

# Macroeconomic Impacts of a Corn Stover to Ethanol Industry in the Midwest

**Purpose:** The purpose of this study is to examine the macroeconomic impacts (total product output, value added, employment) that might result from establishing an ethanol industry in the Midwest using corn stover as the biomass feedstock.

**Approach:** The study includes 10 Midwestern states (IA, IL, IN, KS, MN, MO, NE, OH, SD, and WI) representing 80-85% of corn production and acres. Corn stover supplies assume a continuous corn rotation, reduced tillage practices (current mix of mulch and no-till), and simple representation of soil carbon and erosion needs. Corn stover costs include collection and staging costs (as a function of available yield/acre), transportation costs (using a GIS transportation model—ORIBAS), and impacts of competition for local feedstocks as multiple feedstocks are constructed. The analysis assumes that 100% of the estimated available corn stover quantities are used. Corn stover to ethanol conversion costs were provided by NREL and a market price of \$1.25/gallon of ethanol was assumed. A 30% premium over breakeven collection costs was assumed as payment to farmers for participation. Macroeconomic impacts are estimated using IMPLAN, a regional-input output model that estimates direct, indirect, and induced economic impacts in the construction, agricultural, transportation, and industrial sectors of the economy affected by the establishment of a corn stover to ethanol industry.

**Results:** The table below contains the combined annual industrial, agricultural, and transportation impacts of establishing a corn stover to ethanol industry in the Midwest for a 2000 dMT/day facility (DOE base case). On going analysis indicates that this study is optimistic in that a more rigorous assessment of corn stover supplies indicate that the quantities potentially available are lower than those used in this study and the costs higher. Additionally, new conversion cost estimates are higher. The analysis will be updated when the new analysis is complete, pending available funding. Never-the-less, the potential impacts are substantial, indicating an annual increase of nearly \$9 billion in total industry output (value of the product produced as well as value of increased inputs), \$3.8 billion in value added (taxes, dividends, etc.), and adding 76,000 jobs to the economy. In addition to these annual impacts, the construction of the plants will provide a one time only impact of \$17.7 billion total product output, \$8.4 billion in value added, and 174,000 jobs. In addition to the ethanol price, farmer premium, and plant size shown in the table, the analysis also examined several other ethanol price and farmer premium scenarios for the 2000 dMT/day plant and for a 1000 dMT/day plant as well. Under many of these scenarios, total macroeconomic impacts for an industry consisting of 1000 dMT/day plants was only marginally less (5-10%) than for industry consisting of 2000 dMT/day, and in several cases, the 1000 dMT/day industry provided greater economic impacts.

**Conclusions:**

- ◆ A corn stover to ethanol industry has the potential to provide substantial economic benefits to the Midwest.
- ◆ Under the 100% available corn stover supply scenario, larger scale plants (2000 dMT/day) generally provided greater economic benefits than 1000 dMT/day plants, although not always and in many cases only marginally higher benefits. As noted in other studies, feedstock costs increase substantially more for 2000 dMT/day plants than smaller plants when less than 100% of the estimated available feedstock is available in reality. Under these more realistic conditions it is likely that an industry consisting of plants less than 2000 dMT/day will provide greater economic benefits than an industry based on larger plants.
- ◆ Smaller plants, rather than being just a scaled down version of larger plants, need to be reconfigured to provide increased cost savings.

**Table 1: Combined Annual Industrial, Agricultural, and Transportation Impacts**

	Number of Plants	Ethanol Production (million Gallons)	Total Product Output (million \$)	Employment	Total Value Added (million \$)
Illinois	12	730	2,134	16,624	1,000
Indiana	5	304	835	7,273	365
Iowa	15	912	2,241	19,279	885
Kansas	0	0	0	0	0
Minnesota	9	547	1,464	12,533	595
Missouri	0	0	0	0	0
Nebraska	9	547	1,432	12,831	576
Ohio	2	122	338	2,896	144
South Dakota	1	61	152	1,321	51
Wisconsin	2	122	345	3,371	142
<b>TOTAL</b>	<b>55</b>	<b>3,345</b>	<b>8,941</b>	<b>76,128</b>	<b>3,758</b>