More data in ag today than ever before. How can we use this data to make improvements on farm and between farms? How can we improve management strategies used by farmers? How do we accelerate the evolution of understanding and implementation of technology?
30 year Extension Career

• Worked on Water Quality Project – demonstrations and newsletters
• Center Pivot Project – educational programs – reached new audience
• Monsanto Water Utilization Learning Center – assisted with tours and research plots
• NRD Benchmarking Project
  • UNL EC106. Yield Gaps and Input-Use Efficiency of High-Yield Irrigated Corn in Nebraska
• Yield Contests – throw the kitchen sink at it
• On Farm Research – involves growers in research and interpretation of findings
• UNL-TAPS Farm Management Competitions – new method to engage farmers and industry
Extension Educational Theory

Extension started as on-field demonstrations – Shroyer and Sullins, 1993
Top Down Process – scientists develop answers – Vanclay and Lawrence, 1994
On-Farm Research – two way communication – Shroyer and Sullins, 1993
Learning Communities – Krasney and Doyle, 2002
Transformative Learning – Mezirow, 2000
  - Disorienting dilemma
  - Self Examination
  - Critical Look at their own management
    Begin looking for answers from Industry, University, peers
Chuck Burr, Daran Rudnick and Matt Stockton
West Central Research and Extension Center

Management Team:
Himmy Lo, Hope Nakabuye, Jared Daily, Turner Dorr, Jacob Nickel, & Devin Broadhead
Overview

• The TAPS program enhances engagement of agricultural producers at a high level, including resource use efficiency and profitability by providing a common platform for peer-to-peer learning with participation by University scientists and industry personnel.

• The TAPS program hosts “Farm Management Competitions”

• TAPS is the platform where people can observe and use new ideas and technology, test conventional wisdom, and discover better ways to do business in an environment of friendly competition.
Project Description

• Each “Farm” on paper included 3,000 harvested acres for corn and 1,000 acres for sorghum for the purposes of making decisions. Production decisions were imposed on 3 randomized plots (~0.4 acres) held under a variable rate irrigation (VRI) pivot at WCREC in North Platte, NE.

• Management decisions included:
  • Insurance Selection
  • Nitrogen Management
  • Hybrid Selection
  • Seeding Rate
  • Irrigation Management
  • Marketing Grain

Real-time decisions are logged on TAPS.unl.edu
2018 TAPS Partners

Seed Companies
- Hefty Seed Company
- Channel Seeds
- Fontanelle Hybrids
- Arrow Seed
- DuPont Pioneer
- Dyna-Gro

Non-Profit Entities
- Nebraska Extension
- Platte River Recovery Implementation Program
- Ogallala Water
- The Nature Conservancy

Commodity Boards & Regulatory Agencies
- Central Platte Natural Resources District (CPNRD)
- Twin Platte Natural Resources District
- Nebraska Corn Board
- Nebraska Grain Sorghum Board
- Upper Republican NRD
- Natural Resources District

Financial Institutions
- Equitable Bank
- Great Western Bank
- Sandhills State Bank
- Farm Credit Services of America
- Hershey Bank
- Nebraskan Land National Bank

Agricultural Industries
- DTN
- Lindsay Corporation
- Agri-In-Ject
- Ward Laboratories, Inc.
- Arable
- CropMetrics
- The Climate Corporation
- Phytech
- TerrAvion
- AquaSpy
Awards

1. Most Economically Profitable
   • Amount = $2,000

2. Highest Input Use Efficiency – Water × Nitrogen Intensification Performance Index (WNIPPI)
   • Amount = $1,000
   \[
   WNIPPI = \frac{\left( \frac{Y_{Farm}}{Y_{Control}} - 1 \right)}{\left( 1 + \frac{I_{Farm}}{ET_{Control}} \right) \times \left( 1 + \frac{N_{Farm}}{ANU_{Control}} \right)}
   \]

3. Greatest Grain Yield
   • Amount = $500 × (Percent of Most Profitable Farm)
     • Example: Farm 1 has highest yield, but only profited 78% of the most profitable farm.
       • $500 \times 0.78 = $390
2018 Site Description

- West Central Research and Extension Center (WCREC) in North Platte, NE
- Competition Design
  - 20 Corn Farms
- Soil Type
  - Cozad Silt Loam
- Climate
  - Semi-Arid
- Seasonal Rainfall
  - 13.8 inches
Nitrogen Fertilizer (UAN 32%)

- **Pre-plant**
  - Deadline: April 10th
  - Method: Coulter
  - Amount: 0 to 180 lbs/acre
  - Timing: Earliest convenient date

- **Side-dress**
  - Deadline: May 1st
  - Method: Y Drops
  - Amount: 0 to 180 lbs/acre
  - Corn Timing: V4-V6

- **Fertigation**
  - Amount: 0 to 30 lbs/acre/event
  - Corn Timing: V8, V12, VT, R2
  - Sorghum Timing: Stages 2, 3, 4, & 5
  - Irrigation Depth: ~0.30 in/event

---

**Soil Analysis and Sorghum Recommendations from Ward Labs**

**March 22nd, 2018**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield Goal</th>
<th>Nitrogen N</th>
<th>Phosphorus P2O5</th>
<th>Potassium K2O</th>
<th>Sulfur S</th>
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<tr>
<td>(Ward) Milo, BU</td>
<td>Sub-Soil ID(s)</td>
<td>Depth(s)</td>
<td>SUB-SURFAC</td>
<td>8 - 36 in</td>
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<td>175</td>
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Irrigation Scheduling

• Irrigation System Operated:
  • Monday
  • Thursday

• Irrigation Depths:
  • 0 to 1.0 inches per event

• Decisions:
  • The participants had until 10 AM on the irrigation days to note whether they would like to irrigate using the competition website (www.TAPS.unl.edu).
  • If participants failed to indicate their intent to irrigate by 10 AM, no irrigation water was applied on that irrigation day.
  • Irrigation scheduling could be made approximately 2 weeks in advance using the competition website.
What information was collected?

