Final Report
Awarded/ Project Period 5/5/2020-3/24/2023

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| Entity Name: | Allamakee Soil and Water Conservation District |
| Project Title: | Interseeding Cover Crops into V4-V7 Corn |
| Agreement Number | NR203A750013G007 |
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## 2. Project Summary

The Allamakee SWCD Board applied for a grant through CIG to interseed cover crops into V4-V7 stages of corn. The idea behind this was to allow cover crops time to establish prior to corn canopy. The cover crop would then go dormant from being shaded out and then restart growth once the corn was harvested. We decided to try this because there has been a lack of cover crop establishment success in the fall in Allamakee County due to the short seeding window following the commodity crop harvest. Frustration among producers lead to trying new practices. We tried aerial seedings with limited and inconsistent success.

Many different seeding methods were used including, conventional drill, no till drill, no till planter, Gandy air seeder, and broadcast spreader. Each grower chose from four different seed mixes including species such as rye grass, buckwheat, brassica, and cow peas. A minimum of four replicated strip trials were completed at each site. Producers were also given the option to plant up to 50 extra acres beyond the plots for added cost share. The main components of the project evaluate yield, cover crop biomass, cover crop nutrient uptake, soil microbiology, and soil loss. Temperature loggers were installed in interseeded and non interseeded rows to gauge season long differences in soil temperature. Haney soil tests will be run for every producer and if they continue for multiple years will be used again to gauge any soil health improvements.

Cover crop biomass was measured monthly starting at the beginning of July and continued through October. Yield checks were done at harvest time and Haney tests were also done on the ground each year after the crop had been harvested.

## 3. Project Goal

The goal of the project was to allow cover crops to establish prior to corn canopy. After canopy, the cover crop can go dormant from being shaded out and then restart growth once the corn is harvested. A few local producers have experimented with interseeding cover crops into V4-V7 corn to get it established before the corn canopies. The interseeded cover crop goes dormant when it gets shaded out and then begins growth after the corn is harvested. These producers have created their own interseeding setups with mixed results but continue to innovate. The variability in success is partly due to shade tolerance of the species planted. Access to a dedicated interseeding rig would likely increase the success of this method and create more consistency between fields. Research has shown that interseeded cover crops seeded after V3 generally do not negatively impact corn yield. (Carlson, 2015: Curran, et al, 2018) Interseeded cover crops can get established while the corn crop is growing, giving them a head start once the corn is harvested. The earlier seeded increases the options for species and mixes. Increasing diversity of associated microbes belowground.

## 4. Project Background

Numerous studies have documented the benefits of cover crops including cycling nutrients, reducing soil erosion, improving aggregate stability, increasing microbial diversity, and suppressing weeds (Clark A., 2007). One barrier to more widespread cover crop adoption is the short timeframe in the fall for cover crop seeding. In recent years, heavy fall rainfall has delayed commodity crop harvest which pushed back cover crop seeding until after the recommended seeding deadline (from NRCS) for winter-hardy cover crops. Many producers in Allamakee County, Iowa have tried aerial application (Airplane) in late August or early September with highly variable success due to dependence on timely rainfall and drift issues in many of the strip-cropped fields. These issues have caused most producers to discontinue this method. This has sparked the interest in seeding the cover crops earlier in the year such as the V4-V7 stage of corn which is around June for Allamakee County. This would allow the cover crops to start growing and go dormant and then after the crop is removed to begin growing again. With the hopes of having an established cover before the winter months. By August most of the beans are starting to leaf drop and the corn is starting to dry down which helps the cover crop to get more sunlight and by September the crops are starting to be harvested. Due to the colder weather that comes a the end of September and into October usually by the end of October the biomass has started to die off.

## 5. Project Methods

Many different seeding methods were used including conventional drill, no till drill, no till planter, Gandy air seeder, and broadcast spreader. Each grower chose from four different seed mixes including species such as rye grass, buckwheat, brassica, and cow peas. The cover crop would be seeded in V4-V7 stage of corn which would be in June for our County. A minimum of four replicated strip trials were completed at each site. Each plot was seeded into 30” rows and the second and third years producers experimented with 60” rows which seemed to be more successful in terms of producing biomass The main components of the project evaluate yield, yield data was collected right before harvest of the test plot, cover crop biomass, Which was measured once a month from July through October, cover crop nutrient uptake, Which was evaluated after the last biomass sample is taken and dried and submitted to WARD laboratories for plant analysis, soil microbiology, and soil loss. Temperature loggers have been installed in interseeded and non interseeded rows at 2 inches of depth and set to record temperature every hour to gauge season long differences in soil temperature. Haney soil tests will be run for every producer and if they continue for multiple years will be used again to gauge any soil health improvements. In reviewing the data from the last three years of soil tests there seem to be no significant differences that have been shown between seeded and non-seeded areas.

