Commercial Nitrogen and Manure Fertilizer Selection and Management Practices Associated with Minnesota's 2012 Corn Crop

Minnesota Department of Agriculture
USDA, NASS, Minnesota Field Office

August 2016

625 Robert Street North St. Paul, MN 55155-2538 651-201-6000 1-800-967-AGRI
www.mda.state.mn.us

For information regarding this report
contact:
Denton Bruening
Minnesota Department of Agriculture
Pesticide and Fertilizer Management Division
651-201-6399

Contents

List of Tables

List of Figures

Introduction

The Minnesota Department of Agriculture (MDA) is responsible for the development and promotion of nitrogen Best Management Practices (BMPs) which optimize production and profitability while protecting the state's water resources. The MDA is also responsible for monitoring nitrogen use and the adoption of the nitrogen BMPs. The MDA conducts two types of surveys, which were designed and conducted in partnership with the National Agricultural Statistics Service (NASS). Additional information is available at: http://www.mda.state.mn.us/en/protecting/cleanwaterfund/gwdwprotection/nutrientmgmtsurvey.aspx

In Minnesota, nitrate is detected frequently in groundwater and surface water resources. Nitrates may exceed the drinking water standards in groundwater in some areas, and sometimes exceeds surface water standards. The MDA has invested considerable staff time in water monitoring, development of BMP education programs, and BMP assessment. Commercial fertilizer containing nitrogen and manure is the primary focus of this survey. Phone enumerators located at NASS contacted over 7,600 producers in early 2013. From this pool, approximately 1,600 farmers who raised corn during the 2012 growing season, or applied manure on corn acres, shared valuable information on commercial nitrogen applications, manure rates and management practices associated with both manure and commercial nitrogen.

The general purpose of this survey was to ask farmers about commercial nitrogen applications on corn and manure use practices such as, rates, applications, incorporation, types of manure and other management decisions based on manure use on corn acres. The majority of nitrogen applied on Minnesota fields is applied on corn acres.

These types of surveys help MDA understand regulatory compliance, adoption of voluntary practices, potential informational roadblocks, and opportunities for future technical assistance.

Every other year, the MDA has partnered with NASS to produce a detailed report on nitrogen use and rates used on the state's major crops. The first nitrogen use survey was conducted in 2009 and was designed for commercial nitrogen use on corn. It was repeated in more detail in 2010 by including wheat acres. Readers are encouraged to visit the two reports from this survey at: "2009 Survey of Nitrogen Fertilizer Use" and the "Fertilizer and Manure Selection and Management Practices Associated with Minnesota's 2010 Corn and Wheat Production"

On alternate years, farmers are interviewed on BMPs associated with their commercial nitrogen and manure applications. Due to the length and detail of the surveys, it would not be feasible to interview farmers on both nitrogen applications and nitrogen BMPs at the same time. The 2011 report can be found at the same site.

Acknowledgements

This survey was a cooperative effort by the Minnesota Department of Agriculture (MDA), the United States Department of Agriculture (USDA), National Agricultural Statistics Service (NASS), and the NASS Field Office in Minnesota. The detailed information about commercial nitrogen and manure use could not have been collected without the cooperation of the thousands of farmers who voluntarily responded to the survey in the midst of their busy lives, and for this we are extremely grateful. Special thanks goes to Dan Lofthus, Director of the NASS Minnesota Field Office. The MDA is ultimately responsible for the representations of data provided in this report and for the design of the survey instrument used to collect that data. Excellent participation and good record keeping practices by Minnesota farmers played a vital role in providing complete and detailed manure use information.

2012 Commercial Nitrogen and Manure Use Practices Summary and Highlights

The *2012 Survey of Fertilizer and Manure Selection and Management Practices on Corn in Minnesota* and the *Commercial Nitrogen and Manure Fertilizer Applications on Corn Acres Compared to the U of M Nitrogen Guidelines Crop Year 2012* are companion reports. This report summarized survey results for a number of important practices associated with nitrogen and manure applications on Minnesota's 2012 corn acres. Over 1,600 corn producers participated in the telephone survey and information was collected for 434,592 corn acres, representing five percent of Minnesota's 8,330,000 corn acres. Survey questions focused on the 97 percent of the respondents that fertilized corn with manure and/or nitrogen. This was the third fertilizer survey performed by the MDA and NASS to collect information on nitrogen use and management practices on Minnesota corn acres.

Survey Design and Implementation

Five Nitrogen BMP regions (noted as "BMP regions" throughout the report), were previously developed by MDA staff. Counties were clustered based on similarities in geology, soils, and crops. More information about BMP regions can be found at: http://www.mda.state.mn.us/protecting/bmps/nitrogenbmps.aspx. Regional nitrogen use information is used to help design and implement specific water quality monitoring and nitrogen educational programs for each BMP region.

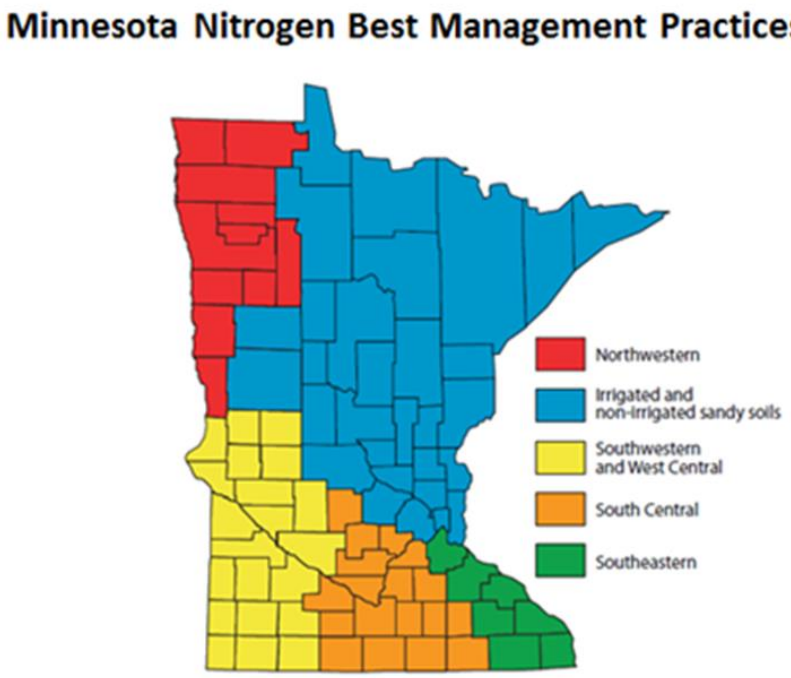

Figure 1. Minnesota nitrogen BMP regions.

For the purpose of this report the Minnesota nitrogen BMP regions are defined as follows: Northwestern as NW, Irrigated and non-irrigated sandy soils as IRR, Southwestern and West Central as SW, South Central as SC, and Southeastern as SE.

NASS developed a systematic sample of 7,600 farms by randomly drawing from its entire database of all corn growers in Minnesota. There were approximately 1,600 farmers that raised corn that participated in the survey. The definition of “corn” for purposes of this report includes both grain and silage and excludes sweet corn and popcorn.

Due to the low amount of row crop agriculture in portions of northern Minnesota, survey results were not listed when there were less than five responses in any category for corn or manure.

History of Data Collection & Process

NASS has a long history of providing statewide crop and production statistics. Over the last decade, NASS has also become an important information source for pesticide and fertilizer use. Several joint pilot projects evolved with the financial assistance from Environmental Protection Agency (EPA) and were conducted from 2001-2003. These pilots were essential to the final methodology used in this report.

The first pilot[1] was conducted in 2001 by expanding the existing Agricultural Resource Management Study (ARMS) developed by NASS. The normal number of participating Minnesota corn farms in an ARMS survey is about 150. The pilot increased the number of personal interviews to approximately 600 and most of the enhancements were focused on the southern third of the state. The pilot provided reliable regionally-enhanced data on pesticide product choices and application rates. Additionally, primary sources of pesticide management, scouting, timing, and other pesticide management related information was obtained.

In neighboring North Dakota, the USDA, NASS, the North Dakota Field Office, and North Dakota State University Extension had already established a strong tradition in collecting statewide pesticide use by using NASS telephone enumerators. With the goal of expanding to a statewide scale while reducing costs, a second pilot[2] was developed. MDA and NASS used many techniques from the North Dakota program, but decided to expand the level of detail by including pesticide application rates. Historically, most mail or telephone style surveys have been unsuccessful at quantifying pesticide rates. Due to the numerous formulations, different application rates and units of measure (i.e. Active Ingredient (AI) can be expressed in pounds, ounces, pints or quarts), complications can quickly develop. Another major complicating factor may result due to the farmer using the services of a commercial pesticide applicator. If the farmer did not apply the product, the likelihood that the farmer would be familiar with the product and rate decreases significantly.

The second pilot survey was conducted in 2003 to test two methods of collecting pesticide rate information. “Method One” was conducted in Douglas County with 150 randomly selected farm operators. Operators were interviewed over the phone by the NASS enumerators. If the operator did not know the pesticides and/or rates, no additional follow-up work was conducted and the data was limited to information that was provided. “Method Two” was used in neighboring Grant County, where another 150 farm operators were contacted, and when farm records were incomplete, follow-up calls were made to the pesticide dealer to complete the

[1] “Expanded Minnesota Agricultural Statistics Pesticide Use Data”, 2003, by NASS and MDA.
[2] Unpublished data. From the September 20, 2003 EPA Report.

survey. The number of surveys with complete data sets significantly increased with the additional assistance from the dealerships. Eighty-three percent of the surveys were complete in Grant County, where dealer follow-up calls were made, compared to forty-six percent in Douglas County. Equally impressive was the overall support by the local dealerships.

Farmers were interviewed over the phone in April 2012. These were 'cold calls', meaning that the farmers did not get any type of notification about the survey prior to the contact. Consequently, all information collected using this approach was based upon either the participant's memory or information readily available during the interview. Depending on the complexity of the farm, the interviews would typically last ten to thirty minutes.

Survey questions can be found in Appendix 1. Corresponding question numbers (noted as "NQ" for commercial nitrogen or "MQ" for manure followed by the survey question number) are incorporated throughout the report and also in the table captions. The reader is encouraged to reference the survey to help interpret the results.

Data Reporting and Limitations

The primary purpose of this survey was to obtain an understanding of commercial nitrogen applications and basic manure management practices associated with corn production.

Due to the simplified method used to collect what is typically considered complex data, it is imperative that the reader understand the limitations of the data sets. Many surveys conducted by NASS employ advanced sampling strategies which are designed to statistically represent a non-homogenous population, thus "weighting" the data to account for sample size, county size, and crop acreage, etc. Such strategies can be very expensive and are not without their own limitations.[3] This survey did not employ such strategies; rather, corn farmers were randomly selected in Minnesota. Therefore, weighting in areas or counties was not performed. The MDA can be contacted to further discuss interpretation of the survey data.

If there were less than 5 responses for the 'Number of Responses', then the responses were not published and were represented by '**'. However, the data was still included in the overall statistical analysis. This is why data in certain columns will be slightly higher in the 'Totals' row of the relevant tables.

[3] For an explanation of survey methods and data quality associated with annual county-level data, visit the NASS "Quick Stats" Frequently Asked Questions website at: http://www.nass.usda.gov/QuickStats/Screens/faqs.htm

Statewide Commercial Fertilizer Nitrogen and Manure Applications and Management on Corn

Information on nitrogen management and manure was gathered for a typical corn field in the 2012 growing season. Information about management on all crop acres was not collected in this survey[4]. All yield data shown in this report is for corn.

Farmers in the survey were first asked "Did you grow corn on your operation in 2012?" Then farmers were asked **"**How many corn acres were planted with field corn in 2012?" Table 1 details the famers who responded they grew corn and the corresponding acres of corn grown (NQ1[5]).

Table 1. Summary of respondents and corresponding corn acres by county and BMP region with and without manure.

County	BMP Region	Number of Respondents	Number of Corn Acres
Clay	NW	12	7,540
Clearwater	NW	**	**
Kittson	NW	**	**
Mahnomen	NW	**	**
Marshall	NW	7	900
Norman	NW	12	5,186
Pennington	NW	**	**
Polk	NW	9	3,993
Red Lake	NW	5	964
Roseau	NW	5	1,450
Wilkin	NW	10	4,527
Totals	**NW**	**72**	**27,646**
Aitkin	IRR	**	**
Anoka	IRR	**	**
Becker	IRR	21	4,044
Beltrami	IRR	7	534
Benton	IRR	26	2,319
Carlton	IRR	**	**
Cass	IRR	7	1,342
Chisago	IRR	9	1,547
Crow Wing	IRR	6	1,456
Hennepin	IRR	10	1,890

[4] Information was field specific. Farmers can manage fields differently depending on soil type, manure applications, and crop history for a particular field.

[5] NQ1 is Nitrogen Question 1 and can be found at the end of the report in the appendix. All question references will be in this format.

Hubbard	IRR	**	**
Isanti	IRR	10	1,988
Itasca	IRR	**	**
Kanabec	IRR	8	614
Mille Lacs	IRR	15	2,079
Morrison	IRR	62	6,161
Otter Tail	IRR	50	12,150
Pine	IRR	14	1,370
Sherburne	IRR	8	1,688
Stearns	IRR	94	11,945
Todd	IRR	43	5,198
Wadena	IRR	14	2,340
Washington	IRR	7	1,513
Wright	IRR	32	6,641
Totals	**IRR**	**458**	**67,759**
Big Stone	SW	13	4,930
Chippewa	SW	15	7,762
Cottonwood	SW	29	9,693
Douglas	SW	14	1,653
Grant	SW	7	3,779
Jackson	SW	23	6,057
Kandiyohi	SW	18	4,788
Lac qui Parle	SW	16	6,607
Lincoln	SW	20	6,127
Lyon	SW	28	11,926
Murray	SW	26	9,003
Nobles	SW	22	5,576
Pipestone	SW	21	4,771
Pope	SW	18	3,870
Redwood	SW	40	18,814
Renville	SW	37	14,474
Rock	SW	24	8,123
Stevens	SW	18	6,585
Swift	SW	21	11,548
Traverse	SW	13	6,875
Yellow Medicine	SW	25	17,331
Totals	**SW**	**448**	**170,292**
Blue Earth	SC	25	8,404
Brown	SC	45	9,375
Carver	SC	22	2,981
Dodge	SC	19	3,879
Faribault	SC	20	11,941
Freeborn	SC	33	9,955
Le Sueur	SC	17	4,754
Martin	SC	20	8,879
McLeod	SC	32	7,843
Meeker	SC	29	9,161
Mower	SC	28	4,903
Nicollet	SC	18	2,836
Rice	SC	36	5,919
Scott	SC	17	3,043
Sibley	SC	38	9,031
Steele	SC	19	6,269
Waseca	SC	18	3,838

Watonwan	SC	19	9,318
Totals	**SC**	**455**	**122,329**
Dakota	SE	21	7,678
Fillmore	SE	34	8,353
Goodhue	SE	38	8,871
Houston	SE	22	3,377
Olmsted	SE	23	6,478
Wabasha	SE	41	7,341
Winona	SE	40	4,468
Totals	**SE**	**219**	**46,566**
Totals	**State**	**1,652**	**434,592**

** Less than five responses

§ BMP region totals may not add up due to some counties having less than five responses, but are included in the BMP region total

Commercial Fertilizer Applications in Minnesota

Farmers in the survey were then asked “Do you have a corn field without manure applied in the last five years? (NQ2)” Table 2 details the famers who answered yes to this question and the corresponding acres of corn grown. All analysis on the commercial fertilizer section includes nitrogen applications from commercial fertilizer only.

Table 2. Statewide summary of respondents and corresponding corn acres by county and BMP region for all corn fields without manure.

County	BMP Region	Number of Respondents	Number of Corn Acres
Clay	NW	12	7,540
Clearwater	NW	**	**
Kittson	NW	**	**
Mahnomen	NW	**	**
Marshall	NW	7	900
Norman	NW	12	5,186
Polk	NW	8	3,923
Red Lake	NW	**	**
Roseau	NW	**	**
Wilkin	NW	10	4,527
Total/Averages	**NW**	**67**	**27,341**
Aitkin	IRR	**	**
Anoka	IRR	**	**
Becker	IRR	13	3,423
Beltrami	IRR	**	**
Benton	IRR	13	1,100
Cass	IRR	**	**
Chisago	IRR	8	1,477
Crow Wing	IRR	5	1,416
Hennepin	IRR	6	1,700
Hubbard	IRR	**	**
Isanti	IRR	7	1,587

Itasca	IRR	**	**
Kanabec	IRR	**	**
Mille Lacs	IRR	11	1,877
Morrison	IRR	30	3,038
Otter Tail	IRR	40	11,085
Pine	IRR	11	1,064
Sherburne	IRR	7	1,672
Stearns	IRR	38	5,845
Todd	IRR	24	3,186
Wadena	IRR	10	2,252
Washington	IRR	5	1,442
Wright	IRR	24	5,176
Total/Averages	**IRR**	**270**	**50,051**
Big Stone	SW	11	4,280
Chippewa	SW	14	7,707
Cottonwood	SW	25	8,666
Douglas	SW	8	1,200
Grant	SW	7	3,779
Jackson	SW	18	5,652
Kandiyohi	SW	13	3,287
Lac qui Parle	SW	13	5,507
Lincoln	SW	14	4,708
Lyon	SW	26	11,711
Murray	SW	16	7,093
Nobles	SW	16	3,963
Pipestone	SW	14	2,481
Pope	SW	12	3,548
Redwood	SW	33	16,885
Renville	SW	31	13,019
Rock	SW	18	6,798
Stevens	SW	17	6,335
Swift	SW	19	10,868
Traverse	SW	12	6,860
Yellow Medicine	SW	21	16,405
Total/Averages	**SW**	**358**	**150,752**
Blue Earth	SC	19	6,729
Brown	SC	30	7,055
Carver	SC	12	1,743
Dodge	SC	11	3,110
Faribault	SC	18	11,727
Freeborn	SC	27	8,744
Le Sueur	SC	11	4,225
Martin	SC	14	5,691
McLeod	SC	25	7,580
Meeker	SC	23	8,876
Mower	SC	22	3,743
Nicollet	SC	13	2,146
Rice	SC	26	4,477
Scott	SC	12	2,751
Sibley	SC	28	8,384
Steele	SC	14	5,711
Waseca	SC	15	3,583
Watonwan	SC	17	8,913
Total/Averages	**SC**	**337**	**105,188**

Dakota	SE	18	7,375
Fillmore	SE	23	5,976
Goodhue	SE	22	6,754
Houston	SE	15	2,445
Olmsted	SE	15	5,550
Wabasha	SE	26	5,681
Winona	SE	20	2,463
Total/Averages	**SE**	**139**	**36,244**
State	**Without Manure**	**1,171**	**369,576**

** Less than five responses
§ BMP region totals may not add up due to some counties having less than five responses, but are included in the BMP region total

Table 3 details the percent of farmers who had a corn field without manure applied by BMP region (NQ2).

