

# Nebraska Soybean Board Year-End Research Findings Report

*Please use this form to summarize the practical benefits of your research project and what has been accomplished. Your answers need to convey why the project is important and how the results impact soybean production.*

**Project Title:** Next Generation On-Farm Research Initiative

**Contractor & Principal Investigator:** Laura Thompson

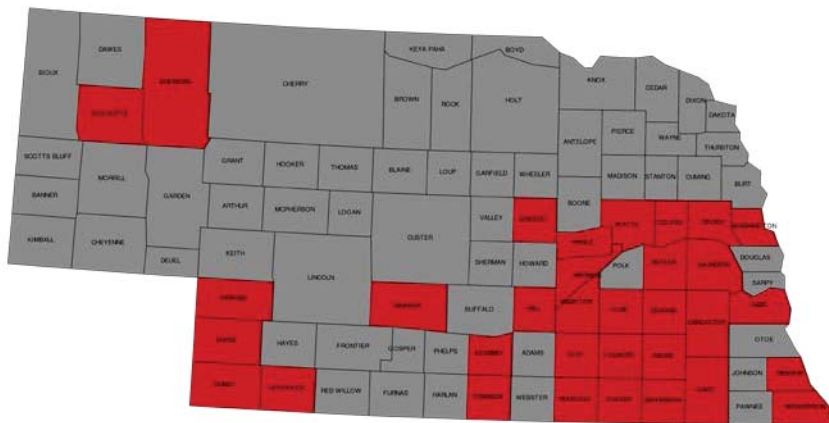
**Please check/fill in appropriate box:** ☐ Continuation research project  
☒ Year 1 of 1 research project (for example: Year 1 of 2)

**1. What was the focus of the research project or educational activity?**

The focus of the Nebraska On-Farm Research Network is to implement a statewide on-farm research program addressing critical farmer production, profitability, and sustainability questions. This project builds upon the previous success of the Nebraska On-Farm Research Network and is ambitiously pursuing new and innovative ways to collaborate, conduct, and disseminate research.

Specifically this is accomplished by:

- Farmers, extension educators and specialists, industry, and consultants working together to generate high quality research that will be directly applicable to Nebraska farmers in accordance with objectives set forward by the Nebraska Soybean Board (and Nebraska Corn Board).
- Exploring opportunities to more fully utilize ag and site-specific technologies to increase impact and learning of farmer-directed research.
- Expanding the geographical area of this project to more fully represent soybean (and corn) growing areas of Nebraska by working with new cooperators across the state. In 2017, over 75 studies were conducted in 33 Nebraska counties (Figure 1).



**Figure 1.** Locations of 2017 On-Farm Research studies. Over 75 studies were conducted in 33 Nebraska counties.

- Engaging and sharing information in a wide range of ways (radio, tv, newspaper, in-person, social media, website, YouTube, etc.) to connect with all producers, including the “next generation” which is currently transitioning into farm operations.

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### **2. What are the major findings of the research or impacts of the educational activity?**

Over the Oct. 2016 to Sept. 2016 time period:

70 on-farm research studies were completed in 2016. Approximately 75-85 on-farm research studies are in progress for 2017. Topics include cover crops, seeding rate, starter fertilizer, growth promoters, fungicide application, row spacing, and more.

In order to establish partnerships for “big data” management and analysis opportunities with campus faculty in Nebraska and other states, On-Farm Research Network has:

