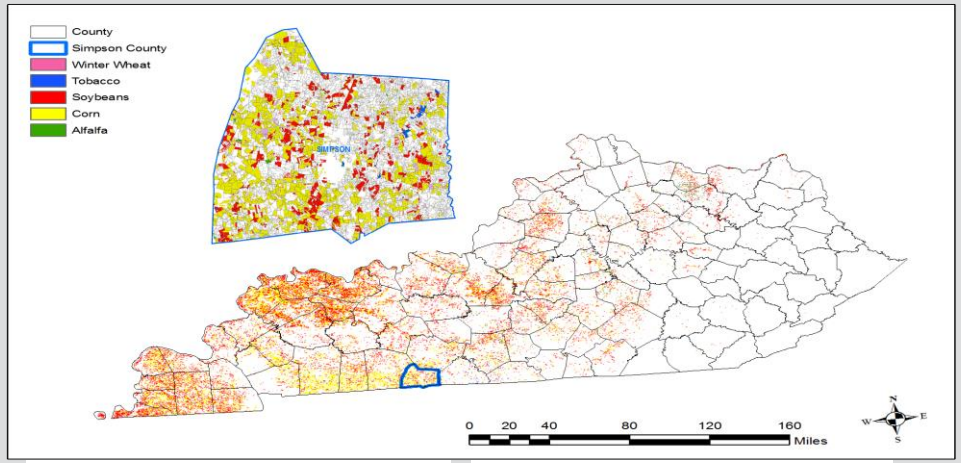
University of Kentucky
College of Agriculture, Food and Environment
Cooperative Extension Service

Advanced Ag Econ Data Analysis

MARK LAB



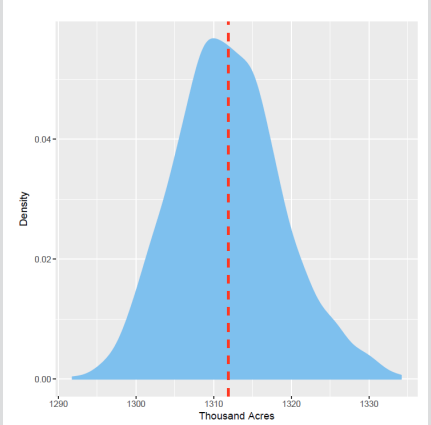


Figure 1: Probability Distribution of Corn Cultivation in Kentucky.

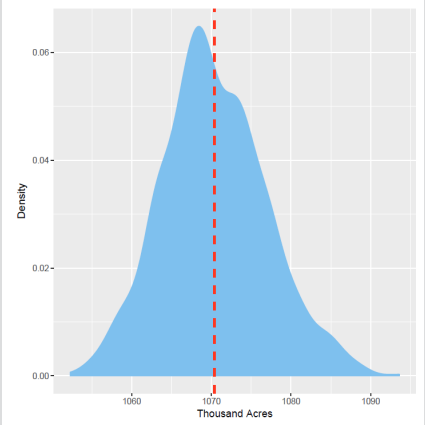
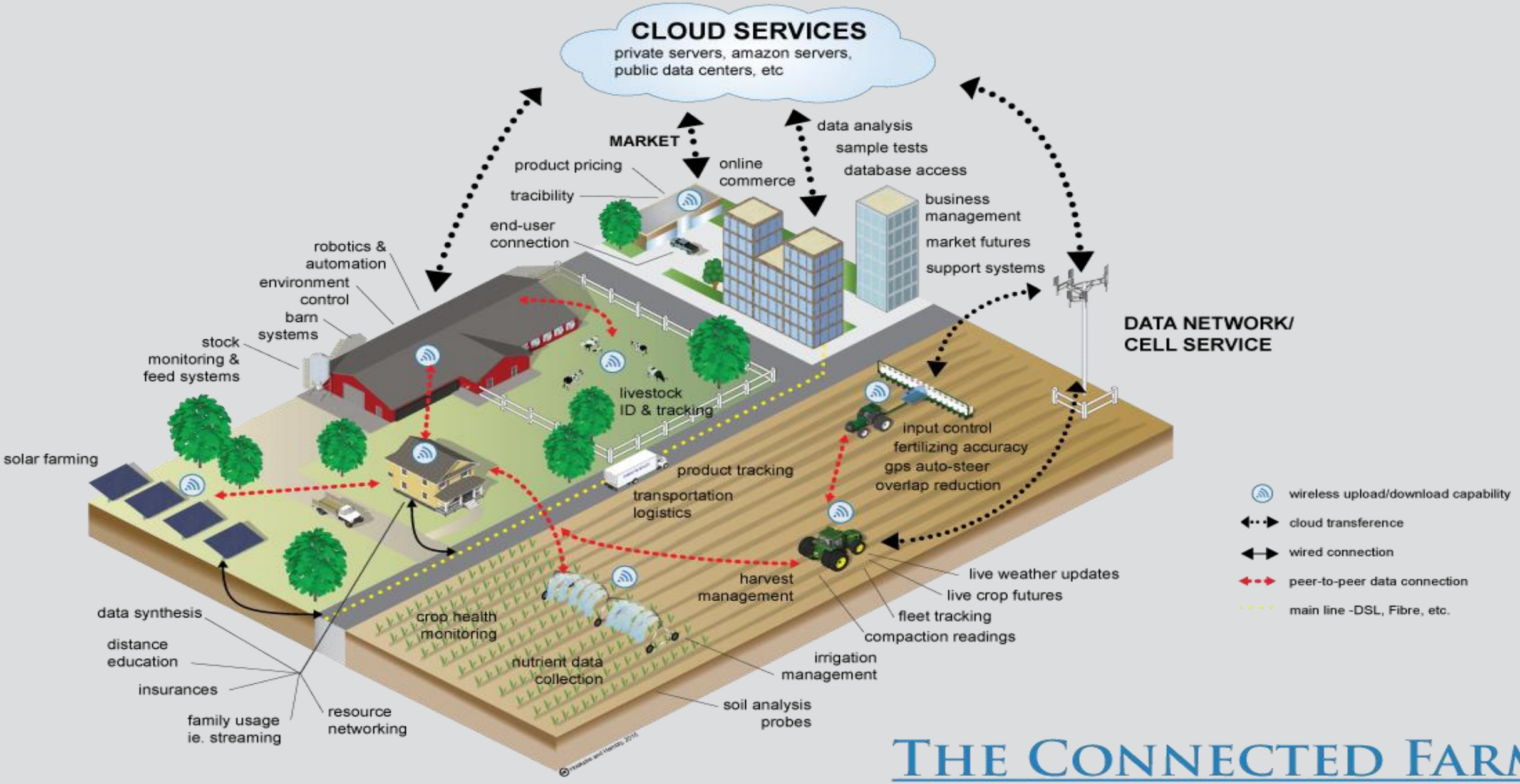
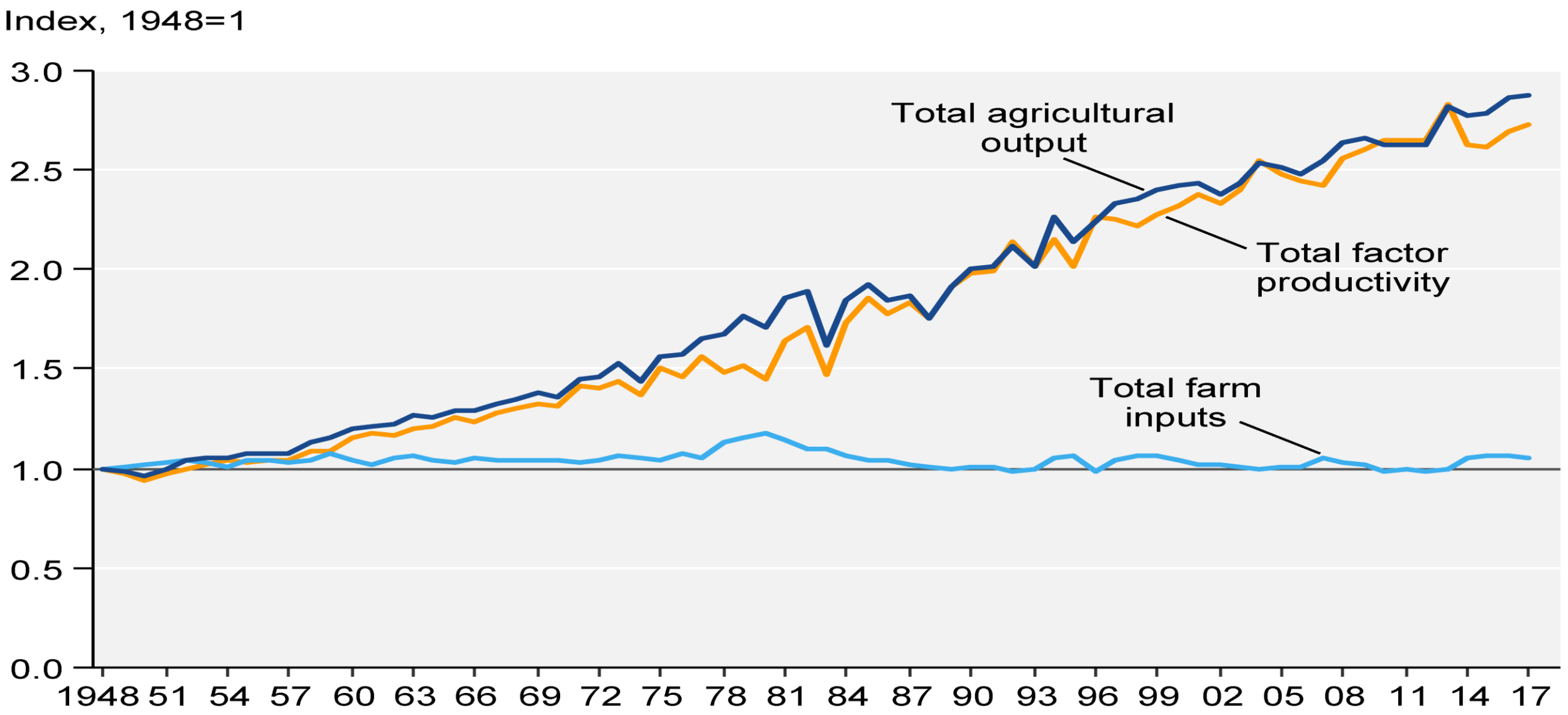


