Considerations for On-Farm Research Trials

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Discussion Topics

- Designing successful on-farm research trials
- Field deployment w/ precision ag technologies
- Harvest data collection and processing
- Other considerations, data collection
  - In-season, georeferenced field scouting
  - Imagery data collection


Designing Successful On-Farm Research Trials...
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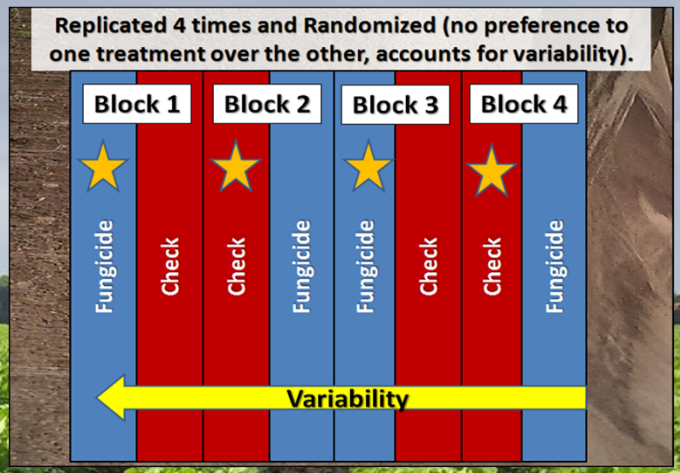
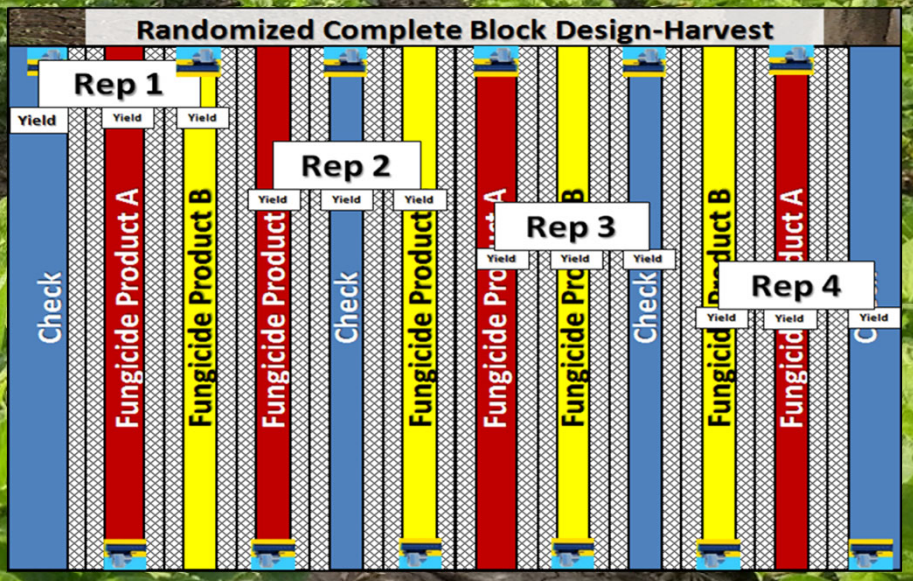
Trial Design Considerations

- Treatment identification (keep it simple)
  - Product study (beware blended products)
  - Rate study
- Compare versus ‘control or check’
  - Include ‘no’ product strips
  - Typical ‘grower’ rate
- Each Block or Replication (Rep) contains all treatment(s) and check
- Randomization across trial is critical