Table 3. Percent of respondents with a corn field without manure applied.

BMP Region	Corn Field Without Manure Applied	Percentage of Respondents
Northwestern	Yes	91
Northwestern	No	9
Irrigated and non-irrigated sandy soils	Yes	55
Irrigated and non-irrigated sandy soils	No	45
South Western and West Central	Yes	72
South Western and West Central	No	28
South Central	Yes	67
South Central	No	33
Southeastern	Yes	60
Southeastern	No	40
Statewide	Yes	65
Statewide	No	35

Table 4 details the previous crop planted before the current corn crop by region and the corresponding yield (NQ3, NQ4 and NQ5). For the previous crop of corn/alfalfa, the definition would be corn in 2012, corn in 2011 and alfalfa in 2010.

Table 4. Percent of fields by previous crop and the corresponding yields.

BMP Region	Previous Crop	Percentage of Fields	Average Corn Yield Bushels per Acre
Northwestern	Soybeans	46	138
Northwestern	Corn	23	140
Northwestern	Corn/Alfalfa	**	**
Northwestern	Alfalfa	**	**
Northwestern	Small Grains	15	120
Northwestern	Other	13	148
Irrigated and non-irrigated sandy soils	Soybeans	42	143
Irrigated and non-irrigated sandy soils	Corn	35	144
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	8	132
Irrigated and non-irrigated sandy soils	Alfalfa	6	152
Irrigated and non-irrigated sandy soils	Small Grains	4	121
Irrigated and non-irrigated sandy soils	Other	5	124
South Western and West Central	Soybeans	60	164
South Western and West Central	Corn	33	166
South Western and West Central	Corn/Alfalfa	2	163
South Western and West Central	Alfalfa	2	144
South Western and West Central	Small Grains	1	152
South Western and West Central	Other	2	149
South Central	Soybeans	56	172
South Central	Corn	37	175
South Central	Corn/Alfalfa	3	166
South Central	Alfalfa	2	156
South Central	Small Grains	**	**
South Central	Other	2	162
Southeastern	Soybeans	46	173
Southeastern	Corn	34	172
Southeastern	Corn/Alfalfa	15	174
Southeastern	Alfalfa	4	159
Southeastern	Small Grains	**	**
Southeastern	Other	**	**
Statewide	Soybeans	53	162
Statewide	Corn	34	164
Statewide	Corn/Alfalfa	5	157
Statewide	Alfalfa	3	152
Statewide	Small Grains	2	129
Statewide	Other	3	142

** Less than five responses

Table 5 details the percentage of non-manured corn fields with nitrogen applied (NQ6).

Table 5. Commercial fertilizer applications applied to non-manured corn fields.

BMP Region	Fertilizer Applied	Percentage of Respondents
Northwestern	Yes	100
Northwestern	No	0
Irrigated and non-irrigated sandy soils	Yes	94
Irrigated and non-irrigated sandy soils	No	6
Southwestern and West Central	Yes	98
Southwestern and West Central	No	2
South Central	Yes	97
South Central	No	3
Southeastern	Yes	95
Southeastern	No	5
Statewide	Yes	96
Statewide	No	4

Table 6 details the percentage of the method of nitrogen application for each BMP region, either by variable rate or by one rate (NQ7).

Table 6. Variable rate nitrogen applications by BMP region.

BMP Region	Variable Rate Nitrogen Application	Percentage of Respondents
Northwestern	Variable rate	29
Northwestern	One rate	71
Irrigated and non-irrigated sandy soils	Variable rate	34
Irrigated and non-irrigated sandy soils	One rate	66
Southwestern and West Central	Variable rate	44
Southwestern and West Central	One rate	56
South Central	Variable rate	40
South Central	One rate	60
Southeastern	Variable rate	38
Southeastern	One rate	62
Statewide	Variable rate	39
Statewide	One rate	61

Table 7 details the nitrogen rates and corresponding yields by BMP region (NQ5 and NQ8). These are nitrogen rates and yields in all corn acres, regardless of previous crop. Nitrogen rates are from commercial nitrogen fertilizer only.

Table 7. Nitrogen rates and average yields by BMP region.

BMP Region	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	134	137
Irrigated and non-irrigated sandy soils	128	141
Southwestern and West Central	150	164
South Central	158	172
Southeastern	152	172
Statewide	147	161

Table 8 details the nitrogen fertilizer rates and corn yields by BMP region on corn following various crops (NQ3, NQ5 and NQ8). These are corn fields are applied with commercial nitrogen fertilizer but no manure applications. For the previous crop of Corn/Alfalfa, the definition would be corn in 2012, corn in 2011 and alfalfa in 2010.

Table 8. Average amount of nitrogen applied and corresponding corn yield by BMP region and previous crop.

BMP Region	Previous Crop	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Soybeans	132	138
Northwestern	Corn	140	146
Northwestern	Corn/Alfalfa	**	**
Northwestern	Alfalfa	**	**
Northwestern	Small Grains	123	120
Northwestern	Other	139	148
Irrigated and non-irrigated sandy soils	Soybeans	129	143
Irrigated and non-irrigated sandy soils	Corn	139	144
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	115	132
Irrigated and non-irrigated sandy soils	Alfalfa	81	152
Irrigated and non-irrigated sandy soils	Small Grains	118	121
Irrigated and non-irrigated sandy soils	Other	123	124
Southwestern and West Central	Soybeans	144	164
Southwestern and West Central	Corn	163	166
Southwestern and West Central	Corn/Alfalfa	129	163
Southwestern and West Central	Alfalfa	119	144
Southwestern and West Central	Small Grains	143	152
Southwestern and West Central	Other	149	149
South Central	Soybeans	152	172
South Central	Corn	172	175
South Central	Corn/Alfalfa	135	166
South Central	Alfalfa	107	156
South Central	Small Grains	**	**
South Central	Other	157	162
Southeastern	Soybeans	150	173
Southeastern	Corn	166	172
Southeastern	Corn/Alfalfa	140	174
Southeastern	Alfalfa	106	159
Southeastern	Small Grains	**	**
Southeastern	Other	**	**
Statewide	Soybeans	144	162
Statewide	Corn	160	164
Statewide	Alfalfa	98	152
Statewide	Small Grains	127	129

BMP Region	Previous Crop	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Statewide	Other	139	142
Statewide	Corn/Alfalfa	129	157

** Less than five responses

Statewide: Corn Following Soybeans

The majority of farmers reported on a corn following soybeans field. Statewide, fifty-five percent of the fields reported were corn following soybeans. Figure 2 details the counties where farmers reported on fields with corn following soybeans. There were 912 fields surveyed in Minnesota.

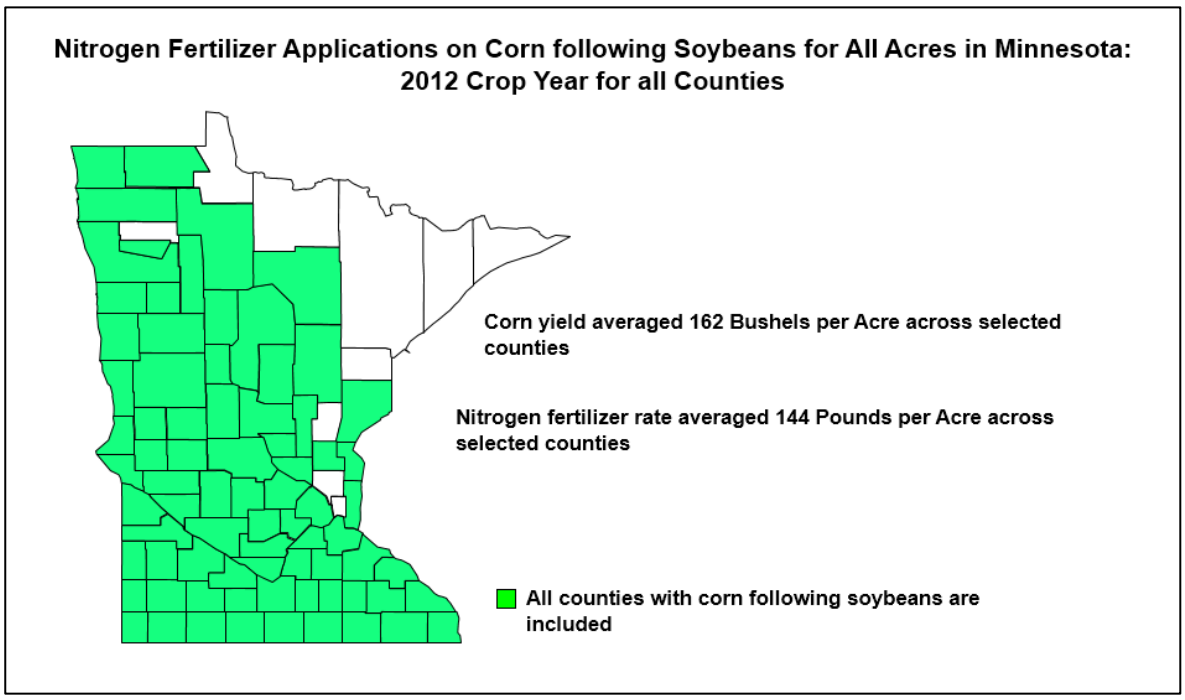

Figure 2. The corn yield averaged 162 bushels per acre and the nitrogen fertilizer rate averaged 144 pounds per acre on fields with corn following soybeans in Minnesota.

Figure 3 details the distribution of average nitrogen fertilizer rates in Minnesota for corn following soybeans; the corresponding corn yields are detailed in red. Nitrogen fertilizer rates are only from commercial fertilizer.

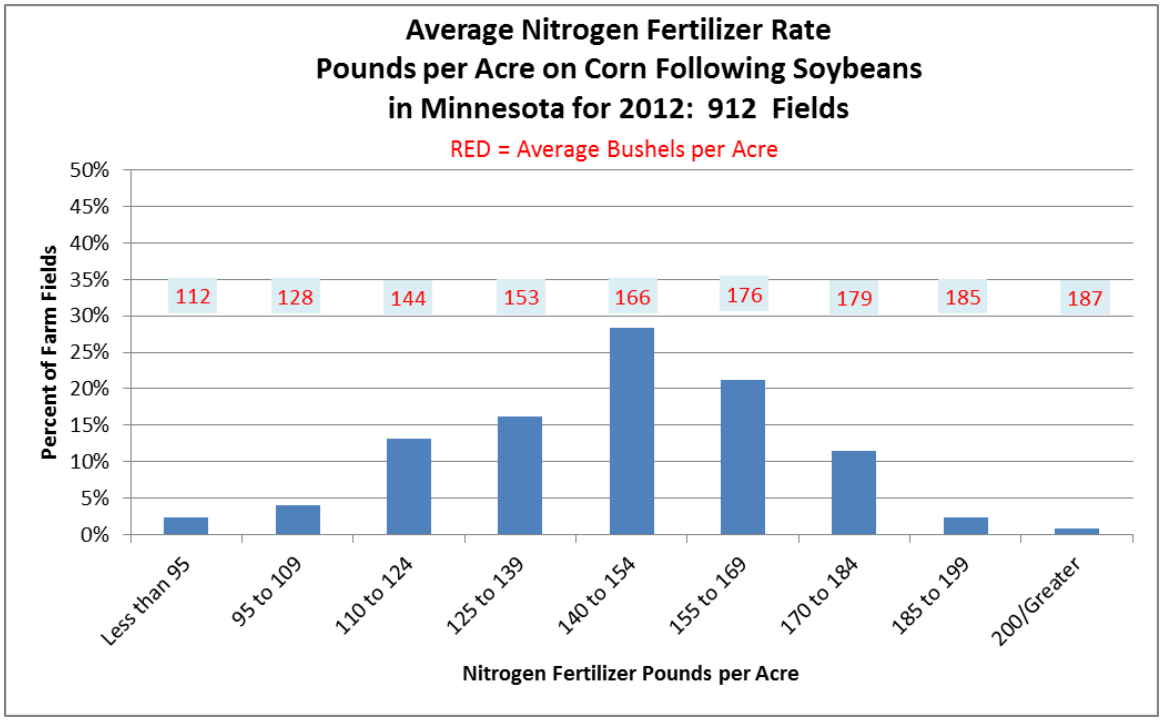

Figure 3. Average nitrogen fertilizer rates and yields on corn following soybeans in Minnesota for 2012: 912 fields.

Southeastern BMP Region: Corn Following Soybeans

There were 94 fields that were included in the SE BMP region corn following soybeans analysis. Figure 4 details the location, average rate of nitrogen fertilizer and average yield for corn following soybeans in the SE BMP region.

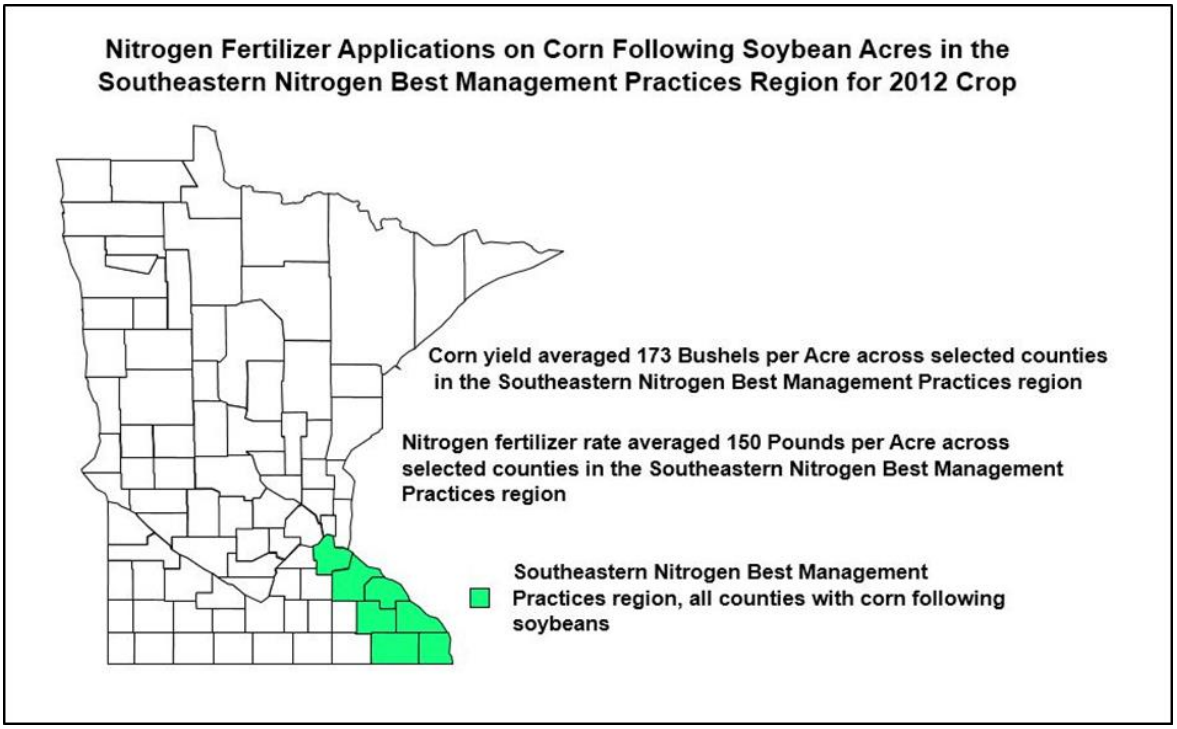

Figure 4. The corn yield averaged 173 bushels per acre and the nitrogen fertilizer rate averaged 150 pounds per acre in the SE BMP region.

