

Higher Energy Costs Cause Rethinking of Crop Rotation Decisions

by Kevin Robertson

Graduate Research Assistant, Department of Agricultural Economics

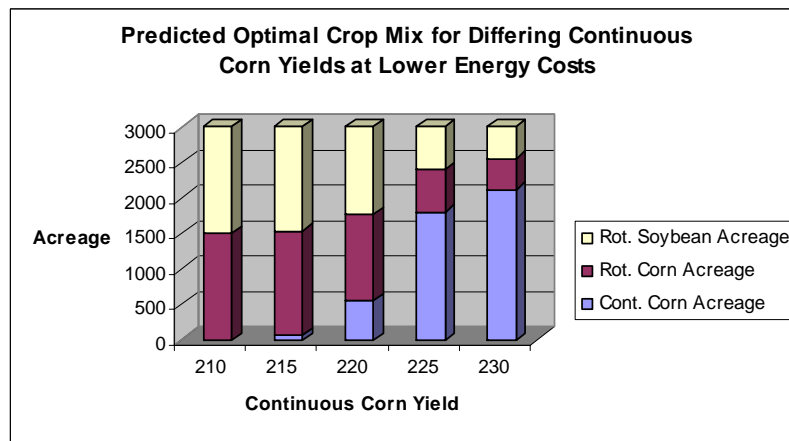
Many Midwestern corn growers have increased the amount of corn in their crop rotations, and countless others are considering the move. With growing ethanol production and more concentrated livestock operations, the continuing threat of soybean rust, and the remarkable success of some growers who raise continuous corn, this approach seems to make good economic sense.

One of the most binding constraints to the profitability of corn following corn is the higher cost of production. Greater needs for tillage and fertilizer are typically needed to produce a high-yielding crop. With energy prices skyrocketing in recent weeks and uncertainty about future costs, does continuous corn remain a viable option for producers?

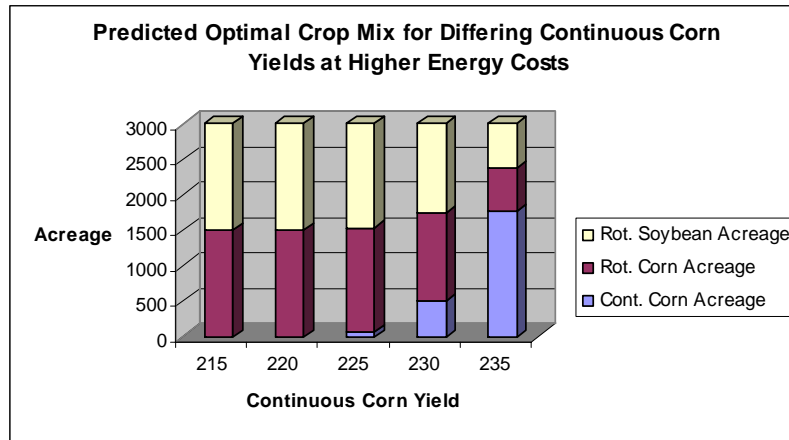
“With higher fertilizer and diesel fuel prices, we’ve been doing a lot of rethinking about crop rotations in our operation,” said Jake Frederick, a Crawfordsville, Indiana farmer that has a part of his operation in corn following corn. “But when you factor in the cost of treating for Asian soybean rust if that is a threat next summer, we still feel that continuous corn is a viable option in some of our fields.”

To analyze the effects of rising fuel costs Purdue’s B-21 linear programming model was used to find the yields necessary to make continuous corn compete with a rotation of corn and soybeans. Continuous corn requires higher energy inputs than corn and soybeans in rotation because of increased tillage and higher fertilizer rates. An increased yield for continuous corn is needed to pay for the additional energy inputs. The computer model optimizes production based on the input costs, field timeliness, available machinery, and weather.