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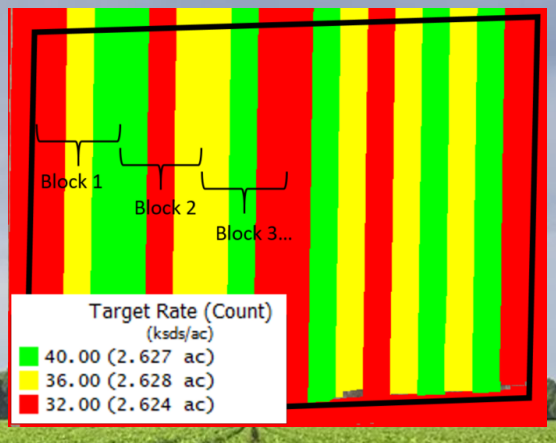
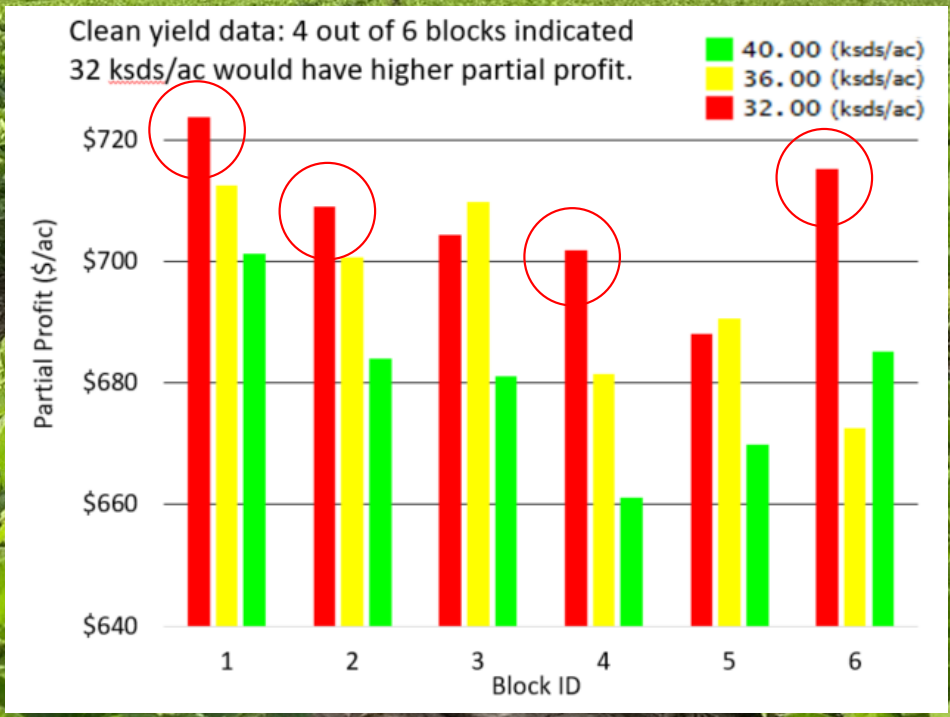
Study Replication (the good)

- Design for at least 4 blocks (or reps) for each study
  - This allows you to average results or better yet, perform statistical analysis
  - If something drastic occurred in one block, it could be removed from the study
- More replicates increases the strength (more confidence) in the statistical analysis



	Clean Yield Data		
Target Seed Pop	Avg. Yield (bu/ac)	Avg. Yield St. Dev. (bu/ac)	Partial Profit ($/ac)
32K	241	18	707[A]
36K	243	20	695[B]
40K	244	18	680[C]