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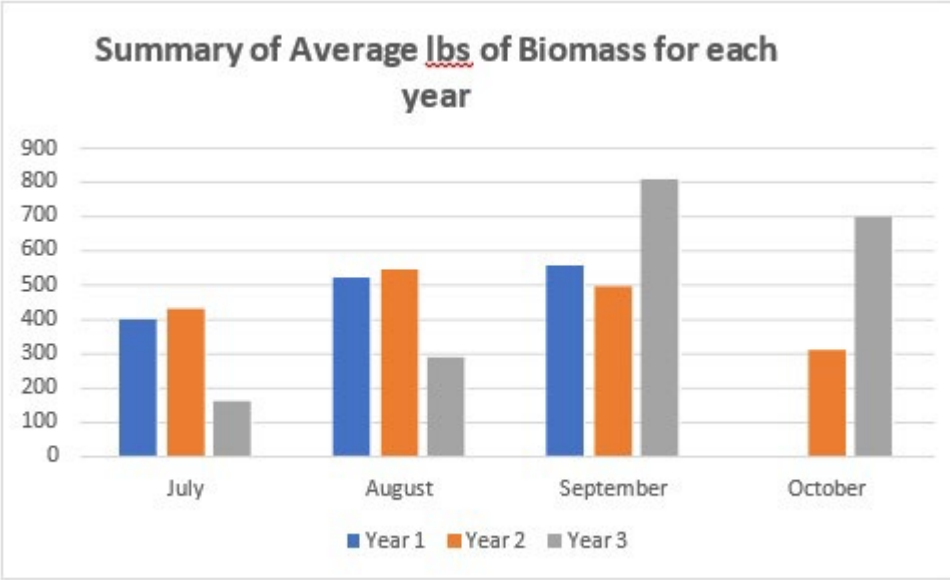
6. Project Results

## Biomass Data

Biomass samples were collected once a month starting in July and going through October. The samples were then dried down and weighed to figure the average pounds per acre of biomass. In year one we saw a drastic increase from July to August. However in September the buckwheat seeded out and died. The brassica species then became the highest producers of the biomass. In the first year October biomass does not show any data due to the seedings being almost completely died out.

The second year of biomass results there was a significant increase from August to September. The struggle for us this year was that in October we had the misfortune of an army worm infestation that completely over took 4 of our sites so we were not able to get data for 1/3 of our plots for the month of October. A couple of the producers also tried 60" twin rows this year and had very successful biomass amounts. The sunlight was able to reach the cover crop for a longer length of time.

In year three we had the greater increase in biomass occur during the July to August time period much like year one. Usually by the end of September the cold is setting in and the cover crops are dying off. In this year all of the producers involved did at least 3 to 4 species in their mixes.



