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The Impact of Biofuels on Western Hemisphere Energy Security

Ronald Soligo
Amy Myers Jaffe
James A. Baker III Institute for Public Policy
Rice University

U.S Biofuels Policy: Progress and Challenges

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Does ethanol contribute to energy security?

- Not a lot……still dependent on fossil fuels
- In Brazil the “success” case ethanol output in 2007 was 390 thousand b/d versus 2.28 million b/d for oil (12% adjusted for energy density)
- But the US concern with energy security can provide opportunities to biofuel producers in Latin America.

Latin American Crude and Petrol Product Energy Balances 2005 (ktoe)

Net Imports Crude, NGL and feedstocks	
Latin America	-83,613.9
Venezuela	-93,812.8
Latin America Net of Venezuela	10,198.8
Net Imports, Petroleum Products	
Latin America	-41,845.2
Venezuela	-37,640.9
Latin America Net of Venezuela	-4,204.4

Source: IEA Energy Balances

North American Crude and Petrol Product Energy Balances 2005 (ktoe)

Net Imports, Crude, NGL and feedstocks	
North America	443,859
Canada	-52,512
Mexico	-102,742
US	599,113

Net Imports, Petroleum Products	
North America	60,745
Canada	-6,446
Mexico	14,164
US	53,027

Source: IEA Energy Balances

Energy Independence versus Energy Security

- The US cannot be independent – although much of the public discussion is in these terms (goes back to Nixon, Ford and Carter)
- Security should mean diversification of supplies- both by type of fuel and by geographical area. (Meaning in context of global markets?)
- Hence the search for alternative energy sources – especially those that substitute for oil – for the transportation sector (accounts for two-thirds of US oil demand)
- Latin America can contribute to both product (ethanol) and geographical diversity. (including within Latin America – many countries that could produce biofuels do not produce hydrocarbons).

US Ethanol Targets and Facts

- US Energy Bill (2005) - 7.5 billion gallons of renewable fuel by 2012.
- Energy Independence and Security Act (2007)
  - 9 bill gals by 2008
  - 36 bill gal by 2022 (of which 21 bill gals from “advanced biofuels”)
- 60 billion gals to replace 30% of current gasoline consumption
  - That would require roughly 75 million acres or 60% of US non-harvested cropland. (Zygourakis)
- The US currently has capacity to produce 10.3 bill gals. Production in 2008 was 9 bill gals.
- Discussion to go from E10 to E20 – to absorb capacity
- California to reduce GHGs by 10% by 2020 and then further by 2050. Low Carbon fuels are one way to meet requirement.

World Ethanol Production (million gallon) in 2008	
USA	9,000
Brazil	6,472
EU	734
China	502
Canada	238
Other	128
Thailand	90
Colombia	79
India	66
Australia	26
Total	17,335

Source: RFA 2009 Ethanol Industry Outlook

Brazil exported 1.3 mil gal in 2008

US Ethanol Protections

- Subsidy 51 cents/gal
- Tariff 54 cents/gal
- Plus ad valorem levy on imports of 2.5%
- Subsidy is paid to auto fuel producers/blenders – not to ethanol distilleries
- Imports from CBI are duty free if produced there
- Reprocessed ethanol is also duty free but subject to quotas of 7% of US Market (Actual imports are far below quota - only 3% of US market in 2006).
- Countries that joined CAFTA were given larger quotas (Costa Rica, El Salvador)

US Ethanol Imports by Country (millions of gallons)

	Brazil	Costa Rica	El Salvador	Jamaica	Trinidad and Tobago	Canada	China	Total
2002	0.0	12.0	4.5	29.0	0.0	N/A	N/A	45.5
2003	0.0	14.7	6.9	39.3	0.0	N/A	N/A	60.9
2004	90.3	25.4	5.7	36.6	0.0	N/A	N/A	159.9
2005	31.2	33.4	23.7	36.3	10.0	N/A	N/A	135
2006	433.7	35.9	38.5	66.8	24.8	N/A	N/A	653.3
2007	188.8	39.3	73.3	75.2	42.7	5.4	4.5	426.2