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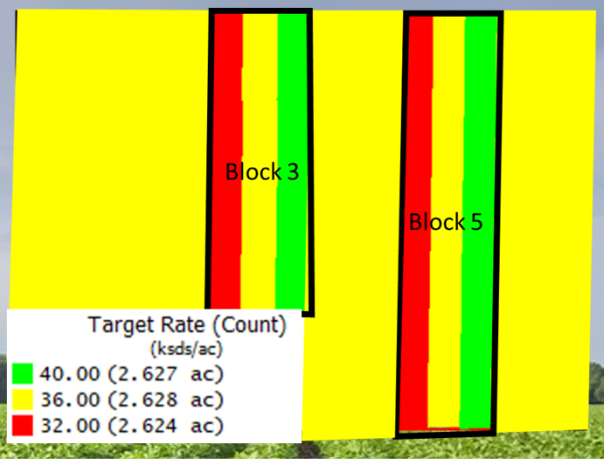
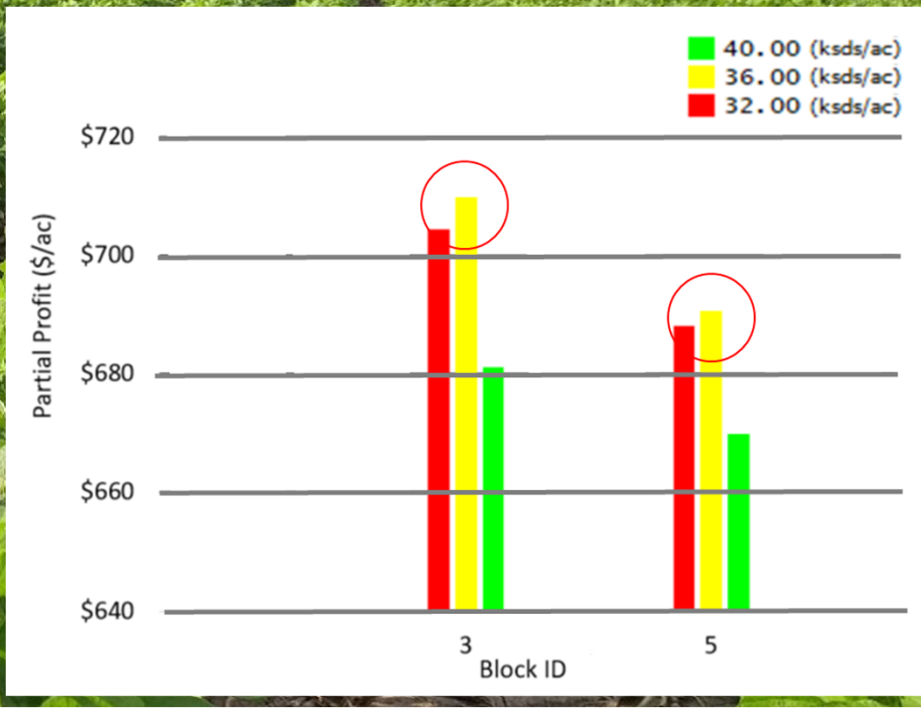
Study Replication (the bad)

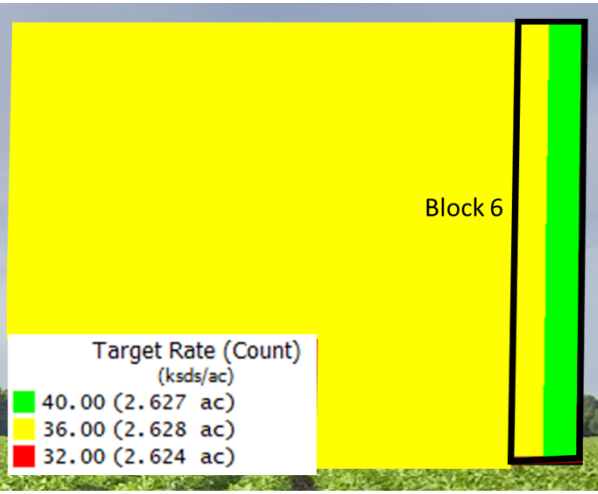
- What if we only deployed blocks 3 and 5 from the previous study?
  - Results would not have shown the same findings
  - No ability to conduct a statistical analysis (did the treatment actually affect the result?)
- In this case, we might have made an incorrect decision and cost us $12/ac.

