

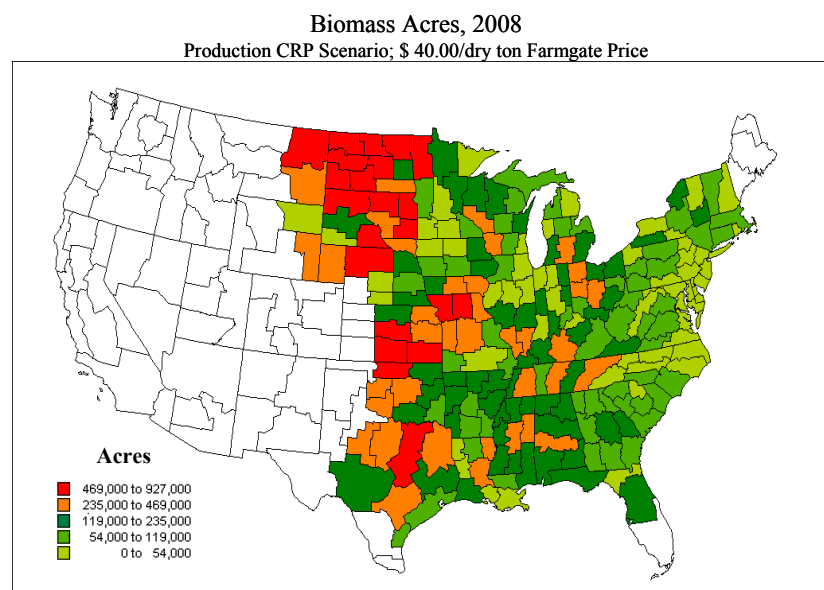
The Economic Competitiveness of, and Impacts on the Agricultural Sector, of Bioenergy Crop Production

Purpose: The purpose of the analysis is to examine the price that must be paid for bioenergy crops to provide sufficient incentive for farmers to switch cropland acres from current uses (such as grain production) to bioenergy crop production. Additionally, the analysis evaluates the impacts of these land use changes on the quantities and prices of conventional crops, and on farm income.

Approach: The project is a joint study between USDA and DOE. A model USDA uses (POLYSYS) was modified to include switchgrass, hybrid poplar, and willow. POLYSYS includes 305 agricultural regions, the major crops (corn, soybeans, wheat, barley, rice, sorghum, oats, cotton, alfalfa, other hay), a livestock sector, and demand markets (food, feed, industrial, export, carry over stocks). POLYSYS includes the major cropland categories (acres currently in crop production and idle, pasture, and Conservation Reserve Program acres). Acres are allocated to the different crops based on relative profitability considering yields, production costs, and market price for all crops. The model identifies land use changes among cropland categories and among and between the different crops for each of the 305 regions (i.e., estimates not only change from corn to bioenergy crops, but changes from corn to other conventional crops as well) (see map). The model is tied to the USDA baseline. Interaction of the supply and demand components of the model allow for estimates of changes in conventional crop prices (which are incorporated into farm planting decisions) and farm income resulting from bioenergy crop production.

Results: Presented below are selected results illustrating the impact of bioenergy crop production on cropped, idle, and pasture land.

CRP analysis is presented separately in another summary report. The table presents the acres of bioenergy crops that could be more profitable than the current use of the agricultural land at \$30/dt and \$40/dt prices. Changes in acres and prices for the three most widely produced crops (corn, wheat, soybeans) are provided (information also available for other crops). The table also includes changes in net farm income that result from



Source: Daniel G. De La Torre Ugarte (UT/APAC), Marie E. Walsh (DOE/ORNL), Hosein Shapouri (USDA/OEPNU), and Stephen P. Slinsky (UT/APAC). "The Economic Impacts of Bioenergy Crop Production in U.S. Agriculture." (1999)

bioenergy crop production and estimates billions of gallons of ethanol or percent of electricity (using current conversion efficiencies) that could be produced from the biomass produced. The map shows the distribution of energy crop acres at the \$40/dt price.

Conclusions:

- ◆ Bioenergy crops have the greatest potential to be the principal supplier of biomass feedstocks for the industry.
- ◆ Energy crops are the most widely dispersed biomass feedstock providing opportunities for use in much of the US.
- ◆ Biological improvements (yield increases, disease and pest resistance, improved establishment, improved drought tolerance) can expand even further the geographic production range, increase yields, and substantially decrease costs.
- ◆ Modification of existing agricultural policies (CRP, LDP, etc.) can be used to significantly reduce the cost of bioenergy crops to user facilities.
- ◆ Conventional crop prices rise modestly, but food prices do not given the small percent of food prices that are accounted for by the cost of grain used in their production.

Table 1: Selected Results From the Bioenergy Crop Analysis

	Bioenergy Crop Price of \$30/dt				Bioenergy Crop Price of \$40/dt			
	Energy	Corn	Wheat	Soybean	Energy	Corn	Wheat	Soybean
Acres (Million)	+11.22	-1.4	-1.4	-1.9	+28.96	- 3.7	-6.2	-3.4
Production (Mdt)	56				188			
% Price increase from base (\$/bu)		(\$2.55) + 4%	(\$4.25) + 4%	(\$6.10) + 5%		(\$2.55) + 9%	(\$4.25) + 12%	(\$6.10) + 10%
Net Farm Income	2.8				6.0			
Percent Electric	2				7			
Billion Gallons Ethanol	5				17			