On-Farm Results and Interpreting Satellite Data for Farmer Use

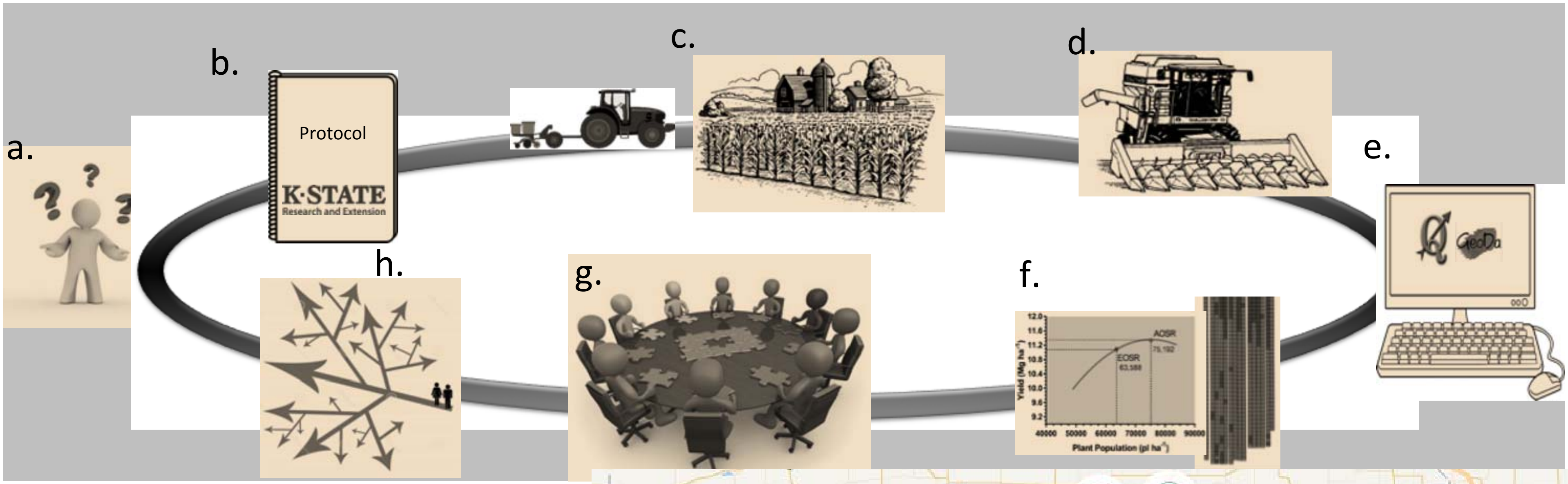
Dr. Ignacio A. Ciampitti
Cropping Systems Specialist,
KSUCROPS Lab, Department of Agronomy
K-State Research & Extension

ciampitti@ksu.edu
@KSUCROPS
/KSUCROPS

Luciana Nieto, KSUCROPS Lab
Rai Schwalbert, KSUCROPS Lab
Sebastian Varela, KSUCROPS Lab

K-State On-Farm Research

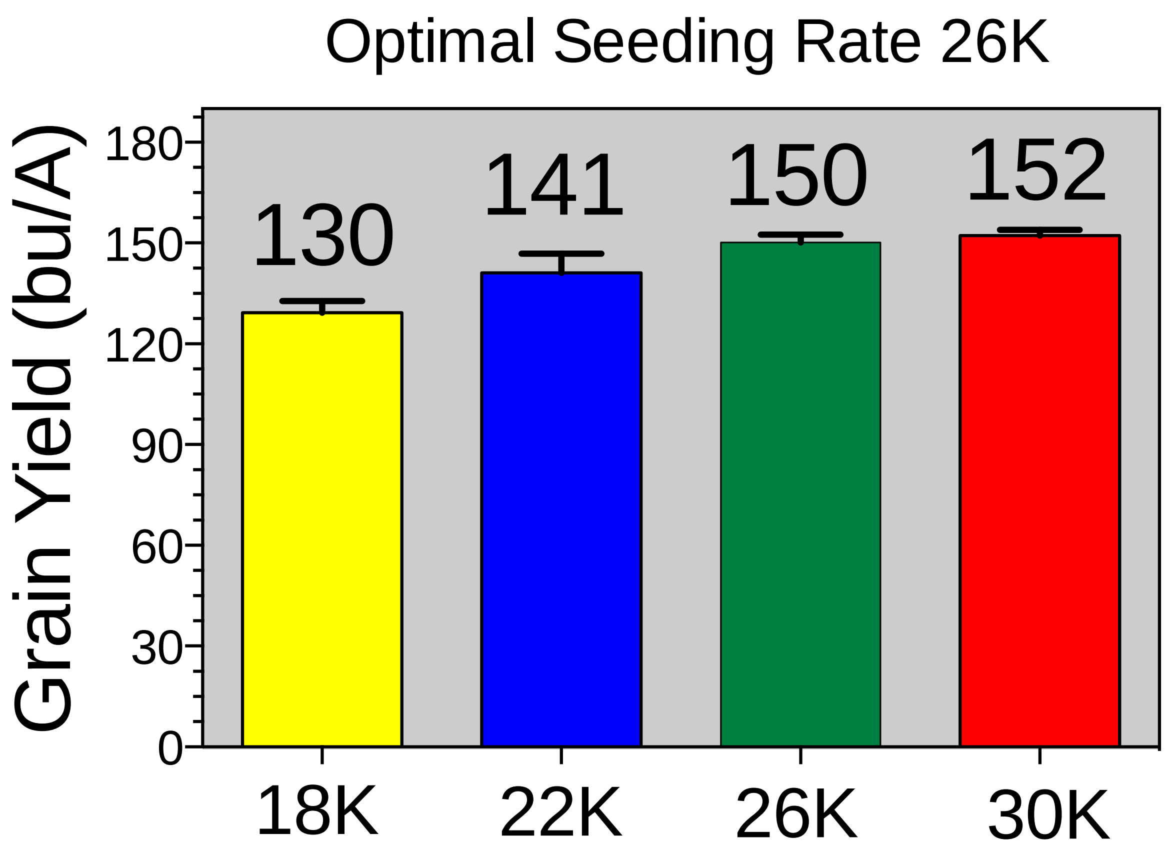
"Bottom-Up APPROACH"

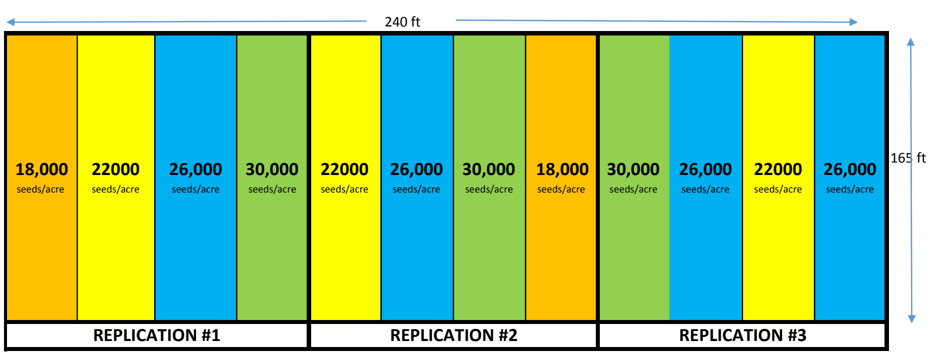


+20 On-Farm Projects in 2016

(+80 since 2014)

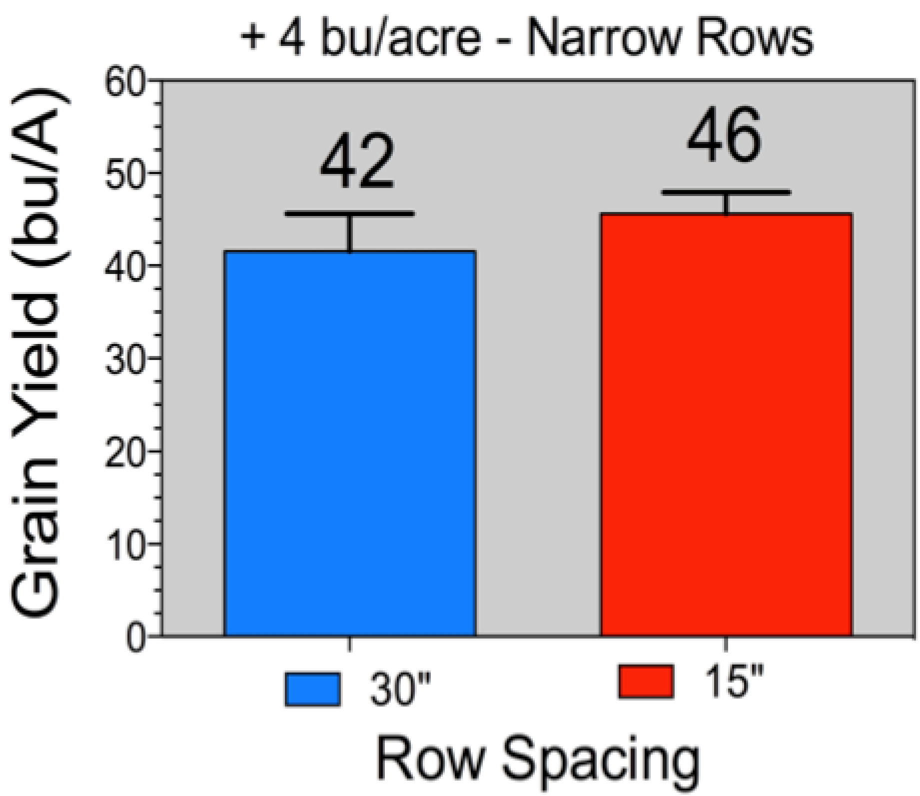
ON-FARM RESEARCH: CORN

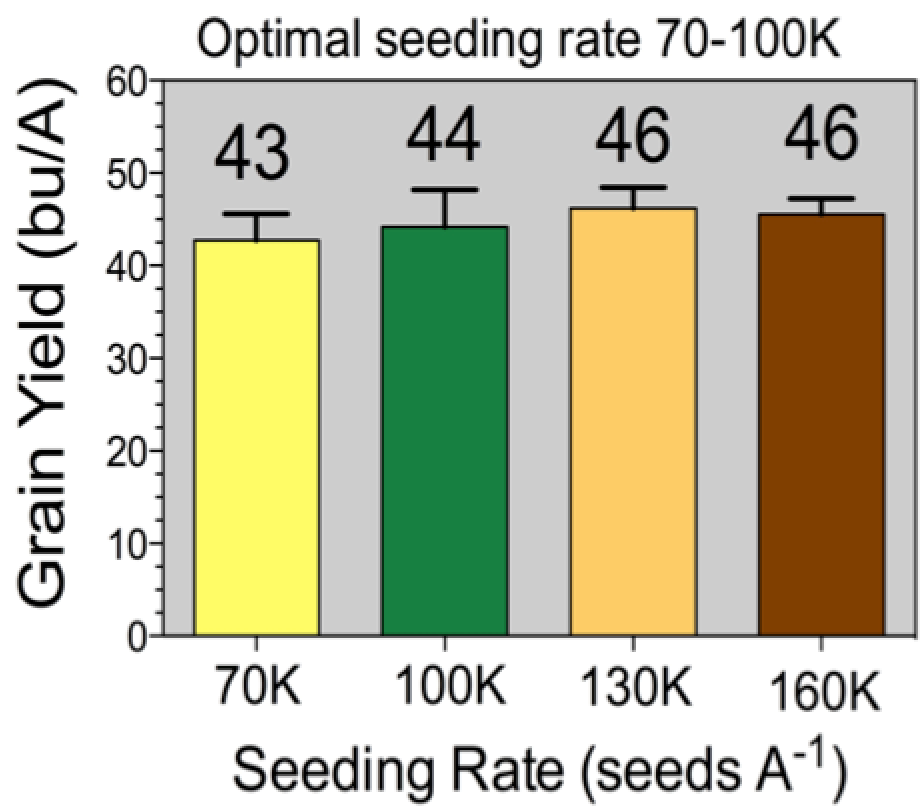




Grain yield response to seeding rate affected by yield level (<150 bu/acre). Agronomical optimal ~26K.

