

Nitrogen Management on Sandy Soils for Environmentally and Economically Sustainable Corn Production

Final Report for FNC95-113

Project Type: Farmer/Rancher

Funds awarded in 1995: \$5,000.00

Projected End Date: 12/31/1996

Region: North Central

State: Michigan

Project Coordinator:

[Edmond Groholski](#)

Project Information

Summary:

PROJECT BACKGROUND

My father and I farm 1500 acres of corn, soybeans, wheat, dry beans, soybean seed, wheat, alfalfa and pasture. Ninety acres are irrigated. We finish out 300 to 400 head of beef cattle each year. We also have 20 brood cows. We are a third generation farm, and have been in the area since the early 1900's.

Before receiving the SARE grant our farm has been involved in nitrate soil testing by utilizing the pre-sideress soil test process. By using this we have decreased commercial nitrogen use by 30 to 65 pounds on over 250 acres of corn ground. We have acres enrolled in SP-53.

PROJECT DESCRIPTION AND RESULTS

The goals we identified were to maximize utilization of organic forms of nitrogen for economic crop production in a sustainable system on our farm. We wanted to decrease commercial forms of nitrogen and manage the application of organic nitrogen (from all sources) to protect our groundwater.

Process:

I worked in conjunction with the local Extension Agent to design our test plots. Because of breakdown problems with the Soil Dr., the plots from spring 1995 did not materialize. We did go out after harvest in a fallow field to begin testing in the fall of 1995. We ran the Soil Dr. in 6 areas, averaging the N test readings. Extension assisted by taking nitrate soil samples in the same area on the same day and had them run through the soil testing lab. The results showed some correlation on 5 out of the 6 samples. Dr. Richard, MSU Mott Sustainable Ag Endowed Chair, assisted in the interpretation of the data. (Attached)

[Editor's note: There are charts that could not be posted on the website. If you would like to see these please email us at ncrsare@unm.edu or call 800-529-1342. Thanks]

In the spring of 1996, MSU Extension assisted in designing replicated plots in a corn field. Pre-sideress nitrate soil tests were taken the day before the Soil Dr. unit was used to side dress nitrogen. Six, 12 row, strips were tested via pre-sidedress N tests.

Surprisingly, all six field length strips tested 35 to 40 pounds of nitrate credit in the soil. On three of the strips, a flat rate of 110 lbs. of N was side dressed as 28%, basically following MSU recommendations and the method that had been used on the farm. The other 3 strips were run by letting the Soil Dr. test and adjust nitrogen rates on the go. The applied rates averaged 78 lbs. of nitrogen applied, but this was not a consistent rate as the applicator tests and adjusts the rate ever 12 seconds. So the rate could easily have varied from zero to over a hundred pounds, but averaged 78 lbs. Regular soil tests were also run on the strips.

These plots were harvested with a weigh wagon to see if there were any differences in yield from nitrogen being applied via a flat rate versus on the go rate changes.

People:

- Natalie Rector, MSU Extension Field Crops Agent for Branch and Calhoun Counties assisted with the plot design, nitrate soil testing and coordination of consulting with Dr. Harwood.
- Sharon William, Groundwater Technician for the Soil Conservation District also assisted in taking soil samples and worked with Extension to plan and host the summer tour at our farm.
- Dan Kesselring, NRCS DC for Calhoun County also assisted at the tour.
- Kevin Vandy Bogurt, Green Yields Crop Consultant assisted in scouting the projects

Results:

Fall 1995 soil data is attached.

Spring 1996 soil test on the replicated strips were:

Replication, N Test, Fall 1996 N Soil Tests (ppm)

1 Soil Dr, 40, 1.6

2 MSU, 40, 1.4

3 SD, 45, 0.6

4 MSU, 40, 6.3

5 SD, 40, 8.5

6 MSU, 40, 1.4

Stalk Nitrate tests were taken, results attached, but we feel the samples were taken too late after black layer as the results were very low.

1996 Yield results were:

Rep., Wet lbs., TW, %Mositure, Dry Yield/bu. N applied:

1SD, 1832, 55, 28, 134.9

1MSU, 1892, 55, 28, 139.3

2SD, 1694, 54, 28, 124.8

2MSU, 1748, 54, 28, 128.7

3SD, 1778, 55, 27, 132.75

3MSU, 1754, 54, 27, 131

Average of the SD (Soil Dr.) replication: $134.9+124.8+132.75=130.8$

Average of the MSU Strips: $139.3+128.7+131=133$

Harvested 300 foot strips x 12 rows.

Corn yields were maintained with less nitrogen on our farm; normal rate would have been close to 150 lbs. per acre. With the pre-sidedress tests, 110 lbs. per acre were side dressed and with the Soil Dr. 75-85 lbs. per acre were side dressed.

Next year I would also like to include a flat rate conventional nitrogen amount; this would help me put a hard dollar amount to the differences, if any.

Discussion:

This project has affected our farm in a positive manner. Using variable rate technology we have used 20 to 35% less total nitrogen and have not decreased our

average yields. This has put hard dollars in our pocket and has to help the environment by decreasing leaching potential to our groundwater from excess nitrogen. In the long run, if everyone used less it could probably bring the price of nitrogen down.

There have been several barriers that we have recognized. Being new technology you always have problems adjusting, fitting, calibrating and getting the equipment to work together. In the past we have used flat rates of nitrogen and it is hard to break family tradition of lower, variable rates. There has also been the chiding from family and friends wondering if this is the right way to go. The hardest part was watching the variable rate monitor in the tractor cab going up and down, and sometimes down to zero rate of nitrogen. I would like to get a yield monitor to really be able to document yields in the spots where the nitrogen rates were very small. It is important to believe in your project and try to give a fair comparison to the various inputs. MSU Extension in our county helped a lot with the testing and comparisons.

Many neighbors have inquired and I would be glad to share my experience with others, sharing both the pro's and con's.

I estimate there are several impacts from this project. I will save dollars now if this technology is used and programmed correctly. Environmentally, if nitrogen is spoon feed to the plant, the plants will produce maximum yields without leaching nitrogen to the groundwater. From a personal standpoint, I hope to improve the farm/family cash flow and maybe take the wife out to dinner and feel that the environment is a better place for my children.

I have learned how to gather and use information more effectively and improved on the ever increasing focus on analysis of information for both economic and environmental considerations.

OUTREACH

Innovative Farmer group: A newly formed group of farmers are sharing their demonstration plots in an informal, round-table format. I have discussed the Soil Dr. several times at these meetings as there is interest and questions related to the technology. Dr. Harwood visited with the group during one meeting on the soil test results and other plots he was involved in with the group. Contacts: 20 people, 3 different times.

Individual farmers have also contacted me personally on the unit to inquire about its effectiveness. One neighbor has also purchased a unit.

Extension and the SCD Groundwater Technician planned a Groundwater Stewardship tour at our farm July 30, 1996. Through our local groundwater stewardship program I have also been involved in a cost share project for one of the first farm owned secondary containment structures for bulk fertilizer. This newly constructed facility was featured at the tour as were Bt corn plots, nitrogen side dress plots, the Soil Dr. and in field pesticide mixing and loading options for are farmers. Over 70 area farmers showed up to view the different practices on tour. (Pictures enclosed)

The harvest data listed in this summary is in the process of being summarized by Extension with other demonstration plots from the Innovative farmer group and will be published upon completion and distribution via Extension mailing lists.

Research

Participation Summary

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or SARE.



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