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Corn Ethanol Aggregate Supply

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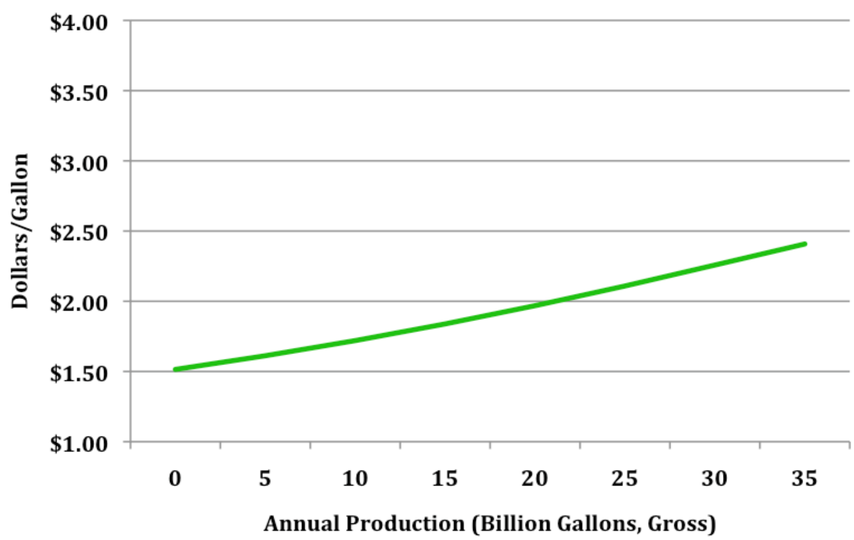
The National Biofuels Action Plan, drawing on mandates and funding in the Energy Independence and Security Act (EISA) of 2007, the Food, Conservation, and Energy Act (FCEA) of 2008, and other Federal legislation, lays out an ambitious plan for replacing imported oil with biofuels derived from plant matter. Biofuel production from first-generation technology, primarily ethanol from corn and biodiesel from vegetable oils, has increased dramatically in the last few years, now accounting for about 10 billion gallons annually.

This briefing paper presents estimates of the aggregate supply curve for corn ethanol over the range of zero to 35 billion gallons or corn ethanol produced annually. A companion paper presents estimates of expanded corn ethanol production on crop prices, land use, fertilizer use and prices, farm income and consumer benefits, while this briefing paper focuses on the aggregate corn ethanol supply curve.[1] AGSIM, a large-scale dynamic econometric-simulation model of demand and supply of the major field crops in the United States, is used for the analysis.[2]

The private costs of producing ethanol are essentially the cost of the feedstock, in this case corn, plus the net cost of distillation. In the aggregate, as corn ethanol production expands, corn price will increase due to pressure on supply and the expanded acreage that tends to occur on less productive land. Figure 1 shows the marginal private cost of corn ethanol production up to 35 billion gallons annually. Estimates in this chart also assume that the net distillation cost for corn ethanol is $0.45/gallon. Feedstock prices are keyed to corn prices in the 2009 USDA baseline. Extreme weather events, international trade and other factors can, of course, shift this curve upward or downward; Figure 1 shows estimated equilibrium costs in current dollars.

Fig. 1. Aggregate Supply (Marginal Production Cost) Curve for Corn Ethanol



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[1] Aggregate Economic Effects of Corn Ethanol and Soy-Based Biodiesel Production, by C. Robert Taylor and Ronald D. Lacewell, BioEnergy Policy Brief BPB070209, July 2009.
[2] A brief description of AGSIM is available at: https://sites.auburn.edu/academic/ag/group/bioenergy/_layouts/viewlsts.aspx?BaseType=1

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Due to biofuel mandates as well as federal subsidies for corn ethanol production, the private costs shown in Figure 1 do not reflect all of the social costs relevant to policy debate. Mandates and subsidies result in distortions in the food economy. Increased crop prices resulting from expanded ethanol production increases farm income but at the same time increases food costs. Although the effect of expanded ethanol production on food prices may be very small in percentage terms, the small food price effect can aggregate up to a substantial effect on food consumer well being.

A mandate or subsidy results in what economists call a dead weight loss to society. In the case of bioenergy policy, the dead weight loss on the food sector must be weighed against benefits that may arise from carbon sequestration or reduced dependence on foreign oil, for example.

AGSIM, the model used to estimate the feedstock cost underlying figure 1 is also structured to provide estimates of effects on farm income, consumers' well-being, taxpayer expense and the net effect on the food sector, which is the dead weight loss to the domestic food industry. These estimates, referred to as economic surplus changes in the jargon of economics, are shown in Table 1 for alternative levels of corn ethanol production.

