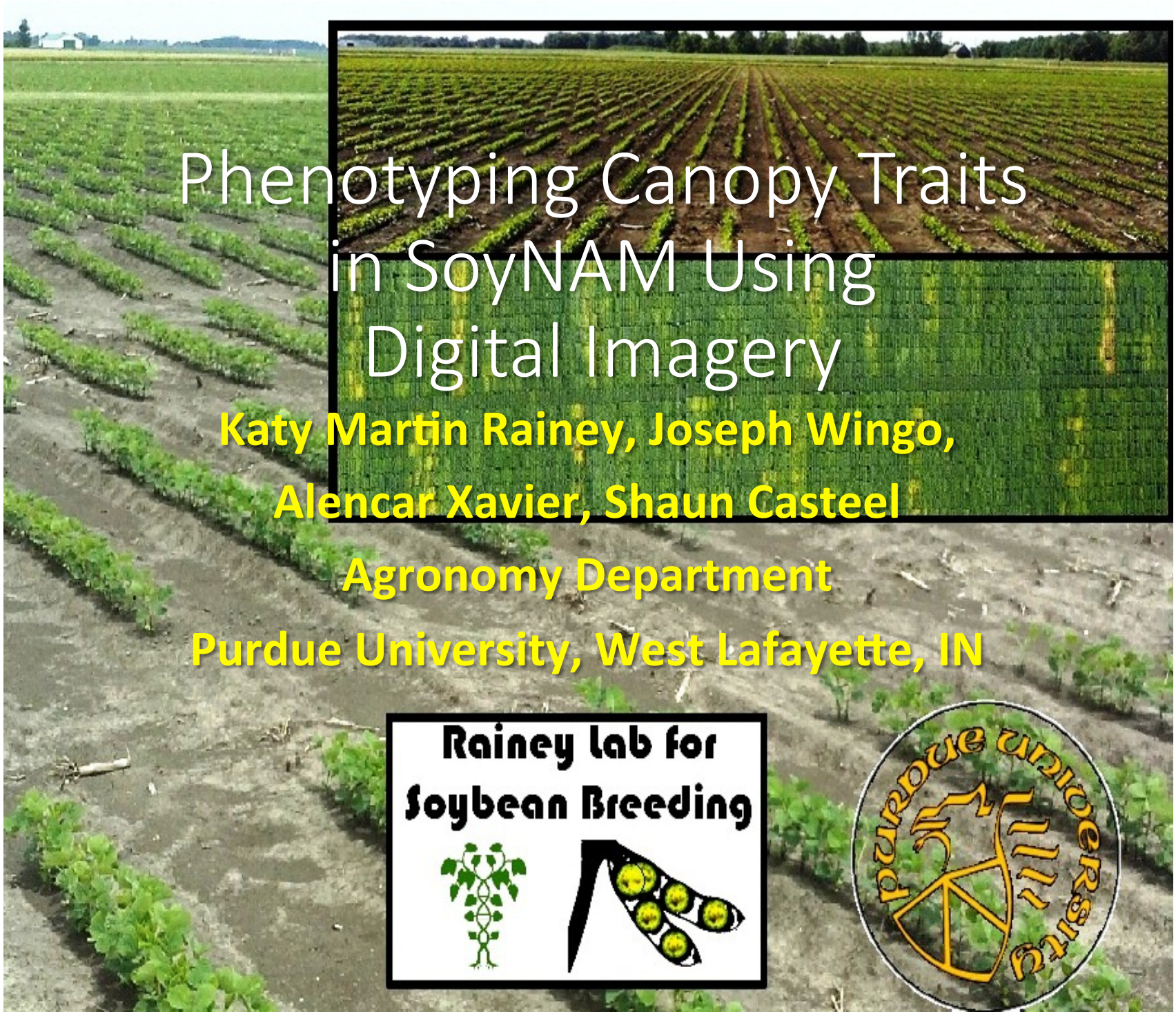

Phenotyping Canopy Traits in SoyNAM Using Digital Imagery

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Agronomy Department

Purdue University, West Lafayette, IN

Rainey lab for Soybean Breeding

Purdue University

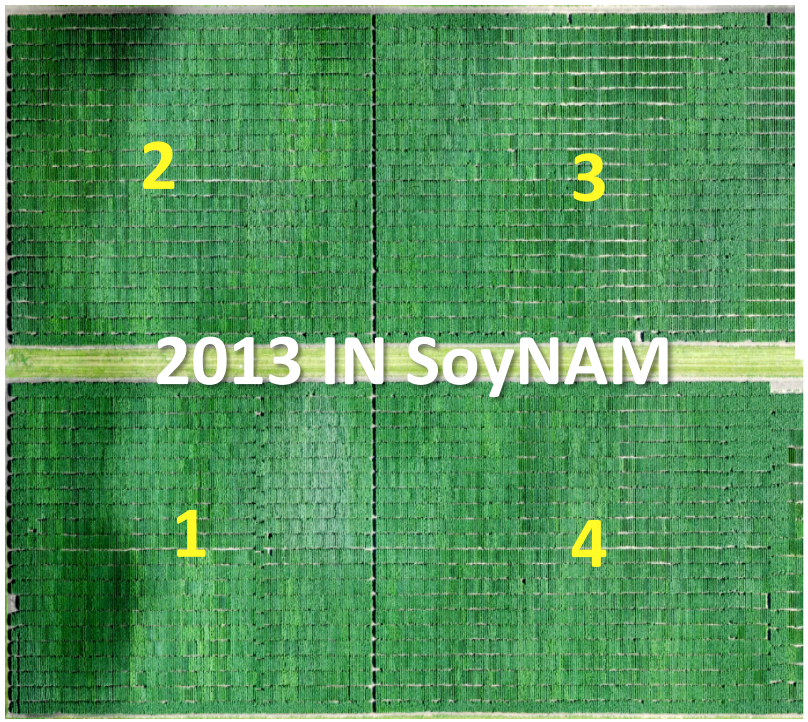
Why Phenotype Canopy Development?