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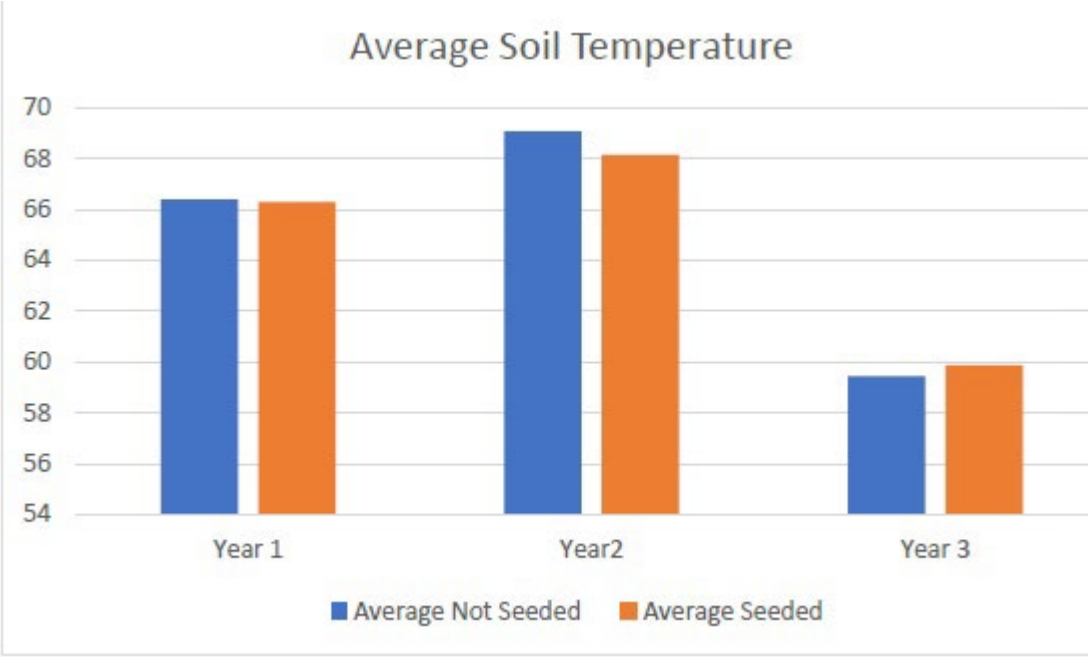
## Soil Temperature

Soil Temperature probes were installed in all of the plots as soon as they were seeded. They were installed at a 2 in depth and set to record every hour during the growing season. They were included in the seeded and non seeded parts of the test plot. The data in the 3 years shows that during the warmest summer months the seeded soil was kept slightly cooler overall in parts of the plots that were seeded with cover crop.

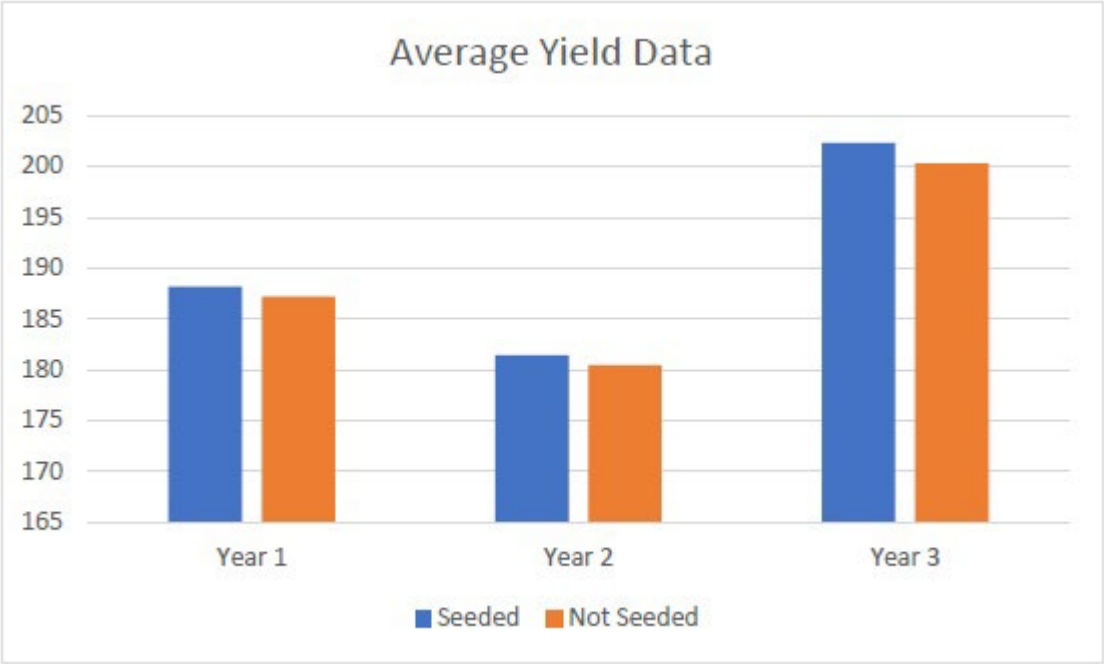
Soil temperature data showed the plots seeded with cover crop kept the soil slightly cooler with fewer extremes in temperature