- Increased interaction with the Nebraska Agriculture Technology Association, attending board meetings and conference planning meetings in an advisory role, and presenting on-farm research opportunities to attendees of the winter conference. The Nebraska Agriculture Technology Association will promote the upcoming Nebraska On-Farm Research Network Results Update Meetings at their annual meeting.
- Teaching Precision Ag Data Management Workshops (10 locations across state in winter) helping growers realize the opportunity for use of precision ag utilization in conducting on-farm research. Two lessons were developed to focus on using data management software for on-farm research and were implemented in Jan./Feb. 2017.
- Collaborated with a multi-state on-farm research effort lead by the USB, contributing three fields in the third year of this partnership.
- Contribute to the On-Farm Research Data Sharing group which is looking at ways to expand the impact of on-farm research data by combining datasets across states.
- Participate in interdisciplinary and agriculture related “big data” meetings to find ways to better analyze and present previously collected research data so that it is valuable for decision making.
- Set up and utilized two drones and multispectral sensor systems to expand on-farm data collection in 2017. In 2017, I mapped 2,500 acres and generated over 0.5 terabytes of data using these drone systems. In soybean fields, drone imagery was also used to document herbicide damage and weed populations.
- In 2016, the Nebraska On-Farm Research Network began a collaboration with the USDA-Natural Resource Conservation Service (NRCS). The NRCS developed a 5-year proposal to establish 12 soil health demonstration farms. The main goal of these research farms was demonstration, however there was also the potential they could be used for research as well. For that reason, they reached out to the Nebraska On-Farm Research Network to assist in developing the demonstration farms into research sites where feasible. I met with the state NRCS office numerous times, going over each demonstration site in detail and advising them on developing research protocols. The Nebraska On-Farm Research Network will also aid the NRCS with research result dissemination. This collaboration is not only an opportunity to collect valuable research information regarding cover crop use, benefits, and impact on subsequent cash crops, but also allows NRCS professionals and field staff to be trained in proper research experimental design. This could yield benefits down the road in future on-farm research collaborative efforts.
- Another impactful collaboration was with Humberto Blanco, an Associate Professor of Soil Management and Applied Soil Physics. Dr. Blanco was interested in working with the Nebraska On-Farm Research Network to find on-farm research cooperators for a cover crop research

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project. I worked with Dr. Blanco to identify research sites and will continue this partnership to disseminate research results through the Nebraska On-Farm Research Network. This collaboration made Dr. Blanco's research grant proposal stronger and allowed us to successfully obtain funding for cover crop research.

- In 2016 and 2017 the Nebraska On-Farm Research Network collaborated with Dr. Joe Luck and graduate student Rachel Stevens to assist with selection of sites for multi-hybrid planting on-farm research. I have continued to assist with this project by analyzing data, flying fields with a drone, and presenting research results through the on-farm research publications and presentations. This partnership has allowed the on-farm research network to be a part of cutting edge ag technology research that is of interest to progressive growers in Nebraska.
- I also worked with the Agronomy and Horticulture Department Soils Faculty to coordinate the 2017 annual soils tour which was held in southeast Nebraska. As a tour coordinator, I was able to bring soils faculty to several on-farm research field sites to learn about ongoing projects. Such visits pave the way for future collaborative work. The tour and stops were well received, with a senior faculty member commenting "I am very grateful for your successful efforts to make this an outstanding tour; I consider it the best of all that I have been on."

A study of the long-term impact of the on-farm research program was conducted in 2016 and 2017. This study interviewed 40 previous on-farm research participants to document experiences in the Nebraska On-Farm Research Network. Key findings of this study:

- Farmers participating described **positive experiences** in the Nebraska On-Farm Research Network.
- Increased use of new agriculture technologies has made conducting on-farm research **more feasible** and less demanding at harvest, reducing the number of participants who thought about quitting participating in on-farm research.
- Farmers were **interested in all aspects of the research experience**, including project ideation, experimental design, and statistical analysis.
- Those who felt they had a **greater role in developing the project idea** had greater overall satisfaction with the experience, were more likely to implement the research results, and had greater longevity in the program.

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### **3. Briefly summarize, in lay terms, the impact your findings have had, or will have, on improving the productivity of soybeans in Nebraska and the U.S.**

In 2017, there were 18 first time on-farm research cooperators. These individuals were able to work with Extension Educators to learn the process and gain skills to conduct research on their own farms. Currently, studies on soybean populations, planting date, row spacing, SDS seed treatment, and cover crops are ongoing and have great potential to impact productivity long term. Those attending the annual results update meetings in Feb. 2017 represented over 2.4 million row crop acres (producers and crop advisors), with the value of knowledge gained in anticipated practice changes averaging \$8.13/acre. The total estimated value of knowledge gained and/or anticipated practices changes is \$1.1 million for producers and \$18.4 million for advisors/consultants/employees.

Attendees were asked to identify the changes they planned to make based on information from the on-farm research meeting. Responses were open ended, but a pattern emerged. The most common responses were:

1. Reducing soybean planting rates (research shows this results in an estimated \$10.69/acre benefit).
2. Re-evaluating products and only using if there is a return on investment.
3. Integrating cover crops.
4. Making adjustments to nitrogen timing and rate.
5. Conducting more on-farm research themselves, using appropriate research design.

