PROGRESS REPORT

PROJECT TITLE: Fertility trials to enhance the learning of future agriculture professionals
PROJECT NUMBER:0000000023
REPORTING PERIOD: Dec 20 2022
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1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. (*Describe project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

GOAL 1 : Have students describe how N rates change yield and corn canopy growth.
GOAL 2: Provide hands-on learning/training opportunities in agriculture to SMSU students.

Pioneer's P9492AM (CM of 94) was planted May 29th with six different rates of N (120, 140, 160, 180, 200, and 240 lbs/ac). All treatments received 60 lbs/ac of P and 60 lbs/ac of K. Each experimental unit was 8 rows wide at 30" spacing, and 60 feet long with a targeted planting population of 33,000 seed/ac. Stand counts were conducted Jun 25th and yield was collected Sept 30th. In order to assess how N rates impacted canopy growth, a Mavic Pro drone has taken aerial photography of each experimental unit on June 8th, 19th, 23rd, 30th, July 6th, 15th, 26th, and Aug 2nd. No further drone images were taken as we determined there was no substantial changes in canopy coverage for at least 3 weeks. Analysis of this aerial imagery took place with the "ImageJ" image analysis software. Weeds were largely kept in check early season with glyphosate sprays and supplemental hand hoeing.

2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT TO DATE.

When looking at the impact of fertility treatment and block on stand counts, neither fertility treatment ($F_{5,15}$=0.87, p=0.526) or block ($F_{3,15}$=0.38, p=0.769) were significant predictors of early season stand counts. While we did have a large early season rain, the corn plants were already in the ground and emerged before any crusting could occur. When looking at the impact of fertility treatment and block on final yields, neither fertility treatment ($F_{5,14}$=1.96, p=0.148) or block ($F_{3,14}$=1.56, p=0.243) had a significant effect.

Table 2. Effect of N-rate on Corn yields

N-rate	Bu per acre ± SE	Tukey HSD Grouping
120	151.44±8.36	a
140	147.13±5.21	a
160	134.42±5.53	a
180	126.46±8.83	a
200	148.41±4.15	a
240	148.83±9.89	a

The final statistical analysis that was completed was looking at how canopy of the corn plants developed in regards to differing N application rates. A table of average canopy closure + SE is presented below (**Table 3**).

Table 3. Effect of fertility treatment on corn canopy closure. No significant ANOVA results ($\alpha<0.05$) were observed within a given week. As canopy development as measured by drone appeared to plateau in weeks 6-8, an average was calculated from the last 3 weeks and analyzed with an ANOVA as well.

N-rate	Week 1	Week 2	Week 3	Week 4
120	2.81±0.70	12.77 ±2.95	30.43±0.93	35.93±1.01
140	3.34±1.17	13.94±2.05	27.87±2.51	34.93±4.16
160	2.53±0.28	12.54±1.53	26.11±2.4	33.12±4.33
180	2.41±0.21	11.80±1.13	27.72±2.42	33.47±3.40
200	2.68±0.45	10.50±0.85	25.15±1.65	30.06±2.14
240	4.00±0.61	9.94±2.95	26.73±1.32	35.00±3.06

N-rate	Week 5	Week 6	Week 7	Week 8	Week 6-8 AVG
120	51.49±1.19	64.11±1.09	72.23±1.90	67.66±2.09	68.00±0.41
140	51.66±3.95	63.51±3.47	68.81±1.14	70.77±1.24	67.69±1.62
160	51.04±5.07	62.19±2.56	70.96±1.12	72.67±1.95	68.61±1.28
180	51.88±3.51	62.59±1.62	74.52±2.88	73.04±0.66	70.05±0.67
200	46.73±3.06	60.62±3.55	73.46±2.89	71.98±2.14	68.69±1.20
240	48.87±2.83	60.44±2.72	72.06±2.42	68.99±1.74	67.17±1.10

When an ANOVA was run on each drone sampling day, no significant differences were observed for any given sampling week. While some weeks had a canopy difference ~5% (weeks 3-5 for example) results were no consistent enough, and we lacked the statistical power for significant results at $\alpha<0.05$

Despite these disappointing results, the field plots were used quite a bit to further student education at SMSU. These results are communicated in section 5 of this report.

3.) CHALLENGES ENCOUNTERED. (*Describe any challenges that you encountered related to project progress specific to goals, objectives, and deliverables identified in the project workplan.*)

The only major challenge we encountered was a delayed planting time frame and occasional down pours which has delayed field operations on occasion. We were unable to get a preplant herbicide out but weeds were kept in check with glyphosate sprays as needed.

4.) FINANCIAL INFORMATION (*Describe any budget challenges and provide specific reasons for deviations from the projected project spending.*)

No budgetary challenges were encountered.

5.) EDUCATION AND OUTREACH ACTIVITES. *(Describe any conferences, workshops, field days, etc attended, number of contacts at each event, and/or publications developed to disseminate project results.)*

Our SMSU field day took place on July 13th this year and drew~70 people. Sydney Walters, the student intern running this project, gave a presentation to all field day goers and communicated preliminary results.

Additionally, in the 2022-23 academic year, the SMSU research plots, **and by extension this study**, received 50-75 unique undergraduate students, which is ~1/20th of the fulltime undergraduate SMSU student body. This demonstrates that the plots can be used to help augment/enhance student learning for ag focused students, and at the least, help introduce non-ag students to agriculture. This brief introduction for the non-ag students may be superficial at first, but it can help lead to a greater understanding of what types of jobs are involved in modern farming. While agriculture focused majors are by far the most common type of student that interacts with the SMSU research farm, I have been able to extend the utility of the plots to other majors and student organizations in the 2022-23 academic year and **communicate preliminary findings of this study** during plot visits. These include:

Biology and Environmental Science majors: who have used the plots for insect collection and for soil health labs

Culinology, Business, and Political Science majors: who have used the field plots to develop the Mindful Meals program (https://www.marshallindependent.com/news/local-news/2022/02/food-for-thought/) in which crops are grown at the research plots, turned into homecooked meals in the SMSU kitchens, and delivered to food insecure children + families on the weekends.

DECA: a business focused student organization consisting of foreign students, who toured the plots as a group activity and learned about US agriculture along with previously funded MNSRPC projects (**Utilization of drone technology as a tool to enhance the agricultural learning of future agriculture professionals** in the 2022 funding cycle)

A dorm event: In which a SMSU RA took their floor and close student friends to the field plots to learn about them as well as how students can use them.