Data was generated on:

- Soil, plant, and atmospheric conditions

--- Plant Sensing ---

----------- Evaporative Demand -----------

--------- Imagery ---------

--- Residue ---

--- Soil Water ---

--------- Soil Properties ---------

--- Field Scouting ---
15 DAY FORECAST

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<tr>
<th>Day</th>
<th>Weather Conditions</th>
<th>High/Low (°F)</th>
<th>Feels Like (°F)</th>
<th>Wind (mph)</th>
<th>Dew Point (°F)</th>
<th>Humidity (%)</th>
<th>Precip Chance (%)</th>
<th>Precip Liquid (in)</th>
<th>Precip Snow (in)</th>
<th>GDD (°F)</th>
<th>Evap. In.</th>
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<td>56</td>
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<td>60</td>
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Soil Water Status
2018 Corn Decisions Made
Irrigation

Corn Farm #

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<th>2nd Half June</th>
<th>1st Half July</th>
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<td>6.20</td>
<td>0.00</td>
<td>4.55</td>
<td>4.70</td>
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</table>
2018 Corn Results
Corn: Grain Yield

Grain Yield (bu/acre)

137.6 12 17 6 16 8 5 4 2 19 11 13 14 3 18 9 20 10 1 15 7

288.5

278.9

274.8

273.5

271.9

270.0

264.1

262.1

260.8

257.7

257.4

256.4

255.5

249.0

246.9

240.6

240.1

233.5

222.1

17

6

16

8

5

4

2

19

11

13

14

3

18

9

20

10

1

15

7
Corn: Highest Input Use Efficiency

- **Grain Yield (bu/ac)**: The input efficiency increases as grain yield increases.
- **Irrigation (inches)**: The input efficiency decreases as irrigation increases.
- **Nitrogen (lbs/ac)**: The input efficiency increases as nitrogen application increases.
Highest Input Efficiency Award

Farm # 15
Tim Schmeecle

Hybrid: DynaGro 52VC91
Seeding Rate: 34,000 plants/acre
Irrigation: 4.70 inches
Nitrogen: 195 lbs/acre
Yield: 278.9 bushels/acre
Profit: $261/acre
Corn: Most Profitable

Profit per acre

Corn Farm #’s

- $278.32
- $276.32
- $260.55
- $232.21
- $226.66
- $216.75
- $215.06
- $204.58
- $200.62
- $194.52
- $186.00
- $185.28
- $179.32
- $176.13
- $160.70
- $158.60
- $149.48
- $138.45
- $133.22
Irrigation versus Profit

2017 and 2018

Profit ($/acre)

Size Indicates
Yield

y = -1.0077x + 124.85
R² = 0.0004
Nitrogen versus Profit

2017 and 2018

Size Indicates Yield

Profit ($/acre)

y = -0.7706x + 263.26

R² = 0.0352
Yield versus Profit

2017 and 2018

Size Indicates Irrigation

Profit ($/acre)

Grain Yield (bu/acre)

\[ y = 4.8157x - 1094.2 \]

\[ R^2 = 0.49 \]
Input Efficiency versus Profit

Size Indicates Yield

Profit ($/acre)

Input Efficiency (WNHPI)

2017 and 2018

\[ y = 1627.9x - 153.45 \]

\[ R^2 = 0.81 \]
Table 1. EC3042. UNL-TAPS. 2018 Farm Management Competition Report.

<table>
<thead>
<tr>
<th>Farm #</th>
<th>Irrigation, Inches</th>
<th>Nitrogen, lb/ac</th>
<th>Grain Yield, bu/ac</th>
<th>Efficiency Ranking</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>210</td>
<td>275</td>
<td>16</td>
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<td>7</td>
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<td>200</td>
<td>289</td>
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<td>15</td>
<td>4.7</td>
<td>195</td>
<td>279</td>
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</table>

Check out all the results at [http://taps.unl.edu](http://taps.unl.edu) - Reports Tab
TAPS Impact

Recorded comments:

• “I’ve really learned a lot by participating in the UNL-TAPS competition. There were a lot of really cool tools at our disposal and we had the opportunity to see if they can add value to our operation without risk.”

• A participant that did no marketing during the growing season admitted that this is what he did on his own operation, but then proclaimed that he had already forward contracted grain for his own operation for 2018.

• Another participant indicated that looking at the results has made him “question every management decision he has ever made on his own operation.”
Extension of the Future

• Conduct programs to help producers benchmark their management strategies
• Real power in showing how they rank – aggregating producer data
• Utilize existing data sources (Natural Resource Districts in Nebraska)
Thank You!

The mention of trade names or commercial products in and during this presentation does not constitute an endorsement or recommendation for use by the University of Nebraska-Lincoln or the author.