The Crops County Estimates Program: Developing Official Statistics Based on Available Data

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Outline

- Crops County Estimates
- Historical Approach
- CNSTAT Review
- Models for Crops County Estimates
- Current Efforts
- Challenges

Crops County Estimates: Corn

Agricultural Survey

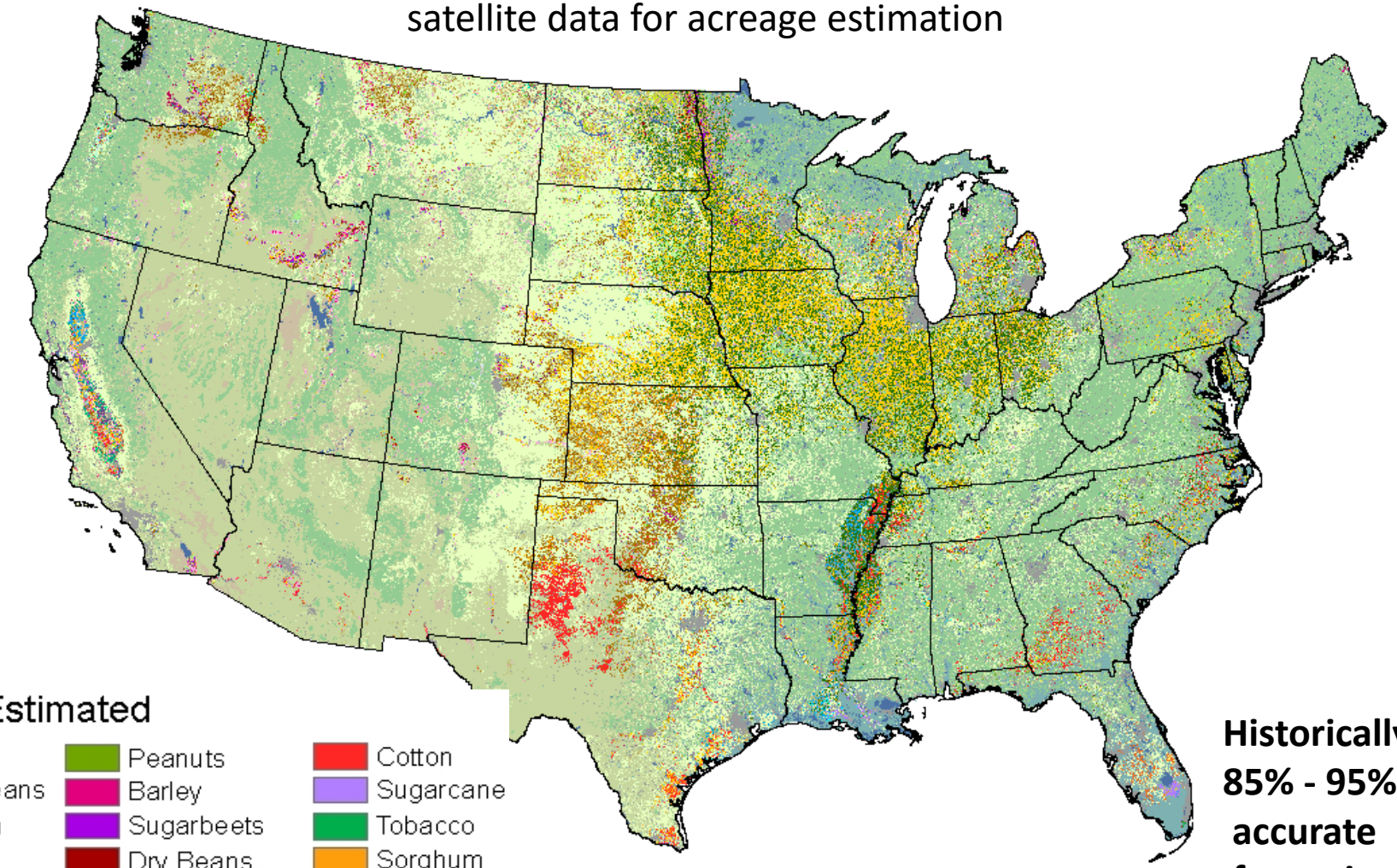
- Conducted quarterly
- National estimates (or predictions) of crop acreage, yields, and production for major crops and quantities of grain and oilseeds stored on farms
- State estimates for the states with the largest production