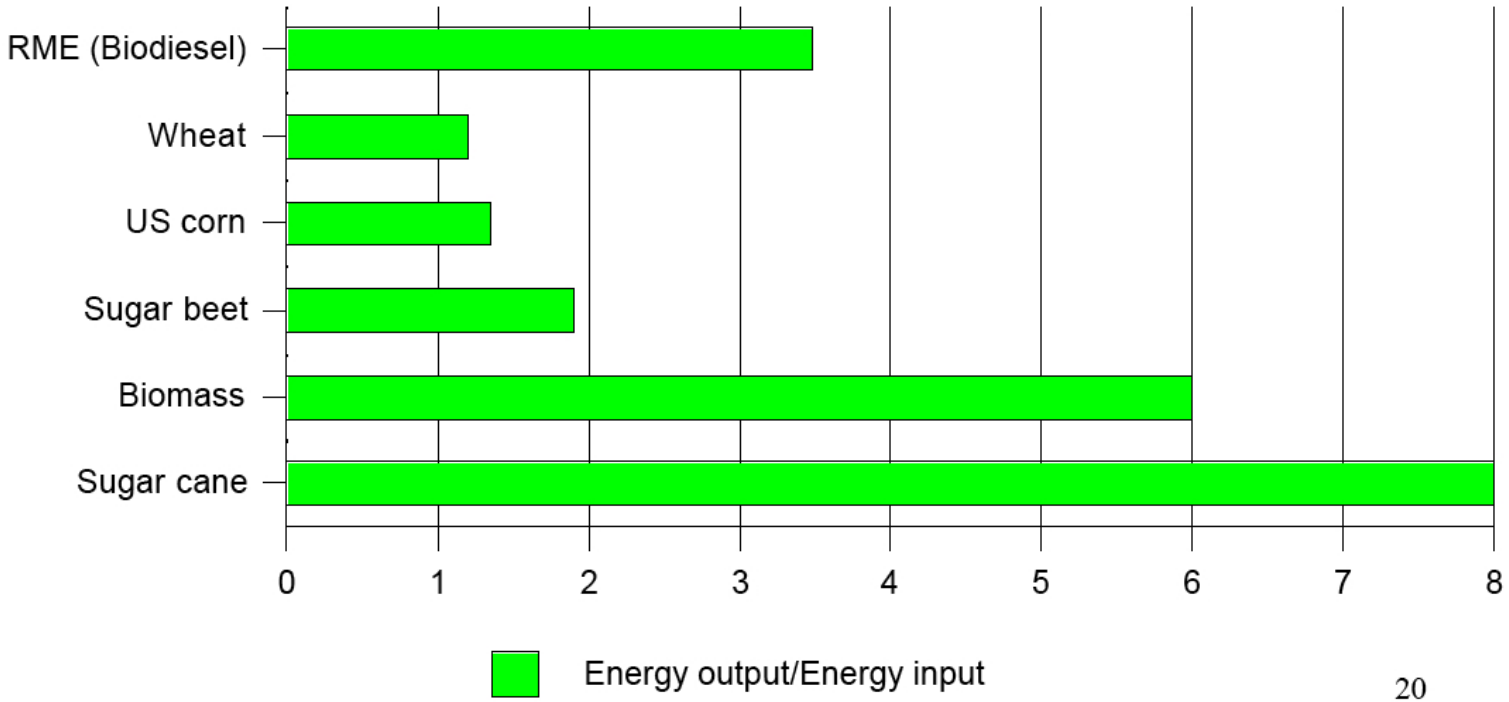
Source: International Trade Commisssion

The Case for More US Imports

- Second generation cellulosic ethanol is still in the future
- Given current technology sugarcane is much more efficient and has more environmental benefits than corn
- A significant part of the US market for transport fuels is on the coasts - easily accessible to imports by sea
- Latin America supplies promote US energy security.
  - Potentially a significant source of supply
  - Promotes geographical diversification of energy supplies
  - Producers are politically stable.

World Fuel Ethanol

Energy balance by feedstock



Demand for Biofuels (Billions gallons/year)					
	2006	2015	2020	2025	2030
World	8.0	24.6	29.6	34.5	39.2
Western Hemisphere	7.2	18.7	21.5	25.0	28.6
OECD North America	4.4	13.1	14.3	16.3	18.7
Latin America	2.8	5.6	7.2	8.7	9.9

Source: IEA

Biofuels as Share of Total Oil					
	2006	2015	2020	2025	2030
Western Hemisphere	1.7%	4.4%	4.9%	5.7%	6.5%
North America	1.3%	3.9%	4.2%	4.8%	5.5%
Latin America	3.8%	6.4%	7.8%	9.1%	10.0%

Estimating Ethanol Production

- Acreage of sugarcane planted.
- Output per hectare depends on sugarcane yield per HA and distillery yield per ton of cane.
- In Nicaragua agricultural yields average 75-85 tons/HA and distillery yields range from 70-80 liters/ton.
- At 75 tons/HA and75 liters per ton and 75 one HA would produce **5,625 liters**.
- Some areas in Center-South Brazil have achieved 84 tons/Ha and 82 liters/yon (**6888** liters/HA). Yields of 100 tons/HA have been reported in some areas of Sao Paolo.
- (Plans have been announced to increase production in Sao Paolo by 50% between 2008 and 2010.)

