**Soybean report 1-30-2020**

**South Dakota Soybean Research and Promotion Council**

**Achieving 100 Bu/A soybean yields: on-farm research and sharing high yield protocols with South Dakota soybean producers**

**Principal investigators:** David Clay, 688-5081, [david.clay@sdstate.edu](mailto:david.clay@sdstate.edu), Agronomy, Horticulture, and Plant Science Department, SDSU, Brookings SD; Sharon Clay, [Sharon.clay@sdstate.edu](mailto:Sharon.clay@sdstate.edu), Connie Strunk, [connie.strunk@sdstate.edu](mailto:connie.strunk@sdstate.edu); and Anthony Bly, [Anthony.bly@sdstate.edu](mailto:Anthony.bly@sdstate.edu); Stephanie Bruggeman, Stephanie.bruggeman@sdstate.edu

**Additional Co-investigators:** Peter Sexton, Thandi Nleya, Cheryl Reese, Graig Reicks, Jon Kleinjan, David Karki, Ruth Beck, Sara Berg, Dwayne Beck, Jiyul Chang, Gared Shaffer, and Peter Kovacs

**Advisory board:** David Iverson, David Wright, Craig Converse, Gordon Andersen,

Gregg Carlson, and Kyle Gustafson (Winfield Solutions)

**Executive summary of project**

Increasing soybean profitability in a highly variable environment requires the development of adaptable systems that links advances in crop genetics with an improved understanding of ecosystem functioning and soil health. The proposed project will build the infrastructure where locally-led production and management questions are identified and tested.

Due to poor weather conditions, we were requested to reduce the project funding. Based on this request, we reduced our funding by over 10%. In addition, due to low projected soybean sales, the funding for Soy100 was eliminated. After a meeting with soybean staff members, we decided to continue this meeting.

Related projects are investigating marketing opportunities energy related projects. This last year, team members had several meetings with The Great Plains Institute that are investigating techniques to increase the production of energy produced from plant materials such as soybeans. This team included partners from many different environmental and commodity groups.

Objective 1. Due to poor weather, we had 35 projects cancel. The name and location of these projects are below. In spite of the adverse climatic conditions, 55 projects were conducted in 2019. Many of these projects were associated with collecting information with a UAV. In addition, several projects were associated with prevent plant seeding in fields where soybean seeding was prevented by flooding.

**Cancelled projects due to poor weather**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Location | Treatment | Total Number |
| Drew Beyers | Flandreau | Normal vs. High/Low Population | 2 |
| Darren Fechner | Delmont | Normal vs. High/Low Population | 2 |
| Arne Harstad | Wilmont | Foliar Inoculant | 1 |
| Morgan Holler | Pierpont | Prescription Seeding | 1 |
| Nick Lorang | Davison | Normal vs. High/Low Population | 1 |
| Tyson Martinmaas | Polo | Normal vs. High/Low Population | 2 |
| BJ McNeil | Wessington | Normal vs. High/Low Population | 2 |
| Bud Metz | Peever | Normal vs. High/Low Population | 2 |
| Colin Nachtigal | Hughes | Starter Fertilizer | 1 |
| John Schubeck |  | Treated vs Untreated Seed | 1 |
| Derrick Scott | Geddes | Foliar Fertilizer | 1 |
| Paul Westhoff | Salem | Foliar Inoculant | 1 |
| Pat & Dawn Scheier | Salem | Normal vs. High/Low Population | 2 |
| Pat & Dawn Scheier | Salem | Foliar Inoculant | 1 |
| Brent Greenway | Mitchell | Normal vs. High/Low Population | 2 |
| Josh Kayser | Emery | Normal vs. High/Low Population | 2 |
| Josh Kayser | Emery | Fungicide | 1 |
| Kevin Deinert | Mt. Vernon | Normal vs. High/Low Population | 2 |
| Clint Overseki |  | Normal vs. High/Low Population | 2 |
| Jamie Johnson | Frankfort | Normal vs. High/Low Population | 2 |
| John Schaeffer | Viborg | Fungicide | 1 |
| Craig Converse | Arlington | Normal vs. High/Low Population | 2 |
| Ron Kohls | Roberts | Rye cover crop | 1 |
|  |  |  |  |
| Total |  |  | 35 |

