Statistical Models for Cropland Cash Rental Rates
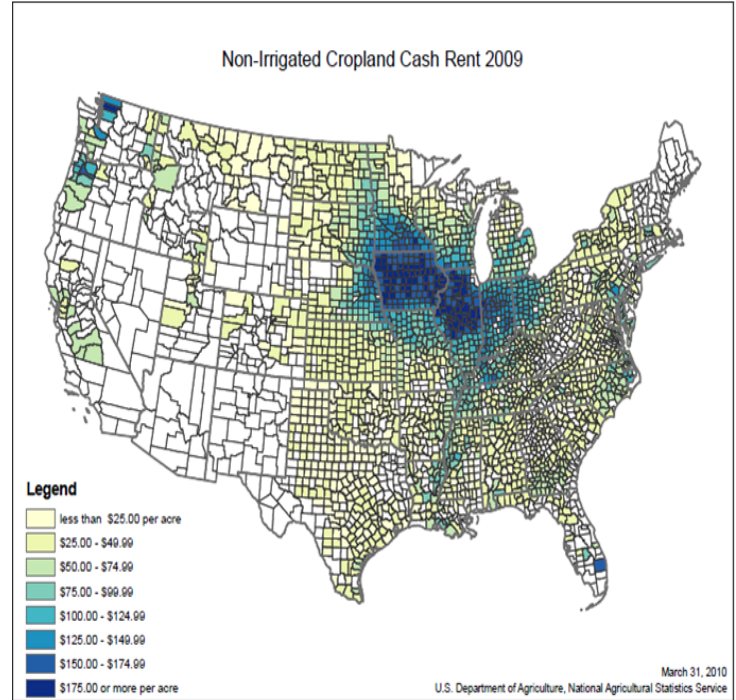
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The National Agricultural Statistics Service (NASS) conducts a multitude of quarterly, monthly, and weekly surveys related to almost every aspect of US agriculture. The products of NASS's massive data collection efforts range from estimates of the number of eggs placed into hatcheries each week to forecasts of future livestock inventory. NASS publications help farmers and government officials make informed business and policy decisions.

Uses of County-Level Cash Rent Estimates

A "cash rent" is cropland or pastureland that a landlord leases to a tenant in units of dollars per acre. Farmers use estimates of local cash rental rates in determining lease agreements. Agronomists use the estimates to study research questions. NASS county-level cash rent estimates have important implications for the Conservation Reserve Program (CRP), a policy that protects natural resources by providing rental payments to agricultural landowners who choose to conserve their land. Because of the role of county-level estimates of cash rental rates in the CRP, the 2008 Farm Bill required NASS to conduct an annual Cash Rent Survey.

Non-Irrigated Cropland Cash Rent 2009

Legend
- less than $25.00 per acre
- $25.00 - $49.99
- $50.00 - $74.99
- $75.00 - $99.99
- $100.00 - $124.99
- $125.00 - $149.99
- $150.00 - $174.99
- $175.00 or more per acre

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NASS Annual Cash Rent Survey and Challenges of County-Level Estimation

The specific objective of the Cash Rent Survey is to estimate cash rental rates for cropland and pastureland at the county level. Estimation of local cash rental rates is challenging because county sample sizes are often very small, sometimes as small as one or two.

Non-irrigated Cropland, Iowa

Correlation = 0.81

2010 Survey Indication (Dollars/Acre)
2009 Survey Indication (Dollars/Acre)

Hierarchical Models Improve Estimates of Cash Rental Rates

NASS is investigating hierarchical modeling as a way to obtain reliable estimates of county-level cash rental rates. Hierarchical models use information from multiple counties in an effort to improve the precision of the county estimates.

Our study of non-irrigated cropland in Iowa, Kansas, and Texas revealed a positive correlation between the 2009 and 2010 cash rental rates. Taking advantage of this correlation through a hierarchical model reduced the mean squared errors of the county estimators. Improving the efficiency of the county estimators through statistical modeling will enable NASS to better serve individuals who use estimates of cash rental rates for guidance in business and policy decisions.