Figure 2: Probability Distribution of Soybean Cultivation in Kentucky.



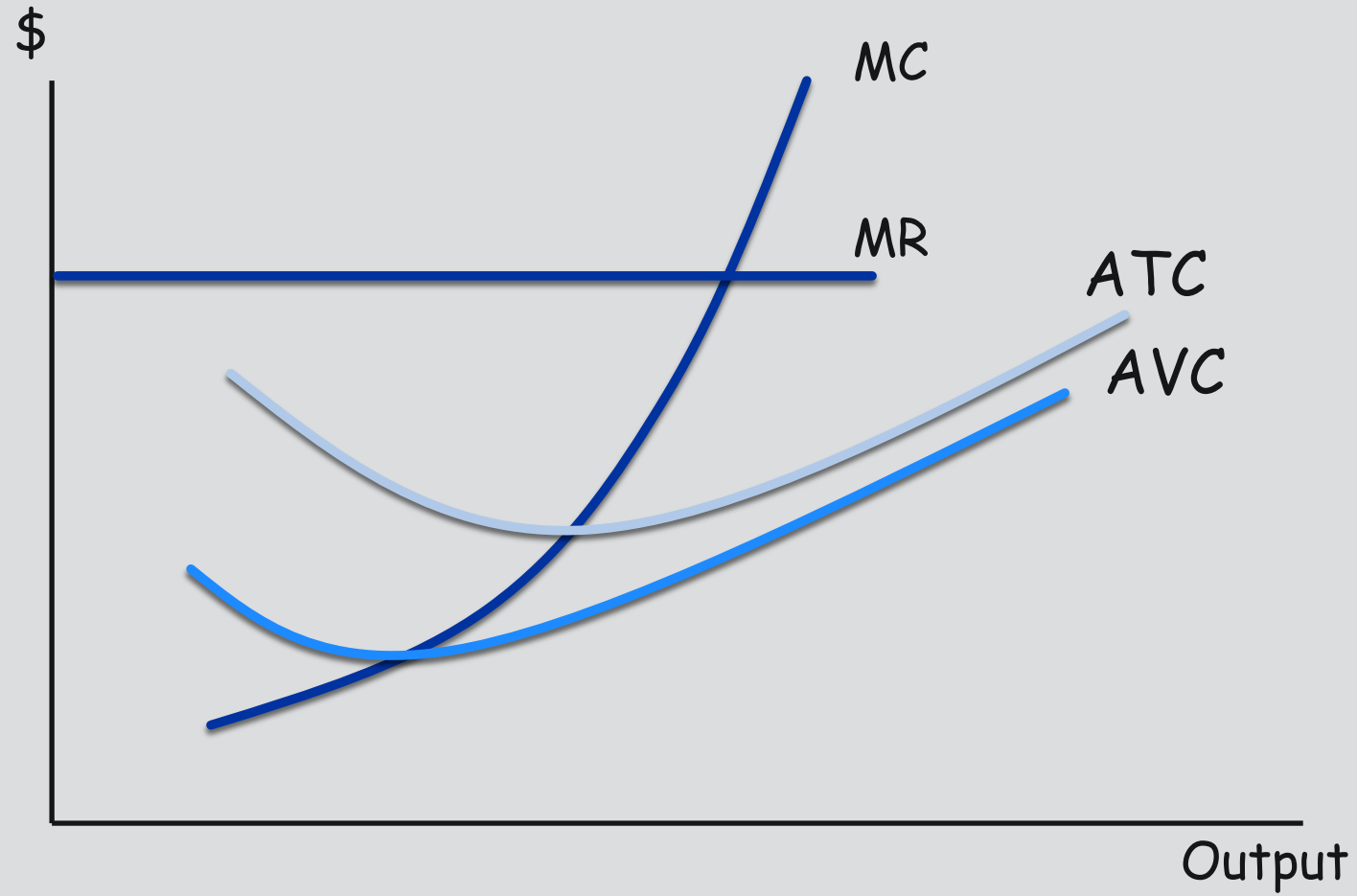
THE CONNECTED FARM

U.S. agricultural output, inputs, and total factor productivity, 1948-2017



Source: USDA, Economic Research Service, *Agricultural Productivity in the U.S.* data product. Data as of January 2020.