Figure 5 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

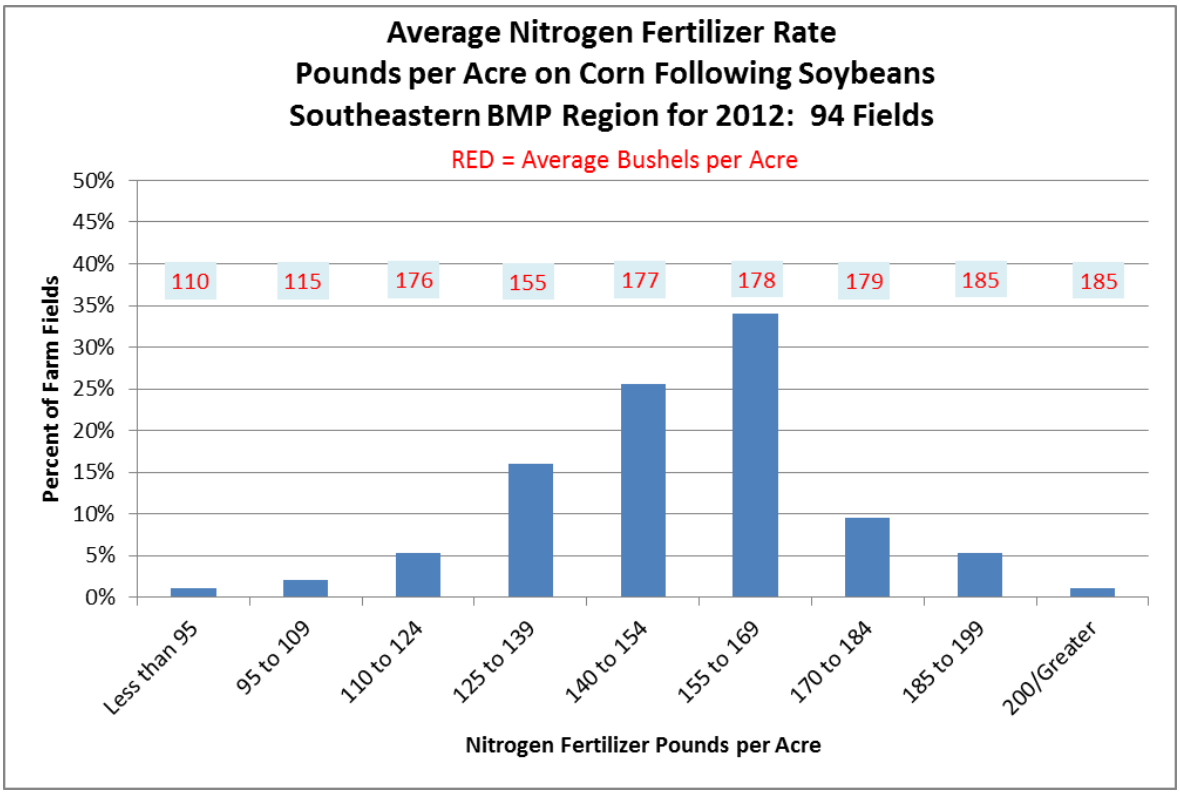

Figure 5. Average nitrogen fertilizer rates and yields on corn following soybeans in the SE BMP region for 2012: 94 fields.

In the SE BMP region, nitrogen fertilizer rates ranged from an average of 143 pounds per acre in Fillmore and Houston Counties to 159 pounds per acre in Winona County as shown in Table 9.

Table 9. Average county nitrogen fertilizer rates and corn yields for the SE BMP region for corn following soybeans.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Dakota	14	152	168
Fillmore	15	143	167
Goodhue	18	154	177
Houston	11	143	180
Olmsted	11	148	174
Wabasha	17	154	177
Winona	8	159	161

South Central BMP Region: Corn Following Soybeans

There were 285 fields that were included in the SC BMP region corn following soybeans analysis. Figure 6 details the location, average rate of nitrogen fertilizer and average yield for corn following soybeans in the SC BMP region.

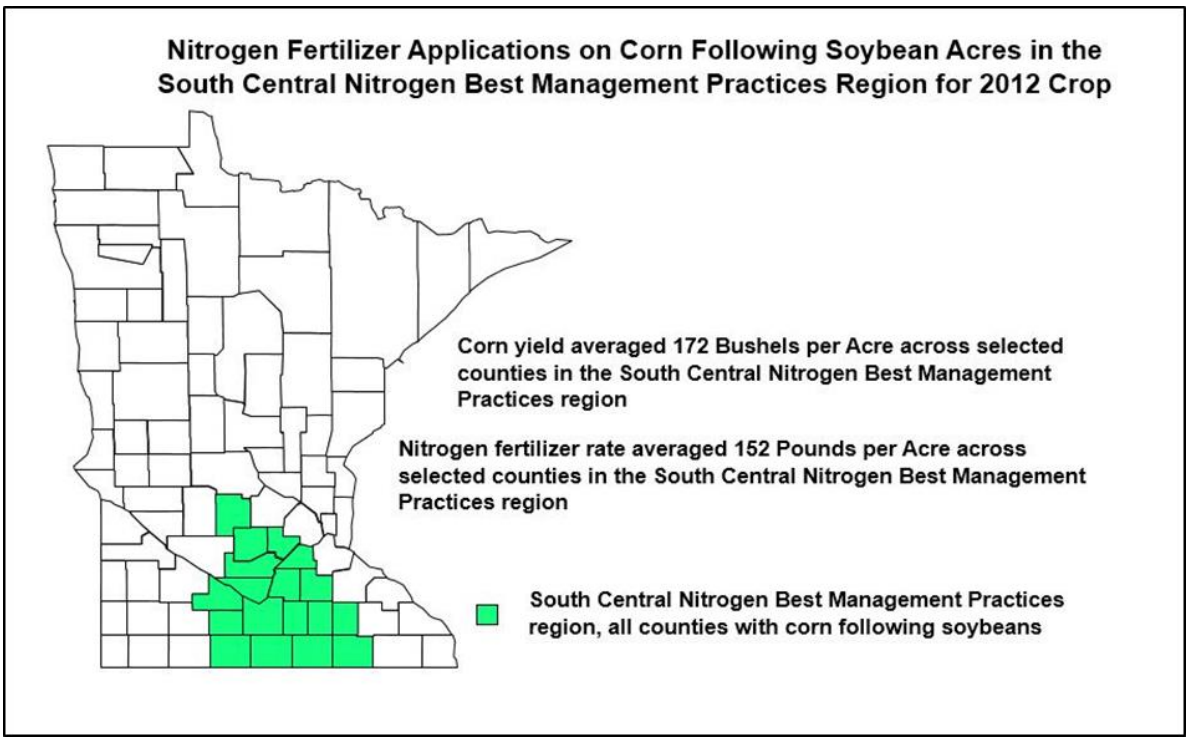

Figure 6. The corn yield averaged 172 bushels per acre and the nitrogen fertilizer rate averaged 152 pounds per acre in the SC BMP region.

Figure 7 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

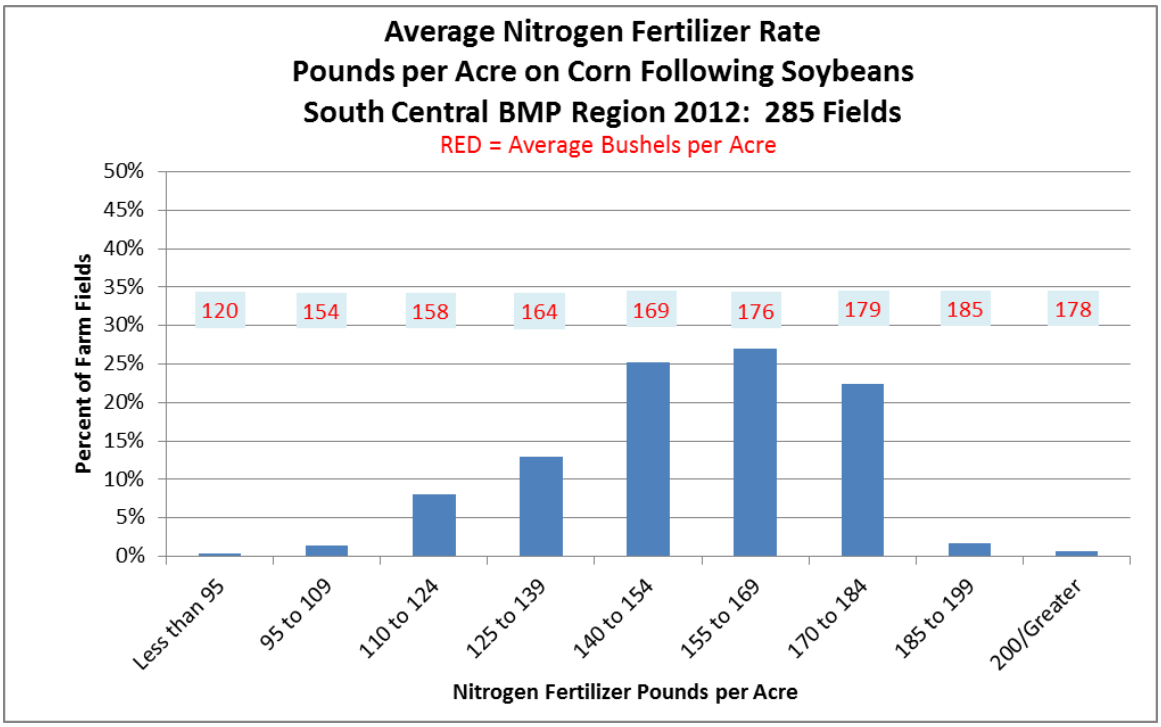

Figure 7. Average nitrogen fertilizer rates and yields on corn following soybeans in the SC BMP region for 2012: 285 fields.

In the SC BMP region, nitrogen fertilizer rates ranged from an average of 132 pounds per acre in Carver County to 159 pounds per acre in Steele County as shown in Table 10.

Table 10. Average county nitrogen fertilizer rates and corn yields for the SC BMP region corn following soybeans.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Blue Earth	18	152	166
Brown	25	154	172
Carver	10	132	170
Dodge	9	153	188
Faribault	18	152	182
Freeborn	23	157	174
Le Sueur	6	148	164
Martin	13	155	179
McLeod	18	157	170
Meeker	22	155	160
Mower	20	156	174
Nicollet	12	158	173
Rice	20	142	167
Scott	10	139	158
Sibley	21	154	174
Steele	12	159	175
Waseca	12	153	169
Watonwan	16	150	177

Southwestern and West Central BMP Region: Corn Following Soybeans

There were 326 fields that were included in the SW BMP region corn following soybeans analysis. Figure 8 details the location, average rate of nitrogen fertilizer and average yield for corn following soybeans in the SW BMP region.

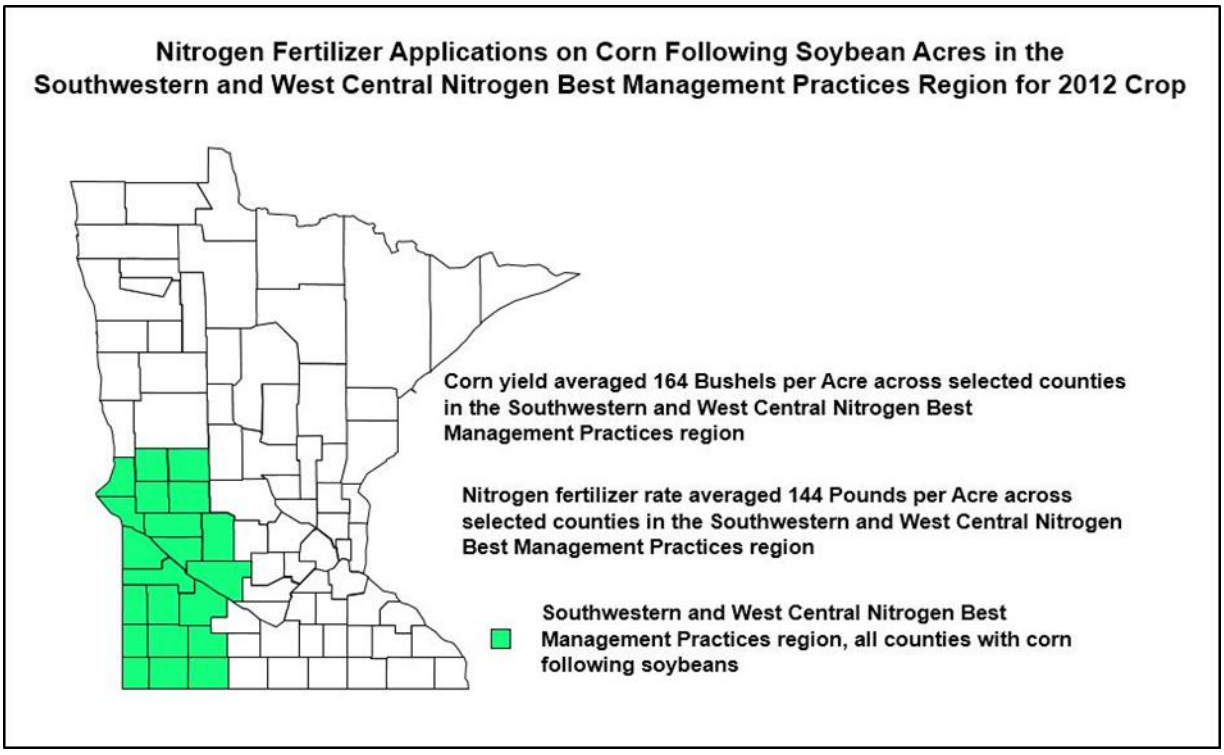

Figure 8. The corn yield averaged 164 bushels per acre and the nitrogen fertilizer rate averaged 144 pounds per acre in the SW BMP region.

Figure 9 details the distribution of nitrogen fertilizer rates in the SW BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

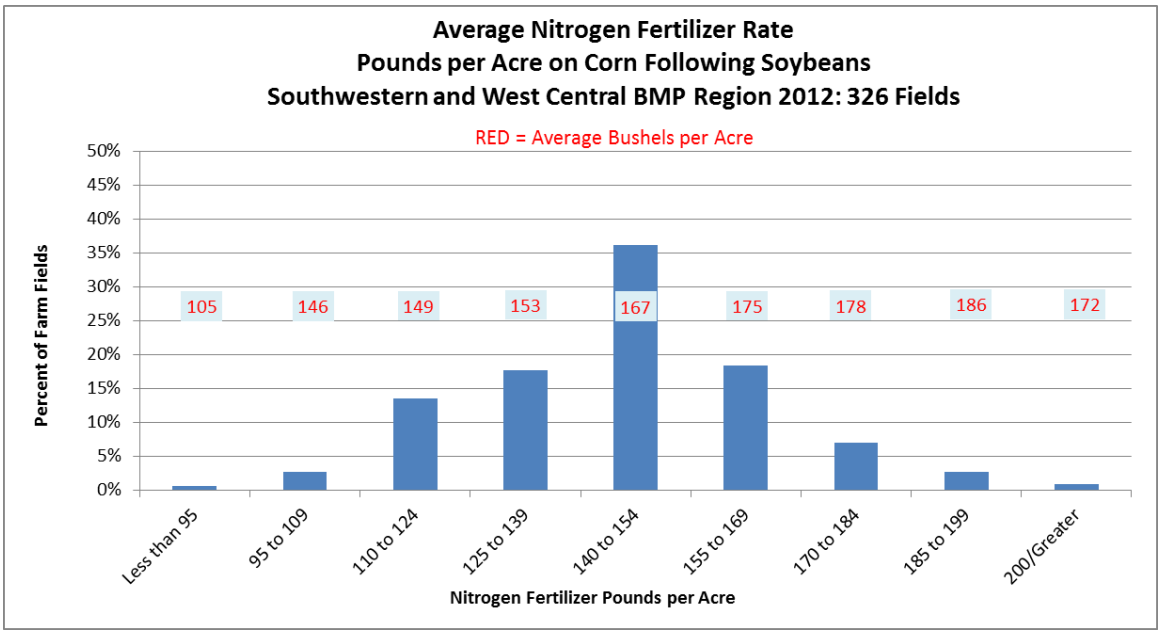

Figure 9. Average nitrogen fertilizer rates and yields on corn following soybeans in the SW BMP region for 2012: 326 fields.

In the SW BMP region, nitrogen fertilizer rates ranged from an average of 133 pounds per acre in Big Stone County to 156 pounds per acre in Renville County as shown in Table 11.

Table 11. Average county nitrogen fertilizer rates and corn yields for the SW BMP region corn following soybeans.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Big Stone	11	133	145
Chippewa	14	148	165
Cottonwood	24	142	164
Douglas	8	140	156
Grant	5	151	171
Jackson	18	147	174
Kandiyohi	10	137	159
Lac qui Parle	13	144	162
Lincoln	11	147	165
Lyon	22	138	161
Murray	14	142	159
Nobles	15	134	158
Pipestone	11	142	166
Pope	12	142	165
Redwood	29	151	167
Renville	28	156	169
Rock	17	137	170
Stevens	16	145	160
Swift	17	153	169
Traverse	11	146	162
Yellow Medicine	20	141	161

Northwestern BMP Region:
Corn Following Soybeans

There were 47 fields that were included in the NW BMP region corn following soybeans analysis. Figure 10 details the location, average rate of nitrogen fertilizer and average yield for corn following soybeans in the NW BMP region.

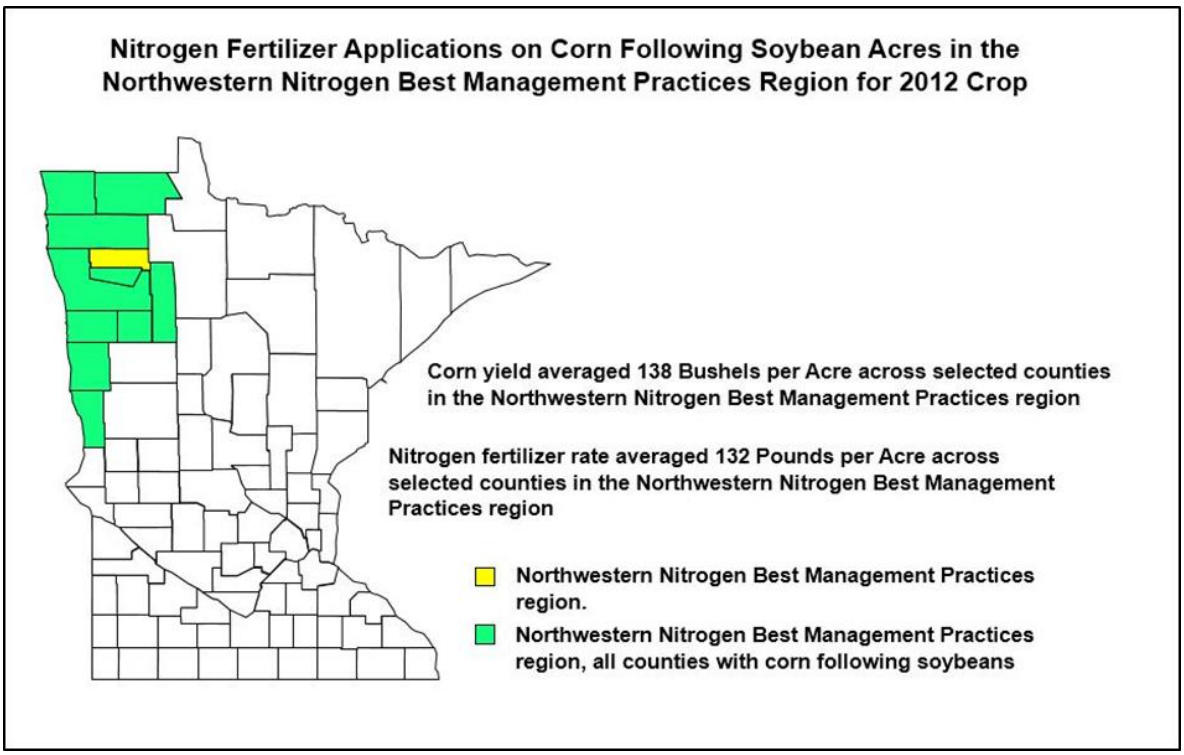

Figure 10. The corn yield averaged 138 bushels per acre and the nitrogen fertilizer rate averaged 132 pounds per acre in the NW BMP region.