ON-FARM RESEARCH: SOYBEAN

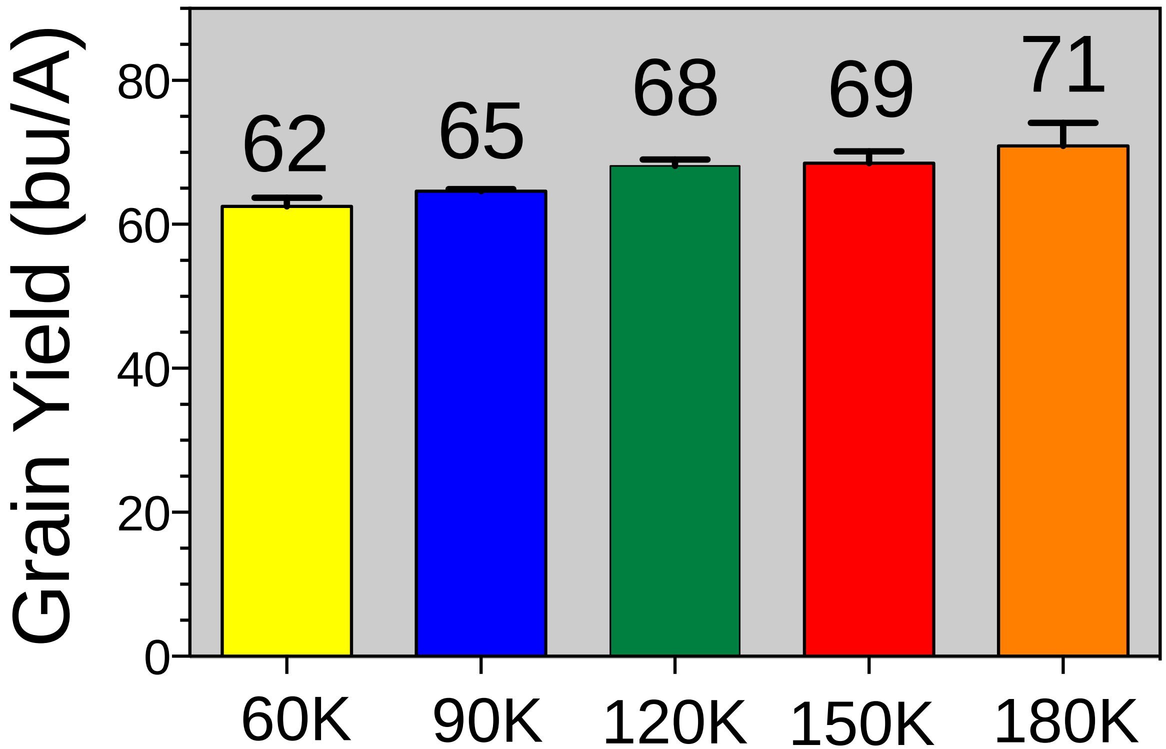




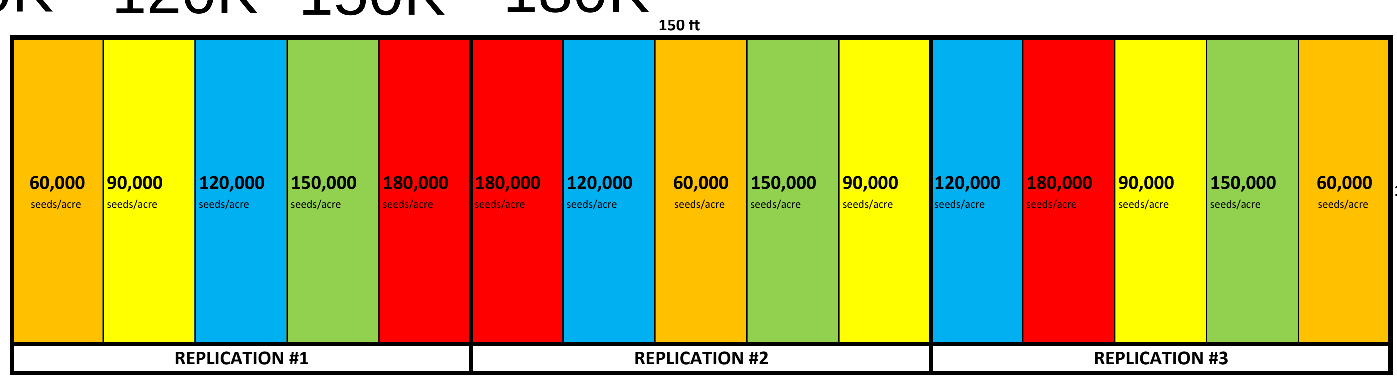
Narrow Row Spacing increases yields;
Seeding Rates 70-100K optimal => 40-50 bu/a

ON-FARM RESEARCH: SOYBEAN

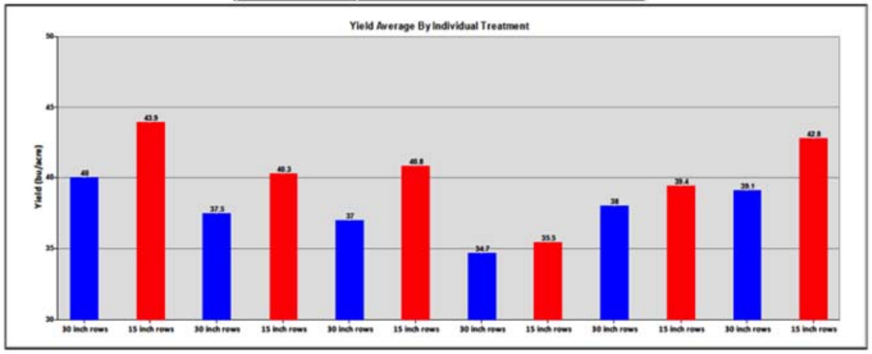
Optimal Seeding Rate 120K



High-yield level (=70 bu/acre), optimal seeding rate at +120K seeds/A

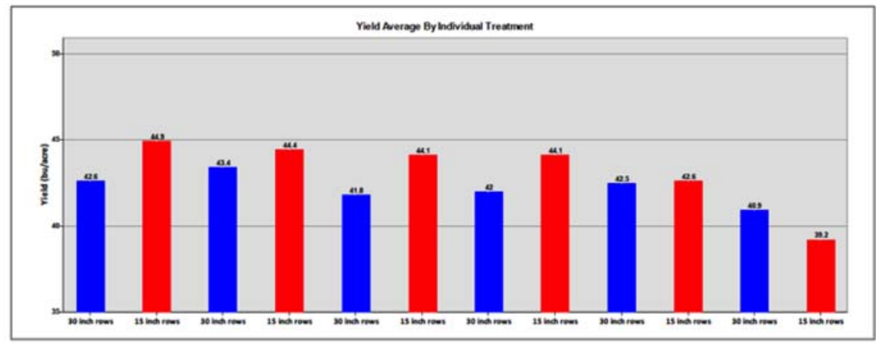


ON-FARM RESEARCH: SOYBEAN



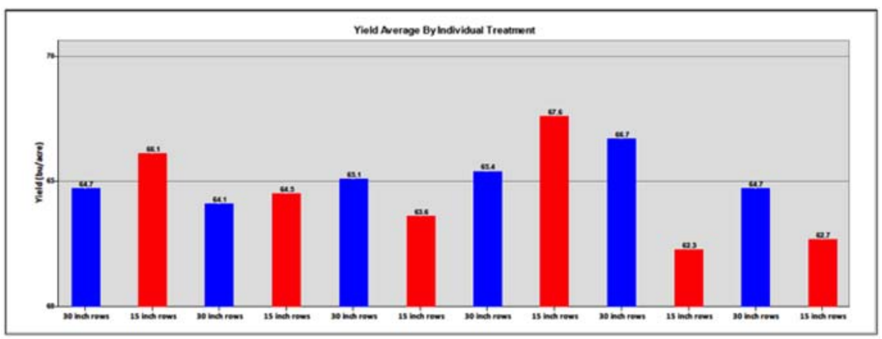
Treatment	15 inch rows	30 inch rows	A randomization test suggested strong evidence of a significant yield difference.
Yield Averages (bu/acre)	40.4	37.7	

Riley Co.
Row Spacing (+3 bu/A)



Treatment	15 inch rows	30 inch rows	A randomization test suggested some evidence of a significant yield difference.
Yield Averages (bu/acre)	43.2	42.2	

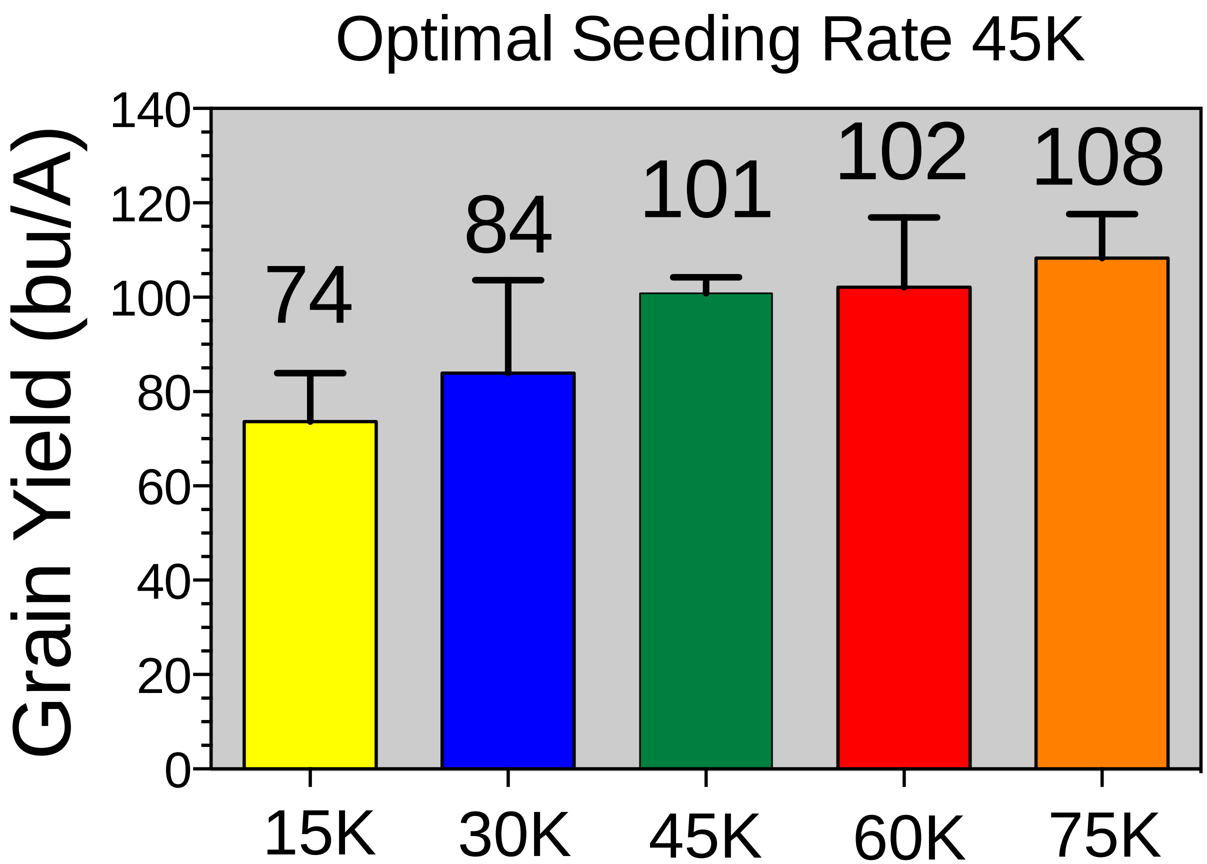
Franklin Co.
Row Spacing (+1 bu/A)



