

*PRX Think Piece: New Topics and Old.*

## Academic Studies Criticize US Corn Ethanol Policy

*Transmittal*

### **Baker Institute (Rice University) Study: Discontinue VEETC** 2

Ethanol subsidies were \$4 billion in 2008 and led to only a 2 percent replacement of petroleum. Corn ethanol harms both air and water quality, and the RFS2 target of 36 billion gallons faces enormous challenges.

### **Iowa State University Policy Brief: VEETC Not Needed** (*new*) 3

The basic supply, demand, and price economics of the RFS with its RIN compliance system provides corn with a guaranteed mandate of 15 billion gallons, and the ethanol tax credit is not needed—advocates should conserve their political capital for other matters.

### **Purdue University Analysis: More Corn Causes More GHG Emissions** (*new*) 4

The Global Trade Analysis Project at Purdue was chosen by California to demonstrate large indirect GHG emissions caused by midwest corn ethanol, which led the state's Air Resources Board to score the fuel as non-compliant with its new Low Carbon Fuel Standard.

*All three of these studies overlook "Inconvenient Details" about how the country's biofuel policy, now promulgated by the EPA's RFS2 Final Rule, works and interacts with the marketplace. The ISU study makes a good point about conserving political capital, because it is hard to imagine the tax credit's being fully renewed this year by a Congress needing badly to reduce deficits. The more urgent goal of corn advocates should be officially re-establishing Zea mays as an Advanced Biofuel.*

### **Land Use Change in Reality — per USDA Official Data** 5

The Purdue study confuses cause with effect, using 2001 data to examine a biofuel policy created in 2007 in *reaction* to the dramatic rise in the price of crude oil; the 2007 policy, furthermore, has been promulgated in 2010 by EPA with a restrictive definition of "agricultural land" that did not exist in 2001.

### **Eisenhower's Warnings** (*revised*) 6

The president's farewell speech in 1961 was prescient in foreseeing that "public policy could itself become the captive of a scientific-technological elite." If anything, Ike underestimated how university-oriented thought would dominate policy formation, while at the same time becoming computerized, deterministic, and essentially detached from reality. *And surely Ike would never have imagined that land grant universities (such as Purdue) would become profoundly critical of corn.*

## Baker Institute Study

### “Fundamentals of a Sustainable US Biofuels Policy”

Origin. Issued by the Institute at Rice University in January, 2010, and funded in part by Chevron Technology Ventures, the study<sup>1</sup> recommended:

1. Discontinue the **Volumetric Ethanol Excise Tax Credit**
  - a. Government ethanol subsidies in 2008 were \$4 billion for only a 2% replacement of the gasoline supply. [*Note. Study did not include the 6 billion gallons of MTBE replacement on the grounds that MTBE was a product derived from natural gas. But so is corn ethanol.*]
  - b. No efficient, low-cost (pipeline-based) transportation system for Midwest ethanol is possible, further raising its cost vs. gasoline.
  - c. No scientific consensus exists on the climate-friendly nature of corn ethanol, but corn ethanol should not be rated better on GHG emissions than petroleum. [*Really?*]
  - d. Strong scientific evidence shows that corn ethanol damages water quality, especially via fertilizer run-off to the seasonal Gulf hypoxia zone.
  - e. Evidence also shows greatly increased water use from irrigated corn for ethanol.
  - f. RFS-2 target of 36 million gallons of biofuels by 2022 faces enormous practical hurdles in E-85 and flex-fuel car availability, and E-10 is limit for regular car fleet without damage to engines.
  - g. “Existing mandated targets for advanced biofuels [21 billion gallons] are not currently achievable—scientifically or commercially—and should be revisited.” Need to reduce investment uncertainty for petroleum refiners.
2. Consider an Alternative Sustainable Biofuels Policy
  - a. Remove ethanol import tariff, enabling large volumes of Brazilian sugarcane ethanol
    - i. Cheaper than corn ethanol. [*Not with high sugar price.*]
    - ii. Better for environment
    - iii. Diversifies political geography of US fuel import origins.
  - b. Develop technologies such as algae, with high productivity per acre, located on marginal lands near final demand.