Figure 11 details the distribution of nitrogen fertilizer rates in the NW BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

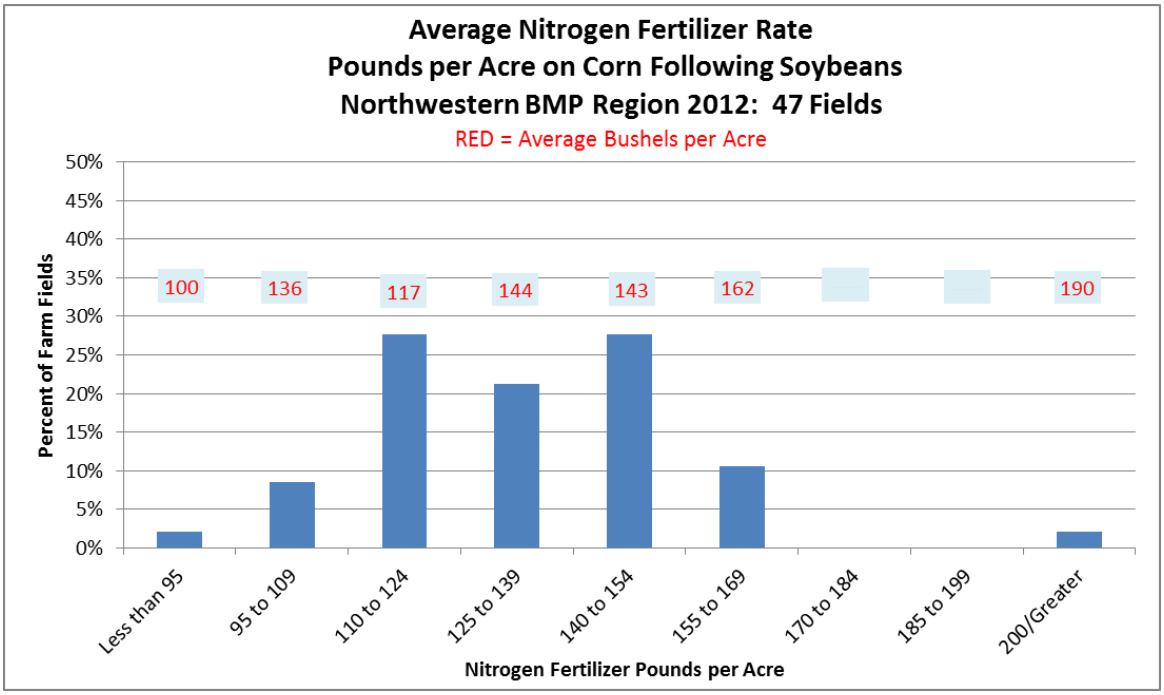

Figure 11. Average nitrogen fertilizer rates and yields on corn following soybeans in the NW BMP region for 2012: 47 fields.

Four counties had more than five responses in the NW BMP region. Nitrogen fertilizer rates ranged from an average of 123 pounds per acre in Polk County to 139 pounds per acre in Clay County as shown in Table 12.

Table 12. Average county nitrogen fertilizer rates and corn yields for the NW BMP region corn following soybeans.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Clay	9	139	148
Clearwater	**	**	**
Kittson	**	**	**
Mahnomen	**	**	**
Marshall	**	**	**
Norman	7	131	137
Polk	6	123	135
Red Lake	**	**	**
Roseau	**	**	**
Wilkin	9	134	145

****** Less than five responses**.**

Irrigated and non-irrigated sandy soils BMP Region: Corn Following Soybeans

There were 160 fields that were included in the IRR BMP region corn following soybeans analysis. Figure 12 details the location, average rate of nitrogen fertilizer and average yield for corn following soybeans in the IRR BMP region.

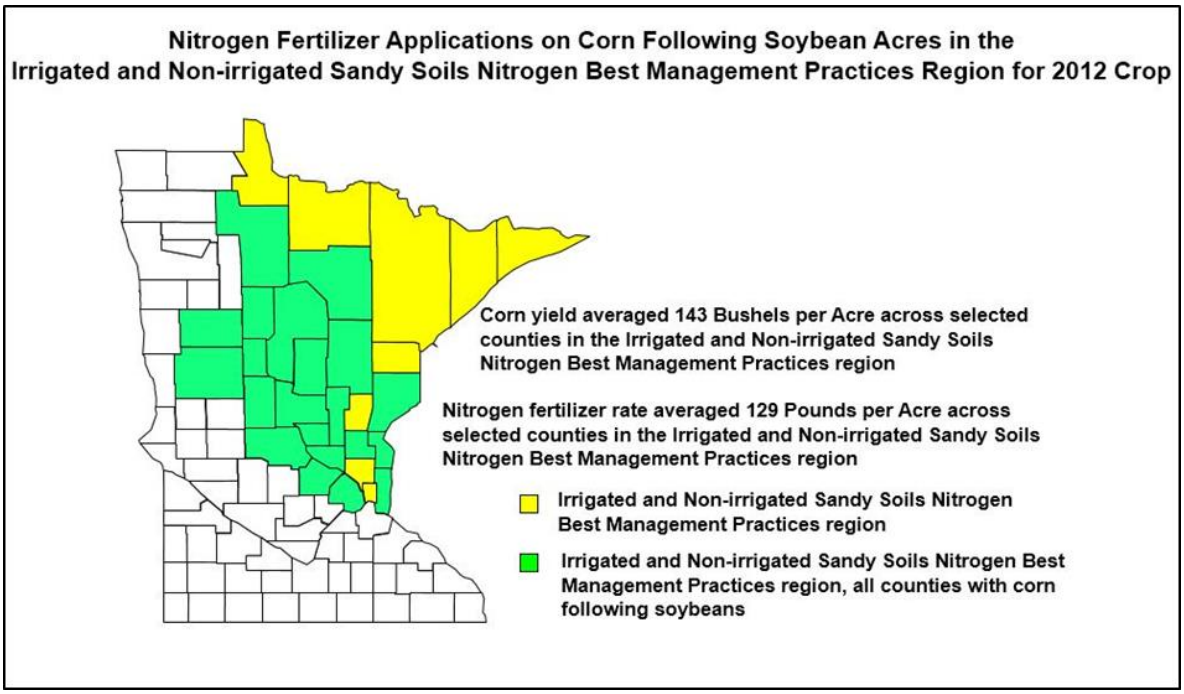

Figure 12. The corn yield averaged 143 bushels per acre and the nitrogen fertilizer rate averaged 129 pounds per acre in the IRR BMP region.

Figure 13 details the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

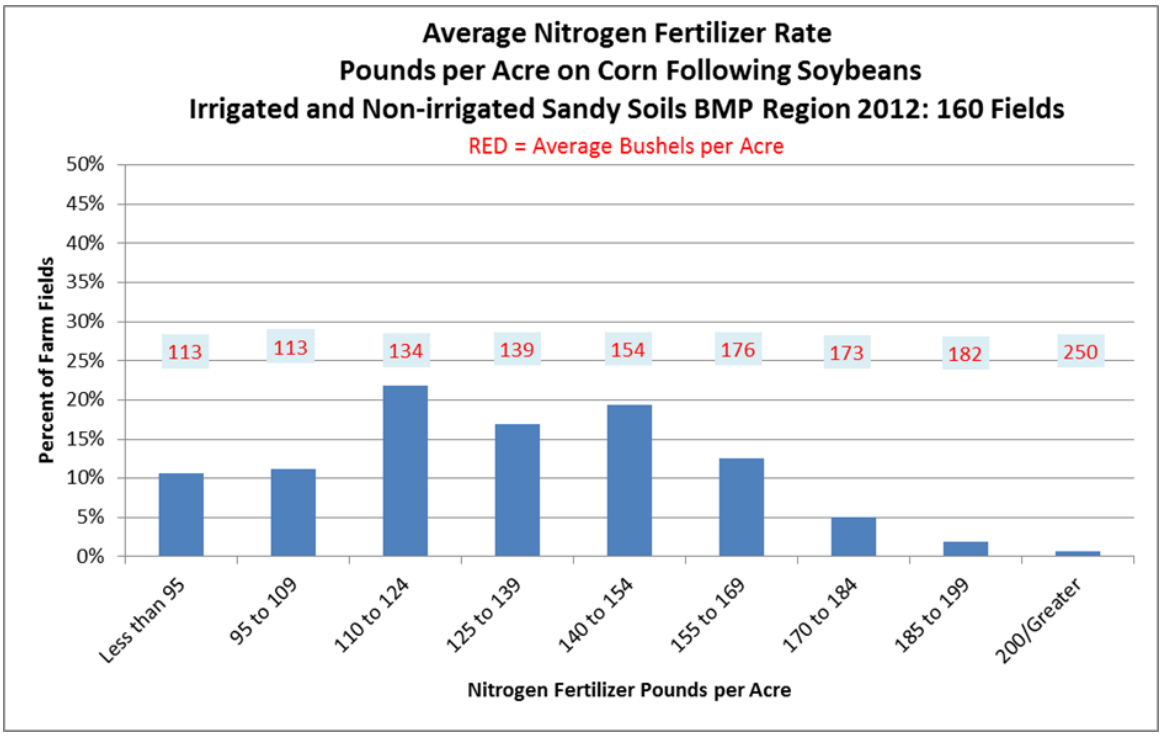

Figure 13. Average nitrogen fertilizer rates and yields on corn following soybeans in the IRR BMP region for 2012: 160 fields.

Eleven counties had more than five responses in the IRR BMP region. Nitrogen fertilizer rates ranged from an average of 105 pounds per acre in Pine County to 141 pounds per acre in Mille Lacs County as shown in Table 13.

Table 13. Average county nitrogen fertilizer rates and corn yields for the IRR BMP region corn following soybeans.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Aitkin	**	**	**
Becker	8	116	124
Beltrami	**	**	**
Benton	9	117	143
Cass	**	**	**
Chisago	**	**	**
Crow Wing	**	**	**
Hennepin	**	**	**
Hubbard	**	**	**
Isanti	6	134	148
Itasca	**	**	**
Mille Lacs	7	141	157
Morrison	15	127	137
Otter Tail	28	130	146
Pine	5	105	121
Sherburne	5	130	152
Stearns	28	135	149
Todd	11	128	129
Wadena	**	**	**
Washington	**	**	**
Wright	15	134	141

****** Less than five responses**.**

Statewide: Corn Following Corn

Statewide, thirty-four percent of the fields reported were corn following corn. Figure 14 details the counties where farmers reported on fields with corn following corn. There were 589 corn following corn fields surveyed in Minnesota.

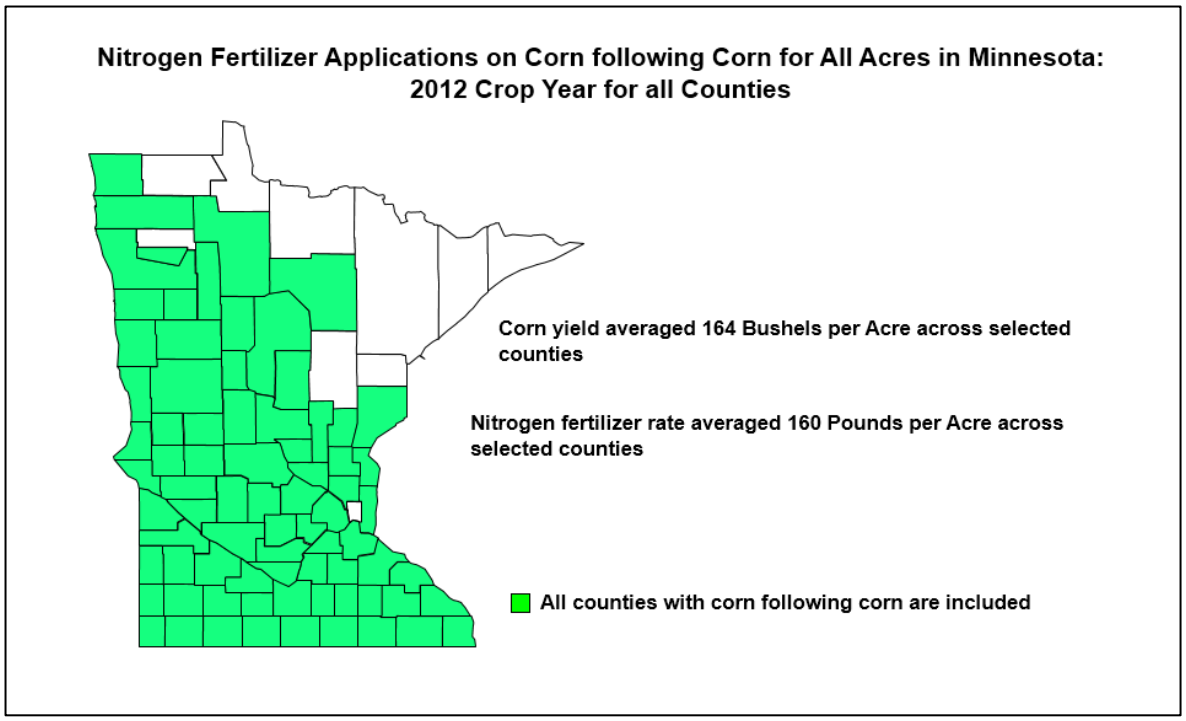

Figure 14. The corn yield averaged 164 bushels per acre and the nitrogen fertilizer rate averaged 160 pounds per acre on fields with corn following corn in Minnesota.

Figure 15 details the distribution of average nitrogen fertilizer rates in Minnesota for the 589 corn following corn fields; the corresponding corn yields are detailed in red.

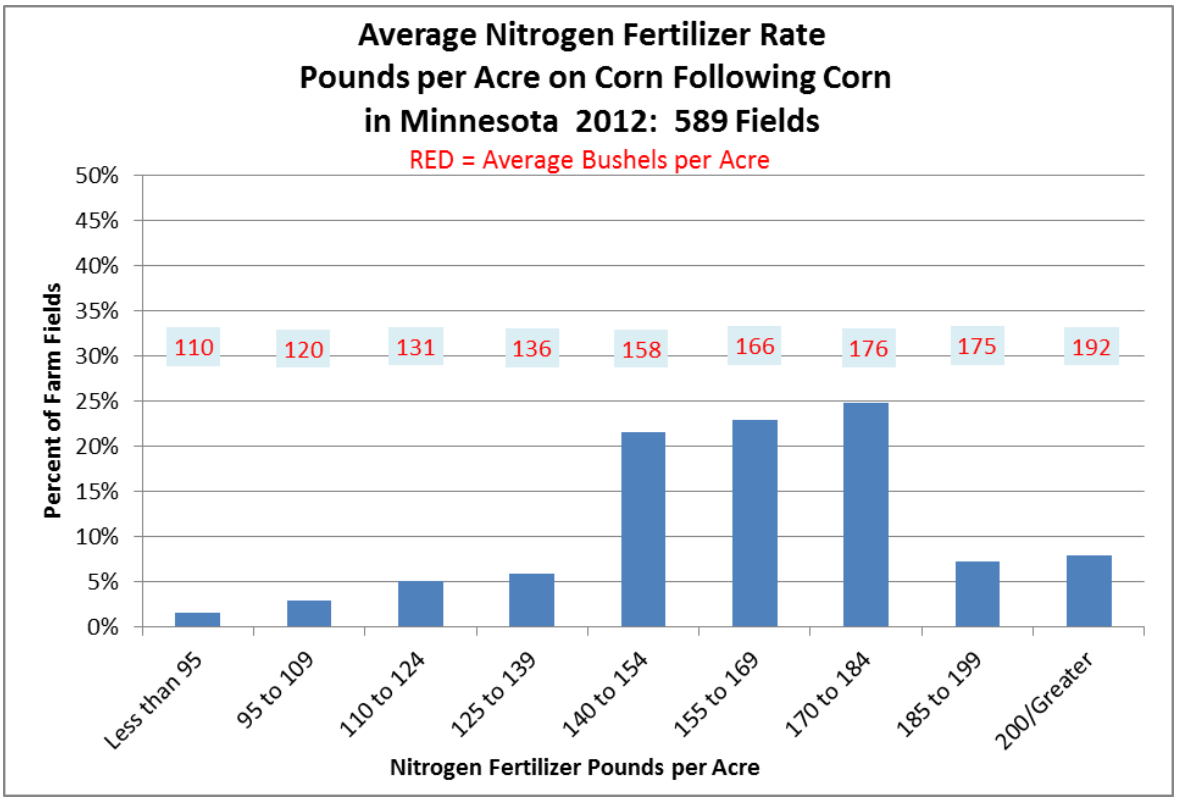

Figure 15. Average nitrogen fertilizer rates and yields on corn following corn in Minnesota for 2012: 589 fields.

Southeastern BMP Region: Corn Following Corn

There were 70 fields that were included in the SE BMP region corn following corn analysis. Figure 16 details the location, average rate of nitrogen fertilizer and average yield for corn following corn in the SE BMP region.