**Current projects**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Location | Treatment | Total Number |  |  |
| Drew Beyers | Flandreau | Foliar inoculant | 1 | Drone | 1 fly |
| Drew Beyers | Flandreau | Starter | 1 |  |  |
| Scott Carlson | Badger | foliar product, Ignite | 1 |  |  |
| Dave Claussen | Miner | fungicide | 2 | Drone | 1 fly x 2 |
| Dave Claussen | Miner | Population | 1 | Drone | 1 fly |
| Craig Converse | Arlington | Emergence | 2 | Drone | 1 fly x 2 |
| Craig Stehly |  | Prevent Plant | 1 |  |  |
| Karl Crymmek | Chamberlain | fungicide | 1 | Drone | 1 fly |
| Karl Crymmek | Chamberlain | Vitazyme | 1 |  |  |
| Karl Crymmek | Chamberlain | Foliar Inoculant | 1 |  |  |
| Chris Fischbach | Warner | Population | 2 |  |  |
| Jim Kettlehut | Chamberlain | Prevent Plant | 1 |  |  |
| Ryan Larson | Garretson | Interseeded Rapeseed | 2 |  |  |
| Mike McCranie | Claremont | fungicide | 1 | Drone | 3 fly |
| Ryan Patterson | Claremont | fungicide | 1 | Drone | 2 fly |
| Cassius Pond | Aberdeen | Population 115,000 vs 145,000 | 1 |  |  |
| Cassius Pond | Aberdeen | Population 145,000 vs 175,000 | 1 |  |  |
| Rich Vande Weerd | Brookings | fungicide | 1 | Drone | 4 fly |
| Paul Westhoff | McCook | norm vs high pop | 1 | Drone | 2 fly |
| Paul Westhoff | McCook | starter fertilizer | 1 | Drone | 2 fly |
| Paul Westhoff | McCook | treated vs. untreated seed | 1 | Drone | 2 fly |
| Paul Westhoff | McCook | rye cover crop | 1 | Drone |  |
| Matt Loewe | Linkin | Variety | 1 | Drone | 1 fly |
| Mike Traxinger | Claremont | fungicide | 1 | Drone | 3 fly |
| Tom Bialas | Mitchel | fungicide | 3 | Drone | 1 fly x 3 |
| Martin Proudy | Hamlin | fungicide | 1 | Drone | 1 fly |
| Blair Arne | Robert | Enlist vs. Enlist + rhizobia | 1 |  |  |
| Blair Arne | Robert | Enlist + Liberty vs Enlist + Liberty + rhizobia | 1 |  |  |
| Blair Arne | Robert | Xtendimax vs Xtendimax + rhizobia | 1 |  |  |
| Blair Arne | Robert | Acifluorfen vs. aciflurofen + rhizobia | 1 |  |  |
| Blair Arne | Robert | Xtendimax vs aciflurofen | 1 |  |  |
| Blair Arne | Robert | Enlist vs. Enlist + Liberty | 1 |  |  |
| Gary Bothe | Brookings | Small plot 30 lbs N vs none - lower landscape | 1 |  |  |
| Gary Bothe | Brookings | Small plot sulfur vs none - lower landscape | 1 |  |  |
| Gary Bothe | Brookings | Small plot 30 lbs vs none - upper landscape | 1 |  |  |
| Gary Bothe | Brookings | Small plot sulfur vs none - upper landscape | 1 |  |  |
| Ross Hanson | Minnehaha | Small plot 30 lbs N vs none - lower landscape | 1 |  |  |
| Ross Hanson | Minnehaha | Small plot sulfur vs none - lower landscape | 1 |  |  |
| Ross Hanson | Minnehaha | Small plot 30 lbs vs none - upper landscape | 1 |  |  |
| Ross Hanson | Minnehaha | Small plot sulfur vs none - upper landscape | 1 |  |  |
| Todd Hanten | Deuel | Small plot 30 lbs N vs none - lower landscape | 1 |  |  |
| Todd Hanten | Deuel | Small plot sulfur vs none - lower landscape | 1 |  |  |
| Todd Hanten | Deuel | Small plot 30 lbs vs none - upper landscape | 1 |  |  |
| Todd Hanten | Deuel | Small plot sulfur vs none - upper landscape | 1 |  |  |
| Bob Speck | Hand | Cover Crop | 1 |  |  |
| Marina Johnson | Milbank | Foliar Inoculant | 1 |  |  |
| Matt Bainbridge | Ethan | Cover Crop w/wo Inoculant | 1 |  |  |
| Todd Hanten | Goodwin | In-Furrow Inoculant | 1 |  |  |
| Total |  |  | 54 |  | 30 fly |