GRAPHICAL ILLUSTRATION



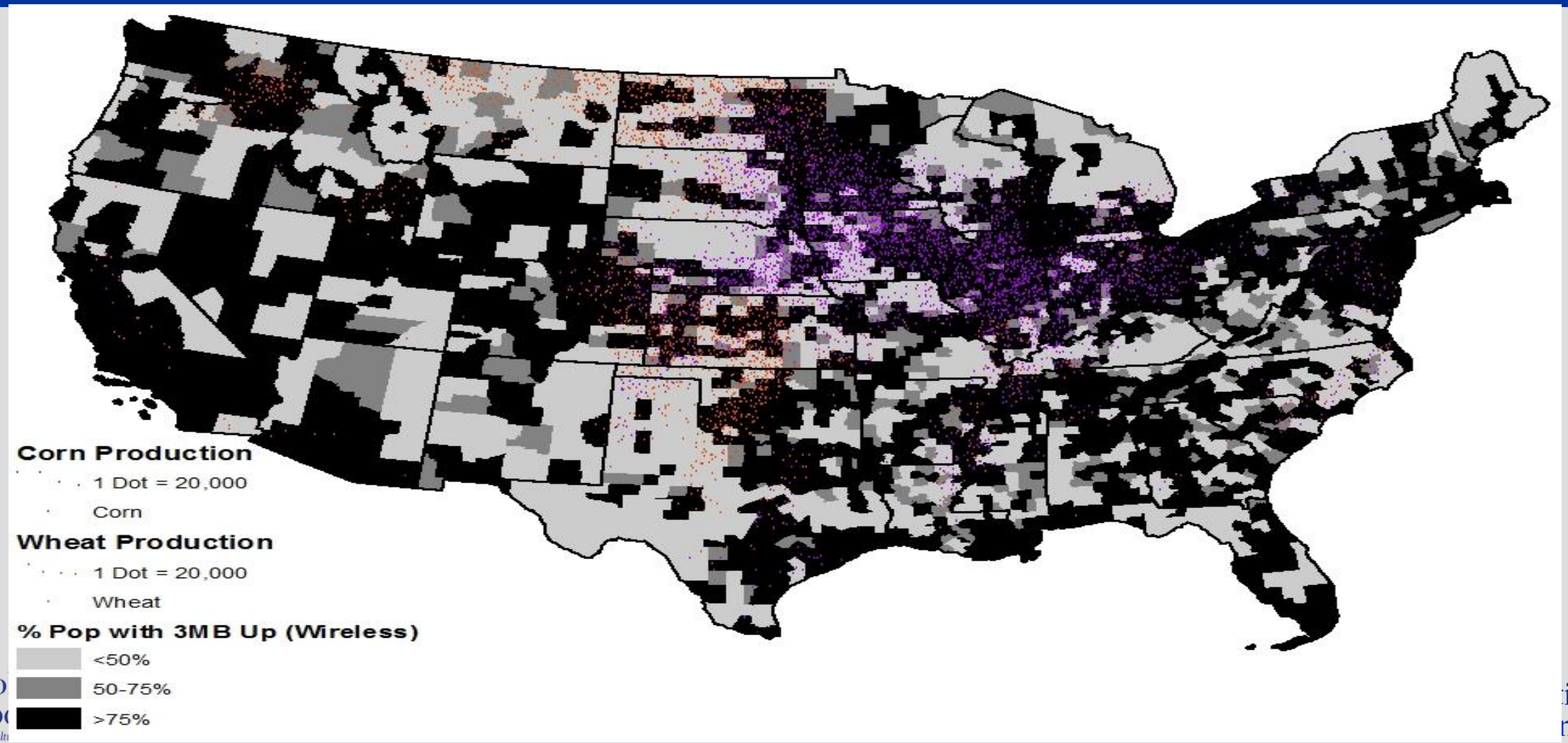
Broadband Availability

Tyler Mark, Terry Griffin, and Brian Whitacre

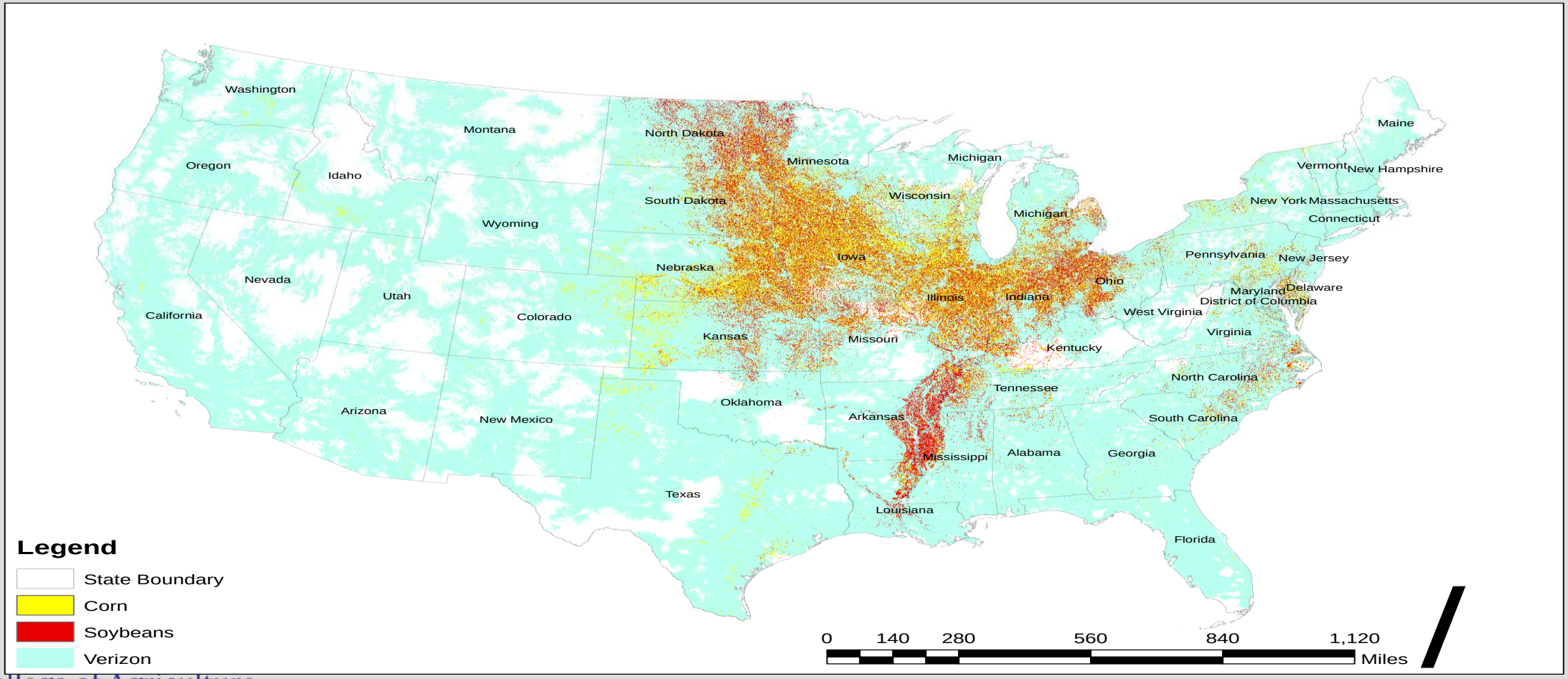
BROADBAND COMMENTS

- “Broadband access is essential for farmers and ranchers to follow commodity markets, communicate with customers, and access new markets around the world”
  - American Farm Bureau
- Broadband is no longer a luxury but a necessity for modern agriculture and the quality of life for rural Americans, Missouri Farm Bureau President Blake Hurst
- “widespread broadband service could boost the agricultural economy by an estimated $64.5 billion”

WIRELESS UPLOAD AVAILABILITY FOR CORN AND WHEAT PRODUCTION, 2015



VERIZON COVERAGE



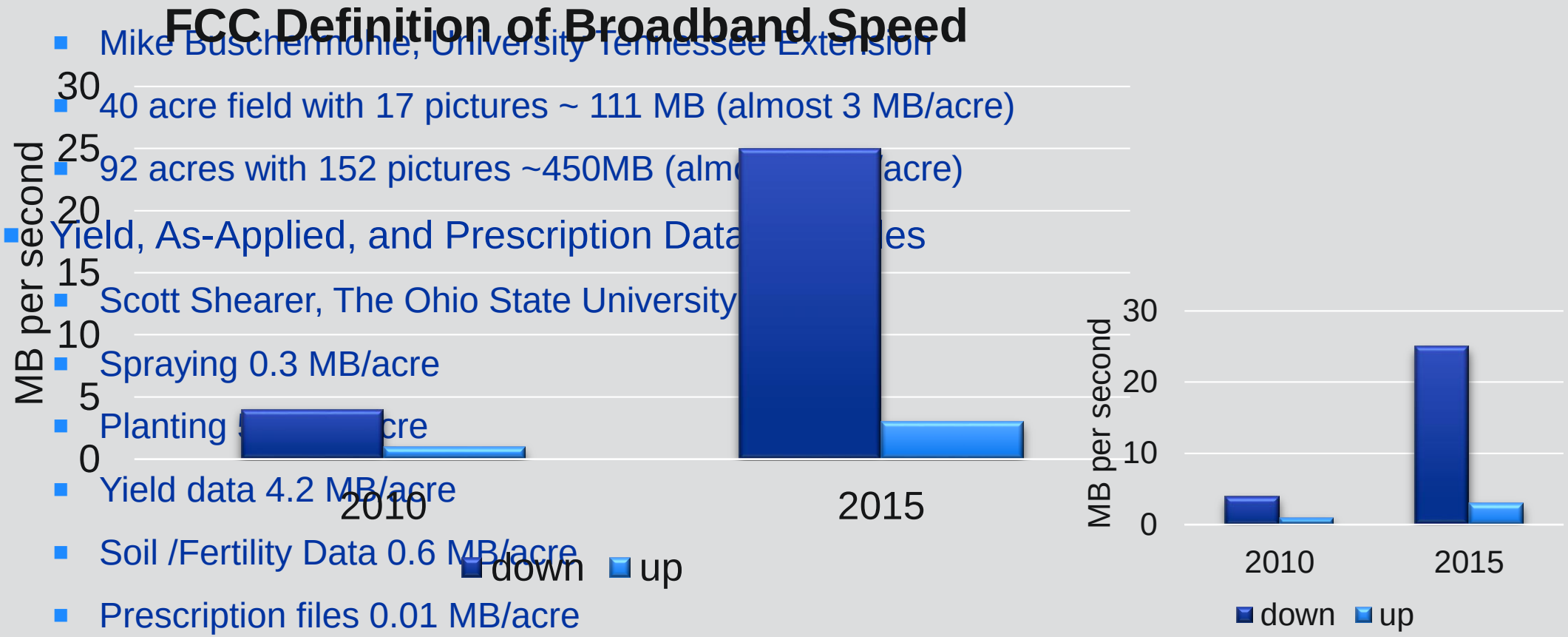
ARE BROADBAND SPEEDS ENOUGH?

AV imagery example

- Mike Buschermohle, University Tennessee Extension
- 40 acre field with 17 pictures ~ 111 MB (almost 3 MB/acre)
- 92 acres with 152 pictures ~450MB (almost 5 MB/acre)

Yield, As-Applied, and Prescription Data Files

- Scott Shearer, The Ohio State University
- Spraying 0.3 MB/acre
- Planting 5 MB/acre
- Yield data 4.2 MB/acre
- Soil /Fertility Data 0.6 MB/acre
- Prescription files 0.01 MB/acre



EXTREME DATA COLLECTION

- **OSU - Terra Project**
  - 18.4 gigabytes of data for 1 plant
    - 28 megabytes per kernel
    - 60 petabytes of data for the 100 ac field
      - 360 Filing Cabinets!!!

