Sunlight Harvest Update
Ames, IA
20 Jan 2018
Agenda

• Why and how CVI does what it does
• Review CVI Plot Learning from 2015, 2016 & 2017 Plots
• Preliminary CVI Plans for 2018 Season
• Collaboration Opportunity
• Questions and Discussion
Cedar Valley Innovation LLC
Why...Does CVI exist?

• “Pay back” the Farmers of the World for giving me a wonderful 41 year career at John Deere

• Support and grow the Farmer’s Triple Bottom Line
  1. Sustainable short and long term economic performance
  2. Care for and Grow the Soil and Water for future generations
  3. Feed, clothe, and fuel the World’s population
CVI Yield Measurement Protocols

1. Total Field, Elevator Weight Tickets
2. Total Field, Yield Monitor Summary
3. Individual Plot Areas within Field, as check strips, etc.

4. Single Row Machine harvest, field length
5. ”Mini-Plot” Machine harvest (new for 2017)
6. ”Bucket Check” Machine Harvest (new for 2018)

7. 17’ 5.25” (1/1000 acre) Bag Check
8. 17’ 5.25” (1/1000 acre) Single Plant Harvest
9. Single ear kernel and plant counts early in the season
10. Plant counts after emergence

* The Focus of Today’s Discussion
### Current vs. New vs. Advanced Farming Practices

<table>
<thead>
<tr>
<th>John Deere</th>
<th>Cedar Valley Innovation LLC</th>
<th>Innovative Grower</th>
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<tbody>
<tr>
<td>4% of Sales to R &amp; D</td>
<td>Continuous Improvement: Every day, every field Support growers with imagery Support growers with high resolution data Identify opportunities for improvement</td>
<td>4% of acres to R &amp; D 40 acres for every 1000 farmed</td>
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<tr>
<td>Continuous Improvement</td>
<td>“Next Step” Processes [Minimal work in this area by CVI] Leverage knowledge networks Leverage ag supplier bases Replicated trials for data confidence</td>
<td>Continuous Improvement 960 Acres</td>
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<tr>
<td>New Product Programs</td>
<td>Advanced Agronomy practices [This is the Major Focus of CVI work] Unproven processes or treatments Small Plot demonstrations of concepts Failure is tolerated; seen as Learning Goal: Trial adoption in small plots by growers</td>
<td>“Next Step” Test Plots 36 Acres</td>
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<tr>
<td>Advanced Engineering 10% of 4%= 0.4% of Sales</td>
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<td>Advanced Practices 4 acres</td>
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2017 Plot Update:
An Unanticipated Result
Different Seasons, Different Questions

2015 Population Plots:
“What Population is Optimal?”

2016 Sunlight Harvest Plots:
“How Much Sunlight is Enough?”

2017 Sunlight Harvest Plots:
“How Many Rows in the Strips?”

Small Plot Yield vs Edge Row Population
- Unlimited Sunlight -

The Answer: For an Edge Row, more than “normal” is Better
2016 Sunlight Harvest Plots: “How Much Sunlight is Enough?”

The Answer: Anything more than an additional 30” of row opening is wasting the sunlight resource
2017 Sunlight Harvest Plots:

“How Many Rows in the Strips?”
## 2017 Trials Overview

<table>
<thead>
<tr>
<th>Total Trials Area:</th>
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<tbody>
<tr>
<td>13 Field Acres</td>
</tr>
<tr>
<td>306 Rows</td>
</tr>
<tr>
<td>Baseline Field Yield</td>
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<tr>
<td>230 bu/a</td>
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<table>
<thead>
<tr>
<th>Corn Strip Widths (5)</th>
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<tr>
<td>Monocrop</td>
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<tr>
<td>1, 2, 4 Row Strips</td>
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<tr>
<td>20/40 Row Pattern</td>
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<table>
<thead>
<tr>
<th>Sunlight Openings (5)</th>
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<tbody>
<tr>
<td>0, 1, 2, 3 Rows Open</td>
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<tr>
<td>20/40 Inch open</td>
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<table>
<thead>
<tr>
<th>Yield Checks:</th>
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<tbody>
<tr>
<td>310 W. Wagon</td>
</tr>
<tr>
<td>8 Bag Checks</td>
</tr>
<tr>
<td>6 Single Plant Layouts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seed Varieties (8)</th>
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<tbody>
<tr>
<td>Pioneer 1197</td>
</tr>
<tr>
<td>Beck’s 5883</td>
</tr>
<tr>
<td>Beck’s 5140</td>
</tr>
<tr>
<td>Beck’s 5337</td>
</tr>
<tr>
<td>Beck’s 5565</td>
</tr>
<tr>
<td>Beck’s 5113</td>
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<tr>
<td>Beck’s 5828</td>
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<tr>
<td>Beck’s 6225</td>
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<tr>
<th>Populations (7)</th>
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<tbody>
<tr>
<td>25K</td>
</tr>
<tr>
<td>30K</td>
</tr>
<tr>
<td>32K</td>
</tr>
<tr>
<td>34K</td>
</tr>
<tr>
<td>51K</td>
</tr>
<tr>
<td>68K</td>
</tr>
<tr>
<td>82K</td>
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<tr>
<td>102K</td>
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13 Sep 2017 Field Day Plots

- 1: East Facing Edge, 2 Open
- 2: 4 Row-Skip 1
- 3: 2 Row-Skip 1
- 4: 3 Open Rows
- 5: 60" Monocrop
- 6: 20/40 No-Till
- 7: 30" No-Till
- 8: Grower 30” Strip Till
- 9: Extreme Hi Pop
- 10: Low Pop

The Focus of Today’s Discussion
2017 Sunlight Harvest Plots:

“How Many Rows in the Strips?”