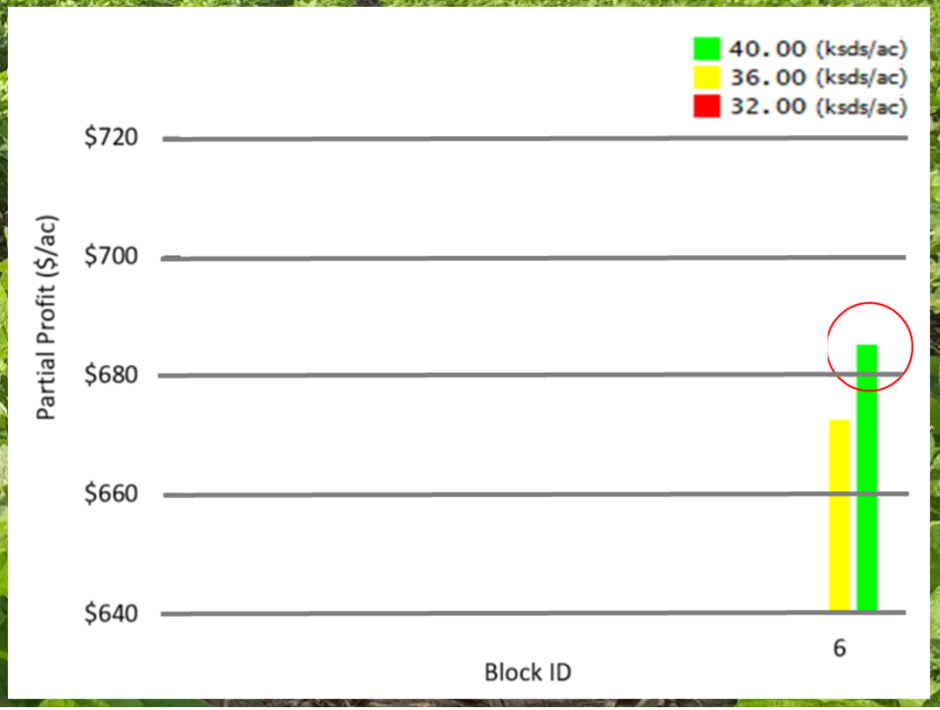




Study Replication (the ugly)

- What if we only put out two strips of a ‘grower’ (36 ksds/ac) approach versus what ‘I’ thought they should do (40 ksds/ac)
- Without replication in the study, block 6 would have indicated that the higher seeding rate (less profitable from our full dataset) would have worked!
- Based on the full set of data, this could have cost us $15/ac (or $27/ac compared to the lowest seeding rate).





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Field Deployment w/ Precision Ag Technologies...
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Using Precision Ag Technologies

- Variable rate application systems give us an opportunity to pre-plan and deploy studies using prescription (Rx) maps using Farm Management Software
- Sub-field analysis?

- Each block contains 4 treatments (seeding rates)
- Sufficient gaps were included between seeding rates
- 16 total blocks were designed into this experiment

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Using Precision Ag Technologies

- Treatment rates changes should span a wide enough range to ensure equipment can control rates at each level and a crop response can be noted:
  - 3,000 sds/ac difference in corn target rates
  - 30,000 sds/ac difference in soybean target rates
  - 30 lb-N/ac difference in N rates
- Consider applicator/planter widths and harvester widths
- Recall that dry spreaders may not have the most consistent distribution across the spread width!