Question 1. Has the study considered the subsidies to the petroleum industry itself, both outright and the cost to Americans of US military protection for the Persian Gulf? Who expects that we can continue pumping crude oil from the ground of Saudi Arabia for under \$20 per barrel?

Question 2. Is the GHG emission “baseline” for petroleum gasoline properly set at the direct value of combusting a barrel—what about an indirect charge for the Land Use Change being driven by crude oil prices in the \$100 to \$150 per barrel range? (See **International Land Use Change**.)

Question 3. Can we ever achieve a powerful Renewable Fuels Policy without using the crops that we can best grow on our soils and in our prevailing climate? Can we ever think about genuine “sustainability” without the aspect of Human Capital—such as the desire of one generation of farmers today to pass the soil on to the next in a better condition than they had found it themselves?

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<sup>1</sup> [<http://www.bakerinstitute.org/programs/energy-forum>]

## Iowa State University Policy Brief

### “Mandates, Tax Credits, and Tariffs: Does the U.S. Biofuels Industry Need Them All?”

Economics 101. ISU professor Bruce Babcock recites basic economic principles of supply, demand, and price for ethanol which in his view show that:

“Expanded mandates under the Renewable Fuel Standard provide ethanol and biodiesel producers a guaranteed future market at volumes that exceed what they have produced in the past. Despite having these mandates in place, biofuel producers continue to support tax credits and ethanol import tariffs. An examination of how the new mandates will be implemented shows that biofuel producers will receive little or no additional benefit from tax credits. Ethanol import tariffs will continue to provide U.S. corn ethanol producers a cost advantage over imported Brazilian sugarcane ethanol until at least 2013 when the demand for sugarcane ethanol to meet the noncellulosic advanced biofuel mandate starts to increase.” [Center for Agricultural and Rural Development, ISU, 10-PB 1, March 2010, Summary.]

Inconvenient Detail. In his analysis, Babcock uses the concept of a “conventional biofuels mandate,” referring to the supposed 15 billion gallons in the Renewable Fuel Standard for corn. But no such term is used in the Energy Act of 2007 or by the EPA in its RFS2 Final Rule. The law instead states that the (total) Renewable Fuel Standard shall reach 36 billion gallons in 2022, of which 21 shall be Advanced Biofuel, with 16 of this class to be Cellulosic Biofuel and (a minimum of) 1 to be Biomass-based Diesel. The quantity of  $36 - 21 = 15$  for “Conventional Biofuel” may be computed as a residual, but the law does not *reserve* this volume specifically as a minimum for corn. In the event that other feedstocks than corn can be converted to Advanced Biofuel more economically than corn, then they will fulfill the Standard instead of corn. — *The 15 billion gallons is not a minimum for corn ethanol but rather a maximum.* The long-term future of corn ethanol depends not so much on the tax credit or the import tariff, but on the ability of corn to compete with the Advanced Biofuel class so favored by Congress and the EPA, and on the ability of its supporters to break through the politics of being officially declared “Advanced.”

Messiness of Reality. In his analysis, too, Babcock places more credence on the ideal economic role of RINs than these instruments have so far demonstrated. In the RFS1 period, RINs have remained very cheap, and after the RFS2 Final Rule, two groups of obligated parties are suing EPA over the RINs system and the dates of implementation.

High Cost of Switchgrass. In an earlier ISU Brief (07-BP 50, March 2007), Babcock and others showed convincingly that “farmers will convert to switchgrass production only with significant conversion subsidies.” But such subsidies have indeed been put in place by the farm bill of 2008, to the tune of perhaps \$1.00 to \$1.50 per gallon or more. And the EPA’s cellulosic waiver credits under RFS 2 use the Energy Act’s so-called “\$3.00 target price” for cellulose.

Art of Politics. Babcock’s stated purpose in the current Brief was to help the corn biofuels industry understand “whether its political capital is being expended on the issue with the highest possible return.” But again, is not the issue broader than the ethanol tax credit? Who would give the tax credit much chance of full extension this year, given the need of Congress to reduce the country’s fiscal deficit? Would the political capital be better spent on tackling the critical issue of corn ethanol’s exclusion from the class of Advanced Biofuel, those which reduce GHG emissions by 50 percent or more? How can any scientist defend the corn *seed* at -19% and the corn *stover* at -130%. Doesn’t this put *Zea mays* at more than -60%?

