trabajo para el Estudio del Biodiesel, 16.

<sup>30</sup> World Ethanol Markets: the Outlook to 2015, S-2, S-3.

<sup>31</sup> Brent D. Yacobucci, CRS Report for Congress Ethanol Imports and the Caribbean Basin Initiative (Washington: Congressional Research Service (CRS), 10 Mar. 2006), 4-5.

<sup>32</sup> César Augusto Parral, "Investigan Nuevas Fuentes de Energía," Girasol (Año 8, No. 29) October/December 2005, 3-4.



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