

# Integrating Landsat 7, 8 and Sentinel 2 data in improving crop type identification and area estimation

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# General approach to land-cover and land-use change mapping and area estimation

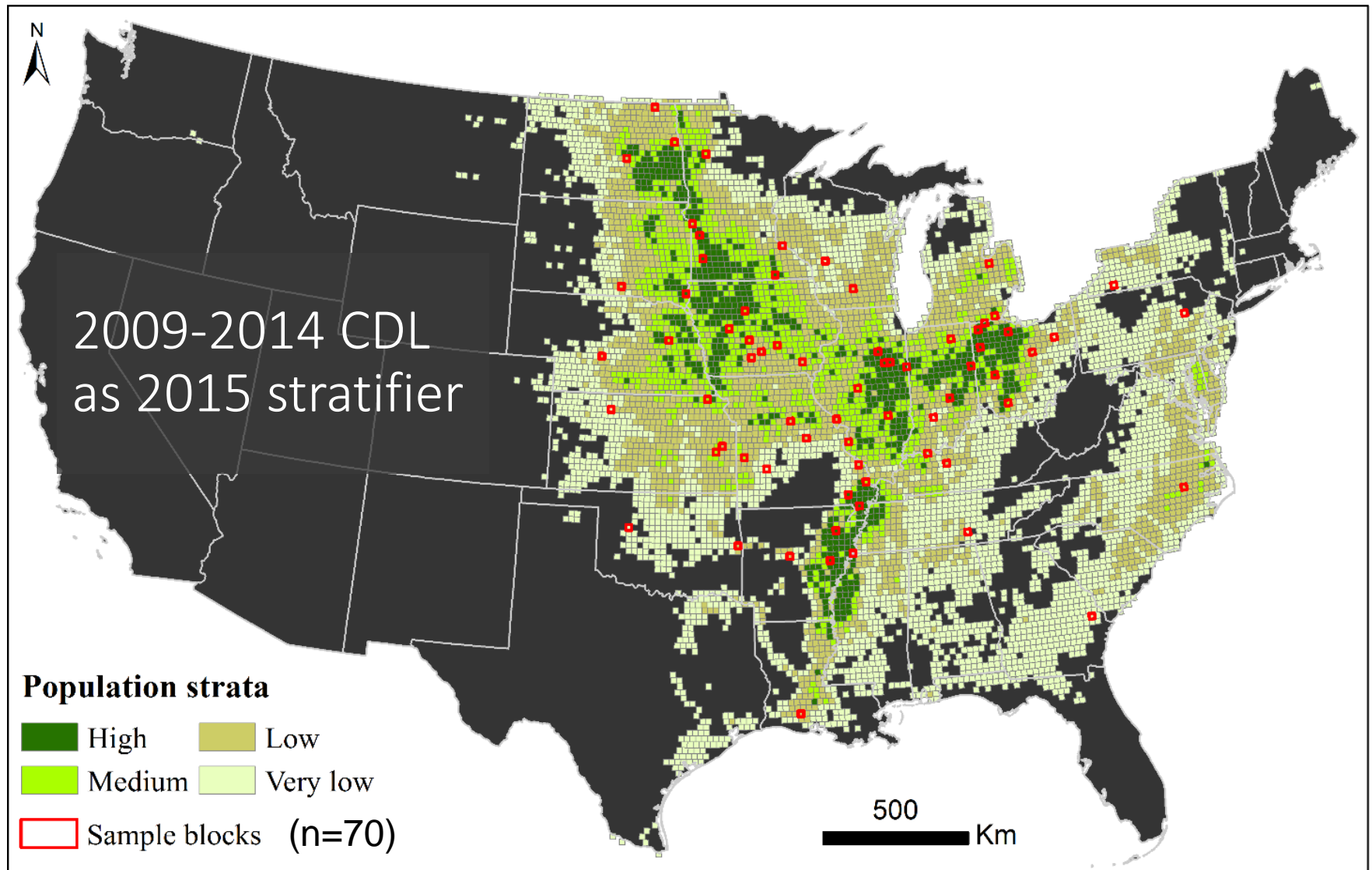
Land-cover / land-use  
change maps  
for stratification

Probability-based  
sampling and reference  
data collection

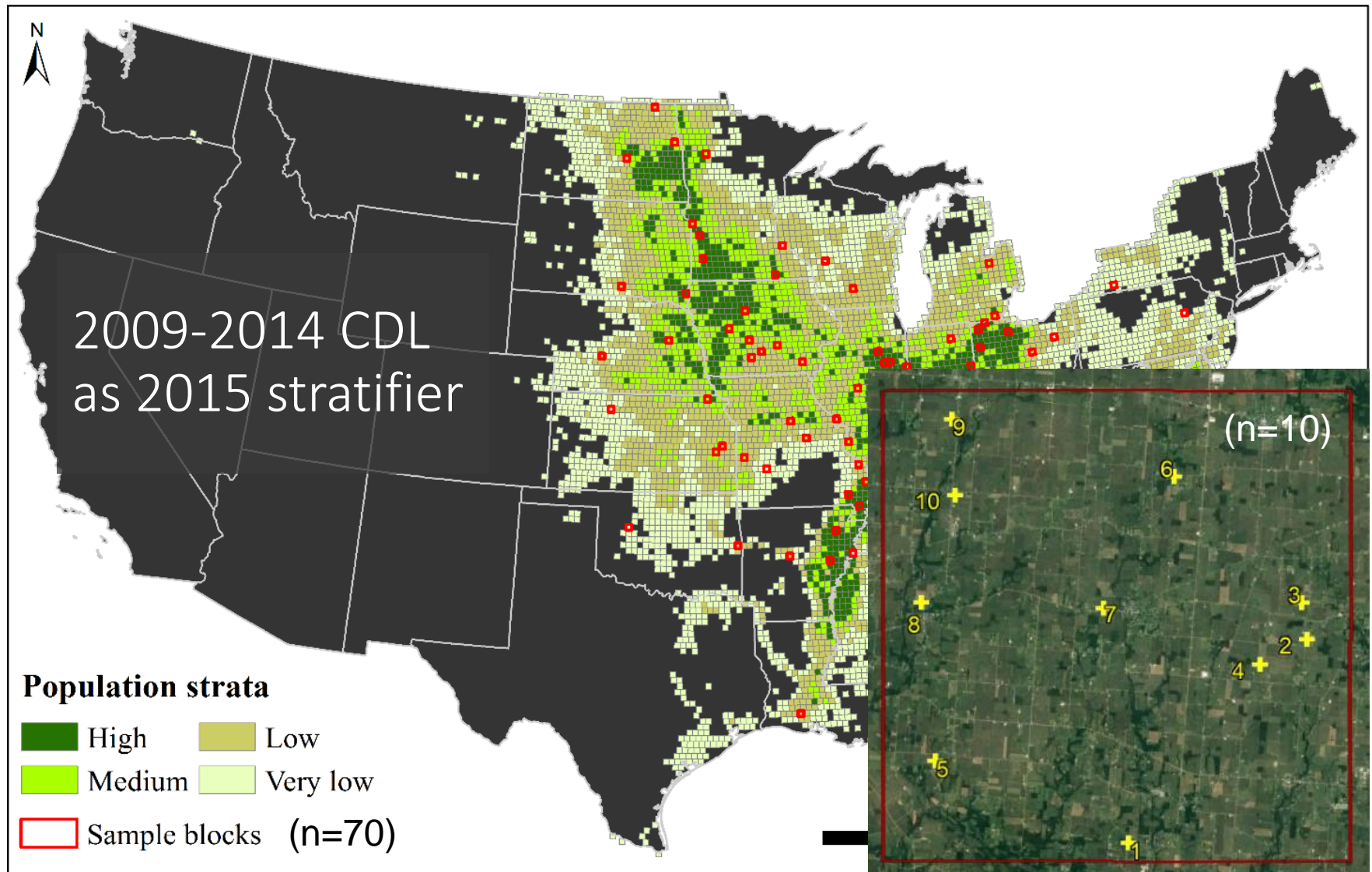
Unbiased area estimation  
from sample

Sample-based area as  
constraint for final map

# 2015 soybean stratification and sample



# 2015 soybean stratification and sample



# Field data collection and area estimation

Soybean area estimate from field sample:  
**341,000** km<sup>2</sup>, derived in **early September, 2 months** ahead of harvest.