Attendees noted:

*"I appreciated the ability for interactions and dialog with educators"*

*"Nice to have unbiased look at products/management methods"*

What attendees liked best about the results update meetings:

*"Research was done by farmers."*

*There was a "Variety of resources and experiments."*

*"Transparency"*

*"Understanding the statistics behind the findings."*

*"Talking with other producers."*

*"Learning from all the research in the book and by the growers who participated."*

*"Producers talking about their experiences."*

This is a unique program as the farmers participating in the research play a large role in delivering the research information (Figure 2). This is well received by the other farmers in attendance and is often a highlight for attendees. Research has shown this method of delivery is highly impactful and we are proud to offer a venue that delivers information in this unique way.



**Figure 2.** Attendees listen to an on-farm research participant share about his research study.

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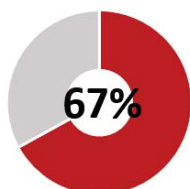
Additionally, attendees noted significant knowledge gained and expected behavior changes.

### 2017 Meeting Highlights

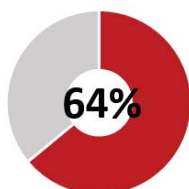
128 respondents

#### Knowledge Gained

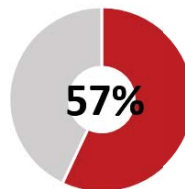
Percentage of respondents that noted moderate to significant agreement that new information was learned about:



How to set up an on-farm research plot.



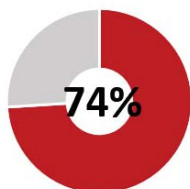
Crop production practices.



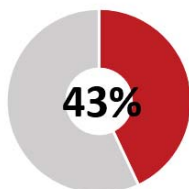
Cover crops.

#### Expected Behavior Changes

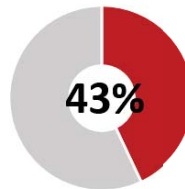
Percentage of respondents that will start or continue doing:



Use statistical significance in making decisions.

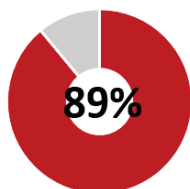


Will continue or expand cover crop use.

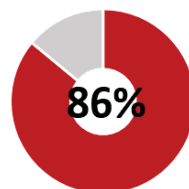


Will make changes to planting population, row spacing, or crop rotation.

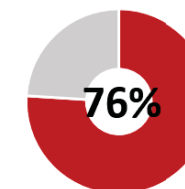
#### General Meeting Responses



Noted the relevancy of the topics was good to excellent.



Noted they will make changes to their operation (consultants noted they would make recommendations for changes) based on information presented.



Noted the networking opportunities were good to excellent.

A study of the long-term impact of the on-farm research program was conducted in 2016 and 2017. This study interviewed 40 previous on-farm research participants to document *actual* behavior changes as a result of participation in the Nebraska On-Farm Research Network. Past on-farm research participants reported that by conducting a research experiment and implementing the findings, on average they were able to save **\$15.43/acre** or gain **\$31.25/acre**.

The increased time, effort, and resources being devoted to this project are building momentum and potential for incredible impact as we move forward.

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**4. Describe how your findings have been (or soon will be) distributed to (a) farmers and (b) public researchers. List specific publications, websites, press releases. etc.**