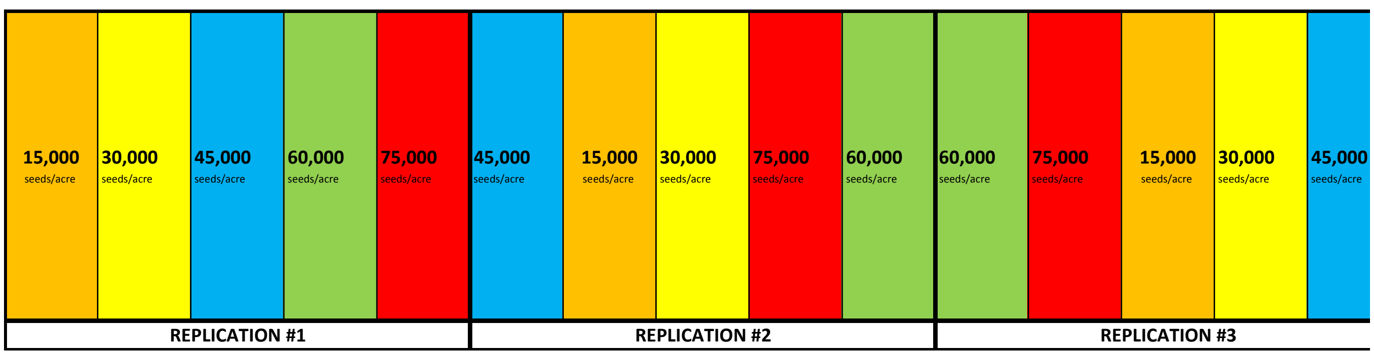
Treatment	15 inch rows	30 inch rows	A randomization test suggested no evidence of a significant yield difference.
Yield Averages (bu/acre)	64.5	65.1	

Jefferson Co.
Row Spacing (-0.5 bu/A)

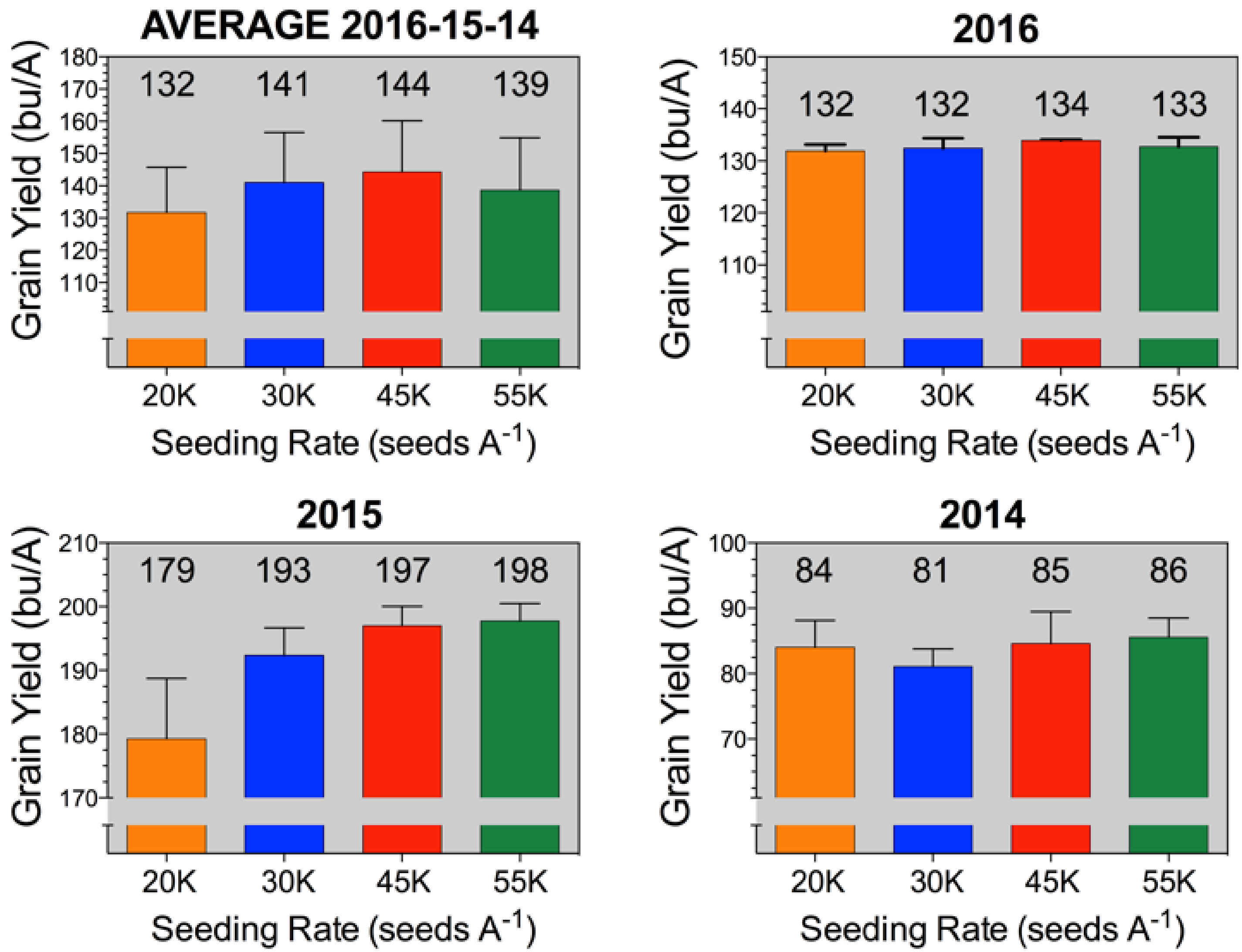
ON-FARM RESEARCH: SORGHUM



For sorghum, Optimal seeding rate at +45K seeds/A 100 bu/A



On-Farm Research (OFR): Sorghum



Optimal seeding rate across years, 30K.

Outline for the Presentation

1. Value of Satellite Imagery
2. Satellite Imagery
3. Applications In Agriculture
4. Forecasting tool for Kansas and US Midwest
5. Summary

1

Value of Satellite Imagery on Ag

InnovationSeries VISIONConference Learning Center

PRECISIONAg GLOBAL HUB FOR AG TECH INNOVATION

Professionals Systems Management Hort Tech Ag Tech Global Learning Ev

Field Monitoring & Sensors: Download The Special Report

Back On The Map: Satellite Imagery Emerges As A Valuable Tool

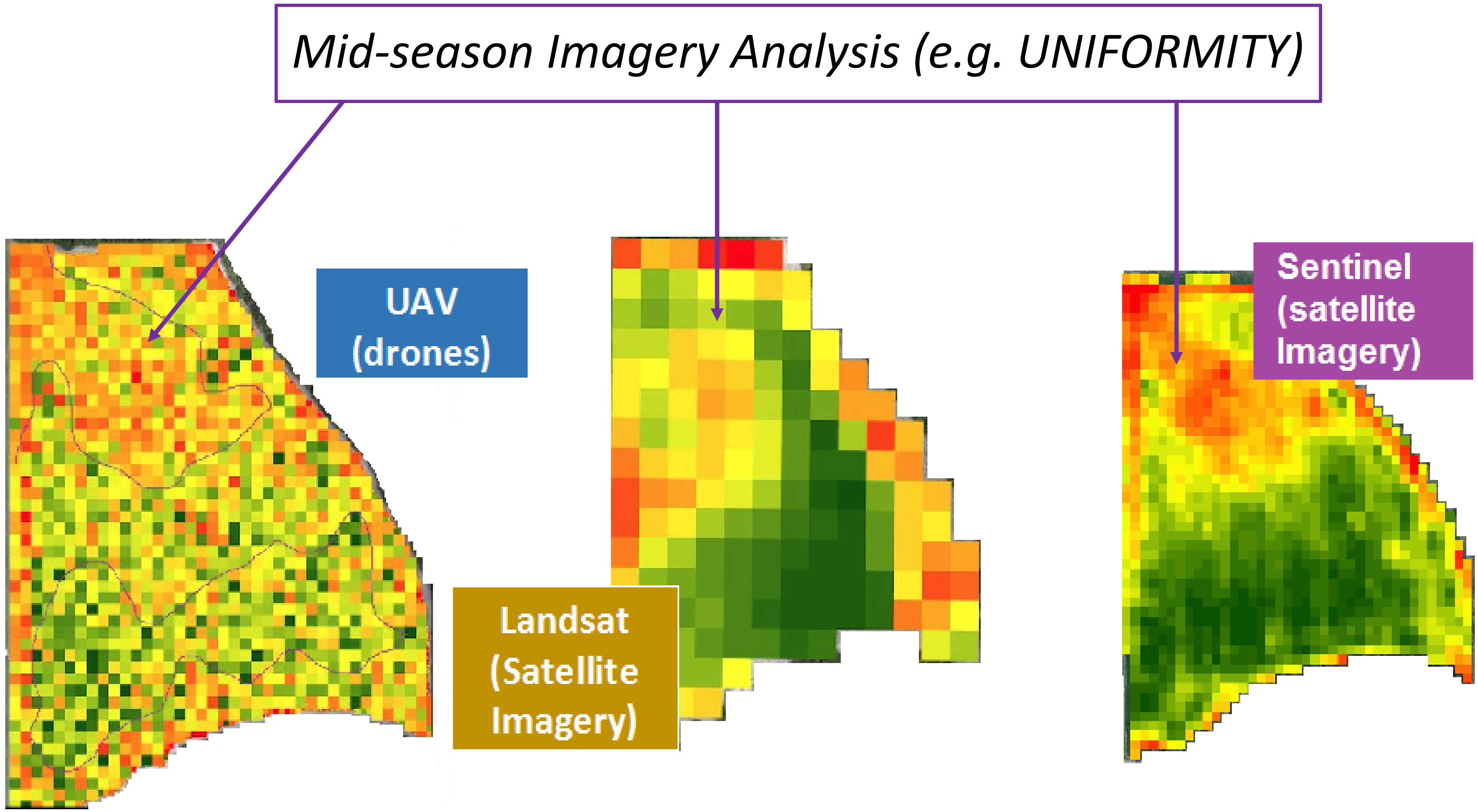
"Remote sensing utilizing drones is very labor intensive at the moment, and that's not likely to change in the near future"

For many years satellite imagery was a solution in search of a viable precision agriculture system in which it could deliver value. In-season, on-demand imagery was often hampered by cloud cover and a dearth of available satellites for taking images. Until recently, as a stand-alone tool it hadn't carved itself a stable and consistent place in the crop production regimen.

Over the past decade, the number of satellites has increased significantly, improving the quality and frequency of the images available to agriculture. Planet Labs, which purchased BlackBridge and its RapidEye satellite constellation, is supplying Wilbur-Ellis and Crop Production Services with imagery to support their precision programs.

Planet also delivers satellite imagery to agronomy/technology consulting firm Farmers Edge. Ron Osborne, Vice President of Innovation, says that while they're doing some work with UAV imagery — specifically with Canadian drones-as-a-service

Satellite Imagery



Applications of Satellite Imagery

1. Seasonal (within a season) and temporal (across seasons) monitoring of crop vegetation (evaluating stress factors such as drought, heat, nutrient deficiency, etc.).

2. Crop scouting, sampling and field trips according to the field dimensions and the potential targets.

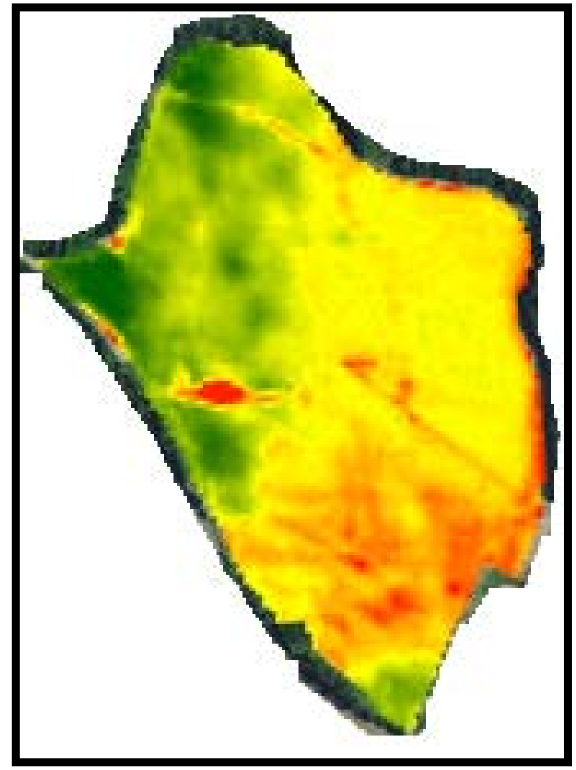
3. Forecasting yields at varying scales: county, regional, & state.