Crop Rotations

Gwanseon Kim, Tyler Mark, and Nick Pates

CROP ROTATION RESPONSE

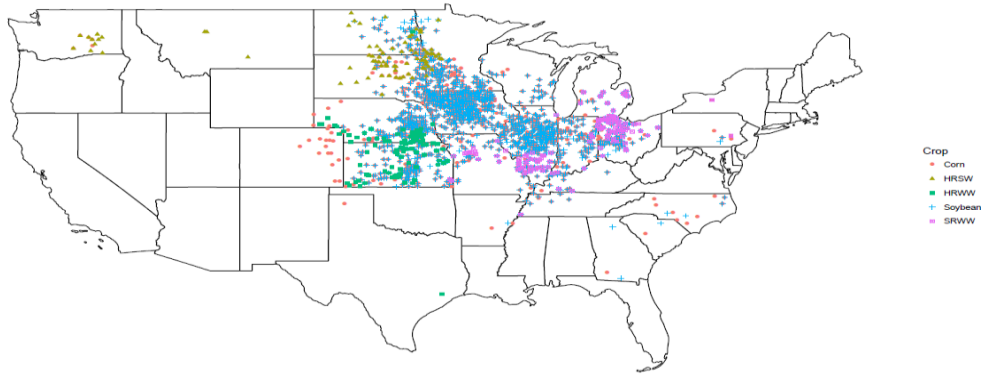
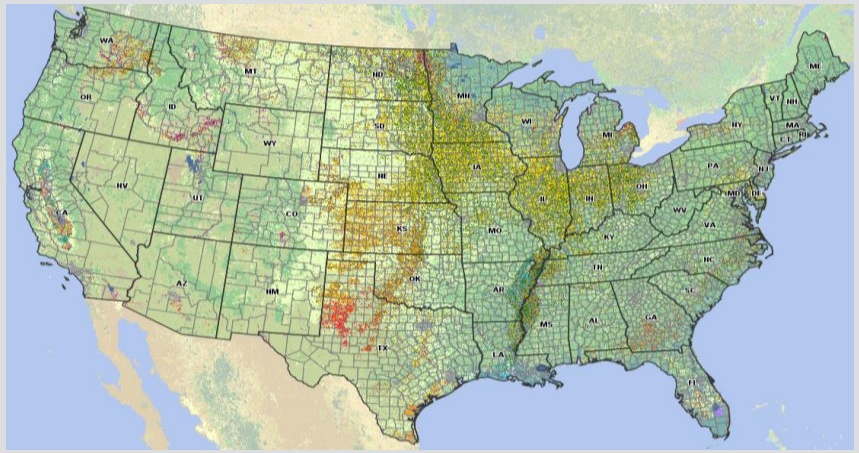


Figure: Price Locations



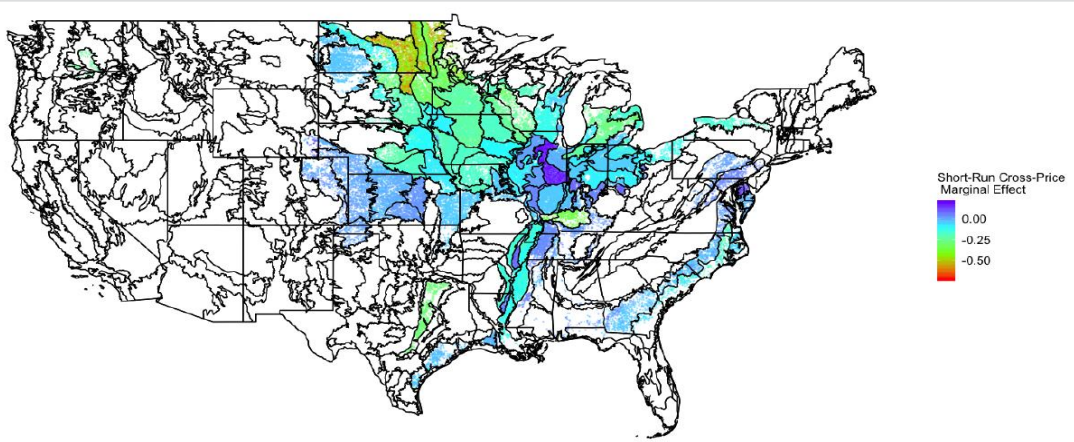
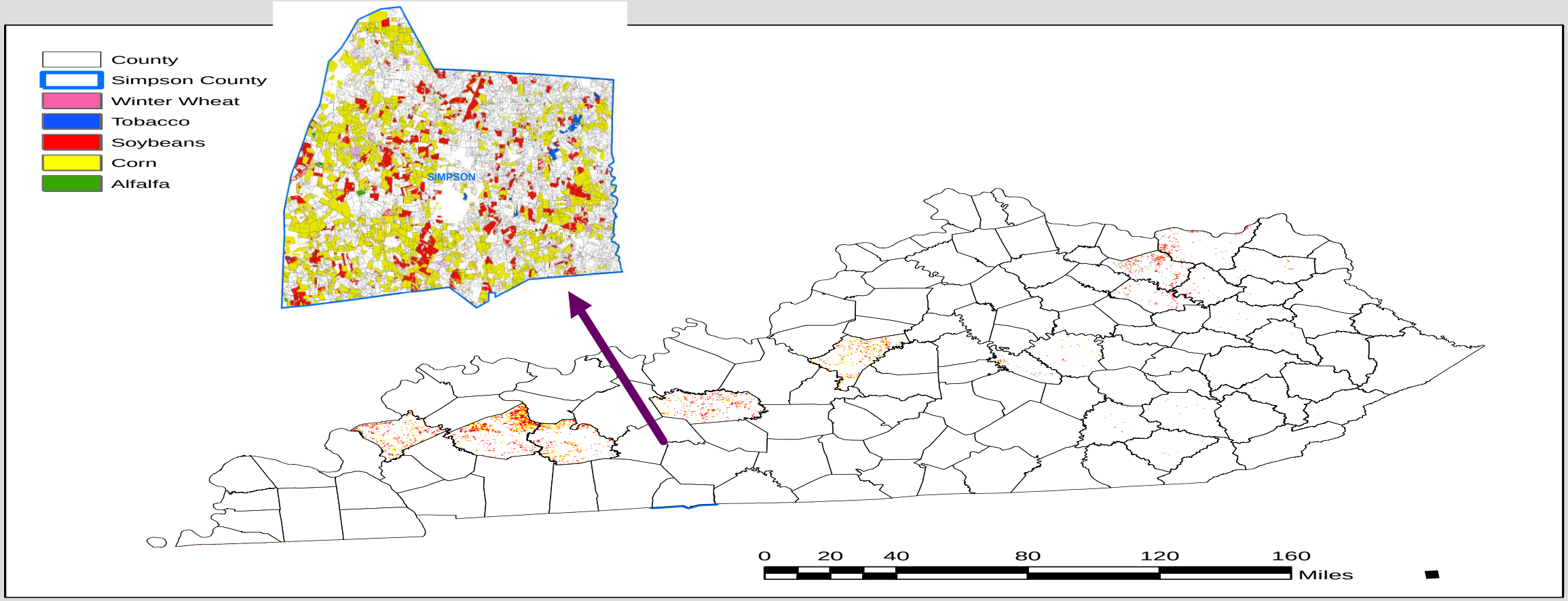
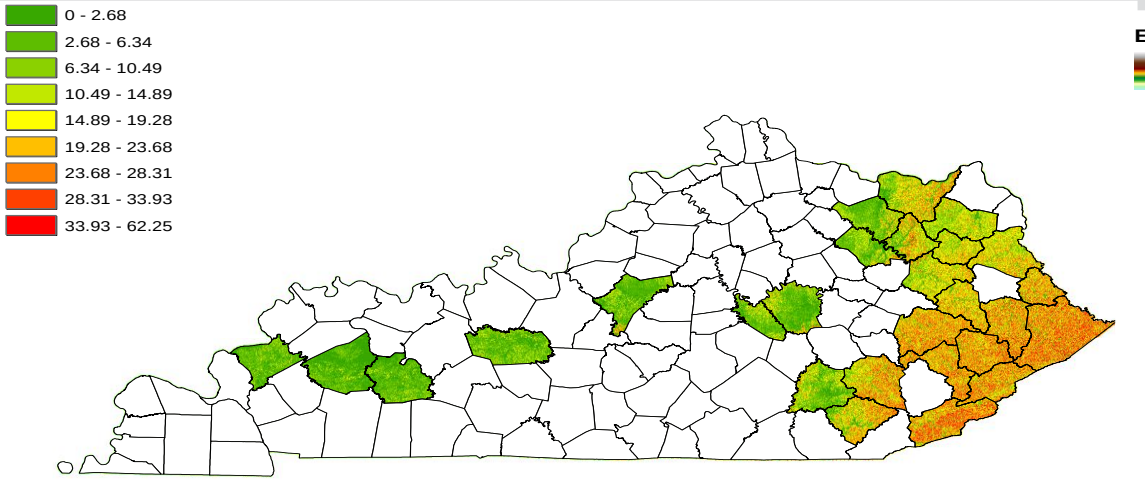
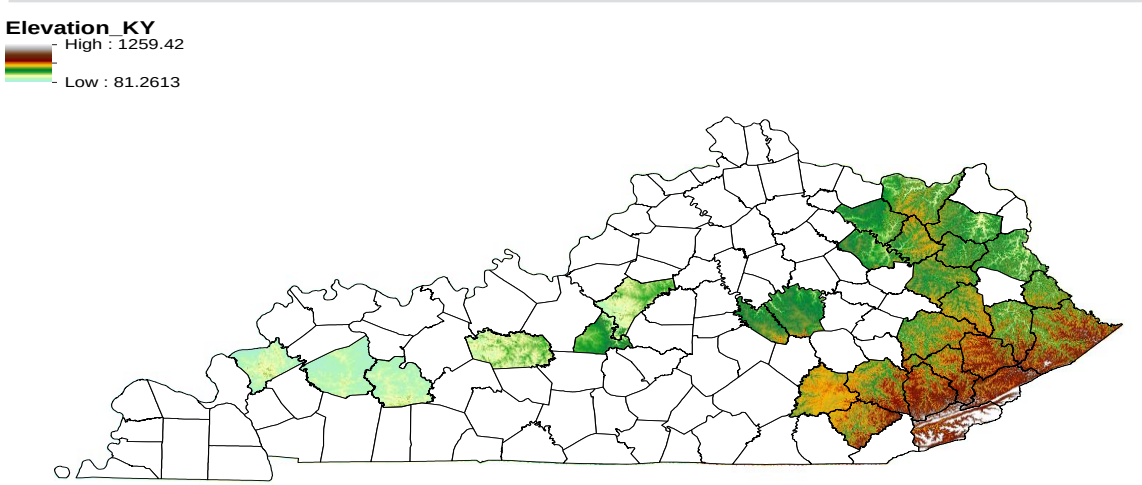


