# Limitations of Yield Monitor Data to Support Field-scale Research


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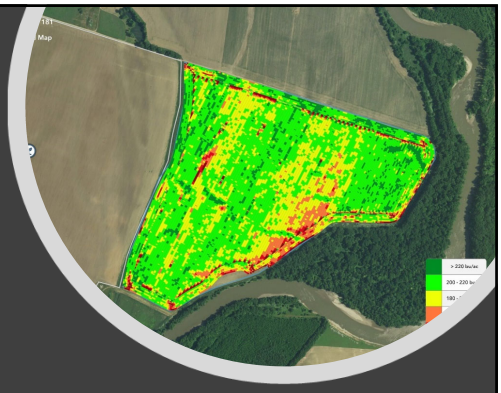
## BACKGROUND

- On-farm experimentation (OFE) has increased significantly over the past few years (farmers, industry, and researchers).
- Yield maps are commonly used to evaluate treatment performance.
  - Evaluating treatment performance relies on accurate yield data
  - Users must understand limitations/sources of error.
- Yield data averaged across a larger header width. Limitations?
  - Lag time (10 to 14 seconds for grain to reach mass flow sensor)
  - Mass flow sensors have non-linear response



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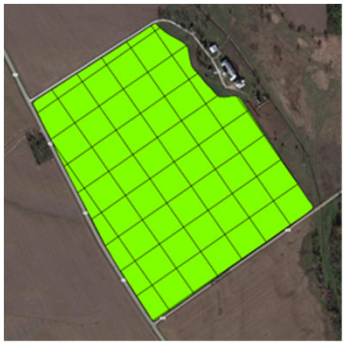
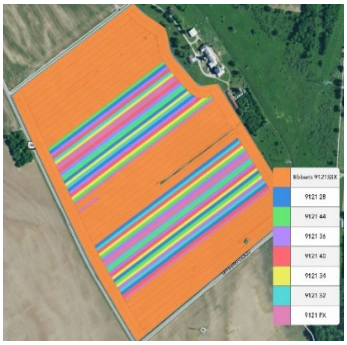
# COMMON OFE DESIGNS

Grid/checkerboard



Blocks

Strips



Best management practices for assigning yield to treatment areas?

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## Objective

To determine the sensitivity of mass flow sensors for grain yield monitors in relation to plot length for providing yield estimates.

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# METHODOLOGY

**Weigh Wagon**
Measured accumulated weight per pass

**Plot Combine** (2-row)
Ground truth yield estimates every 15.2 m

**Commercial Combine** (8-row)
4 yield monitors
(YM1, YM2, YM3, and P1)

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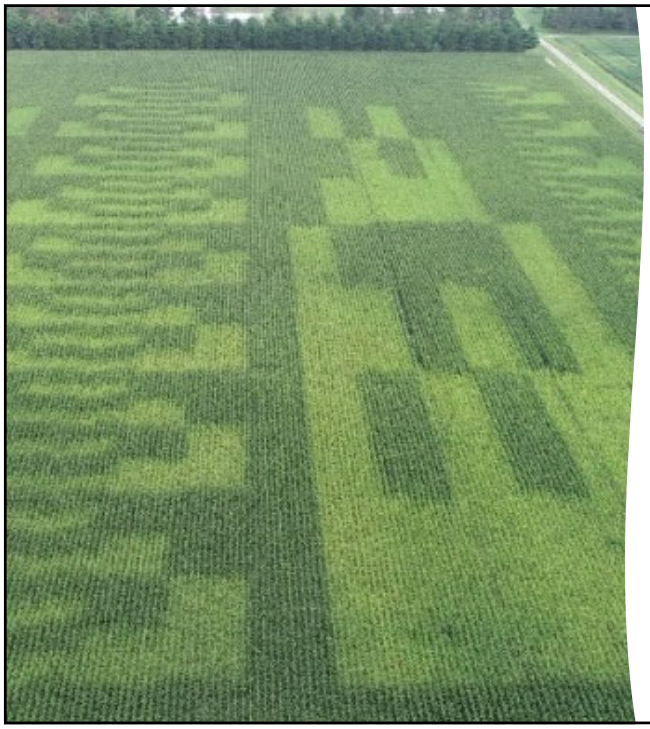

# METHODOLOGY

- 3 fields - maize (*Zea mays*)
- Randomized complete block design replicated 3 times
- Nitrogen (0 or 202 kg N/ha) was applied to create low and high yield zones
- 6 treatment lengths: 7.6, 15.2, 30.5, 61.0, 121.9, and 243.8 m
- 30.5 m section on each end of the field to "fill-up" and exit from the plot area to ensure continual flow conditions for the mass flow sensor.

