

**Minnesota Department of Agriculture
Sustainable Agriculture Grant Program - Annual Progress Report**

**Soil Health Research in Southwest Minnesota
2015 Annual Report**

SECTION I. NARRATIVE

A. PROJECT SUMMARY

This project will provide the opportunity to measure changes in soil fertility and soil health through the use of the Haney Soil Health Test and the Nitrate Soil Test. These tests would be used to provide a dataset with which to analyze the impact of cover crop management and provide sufficient data points to statistically analyze the impact of that management. In addition, project partners will work together to host a field day at the end of the grant period. This field day will provide an opportunity to have a model of managed cover crops and measured impacts on known indicators of soil health and fertility. This grant effort provides the opportunity for first-hand, measurable results in southwest Minnesota. Having this data will provide southwest Minnesota farmers with data that will assist them in determining how cover crops can be implemented in their farming operation and how cover crops can help improve water quality in local streams.

B. PROJECT DESCRIPTION

Jerry and Nancy Ackermann: We have been farming for 38 years and are extremely active in on-the-farm research and test plots. The farm is a 1,050 acre crop rotation of corn, soybeans, and alfalfa. For the past eleven years, the landowners have incorporated 350 acres of no-till soybeans and 350 acres of strip-till corn in the crop rotation. The alfalfa crop is a cash crop and is used in nutrient management for alfalfa-corn rotations.

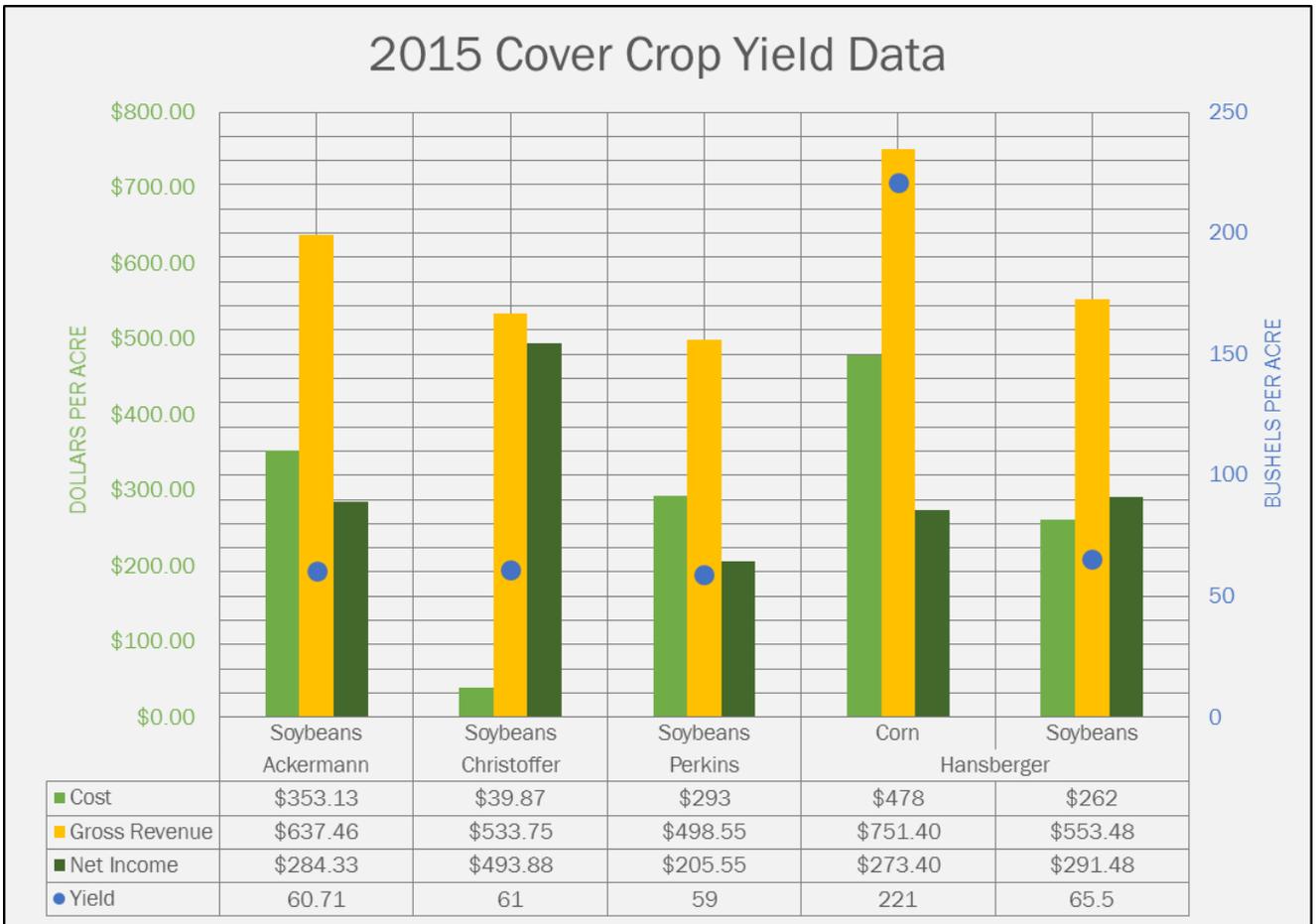
The farmers identified in this grant are working in partnership with the Heron Lake Watershed District (HLWD) and Extended Ag Services, Inc. on an Environmental Protection Agency (EPA) 319 grant. Through the EPA 319 project, each farmer established 50 acres of cover crops. Tillage transects, infiltration measurements, and soil samples are taken to gauge cover crop success. We are aware that cover crops reduce erosion, decrease soil compaction, increase water infiltration to prevent runoff, bring leached nitrogen back to the root zone for the following year's crop, increase organic matter, and provide habitat cover. We are unaware of any first-hand data about cover crop effects on soil fertility and soil health for southwest Minnesota. The need for first-hand data about cover crop effects is the main reason we applied for this grant.