USDA NASS 2015 June survey:  
**344,000** km<sup>2</sup>



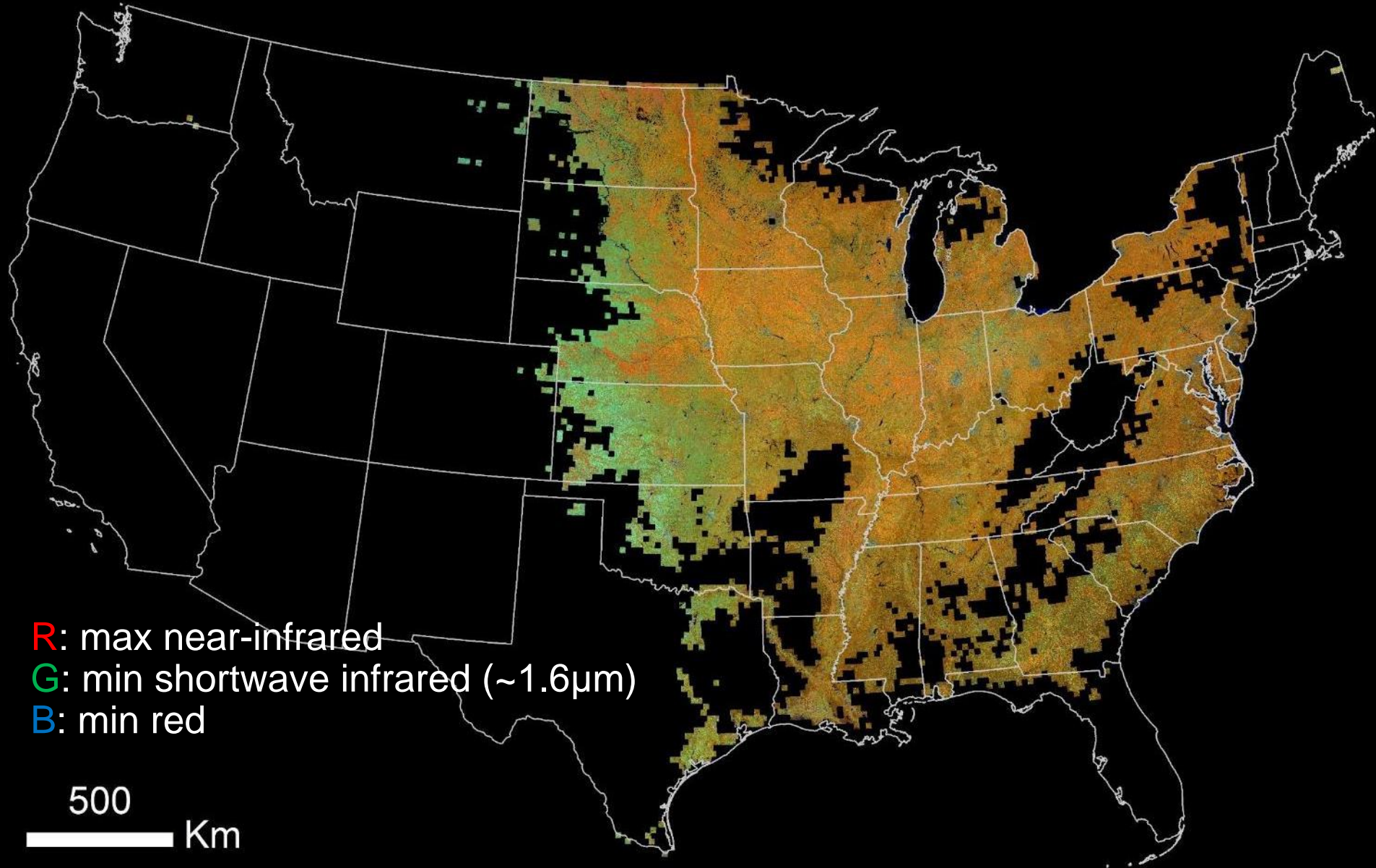
USDA NASS 2016 January estimate:  
**334,000** km<sup>2</sup>