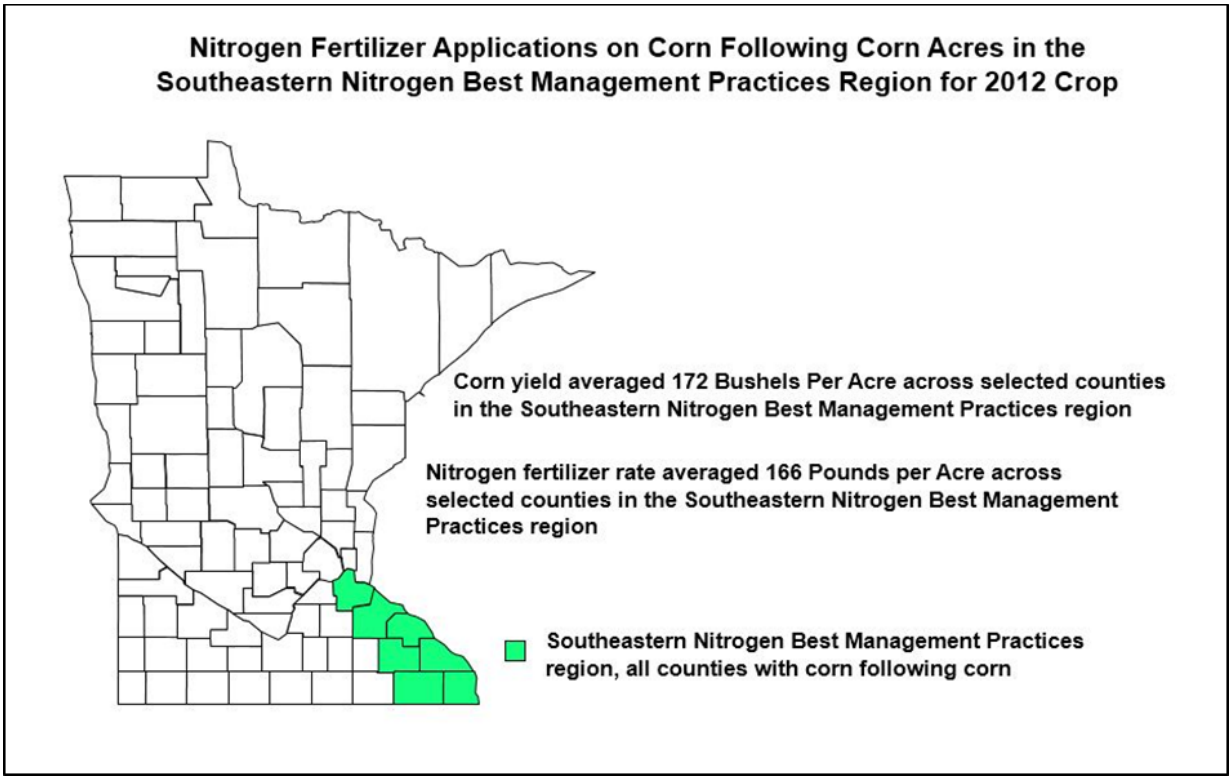

Figure 16. The corn yield averaged 172 bushels per acre and the nitrogen fertilizer rate averaged 166 pounds per acre in the SE BMP region.

Figure 17 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following corn; the corresponding corn yields are detailed in red.

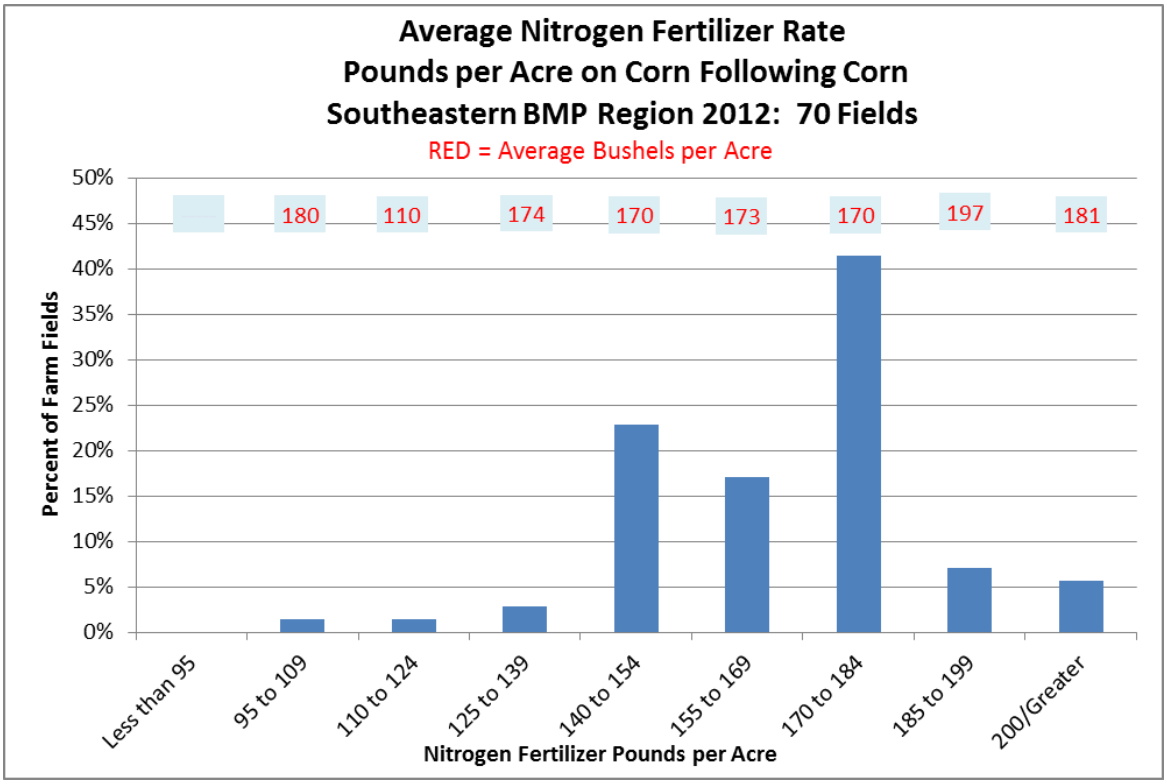

Figure 17. Average nitrogen fertilizer rates and yields on corn following corn in the SE BMP region for 2012: 70 fields.

In the SE BMP region, nitrogen fertilizer rates ranged from an average of 154 pounds per acre in Houston County to 172 pounds per acre in Fillmore and Goodhue Counties as shown in Table 14.

Table 14. Average county nitrogen fertilizer rates and corn yield for the SE BMP region for corn following corn.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Dakota	12	169	181
Fillmore	7	172	173
Goodhue	11	172	179
Houston	7	154	164
Olmsted	10	160	166
Wabasha	15	169	170
Winona	8	161	169

South Central BMP Region: Corn Following Corn

There were 185 fields that were included in the SC BMP region corn following corn analysis. Figure 18 details the location, average rate of nitrogen fertilizer and average yield for corn following corn in the SC BMP region.

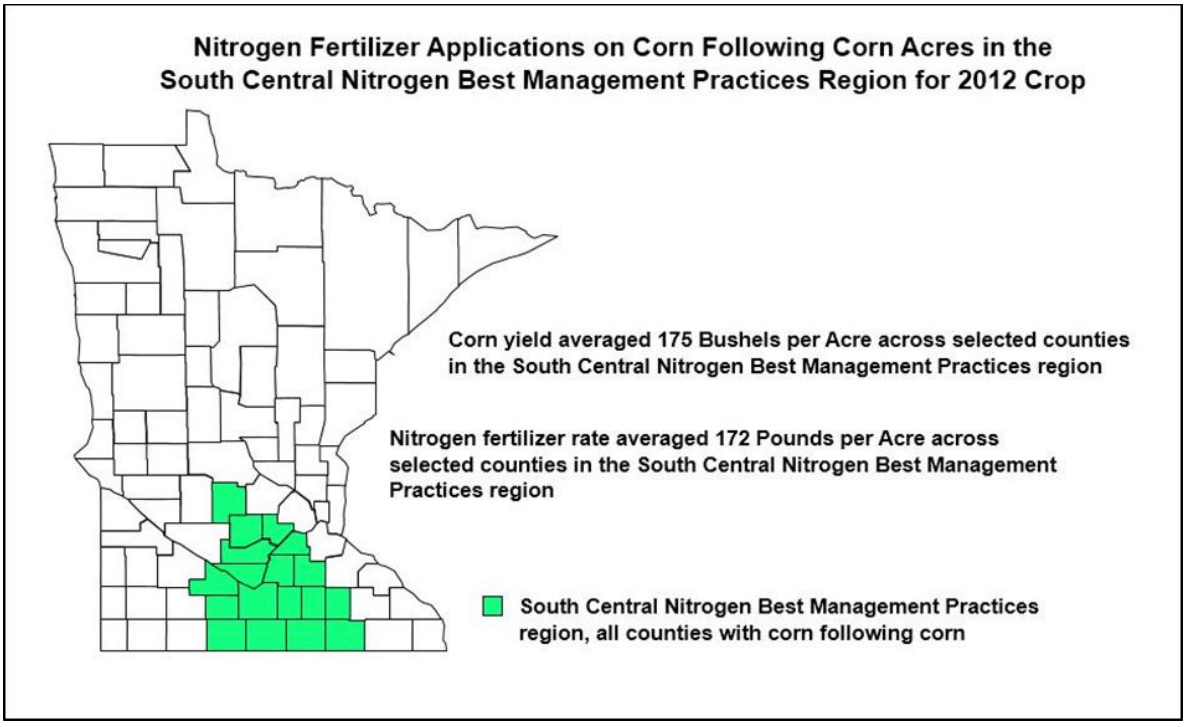

Figure 18. The corn yield averaged 175 bushels per acre and the nitrogen fertilizer rate averaged 172 pounds per acre in the SC BMP region.

Figure 19 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following corn; the corresponding corn yields are detailed in red.

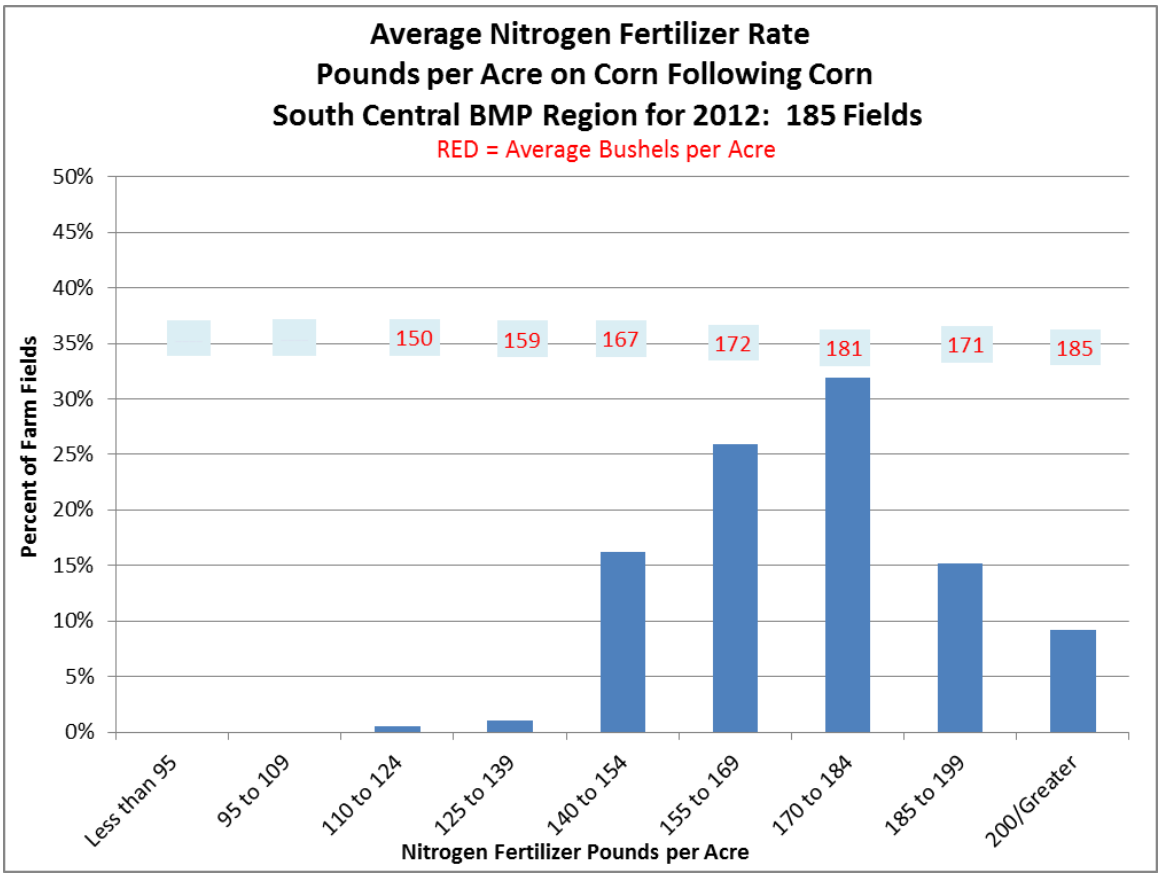

Figure 19. Average nitrogen fertilizer rates and yields on corn following corn in the SC BMP region for 2012: 185 fields.

Seventeen counties had more than five responses in SC BMP region. Nitrogen fertilizer rates ranged from an average of 158 pounds per acre in Scott County to 181 pounds per acre in Nicollet and Sibley Counties as shown in Table 15.

Table 15. Average county nitrogen fertilizer rates and corn yields for the SC BMP region for corn following corn.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Blue Earth	9	168	166
Brown	17	170	172
Carver	5	160	173
Dodge	**	**	**
Faribault	10	174	177
Freeborn	18	175	180
Le Sueur	6	161	167
Martin	8	173	177
McLeod	13	174	172
Meeker	13	177	167
Mower	12	173	171
Nicollet	6	181	174
Rice	13	165	177
Scott	5	158	166
Sibley	16	181	178
Steele	10	178	193
Waseca	9	173	172
Watonwan	12	167	180

****** Less than five responses**.**

Southwestern and West Central BMP Region: Corn Following Corn

There were 178 fields that were included in the SW BMP region corn following corn analysis. Figure 20 details the location, average rate of nitrogen fertilizer and average yield for corn following corn in the SW BMP region.

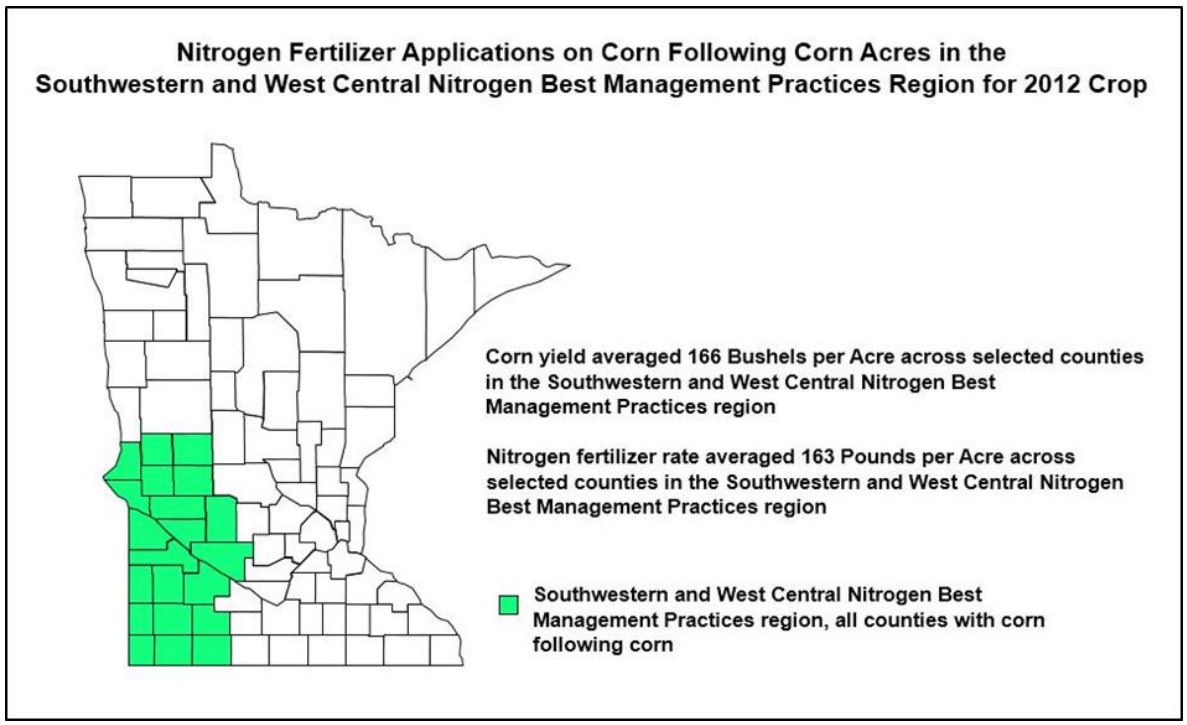

Figure 20. The corn yield averaged 166 bushels per acre and the nitrogen fertilizer rate averaged 163 pounds per acre in the SW BMP region.

Figure 21 details the distribution of nitrogen fertilizer rates in the SW BMP region for corn following corn; the corresponding corn yields are detailed in red.