Figure 8: Average MLRA-Group Short-Run Cross-Price Marginal Effect over CONUS

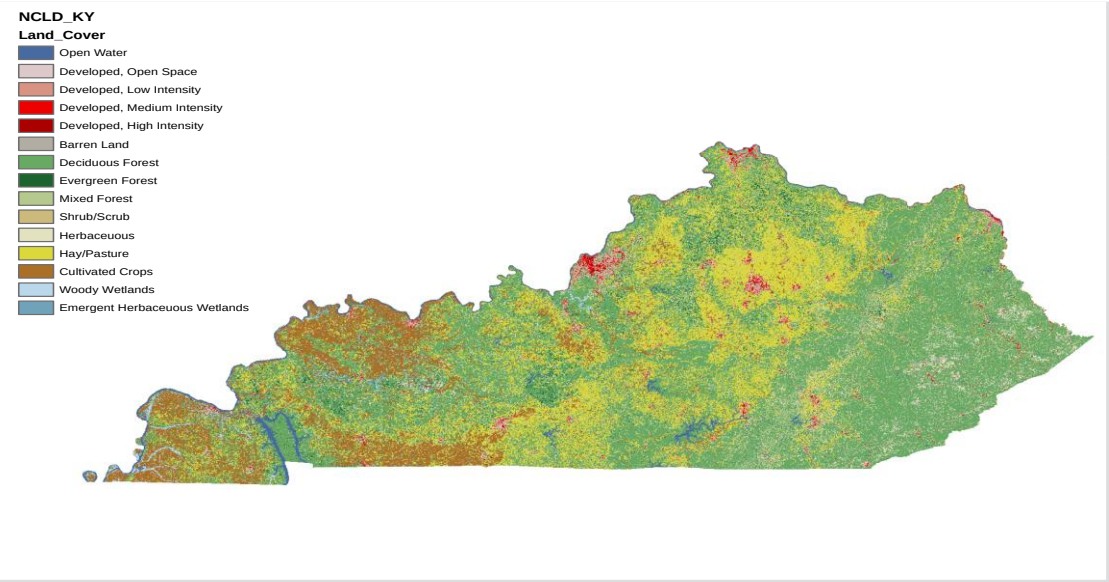
STATE LEVEL EXAMPLE



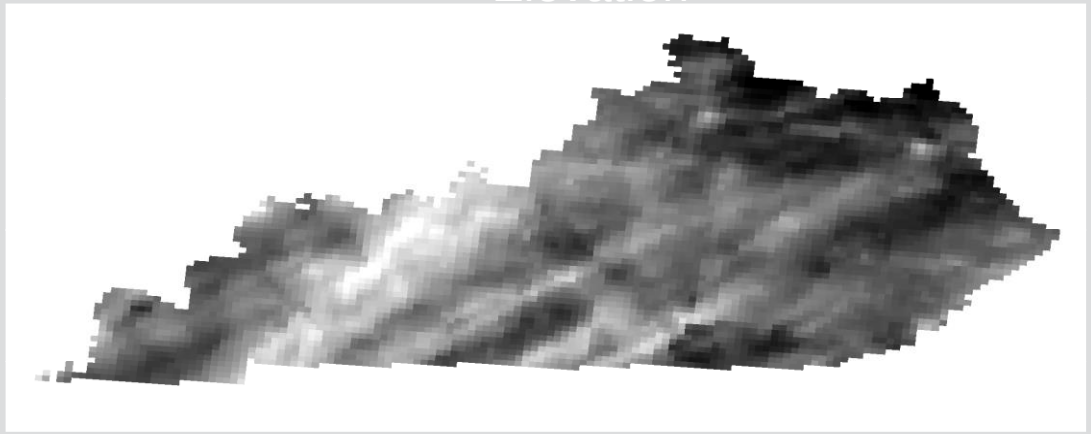




Elevation



Land Cover



Precipitation

SIMULATION RESULTS

Simulate and forecast future distribution of the main crops in Kentucky

- Able to find what percentage of acreage for each crop will be placed on average in future

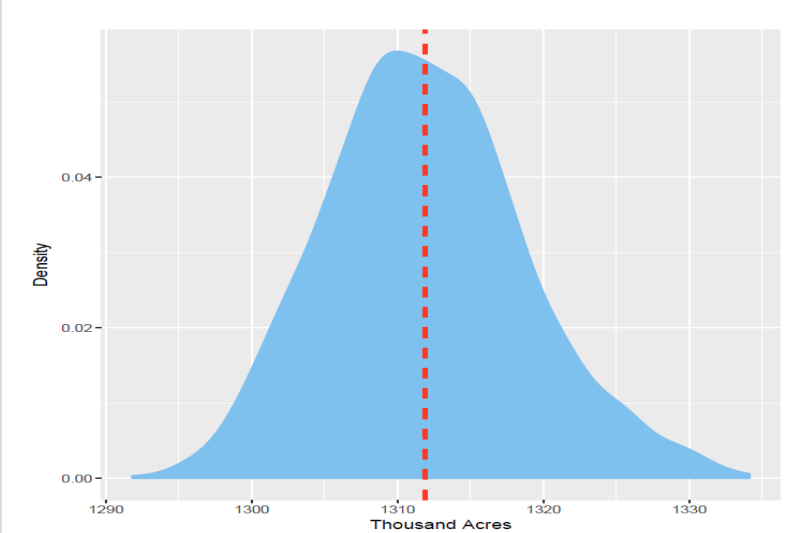


Figure 1: Probability Distribution of Corn Cultivation in Kentucky.

Corn

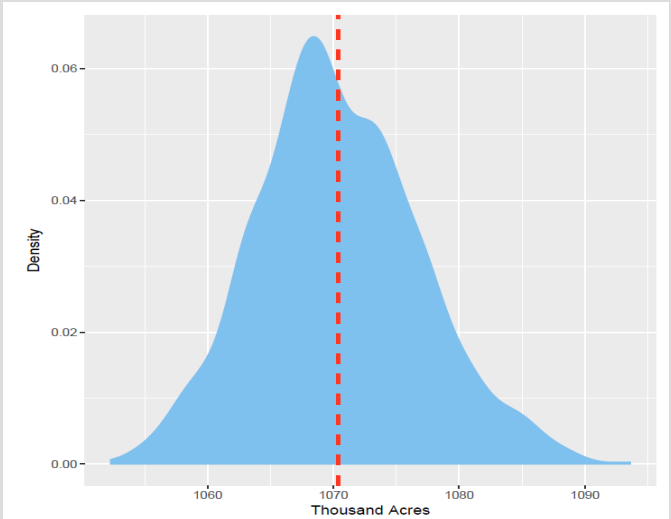


Figure 2: Probability Distribution of Soybean Cultivation in Kentucky.