County Agricultural Survey

- Additional data collected in December
- December surveys provide foundation for county estimates
  - Planted acreages
  - Harvested acreages
  - Production
  - Yield

Cropland Data Layer (CDL)

Annual national coverage since 2008
A raster, crop-specific, land cover data set produced using satellite data for acreage estimation



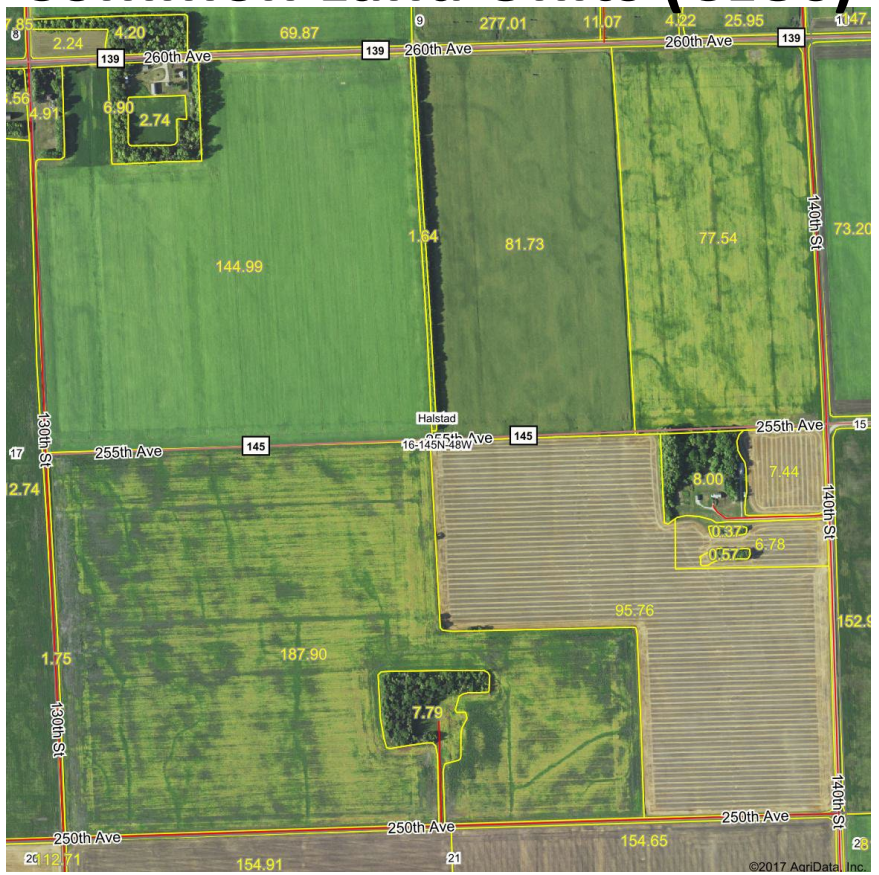
*** 9 billion pixel 30m product**

Historically, 85% - 95% accurate for major crops

Farm Service Agency (FSA) Form FSA-578

- Completed by all producers participating in a USDA program for that crop season
- Information for each Common Land Unit
  - Crops
  - Acreage
  - Irrigation
- Variable coverage for crops and states, but high in major corn states
- Provides lower bound for acreages planted to a crop within a county

Common Land Units (CLUs)



https://www.agridatainc.com/Home/Products/Mapping%20Features/Land%20Resource%20Intelligence/FSA%20Field%20Boundaries%20(CLU)

