# Iowa State University Biofuels Study Fact Sheet – Major Findings

## May 17, 2007

1. **Purpose:** The purpose of the study by the Center for Agricultural and Rural Development at Iowa State University was to provide a realistic assessment of how large the U.S. biofuels sector could become, and to estimate the likely impact this sector could have on crop markets, the livestock and poultry sectors, exports, and grain-based wholesale and retail food prices.

   The study finds that the United States is near the tipping point when it comes to the development of the biofuels industry. The study's findings are based upon two distinct scenarios:

   - Under a "base scenario," with crude oil prices ranging from $55 to $60 per barrel, the study projects ethanol capacity could plateau at around 15 billion gallons annually.

   - Under a "high-price crude oil scenario," with crude oil prices ranging from $65 to $70 per barrel, the study finds ethanol capacity has the potential to expand to nearly 30 billion gallons annually.

2. **Retail Food Price Impacts:**

   - **U.S. Impact:** The study very conservatively estimates that U.S. consumers already have seen an increase in retail food prices amounting to $47 per person, as a result of corn prices increasing by approximately $1.50 per bushel since the approximately $2-per-bushel price that existed in mid-2006. That equates to a $14 billion increase in food prices nationally.

     If long-run equilibrium corn prices were to increase to $4.42/bu. (as projected by the study under the high-price crude oil scenario), retail food prices for beef, pork and poultry would increase by 6.8 percent, 7.5 percent and 8.5 percent, respectively. Egg prices would jump 13.5 percent. Given that total U.S. food expenditures total $1.1 trillion, the total food price impact of corn-based ethanol would equate to about $20 billion annually for U.S. consumers under this scenario.

     *[**Note:** It is important to note these cost impacts measure only the direct effect of higher feed costs. They do not consider second-round impacts, such as demands from employees for higher wages to compensate for higher food costs. Nor do they consider ancillary food-cost changes for other land-intensive crops, like vegetables.]*

- **Global Ramifications:** The study also projects that increased use of corn for ethanol production will have ripple effects throughout world commodity markets. Under the high-price crude oil scenario, the study projects that 15 percent of total world wheat and coarse grain production would be utilized for ethanol, further reducing already-tight global grain supplies. Under the high-price crude oil scenario, the study projects the United States would utilize more than 50 percent of its total wheat and coarse grain production for ethanol.

  In addition to a 40 percent increase in U.S. corn prices projected under a high-price crude oil scenario, Canadian feed barley prices would increase by 26 percent and world soybean prices (CIF Rotterdam) would increase by 22 percent. Meanwhile, U.S. domestic wheat prices are projected to increase by 23 percent, Australian wheat prices by 16 percent, and EU wheat prices (basis Rotterdam) by 7 percent.

3. **Acreage and Commodity Price Impacts by 2016** (based upon long-run equilibrium season-average corn prices ranging from $3.16 to $4.42 per bushel.):

   - **Corn:** Farmgate corn prices are projected to range from $3.16/bu. (under the base crude oil price scenario) to $4.42/bu. (under a high-price crude oil scenario). Under the high-price crude oil scenario, U.S. acreage planted to corn is projected to increase by 44 percent (from 78 million acres in 2006 to 112.3 million acres). But there is considerable uncertainty over how high corn prices would need to reach to sustain the 112.3 million acres of corn plantings the study projects would be required to produce 30 billion gallons of ethanol under the high-price oil scenario. That uncertainty is caused by the fact that prices of other competing crops would be expected to increase dramatically to vie for limited acreage available for crop production, and because the United States has never experienced the market impacts of such a large, permanent corn-price increase. If U.S. corn prices increase to even greater-than-projected levels, retail cost impacts on meat, milk and eggs could be greater than projected in the study.

     Meanwhile, U.S. corn exports are projected to decline from the current 2.4 billion bushels to as low as 911 million bushels (under a high-price crude oil scenario) – a 63 percent decline.

   - **Soybeans:** Soybean planted acres would sustain a significant decrease from approximately 75 million acres in 2006 to 68.4 million acres (under the base crude oil scenario) and 57.3 million acres (under a high-price crude oil scenario) by 2016. Projected season-average soybean prices would increase from approximately $6.10 per bushel in 2006 to $7.25 per bushel by 2008. Projected prices could range as high as $8.07 per bushel (under the high-price crude oil scenario). U.S. soybean exports would decline by about 300 million bushels to 594 million bushels – a 33 percent drop.

- **Wheat:** Similarly, planted wheat acreage would decline significantly – to between 42 million (under the high-price crude oil scenario) and 57 million acres (under the base crude oil price scenario). U.S. wheat exports are projected to decline to 1 billion bushels (under the base crude oil price scenario) and to 483 million bushels (under the high-price crude oil scenario). Projected farmgate wheat prices would range from $4.29 per bushel (under the base crude oil price scenario) to $5.27 per bushel (under the high-price crude oil scenario).

4. **Livestock/Poultry Impacts by 2016** (based upon long-run equilibrium season-average corn prices ranging from $3.16/bu. to $4.42/bu.):

   - **Beef:** Retail beef prices would increase 4 percent and production would decline by 1.6 percent.

   - **Pork:** Production costs would increase by 18.4 percent (under base scenario) and up to 36.8 percent (under higher oil-price scenario); the decline in pork production would range from 4.6 percent (base scenario) to 9.2 percent (high-price crude oil scenario). Retail pork prices would be expected to increase 4.2 percent (under base scenario) and by 8.4 percent (under high-price crude oil scenario). Meanwhile, the study projects U.S. pork exports would decline by 21 percent, which would reverse 15 consecutive years of increasing U.S. pork shipments to foreign markets.