**On-farm undergraduate student problems**

In PS475 students are required to conduct a special problems. This last year, undergraduate students enrolled in PS 475 used on-farm studies for these problems. Individual groups conducted processed the on-farm data and conduct an economic analysis of the different treatments. They are working with SDSU staff and the farmers associated with these projects.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Students | Topic | Farmer | Location |  | Students | Topic | Farmer/ | Location |
|  |  |  |  |  |  |  | contact |  |
| Mitchen Moritz | cover crops | Larson | Garretson |  | Kyla Dendinger | Fungicide | Deepak | Volga |
| Tyler Vogel | and |  |  |  | Taylor Schultz | treatments | Joshi |  |
| Brennan Lewis | soil health |  |  |  | Tye Kost |  |  |  |
| Bradley Berg |  |  |  |  | Tayler Gravos |  |  |  |
| William Brolin |  |  |  |  | Nathan Oberembt |  |  |  |

**Objective 2:** Soil health research reducing costs and increasing yields

For this objective research is being conducted to assess how to document changes in soil microbial community structure. Over the last 6 months, we have developed a method for determining soil microbial community structure, using the PLFA approach. To reduce costs, most of this research is being funded by NREC. In addition to research being conducted on corn fields to assess N, P, and K recommendations we have several prevent plant experiments. A summary of these experiments are below.

In long-term North Dakota no-tillage fields, research shows fertilizer recommendation should be modified by tillage practices. Our research will determine if similar guidelines are appropriate for South Dakota. Many long-term South Dakota no-tillage farmers report that their fertilizer recommendations have decreased. A common perception is that these practices are linked to improved soil health resulting from the adoption of cover-crops and the adoption of reduced or no-tillage systems. In response to this perception, some soil testing laboratories are conducting soil health assessments, the NRCS and the SD Soil Health coalition has been demonstrating the impact of tillage on soil health and resiliency using the rainfall simulator and the buried underwear tests [(http://igrow.org/agronomy/corn/tighty-whities/)](http://igrow.org/agronomy/corn/tighty-whities/), and commercial products have been created that allows farmers to estimate N mineralization [(https://solvita.com/soil/)](https://solvita.com/soil/).

The impacts of cover crops, tillage, and plant diversity on soil and plant health is well documented in the scientific literature. For example, research in South Dakota shows that cover crop management affects the soil biology, and that changes in this biology could affect the surface residue decomposition and fertilizer use efficiency. Changes in the microbial composition are important because different organisms have different responsibilities in the soil. For example, bacteria decompose soil organic materials and release organic acids and siderophores that increase the availability of many nutrients, whereas fungi enhance the transport of nutrients to the plant roots.

Benefits from a diverse microbial community can be integrated into fertilizer recommendations through multiple mechanisms including basing the recommendation on changes in a measured soil property. We will explore if nutrient recommendations should be modified based on the rotational sequence or tillage. We believe that integrating soil health into nutrient recommendations will reduce production costs. In year 1, experiments were initiated at seven South Dakota sites. At this point, all sites have been harvested and the soil sample analysis for water infiltration, microbial community structure, microbial respiration, and initial inorganic N have been completed. We are in the process of analyzing the soil and plant results from year 1. Funds for this on-farm study are primarily provided by NREC and NRCS.

**Objective 3:** Continue on-farm research designed to assess the impact increasing salt concentration and drainage on yields.