**1.0 %** lower than 2015 June survey but  
**1.9 %** higher than 2016 January estimate.

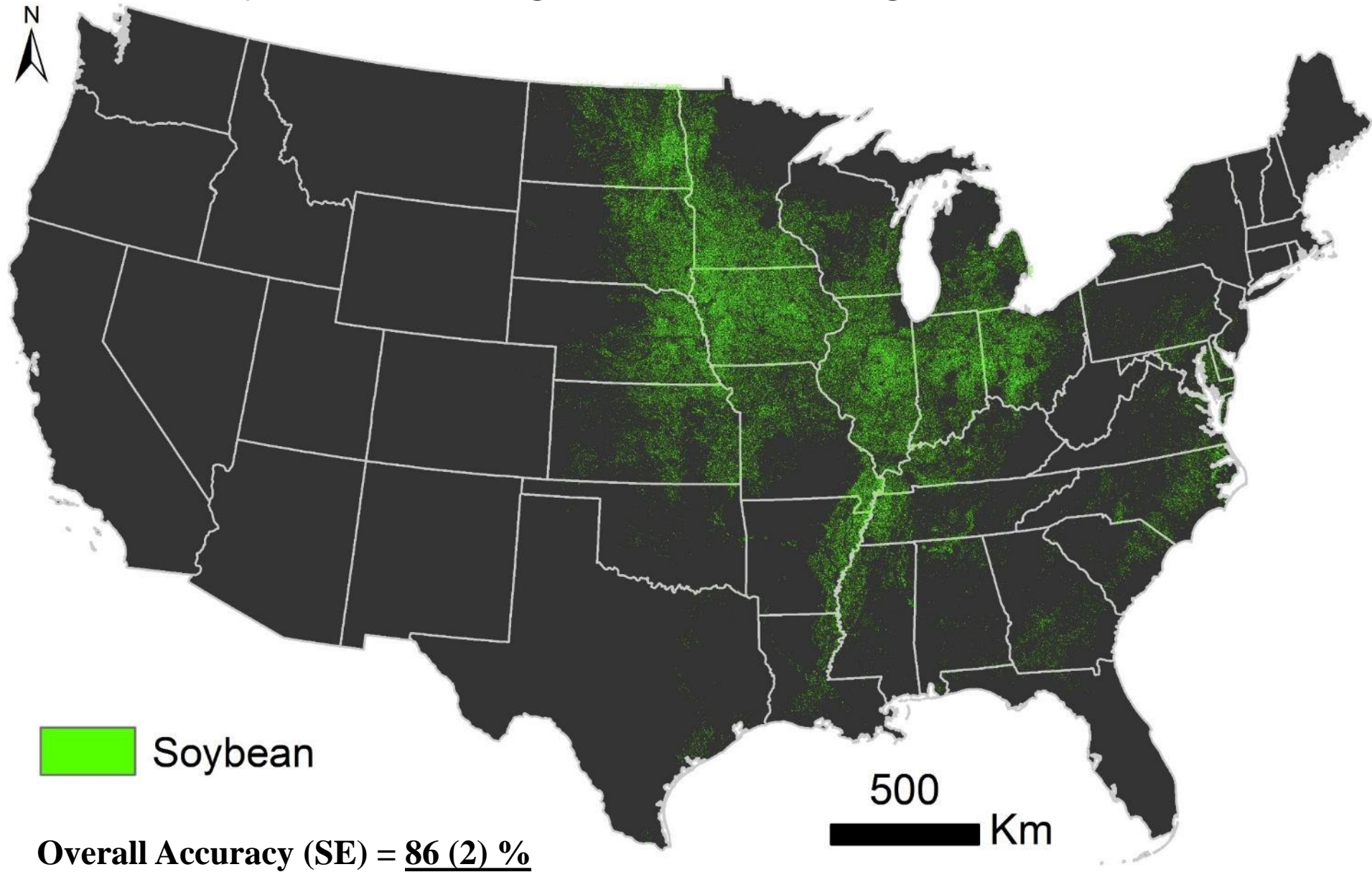


Song et al. (2017) *Remote Sens. Environ.*

# Cloud-free Landsat image composites

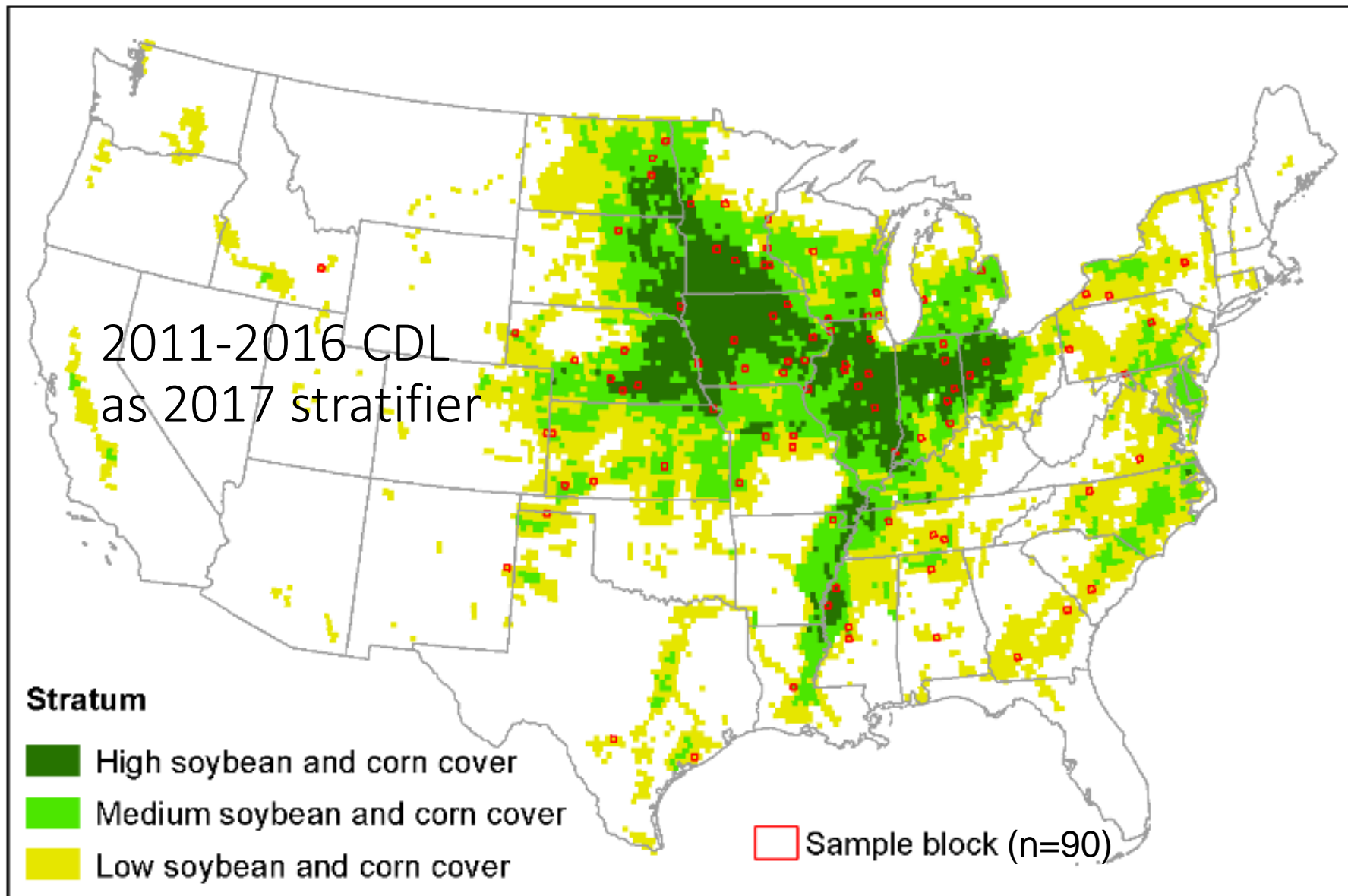