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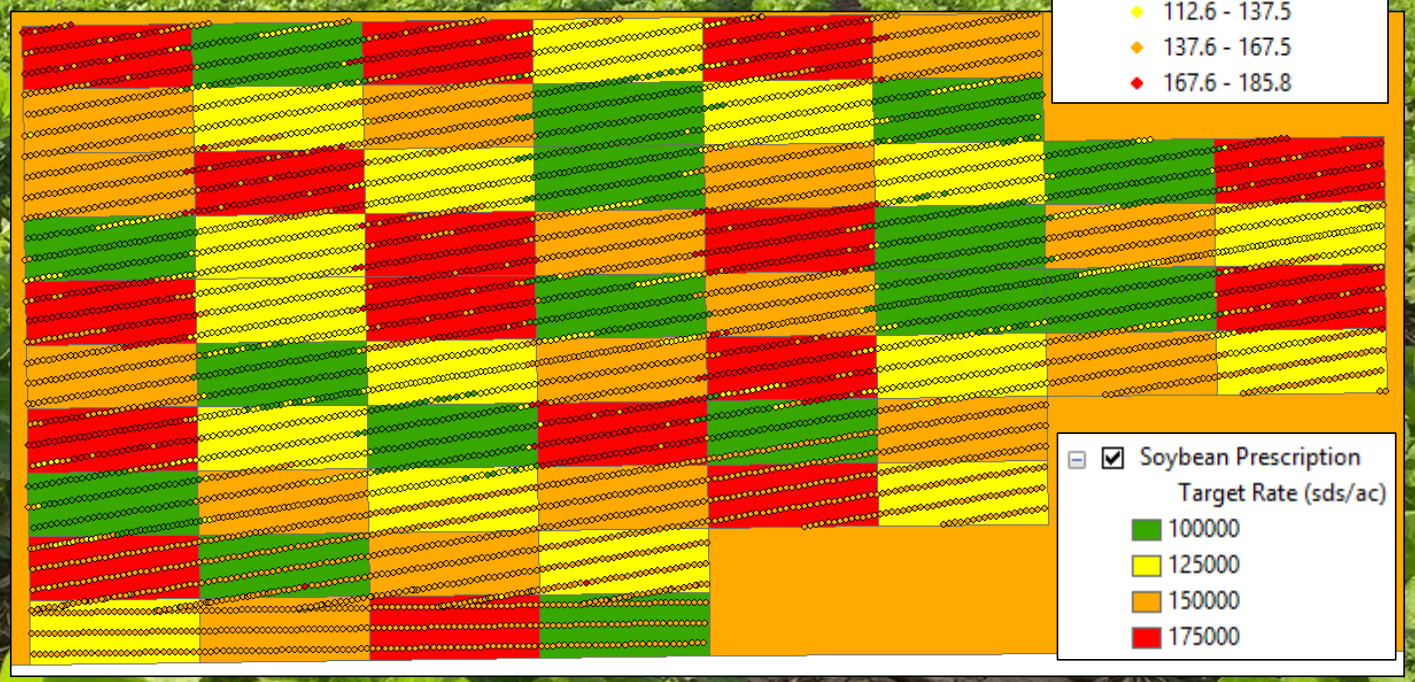
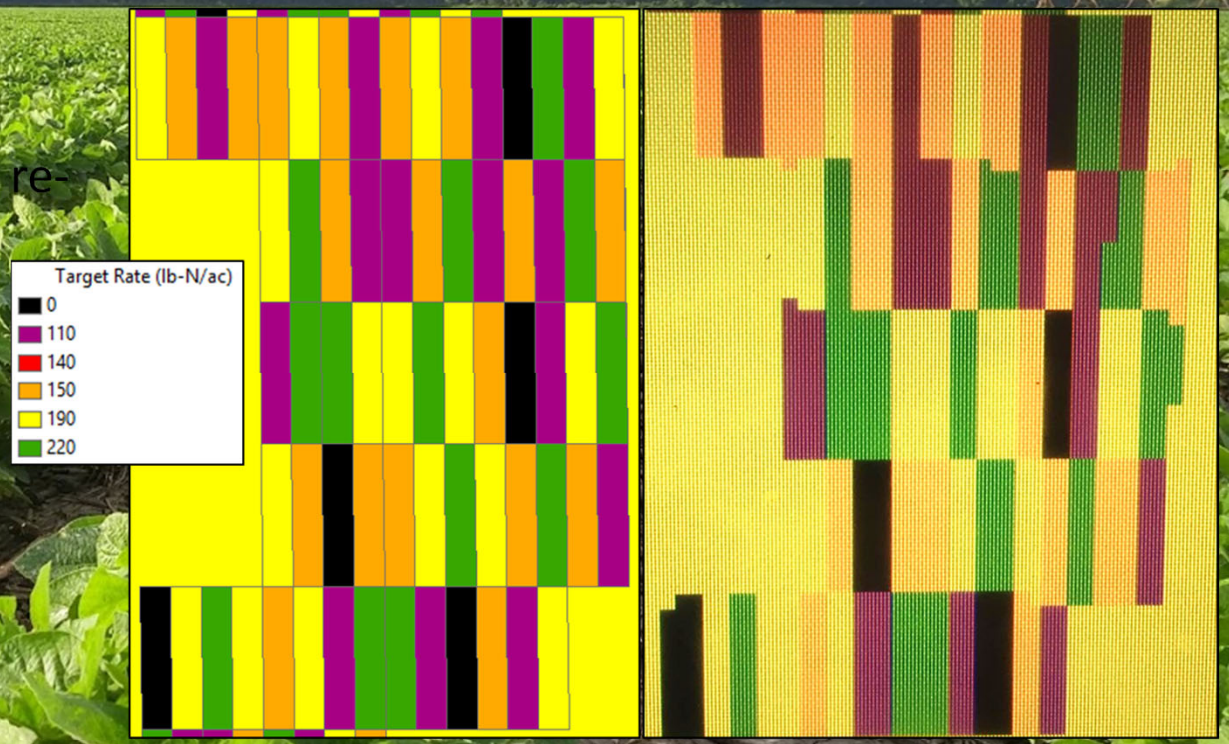
Using Precision Ag Technologies