Soybean

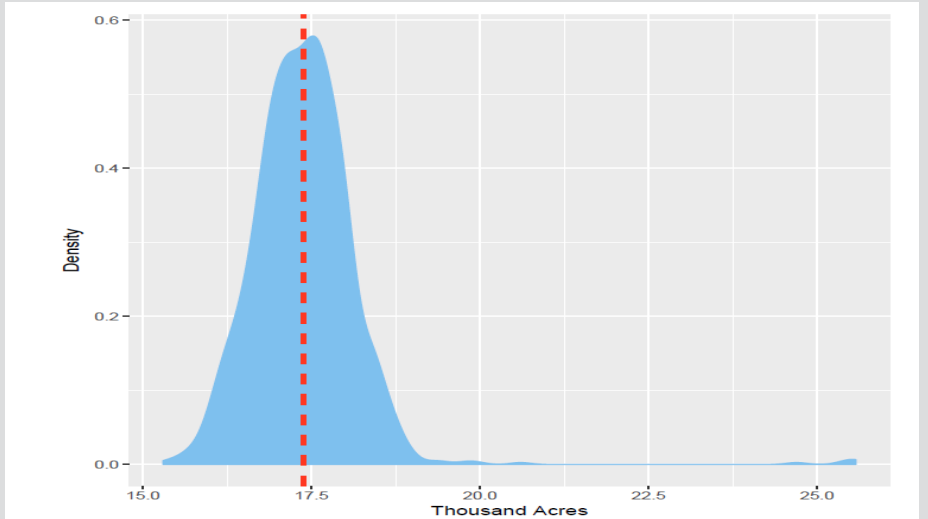


Figure 3: Probability Distribution of Tobacco Cultivation in Kentucky.

Tobacco

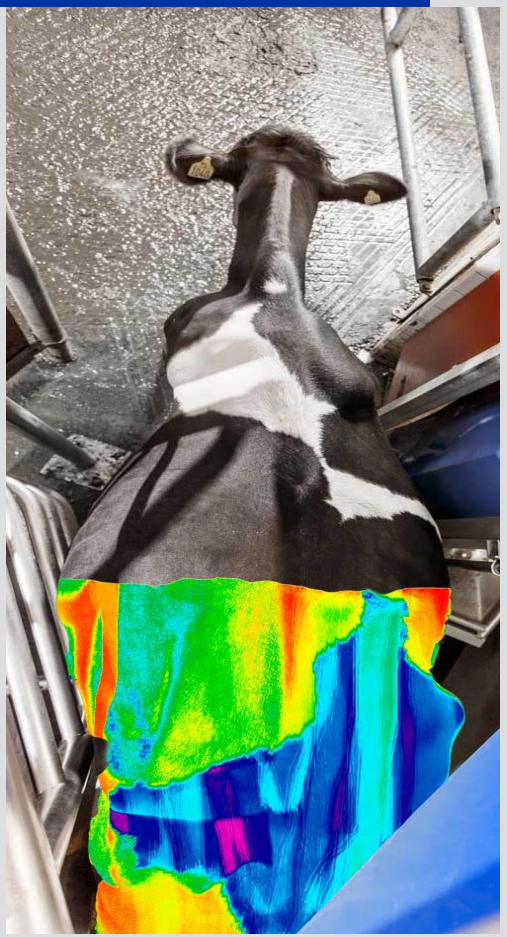
Precision Dairy

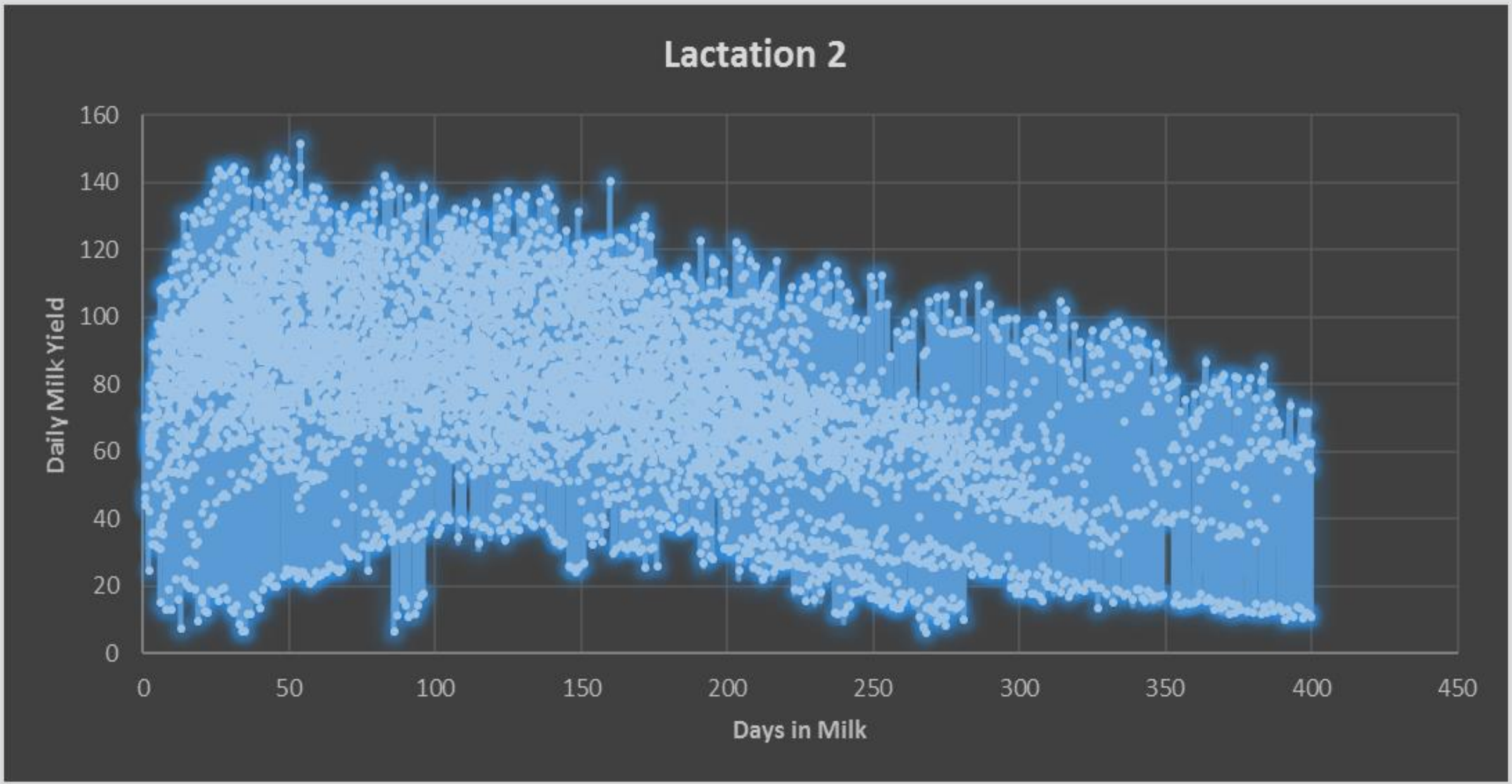
Tyler Mark

PRECISION DAIRY

- Milk yield by cow
- Daily body condition score
- Weight
- Respiration Rate
- Chewing Activity
- Rumination
- Rumen pH
- Lameness
- Animal Location
- Sleep

- Water Consumption
- Body Temperature
- Feed Intake
- Heart Rate
- Mastitis
- Lying/Standing Behavior
- Heat
- Pregnancy
- Calving Event
- Comments
- Etc.

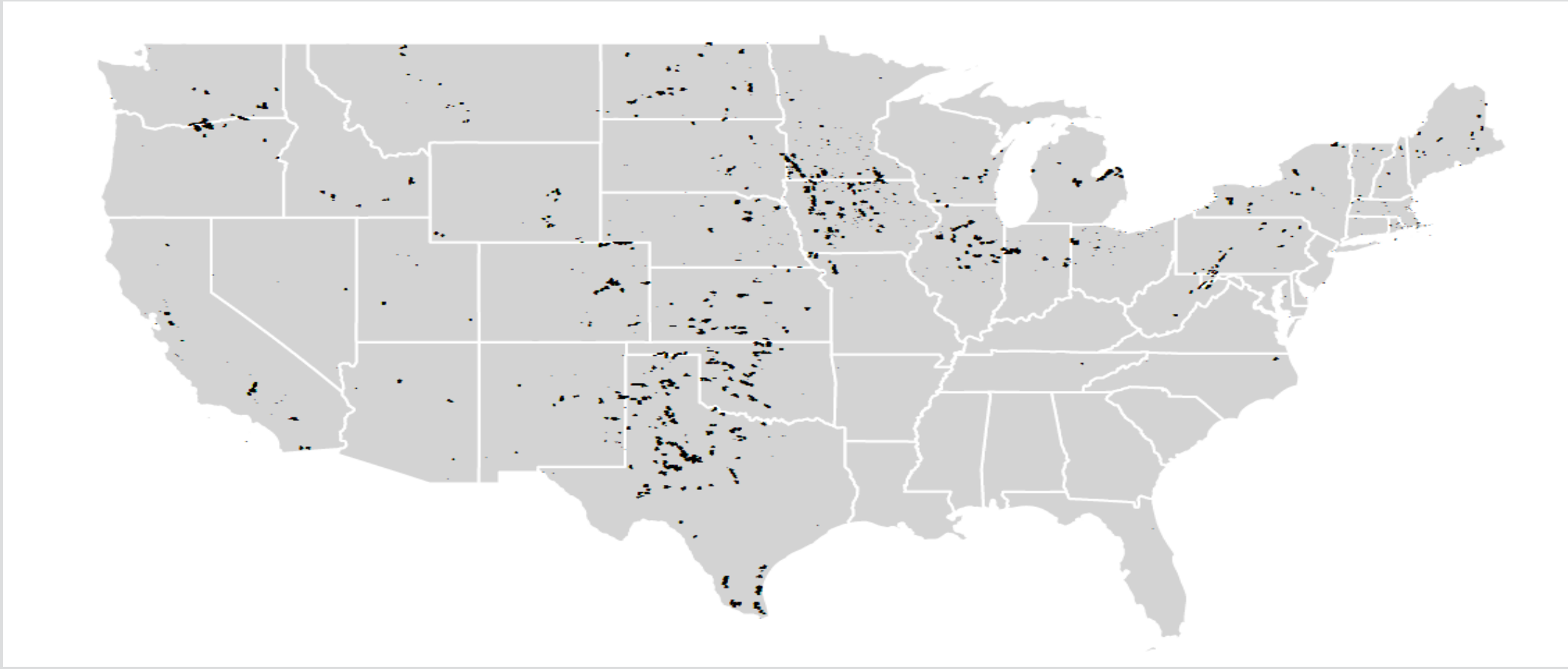



Lactation 2
Daily Milk Yield
160
140
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
Days in Milk

