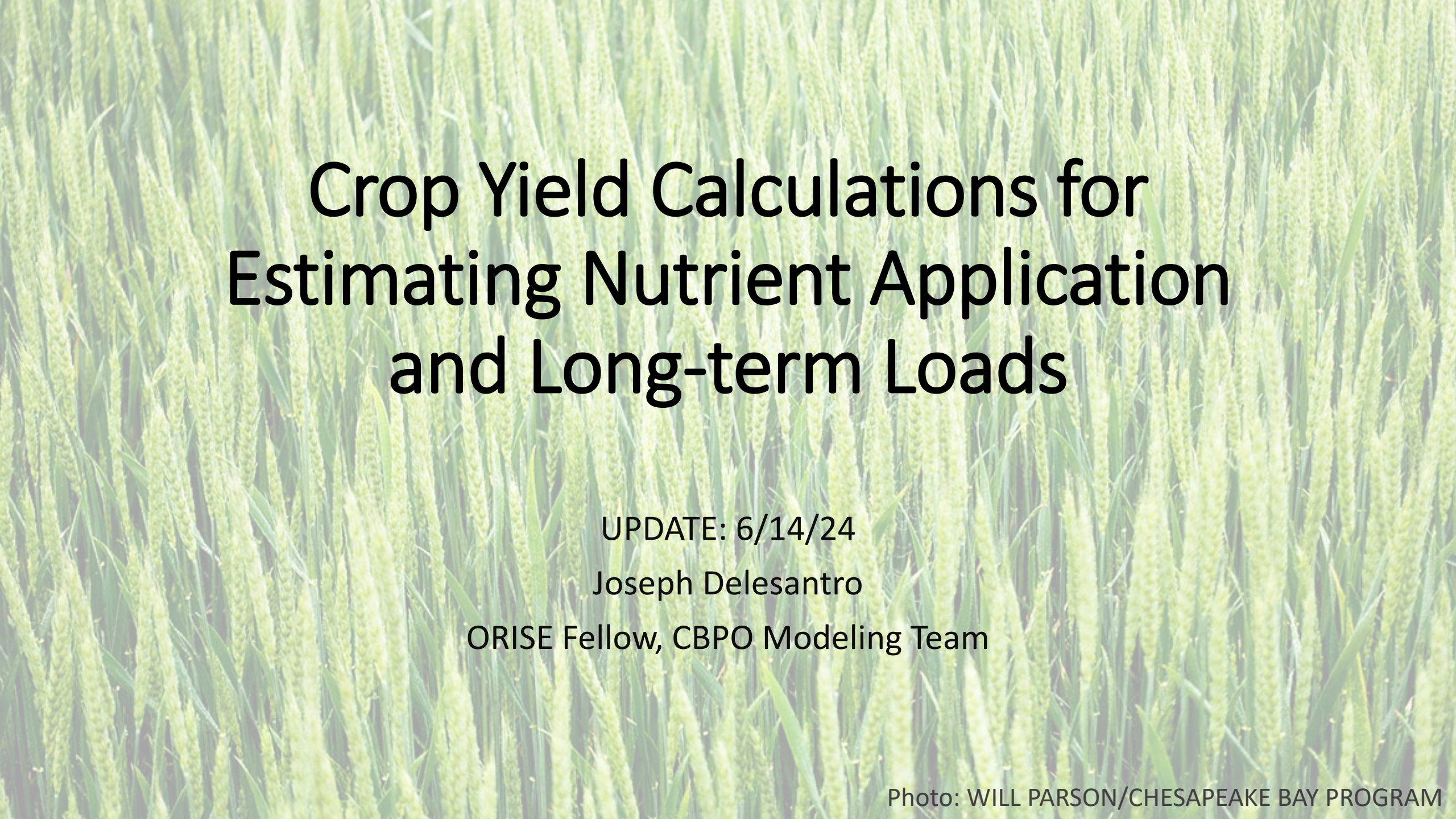


General Updates

- Updating Census with 2022 data
- Organizing and processing animal data
- Reviewing literature on manure application and runoff from organic and inorganic fertilizers