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## Experimental Design

- RCBD design replicated 3 times
- 6 treatment lengths: **7.6, 15.2, 30.5, 61.0, 121.9, and 243.8 m**
- Alternating high and low yield within a pass:
  0 vs. 202 kg N/ha applied.
- 30.5 m of entry and exit area

Precision Ag

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# RESULTS

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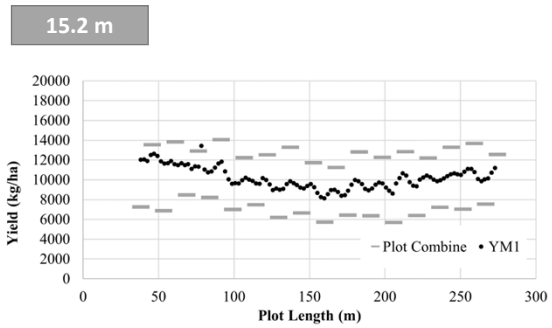


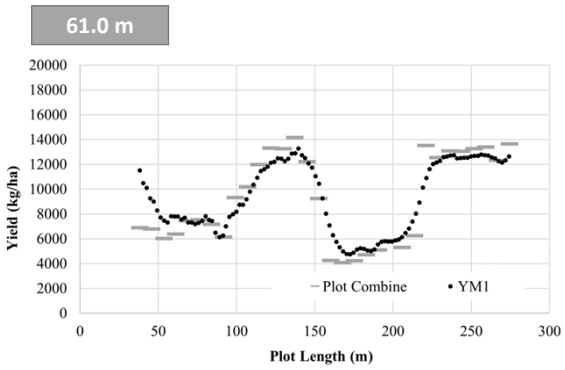


# MASS FLOW SENSOR SENSITIVITY

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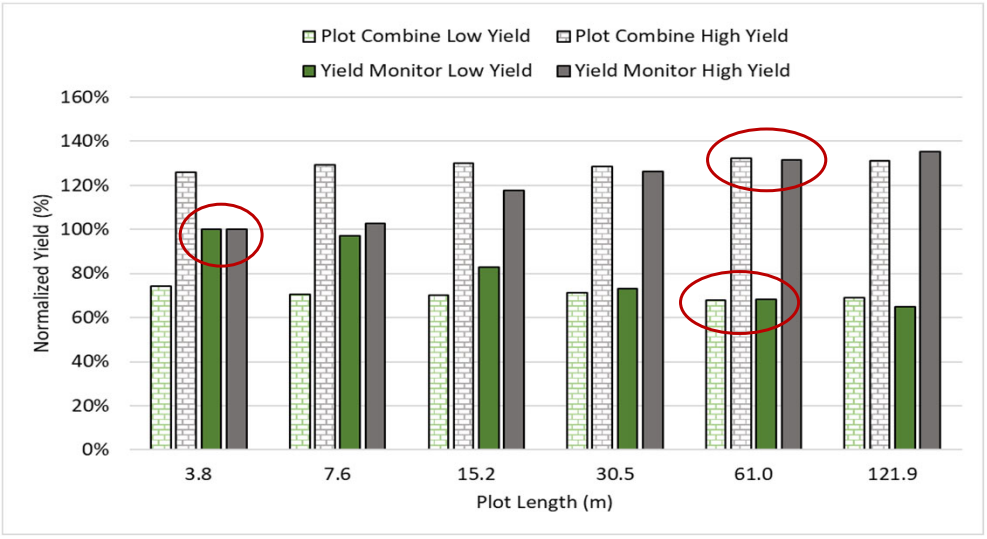


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## Results

- Mass flow sensors could not detect yield grain flow (kg/s) differences at scales of 3.8 or 7.6 m.
- Mass flow variations were measured at 15.2 and 30.5 lengths but were not accurate in magnitude.
- Mass flow estimates at the 61.0 m length accurate in magnitude.
  - 121.9 m ensured estimates between the flow sensor data and plot combine yield were accurate for all yield monitors.

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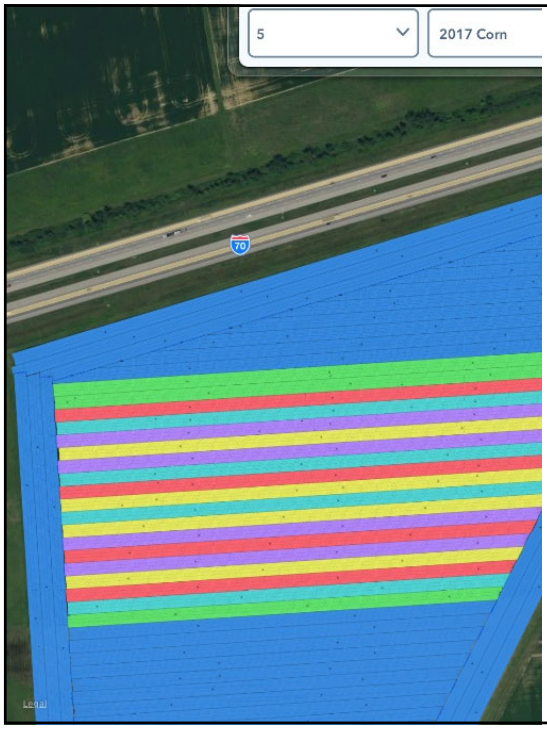


## CONCLUSIONS

**Mass flow sensor sensitivity and accuracy did not occur until around 121.9 m.**

- Minimum size of treatment area to accurately represent yield.
- Need to pay closer attention to grain yield monitor calibration and ground speed when harvesting OFE's.

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