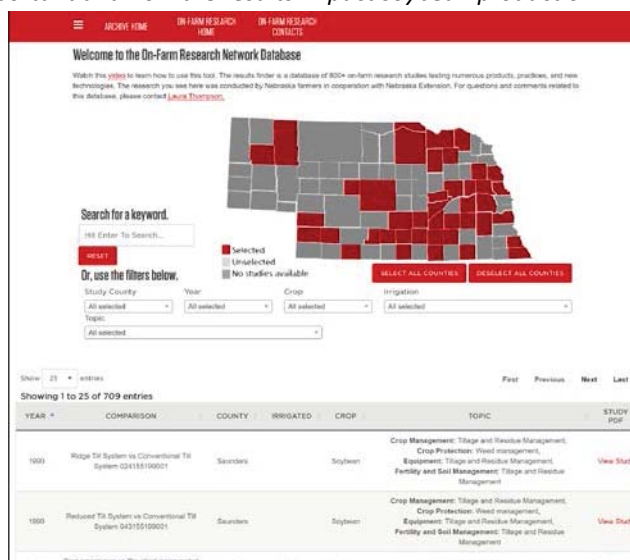
- Results of 2016 Studies were shared at the 2017 Results Update Meetings in Feb. 2017. A total of five locations were planned, with Alliance being added as a new location. Due to winter weather conditions, only 4 meetings were held (Alliance was cancelled). Attendance at all locations was 177, of which 35% were first time attendees.
- 2017 growing season results will be shared in Feb. 2018 at five locations, including Alliance and a new location in Grant.
- The 2016 Growing Season Results book was published as an official UNL Extension publication:  
**Thompson, L.,** K. Glewen, C. Burr, T. Ingram, B. Krienke, D. Krull, G. Lesoing, N. Mueller, A. Nygren, J. Rees, M. Rethwisch, S. Stepanovic, J. Thomas, T. Whitney, G. Zoubek, T. Adesemoye, R. Elmore, R. Ferguson, L. Giesler, J. Luck, J. McMechan, T. Mieno, H. Nemala, J. Peterson, D. Rudnick, C. Shapiro, C. Wortmann, K. Eskridge, J. Crowther, J. Parrish, R. Stevens, N. Arneson, R. Arnold, C. Dunbar, D. Pittman, S. Spicka. (2017). Nebraska On-Farm Research Network: 2016 Growing Season Results (EC3014). (pp. 142).  
<https://cropwatch.unl.edu/OnFarmResearch/2016OnFarmResearchResults.pdf> or  
<http://extensionpublications.unl.edu/assets/pdf/ec3004.pdf>
- Results are also shared digitally through a variety of mediums. In 2017, the on-farm research website (<https://cropwatch.unl.edu/on-farm-research>) was redesigned to better display information and be mobile friendly. The on-farm research website has received over 10,000 views in FY17 (Oct. 1, 2016 to Sept. 31, 2017).
- The 2016 growing season results book was downloaded 250 times.  
(<https://cropwatch.unl.edu/OnFarmResearch/2016OnFarmResearchResults.pdf>)
- Research results are also being shared on Twitter and Facebook.



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- The Results Finder (Figure 3), an online archive of all previous on-farm research studies, was launched in January, 2017 (<http://resultsfinder.unl.edu/>). This archive serves as a searchable, filterable database of over 700 on-farm research studies to date, with an additional 75-80 studies being added annually. Since the launch of this site to the end of FY17, there have been 1,913 views of research studies on this site.



**Figure 3.** The Results Finder, an online searchable, filterable database of all previous on-farm research studies. <http://resultsfinder.unl.edu/>

- Results and information were shared at winter meetings in FY17, including a booth at the Fremont Corn Expo (~280 attendees) and crop production clinics across the state.
- Thompson, L.,** K. Glewen. (2017). Nebraska Extension On-Farm Research Network. Amit J. Jhala (Ed.), (pp. 30-33). Lincoln, NE. Nebraska Extension Crop Production Clinics Proceedings 2017.
- Numerous other professional presentations have raised the national prominence of the Nebraska On-Farm Research Network and disseminated research results to public researchers during FY17:
- Stevens, R., J. Luck, R. Ferguson, L.J. Giesler, K. Glewen, N. Mueller, **L. Thompson**, S. Pitla. 2016. Assessment of Zone and Hybrid Decisions for Implementing a Multi-Hybrid Planting Platform. Presented at: American Society of Agronomy, Crop Science Society of Agronomy, Soil Science Society of Agronomy International Annual Meeting, Phoenix, AZ, 9 November 2016.
- Crowther, J., J. Parrish, R. Ferguson, J. Luck, T. Shaver, K. Glewen, B. Krienke, **L. Thompson**, N. Mueller, D. Krull, T. Ingram, T. Mieno. 2016. Integrating Management Zones and Canopy Sensors to Improve Nitrogen Recommendation Algorithms. Presented at: American Society of Agronomy, Crop Science Society of Agronomy, Soil Science Society of Agronomy International Annual Meeting, Phoenix, AZ, 8 November 2016.
- Thompson, L.,** N. Mueller, N. Arneson, L.J. Giesler, G. Lesoing, J. Rees, M. Rethwisch. 2016. On-Farm Evaluation of Fluopyram as a Seed Treatment for Sudden Death Syndrome (*Fusarium virguliforme*) Management in Nebraska Soybean (*Glycine max*) Production. Presented at: American Society of Agronomy, Crop Science Society of Agronomy, Soil Science Society of Agronomy International Annual Meeting, Phoenix, AZ, 8 November 2016.

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Krienke, B., J. Parrish, R. Ferguson, J. Luck, K. Glewen, **L. Thompson**, N. Mueller, T. Ingram, D. Krull, J. Crowther, T. Shaver, T. Mieno. 2016. Project SENSE: Demonstrating and Encouraging Sensor Based Nitrogen Management. Presented at: American Society of Agronomy, Crop Science Society of Agronomy, Soil Science Society of Agronomy International Annual Meeting, Phoenix, AZ, 8 November 2016.