## Yield Data

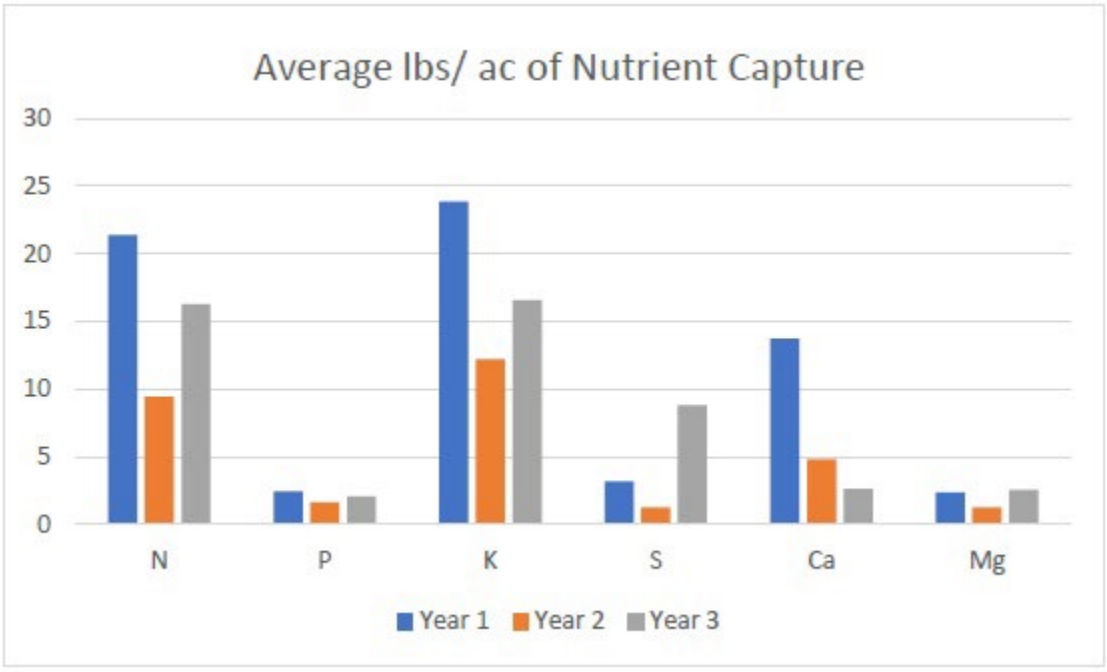
Yield data was taken right before harvest each year. The average yield did not differ by much in either of the 3 years but it did show that the seeded areas yielded slightly higher all 3 years than the non seeded areas. This would disprove the original thought of seeding the cover crops in with the corn would hurt the yield of the crop.

Data from year one of the trial showed no significant difference in yield with the average of seeded plots being 188.2 bu/ac and the control plots showing 187.2 bu/ac. Data from year two shows no significant difference in yield with the average of seeded plots being 181.4 bu/ac and the not seeded plots showing 180.4 bu/ac.The final year also showed no significant difference in yielf with the average seeded plots being 202.3 bu/ac. and the not seeded plots showing 200.3 bu/ac.




## Cover Crop Nutrient Capture

Results seemed to follow biomass closely with higher biomass numbers capturing more nutrients. The cover crop was able to capture Nitrogen and Potassium in higher amounts to keep it from leaching.



**Haney Test**

Haney soil tests did not show a significant or consistent difference between interseeded and control plots. There were many different herbicide programs used by producers in the project with varying success. Plots with the fewest weeds used glyphosate paired with residual products one week to one month prior to interseeding. Examples of successful products include: Resicore, Atrazine, Triple Flex, Ravine, and Outlook to name a few.

## 7. Project Outputs

**Field Days**:

**July ,28, 2020- Mark Stock and Aarik Deering Farms**

This field day was a tour of the 3 farms to discuss with the producers the types of seeders they had used for the first year and how the farmer thought that it went. People in attendance were able to ask questions and walk through some of the plots to see how the cover crop was growing and the different types of seeding and how they were doing. There were 13 attendees at this field day.

Pictures to left is Mark Stock with his custom airseeder. It was constructed from a Gandy air seeder box and a cultivator tool bar with single disc fertilizer openers¶

Picture to the left is Aarik Deering case 5400 3 point no till drill. Coop spread his single species mix with Urea.¶

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**September, 2020- Brady Kruger 20 people were in attendance**

There were several field days that were held over the 3 years of the Grant period. The first year Brady Kruger hosted the field day in September after the cover crop had a few of months of growth to show producers his plots and also discuss with what he thought worked and what didn't. He discussed that in the second year he would like to try a side by side plot of 30" rows and 60" twin rows to see what would have better success.