- Associated with yield
  - Maximization of light interception
  - Use of solar radiation
- Weed control
- Sustainability
- Aesthetics

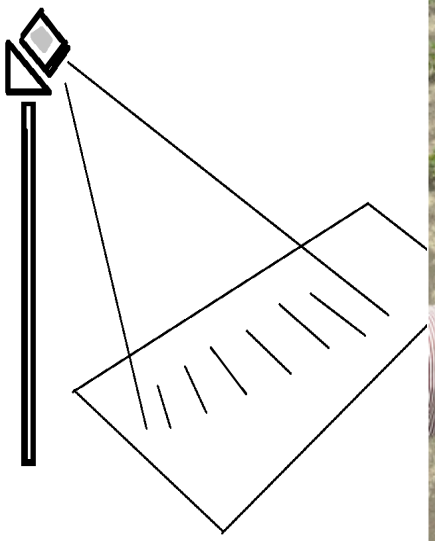
Tracking vegetative development

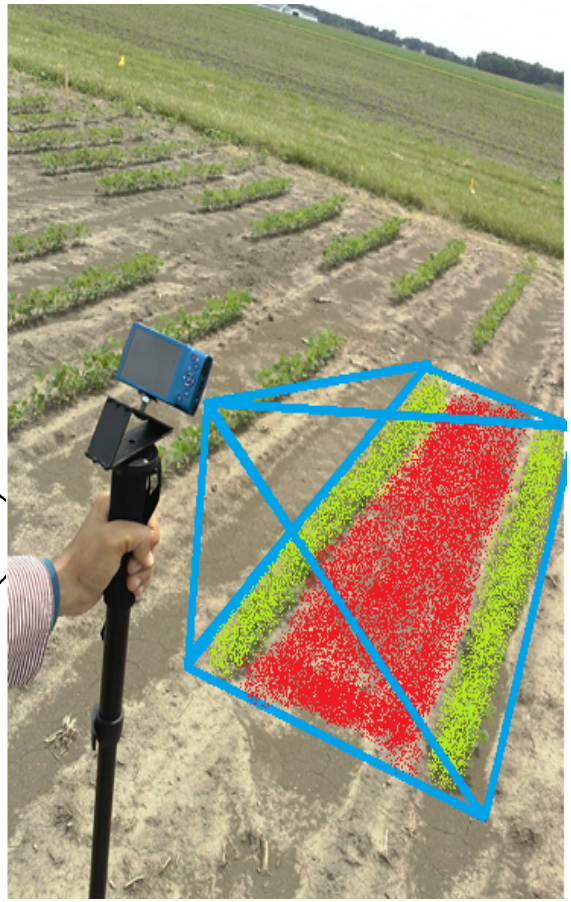
Data Collection: **Assaying Canopy Coverage**

6400 plots
7 dates
44,000 images



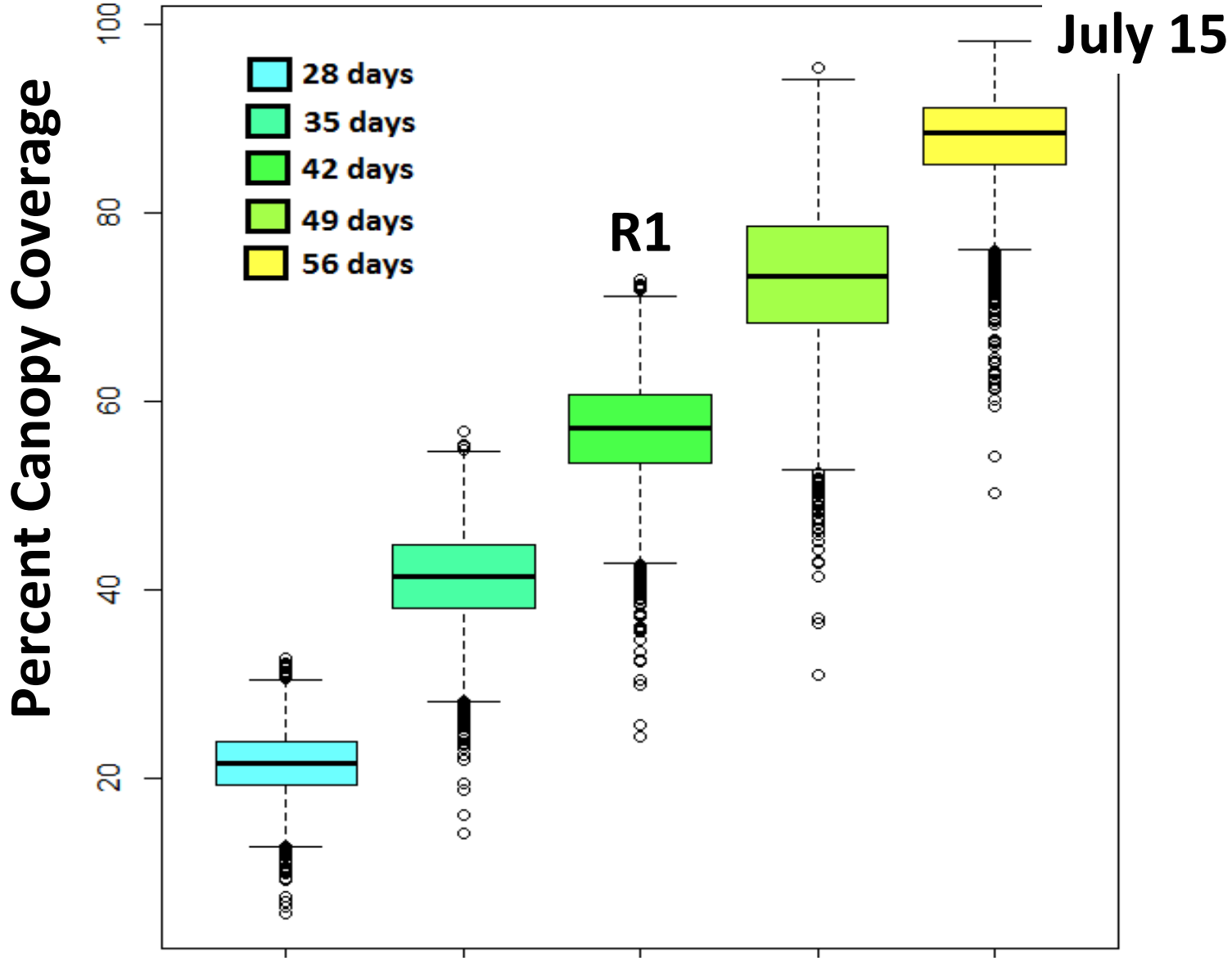
Larry Purcell. Soybean canopy coverage and light interception measurements using digital imagery. Crop Sci. 2000. 40:834–837.