Risk Management Agency (RMA)

- Manages the USDA's crop insurance program
- Producers report adverse events that impact crops, including decisions not to harvest certain acreages
- Acreages planted and not harvested for each crop
- Other information not available prior to publishing estimates
- Provides
  - Lower bound for the number of acres planted in a county to corn
  - Lower bound for the number of acres in a county planted but not harvested

Expert Opinion to Produce Official Estimates

- Historical approach used by NASS
- State estimates set prior to county estimates
- Available information
  - Survey estimates by county
  - Estimates derived through remote sensing (CDL)
  - FSA- and RMA-reported planted acres by county
  - RMA-reported acres planted but not harvested by county
  - Recommendations from each state based on data and local factors
- Concerns
  - Lack of transparency and reproducibility
  - No valid measure of uncertainty

CNSTAT Panel

- Established through a cooperative agreement in September 2014
- Purpose: Review NASS county estimates programs and provide suggestions for how to better combine all available data to produce improved county estimates for (hopefully) more counties
- Consensus report released in October 2017

Vision for 2025

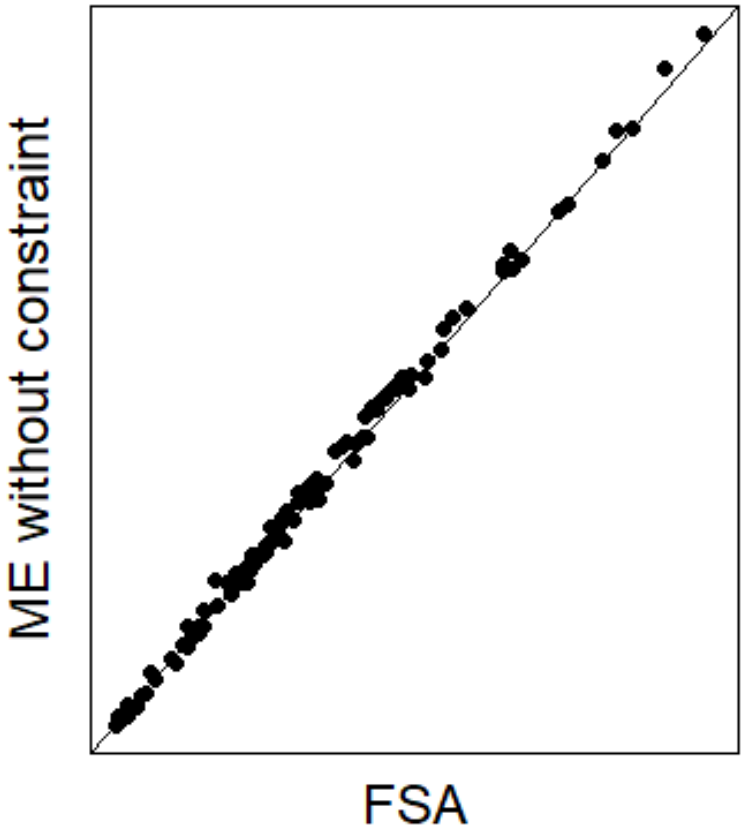
- NASS should evolve its Agricultural Statistics Board process
  - County-level estimates based on models incorporating multiple data sources with uncertainty measures
  - ASB would review predictions, macro-edit, and ensure models are continually reviewed
- NASS should acquire all georeferenced administrative and remotely sensed and ground-gathered data relevant to developing estimates and use the data to complement its survey data
  - Current data (FSA, RMA, Remotely Sensed, Weather)
  - Potential new data (Precision agriculture, in situ sensors, drones, etc.)