4. Site-Specific Management (SSM) using prescription maps to variable seeding rate/fertilization, depending on # environments.

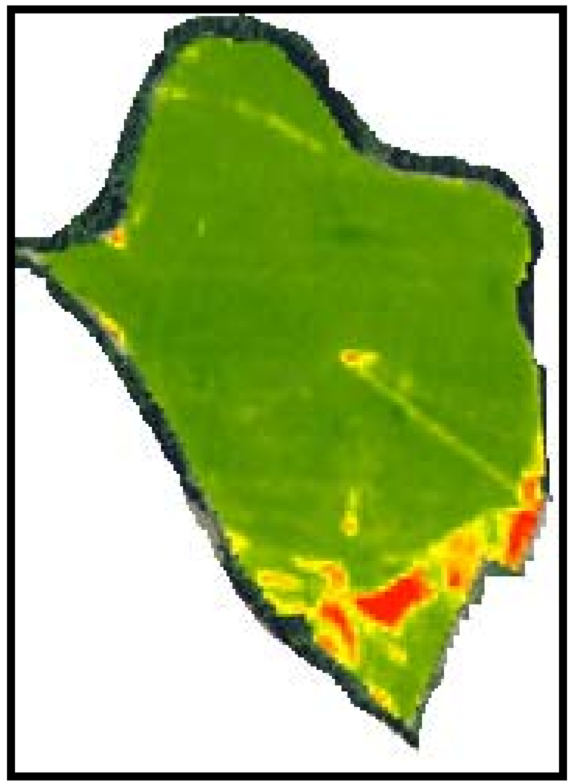
5. Environmental impact assessment, fires, floods, to tracking potential changes in land use, and the status of the fields.

Seasonal Crop Vegetation Status: same crop, same year

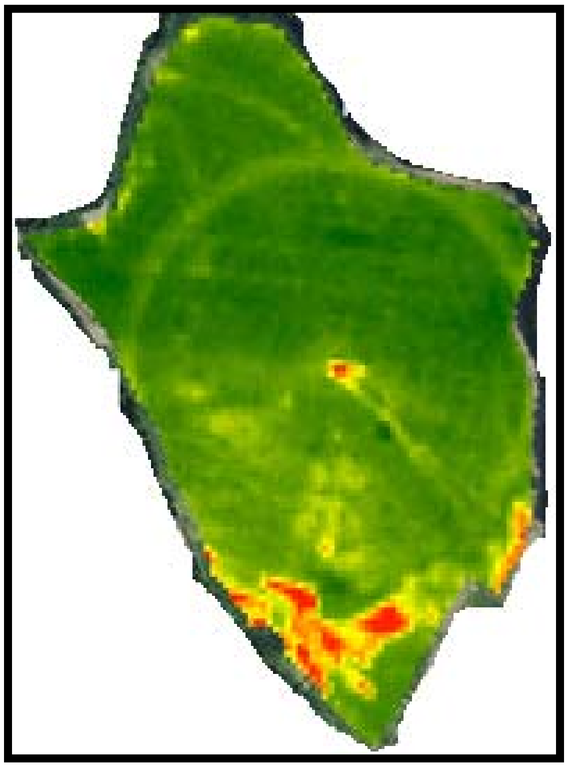
August 2017



July 2017



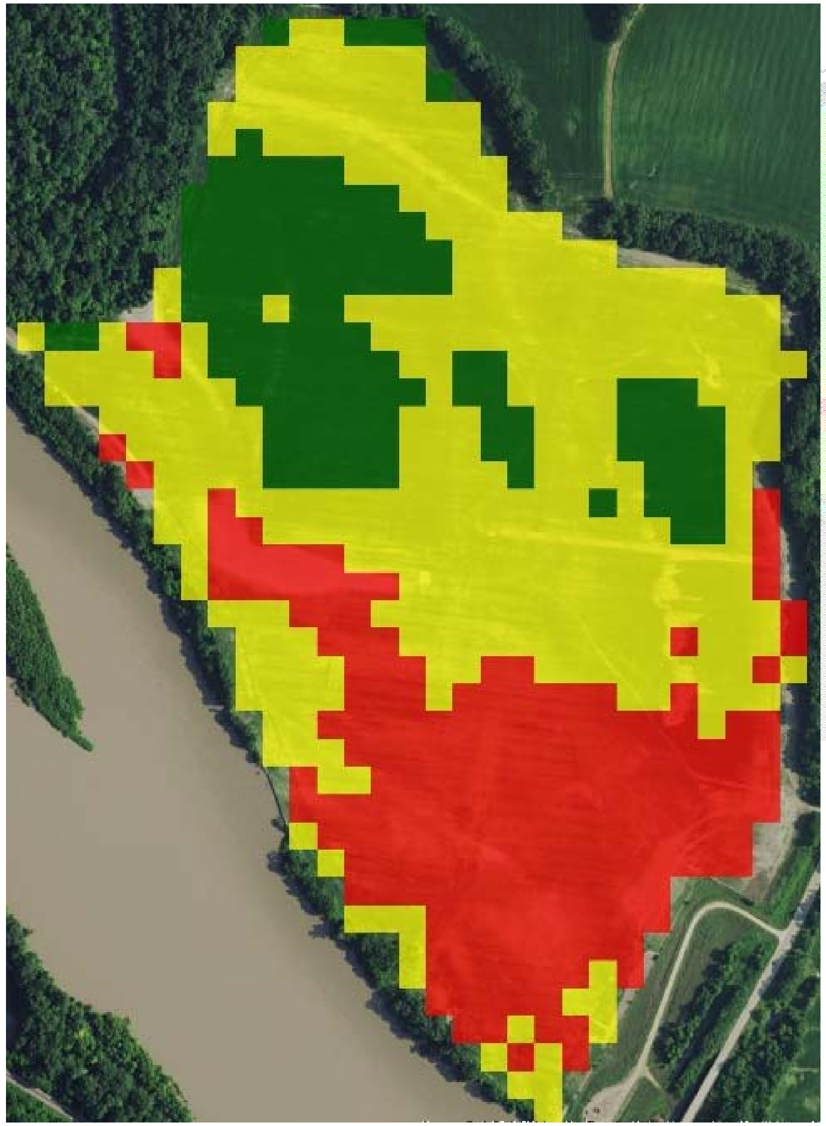
June 2017



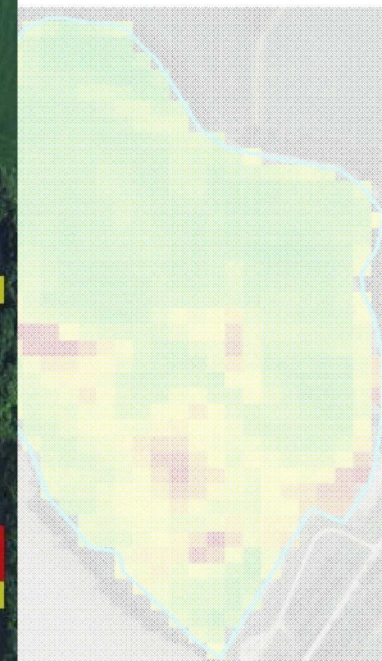
Sentinel 2017

Temporal Crop Vegetation Status: different seasons

Summer 2013



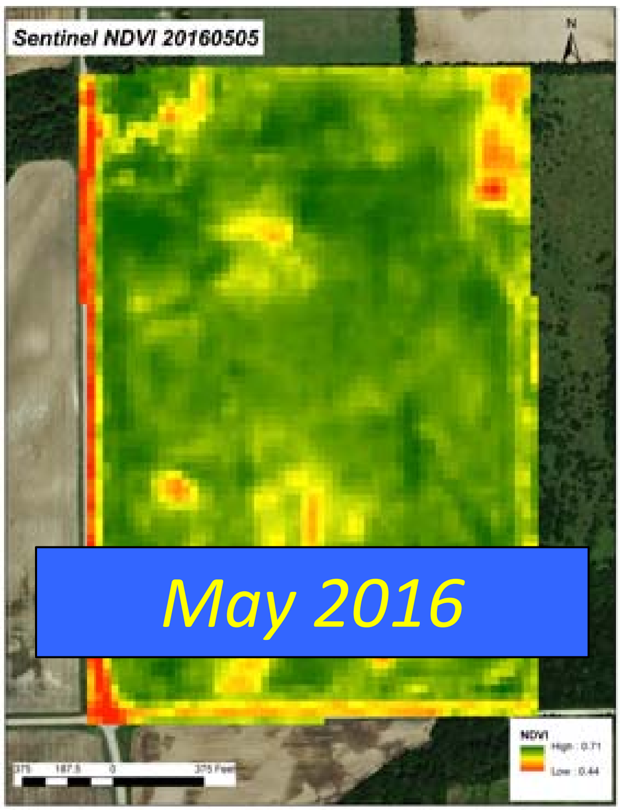
ummer 2016



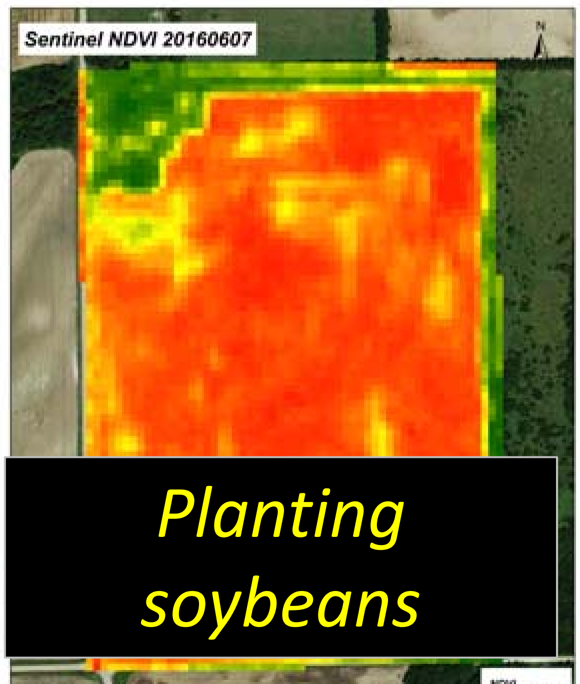
Seasonal Crop Vegetation Status: High-Res Satellite Imagery