SigmaSCAN®
Automated Image Analysis

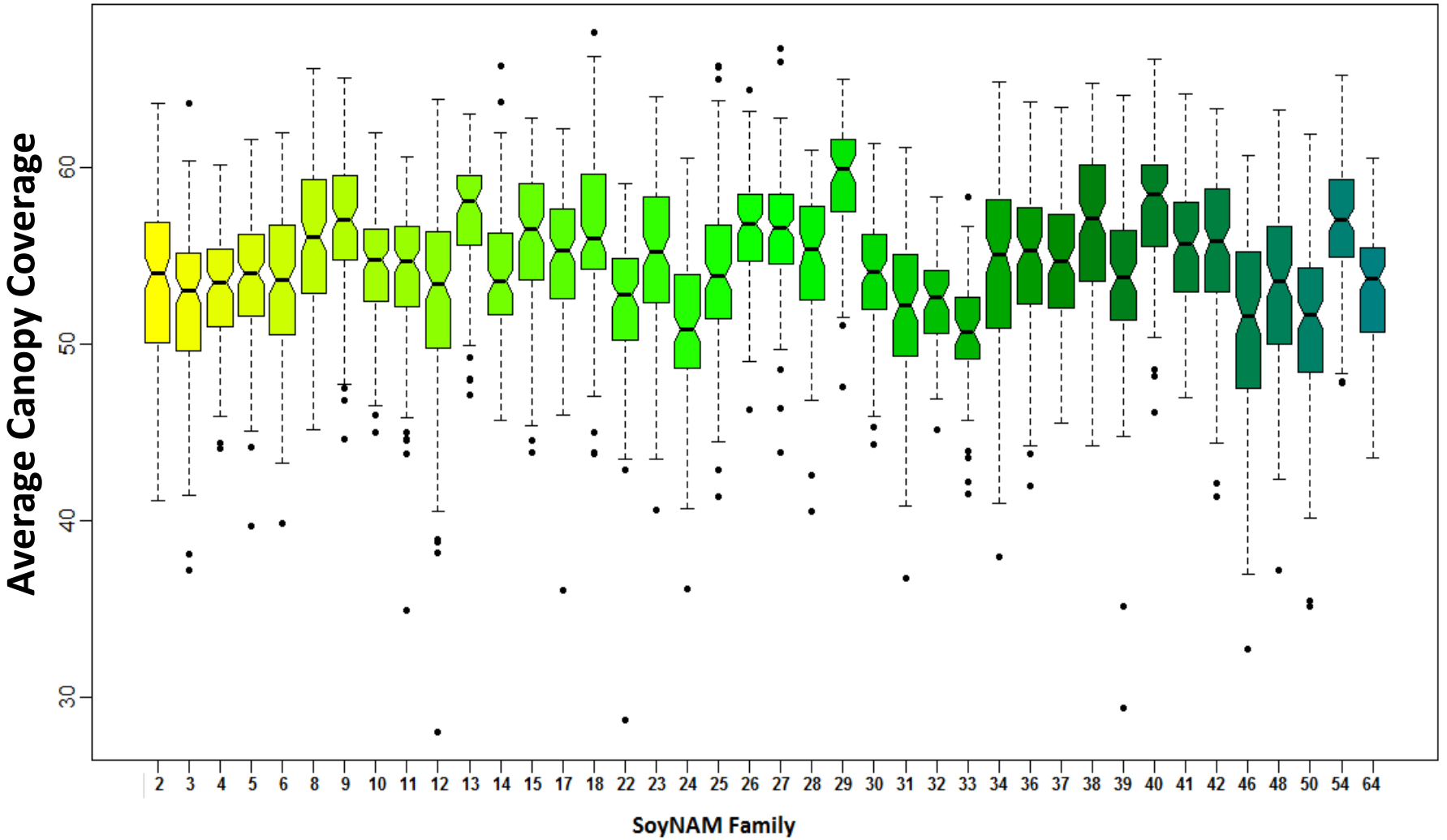
Analyzing Canopy Development

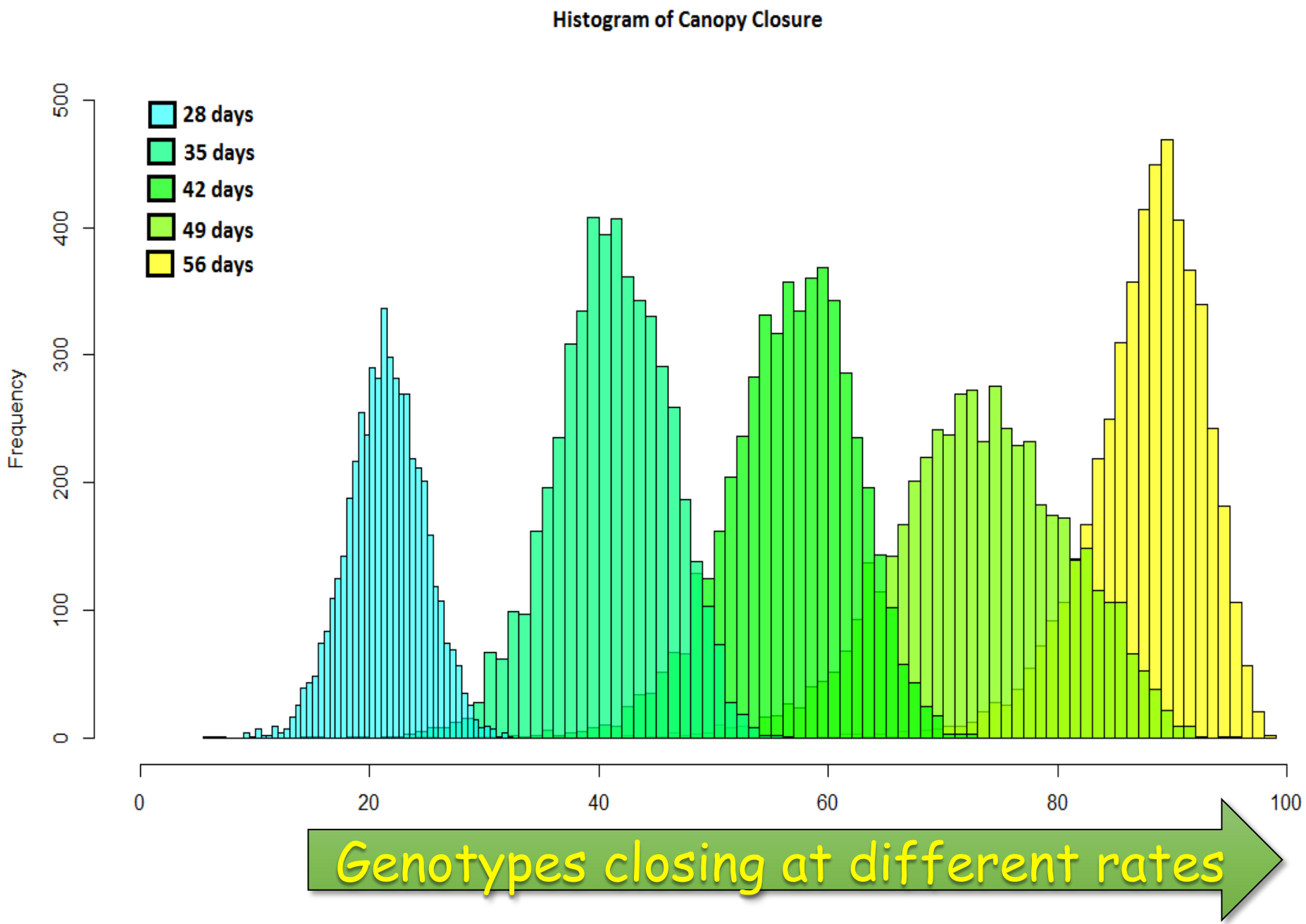


Analyzing Canopy Development: What is the Phenotype?

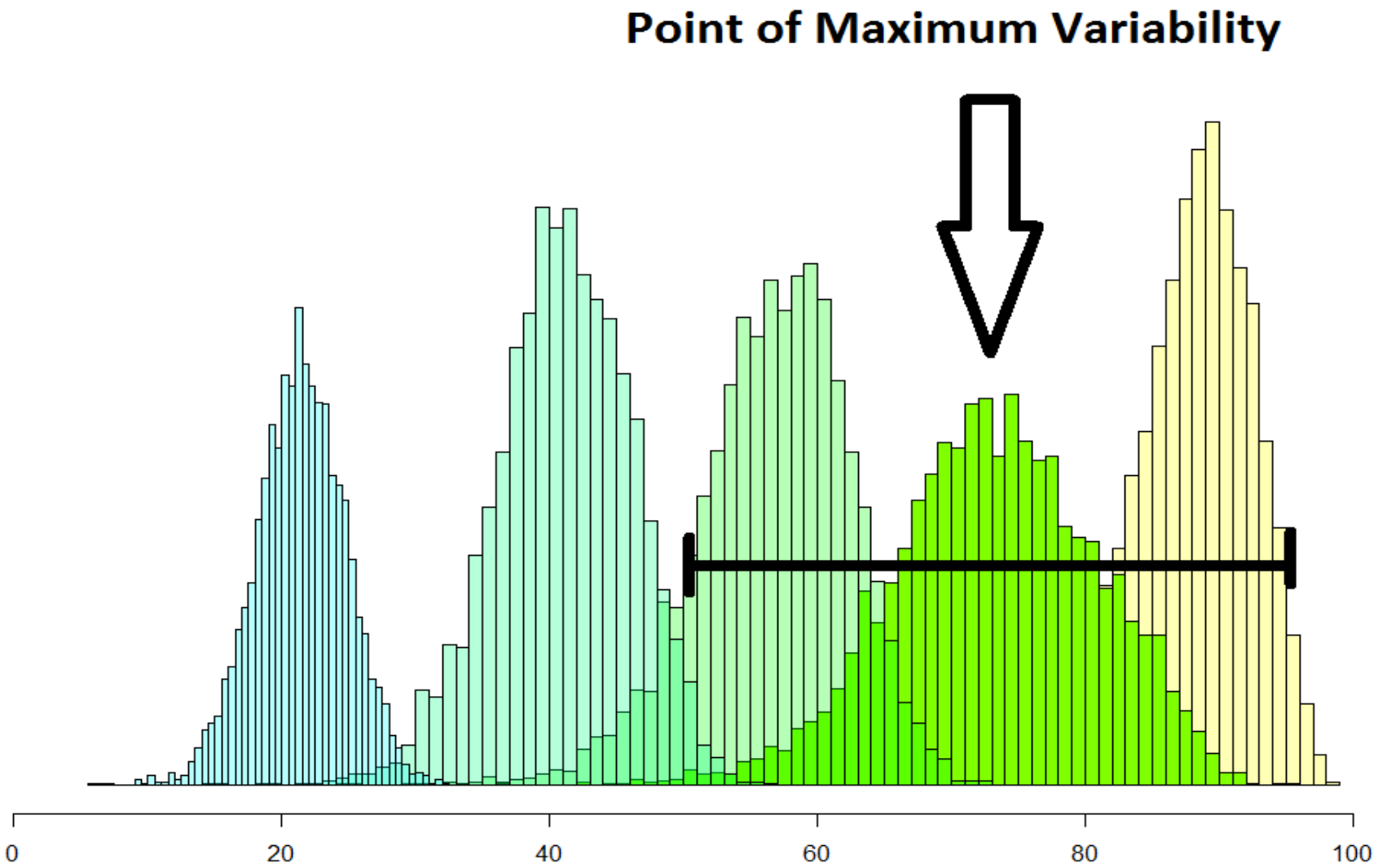
- Canopy Coverage= percent canopy on a date
- Average Closure= closure across days
  - 'Day' as random effect (autoregressive structure)
- Slope of growth= how fast canopy closes
  - Regressing closure by time