Crops County Estimates: Corn

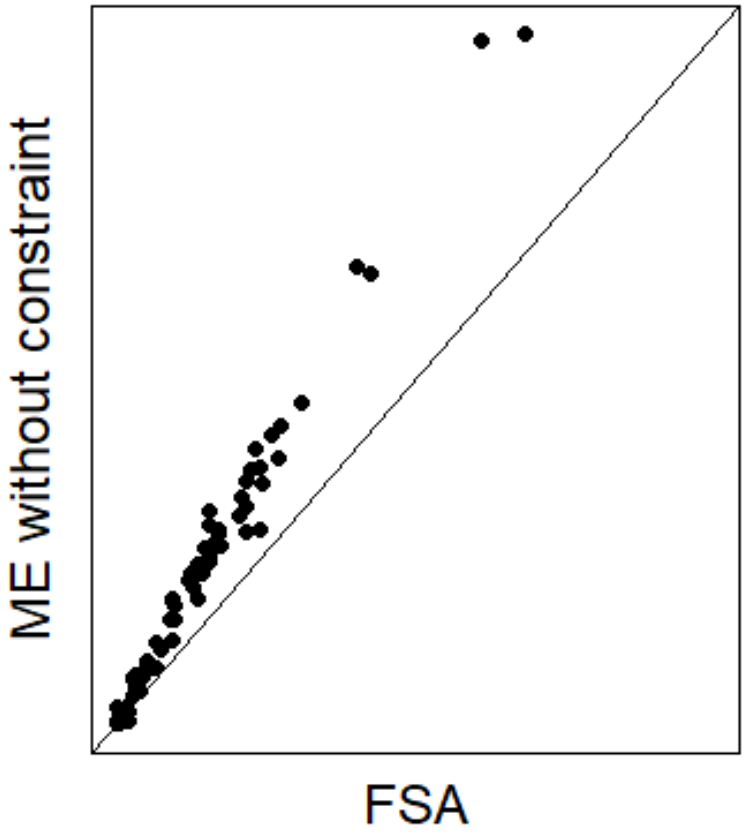
- Three Bayesian hierarchical models used to combine information at the county level
  - **Planted acreage**
  - Harvested acreage, which must be no greater than planted acreage
  - Yield—production estimated by (yield) · (harvested acreage)
- Challenges
  - County estimates must sum to state estimate
  - Honoring the bounds obtained from FSA and RMA
  - Rounding