June 2016

Wheat 2015/16

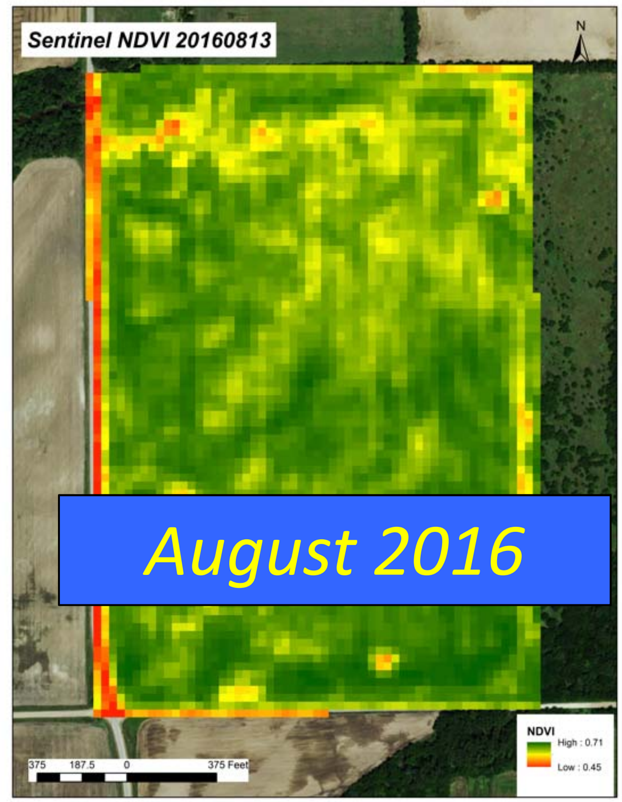


May 2016



Planting soybeans

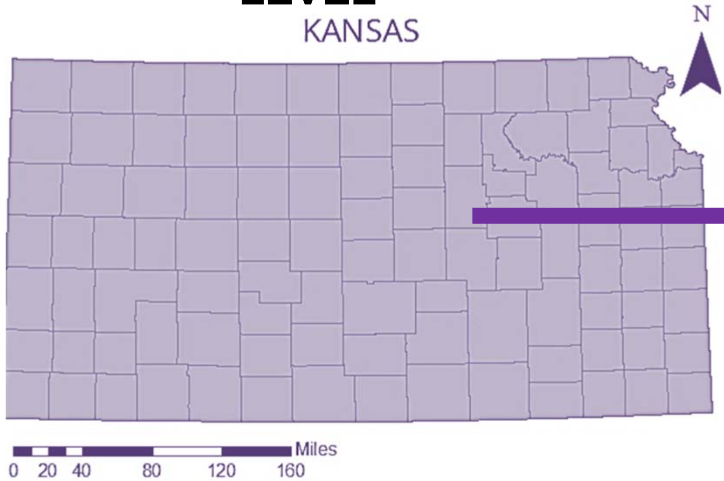
Double-crop Soybeans 2016



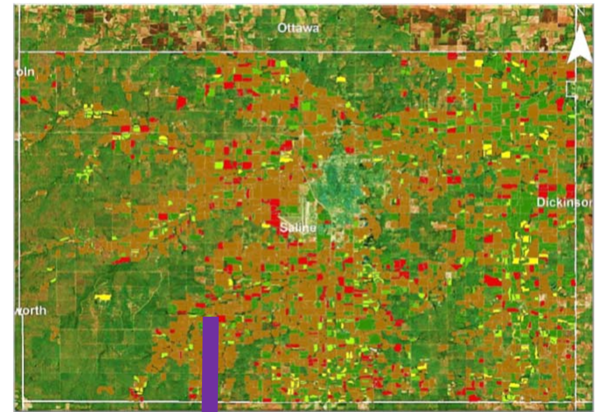
August 2016

Crop Identification

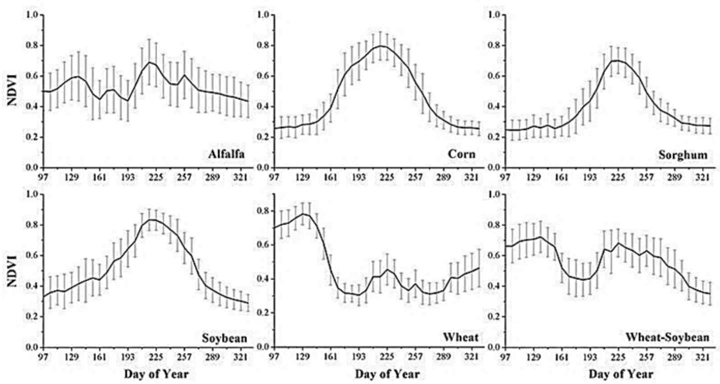
STATE AND COUNTY LEVEL



Soybean and corn area quantification via satellite imagery



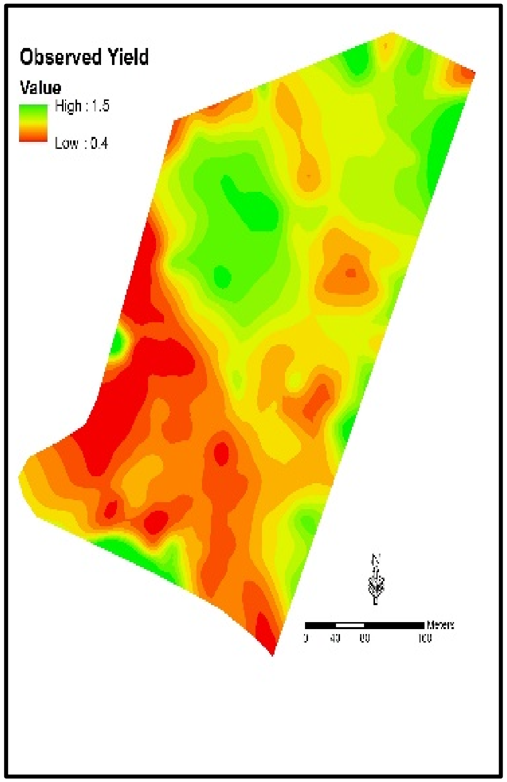
Corn
DC/ W
Soybean
Sorghum



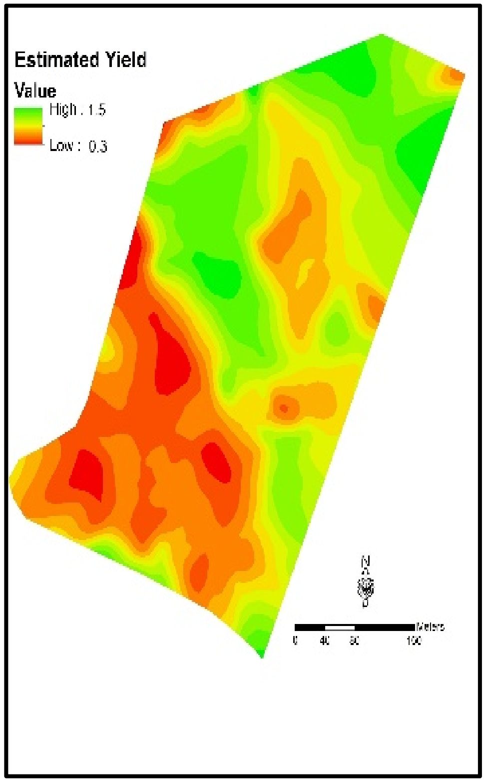
Year-based phenology and spectral response by crop type

Mid-season Satellite Imagery (Predicted Yield) vs. End-season final Yields (Observed Yield)

