



INNOVATION GRANT FINAL REPORT

PROJECT TITLE: Cover Crops ability to suppress weeds and reduce chemical inputs
 REPORTING PERIOD: Final Report and Invoice due Jan 31, 2020
 Matt Alford-Blue Earth, MN

- 1.) PROJECT ACTIVITIES COMPLETED DURING THE REPORTING PERIOD. *(Describe project progress specific to goals, objectives, and deliverables identified in your project proposal.)*

Yield numbers, soil nitrate levels and soil tests were collected, processed and evaluated.

- 2.) IDENTIFY ANY SIGNIFICANT FINDINGS AND RESULTS OF THE PROJECT. *(This could include photo documentation of the project at various stages if you haven't already provided these as well as final relevant images of the project at completion. Any data analysis (especially Level 3 Grants), graphics or record of observations throughout the growing season or during the field day event are also anticipated.)*

Updated Yield results: After measuring our bins we updated our yield data and corrected yield monitor results. The final yield numbers for the cover crop trial are as follows:

Cover Crop 1 – 225.86
 Control 1 - 225.26
 Cover Crop 2 – 223.29
 Control 2 - 223.35
 Cover Crop 3 – 221.67
 Control 3 - 221.0

Means

Cover Crop w/ no post herbicide application – 223.61bu
 No Cover Crop and full herbicide program (Control) – 223.20bu

	<u>Application & Herbicide Cost</u>	<u>Cover Crop Seed Cost</u>	<u>Yield @ \$3.85/bu</u>	<u>Total \$/Acre</u>
<u>Cover Crop-No Post herbicide</u>	Pre - \$12.75 App. - \$7.00	-\$20.50/acre	223.61x3.85 = \$860.90	\$820.65
<u>Control</u>	Pre - \$12.75 Post - \$13.31 App. - \$14		223.20x3.85 =\$859.32	\$819.26

This year's project echoes the results of the 2018 trials. The cover crops more than held their own in both terms of profit/acre as well as providing weed control. I have documented a 0.6-1.1 bushel gain from interseeding from multiple replications all across our farm. While this alone does not pay for the seed costs, I believe the many other benefits do.

One of the immediate returns you see from cover crops is weed control. I am now confident that if no weeds are emerged and I can seed cover crops early (V3-V5) then I can skip my post-emerge herbicide application. Cover crops in this type of scenario not only “cash-flow” year to year, but provide multiple soil and environmental benefits as well. A herbicide is really only a single year type of investment. You really do not see long term benefits to using a herbicide multiple times per year. Cover crops on the other hand not only provide immediate results, but also bring benefits for years to come.

Soil Nitrate tests had the exact opposite result of what I was expecting. The table below displays the average values for each treatment. The lbs. of subsurface nitrate are the only test I included in my initial proposal, but as the season progressed, I thought it would be very interesting to see the results of a Haney soil test comparing the cover crop treatment to no cover crop. The VAST is an aggregate stability test, CO2 burst is a measure of the respiration of microbes in the soil sample, WEOC is water extractable organic carbon and the estimated N release is a value calculated based on the Haney test. It was very interesting to see the CO2 burst, aggregate stability and WEOC numbers higher in the cover crop portion

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	lbs Subsurface Nitrate	VAST %	CO2 Burst	Organic N	WEOC	Estimated N-release
Cover Crop	25.6	39.7	56.4	28.5	89.83	42.9lbs
Control	16	36	19.65	25.5	87.5	37.5lbs

I was disappointed in the results of the subsurface nitrate test. I do have a theory as to why I believe the results ended the way they did. The annual ryegrass is the primary nitrogen scavenger in my interseed mix. It has a lot of root biomass that go deep into the soil. In the trial portion of this field I had very high earthworm activity and even observed them pulling corn leaves into middens as they were still attached to the plant. The cover crop growth before the canopy opened up is pictured to the right.



I went back to pull my soil cores on October 4th and almost all of my ryegrass was dead and had also been pulled into middens (picture at bottom right). I am still not sure why it died, but I have since talked to others who have had similar problems. This was only in certain portions of the field, but it was especially pronounced in the area my trial was located due to a history of cover crops on that ground. The picture below shows what the cover crop looked like at the end of the season after the ryegrass was gone. The brassicas took off and still provided some groundcover.



I believe that the annual rye grass had gathered a good portion of nitrate, but because it died and was “consumed” so rapidly that nitrate showed up on my soil tests. This is only a hypothesis. If the rye grass had not died off I believe we would have seen a significant reduction in soil nitrate.

Overall, I was very pleased with how things turned out this year. I am confident that cover crops can suppress weeds and improve soil function simultaneously. In 2020 I plan to employ this at field scale. Where weather allows, I will spray pre-emerge only and then interseed at V3-V4 while simultaneously side dressing nitrogen. This project has given me the confidence to do this on a large scale. I again thank you for the opportunity to conduct this research and learn along the way. I have really enjoyed working with you! Thanks!

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

4.) EDUCATION AND OUTREACH ACTIVITIES. *(Describe any opportunities to engage with farmers, influencers or the media about your project.)*

5.) HOW CAN WE HELP? *(Please let us know how we can improve the experience for the next generation of projects.)*

Attached are the two invoices required for this years project. The sub surface standard nitrate tests for \$48.00 was the only test I had included in my proposal budget. I paid for the Indicator Haney tests myself. The rest was the balance on my Hinker Cover Crop Delivery System. The total I requested in my proposal was \$4484. If you need anything else or have any other questions let me know. Thank you!

2019 Next Level Laboratories Analysis

- Soil Nitrate Tests \$4.75 x 6 tests-\$28.50
 - (3 controls & 3 cover crop applied blocks)

- **Total Analysis Costs=\$28.50**

In 2018 I received \$7,000 towards the purchase of the Hiniker Seed delivery system. \$4,455 was the amount that I personally paid to purchase that unit in 2018. For the 2019 Innovation Grant I am requesting the remaining portion of that as well as the cost of the soil nitrate tests. The total requested for 2019 is **\$4483.50**. The additional soil test cost I paid for myself.