From each 50-acre field, Andy Nesseth, Extended Ag Services, Inc. will collect six to ten total soil samples. In addition to the six to ten samples, three "control" samples will be collected for comparison purposes. The three control samples will include: 1) A non-ag site with grass cover. This will give us an idea of where we want to be. 2) An ag site with a history of no cover crops. This will give us an idea of where we started. 3) Samples from four fields with three to five years cover crops history. These samples will give us an idea of long-term results of cover crop management.

We plan to get a better understanding of biological activity with the Haney soil test. These test results will be compared it with conventional soil tests over a three-year period to analyze the soil health using cover crops. This project is also giving us the opportunity to incorporate more acres of cover crops on our farm, which is giving us the confidence to continue to increase and implement cover crops.

We strongly believe that promotion of cover crops is dependent upon presenting measurable results.

C. RESULTS

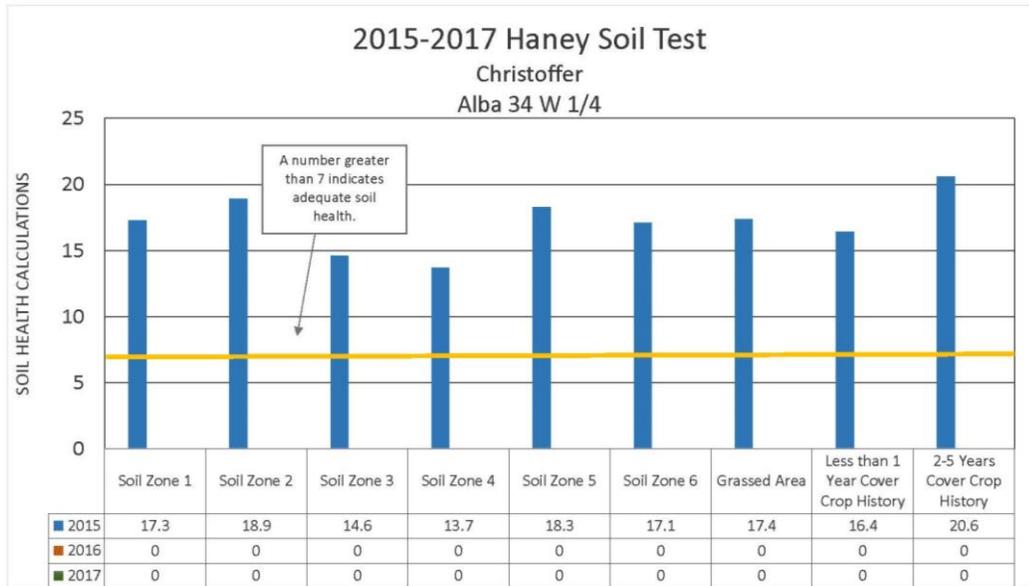


We received six inches of rain in a ten-day period after harvest. Where cover crops have been used there was no ponding of water, even on the rows that were heavily trafficked with trucks and grain carts. Neighboring fields that had been tilled were showing ponded water on top of tillage that had been done to relieve compaction.