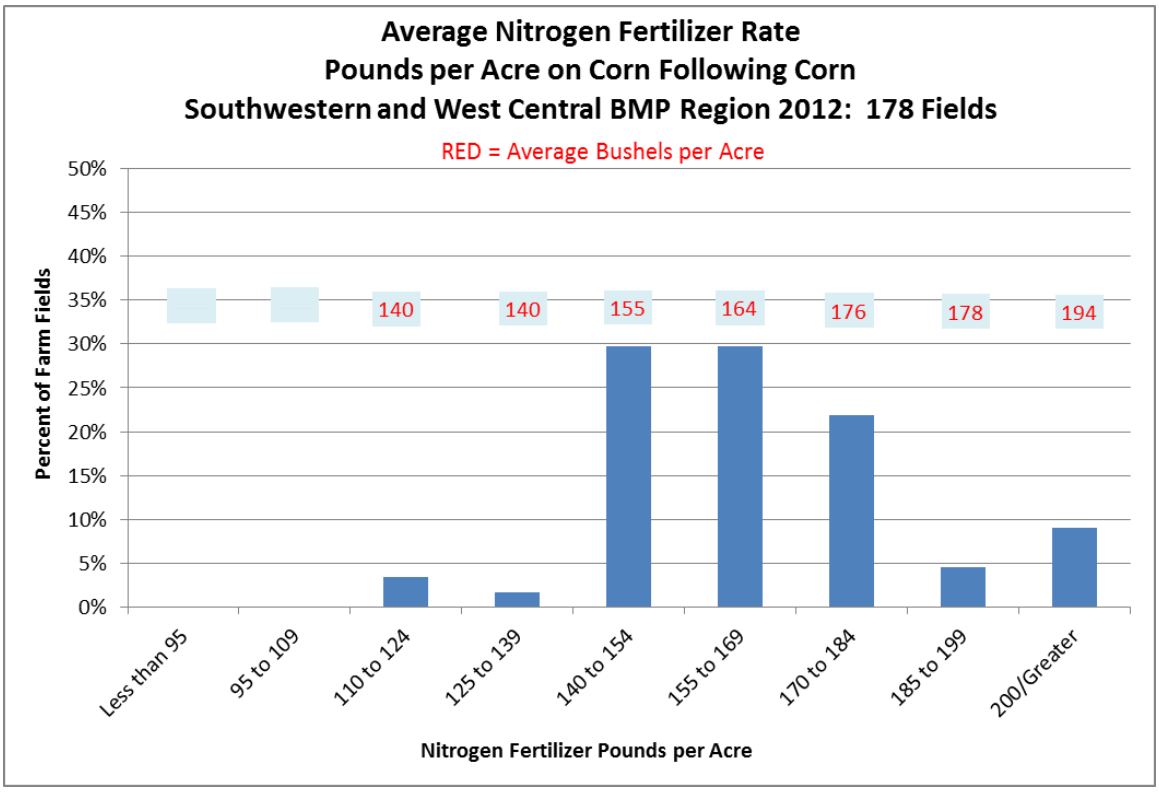

Figure 21. Average nitrogen fertilizer rates and yields on corn following corn in the SW BMP region for 2012: 178 fields.

Eighteen counties had more than five responses in SW BMP region. Nitrogen fertilizer rates ranged from an average of 148 pounds per acre in Kandiyohi County to 176 pounds per acre in Chippewa County as shown in Table 16.

Table 16. Average county nitrogen fertilizer rates and corn yields for the SW BMP region for corn following corn.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Big Stone	8	153	153
Chippewa	7	176	177
Cottonwood	14	158	162
Douglas	**	**	**
Grant	**	**	**
Jackson	11	164	176
Kandiyohi	5	148	148
Lac qui Parle	7	157	162
Lincoln	**	**	**
Lyon	18	161	164
Murray	6	162	158
Nobles	6	152	161
Pipestone	9	155	159
Pope	7	166	164
Redwood	19	167	167
Renville	15	168	169
Rock	6	165	163
Stevens	7	167	175
Swift	10	174	180
Traverse	5	157	158
Yellow Medicine	8	157	171

****** Less than five responses**.**

Northwestern BMP Region: Corn Following Corn

There were 23 fields that were included in the NW BMP region corn following corn analysis. Figure 22 details the location, average rate of nitrogen fertilizer and average yield for corn following corn in the NW BMP region.

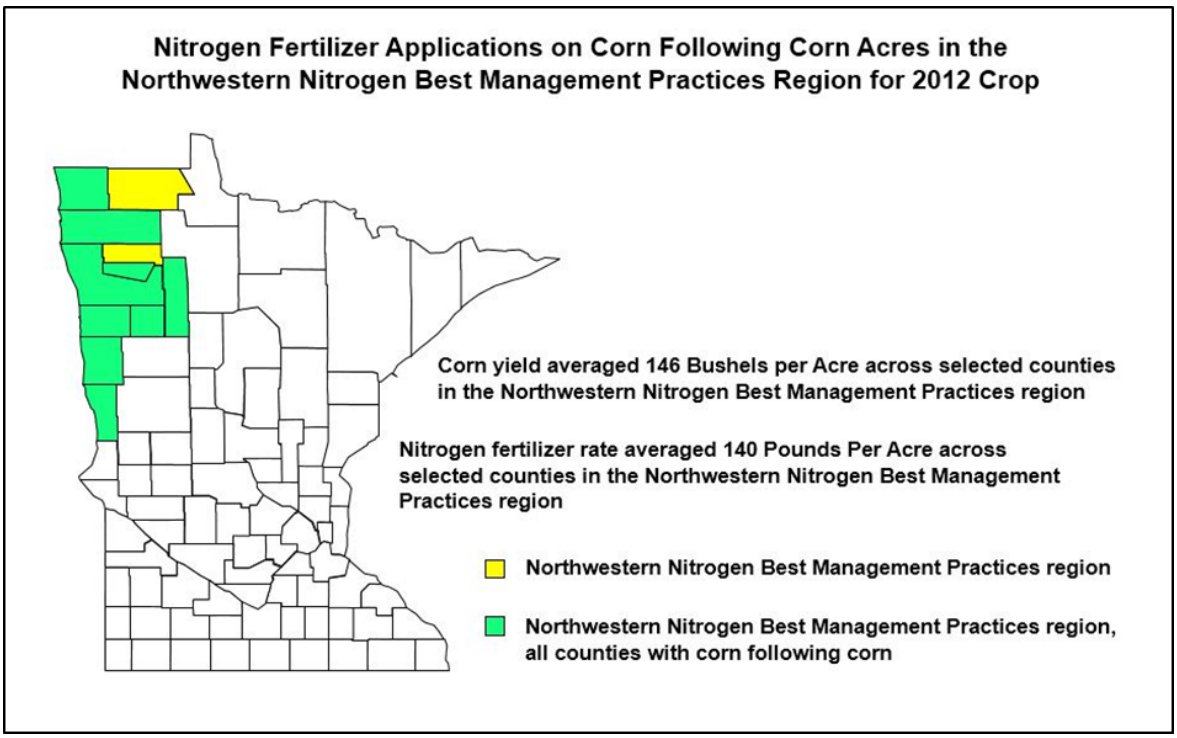

Figure 22. The corn yield averaged 146 bushels per acre and the nitrogen fertilizer rate averaged 140 pounds per acre in the NW BMP region.

Figure 23 details the distribution of nitrogen fertilizer rates in the NW BMP region for corn following corn; the corresponding corn yields are detailed in red.

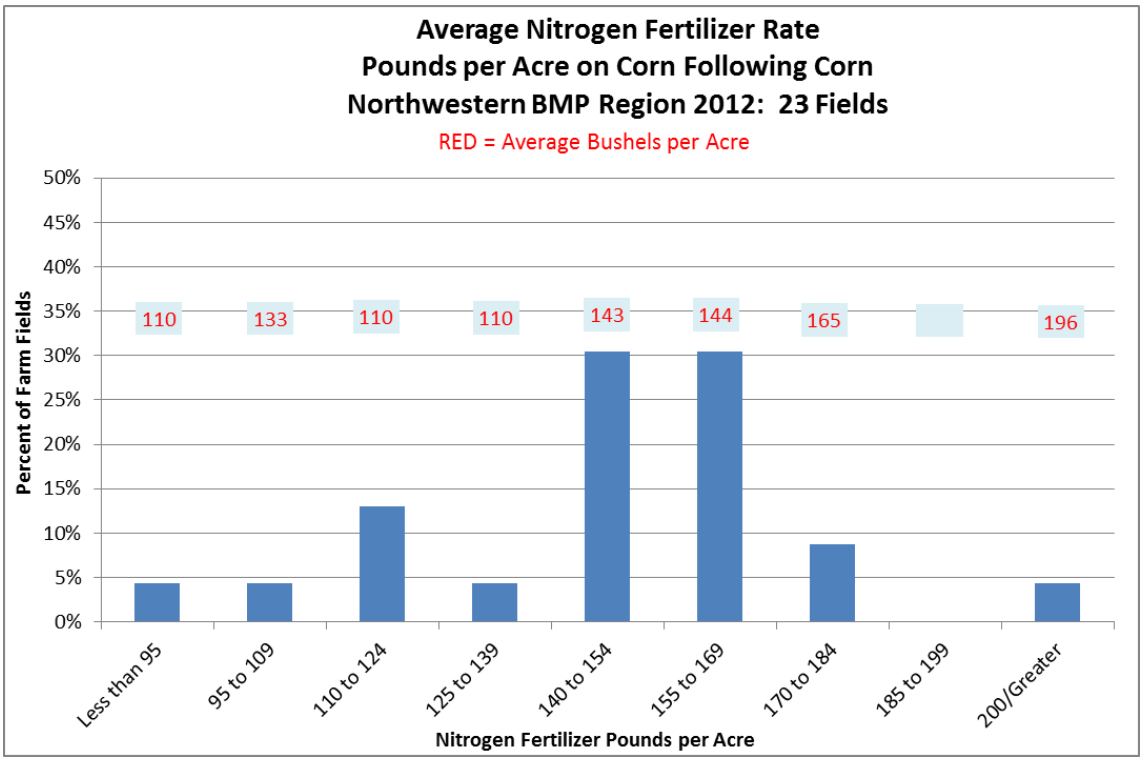

Figure 23. Average nitrogen fertilizer rates and yields on corn following corn in the NW BMP region for 2012: 23 fields.

One county had more than five responses in NW BMP region. Nitrogen fertilizer rates averaged 143 pounds per acre in Clay County as shown in Table 17.

Table 17. Average county nitrogen fertilizer rates and corn yields for the Northwestern BMP region for corn following corn.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Clay	5	143	139
Clearwater	**	**	**
Kittson	**	**	**
Mahnomen	**	**	**
Marshall	**	**	**
Norman	**	**	**
Polk	**	**	**
Red Lake	**	**	**
Wilkin	**	**	**

****** Less than five responses**.**

Irrigated and Non-irrigated Sandy Soils BMP Region: Corn Following Corn

There were 133 fields that were included in the IRR BMP region corn following corn analysis. Figure 24 details the location, average rate of nitrogen fertilizer and average yield for corn following corn in the IRR BMP region.

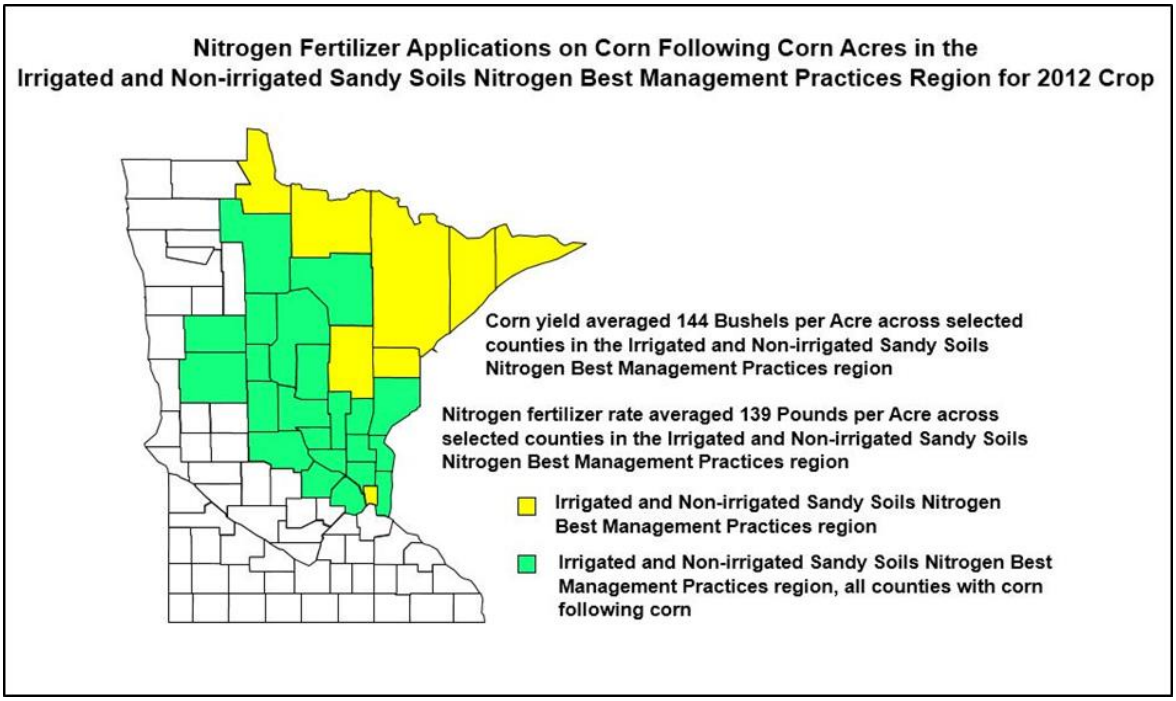

Figure 24. The corn yield averaged 144 bushels per acre and the nitrogen fertilizer rate averaged 139 pounds per acre in the IRR BMP region.

Figure 25 details the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following corn; the corresponding corn yields are detailed in red.

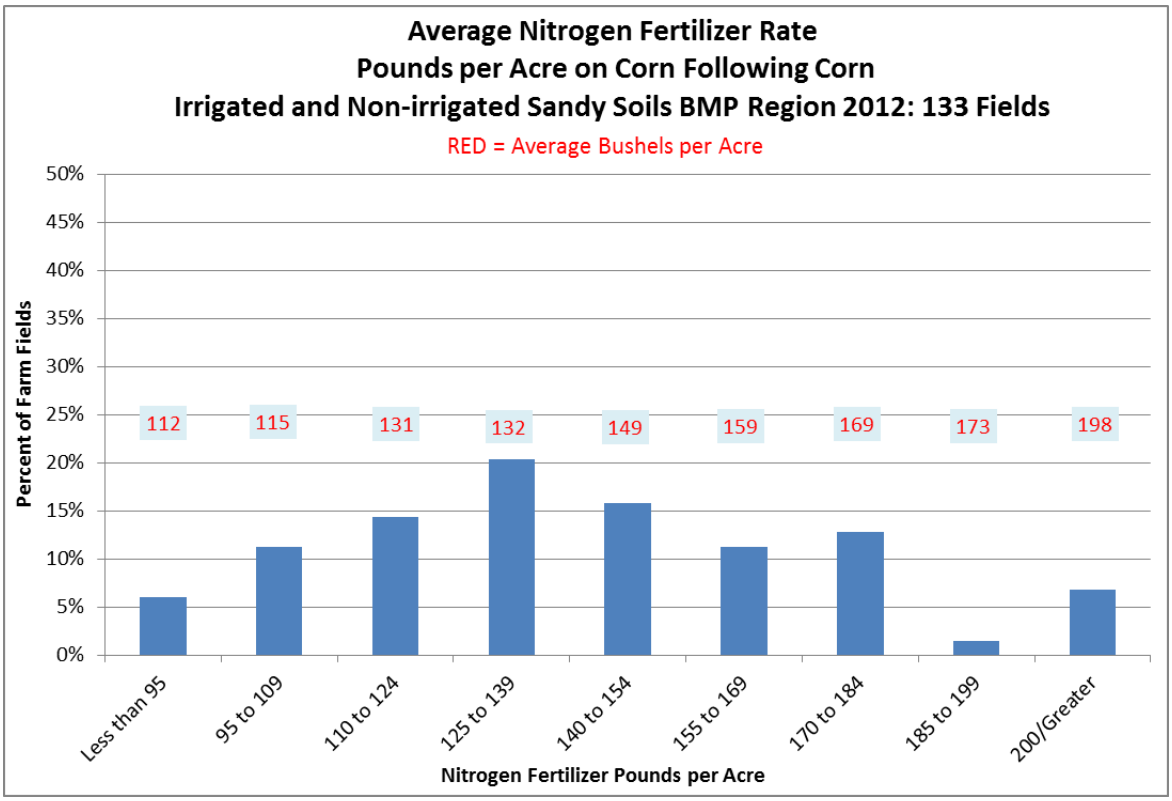

Figure 25. Average nitrogen fertilizer rates and yields on corn following corn in the IRR BMP region for 2012: 133 fields.

Ten counties had more than five responses in IRR BMP region. Nitrogen fertilizer rates ranged from an average of 121 pounds per acre in Becker County to 160 pounds per acre in Wright County as shown in Table 18.

Table 18. Average county nitrogen fertilizer rates and corn yields for the IRR BMP region for corn following corn.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Anoka	**	**	**
Becker	6	121	132
Beltrami	**	**	**
Benton	8	146	135
Cass	**	**	**
Chisago	**	**	**
Crow Wing	**	**	**
Hennepin	**	**	**
Hubbard	**	**	**
Isanti	**	**	**
Itasca	**	**	**
Kanabec	**	**	**
Mille Lacs	5	129	143
Morrison	18	140	131
Otter Tail	16	155	142
Pine	7	128	128
Sherburne	6	153	148
Stearns	14	153	150
Todd	13	144	137
Wadena	**	**	**
Washington	**	**	**
Wright	9	160	152

****** Less than five responses**.**

Statewide: Corn Following Corn Following Alfalfa

Statewide, five percent of the fields reported was corn following corn following alfalfa. Figure 26 details the counties where farmers reported on fields with corn following corn following alfalfa. There were 89 corn following corn following alfalfa fields surveyed in Minnesota.