- As-applied data allows us to verify what when where and at what rate
- Notice the southeast blocks, many rates were not placed properly (Rx map not loaded)



Using Precision Ag Technologies

- Verify how Rx maps were loaded into the control monitor, if at all possible
- What happened to the amazing Rx map I created (left) for this N rate study!?
- In this case an older monitor (GS3) re-gridded the map which negatively impacted block/treatment layout



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Using Precision Ag Technologies

- When designing these studies using Rx maps, we suggest minimum plot lengths of at least 300 feet
- This gives the variable-rate equipment a chance to hit target rates for the bulk of the treatment strip
- Previous research has shown that yield monitors require about that much length to correlate well against a scale weight

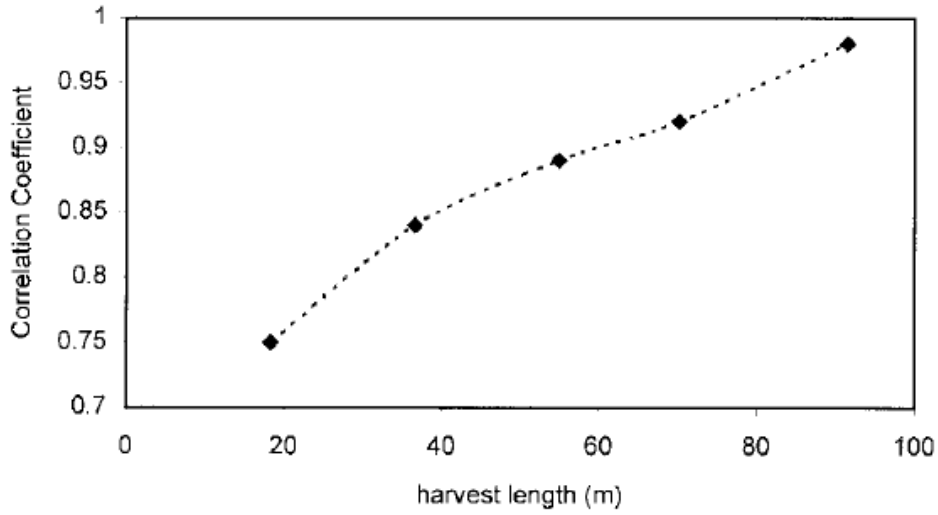

Figure 8–Correlation coefficient between cumulative yield monitor weights and scale weights (kg) against harvest length (m) corn, 1997.