Crop Yield Calculations for Estimating Nutrient Application and Long-term Loads

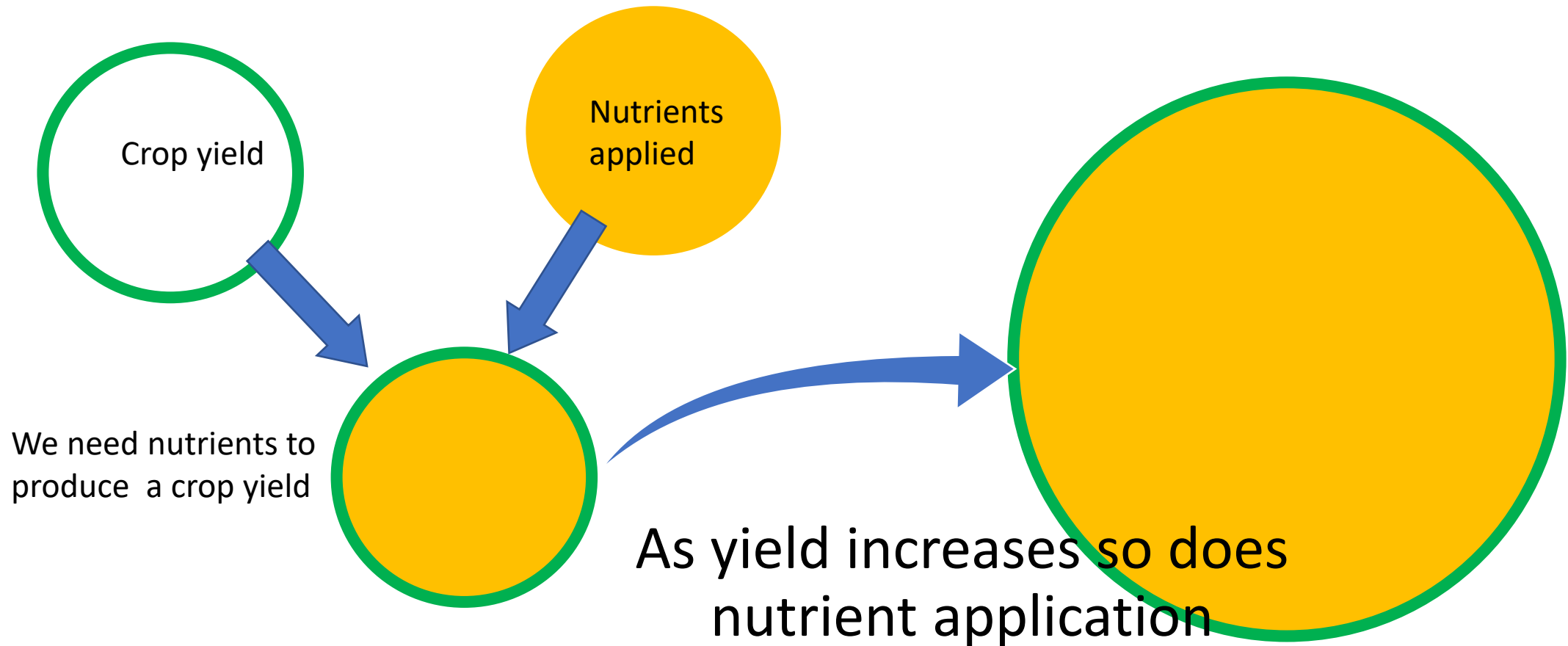
UPDATE: 3/8/24

Joseph Delesantro

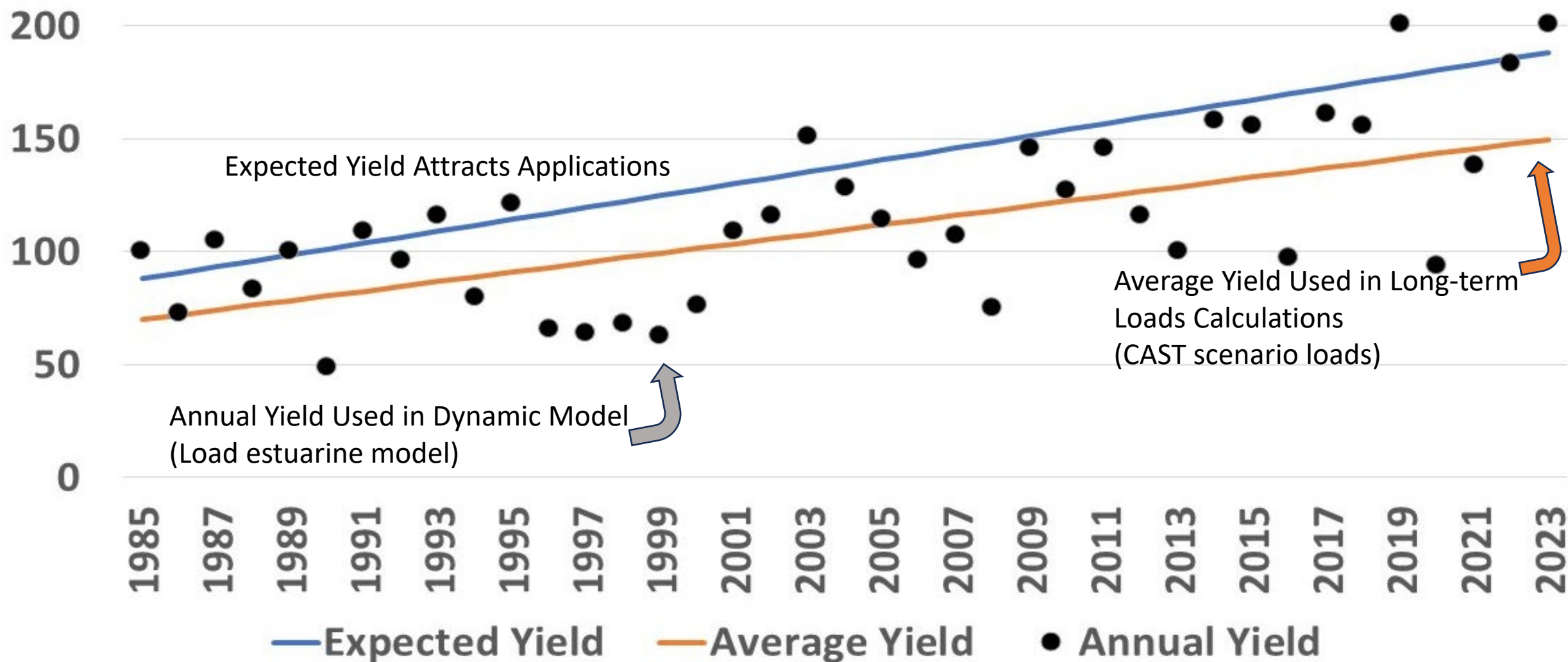