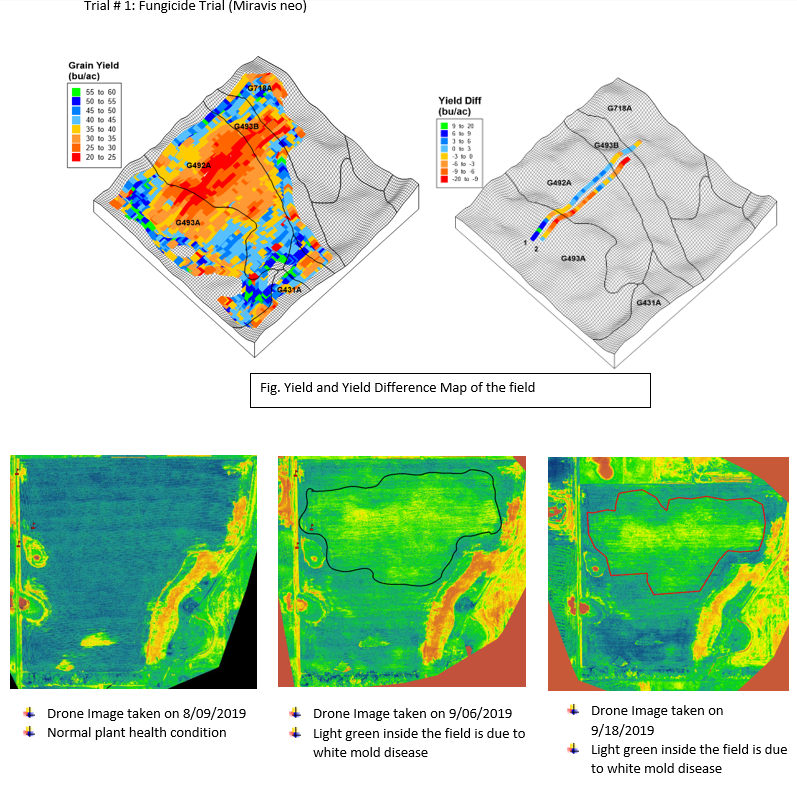
This research was handicapped due to extensive flooding in 2019. To reduce the costs to soybean, additional support was provided by NRCS and USDA-AFRI. In consultation with local NRCS staff members, we selected a site where we are attempting to define the impact of drainage on salinity remediation. In this research, we in collaboration with local NRCS partners collected soi**l** cores to assess subsoil drainage potential in saline sodic soils. Deep soil cores were collected around the tile drains. These cores will be analyzed for chemical and physical characteristics. In the fall of 2017, the subsurface drainage was installed at 1.05 m and 12 m spacing between drain lines at the about 20 ha of the experiment field. We found the tile lines based on the appearance of the soil and crop. In this experiment, we set up 4 different treatments based on hill slope differences that shoulderslope, backslope, footslope, and toeslope.

In each treatment, 20 soil sample points determined to collect from 0-15 cm and 15-30 cm by hand soil sampler in June 2018. Disturbed and Undisturbed depth soil samples (115cm×7.5cm) collected by hydraulic driven soil samples after harvest (November 2018). Surface and disturbed depth soil samples analyzed for EC1:1, pH1:1, Na+, and soil texture (Table 1 and 2). These soil samples were ground air-dried and ground to pass through a 2mm sieve. The 1:1 soil water extracts were used to measure EC1:1 and pH1:1 with a EC meter and pH probe (Thermo scientific, Fisher scientific), Na+ was measured with neutral ammonium acetate by Jenway model PFP7 industrial flame photometer. After soil organic matter was removed from soil sample using hydrogen peroxide (H2O2), soil texture was analyzed by the hydrometer method. At additional sites, we are tracking changes in soil EC and apparent exchangeable sodium contents in tile and no-tile drained fields over time.

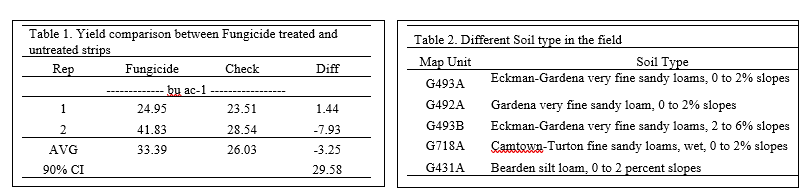
**On-farm project reports.**

We are in the process of analyzing data from 2019. Several reports are provided below. This last year many farmers were interested in the effectiveness of different fungicides and if drones could be used to assess problem areas. Several draft reports are provided below.