   - **Poultry:** U.S. broiler production would decline by 6 percent. Broiler exports are projected to decline by 15 percent, while turkey exports would fall by 6 percent. Wholesale broiler prices would increase by 15 percent, retail prices would increase by 5 percent and domestic consumption would decline by 4 percent.

5. **Fragile Grain Stocks Situation:** There is virtually no leeway for supply disruptions or other anomalies, given that the study projects ending-year corn stocks would range from 400 million to 800 million bushels (400 million bushels is less than "pipeline" supply levels). Any supply disruption (e.g., drought-reduced yields, shifts in cropping patterns) in the United States or a major foreign grain-producing country could result in major ripple effects on multiple user sectors in the short term, ranging from livestock liquidations (in the event of feed grain shortages) to adverse impacts on grain processing sectors (soy processing, corn milling/refining, wheat flour milling, etc.) to steep reductions in U.S. grain exports.

6. **Conservation Reserve Program:** The study finds that the CRP represents the largest source of available tillable acres in the United States, and could "alleviate some of the financial stress on livestock producers (during the early years of rapid ethanol growth)," as well as mitigate short-term supply disruptions (such as those caused by drought). However, it finds that CRP acres would not alleviate future possible supply shortages in basic crop commodities. A moderate increase (7 million acres) in current CRP land being shifted to crop production could have a mild tempering effect on long-term constrained supplies of basic commodities, according

to the study, resulting in a 1 percent increase in corn supplies. The study predicts that bringing 11 million acres (of the 36 million currently enrolled) out of the CRP would add slightly more than 1 percent to corn supplies and would reduce long-term corn prices by 2.2 percent (7 cents per bushel) under the base oil-price scenario.

In addition, given the study's finding that under a high-price crude oil scenario, corn prices would increase to a level that caused 15 million acres of wheat land to be diverted to corn, and given that CRP land is concentrated heavily in traditional wheat-planting areas, additional land coming out of CRP could relieve some of the economic stress on the U.S. wheat sector and keep the United States more competitive in global wheat markets.

7. **Cellulosic Ethanol Potential:** The study analyzed the economic feasibility of using either corn stover or switchgrass as ethanol feedstocks under reasonably optimistic assumptions about the technology forecasts for conversion rates. The study concluded that neither of these feedstocks appeared likely to come into widespread use, due to conversion, handling, logistics and capital costs and constraints. The authors concluded that in U.S. corn-producing regions, switchgrass would make economic sense "only if it receives an additional subsidy that is not provided for corn-based ethanol." In addition to the highway fuel tax break offered for ethanol use in fuel, the federal government would need to provide approximately $270 per acre in subsidies for biomass production to entice producers to switch from corn to switchgrass production. *[Note: The $2.70-per-acre subsidy estimate is based upon a per-gallon ethanol price of $1.75 and switchgrass production of 6 tons per acre.]*

8. **Impact of Drought or Other Short-Crop Scenario:** Coupled with a higher ethanol mandate of 14.715 billion gallons, the study found that the fragile corn stocks situation would be susceptible to any supply disruption resulting from drought, reduced yields or shifts in cropping patterns. The study projects the following impacts if U.S. crop yields are reduced in 2012 (the year already-existing ethanol plants and those under construction reach their production potential) by a level equivalent to what occurred during the 1988 drought, even after accounting for trend-yield increases:

   - **Corn prices** are projected to increase an additional 42 percent from baseline levels – to $ 4.75 per bushel – based upon yields being reduced by 25 percent.

   - **Soybean prices** are projected to increase by 22 percent – to $8.50 per bushel – if yields are reduced by the same amount (18 percent) as occurred in the 1988 drought.

   - **Other Impacts:** U.S. corn exports and U.S. corn stocks both would decrease by more than 60 percent. Feeding of U.S. wheat to livestock would increase by 50 percent to 118 million bushels.

The study notes that without a high biofuels mandate, the market more easily adjusts to short-supply situations because ethanol producers will, at some corn-price level, also reduce corn usage. Conversely, high biofuels mandates create inflexibility in markets, the study says, and "any required adjustment in demand (for corn) would occur outside the ethanol industry" (e.g., feed, livestock/poultry, food).

**9. Other Significant Findings:**

- **Distillers Dried Grains with Solubles (DDGS):** DDGS prices will closely track corn. Thus, the impacts of rising corn prices are as significant for beef and dairy as they are for hogs and poultry.

- **Import Tariffs:** The study found that eliminating the import tariff on ethanol would not result in large quantities of U.S. imports of foreign-produced ethanol. It projects that ethanol imports would increase 136 percent, although the volume increase would be relatively modest – from the current 314 million gallons annually to about 743 million gallons. But importantly, the study notes that "under free ethanol trade, ethanol imports could play a bigger role in attenuating the negative impact of short crops under an ethanol mandate as blenders could source the ethanol more cheaply abroad."

**10. Issues Not Addressed:** Several issues were not within the scope of the research study, including several important unintended consequences that could result from a sharp increase in the quantity of corn used for ethanol. This includes the impact of additional plantings on environmentally sensitive areas; the impact on the availability of grain-based food aid to respond to world hunger needs; and, for the food industry, the impact on the availability of healthier oils that currently are being used to replace trans fats and saturated fats for cooking and in many foods.