# Soybean map generated using decision tree



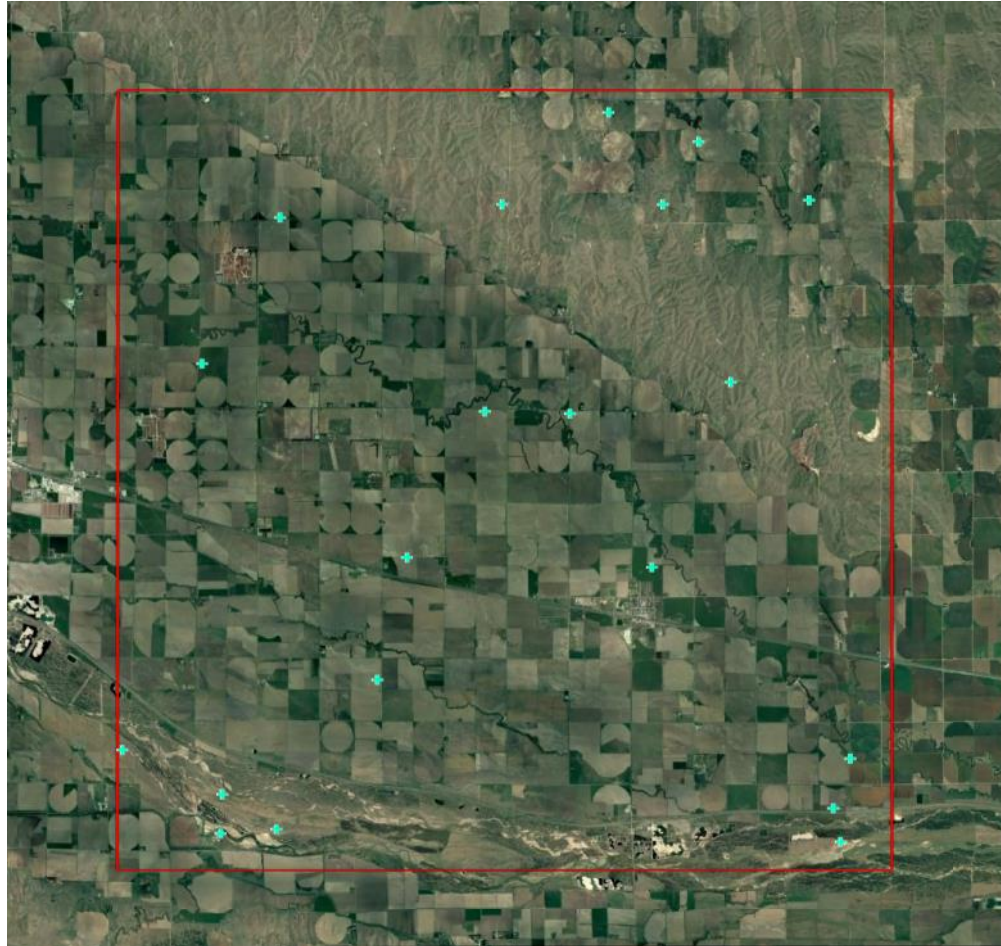
**Overall Accuracy (SE) = 86 (2) %**

# 2017 soybean and corn stratification and sample



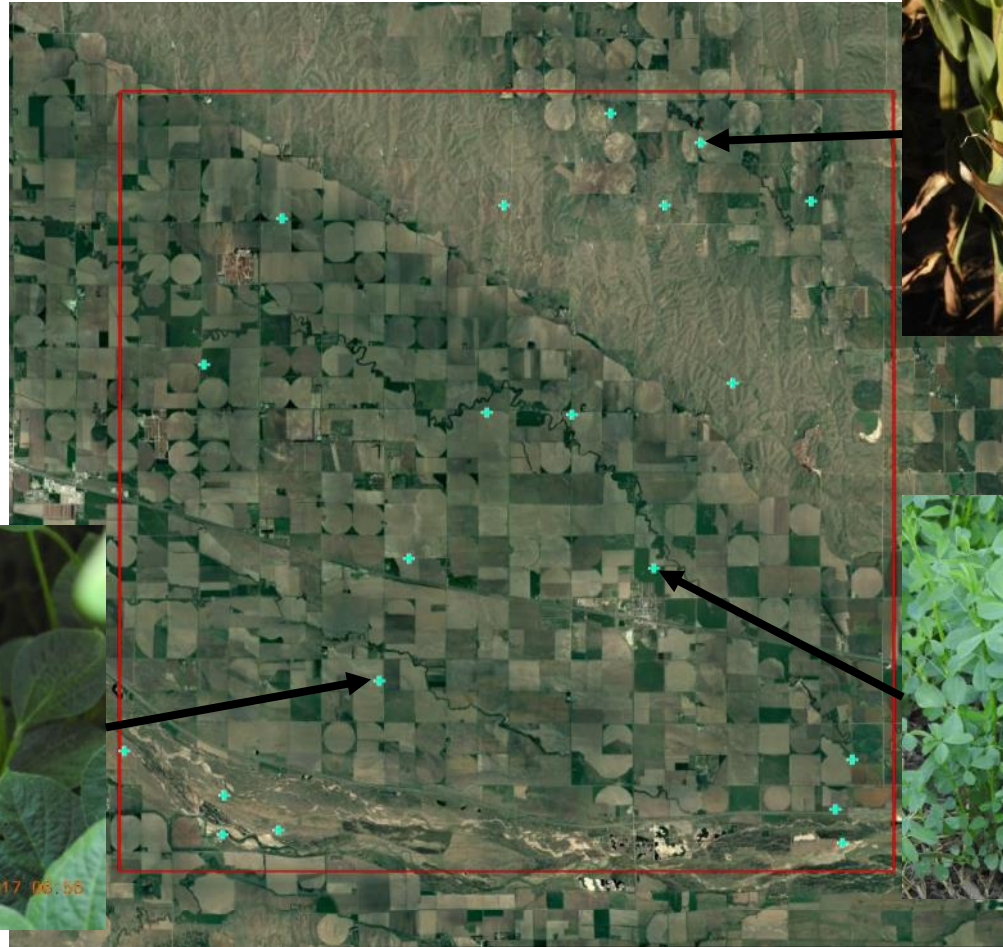


High stratum  
block near  
Lexington, NE



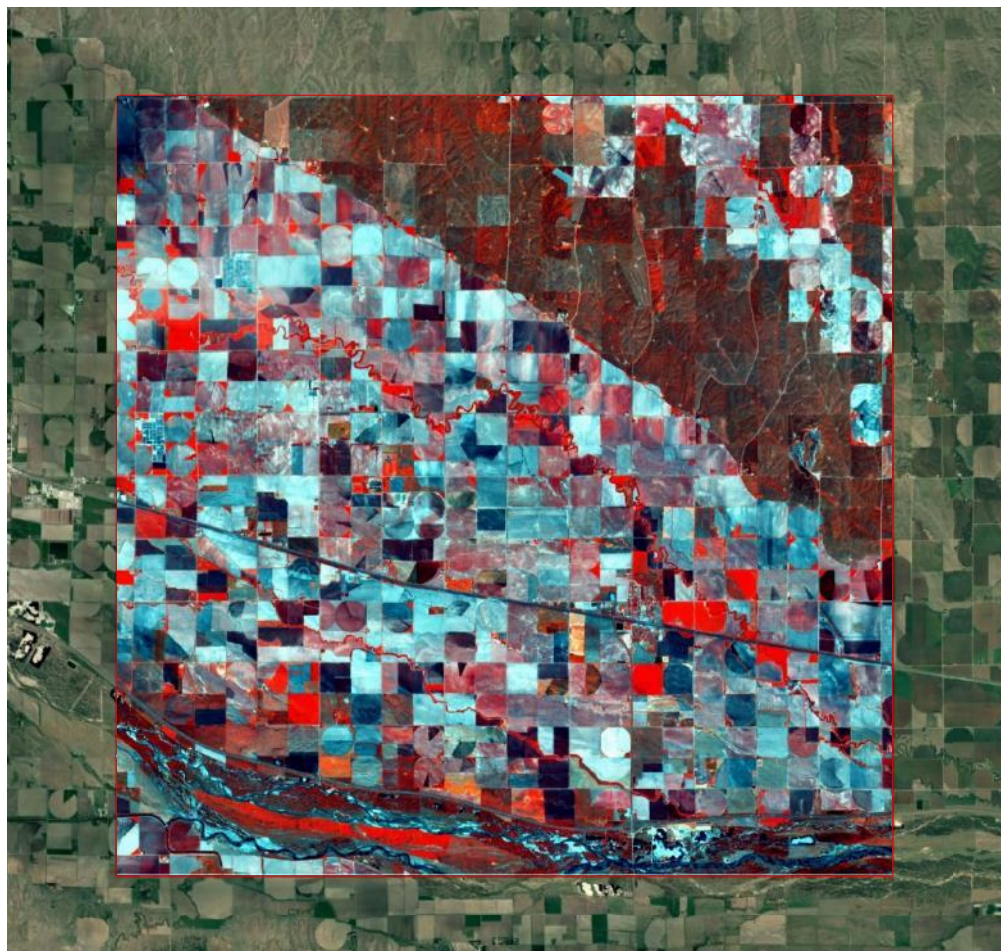
+ Field sample  
(n=20)