Haney Soil Test Results 2015

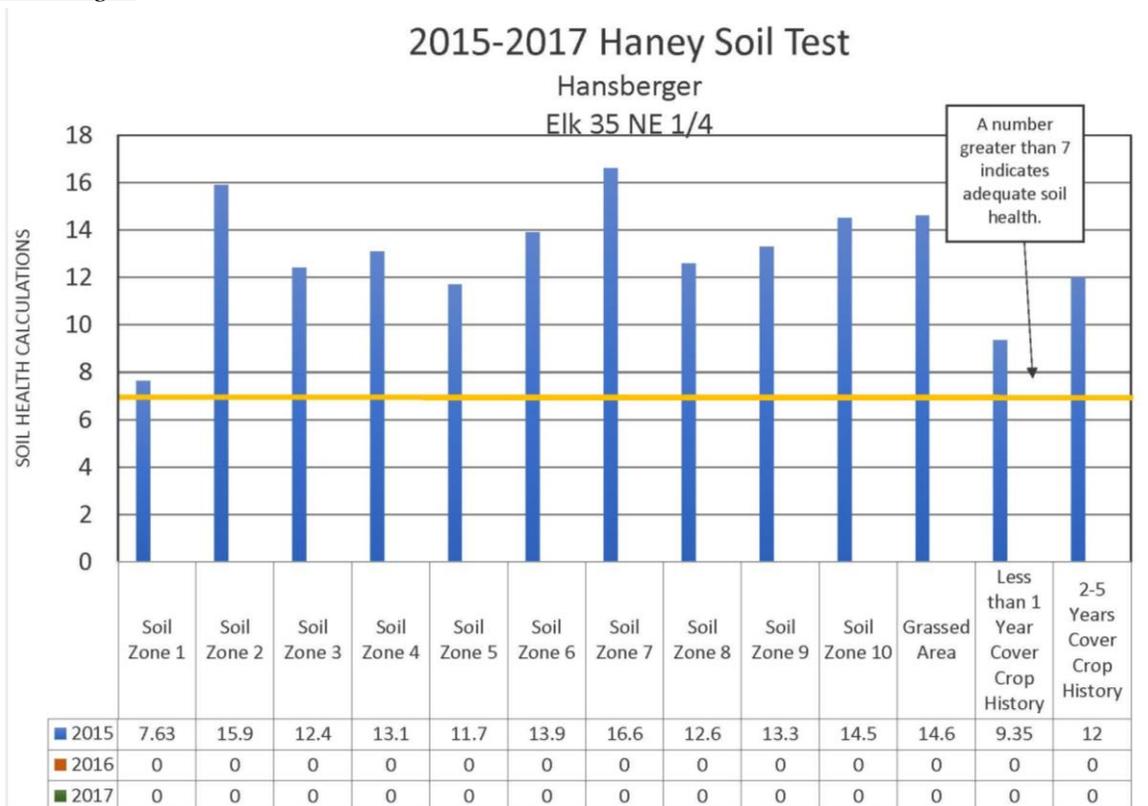
In November 2015, Andy Nesseth, Extended Ag Services, took Haney Soil Test Samples for each of the four sites. Each field had 6-10 soil zones along with three control sample zones. These control samples included a grass covered site, a site with no history of cover crops, and a site with three to five years of cover crop history. Results were submitted to MVTL on November 18, 2015 and November 23, 2015. Several samples were analyzed to give an overall “Soil Health Calculation”. This calculation gives an idea of adequate soil health. A number greater than 7 indicates adequate soil health.

Christoffer



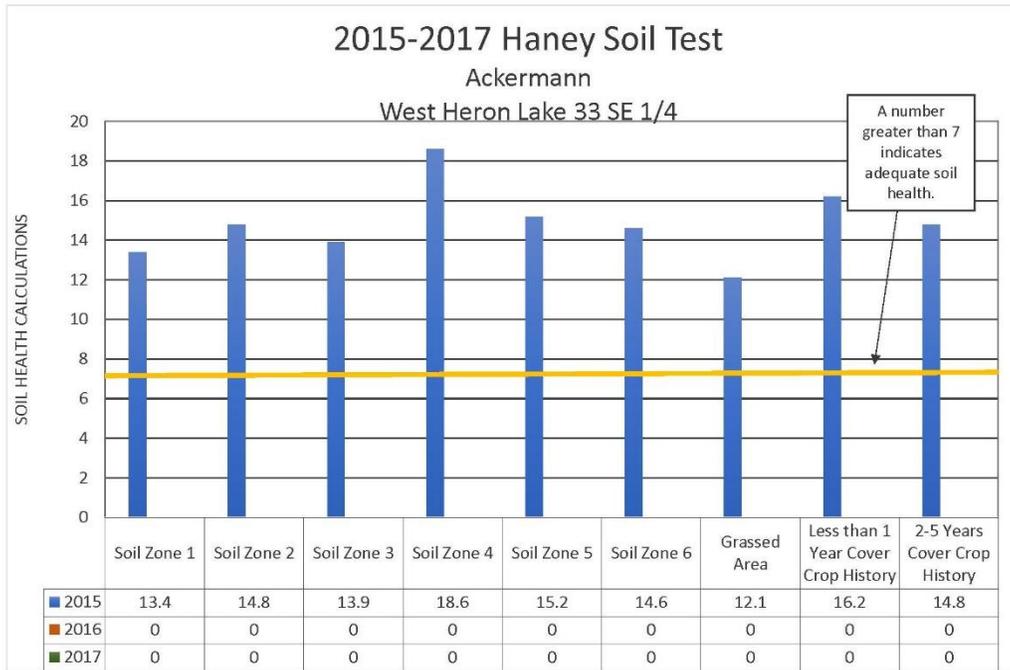
All six soil zones had a soil health calculation above 7, with an average of 16.7. The control zones showed that the grass covered area was at 17.4 and the highest soil calculation zone was 20.6 for the field with 2-5 years of cover crop history. The lowest calculation was 16.4, for the less than one year of cover crop history.