Ethanol Potential in Cuba

- Estimating Cuba's potential is easier:
  - At one time Cuba was the world's largest exporter of sugar.
  - It was a major supplier of sugar to the US before the Revolution and to the Soviet Union in the 1970s and 80s.
  - Sugar production, which was as high as 8.1 million tons in 1988, has fallen to 1.5 million tons in 2006.
  - Acreage devoted to sugar was reduced by over 60% since 2003.
  - Sugarcane yields have fallen from 58 tons/Ha to 28.
- One can assume that Cuba can reverse this trend and re-plant sugarcane in the areas that have been abandoned - or in some cases planted with other crops. (Sugarcane may compete with soybeans).

Ethanol Potential in Cuba

Ethanol Output (millions of Gallons) per Million Hectares of Sugar Cane						
		Sugarcane Yields (Metric Tons/ Hectare)				
		32.3	55	65	75	80
Distillery Yield. (liters/ Ton)	70	597	1,017	1,202	1,387	1,479
	75	640	1,090	1,288	1,486	1,585
	80	683	1,162	1,374	1,585	1,691

Table: Land Availability and Use (2005)

	Agricultural Area (1000 Ha)	Arable Land (1000 Ha)	Permanent Crops (1000 Ha)	Permanent Meadows and Pastures (1000 Ha)	Sugar Cane Harvested (1000 Ha)	Sugarcane share of Total Ag Land
Argentina	129,355	28,500	1,005		285	0.2%
Belize	152	70	32	50	23.9	15.7%
Brazil	263,600	59,000	7,600	197,000	5,806	2.2%
Colombia	42,557	2,004	1,609	38,944	425.7	1.0%
Costa Rica	2,895	225	330	2,340	48.0	1.7%
Cuba	6,597	3,665	673.0	2,259.0	517	7.8%
Dominican Rep	3,420	820	500	2,100	85.1	2.5%
El Salvador	1,704	660	250	794	54.3	3.2%
Ecuador	7,552	1,348	1,214	4,990	93.9	1.2%
French Guiana	23	12	4	7	0.1	0.3%
Guatemala	4,652	1,440	610	2,602	190.0	4.1%
Guyana	1,740	480	30	1,230	49.0	2.8%
Honduras	2,936	1,068	360	1,508	75.9	2.6%
Jamaica	513	174	110	229	39.0	7.6%
Mexico	107,500	25,000	2,600	79,900	650.0	0.6%
Nicaragua	5,326	1,925	236	3,165	46.4	0.9%
Panama	2,230	548	147	1,535	34.9	1.6%
Peru	21,310	3,700	610	17,000	61.5	0.3%
Venezuela	21,690	2,650	800	18,240	130.7	0.6%
Totals	**496,397**	**104,789**	**17,715**	**373,893**	**8,332**	**1.7%**

Source: FAO.org

Estimates of Ethanol Output: Yields = (5,600 Liters/HA)					
Scenarios	Sugarcane Acreage (Thousands HA)	Millions Liters	**Million Gal**	Million Barrels	Thousand Barrels /day
Harvest Ares +20%	9,998	55,989	**14,792**	352.2	964.8
Harvest Area Doubles	16,663	93,315	**24,654**	586.9	1,608.0
Harvest Area +250%	20,829	116,644	**30,817**	733.7	2,010.0
5% of Ag Land	24,820	138,991	**36,722**	874.2	2,395.1
10% of Ag Land	49,640	277,982	**73,443**	1,748.4	4,790.2

Estimates of Ethanol Output: Yields = (7,000 Liters/HA)					
Scenarios	Sugarcane Acreage (Thousands HA)	Millions Liters	**Million Gal**	Million Barrels	Thousand Barrels /day
Harvest Ares +20%	9,998	69,986	**18,490**	440.2	1,206.0
Harvest Area Doubles	16,663	116,644	**30,817**	733.7	2,010.0
Harvest Area +250%	20,829	145,805	**38,522**	917.1	2,512.5
5% of Ag Land	24,820	173,739	**45,902**	1,092.8	2,993.9
10% of Ag Land	49,640	347,478	**91,804**	2,185.5	5,987.8

Conclusions

- Ethanol can play a small but important part in diversification of Hemispheric energy supply.
- The US should rely more on imported sugarcane based ethanol.
- Significant ethanol producers and potential producers are Brazil, Cuba, Columbia and Mexico.
- Cuba could be a significant source of ethanol for the US market up to 2 bill gals - without reducing food production.
- Central America/Caribbean. Production (and area) are relatively small. Area planted (harvested) in sugarcane would have to double to increase ethanol output by about 1 - 1.2 bill gallons.
- Biofuels can be a significant contributor to economic growth in some countries.
- IEA forecasts Hemispheric demand at 28.6 billion gal by 2030.
- This will require doubling harvested area and/or higher yields.