# High stratum block near Lexington, NE



# High stratum block near Lexington, NE

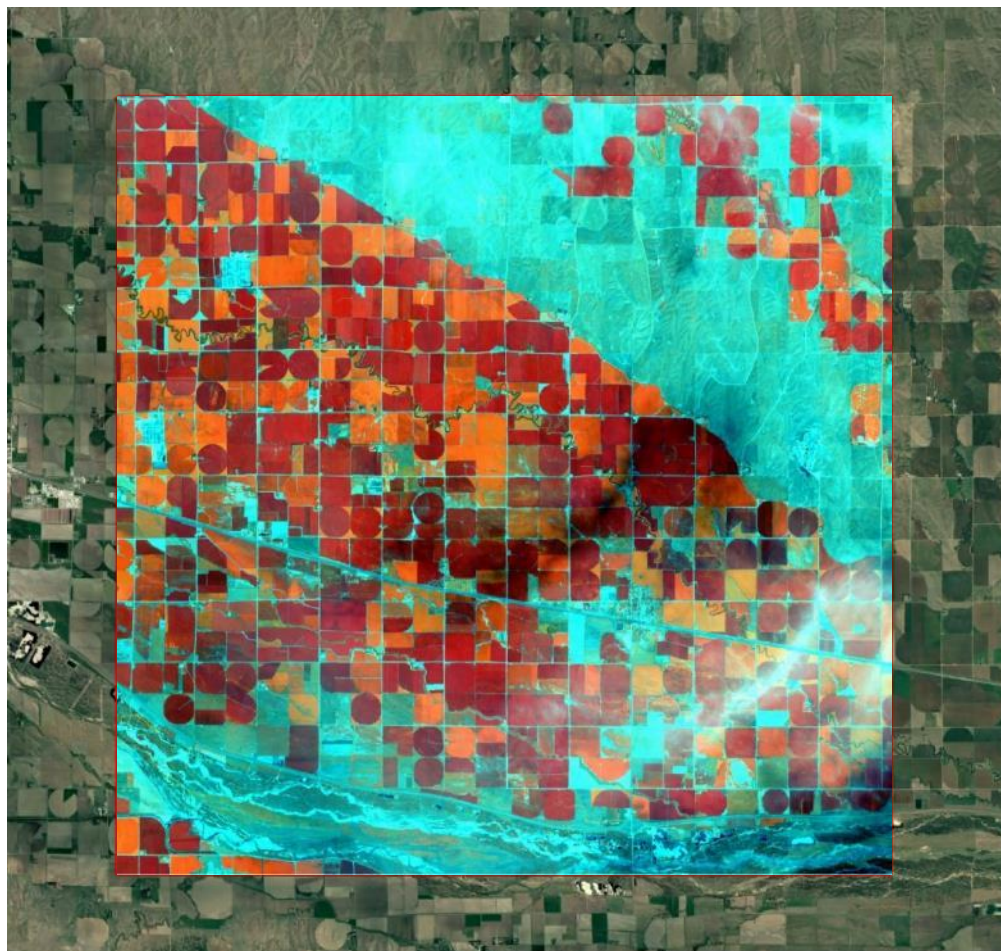
6-15-2017  
Sentinel 2A



R-g-b of nir-swir-swir

# High stratum block near Lexington, NE

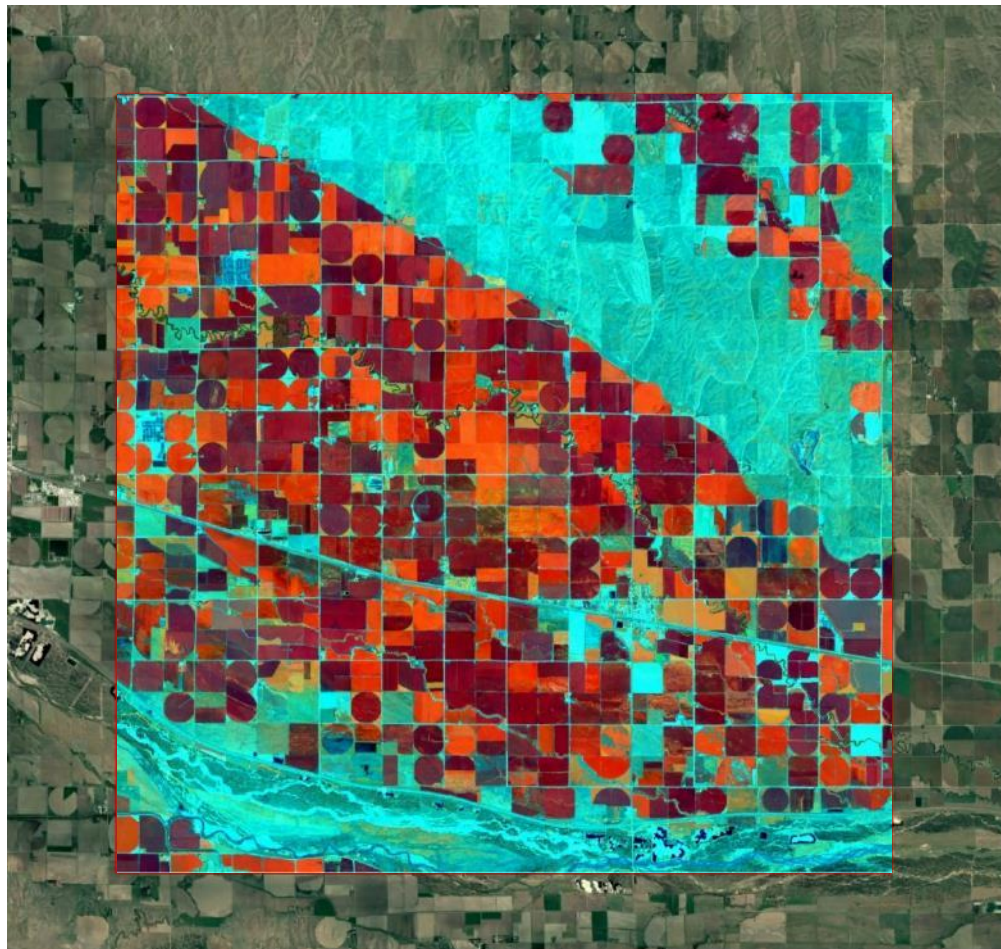
7-25-2017  
Sentinel 2A



R-g-b of nir-swir-swir

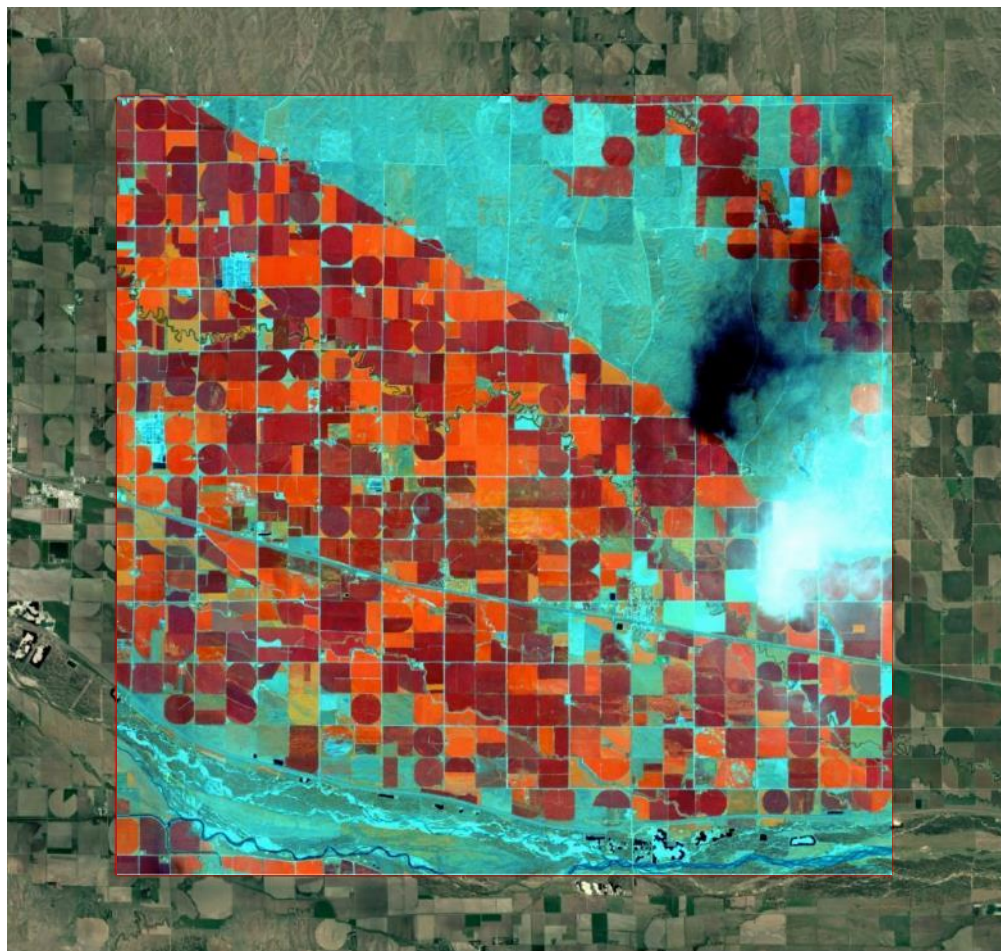