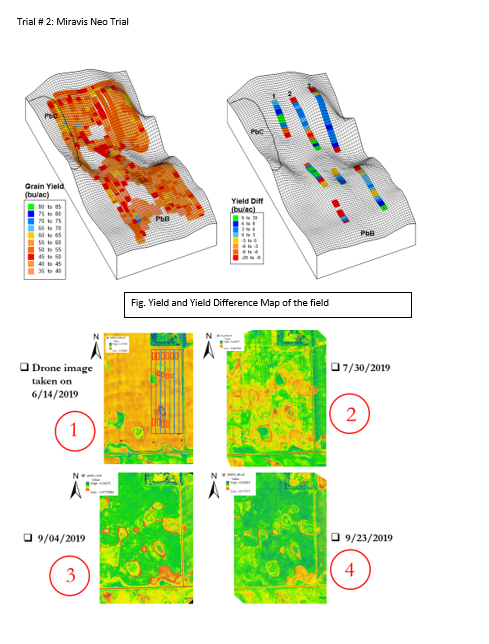
**Methods:** Soybean was planted 160,000 seeds/ac in 30-inch rows. Miravis neo fungicide was applied on 120 feet wide strip at the middle of field. Drone image was collected at 3 different time: 8/9/2019, 9/06/2019 and 9/18/2019

****

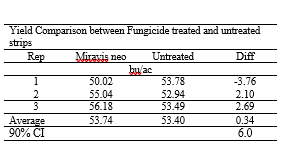
**Results**: In this trial, Miravis neo did not increase yield (Table 1). There was overall decrease in yield by -3.25 bu/ac. This decrease in yield was due to the white mold disease. From the drone pictures at different time, we can see the plant health condition of the field. Drone image shows that most of the center part of the field is affected by the white mold disease. However, this decrease in yield was not significantly different than the check.  More future fungicide trials are needed to better understand their role in SD Soybean production.

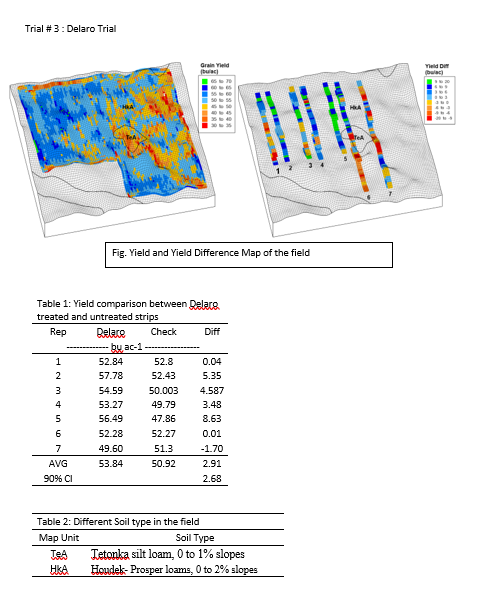


**Methods:** Soybean was planted on May 14, 2019 at 160,000 Seeds/acre in 30-inch rows. Miravis neo fungicide was applied on July 30 at the rate of 8 oz in 90 feet wide strips which was replicated three times. Drone image was collected at four different times: 6/14/2019, 7/30/2019, 9/04/2019 and 9/23/2019.