Average Closure
Variability Across Families

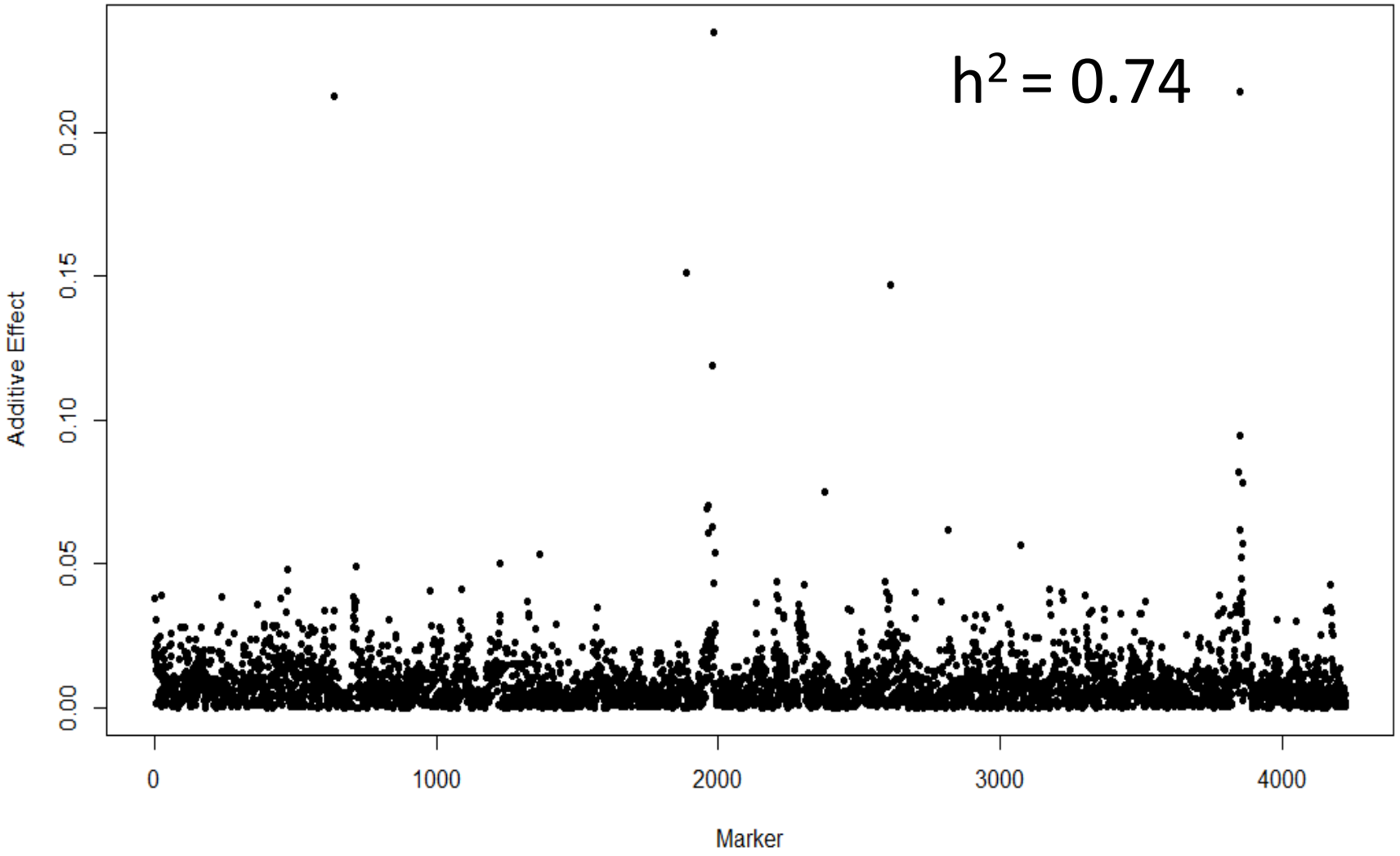



Histogram of Canopy Closure
28 days
35 days
42 days
49 days
56 days
Frequency
0
100
200
300
400
500
0
20
40
60
80
100
Genotypes closing at different rates

Can I measure canopy only once?