# High stratum block near Lexington, NE

8-14-2017  
Sentinel 2A



R-g-b of nir-swir-swir

High stratum  
block near  
Lexington, NE

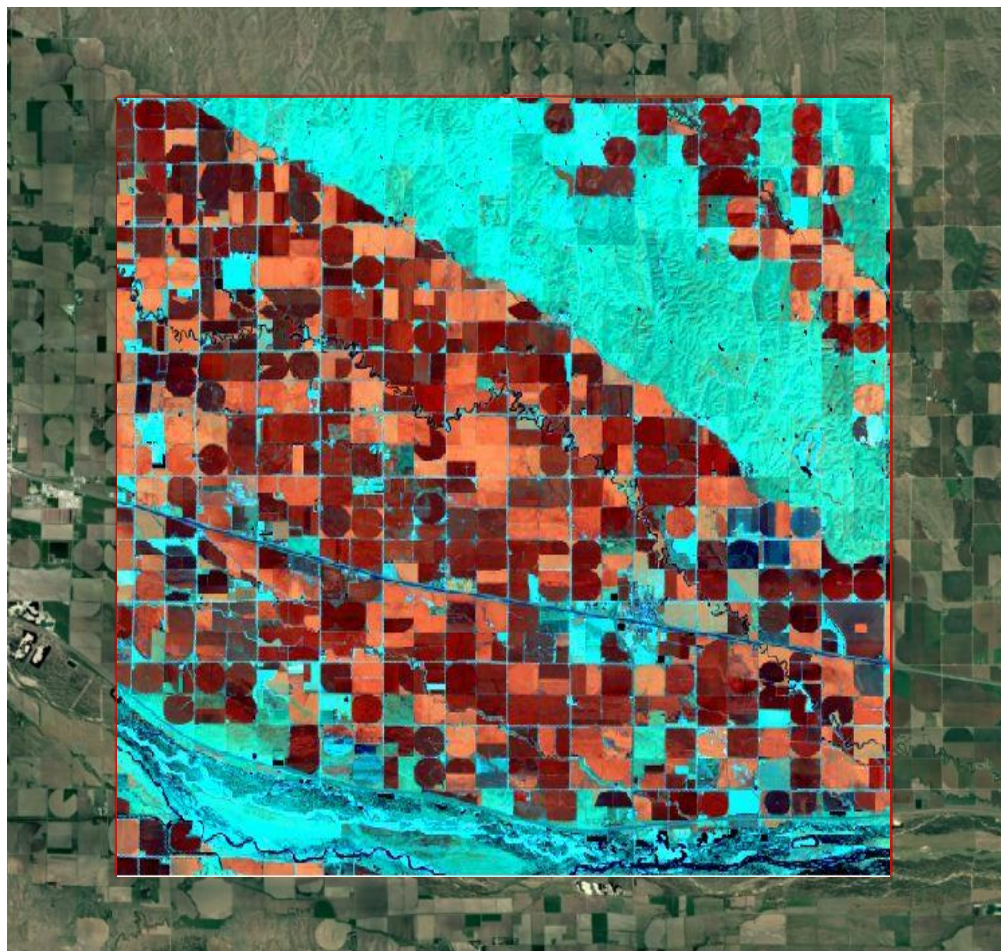


8-21-2017  
Sentinel 2A

R-g-b of nir-swir-swir

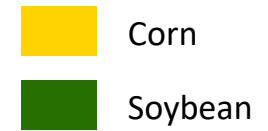
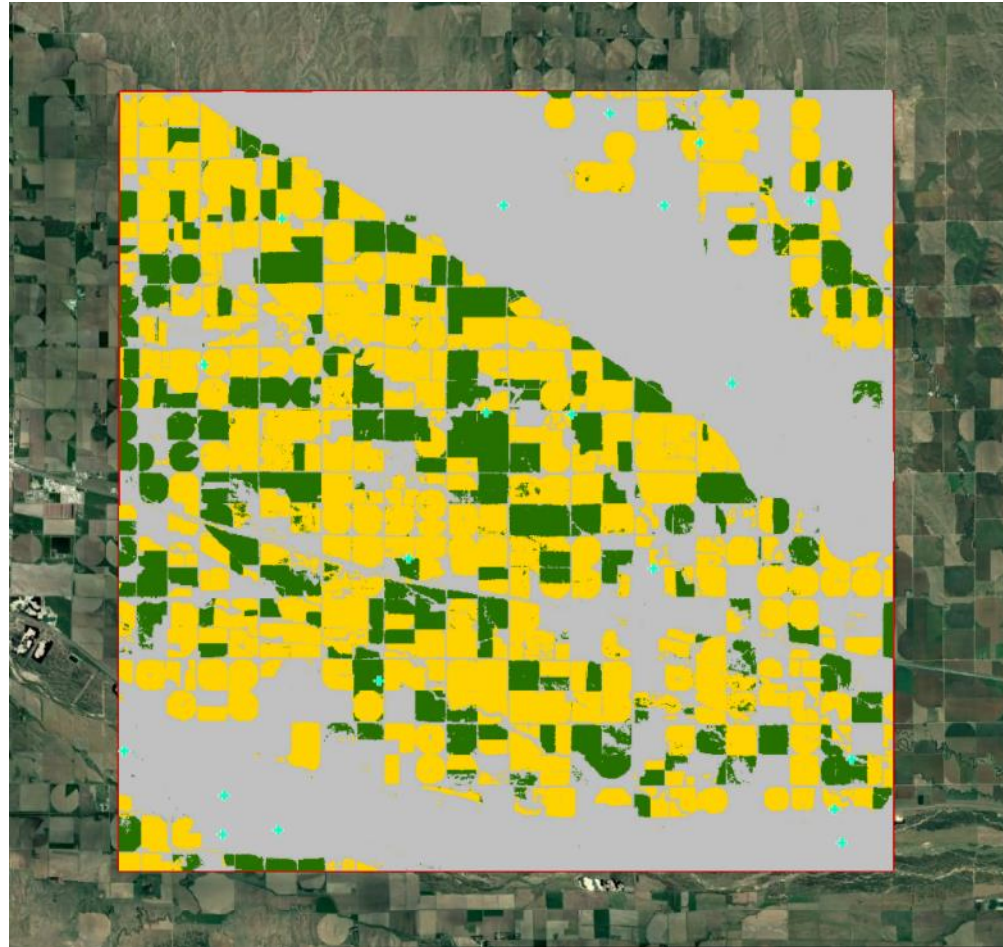
# High stratum block near Lexington, NE