Hansberger



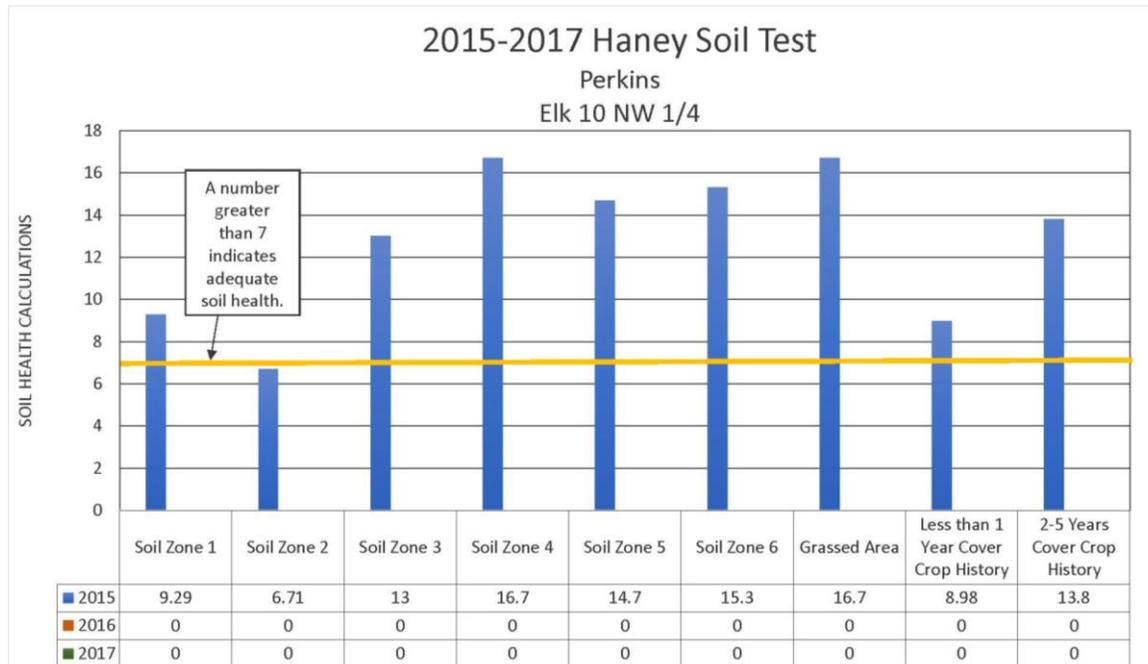
All ten soil zones had a soil health calculation above 7, with an average of 13.2. The control zones showed that the grass covered area was at 14.6 and had the highest soil health calculation. The lowest control sample calculation was 9.35, for the less than one year of cover crop history.

Ackermann



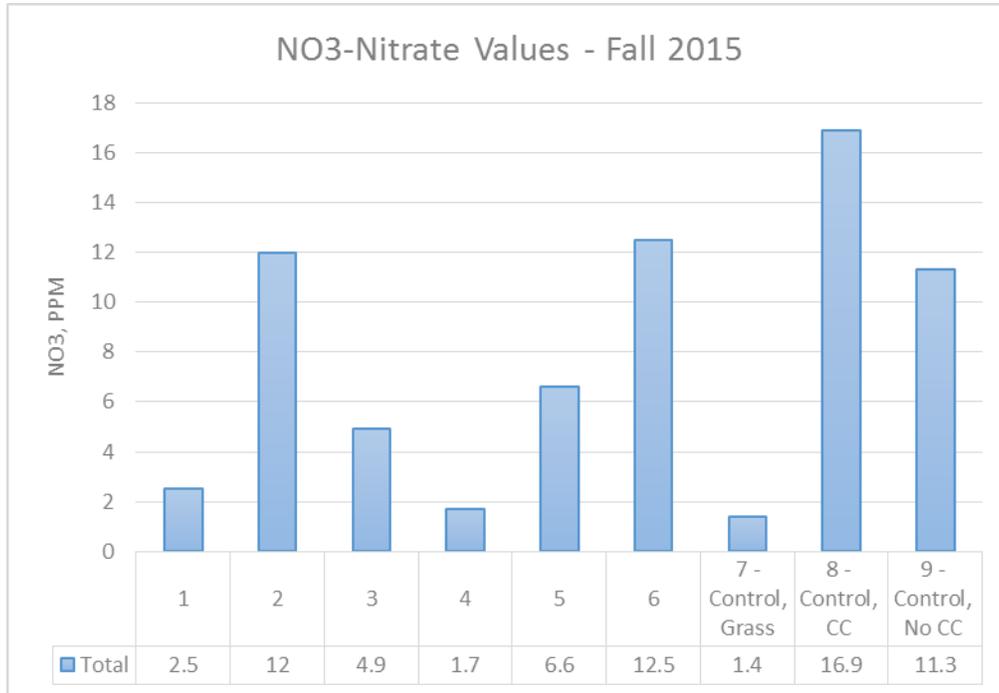
All six soil zones had a soil health calculation above 7, with an average of 15.1. The control zones showed that the grass covered area was at 12.1 and the highest soil health calculation was on the field with the less than one year of cover crop history. The control sample calculation for the field that had 2-5 years of cover crop history was 14.7.

