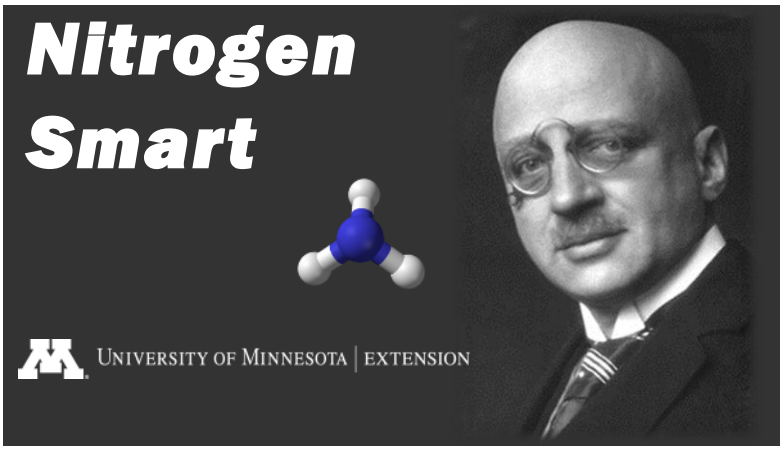
Nitrogen Smart Three Year Summary of Outcomes



OVERVIEW

This report gives summary outcomes data for the first three years of the Nitrogen Smart program. A total of 36 events were conducted around Minnesota between 2016 and 2018. The program is a "quasi-certification" program, in that a "Nitrogen Smart" certification is granted, but there is no legal requirement to attend, nor special privileges granted with the certification.

Because the certification is good for three years, meetings held in 2019 and beyond may have a mix of new and returning attendees. In addition, an on-line version of the program was launched late in 2018, and an Advanced Nitrogen Smart program series is set to begin in 2019. For these reasons, it is an appropriate time for an overall summary.

POST EVENT EVALUATION

Unofficial head count at the meetings has total attendance at 756. There were 689 cards turned in to receive Nitrogen Smart Certification (91%). As this program is targeted toward farmers, the difference in the number in attendance and the number of cards is likely primarily due to a number of attendees that are either agency staff or ag professionals who chose to not become certified.

The table below gives attendance details by Year.

Year	Head Count	Registered	Evaluations	Farmers	Agronomists	Agency
2016	274	253	203	148	32	23
2017	328	300	191	143	24	18
2018	154	136	112	72	16	24
Total	756	689	466	363	72	65

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A total of 466 evaluations were returned for a return rate of 62%. Analysis of this data shows that 15% of attendees were Agronomists (sales and consulting were combined), and 14% were agency staff (combined with educators). If one assumes the ratios of farmers to agronomists and agency staff are similar between those that filled out evaluations and those that didn't, the overall attendance can be extrapolated to 537 farmers, 106 agronomists, and 96 agency staff.

Farmers self-reporting showed a total of 423,695 ac. 359 out of 363 shared their farm size. This means the average size of an attendee's farm was 1,180 acres. Attendees reported 202,248 acres of corn, or 48% of the total acreage. 69% of corn acres were in rotation with soybeans or alfalfa and 31% followed corn or wheat. Other crop acreages include: soybeans – 152,098 (36%), small grains – 19,726 (5%), sugar beets – 15,950 (4%), sweet corn – 5,263 (1%), peas – 2,866, alfalfa – 9,360 (2%), dry beans – 9,521 (2%), potatoes – 2,995, pasture –2,977, and other crops that use nitrogen – 691. Attendees (60 total, or 17%) reported 45,474 ac of land under irrigation, which is 11% of the total reported. 175 producers (49%) reported using manure. The average producer using manure uses it on 31% of his/her crop land. This equates to a total of 64,359 ac which is 15% of total acres, or 32% of total corn ac (if one assumes all the manure goes on corn ground). Extrapolated numbers for attendees based on collected data and percent participation in the evaluations equals 632,381 acres total and 301,863 acres of corn.

SURVEY OF ATTENDEES IN AUGUST

The August and September survey of attendees was sent to all email addresses collected on registration cards. The survey used the Qualtrics web based survey tool. .

Nitrogen application decisions occur at different times of the year for different farmers meaning there is no perfect time to determine when a practice change has occurred. August was chosen because significant time had passed since the training, and attendees were likely to know by August what their ideal management practices for the subsequent application/crop season would be.