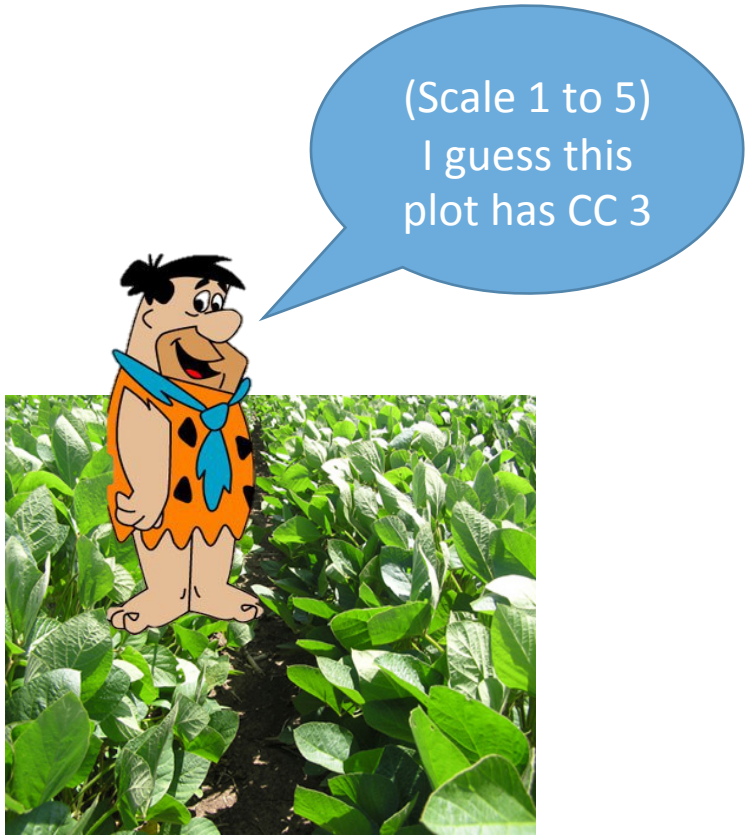
Genetic Control of Canopy Development
Average Closure



Genetic Control of Canopy Development **Slope/Rate**

Genetic Correlation

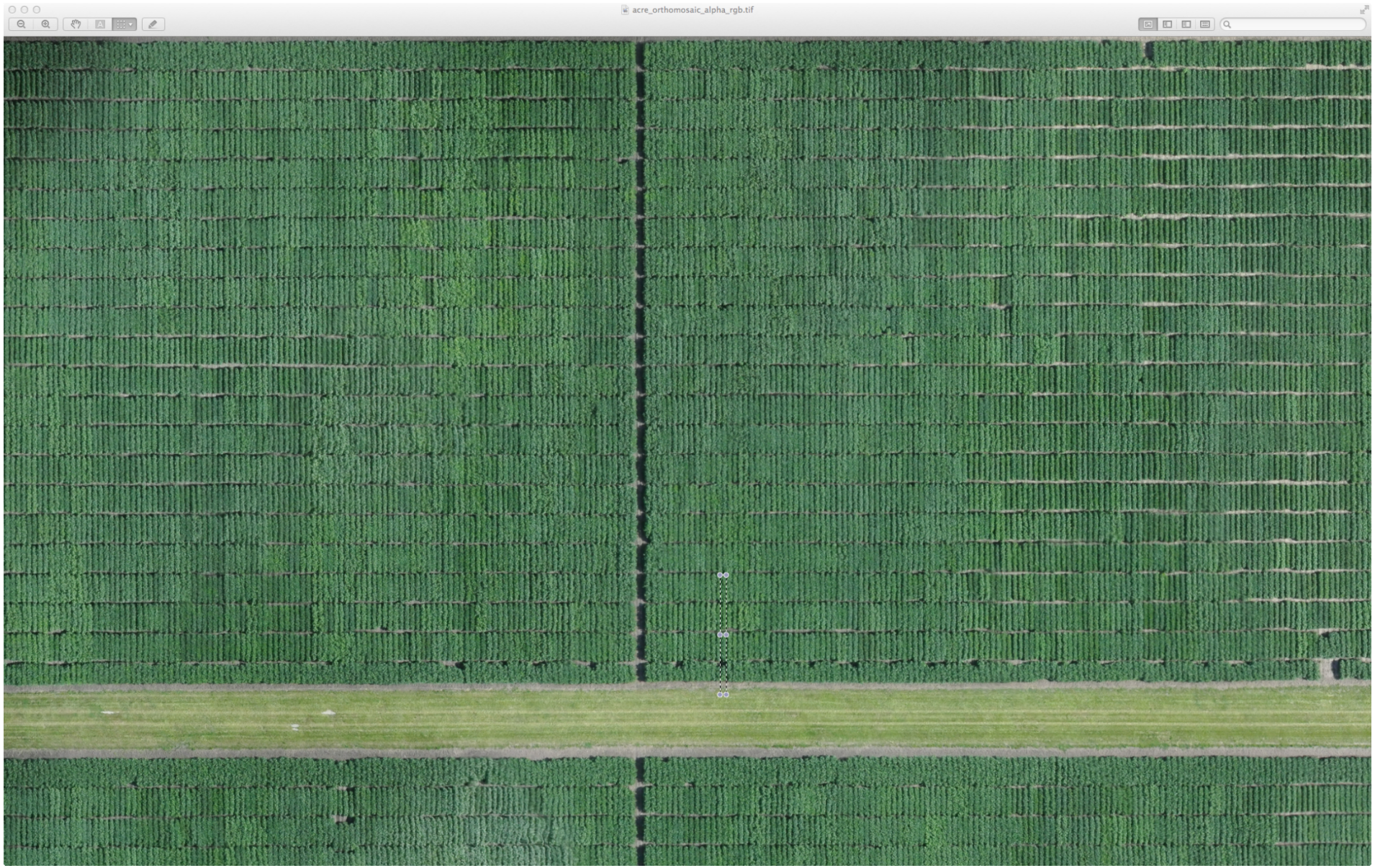
Canopy Development and Precision Phenotyping