## Purdue University Analysis

### “Effects of US Maize Ethanol on Global Land Use and Greenhouse Gas Emissions”

California’s Choice. In developing the rules for its Low Carbon Fuel Standard—released in March, 2009, and finalized in December, 2009—the California Air Resources Board estimated that the principal reformulated gasoline (RFG) used in the state emitted greenhouse gases at the rate of 95.86 gCO<sub>2</sub>e/MJ. The RFG is 90% petroleum and 10% ethanol. According to the Board, which *chose* the Purdue University analysis to define its rule, the midwest corn ethanol used for 10% of the RFG emits greenhouse gas at the rate of 99.40 gCO<sub>2</sub>e/MJ, which is higher (worse) than the 90% petroleum itself. The 99.40 grams score for midwest corn ethanol, according to the Purdue method, consisted of 69.40 grams of direct emissions and 30.00 grams of indirect emissions—supposedly caused by the process of “international land use change.”

Purdue’s Method Now Published in Scientific Journal. According to Thomas W. Hertel of Purdue’s Global Trade Analysis Project (GTAP) in the March, 2010, issue of *BioScience*:

“Releases of greenhouse gases (GHG) from indirect land-use change triggered by crop-based biofuels have taken center stage in the debate over the role of biofuels in climate policy and energy security. The GHG release estimated in our framework is 800 grams of carbon dioxide per megajoule (MJ); 27 grams per MJ per year, over 30 years of ethanol production. [This is] enough to cancel out the benefits that corn ethanol has on global warming, thereby limiting its potential contribution in the context of California’s Low Carbon Fuel Standard.”

GTAP Method and Results. Hertel says that “biofuels’ demand for feedstock triggers a succession of land-use changes that cause forest and other ecosystems with high carbon stocks (often far from where the biofuel is grown) to be converted to cultivation,” thus *indirectly* releasing greenhouse gases. The GTAP model shows that, globally, the US biofuel policy in the Energy Act of 2007 will lead to cropland cover increases of 3.8 million hectares (about 9.4 million acres), which means emissions of 27 grams of CO<sub>2</sub>e per year (rounded to 30 by CARB). Of the global total, the land use change in the US would be 1.6 million hectares (about 4 million acres).

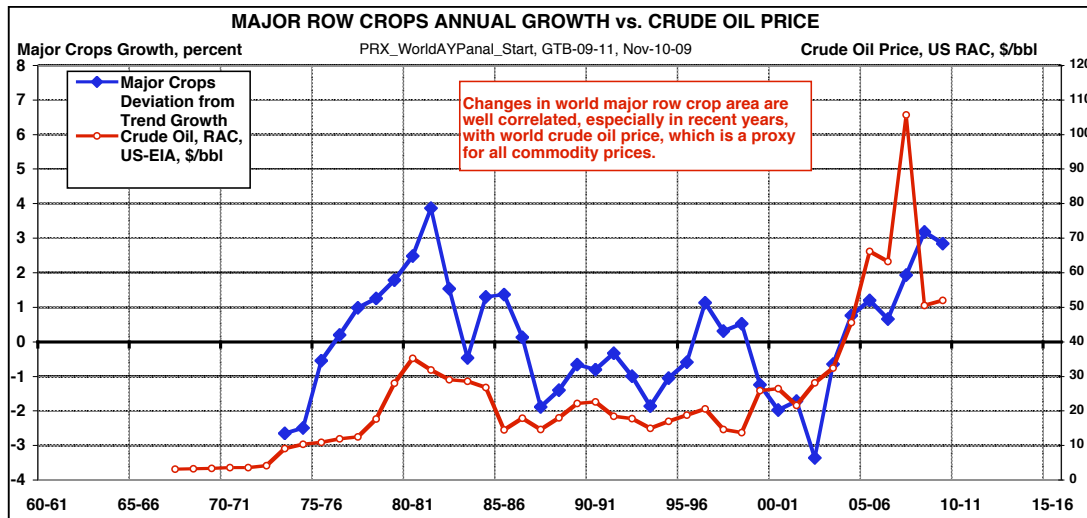
Inconvenient Detail. The Purdue model uses world land and economic data for the year 2001, *six years prior to the Energy Act of 2007, and nine years prior to the EPA’s promulgation of the RFS2 final rule.* In that final rule, EPA provides a restrictive definition of “existing agricultural lands” eligible for producing renewable biomass which can earn RINs under the RFS. The EPA specifies an annual “Crop History Database” by USDA’s Farm Service Administration, which comes to 402 million acres in 2007. This, Hertel’s statement that “We expect that most of the [4 million acres in the US] will come from high-quality pastureland” runs afoul of the EPA’s definition, which seen at the state level provides for only about 40 million acres of cropland pasture, virtually all in the western high plains, not of suitable quality for biofuel crops.