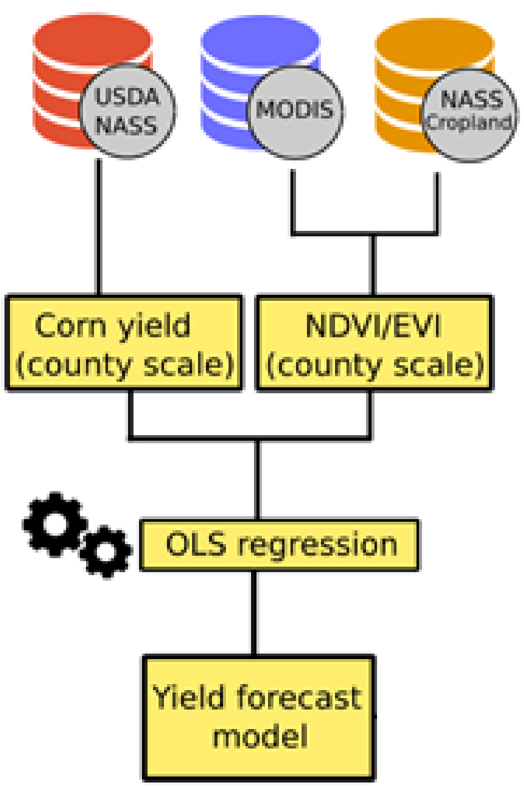
Observed Yield

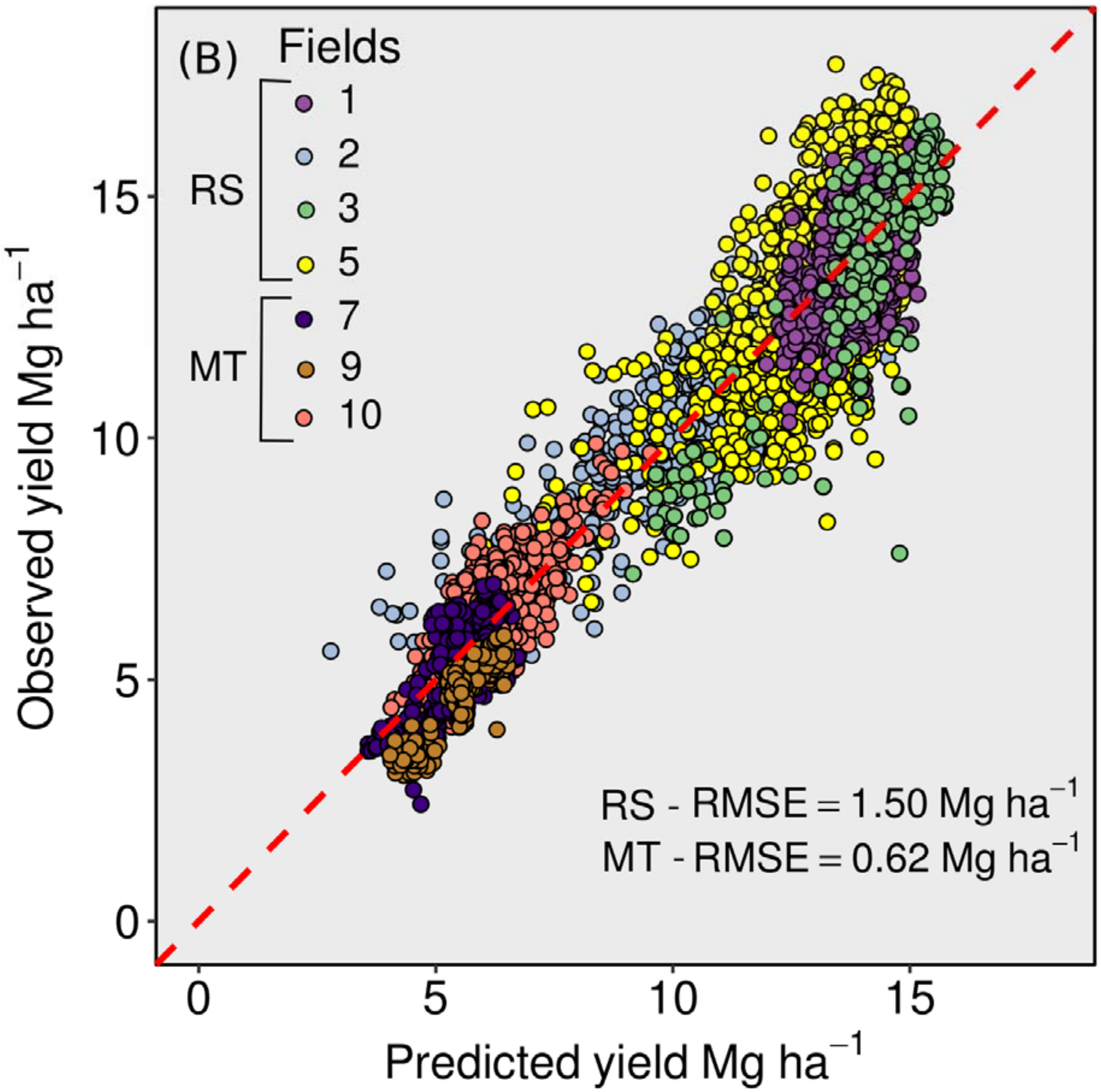


Predicted Yield

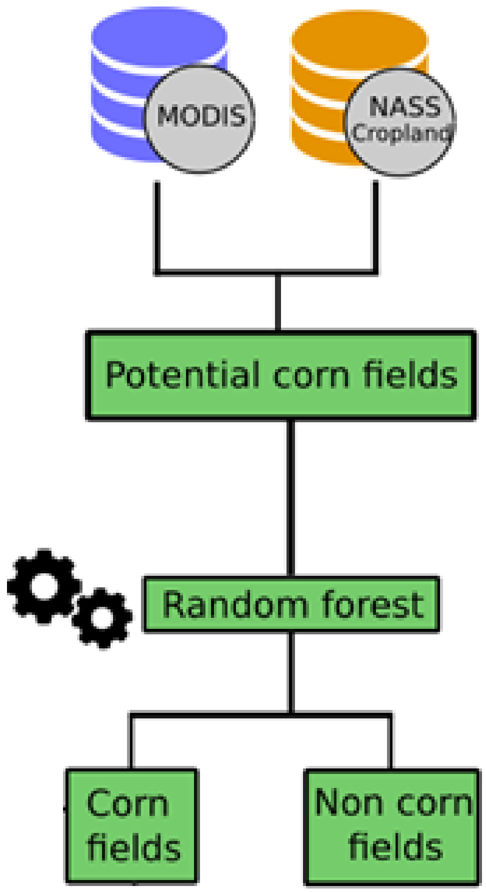


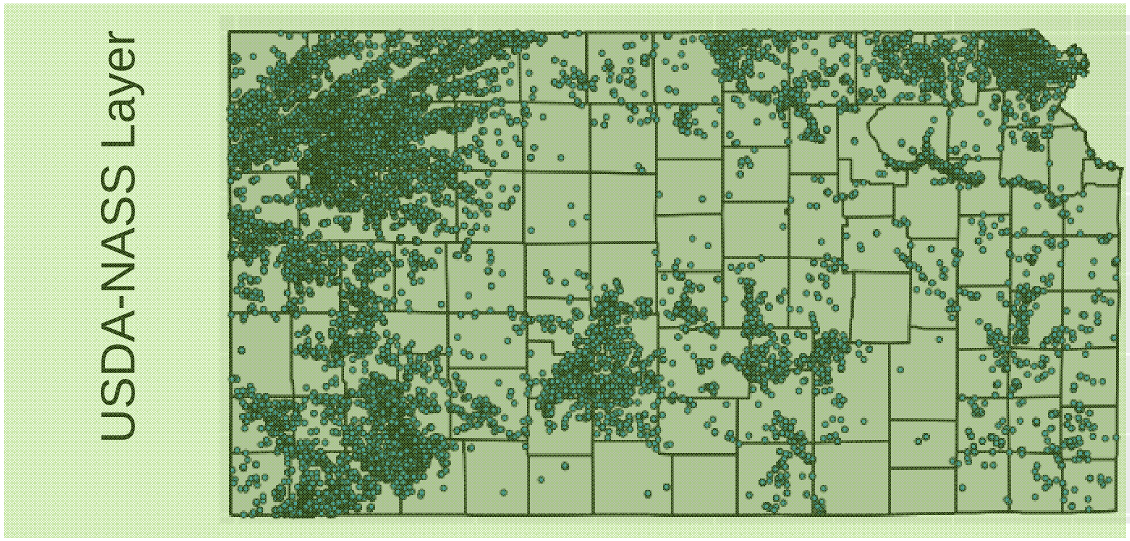
Building the Forecast Yield Model