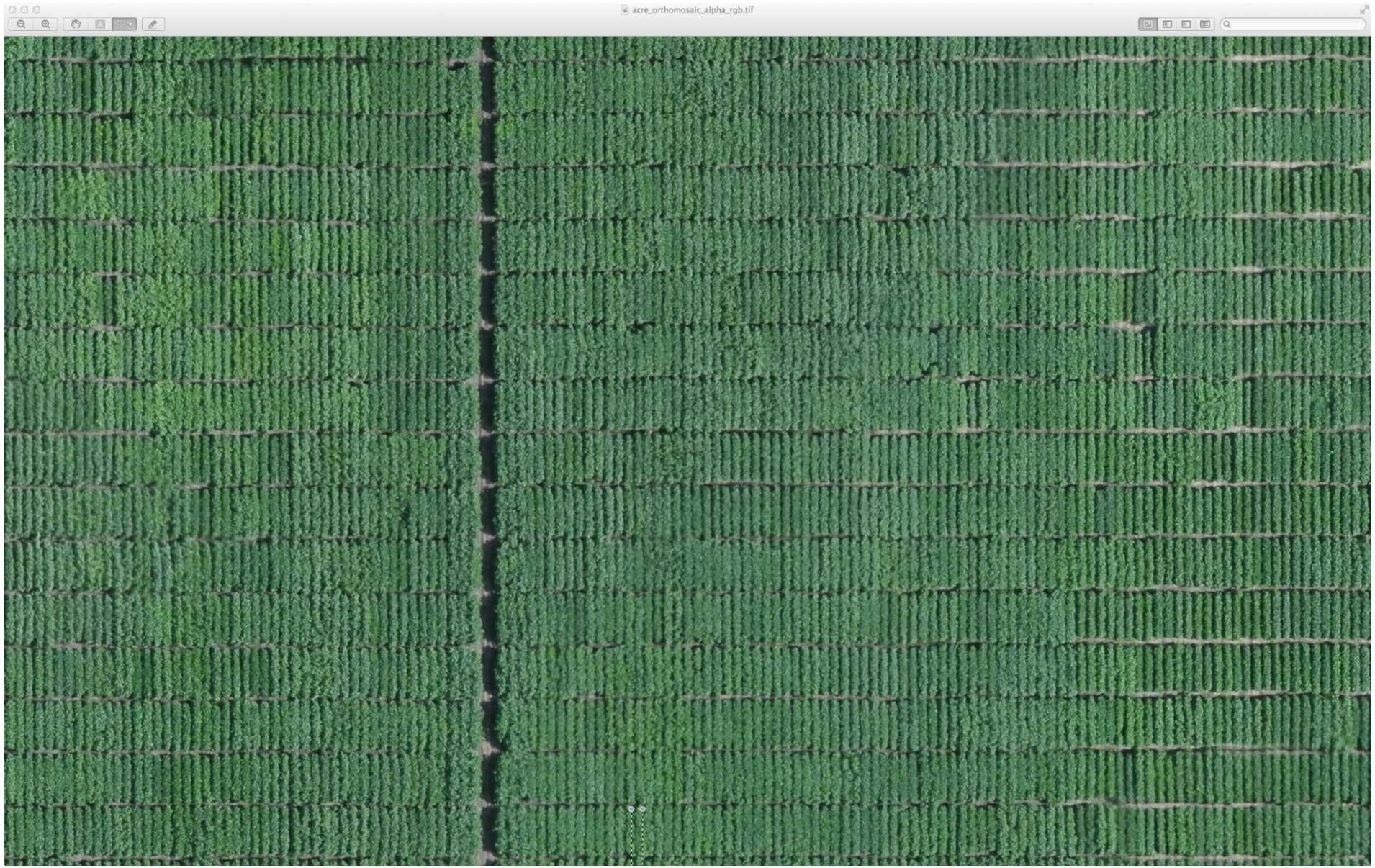


Canopy Development and Precision Phenotyping

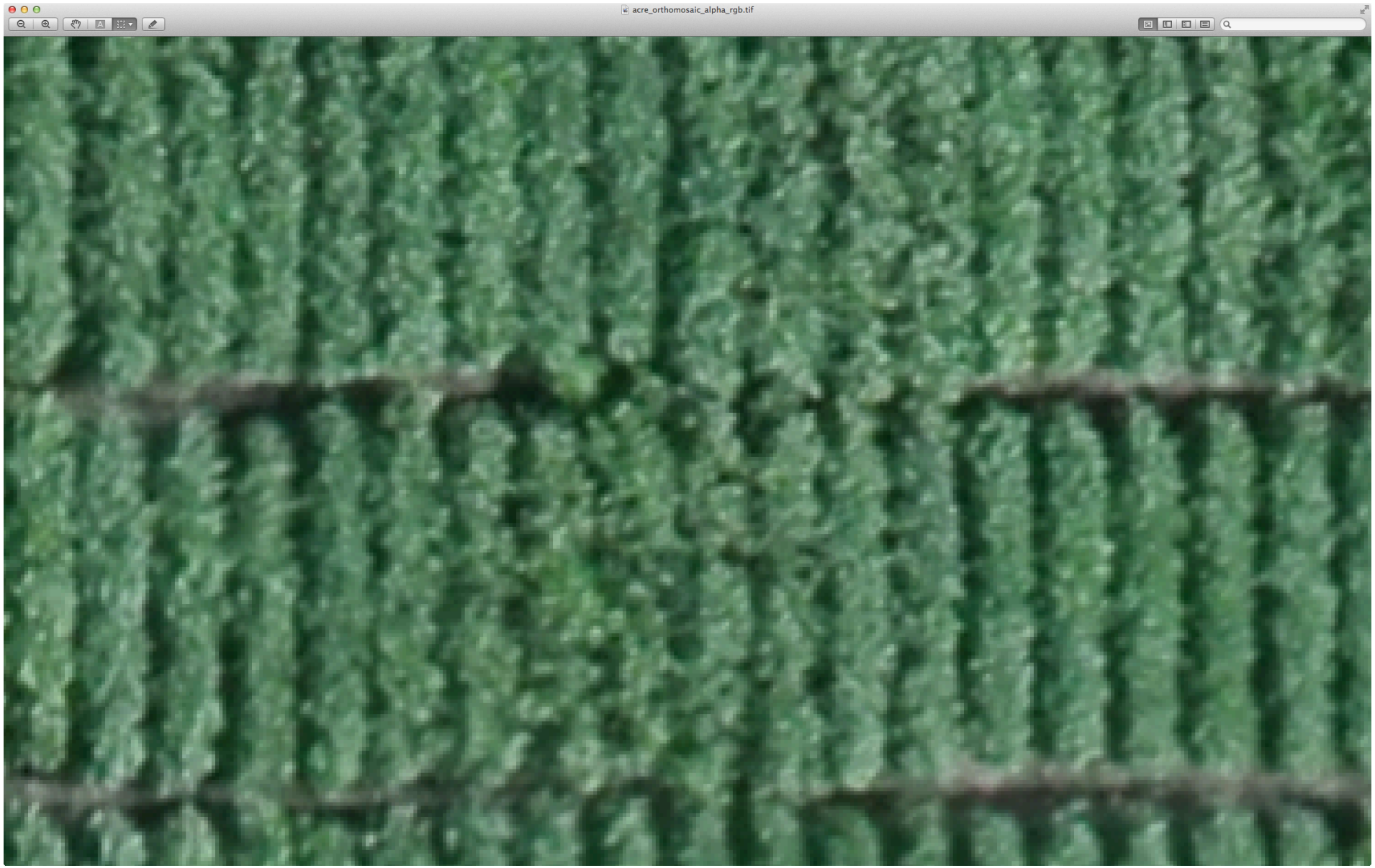

acre_orthomosaic_alpha_rgb.tif
SoyNAM is
6400 plots or
about 8 acres

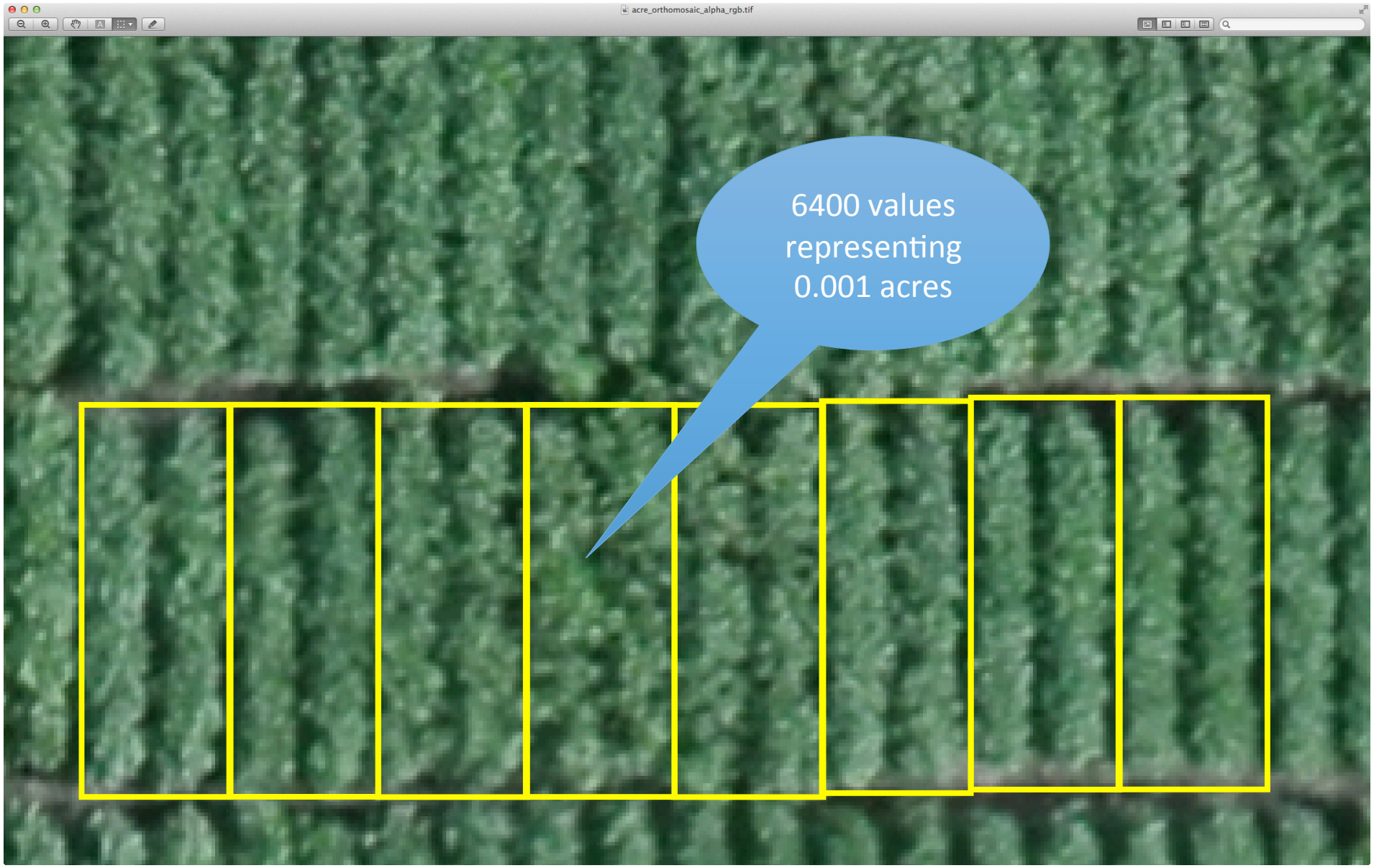

acre_orthomosaic_alpha_rgb.tif


acre_orthomosaic_alpha_rgb.tif


acre_orthomosaic_alpha_rgb.tif


acre_orthomosaic_alpha_rgb.tif


acre_orthomosaic_alpha_rgb.tif


acre_orthomosaic_alpha_rgb.tif
6400 values
representing
0.001 acres

SoyNAM Collaborators & Contributors

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