Table 1. Change in Economic Surpluses in the Food Sector at Alternative Levels of Ethanol Production (millions of dollars)

Impact	Billion Gallons of Corn Ethanol Produced, Gross							
	0	**5**	**10**	**15**	**20**	**25**	**30**	**35**
Food Consumers' Well Being	$0	-$5,329	-$11,744	-$19,378	-$28,368	-$38,860	-$50,929	-$64,223
Net Farm Income	$0	$4,739	$10,193	$16,480	$23,735	$32,118	$41,716	$52,389
Subsidy Cost	$0	$2,673	$5,345	$8,018	$10,690	$13,363	$16,035	$18,708
Net Surplus Change (Dead Weight Loss)	**$0**	**-$3,262**	**-$6,896**	**-$10,915**	**-$15,323**	**-$20,105**	**-$25,248**	**-$30,542**

A more complete accounting of the marginal costs of expanded corn ethanol production is shown in Figure 2. The dashed green line at the bottom shows the aggregate marginal private cost of corn ethanol production, as shown in Figure 1. The blue line in the middle of Figure 2 shows the marginal private cost plus the taxpayer cost of the ethanol subsidy, while the top line includes the marginal dead weight loss.

Marginal private cost of producing corn ethanol increases from about $2.50/gallon to almost $3.00/gallon if 35 billion gallons are produced annually. Including the subsidy and dead weight loss on the food sector, the marginal cost increases from about $2.50/gallon to almost $3.50/ gallon if 35 billion gallons are produced. It is critical to note that these estimates do not include possible benefits of mandated corn ethanol production such as carbon sequestration or less dependence on foreign oil. Such benefits, which have yet to be estimated, may outweigh the costs shown in Table 1 and Figure 2.

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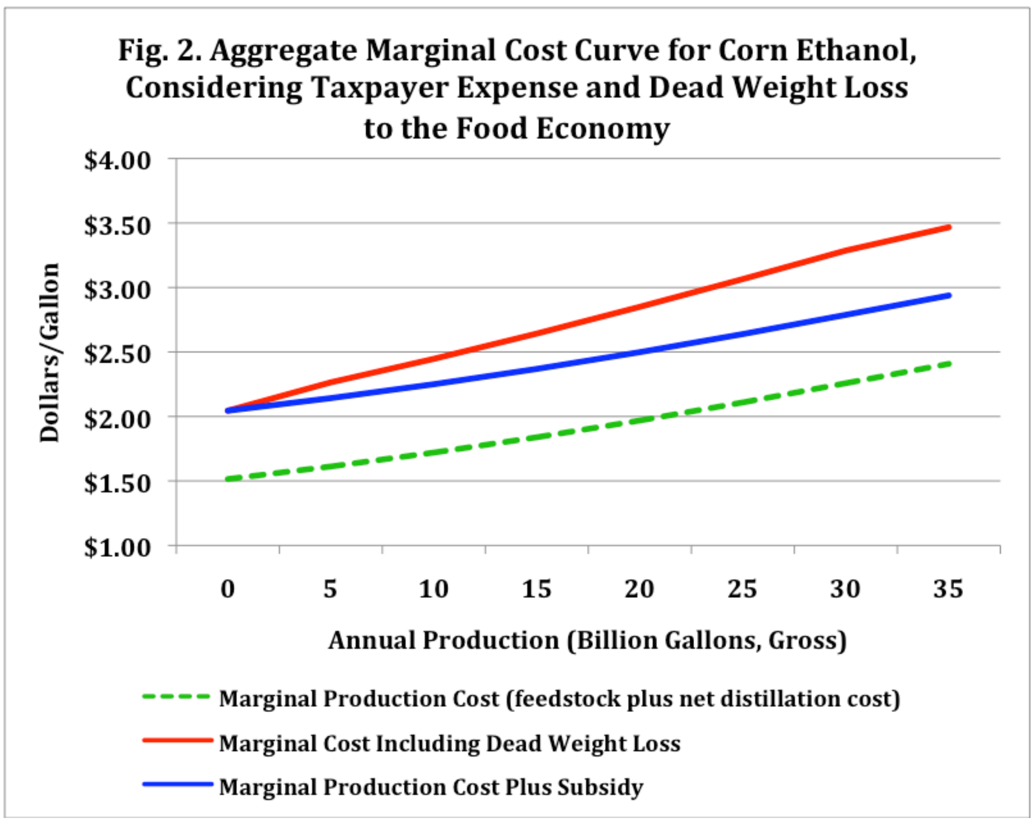

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