Nitrate Soil Test Results 2015
Perkins



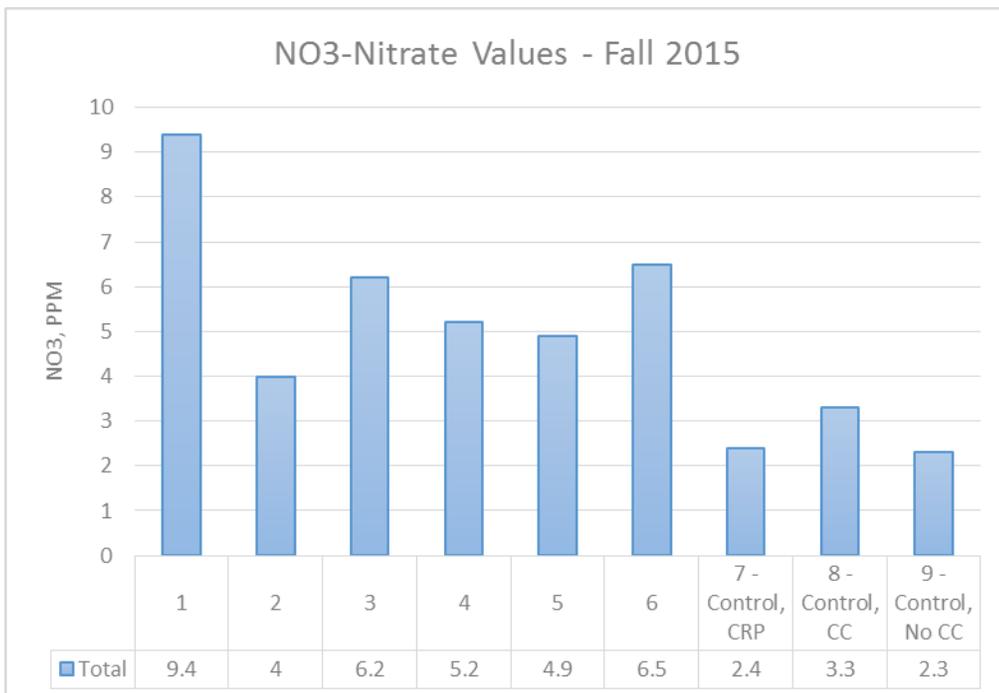
All six soil zones had a soil health calculation above 7, with an average of 12.6. The control zones showed that the grass covered area was at 16.7 and the highest soil health calculation. The control sample calculation for the field that had 2-5 years of cover crop history was 13.8 and the field with less than a year of cover crop history was 8.98.

Christoffer



Nitrate values are expressed as parts per million (ppm) and were taken from 0-6". Values are extremely variable across the zones which is typical for nitrate sampling. Zones 1-6 all had a successful cover crop mix established in August 2015 and persisted with a favorable fall. Overall values are lower than what was expected for fine-textured soils with high organic matter in a corn following soybean rotation. It was unclear if some nitrate was immobilized in the cover crop plant matter.

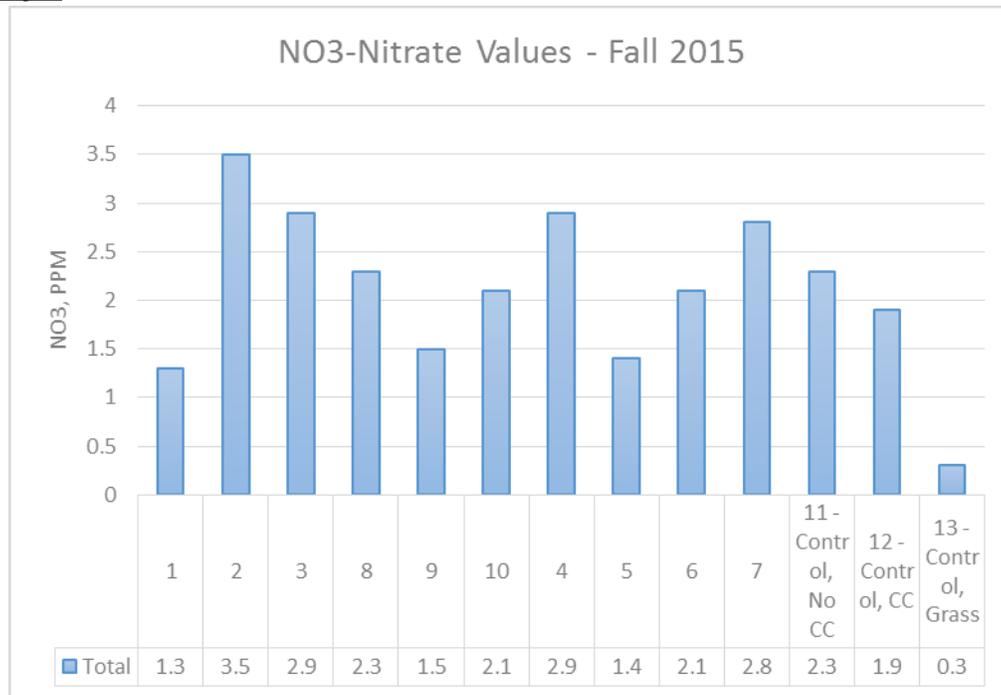
Perkins



Nitrate values are expressed as ppm and were taken from 0-6". Values were fairly consistent across the zones. Zones 1-6 all had a successful cover crop mix established in August 2015 and