**Brady's** Monosem twin row no till planter (vacuum plate planter) had trouble due to large range in seed size. Used it to plant the buckwheat but had to Atv broadcast the other 2 species in his mix.

**March 31, 2021 Brady Kruger Field**

A small field day/meeting was held March 31st to get producers together to discuss what was learned in 2020 and what was new for 2021. One of the producers showcased his additions to his interseeding equipment and his own plans for this year.

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**July 28, 2021- Tom Mellicks, Roller Crimper Field Day**

The Roller Crimper Field Day was hosted to demonstrate Dawn Equipment's individual row crimper. It showed producers a smaller roller crimper for our steeps slopes was better and less variable than the wider roller crimpers on our steeper slopes. There were 18 participants and of those one beginning farmer and one individual who had never worked with us before!

**February 2, 2022-** Meeting at the Bank for informational meeting for Spring Seeding-11 producers were in attendance. This meeting was our annual meeting to review last years results and the previous years changes that may be made.

**September 2, 2022 Field Day Brady Kruger and Don Elsbernd**A field day was held on September 2,2022 to show the 30" and 60" rows and the current biomass growing. Brady Kruger hosted the field day and showed how he seeded his cover crop and also Don Elsbernd brought his seeder to show the group as well. Brian Dougherty, ISU Extension, spoke about input reduction potentials with emphasis on cover crop. He also discussed weed control utilizing cover crops and some economic data in terms of money savings that could be realized through soil health practices. Brady discussed what he was

doing interms of interseeding and his thoughts on the advantages of the interseeding in terms of weed control and fertilizer placement. The speakers were followed by a group discussion of what was and wasn't working with the entire group.

Seeder above is owned by Brady Kruger it is what he used to seed his 2022 diverse cover crop mix into his 30" and 60" rows

Picture to the right is Don Elsbernds Seeder

Picture to the left: Brady Kruger standing next to his 60" rows and discussing with other producers his seeding types and what his herbicide methods were.

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**December 13, 2022**- Bank Final Wrap up of all 3 years. 21 people in attendance
Brian Dougherty presented on soil health along with Neil Sass, NRCS Soil Scientist, and Alisha Sedlmayr, Soil Health Specialist. Producers discussed the last year of the project and additional ways to help improve soil health.


Articles:

**Interseeding Cover Crops Early Could Solve Fall Establishment Issues**
**by Jason Johnson, State Public Affairs Specialist**
*November 2020*

New Grant Awarded
By Don Elsbernd, SWCD Commissioner, Allamakee SWCD Newsletter 2020
Article Links

https://www.farmprogress.com/cover-crops/try-interseeding-cover-crops-early

https://waukonstandard.com/articles/2020/07/22/local-organic-farmer-reduces-erosion-and-improves-soil-health-through

https://waukonstandard.com/articles/2020/11/18/interseeding-cover-crops-early-could-solve-fall-establishment-issues

https://waukonstandard.com/articles/2020/07/01/project-promotes-interseeding-cover-crop-establishment

https://waukonstandard.com/articles/2020/04/29/allamakee-county-soil-and-water-conservation-district-awarded-grant-funding

https://waukonstandard.com/articles/2020/06/10/waterville-area-farmer-uses-alternative-farming-practice-improve-soil

https://waukonstandard.com/articles/2020/09/30/using-drone-plant-cover-crops

https://waukonstandard.com/articles/2020/08/12/local-farmer-utilizes-cover-crops-prevent-soil-erosion-and-additional-forage

2020- there were 2250 newsletters that were sent to producers
2021- there were 2200 Newsletters that were sent to producers
2022- there were 2200 newsletters that were sent to producers

**8. Project Impacts**

**The Allamakee SWCD's goal was to help farmers apply cover crops into V4-V7 stage of corn. In doing this the cover crop is already growing before the harvest has even started therefore keeping the soil erosion down on the ground that it has been planted on. This also helps keep some of the nutrients in the ground over winter.**

Projects that had on the ground activity:

- 569.3 total acres impacted
- Cover Crop 340 practice implemented

For Projects related to behavior change

- 17 Producers were involved in the 3 year project
- About half of the producers who did the trials plan on continuing to experiment with the cover crops seeded in V4-V7 stage of corn.

For projects involving Historically Underserved Producers:

- 3 HU Producers
- Beginning Farmers