



Producer Supply Response for Area Planted of Seven Major U.S. Crops

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What Is the Issue?

Numerous studies have examined the accuracy of USDA projections, some of which looked at short-term projections, while others focused on longer term baseline projections. Recent studies evaluating the Agricultural Baseline's 10-year projections for U.S. harvested area show that wheat area harvested is frequently overestimated while soybean area is consistently underestimated. The researchers found that a simple time-series forecast improves baseline projections that extend beyond the first 3 years of the 10-year projections. Given the findings from prior research, significant potential exists for improvement in the underlying model for the USDA Agricultural Baseline's area planted projections. Updating the model with theoretically consistent estimations of own- and cross-price supply elasticities will provide a strong foundation for future USDA Agricultural Baseline modeling efforts.

What Did the Study Find?

Elasticities with respect to net returns and price for each crop as well as competing crops are estimated for area planted of seven major U.S. program crops—corn, soybeans, wheat, sorghum, barley, oats, and cotton. Each of the own-net returns elasticities (defined as percent change in area planted with a 1-percent increase in net returns) shares a positive sign while each of the cross-elasticities (the percent change in area planted of one crop with a 1-percent change in net returns for a competing crop) share a negative sign for all variables.

- Own- and cross-price elasticities are calculated from the elasticities with respect to net returns. The own-price elasticity for corn area planted is estimated to be 0.210. A 1-percent increase in soybean price will yield a 0.192-percent increase in soybean area planted while the own-price elasticity for wheat is 0.217.
- Each of the cross-price elasticities for area planted is negative. A 1-percent increase in soybean prices is associated with a decrease of 0.115 percent in corn area planted while a 1-percent increase in wheat prices reduces corn area planted by 0.013 percent. Similarly, a 1-percent increase in the price of corn will result in a 0.107-percent decline in projected soybean area planted while a 1-percent decrease in the price of wheat and sorghum will result in decreases of 0.125 and 0.148 percent in soybean area planted. Overall, when forecasted values using the reestimated results are compared with the existing baseline model, the elasticities estimated in this study represent an improvement in the accuracy of the projections.

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How Was the Study Conducted?

This study used national-level data from 1996 to 2021 to estimate a national supply response for seven major U.S. program crops using a seemingly unrelated regression in which the share of total area planted is estimated as a function of net returns. Results are used to calculate own- and cross-price elasticities. Yield data for each of the crops are collected from the USDA, Foreign Agricultural Service's Production Supply and Distribution (PSD) data portal. Planted area and producer price received data are collected from USDA, National Agricultural Statistics Service. Data on variable cost of production are collected from the USDA, Economic Research Service (ERS) Commodity Cost and Return Estimates.