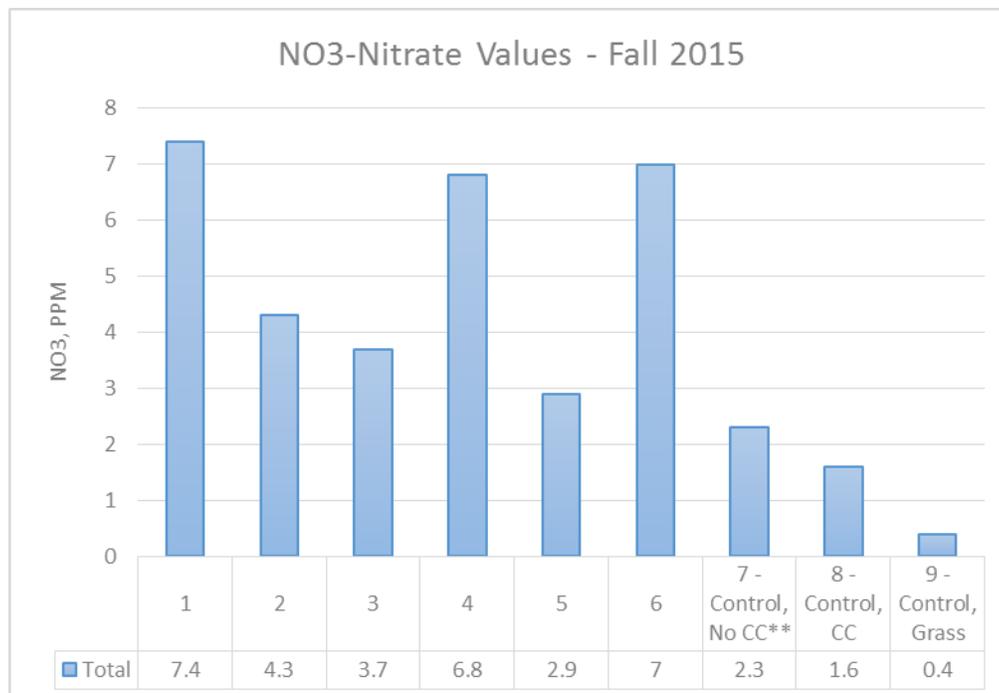
persisted with a favorable fall. There appears to be higher overall nitrate levels in the cover crop zones when compared to the control samples.

Hansberger



Nitrate values are expressed as ppm and were taken from 0-6". Values were fairly consistent across the zones. Zones 4-7 all had a successful cover crop mix established in August 2015 and persisted with a favorable fall. Zones 1-3 and 8-10 did not have a cover crop planted in 2015. There does not appear to be a strong correlation with measured nitrate levels and cover crop establishment.