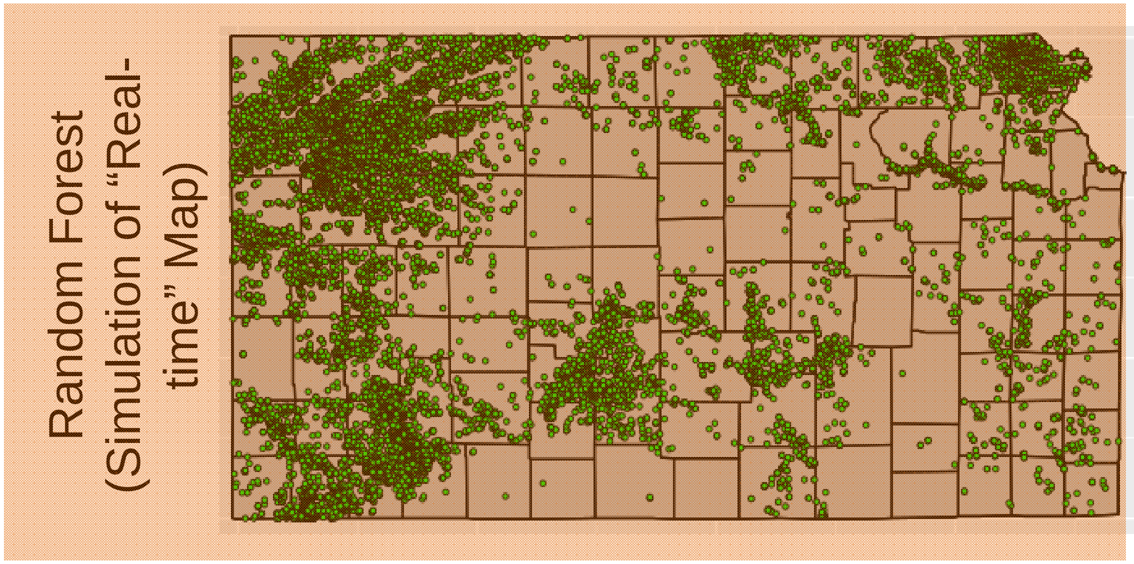




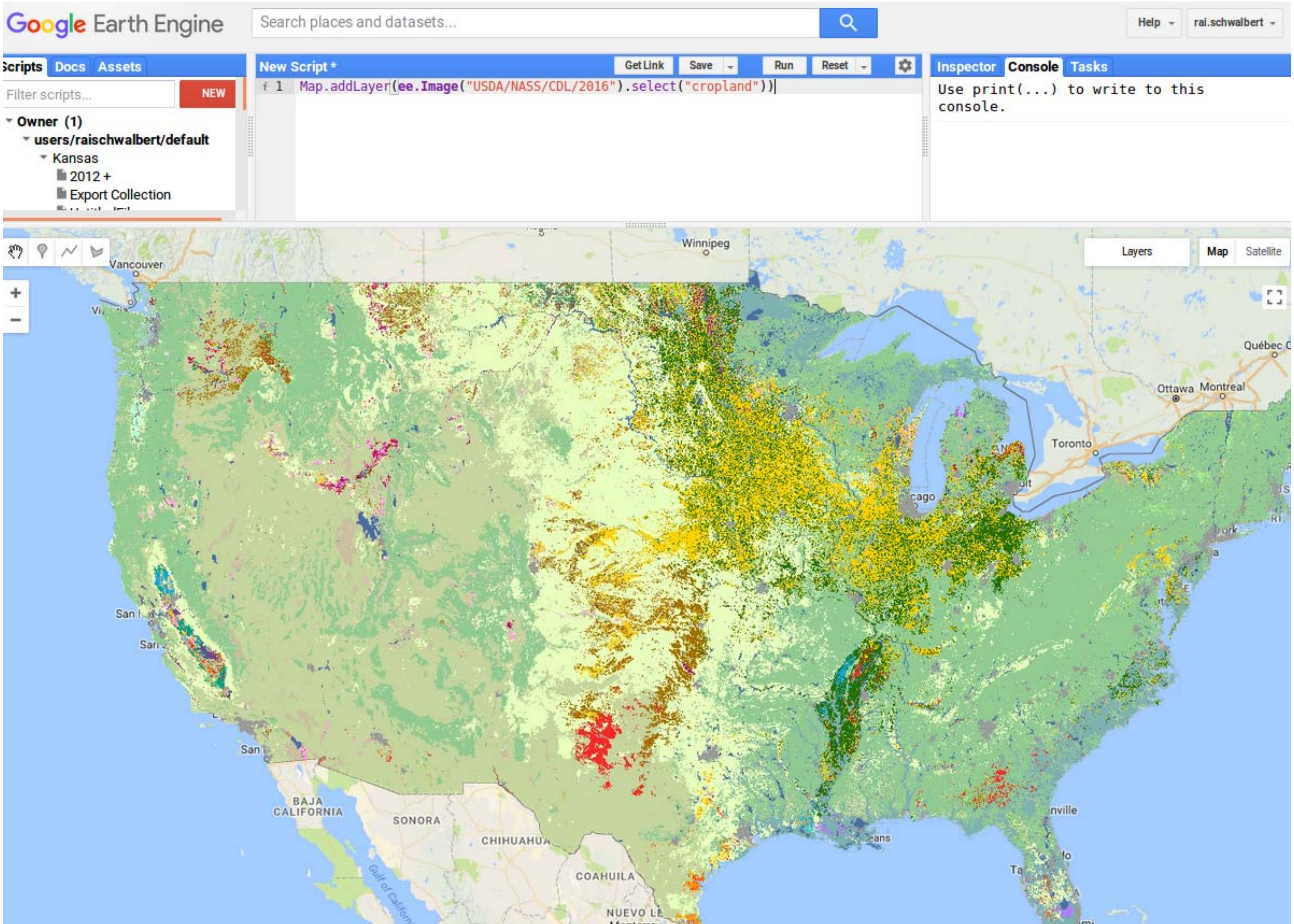
Crop Classification



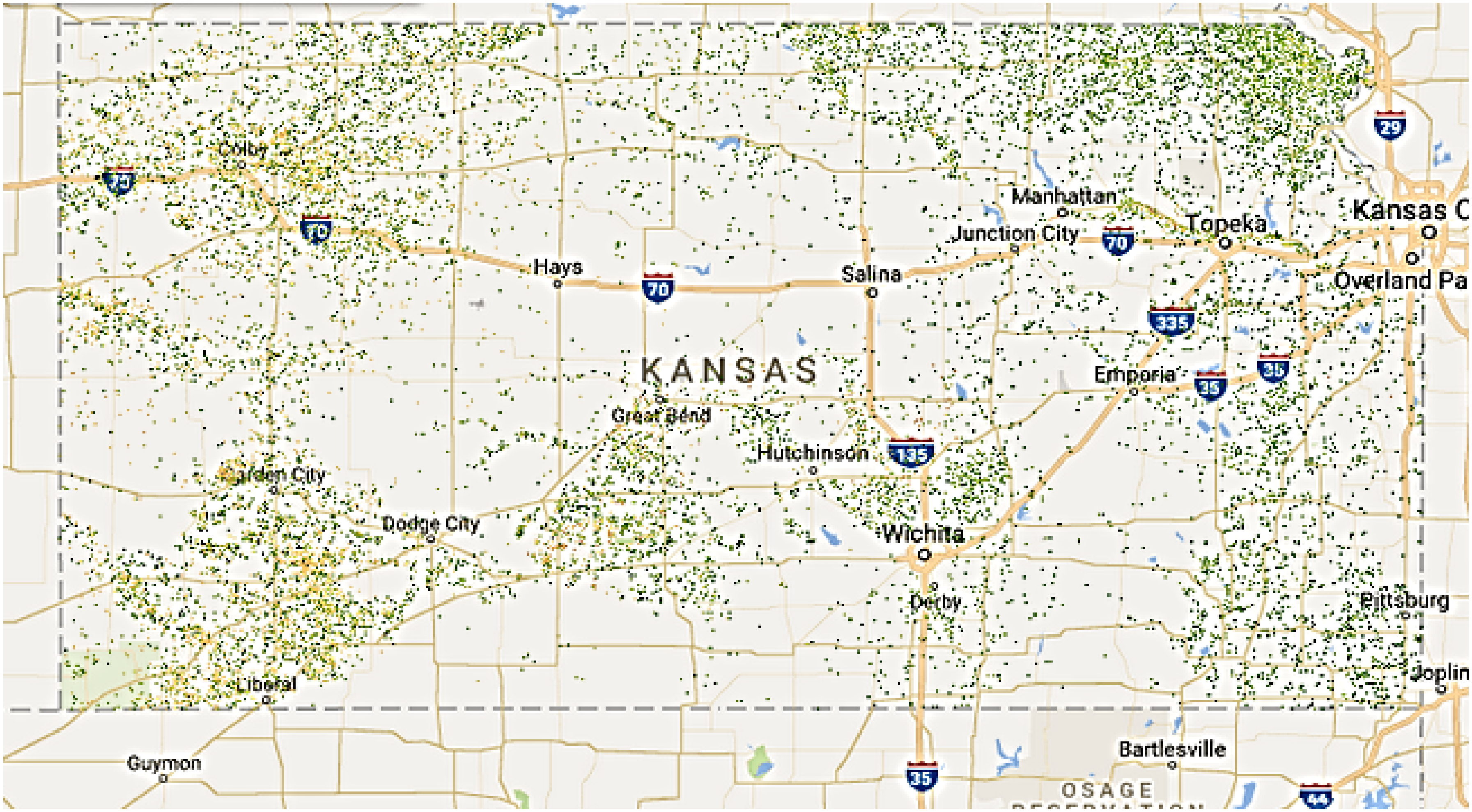




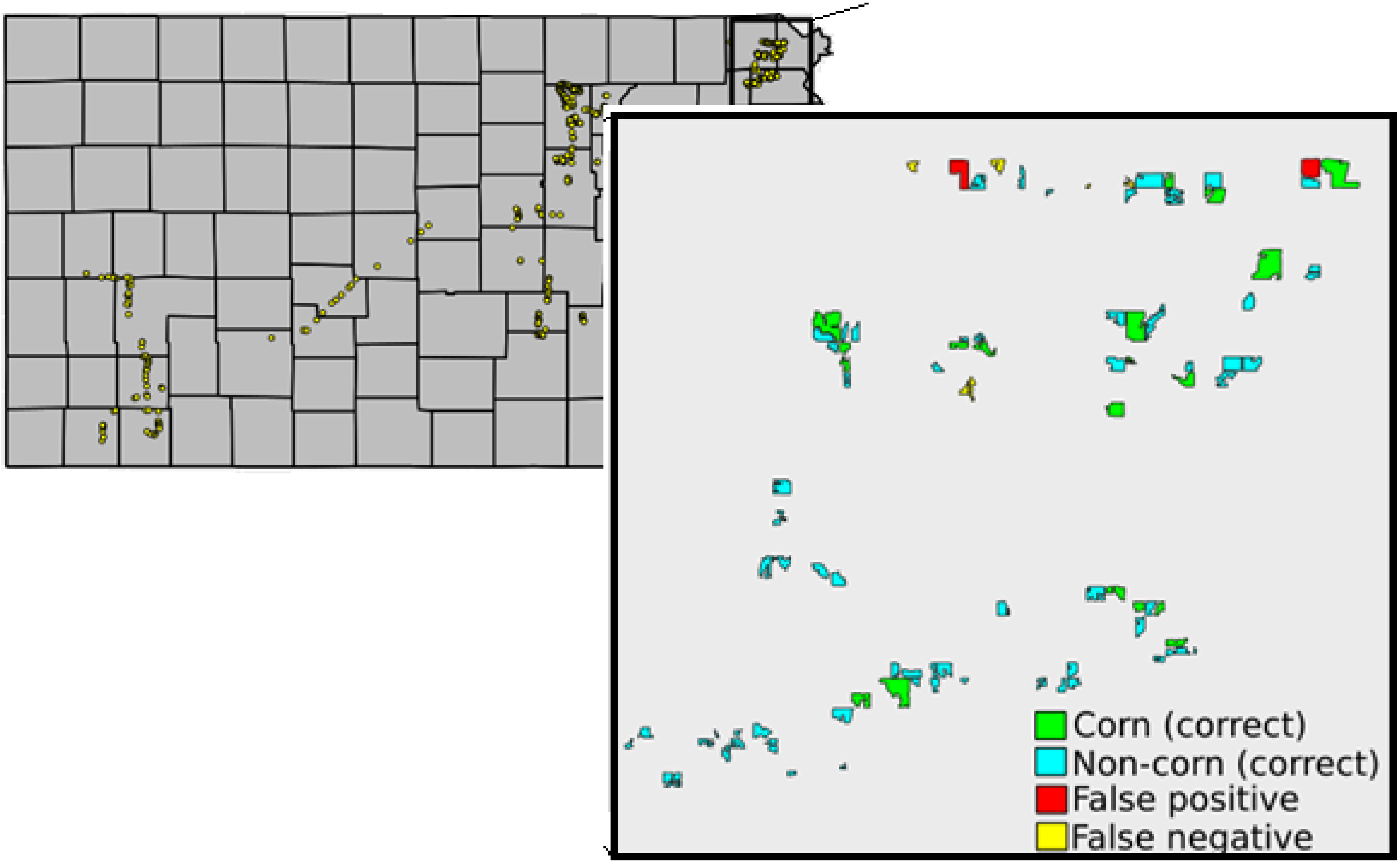
USDA NASS Cropland Data Layer – corn field location