ORISE Fellow, CBPO Modeling Team

Why crop yields matter

- Yields and nutrient applications are tied together



*EXAMPLE
DATA ONLY

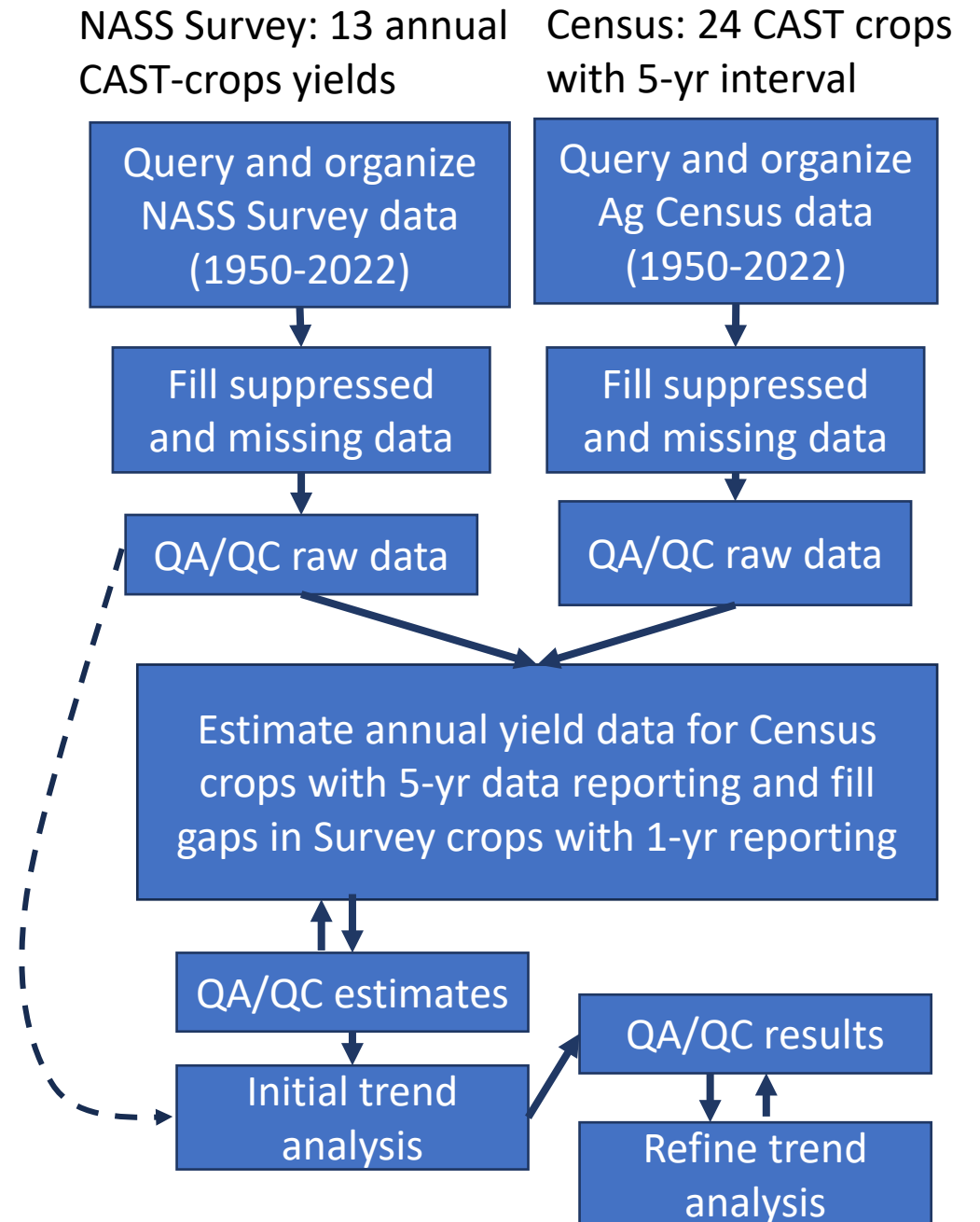


Planned path for investigation

Goals:

