ND EPSCoR
Modeling Acreage Responses to Climate and Economic Variations for Five Agricultural Land Uses in North Dakota Using Seemingly Unrelated Tobit Regression

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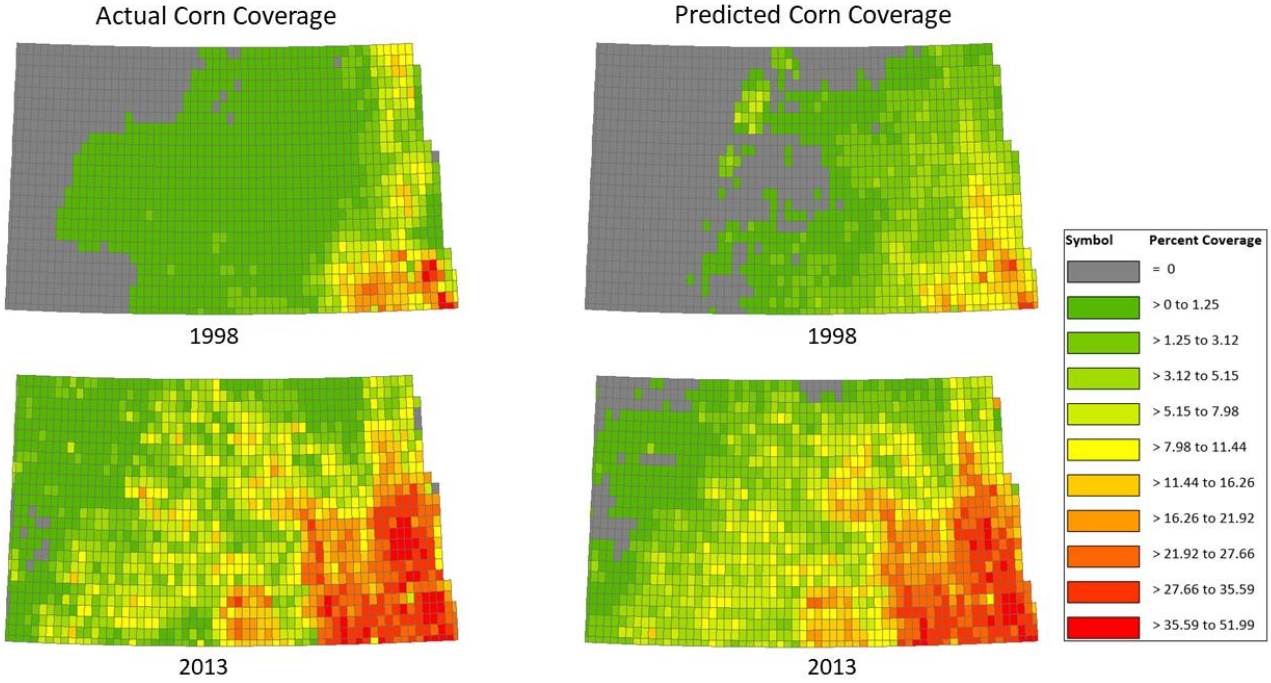
What is the outcome or accomplishment?

A team of researchers has applied an econometric modeling technique known as seemingly unrelated spatially weighted Tobit regression to understand the effects of changing commodity prices and changing climate patterns on North Dakota farmers' crop selections at a spatial resolution of 50 mi^2.



What is the impact?

The results of this study describe how and where acreages of five major land uses have changed throughout North Dakota from 1998 to 2014 in response to both economic and climate factors affecting farmers. The estimated functions and forecasts derived from them will be useful in planning future infrastructure investments in the agribusiness industrial sector—for example, where new grain storage and loading facilities should be built to accommodate shifting production regions for various crops. Additionally, federal and state-level policy makers should take interest in these results because federal and state agricultural policy will need to respond to changing needs of farmers as they change their production mixes.

What explanation/background does the lay reader need to understand the significance of this outcome?

Since the mid-1990s and before, North Dakota has been the site of rapidly changing land use within crop categories. For example, area planted to corn in the state has increased from 700,000 acres in 1995 to over 3 million acres in 2018—more than a 70 percent increase—and the area planted to soybean has increased from 660,000 acres to over 7 million acres during the same period. The state has experienced commensurate declines in acreage planted to hard red spring wheat—historically North Dakota's predominant crop. Acreages of these same crops have been stable in most other states relative to North Dakota. Our interest was to explain the behavior of farmers in response to economic variables and climate over the past 15 years so that we may make inferences about how farmers' choices may change in the future. Knowledge of price elasticities of the acreage responses for different crops—and of how these elasticities vary spatially and in response to climate parameters—will be essential for policy makers as they engineer the agricultural policy of the future. NSF funding through ND EPSCoR, under the Innovative and Strategic Program Initiatives for Research and Education-North Dakota (INSPIRE North Dakota) NSF EPSCoR RII Track-1*has been integral to this research and to the research training of one doctoral candidate in Environmental and Conservation Sciences at North Dakota State University, who will graduate in Summer 2018.*