Ackermann



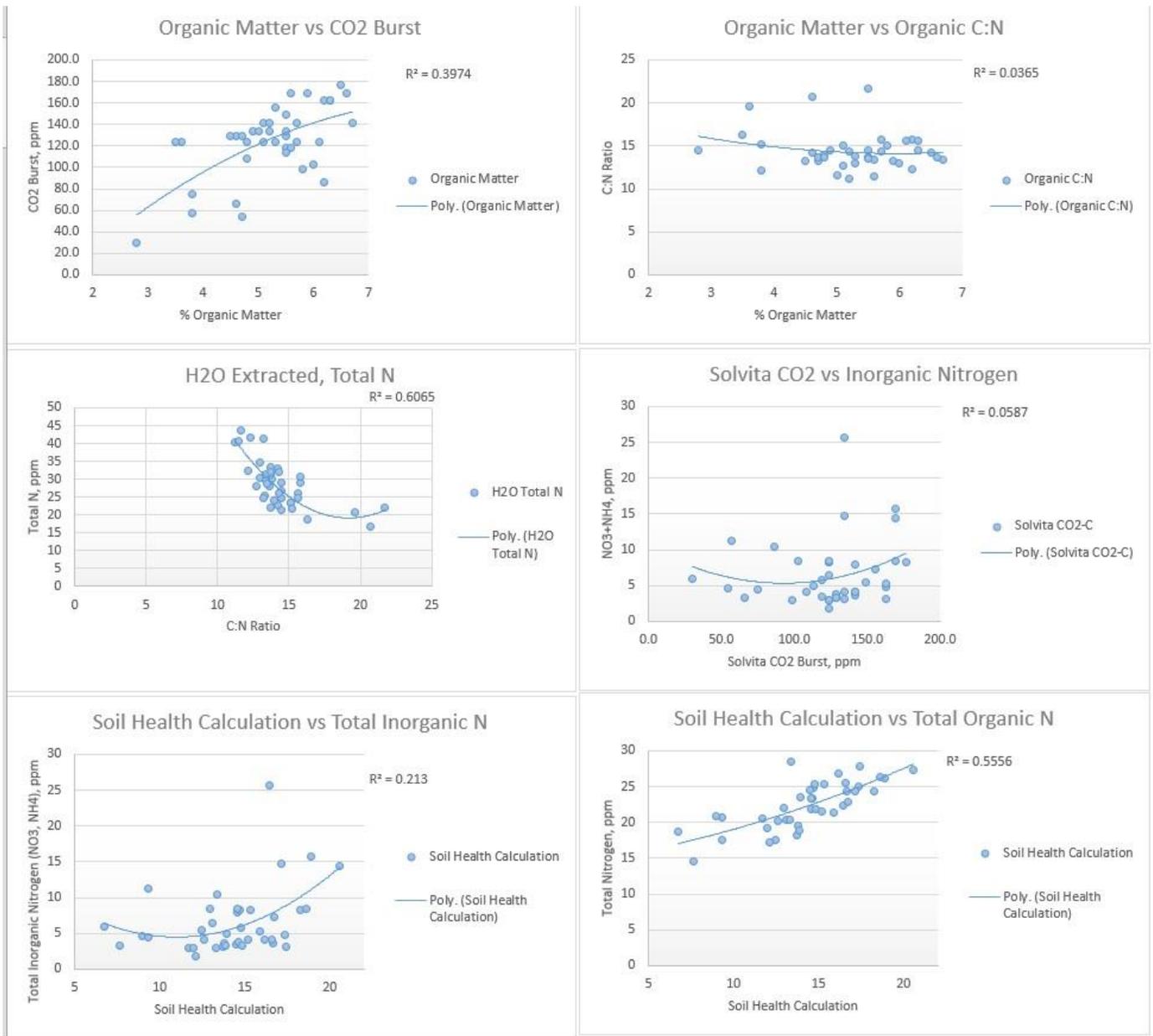
Nitrate values are expressed as ppm and were taken from 0-6". Values were variable across the zones. Zones 1-6 all had a successful cover crop mix established in August 2015 and persisted with a favorable fall. There does appear to be correlation with measured nitrate levels and cover crop establishment.

Soil Sample Results Meeting

On January 14, 2016, Andy Nesseth, Extended Ag Services, Inc.; Jerry and Terry Perkins; Jerry and Nancy Ackermann; Tim Hansberger; Dave Christoffer; Catherine Wegehaupt; and Jan Voit met. Andy Nesseth explained the Haney Soil Health Test Results and the Nitrate Soil Test Results. Each landowner received a copy of the map of their property as well as the sampling results.

Discussion was held regarding soil sampling depth, soil types, the Solvita test, and carbon-nitrogen measuring.

The following charts were submitted after the grant report was submitted. They contain data from all four sites combined.



D. MANAGEMENT TIPS

- *Using a multi-species mix of cover crops seems to work better so that if one type doesn't grow in a drought year another one will.*
- *Cover crops seem to work better with earlier variety soybeans due to leaf drop.*
- *Seeding should be done when leaves are turning yellow or the last week of August.*

E. COOPERATORS

Dave Christoffer has been farming for 43 years. He farms 220 acres. When he began farming, he used conventional tillage. In 1992 he converted to ridge till. Since 2007, he has been implementing strip-till. He rents 300 acres to two different individuals and works with them to use more conservation tillage and cover crops. Soil tests were on his farm. He will assist with the field day. Address: 78597 370th Avenue, Okabena, MN 56161. Phone: 507-853-4496.

Jerry and Terry Perkins have been farming for 40 years. Jerry and Terry own 627 acres of farmland. They cash rent 415 acres to a young farmer who is engaged in a no-till soybeans and strip-till corn rotation. They farm 112 acres in a no-till soybean and strip-till corn rotation. Soil tests were taken on their farm. They will assist with the field day. Address: 316 Lake Street, Worthington, MN 56187. Phone: 507-376-4792.

Tim Hansberger has been farming for 10 years. He graduated from the University of Minnesota (UM) with an agronomy production degree. He farms 645 acres in a no-till soybean and strip-till corn rotation. Soil tests were taken on his farm. He will assist with the field day. Address: 1974 Woodland Ct., Worthington, MN 56187. Phone: 507-727-0462.

Andy Nesseth, Extended Ag Services, Inc. will collect 68 soil samples in the fall of 2015. The 40 soil samples for the Haney Soil Health Test will be sent to Ward Laboratories, Inc. for analysis. The 28 soil samples for the Soil Nitrate Test will be sent to Minnesota Valley Testing Laboratories for analysis. Project partners will meet by the spring of 2016 to review test results. A database will be started to compile information. Address: 507 Milwaukee Street, Lakefield, MN 56150. Phone: 507-662-5005.