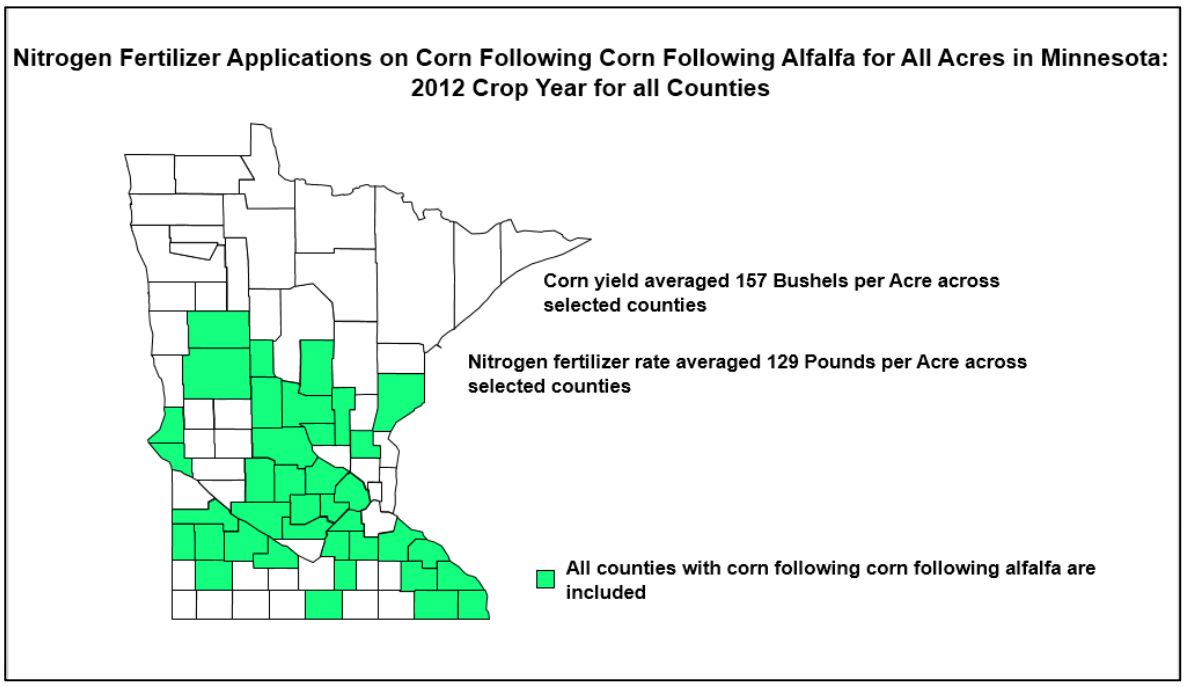

Figure 26. The corn yield averaged 157 bushels per acre and the nitrogen fertilizer rate averaged 129 pounds per acre on fields with corn following corn following alfalfa in Minnesota.

Figure 27 details the distribution of nitrogen fertilizer rates statewide for corn following corn following alfalfa fields; the corresponding corn yields are detailed in red.

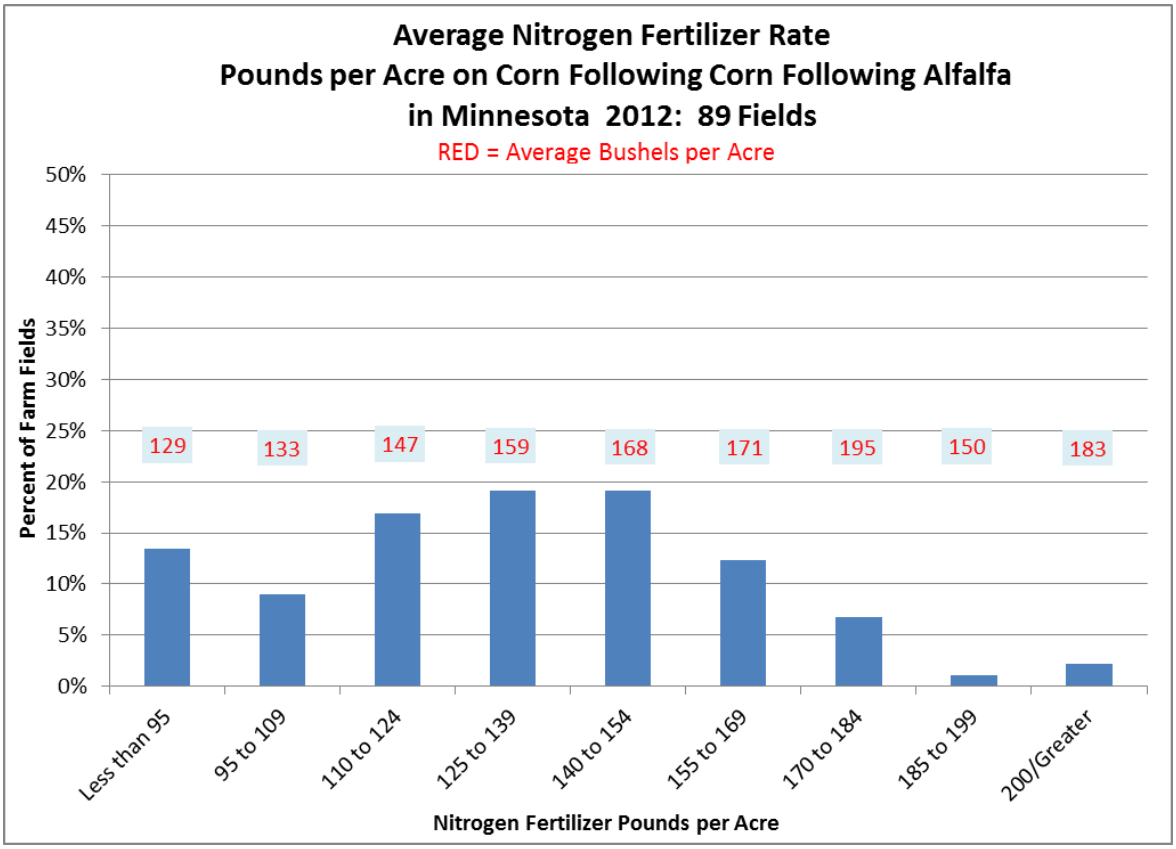

Figure 27. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in Minnesota for 2012: 89 fields.

Southeastern BMP Region:
Corn Following Corn Following Alfalfa

There were 30 fields that were included in the SE BMP region corn following corn following alfalfa analysis. Figure 28 details the location, average rate of nitrogen fertilizer and average yield for corn following corn following alfalfa in the SE BMP region.

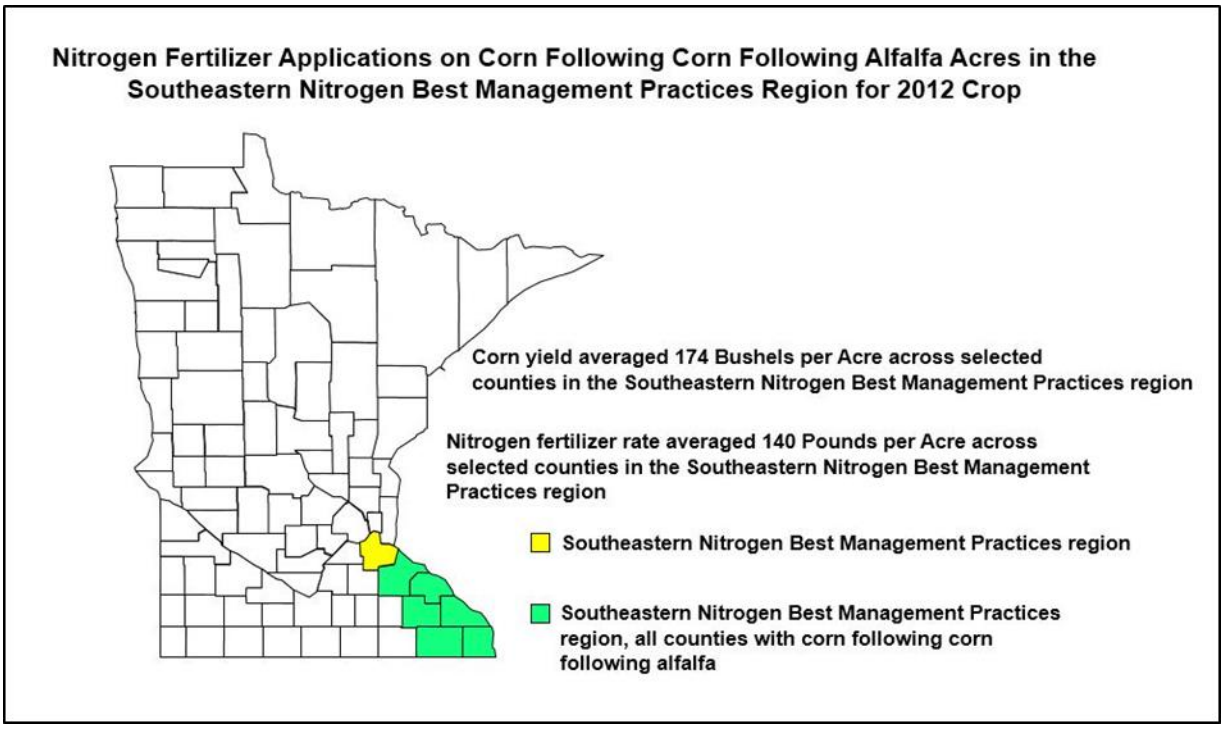

Figure 28. The corn yield averaged 174 bushels per acre and the nitrogen fertilizer rate averaged 140 pounds per acre in the SE BMP region.

Figure 29 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following corn following alfalfa; the corresponding corn yields are detailed in red.

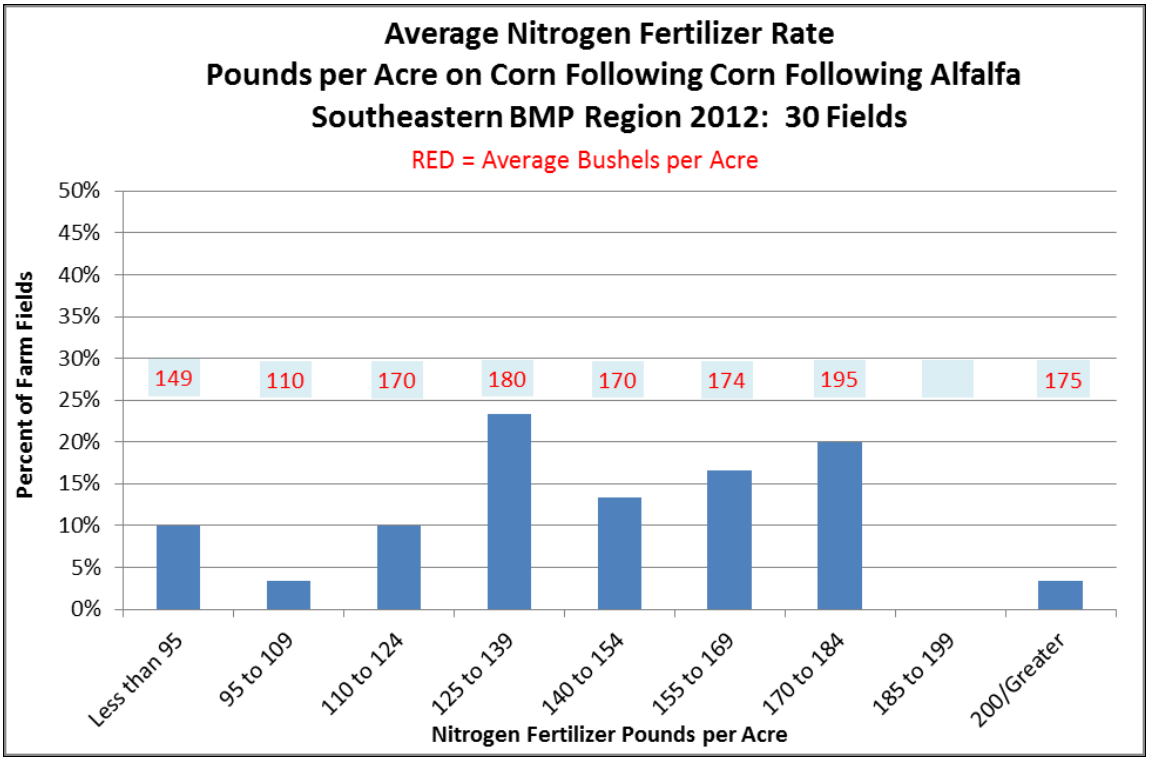

Figure 29. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the SE BMP region for 2012: 30 fields.

Two counties had more than five responses in the SE BMP region. Nitrogen fertilizer rates ranged from an average of 132 pounds per acre in Fillmore County to 152 pounds per acre in Wabasha County as shown in Table 19.

Table 19. Average county nitrogen fertilizer rates and corn yields for the SE BMP region for corn following corn following alfalfa.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Dakota	**	**	**
Fillmore	10	132	164
Goodhue	**	**	**
Houston	**	**	**
Olmsted	**	**	**
Wabasha	5	152	180
Winona	**	**	**

****** Less than five responses**.**

South Central BMP Region:
Corn Following Corn Following Alfalfa

There were 15 fields that were included in the SC BMP region corn following corn following alfalfa analysis. Figure 30 details the location, average rate of nitrogen fertilizer and average yield for corn following corn following alfalfa in the SC BMP region.

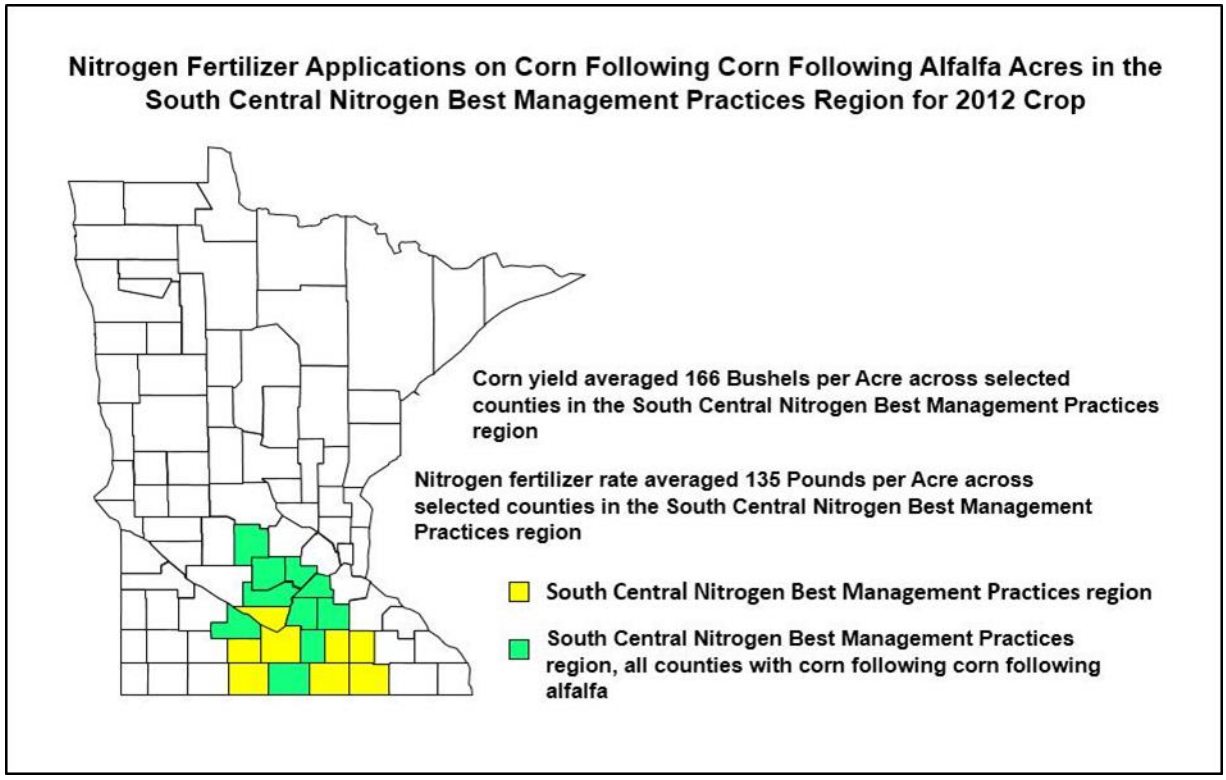

Figure 30. The corn yield averaged 166 bushels per acre and the nitrogen fertilizer rate averaged 135 pounds per acre in the SC BMP region.

Figure 31 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following corn following alfalfa; the corresponding corn yields are detailed in red.

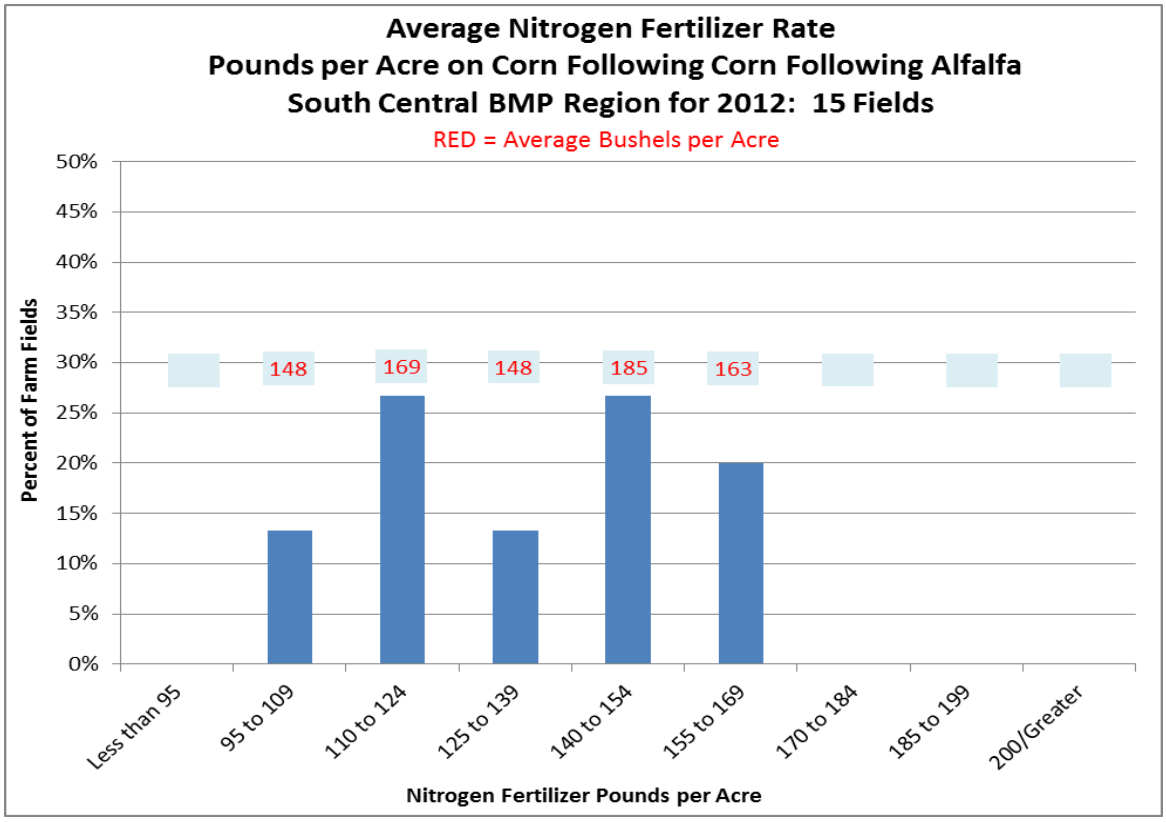

Figure 31. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the SC BMP region for 2012: 15 fields.