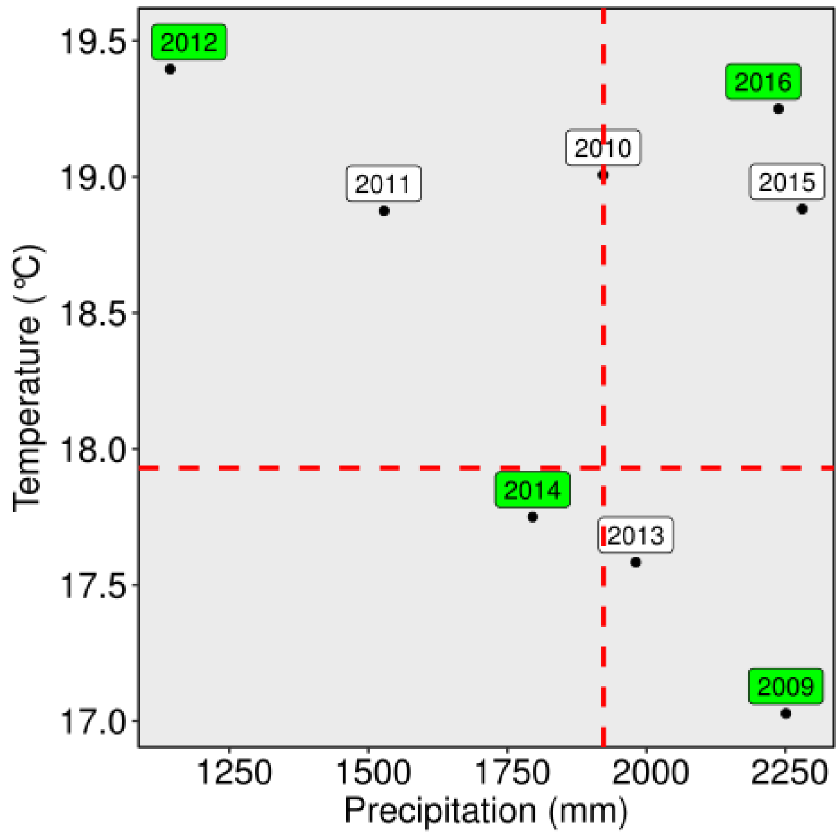
Pixels within Corn Fields

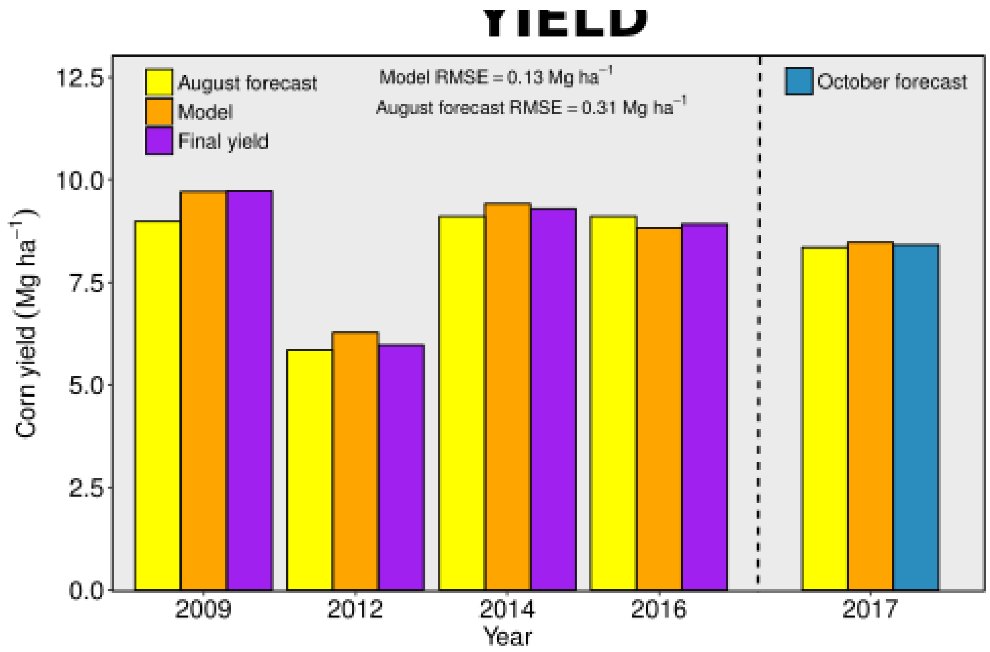


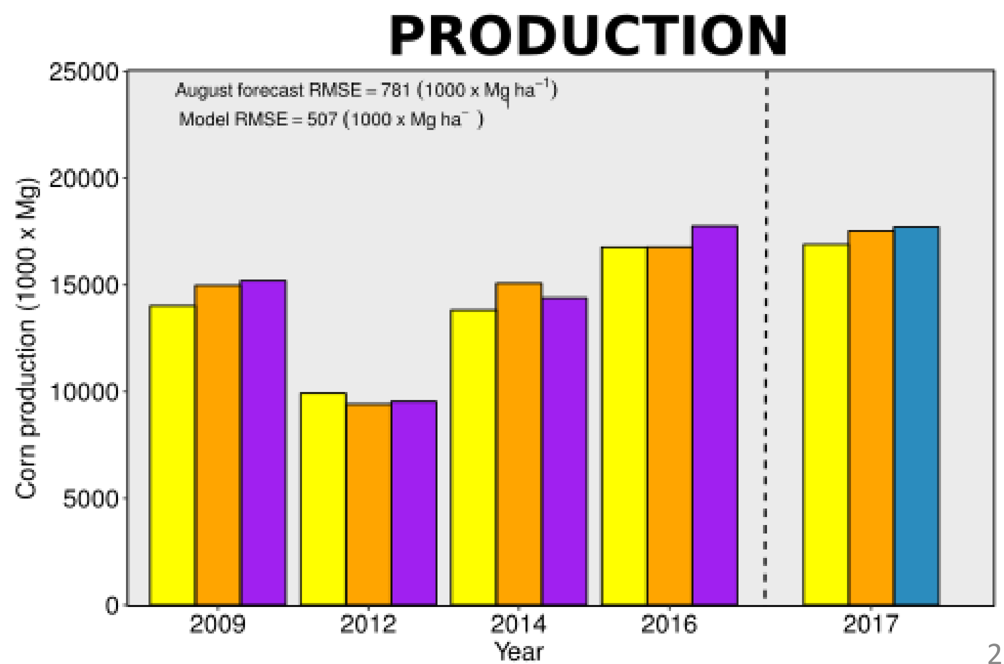
Field Survey - Validation



KANSAS MODEL-YIELD AND PRODUCTION





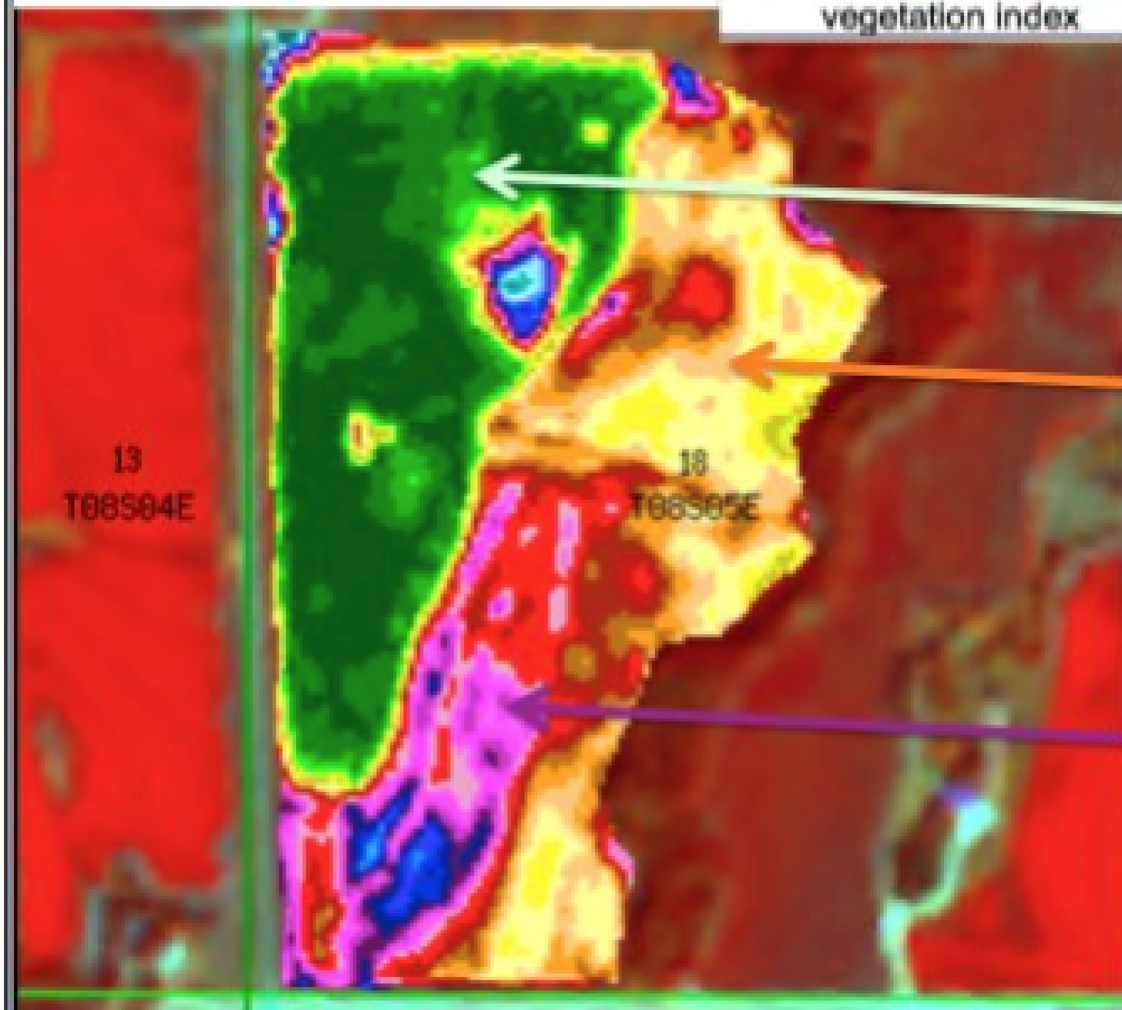


On-Farm Research (OFR): Management Zones utilizing High-Resolution Satellite Imagery

Sentinel Satellite Imagery, August 13 2016

INTERPRETATION

Normalized difference vegetation index	NDVIr	(RNIR-RED)/(RNIR+RRED)



SOYBEAN field

"High-productivity" CORN field

"Low-productivity" CORN field

KANSAS STATE UNIVERSITY

Yield monitor and site-specific data zone management

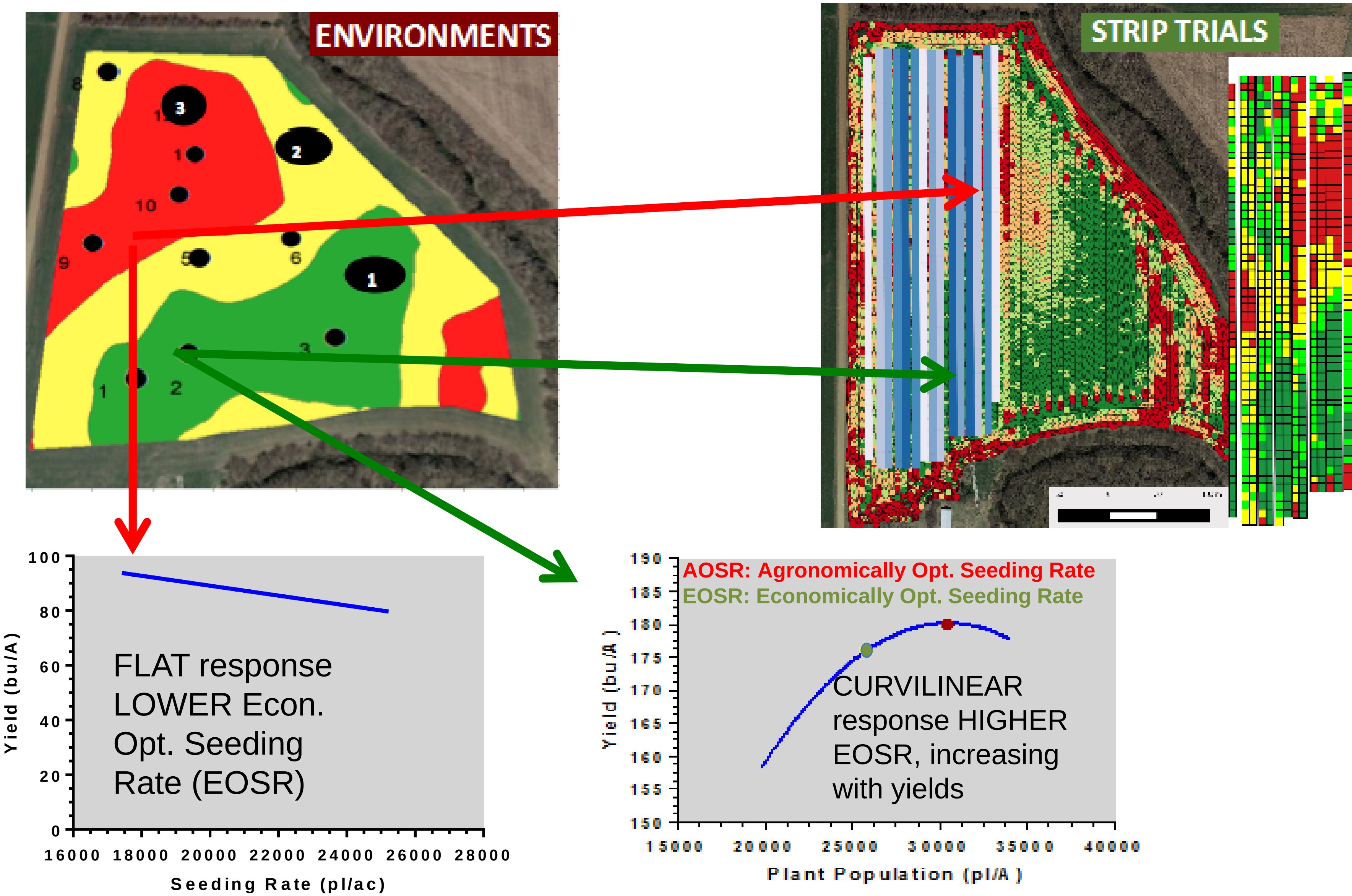
Digital maps of grain yield obtained from yield monitors allow analysis of the spatial variability within an area of production

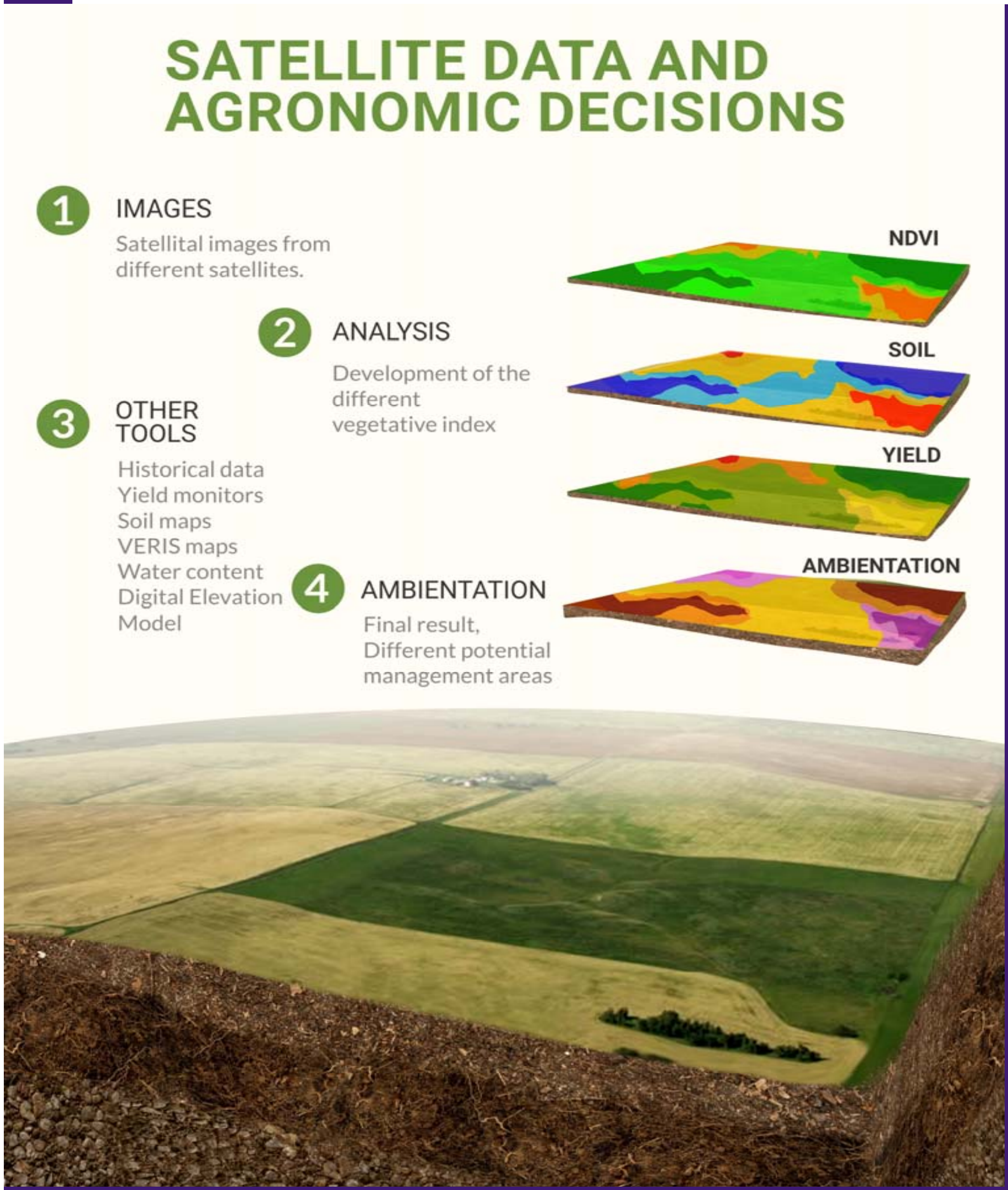
Key Principles… *Yield Monitor Data*

Interpretation, however, is often difficult because pattern of grain yield variability is permanently influenced by spatial (terrain attributes, erosion classes and soil properties) and temporal (soil pathogens, diseases and production issues in planting the crop) factors

On-Farm Research (OFR): Interpretation

Density-response by MANAGEMENT ZONE





On-Farm Research + Precision Ag Tools + Site-specific management = more $$$

Using Satellite Imagery for Ag… *Challenges*

- Coarse resolution compared to sUAS

***Remote sensing** data (form satellite, drones, or planes) **do not replace** the need for an **agronomist** and the **scouting** of the crops.*

Better Characterization of our Farming Environment, more layers of DATA will allow us to fine-tune the best management practices to improve $$$ profits.

Winter Crop Schools - Schedule

- Monday Jan 8, Hesston.
- Tuesday Jan 9, Garden City.
- Thursday Jan 11, Leavenworth.

- Monday Jan 22, Phillipsburg.
- Tuesday Jan 23, Salina.
- Wednesday Jan 24, Rossville.

- Tuesday Feb 6, Dodge City.
- Wednesday Feb 7, Hutchinson.
- Thursday Feb 8, Washington.

THANKS!
QUESTIONS?

Dr. Ignacio A. Ciampitti
Cropping Systems Specialist

@KSUCROPS ciampitti@ksu.edu KSUCROPS