Jan Voit and Catherine Wegehaupt, HLWD, will assist with reporting and the field day. Address: PO Box 345, Heron Lake, MN 56137. Phone: 507-793-2462.

F. PROJECT LOCATION

- *Ackermann: 5 ¼ miles west of Lakefield, Minnesota on Jackson County Highway 14 (820th Street) and ¼ mile north on the west side of the road.*
- *Christoffer: about 2 miles south of Brewster, Minnesota on Highway 264, east on Jackson County Road 14 (820th Street) for three miles, turn north on 340th Avenue. The cover crop is on the east side of 340th Avenue – extending for the entire mile.*
- *Perkins: 8 miles north of Worthington, Minnesota on US Highway 59; then 1 ¾ miles west on 170th Street – south side of road.*
- *Hansberger: 4 miles north of Oxford Street in Worthington, Minnesota on Highway 59, turn west and go ½ mile. The cover crops are seeded on both sides of the tree line in the south half of the field.*

G. OTHER RESOURCES

- *No-Till Farmer magazine*
- *The High Yield Conservation section in the Farm Journal*
- *Managing Cover Crops Profitably – Sustainable Agriculture Research & Education*

Name: Soil Health Research in Southwest Minnesota

Section II. 2015 – Summary of Public Information Activities

Year of Project: (Circle one) 1 2 3 Final year? Yes No

Did you solicit any radio, newspaper, or television reporting on your project? *If yes, please elaborate. Although not specifically part of this grant, the farmers and HLWD were featured in articles in the Tri State Neighbor, Corn + Soybean Digest, and the Daily Globe. In addition, Jerry and Nancy Ackermann were honored for their efficient and effective use of applied fertilizer in their no-till systems at the National No-Tillage Conference on January 8, 2016 in Indianapolis, Indiana. The articles are included as attachments.*

Number of: Newspaper articles: 1 TV Reports: Radio Reports: about your project.

If this is the final year of your project:

Date of Your Field day: _____

What did visitors see/learn?

What was the weather like? _____

How many people attended? _____

Was this a good time of year for a field day on your project topic? Why/why not?

Total number of people that visited your project this year: _____

What do you think would help reach more people with information about your project?

Please include copies of any news clippings, program bulletins, or information about any radio or coverage about your project.

Section III. 2015 BUDGET

How did you spend the grant money this year? List your actual expenses for this year. An accurate accounting will benefit both you and us. We are not attempting to regain unspent funds at this time. We realize that you will incur unexpected or future expenses as the project continues. Please be accurate. *****Please explain any major changes (greater than 10%) to your budget categories.** (EX: In original budget, you have \$750 in 2015 for Analysis, but you only spent \$75 on Analysis and moved \$675 to Personnel Salaries – why?) **MAJOR BUDGET CHANGES need to be PRE-APPROVED by the Grant Coordinator.**

Item	Funds Spent in 2015	Amount Budgeted for 2015¹
1. Analysis (soil, plant, water, manure, nutritional value, statistical, etc.)		
a.	\$ 2,126.00 _____	\$ 2,260.00 _____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____
2. Consultant(s), Subcontractor(s), Bookkeeping (administration, technical assistance, analysis, etc.)		
a.	\$ 1,000.00 _____	\$ 1,000.00 _____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____
3. Personnel Salaries (Time/labor - Only labor directly related to grant activities over and above time spent on normal farm operations.)		
a.	\$ 1,090.00 _____	\$ 1,090.00 _____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____
4. Supplies and Materials		
a.	\$ 179.80 _____	\$ 179.80 _____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____
5. Use of Farm Equipment		
a.	\$ _____	\$ _____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____
6. Outreach		
a.	\$ _____	\$ _____
b.	\$ _____	\$ _____

(continued on next page)

¹List the amount you budgeted for 2015 in your original grant application. Contact us if you need help finding these amounts).

7. Communications (telephone, faxes, mail)

a.	\$ _____	\$ _____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____

8. Travel

a.	\$ 200.00_____	\$ 200.00_____
b.	\$ _____	\$ _____
c.	\$ _____	\$ _____

9. TOTALS (Add Items 1 thru 8)

	\$ 4,595.80_____	\$ 4,729.80_____
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*The Haney Soil Health Test cost \$6 more than budgeted.

*The soil nitrate tests are taken twice a year. The bill for the second sampling will be submitted in the fall of 2016 or winter of 2017.

SECTION IV. FINAL YEAR REPORT

Answer the following questions ONLY if this was the FINAL YEAR of your project. Use as much space as you need to.

a.) In your opinion, what should be done to follow up on the system you experimented with so that it could be adopted by Minnesota farmers? What kind of additional research is needed? What kinds of modifications should be made to make the system more practical?

b.) Do you intend to continue these practices on your farm now that the grant project has ended? Why or why not?

c.) Would you recommend this system to other farmers? Why or why not?

d.) What kind of impact has your project had on your others? For example, do you know of other farmers who have adapted this system in their farm operations after seeing or hearing about your demonstration? Do you sense a shift in attitude of your neighbors/visitors about the system you worked on?