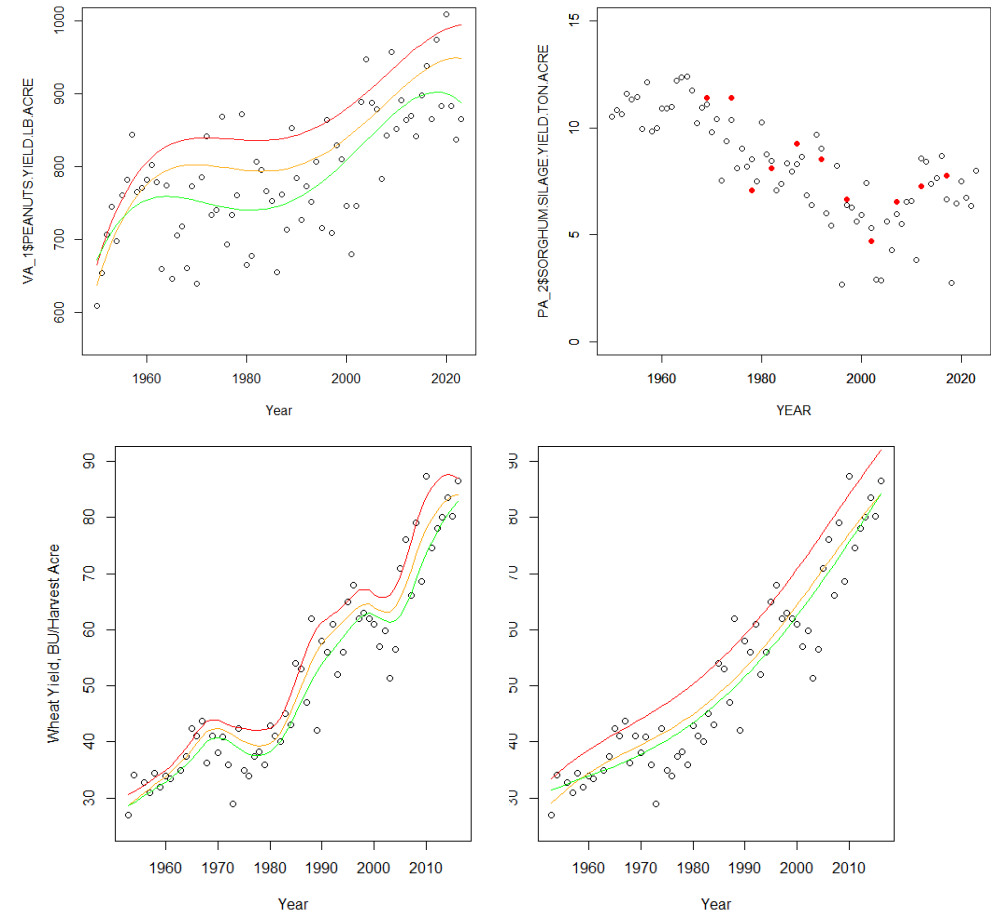
- Estimate farmer yield expectations at the county level which drive the application of nutrients.
- Estimate various yield trends to support several potential scenarios.