For the base case, as presented at the Top Farm Workshop in July, a representative 3000 acre farm was used in the linear programming model with yields of 180 Bu/A for corn and 55 Bu/A for beans. In the original analysis an initial diesel price of \$1.85 per gallon and \$0.32 per pound of nitrogen along with a price of \$2.30 per bushel of corn and \$5.80 per bushel of beans were used. Traditionally the corn to soybean ratio has been a useful tool in influencing how much corn and soybeans are planted; as the ratio decreases corn is favored. The ratio has hovered between 2.4 and 2.6 since the late 1990’s. Continuous corn yields were increased until the computer included that cropping system as part of its optimal mix. The model output shows that continuous corn must yield at least 215 Bu/A, 35 Bu/A more than rotation corn, in order to compete with a corn/soybean rotation.



As continuous corn requires higher energy inputs than corn and soybeans in rotation it is reasonable to assume that the rapid increase in the cost of diesel fuel and nitrogen this year would have a greater effect on continuous corn, making it less feasible. To analyze the effect fuel prices have a new diesel price of \$3 per gallon and nitrogen cost of \$0.38 per pound was used in the linear programming model. The diesel price represents the highest diesel prices realized and the nitrogen price is a representative price that reflects how nitrogen prices are increasing and might increase into the future. The model shows continuous corn yields needed to increase to 225 Bu/A to remain competitive. As energy prices increase the producer would need to capture an additional 10 Bu/A yield increase. Elevated energy costs caused total input costs to increase 7% for rotation corn, 3% for rotation beans, and 8% for continuous corn.



When a grower is considering such a large shift in production from a rotation to continuous corn they should carefully examine the costs. The variable cost to yield ratio is an easy way to compare cropping systems and relationships between yield and inputs. When diesel prices were lower the ratio for rotation corn was \$1.24 per bushel with a yield of 180 Bu/A while the continuous corn ratio was \$1.35 with a yield of 215 Bu/A; a difference of eleven cents. When energy costs are increased there is a change in the yield needed to grow continuous corn. The variable cost to bushel ratio for rotation corn increased to \$1.33 per bushel and the ratio for continuous corn is \$1.43 per bushel at a yield of 225 Bu/A; a difference of ten cents. A farmer might grow continuous corn even when the variable cost to bushels ratio is higher than for rotation corn because of timeliness issues in the model or because the farmer is able to spread the fixed costs of continuous corn over more acres. The ratio is about ten cents higher for continuous corn than rotation corn at the point where continuous corn is first grown at both price levels. This suggests there is a relationship between the ratios even at different price levels. This is useful because as price fluctuates growers can easily compute these ratios to quickly determine if continuous corn might be feasible for them.

The increases in energy costs have raised the hurdle for growing continuous corn. In the original analysis 215 Bu/A of continuous corn was needed to compete against rotation corn at 180 Bu/A. When incorporating higher fuel and nitrogen costs, continuous corn yields must be at least 225 Bu/A. Other than increasing continuous corn yields, there are at least two other options for growers wanting to make continuous corn work: reducing input costs and increasing commodity prices. Knowing that continuous corn usually requires more tillage and higher nitrogen rates; lowering input costs do not seem feasible. The final option, higher prices, might make continuous corn feasible for growers who are able to capture contracts for higher-value corn in their local area. Growers near corn processing or ethanol plants, or those in areas where livestock is concentrated may have enough price benefit to swing the continuous corn ledger in their favor.



For More Information

Gasoline and Diesel Fuel Update, Energy Information Administration, United States Department of Energy.
Available at: <http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>

Lin, William, and Peter Riley. 1998 Rethinking the Soybeans-to Corn Price Ratio: Is it Still a Good Indicator for Planting Decisions? Economic Research Service, United States Department of Agriculture.
Available at: <http://www.ers.usda.gov/publications/corn/crnprato.pdf>

Erickson, Bruce and Jess Lowenberg-DeBoer. 2005. Weighing the Returns of Rotated vs. Continuous Corn. Top Farmer Crop Workshop Newsletter, February, 2005. Purdue University. Available at: http://www.agecon.purdue.edu/topfarmer/newsletter/TFCW2_05.pdf