The Answer: It Doesn't Matter...With the right variety and population the field yield is the same.
4 Row-Skip 1 Single Plant Harvest Plot

Imagery and Data from 13 Sep 2017 CVI Plot Day

327 bu/a
252 bu/a
227 bu/a
356 bu/a

Strip Average: 291 bu/a (4 rows)

34K, 34 Plants
Planted 51K, 48 Plants

Field Average: 232 bu/a (5 rows)

Planted 34K, 33 Plants
Planted 51K, 48 Plants
Single Plant Yield
Row 4 (West Side) of 4 Row-Skip 1 Plot

8 plants above 500 bu/a
Row Average: 356 bu/a
48 Plants
11 plants below 300 bu/a

CI Note: Bringing the 11 lowest plants up to row average would increase the row yield to 400 Bu/a
Single Plant Ear Weight
Row 4 (West Side) of 4 Row-Skip 1 Plot

11 Ears above 0.8 lbs.
Row Average: 0.72 lbs.
48 Ears, 356 bu/a
7 Ears below 0.6 lbs.

CI Note: Bringing the 7 smallest ears up to row average would increase the row yield to 377 Bu/a
# Row vs. Strip vs. Field Yield

4 Row-Skip 1 Strips

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<tr>
<th>Field Length</th>
<th>Row Yield:</th>
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<td>348</td>
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Strip Yield (Average of 4): 298 bu/a

Field Yield (Average of 5, one being zero): 238 bu/a
Field Length Weigh Wagon Yield of Various Configurations

Field Yield of Various Plot Trials

Replications

230 230 220 238 234 202 190 230 223 213 238 223 225 221 213 209 208 204

Grover Planned 30' P1107 30k
CV Planned 30' P1107 30k
30' Monocrop 85683 30k
4R 51 P1107 52/34/51K
4R 51 85683 5/13/250K
4R 51 85683 4/53/57K
2R 51 85683 7/34/51K
4R 51 85683 7/13/340 5/11/34K
2R 51 P1107 32K
2R 51 BS625 8XK
2R 51 BS625 8XK
60' Wide Rows 85683 5/13/34K
60' Wide Rows 85683 5/13/340 32K
60' Wide Rows 85683 5/13/340 8XK
60' Wide Rows 85683 5/13/340 8XK
60' Wide Rows 85683 5/13/340 8XK
60' Wide Rows 85683 5/13/340 8XK

Conclusion:
CVI Planting System performs equivalent to Grower’s
Conclusion: 4 Row-Skip 1 has potential to yield same as 30” Monocrop
Conclusion: Supplier Recommended configuration did not perform well, statistically significant
**Conclusion:**

2 Row-Skip 1 did much better than expected
Conclusion:

60” Monocrop Rows far exceeded expectations
Conclusion:
Going Forward, Variety Selection & Population Matter
Continuous Improvement Opportunity:
Ears from 60” Row, Field Day Layout

Planted Population: 82K
End of Season Ears: 72
Row Yield, per 30” Row: 381 bu/a
Field Yield, 60” Row: 191 bu/a
Fix These!!!, Plus prevent the 10 Missing or Barren Plants
The Answer: It appears there is potential to retain the same field yield with "strips" that are 1 to 4 rows wide in 30” corn with a single row open (20%, 33%, or 50% open for sunlight harvest)
High Yield 60” Rows: How can this be?

• It doesn’t make sense to “waste” half the land space
• The plants in the high pop row are too close together
• Nobody does it
• What gives?
Seems like a lot of wasted sunlight...

4:25 pm 04 Jul 2017
A day in the life...01 July 2017

Time Lapse Video Analysis
“Breakthrough” Learning for 2017:
60” Rows

Much Simpler system to develop
• Use existing planting equipment
• Conventional Meters
• Single Population across planter
• Single variety across planter
• Single Nutrient Application rates
• Excellent field access for high clearance equipment—all season
The “Rest of the Story”....

What to do with all that extra field space?
Sunlight Utilization Opportunity

Grower: Loran Steinlage, West Union, IA
flolofarms@gmail.com

Companion Crop Species:
• Annual Ryegrass
• Buckwheat
• Radish
• Dwarf Essex Rape

Row Configuration:
2 Row-Skip 1 (2RS1)
Photo Date: 23 Sep 2017
Companion Crops Benefit from Additional Sunlight

Steinlage Plots, 60” opening
23 Sep 2017

Steinlage Plots, 30” opening
23 Sep 2017
Companion Crops Species Selection and Management is Critical!

Steinlage Plots, 60” opening
23 Sep 2017

CVI Plots, 60” opening
17 Aug 2017
Evolving CVI Plans for 2018
Sunlight Harvest Sustainability Strips

1. CVI Trials at La Porte City, Tentative Plot 52051 (same location as 2016 Season)
   • 60” Rows: Major Focus
   • Tramlines: Minor Focus
   • 4 Row Skip 1
   • Variety Screening Plots (Potential)
   • Cover/Companion Crop Screening (Potential...)

2. Grower Plots-Advanced Farming Model
   • 60” Rows w/cover crops
   • “One Several Rounds for Bob”
“Elevator Speech” Summary

Based on 60” Row Data from 2017 Plots

Mr. Grower,
You can leave half of your cornfield space open for traffic lanes and cover or companion crops by turning off every other row on your planter and doubling the per row population with no significant loss in yield. The resulting 60 inch rows make 50% of the area available for growing soil health, managing runoff, and providing a 60” traffic lane for each wheel of your high clearance applicator.
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Cedar Valley Innovation LLC
What’s in Your Field?

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