8-31-2017  
Landsat 8



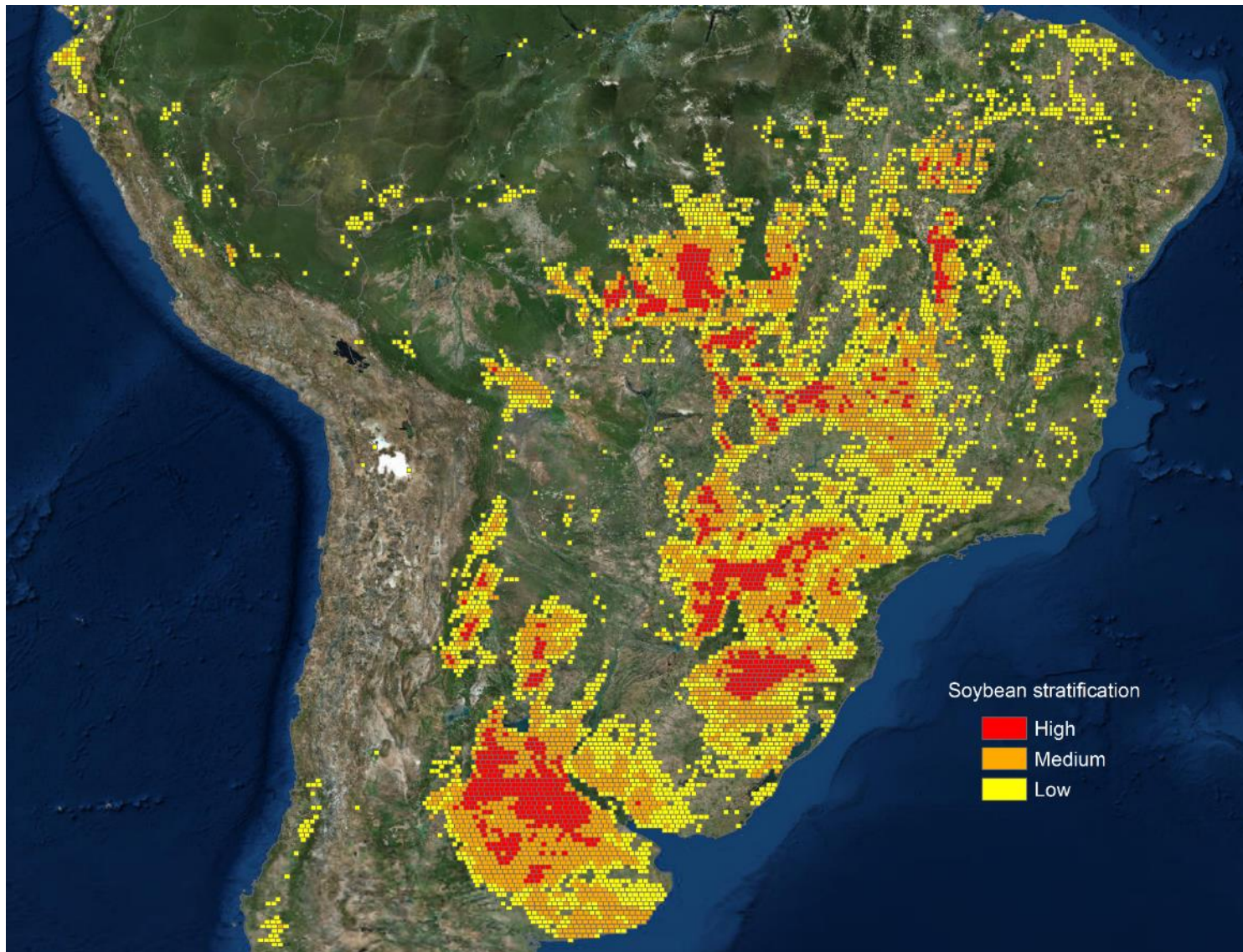
R-g-b of nir-swir-swir

High stratum  
block near  
Lexington, NE

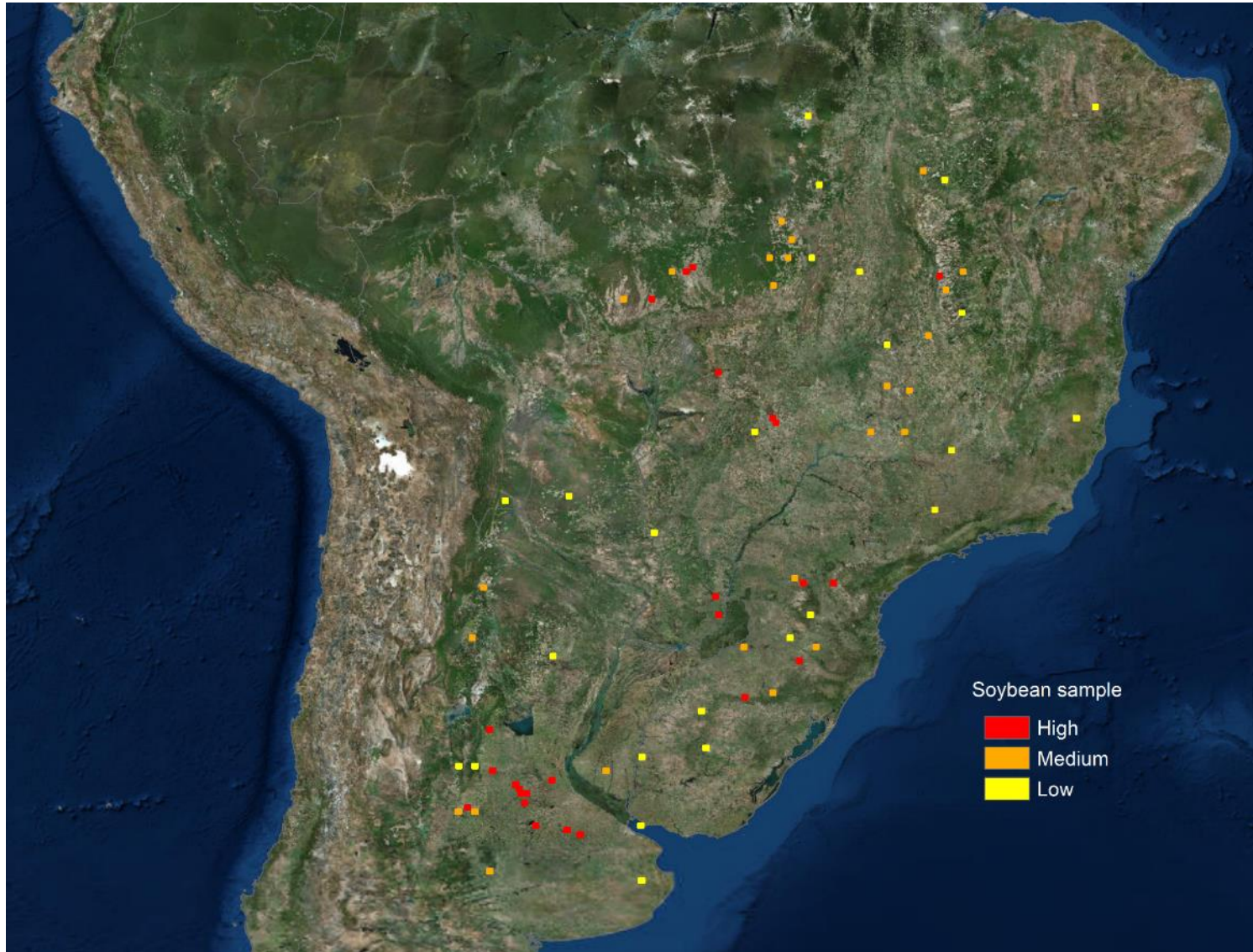




# Soybean stratification (20-km by 20-km blocks)

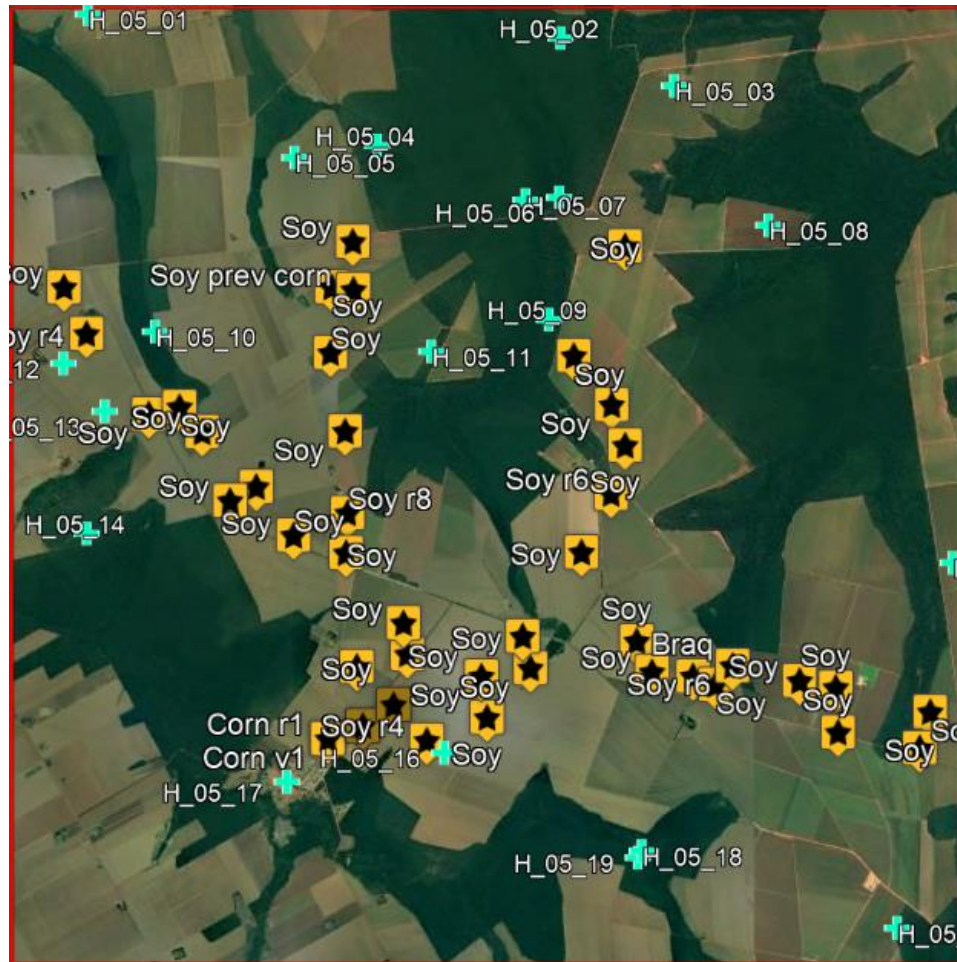


# Soybean sample blocks (n = 25 x 3)



# Classify sample blocks using field data as training

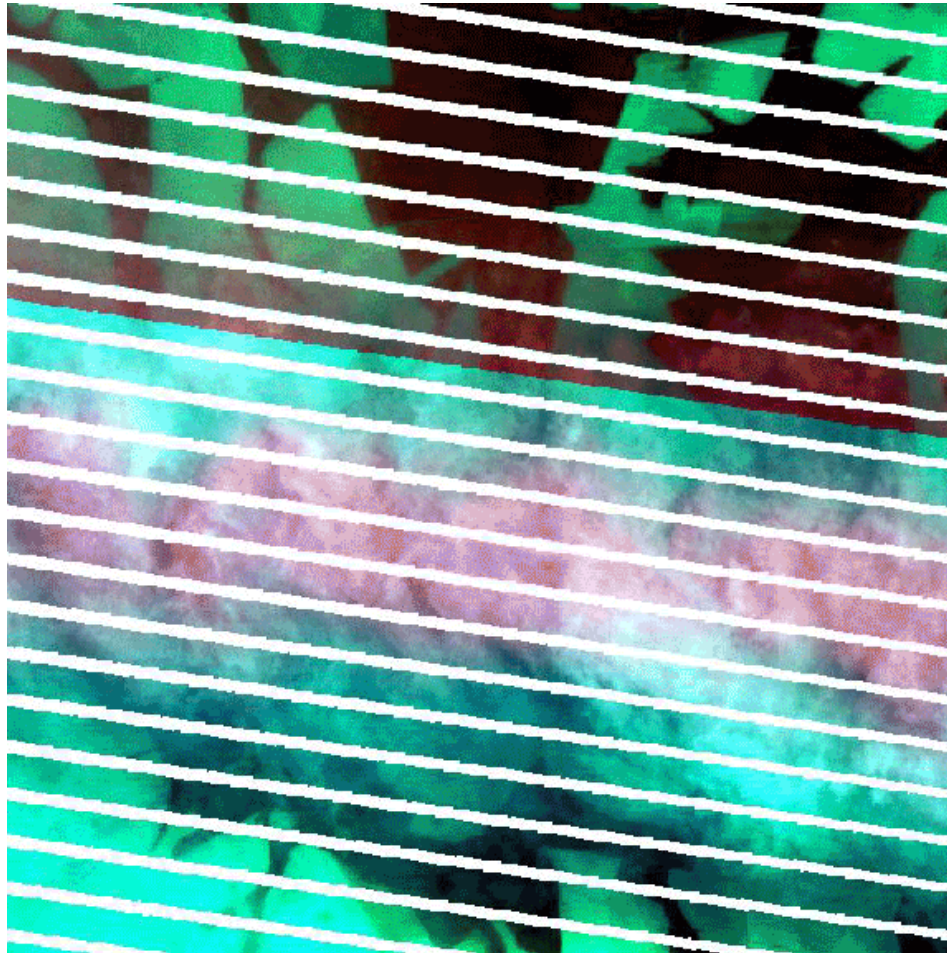
High stratum  
block in central  
Mato Grosso



 Training data

# Classify sample blocks using field data as training

High stratum  
block in central  
Mato Grosso



All Landsat and Sentinel 2 images in growing season

# Classify sample blocks using field data as training

High stratum  
block in central  
Mato Grosso



■ Soybean ■ Non-soybean + Validation data

# Summary

- Mapping global crop type is a challenge due to a variety of cropping systems, field sizes and management practices.
- Field validation is critical. Satellite-based maps can be used as an efficient indicator for allocating field sample. Two-stage cluster sampling is efficient for minimizing costs.
- Developed method can derive unbiased area estimate within growing season and map crop type at national-to-continental scales with high accuracy.



Thank you!

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