- Additional presentations to stakeholders:

**Thompson, L.** 2017. Data to Decisions: Using On-Farm Research to Improve Ag Profitability. Presented at: Ag Builders of Nebraska meeting, Lincoln, NE, 7 July 2017.

**Thompson, L.** 2017. Data to Decisions: Using On-Farm Research to Improve Ag Profitability. Presented at: USDA NIFA program leader meeting, Lincoln, NE, 20 July 2017.

Shi, Y., **L. Thompson**. 2017. UAVs in Agriculture. Presented at: Farm Bureau Agricultural Economic and Technology Summit. Kearney, NE. 13 June 2017.

**Thompson, L.** 2017. UAV imagery: Data Processing, Software, and Interpretation. Presented at: Precision Ag Crop Management Diagnostic Clinic. Mead, NE. 2 August 2017.

Thompson, L. 2017. Nebraska On-Farm Research Network. Presented at: Nebraska Ag Tech Association Conference. Lincoln, NE. 2 February 2017.

- A number of articles were written and shared through UNL CropWatch:

Rees, J., **Thompson, L.**, Glewen, K., Zoubek, G., Mueller, N., VanDeWalle, B. (2017). 10 Years of Research Shows Benefit of Reducing Soybean Seeding Rates.

<http://cropwatch.unl.edu/2017/10-years-research-show-benefit-reducing-soybean-seeding-rates>

Mueller, N., Elmore, R., Shapiro, S., Rees, J., **Thompson, L.** (2017). Making Data-Driven Decisions on Soybean Inoculation. <http://cropwatch.unl.edu/2017/making-data-driven-decisions-soybean-inoculation>

Shapiro, C., Krienke, B., **Thompson, L.** (2017). Starter Fertilizer: When is it Warranted? <http://cropwatch.unl.edu/2017/starter-fertilizer-when-it-recommended>

**Thompson, L.**, Glewen, K., Rees, J. (2017). Increase profitability with On-Farm Research. <https://cropwatch.unl.edu/2017/increase-profitability-farm-research>

- Additional articles were shared in state and national ag media:

Rees, J., **Thompson, L.**, Glewen, K., Zoubek, G., Mueller, N., VanDeWalle, B. (2017). 10 Years of Research Shows Benefit of Reducing Soybean Seeding Rates. Tyler Harris (Ed.), Nebraska Farmer. Farm Progress. <http://www.nebraskafarmer.com/soybean/10-years-data-show-benefit-reducing-soybean-seeding-rate> (Reprint)

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**Thompson, L.** (2017). New Online Tool Helps Growers Easily Find On-Farm Research Results.

Tyler Harris (Ed.), Nebraska Farmer. Farm Progress.

<http://www.nebraskafarmer.com/market-reports/new-online-tool-helps-growers-find-farm-research-results> (Reprint)

Mueller, N. (2017). Rethinking Optimum Soybean Populations (Front Page Article in July). Tyler Harris (Ed.), Nebraska Farmer. Farm Progress.

<http://www.nebraskafarmer.com/soybean/rethinking-optimum-soybean-populations>

Mueller, N. (2017). Precision Ag's Rubik's Cube. Tyler Harris (Ed.), Nebraska Farmer. Farm Progress. <http://www.nebraskafarmer.com/crops/precision-ag-s-rubiks-cube>

- A new NebGuide was developed:

**Thompson, L., Y. Shi, R. Ferguson.** 2017. Drones in Agriculture. NebGuide. Accepted.

- On farm research opportunities were shared on Market Journal, Ag Almanac, and Press Releases.

- Interviews:

In 2017 I did a feature on Pure Nebraska sharing the results of soybean seeding rate studies. Additionally, my summer intern did a feature on Pure Nebraska talking about his summer research project using drones to assess nitrogen need on corn following cover crops.

Drones in Agriculture – Above the Ground Benefitting What's in the Ground. Interview by Women and Drones. <http://womenanddrones.com/2016/10/drones-in-agriculture-above-the-ground-benefitting-whats-in-the-ground/>

**5. Did the NE soybean checkoff funding support for your project leverage any additional state or Federal funding support? (Please list sources and dollars approved.)**

Nebraska Extension – Approximate \$40,000 investment in salary and program development.