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Harvest Data Collection and Post-Processing…
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Harvest Data Collection

- Yield monitor data allows us to assess treatment differences and, if need be, look at spatial variability due to field terrain, soils, etc.
- Try to calibrate the yield monitor within the study field if possible so harvest conditions will be similar
- Recall manufacturer specifications calibration:
  - Multi-point (4 or more calibration loads across wide range of grain flow
  - Small amounts of grain (60-90 bu) per calibration load are all that's required
  - Make sure operators minimize speed changes if possible

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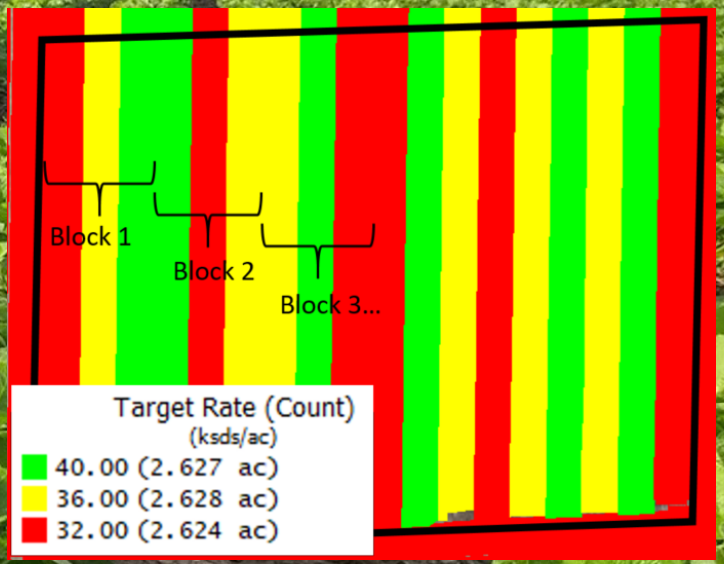
Harvest Data Collection

- It's critical to do a data quality check on yield data, if possible use software like Yield Editor (USDA) to automatically remove errors
- Observe the differences in our previous example between raw yield data and post-processed (cleaned) yield data:

	Raw Yield Data			Clean Yield Data		
Target Seed Pop	Avg. Yield (bu/ac)	Avg. Yield St. Dev. (bu/ac)	Partial Profit ($/ac)	Avg. Yield (bu/ac)	Avg. Yield St. Dev. (bu/ac)	Partial Profit ($/ac)
32K	237	27	690^{A}	241	18	707^{A}
36K	242	30	691^{A}	243	20	695^{B}
40K	239	34	663^{B}	244	18	680^{C}




Other Considerations, Data Collection…
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Georeferenced Crop Scouting

- Georeferenced (GPS logging) crop scouting is a great way to note issues in the field study, or document other important factors
- For example, in seeding rate studies, we noted significant yield drop-off when emerged populations dropped below 65,000 sds/ac and where this occurred

C	1	80K	62	52	63	
C	2	110K	72	76	94	
C	3	140K	125	126	127	
C	4	170K	155	139	153	
C	5	140K	120	126	117	
C	6	170K	156	145	150	
C	7	110K	95	92	94	
C	8	80K	69	76	69	
D	1	140K	128	125	132	
D	2	110K	104	107	102	
D	3	80K	73	76	70	
D	4	170K	147	161	159	
D	5	80K	77	75	72	
D	6	140K	131	120	126	
D			162	161	161	
D			105	101	102	
Total Average Stand Counts:						67,458
		110K				92,958
		140K				119,542
		170K				148,500