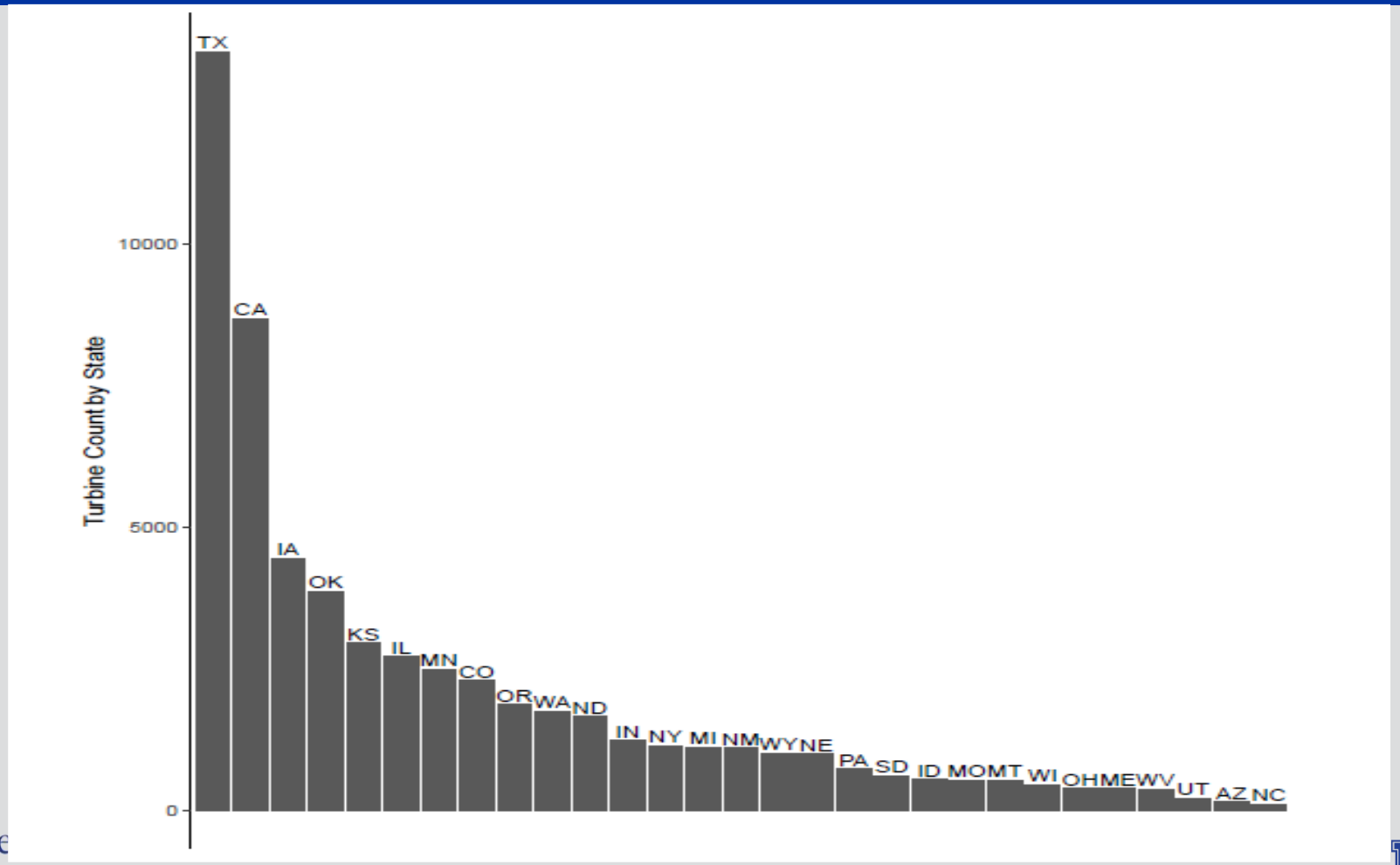
Windfalls or wind falls? Effects of Turbine development of Us ag land values