2019 Modeled County Estimates Without Constraint vs FSA Reported of Planted Acreage

Illinois



Pennsylvania



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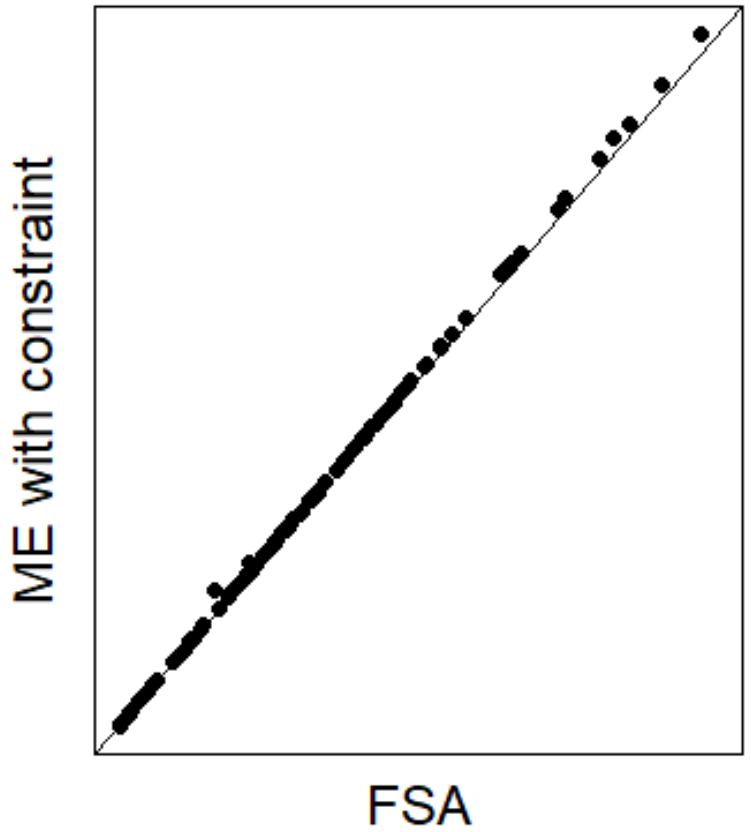
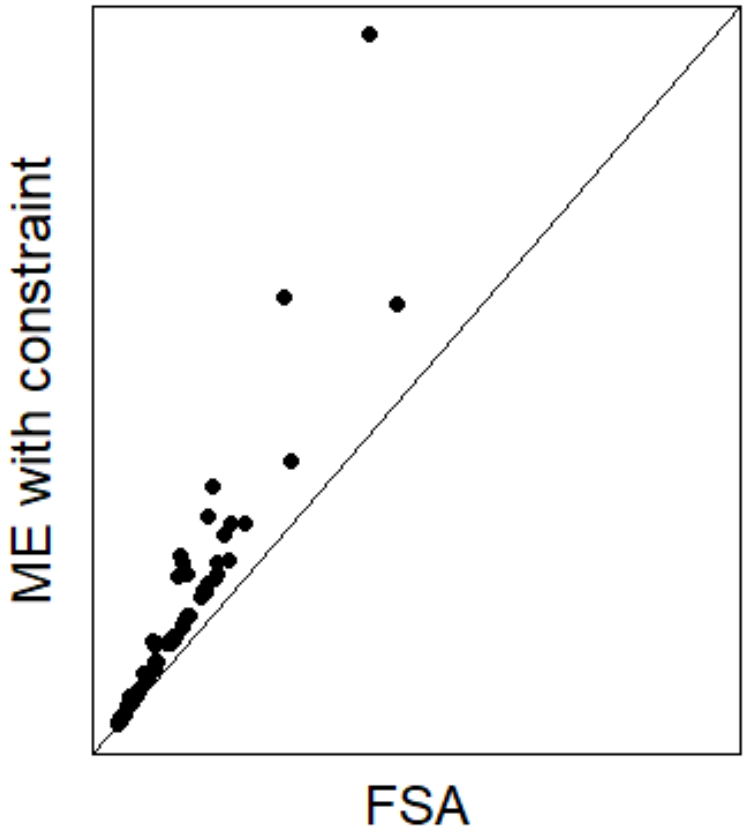


Pennsylvania



Published Crops County Estimates

- Moved into production for 2020 crop year
  - Publish for 13 crops
  - Transparent and reproducible: methodology published
  - Valid measures of uncertainty
  - Rounding for publication was automated
  - Estimates reviewed by staff in State Field Offices
  - Saved substantial hours of staff time within each state

Published Model Estimates

- Models based on aggregated data
  - Crops county estimates
  - Cash rents county estimates
  - Farm labor

Integrating Survey and Non-survey Data

- FSA and NASS have different definitions of a farm
- NASS list frame is not fully geo-referenced
- Surveys
  - Generally, not designed to provide estimates lower than a state
  - Information at farm level does not provide field-level data
- Integration into existing production process
  - Flow of survey and non-survey data
  - Analysis methods
  - Review processes

Other Technologies

- Drones
  - USDA's Advisory Committee on Agricultural Statistics
  - Potential limited use with producer permission
- In-situ sensors
  - Establishing a nationwide system costly
  - Potential to collaborate within proposed AI Institute—Climate Resiliency in Agriculture and Forests (AI-CRAFT)

Precision Agriculture

- Immense potential
  - Reduce respondent burden
  - Improve data quality
- Major challenges
  - Access
  - Coverage
  - Data standards
  - Data quality
- Who pays?

Final Thoughts

- NASS conducts more than 100 surveys and produces over 400 reports each year
- Challenges to integrating survey and non-survey data
  - Record level versus higher level of geography
  - Survey design
- Major effort underway to modernize processes

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Thank you!

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