Stand counts

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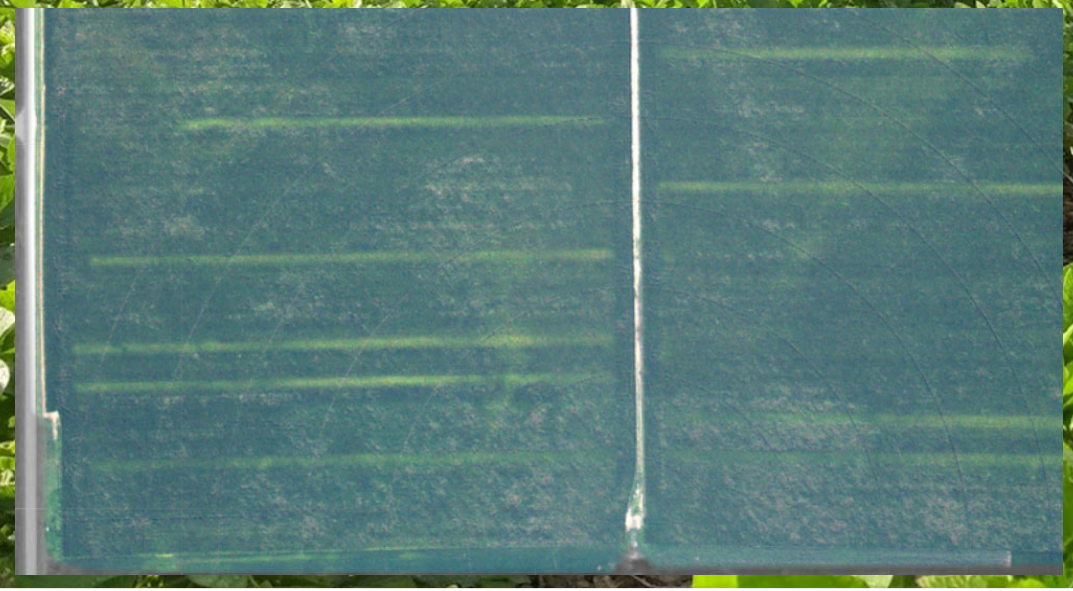
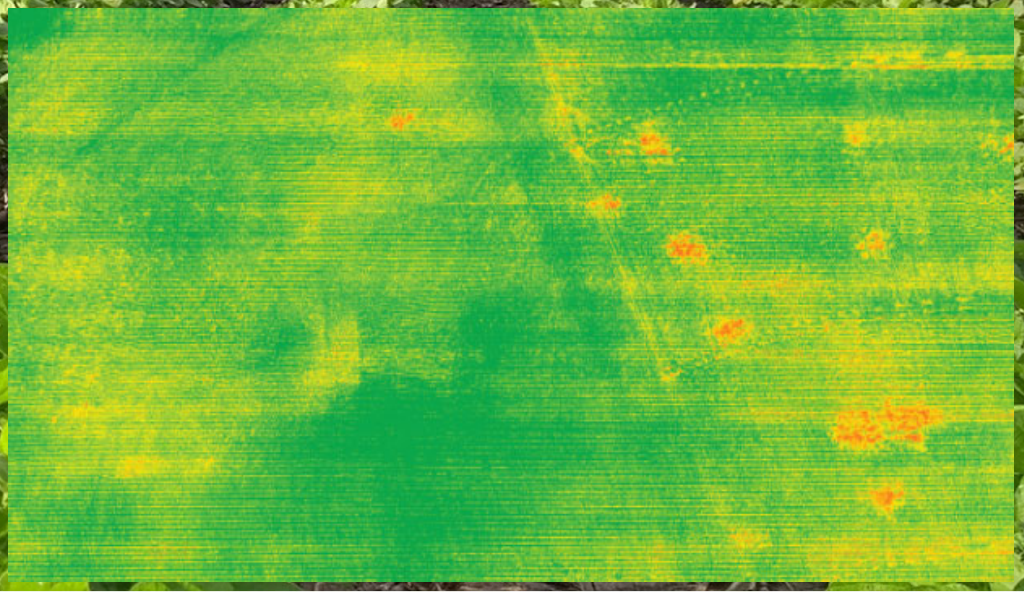
In-season Imagery

- Imagery, especially when tied with georeferenced crop scouting can help identify where issues may have occurred in the field that affected the study
- Wind (bottom left), hail, pest (ground squirrel damage bottom right) for example might not have uniformly affected the study site





Parting thoughts…

- Narrow down treatments so you're not confounding the study (be careful when blended products are used…for example, MAP or 28-0-0-5 for N rate studies include other product rate variation)
- Plan for a lot of replicates for each group of treatments (4 minimum)
- Randomize the order of treatments within each replicate or block
- For product tests remember a check or control treatment
- Precision ag technology can help, but just remember to design plots that are large enough and check as-applied data and post-process yield data for best results

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