Approach: Use trend analysis of long-term annual crop yields.



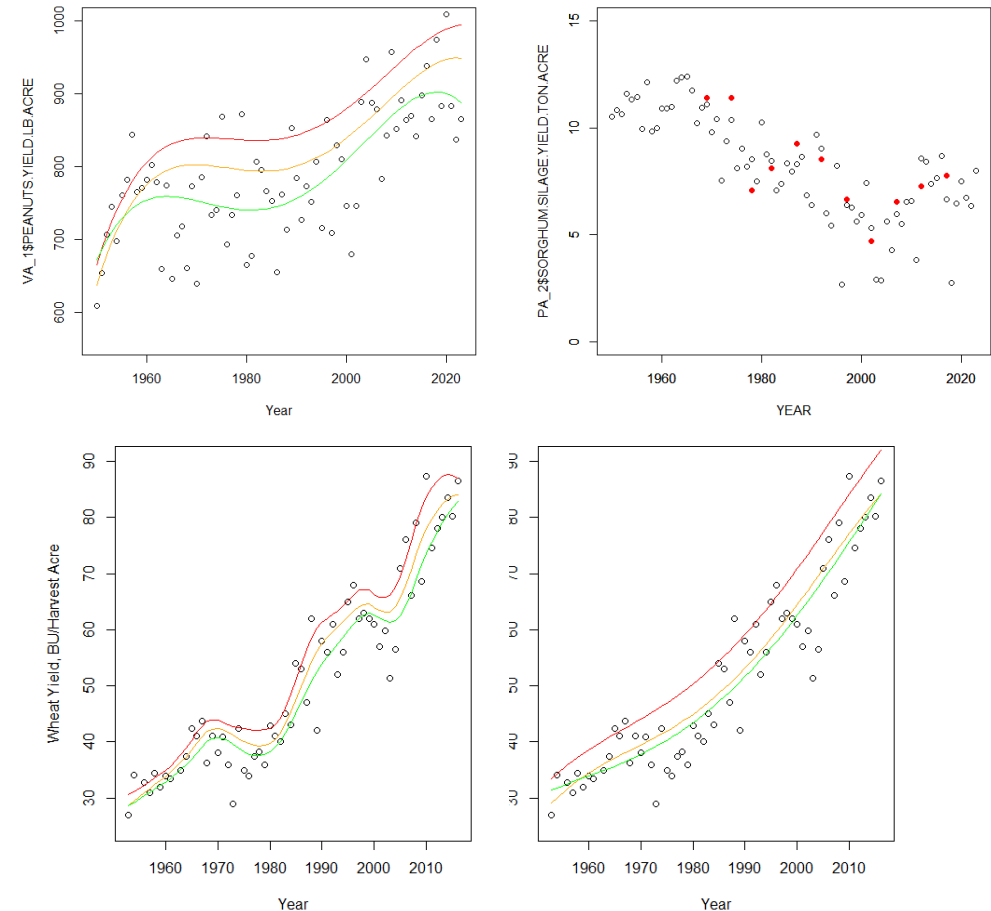
Generating a suite of metrics to describe the yield estimates and trend analyses

- Generating thousands of these plots
- We need a way to iterate without visually inspecting all of the generated data
- A suite of metrics to quickly assess the changes to numerical methods and flag issue to bring to the working group
 - “Smoothness”
 - Change metrics
 - Fit



Generating a suite of metrics to describe the yield estimates and trend analyses

- Smoothness and change metrics
 - Lag-one autocorrelation
 - Coefficient of variation of the change between timesteps
 - “Anomaly detection”-variation greater than one standard deviation in a timestep
 - Deviation from smoothing line
 - Directional symmetry – is the value consistently increasing or decreasing and how does the trend compare to the data?
- Fit
 - Adjusted R^2



Issues with estimates of annual yields

- Model is fit at the growth region scale, on occasion, applying the model at the county scale generates estimates inconsistent with the county data
 - The method may be deficient, but it's also possible the yield data for some counties is not reliable
- Are yields different across counties within a growth region?
 - Can we use the same yield across counties within a growth region?
- Are yield trends different across counties within a growth region?
 - Can we apply the same trend across counties within a growth region?
- Some crops don't have clear yield trends and estimates accuracy is hard to validate
 - Use estimate or fall back to previous interpolation methods?
- Some crops are not widely grown in some regions leading to poor fits.
 - Estimates based on yields from neighboring regions with more data may be more reliable.