Does Purdue Method Miss the “Center Stage”? Why would we expect that the world’s land and trade patterns of 2001 to be a reliable guide for the conditions of 2009 or 2015? Land is not free to change of its own accord—there are legal strings attached to all of it, and governments are constantly changing the rules, as noted above by the US EPA. Furthermore, and more importantly, the actual change of world cropland between 2001 and 2009 was not a mere 9.4 million acres, but an astonishing 142 million acres (as shown on the next page). The cause was not US biofuel policy. The cause was the dramatic rise in the price of crude oil during this period. US biofuel policy is a *reaction* to the main cause of land use change, namely petroleum itself. To be realistic, should California not choose to double its 95.86 gram figure for petroleum role in land use change? Isn’t the “center stage” of Global Warming *petroleum*, not biofuel?

## Land Use Change in Reality — per USDA Official Data

**WORLD & US HARVESTED AREA OF TEN MAJOR ROW CROPS, 2000-2008**  
Crop data source: USDA-FAS, <http://www.fas.usda.gov/psdonline/psdhome.aspx>, May-09

Region	Row Crop	PRX_WorldAYPanel_Start, GTB-09-11, Nov-10-09 Northern Hemisphere Crop Years										09-10 minus 01-02
		00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	
		mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac
<b>WORLD</b>												
	Barley	133	139	138	147	143	138	141	141	137	136	-3
	Corn	339	340	339	350	358	359	369	395	389	388	47
	Sorghum	102	106	100	107	97	103	103	105	104	106	0
	Major Feedgrains	574	586	577	605	599	601	613	642	630	630	44
	Wheat	538	532	530	518	537	542	524	539	557	558	26
	Peanuts	56	57	53	56	53	53	50	52	53	49	-8
	Rapeseed	61	58	55	63	66	67	65	69	76	78	20
	Soybeans	186	196	203	218	230	230	233	224	238	251	54
	Sunflower	49	47	50	57	52	56	58	52	58	57	11
	Major Oilseeds	353	357	361	394	401	407	406	397	424	434	77
	Rice	375	373	361	368	374	379	381	382	387	376	3
	Cotton	79	83	76	80	88	86	86	81	76	75	-9
	Major 10 Row Crops	1919	1931	1905	1964	1999	2014	2010	2042	2073	2073	142
<b>UNITED STATES</b>												
	Barley	5.2	4.3	4.1	4.7	4.0	3.3	3.0	3.5	3.8	3.1	-1.2
	Corn	72.4	68.8	69.3	70.9	73.6	75.1	70.6	86.5	78.6	79.3	10.5
	Sorghum	7.7	8.6	7.1	7.8	6.5	5.7	4.9	6.8	7.3	5.7	-2.9
	Major Feedgrains	85.4	81.6	80.6	83.5	84.2	84.1	78.5	96.8	89.7	88.1	6.5
	Wheat	53.1	48.5	45.8	53.1	50.0	50.1	46.8	51.0	55.7	49.9	1.4
	Peanuts	1.3	1.4	1.3	1.3	1.4	1.6	1.2	1.2	1.5	1.1	-0.3
	Rapeseed	1.5	1.5	1.3	1.1	0.8	1.1	1.0	1.2	1.0	0.8	-0.6
	Soybeans	72.4	73.0	72.5	72.5	74.0	71.3	74.6	64.1	74.6	76.6	3.6
	Sunflower	2.6	2.6	2.2	2.2	1.7	2.6	1.8	2.0	2.4	1.9	-0.6
	Major Oilseeds	147.7	148.8	147.6	147.3	150.1	145.2	151.4	130.6	151.8	155.1	6.3
	Rice	3.0	3.3	3.2	3.0	3.3	3.4	2.8	2.7	3.0	3.1	-0.2
	Cotton	13.1	13.8	12.4	12.0	13.1	13.8	12.7	10.5	7.7	7.7	-6.1
	Major 10 Row Crops	232.4	225.6	219.3	228.6	228.4	228.0	219.5	229.6	235.6	229.2	3.6
<b>CROP PRICES (US Farm Price, USDA WASDE, Mar-09)</b>												
		dol/bu	dol/bu	dol/bu	dol/bu	dol/bu	dol/bu	dol/bu	dol/bu	dol/bu	dol/bu	dol/bu
	Corn	1.85	1.97	2.32	2.42	2.05	2.00	3.04	4.20	4.20	4.10	2.13
	Wheat	2.62	2.62	3.56	3.40	3.40	3.42	4.26	6.48	6.85	5.20	2.58
	Soybeans	4.54	4.38	5.53	7.34	5.74	5.66	6.43	10.10	9.85	9.45	5.07
<b>CRUDE OIL PRICE (WTI, EIA STEO, Mar-09))</b>												
		dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl	dol/bbl
	Crude oil, WTI	26	22	28	32	46	66	63	106	50	52	30