****

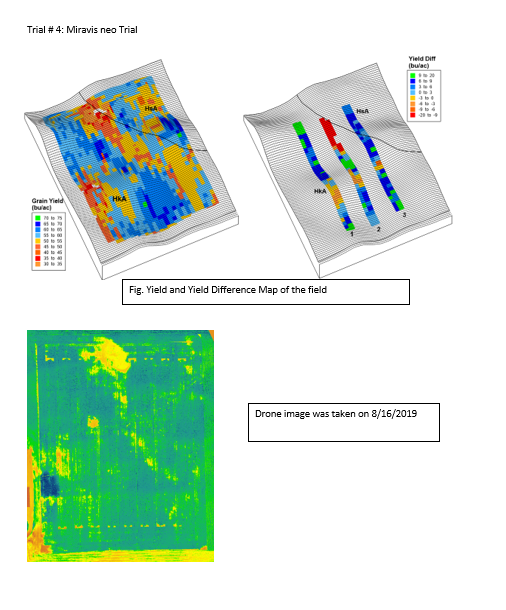
**Results:** Overall there was increase in yield by 0.34 bu/ac. Rep 2 and Rep 3 had increase in yield by 2.10 and 2.69 bu/ac, however Rep 3 had decrease in yield by 3.76 (Table 1). Drone images at different time does not show any white mold incidences however we can see the seed emergence and plant coverage variability along the different landscape of field. More future fungicide trials are needed to better understand their role in SD soybean production.

****

****

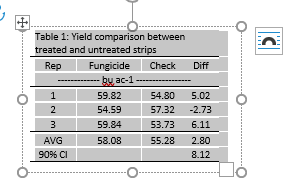
**Methodology:** Soybean was planted on June 16, 2019 at 180,000 Seeds/acre in 30-inch rows. Delaro fungicide was applied on August 3 at the rate of 8 oz in 100 feet wide strips having seven replications. Asgrow 26x8 variety was planted in field.

**Results:** Overall there was increase in yield by 2.91 bu/ac. Except for Rep 7, all 6 remaining replications showed increase in yield. More future fungicide trials are needed to better understand their role in SD soybean production.

****

**Methods**: Soybean was planted on June 18, 2019 at 180,000 Seeds/acre in 30-inch rows. Delaro fungicide was applied on August 5 at the rate of 8 oz in 100 feet wide strips having three replications. Asgrow 26x8 variety was planted in field. Done image was taken once on 8/16/2019.

**Results**: Overall there was increase in yield by 2.8 bu/ac. Rep 1 and 3 had increase in yield by 5.2 and 6.9 bu/ac, however Rep 3 had decrease in yield by 2.73 bu/ac. More future fungicide trials are needed to better understand their role in SD soybean production

****

**Soy100 Planning meeting**

Planning for the 2020 Soy100 is underway. The planning committee consists of David Clay (SDSU), Sharon Clay (SDSU), Adam Kask (SD Soy), Craig Converse (SD Soy Board), Stephanie Bruggeman (Augustana), Anthony Bly (SDSU Extension), David Karki (SDSU Extension), Connie Strunk (SDSU Extension), and Shaina Westhoff (SDSU). The date has been set for Tuesday, March 24, and will be held from 8am to 3pm at the Performing Arts Center (PAC) on the SDSU Brookings campus. Preparations are being made to host, feed, and share pertinent soybean production information with approximately 175 South Dakota soybean producers.

South Dakota Soybean has arranged for Hurley Associates to be the morning keynote and present on markets/economics. Dr. Dennis Todey, Director of the ARS Midwest Climate Hub, is assessing if he is available to present on past weather patterns and on weather expectations for 2020. Dr. Laura Edwards, the SD State Climatologist, has also been contacted in the case that Dr. Todey cannot attend. Dr. Bill Gibbons and Dr. Mike Brown have recommended communicating with Dr. Phillip Kerr on emerging/alternative soybean markets. Depending on Dr. Kerr’s availability and estimated travel expenses, Dr. Gibbons said he would be willing to present on new markets. In addition, SD Soybean is working on contacting the United Soybean Board for interest in sending a representative to speak on new markets. Our Extension professionals will be conducting a panel discussion on best management practices, as well as, answer questions from meeting participants. Breakout sessions in the afternoon will consist of sessions regarding markets, soil health, and agronomic best management practices. See the attached draft agenda.

Expenses for the 2020 Soy100 meeting include rental fee for the PAC, morning coffee, morning rolls, lunch, and meeting supplies. Advertising is taking place via email, social media, SDSU Extension meetings, and Soy100 will be promoted on campus to engage students. SDSU Extension printed advertisement cards that will be distributed at grower meetings and farm shows (ex: Sioux Falls Farm Show) leading up the March 24 meeting. The planning committee is looking forward to continuing this important meeting as a service to South Dakota’s soybean producers.

****