The survey first asked the respondent to identify whether they are a farmer, ag professional, or agency person. The following tables summarize the Qualtrics participation data:

Year	Respondents	% of those certified	Farmers	Agronomists	Agency
2016	101	40	64	21	16
2017	89	30	46	19	21
2018	47	35	14	19	14
Total	237	34	124	59	51

Farmers were asked whether they intend to change various practices for the next year's crop based on information obtained at the Nitrogen Smart meeting. The following table reflects farmer

attendee's intention to adopt various practices for their N management for the next year's crop, as well as an estimated number of farmers (extrapolating from participation percentage and overall attendance) making change based on the evaluation and the survey:

Practice	% of respondents	Estimated # of farmers
Reduce overall N rate	33.9	133
Increase overall N rate	3.2	15
Use different rates on different fields	38.7	148
Use a nitrification inhibitor for fall application	20.9	95
Change from all fall application to all spring	16.9	79
Change from all fall to some fall and some spring	12.9	89
Start split-applying N	37.1	159
Stop using fall Urea	11.3	49
Adopt a variable rate technology	29.8	119
No Changes	24.2	132

Farmers who answered that they intend to reduce N rate were then asked by how much. The average response was 30 lb./ac. The average farmer attendee grows 563 acres of corn. If we assume the percentages reflected in the survey extrapolate to all attendees we can estimate the number of acres affected through changed practices and even potential reductions in the amount of N lost, and improved profits. The annual reduction in applied N by attendees using these averages and estimates is 2,246,370 lb. Using an estimated price of $0.30 per pound of N in fertilizer, this translates to a savings of $673,911, or $5,067 per attendee that will reduce rates. Research at the U of M Southern Research and Outreach Center (SROC) shows a long term yield advantage of 8 bu./ac (Randall, in Carlson, et. al. 2014) for switching from fall to spring N application. For those that switched their fall application to spring this extrapolates to 44,477 ac, and an increase of 355,816 bu. of corn. Using a value of $3/bu. this gives an economic impact of $1,067,448, or $13,512 per attendee that adopted this practice.

Another interesting result is the conversion of an estimated 27,587 ac of land that previously received fall urea. The impacts of this change will vary geographically, and from year to year, but a recently completed study at the SROC (Vetsch, unpublished) showed fall applied urea had a 3-year average N loss of 20 lb./ac greater than spring applied urea. If one uses these numbers, it extrapolates to a reduction of 551,740 lb. N lost to the environment.

As a final point, it should be noted that 75.8% (or over 3 out of 4) of attendees changed at least one practice as a result of attending the meeting. Taking the estimates for rate reduction and change in timing alone, and dividing by overall farmer attendance the value of this program was $3,243 per attendee. The number is obviously much higher than that, but because making estimates for the other practice changes requires many more assumptions it is difficult to determine what the overall impact is per attendee.

The last question asked of farmers was whether they felt various conservation practices had the potential to be used on their farm to reduce nitrate in water. The following table lists these in order of farmer preference, and the percentage of those choosing the practice.

Practice	% Farmers
Changing N Fertilizer Management	61.3
Cover Crops	42.7
Retirement of sensitive or marginal land	16.9
Changes in Crop Rotation	16.9
Controlled Drainage	16.9
Saturated Buffer	12.9
Bioreactor	5.6
Constructed Wetland	3.2

An additional piece of information collected was from the Agricultural Professionals that responded to the survey. Unlike the responding farmers, who were asked to check all that apply, the Ag Professionals were asked to rank the practices with respect to their potential to reduce nitrate in water. The following table shows their preference of potential solutions, and separates sales and consulting agronomists from agency staff and educators.

Practice	Average Rank Ag Professionals	Average Rank Agency Staff
Better N Timing	2.1	2.6
Reducing N Rates	3.4	3.3
More Prescriptive N Rates	3.4	3.7
Cover Crops	4.8	4.3
Controlled Drainage	5.7	6.4
Changes in Crop Rotation	6.1	5.0
Constructed Wetlands	7.1	7.6
Retirement of Sensitive/Marginal Land	7.3	5.8
Bioreactors	7.3	7.8
Saturated Buffers	7.7	8.5

REFERENCES

Randall, G.W. in Carlson, B.M., J.A. Vetsch, and G.W. Randall. 2014. Nitrates in Drainage Water in Minnesota. University of Minnesota Extension Publication.

Vetsch, J.A. Corn Production and Nitrogen Loss as Affected by Nitrogen Application Timing/Source, Rate and the Nitrification Inhibitor Instinct™. Report to MN Corn Growers.

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