ERS Report Summary

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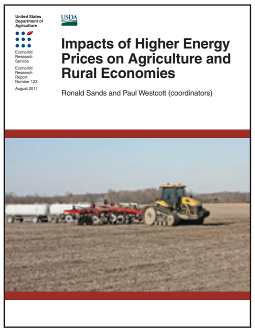

This is a summary of an ERS report.

Find the full report at *www.ers.usda.gov/publications/err123*

Impacts of Higher Energy Prices on Agriculture and Rural Economies

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What is the Issue?

Agricultural production consumes large amounts of energy, either directly through combustion of fossil fuels, or indirectly through use of energy-intensive inputs, especially fertilizer. Over 2005-08, expenses from direct energy use averaged about 6.7 percent of total production expenses in the U.S. farm sector, while fertilizer expenses represented another 6.6 percent. However, these sector averages mask much greater energy intensities for major field crops. Agricultural production is therefore sensitive to changes in energy prices, whether the changes are caused by world oil markets, policies to achieve environmental goals, or policies to enhance energy security.

To illustrate the flow of energy prices through the agricultural system from farm to retail, we construct three scenarios: a reference scenario of agricultural production from 2012 through 2018, and two alternative scenarios over the same time period with energy price increases expected to result from pricing greenhouse gas emissions. Price increases for different energy sources in the alternative scenarios are based on their carbon content. Results are compared to the reference scenario to estimate economic implications. Higher energy-related production costs would generally lower agricultural output, raise prices of agricultural products, and reduce farm income in the short run.

What Did the Study Find?

- Energy-related production expenses vary significantly for different crops. On a per-acre basis, corn and rice have the highest energy-related costs of the eight major crops (corn, sorghum, barley, oats, wheat, rice, upland cotton, and soybeans) examined in this report, while soybeans have the lowest. With higher energy-related expenses (fuel up an average of 2.6 to 5.3 percent; fertilizer up 4 to 10 percent), total acreage for these eight crops would decline by an average of 0.2 percent (under the lower price change scenario) to 0.4 percent (higher price change scenario) over 2012-18. Planted area would decline for seven of the eight crops, the exception being soybeans.
- Energy-related expenses also affect livestock producers. Although their direct energy costs are lower than for crop production, livestock producers would face higher feed costs under both

the lower (0.2 to 0.6 percent higher annually, 2012-18 average) and higher (0.6-1.3 percent higher) energy price change scenarios. Poultry production would be less affected than beef and pork, since poultry is the most efficient feed-to-meat converter of the animal types.

- The scenarios analyzed did not account for potential changes in technology (beyond those implicit in the reference scenario) in response to sustained increases in energy prices. Additionally, a decades-long declining trend in energy use per unit of output in the agricultural sector is likely to continue, which is only partly represented in the scenarios by increasing yields. For these reasons, reported impacts of higher energy prices on the agricultural sector may be somewhat overestimated. Additionally, longer run impacts of further energy price increases would not be proportionately as large as the short-term impacts we report here.

- Effects also vary regionally. The Mississippi Portal region is most affected by higher energy costs, due to the predominance of fertilizer-intensive crops like cotton. Farms in that region would see net cash income decline by 8 to 19 percent on average (in 2014) under the lower and higher energy price change scenarios, respectively.

- Although increased agricultural commodity prices affect consumer food prices, retail food prices are more affected by energy costs in food processing, distribution, and marketing than in agricultural commodity production. For the scenarios and time period focused on in this report, the Consumer Price Index (CPI) for food—including food at home and food away from home—would be 0.6 to 0.9 percent higher than without the simulated energy-related cost increases for electricity, diesel fuel, and natural gas.

- It does not appear that impacts through the agricultural sector of the higher energy prices scenarios studied in this report would have a substantial effect on farm county economies and populations. In general, farm counties tend to have relatively few people without high school degrees, very high proportions of adults employed, and low poverty rates compared with other nonmetro counties. Some farm-dependent counties in the Mississippi Portal region may be relatively more affected by energy-related farm income losses.

- A decrease in fossil fuel production under an emissions tax or a cap-and-trade program would reduce overall employment in related energy extraction industries. Counties specializing in energy production are overwhelmingly rural. However, few nonmetro counties derive a substantial share of nonfarm employment from energy production, so overall rural impacts would be small, with the exception of some mining counties, principally located in eastern Kentucky and West Virginia.

How Was the Study Conducted?

Two key economic models at USDA's Economic Research Service (ERS)—the Food and Agricultural Policy Simulator (FAPSIM) and the Farm-Level Partial Budget Model—were used as the foundation of this analysis. We started with a range of prices for carbon dioxide emissions, taken or derived from studies by the U.S. Environmental Protection Agency and the U.S. Energy Information Administration. Both studies are based on the American Clean Energy and Security Act of 2009 (House Resolution 2454), which specified an increasingly stringent cap on U.S. greenhouse gas emissions from 2012 through 2050. Corresponding impacts on prices for electricity, natural gas, and petroleum products were also provided by these studies. We focus on the 2012-2018 timeframe, which corresponds to the timeframe of results provided by the FAPSIM model.

Implications of these energy-related price impacts for changes in agricultural production costs were used as input to FAPSIM to provide national agricultural sector effects. The Farm-Level Partial Budget Model was used to convert national impacts into changes in farm business net cash income for nine resource regions in the United States. Econometric regression analysis provided a link from agricultural producer prices to retail food prices, including energy costs in food processing, distribution, and marketing channels from the farm to retail.

Results focus solely on effects of higher cash expenses associated with emissions pricing, and do not include potential financial benefits from sequestering carbon or reduced climate change.