Nicholas Pates, Gwanseon Kim, Tyler Mark, Matthias Ritter

WIND TURBINE LOCATIONS IN THE CONTIGUOUS UNITED STATES



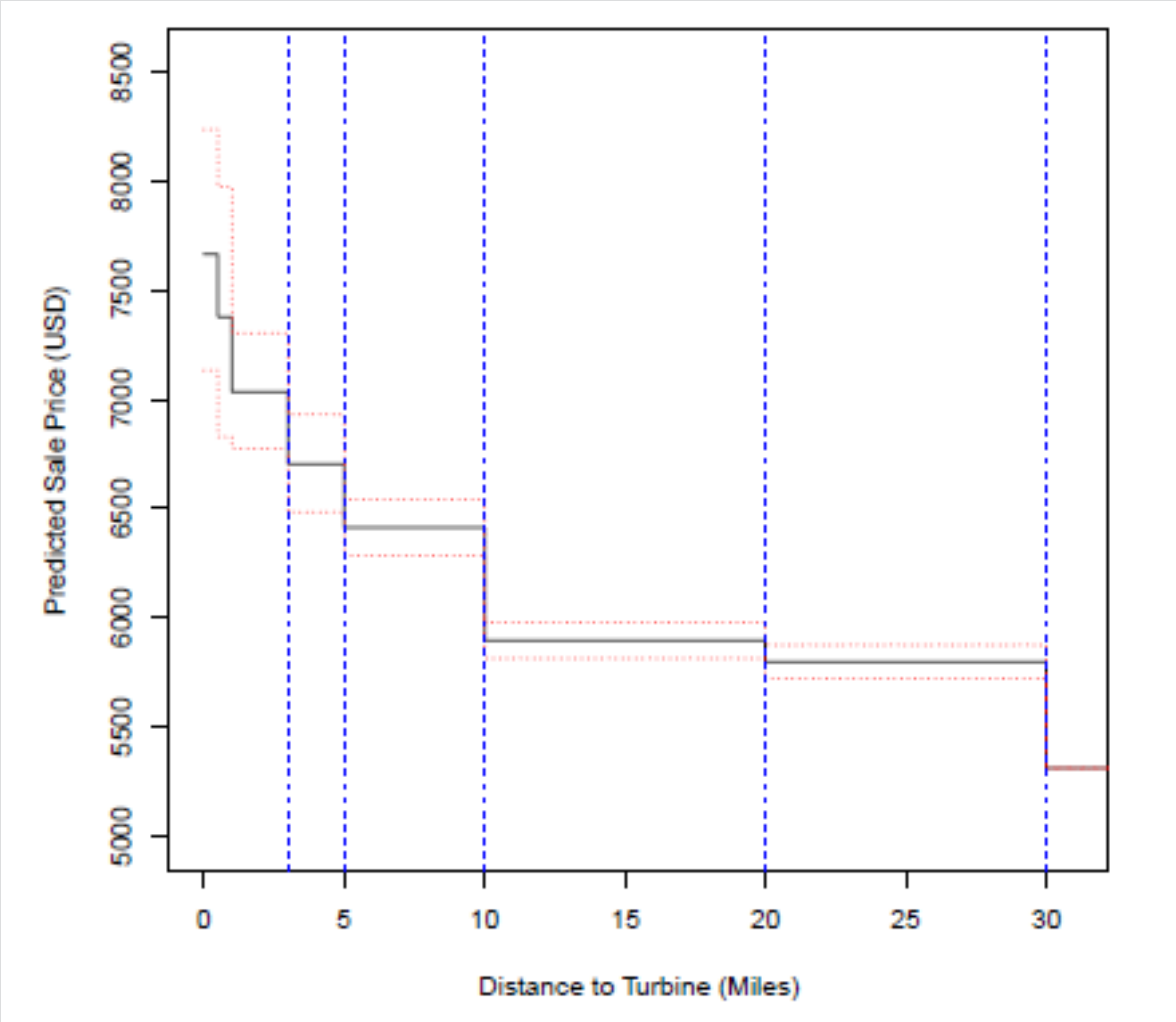
2016 TURBINE COUNT BY STATE



SUMMARY STATISTICS

Variable	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Per-Acre Price ($/Acre)	341	1,692	3,650	10,080	9,318	181,747
Lot Size (Acres)	2.26	15	35.8	56.6	70.8	1,278
Slope	0	1	4	7.55	9	87
Soil Silt (%)	0	25.3	38.7	39.3	53.6	90
Soil Clay (%)	0	18.4	24.8	25.7	32.8	80.8
NCCPI	0	0.288	0.527	0.491	0.689	0.991
Nearest Market Pop.	25,137	46,187	117,394	345,907	359,968	2,657,146
Distance to Nearest Market (Miles)	0.00818	16.5	26.8	32.7	41.5	201
Distance to Rail (Miles)	0.00119	1.51	3.47	4.97	6.64	66.4
Distance to Primary Road (Miles)	0.0466	9.89	17.4	22.5	29.4	181
Distance to Elevator (Miles)	0.00781	11.6	19.2	24.8	32.4	162
Distance to Turbine (Miles)	0.0166	32.2	85.2	120	166.	876

SALE PRICE STEP-FUNCTION PREDICTIONS BY DISTANCE TO WIND TURBINE



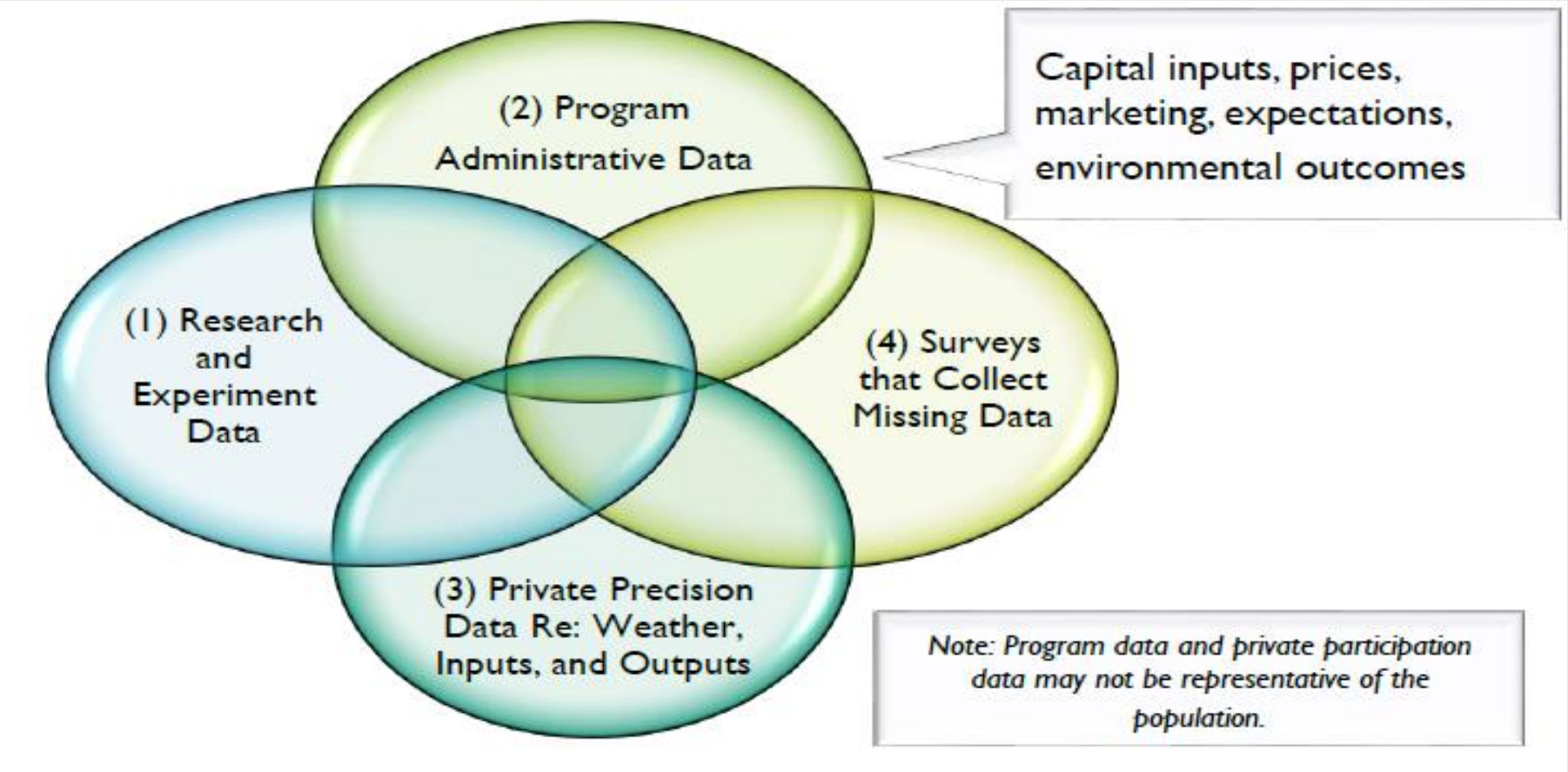
Consumer Panels

CONSUMER PANELS

Products	Regions	2008	2009	2010	2011	2012	2013	2014	2015
Granola	Northeast	27,469	17,054	14,508	19,855	23,070	19,023	13,012	14,171
	Midwest	36,299	32,427	37,898	42,753	45,648	41,713	37,471	36,763
	South	32,387	32,201	34,556	41,673	45,095	42,724	38,065	46,816
	West	34,787	37,400	60,834	73,067	75,967	65,929	68,496	77,001
	Total	130,942	119,082	147,796	177,348	189,780	169,389	157,044	174,751
Nuts	Northeast	467	577	970	1,873	6,001	18,687	23,220	25,808
	Midwest	166	349	751	1,189	2,902	7,607	15,915	19,944
	South	222	253	426	613	998	3,559	10,271	20,181
	West	-	79	214	322	618	1,708	26,944	42,806
	Total	855	1,258	2,361	3,997	10,519	31,561	76,350	108,739
Nutrition	Northeast	-	9	26	198	863	10,470	21,753	20,405
	Midwest	45	253	94	150	1,523	6,305	13,531	15,703
	South	104	504	32	-	63	553	12,958	14,516
	West	4,073	3,312	2,959	6,416	9,303	12,216	19,194	16,999
	Total	4,222	4,078	3,111	6,764	11,752	29,544	67,436	67,623
Protein	Northeast	-	54	47	32	65	185	314	8,149
	Midwest	253	1,540	1,018	1,367	2,230	3,256	3,403	5,027
	South	1,029	3,023	187	153	170	270	276	596
	West	660	6,106	4,806	3,235	3,813	4,845	967	494
	Total	1,942	10,723	6,058	4,787	6,278	8,556	4,960	14,266

Other Thoughts

FILLING THE GAPS



Big Data Considerations for Rural Property Professionals

By Terry W. Griffin, Tyler B. Mark, Shannon Ferrell, Todd Janzen, Gregory Ibendahl, Jeff D. Bennett, Jacob L. Maurer, and Aleksan Shanoyan

ABSTRACT

The promise of "big data" has been praised by the popular media. Concepts and impediments surrounding big data are discussed relative to both the current status and anticipated direction of the industry. Rural property professionals, such as farm managers and rural appraisers, have an opportunity to position themselves and their clients to make effective use of big data. Topics relevant to big data in agriculture include farmland values, lease arrangements, data ownership, data as an asset and its valuation, and the ramifications of wireless connectivity. The challenges that rural property professionals may encounter when integrating big data into their portfolio of services are described.

Terry W. Griffin is Assistant Professor, Kansas State University, Manhattan, Kansas. Tyler B. Mark is Assistant Professor, University of Kentucky, Lexington, Kentucky. Shannon Ferrell is Associate Professor, Oklahoma State University, Stillwater, Oklahoma. Todd Janzen is Attorney, Janzen Agricultural Law LLC, Indianapolis,

POTENTIAL & BARRIERS

Potential

- Fully integrated system (farm level)
  - Transparency within the supply chain
- Analytical tool development
- Secondary Usage
- Supplementing USDA
- Efficiency improvements

Barriers

- Analytical Tools
- Training
- Security
- Privacy
- Broadband
- Low Adoption
- Small farms

SUMMARY

- Potential to overcome economies of scale for small farms
- Developing additional tools
- Farm level data is still a big barrier
- Data platforms are racing to acquire acres
  - Who will win
- Data will have more value in secondary uses
  - Sold
  - Becomes an asset
  - Built into land values
- Privacy, security, & data movement
- Anti-trust or Arbitrage

CONTACT INFORMATION

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