Reality. The global changes in land use in the past decade are more than a magnitude greater than considered in the Purdue 2001 GTAP model, and are not attributable to *alternative* energy policy but to the reality of price increases in *petroleum* energy. How can a vast number of grams of CO2 emissions not be charged directly against CARBOB?

## Eisenhower's Warnings

In his Farewell Speech of 1961, President Dwight Eisenhower made a number of warnings concerning the future of the country, of which the most famous is:

"In the councils of government, we must guard against the unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist." [[www.ourdocuments.gov](http://www.ourdocuments.gov), see "Eisenhower Farewell."]

In early drafts of the speech, the President used the triplet phrase, "military-industrial-congressional complex," but he deleted "congressional" before his final delivery.

A second warning from Eisenhower is less well known, but just as appropriate for today, concerning the sources and potential future impact of the "technological revolution" in the country's industrial-military posture, over which he had presided:

"In this revolution, research has become central; it also becomes more formalized, complex, and costly. A steadily increasing share is conducted for, by, or at the direction of the Federal government. Today, the solitary inventor, tinkering in his shop, has been over-shadowed by task forces of scientists in laboratories and testing fields.

In the same fashion, the free university, historically the fountainhead of free ideas and scientific discovery, has experienced a revolution in the conduct of research. Partly because of the huge costs involved, a government contract becomes virtually a substitute for intellectual curiosity. For every old blackboard there are now hundreds of new electronic computers.

The prospect of domination of the nation's scholars by Federal employment, project allocations, and the power of money is ever present and is gravely to be regarded. Yet, in holding scientific research and discovery in respect, as we should, *we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite.*"

Point. Biofuel policy seems to bring Eisenhower's warnings of nearly 50 years ago close to reality, especially in the aspect of its being regulated by **Computer Models** of such key concepts as **Lifecycle Greenhouse Gas Emissions** and **Land Use Change**, and especially as these concepts are developed and promulgated by large teams of EPA and academic scientists.

Power of Money from Whom? The Baker Institute Study was funded in part by Chevron Technology Ventures. The sources for the Iowa State University work are not stated, but are probably from the University and in some part the US Congress, through its grant to FAPRI. The Purdue study was partly funded by the California Air Resources Board and the US EPA. A study countering these three academic studies, entitled "Importance of the VEETC to the US Economy and the Ethanol Industry," has been prepared by the private consulting firm Entrix for the Renewable Fuels Association. In his 1961 warning, Ike worried most about *federal* funding of research, but today the power of money from all advocates strongly affects policy analysis.

Do Studies Receive Peer Review? Yes, sometimes, but this process is mainly about checking the correctness of the arithmetic *inside* the models and the correlation with sample historical data. The peer review does not consider whether the results actually match reality in its fullest sense. This ultimate check of trends, forecasts, and models occurs mainly in the commercial sector, where if results do not match market outcomes the practitioner is forced to abandon them and seek alternative approaches.