No counties had more than five responses in SC BMP region.

Southwestern and West Central BMP Region: Corn Following Corn Following Alfalfa

There were 14 fields that were included in the SW BMP region corn following corn following alfalfa analysis. Figure 32 details the location, average rate of nitrogen fertilizer and average yield for corn following corn following alfalfa in the SW BMP region.

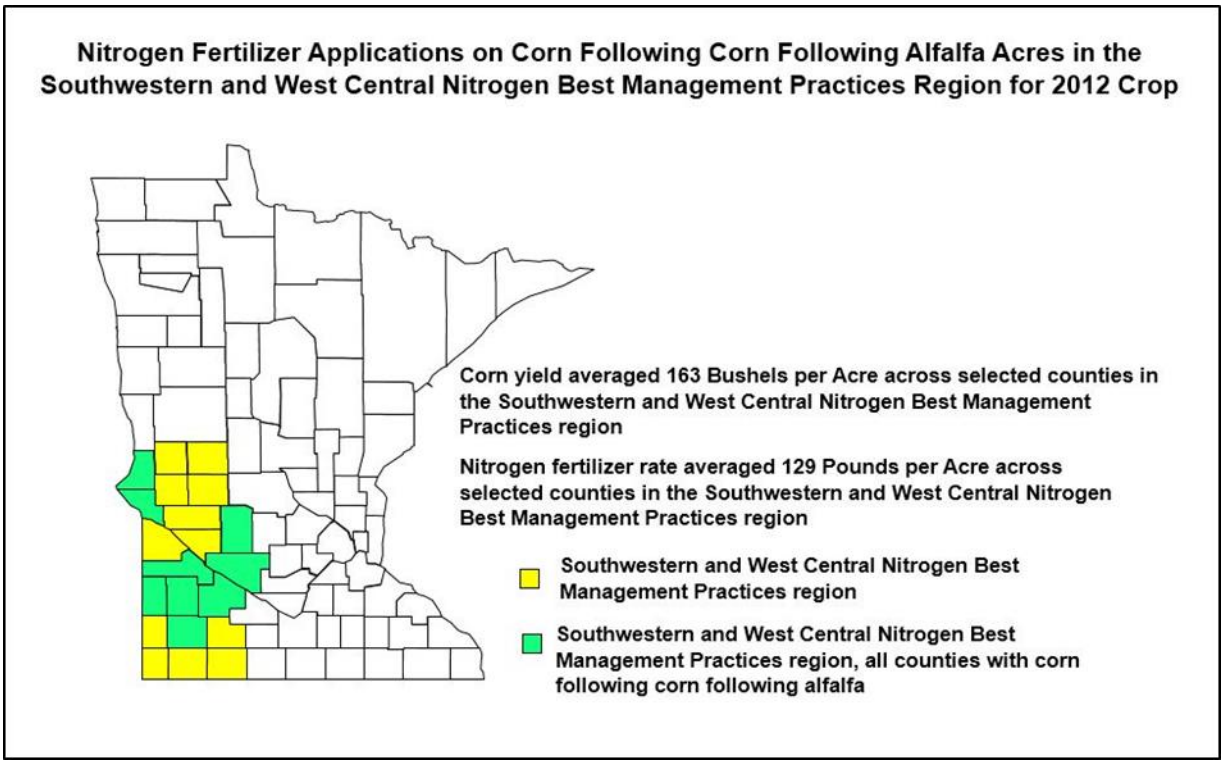

Figure 32. The corn yield averaged 163 bushels per acre and the nitrogen fertilizer rate averaged 129 pounds per acre in the SW BMP region.

Figure 33 details the distribution of nitrogen fertilizer rates in the SW BMP region for corn following corn following alfalfa; the corresponding corn yields are detailed in red.

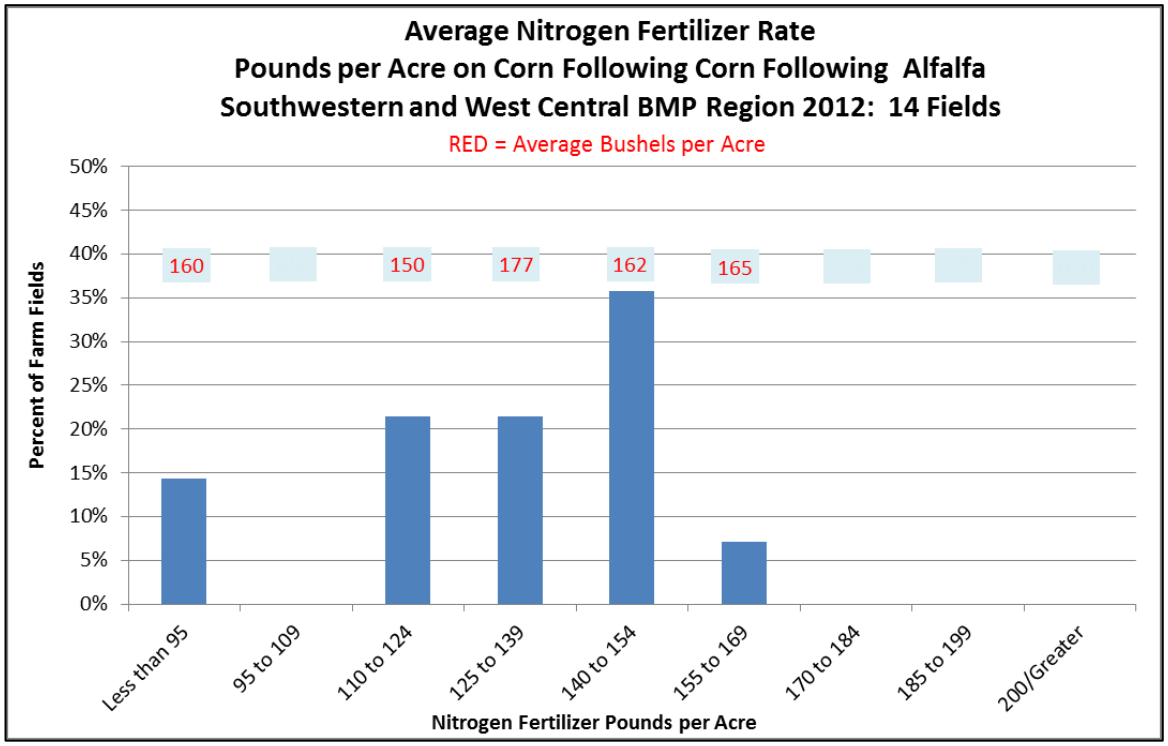

Figure 33. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the SW BMP region for 2012: 14 fields.

One county had more than five responses in SW BMP region. Nitrogen fertilizer rates were an average of 109 pounds per acre in Murray County as shown in Table 20

Table 20. Average county nitrogen fertilizer rates and corn yields for the SW BMP region for corn following corn following alfalfa.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Big Stone	**	**	**
Kandiyohi	**	**	**
Lincoln	**	**	**
Lyon	**	**	**
Murray	5	109	168
Redwood	**	**	**
Renville	**	**	**
Traverse	**	**	**
Yellow Medicine	**	**	**

****** Less than five responses**.**

Northwestern BMP Region: Corn Following Corn Following Alfalfa

There were less than five fields that were included in the NW BMP region corn following corn following alfalfa analysis.

Irrigated and Non-irrigated Sandy Soils BMP Region: Corn Following Corn Following Alfalfa

There were 30 fields that were included in the IRR BMP region corn following corn following alfalfa analysis. Figure 34 details the location, average rate of nitrogen fertilizer and average yield for corn following corn following alfalfa in the IRR BMP region.

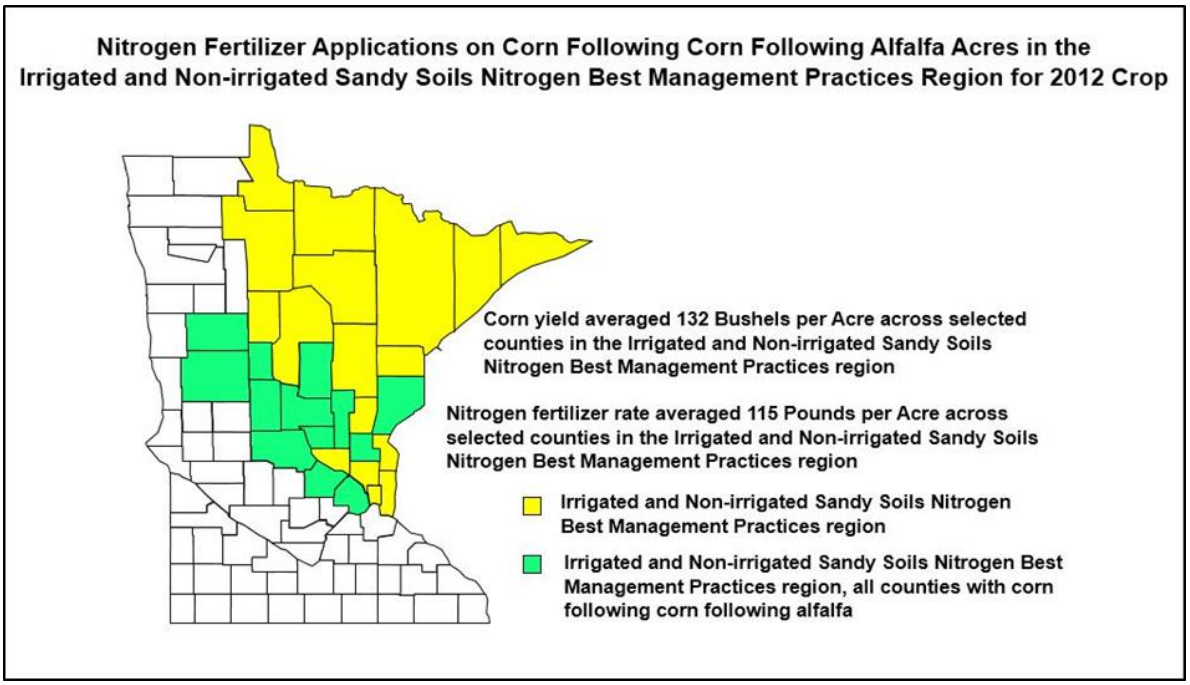

Figure 34. The corn yield averaged 132 bushels per acre and the nitrogen fertilizer rate averaged 115 pounds per acre in the IRR BMP region.

Figure 35 details the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following corn following alfalfa; the corresponding corn yields are detailed in red.

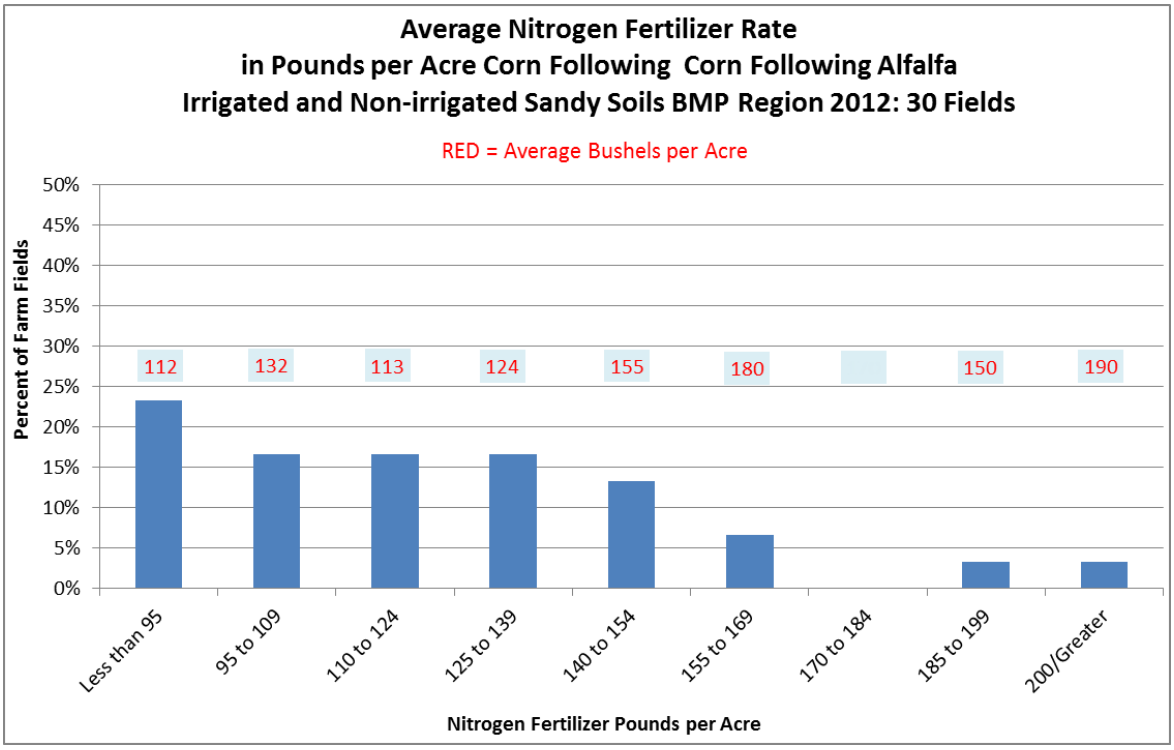

Figure 35. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the IRR BMP region for 2012: 30 fields.

Two counties had more than five responses in IRR BMP region. Nitrogen fertilizer rates ranged from an average of 97 pounds per acre in Stearns County to 110 pounds per acre in Otter Tail County as shown in Table 20.

Table 20. Average county nitrogen fertilizer rates and corn yields for the IRR BMP region for corn following corn following alfalfa.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Becker	**	**	**
Benton	**	**	**
Crow Wing	**	**	**
Hennepin	**	**	**
Isanti	**	**	**
Mille Lacs	**	**	**
Morrison	**	**	**
Otter Tail	8	110	124
Pine	**	**	**
Stearns	5	97	123
Todd	**	**	**
Wadena	**	**	**
Wright	**	**	**

****** Less than five responses**.**

Statewide: Corn Following Alfalfa

Statewide, three percent of the fields reported were corn following alfalfa. Figure 36 details the counties where farmers reported on fields with corn following alfalfa. There were 52 corn following alfalfa fields surveyed in Minnesota.

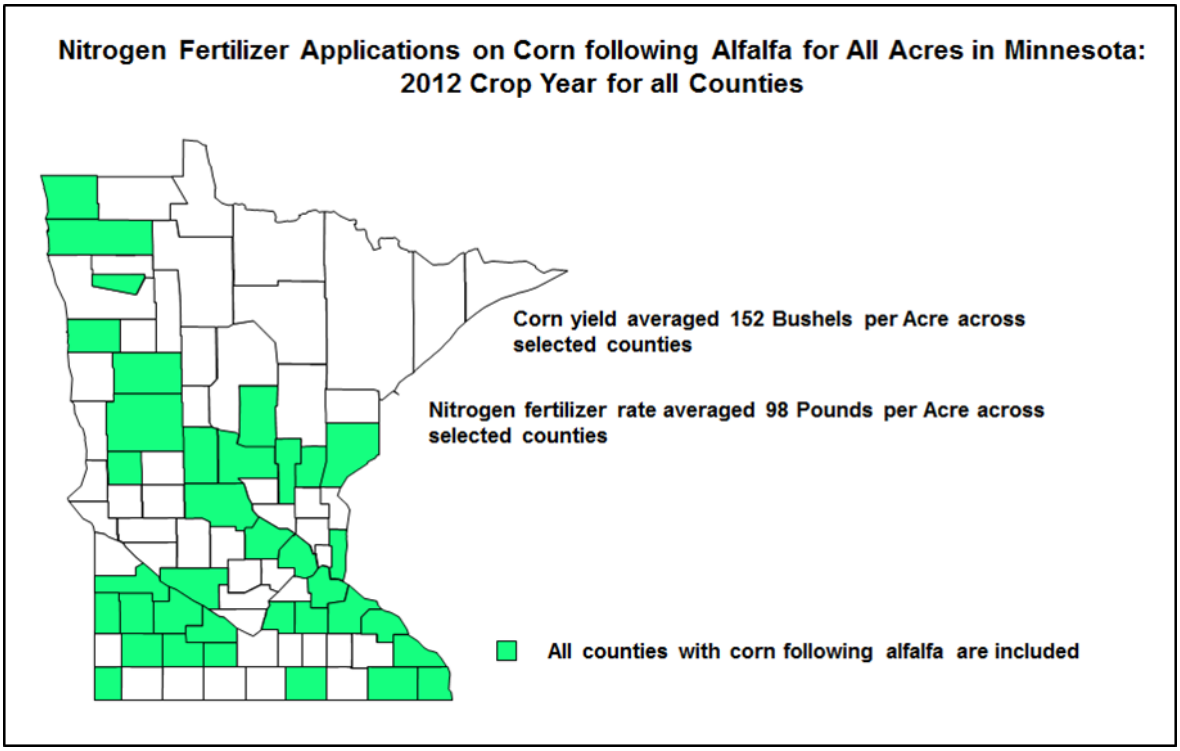

Figure 36. The corn yield averaged 152 bushels per acre and the nitrogen fertilizer rate averaged 98 pounds per acre on fields with corn following alfalfa in Minnesota.

Figure 37 details the distribution of average nitrogen fertilizer rates in Minnesota for corn following alfalfa; the corresponding corn yields are detailed in red.

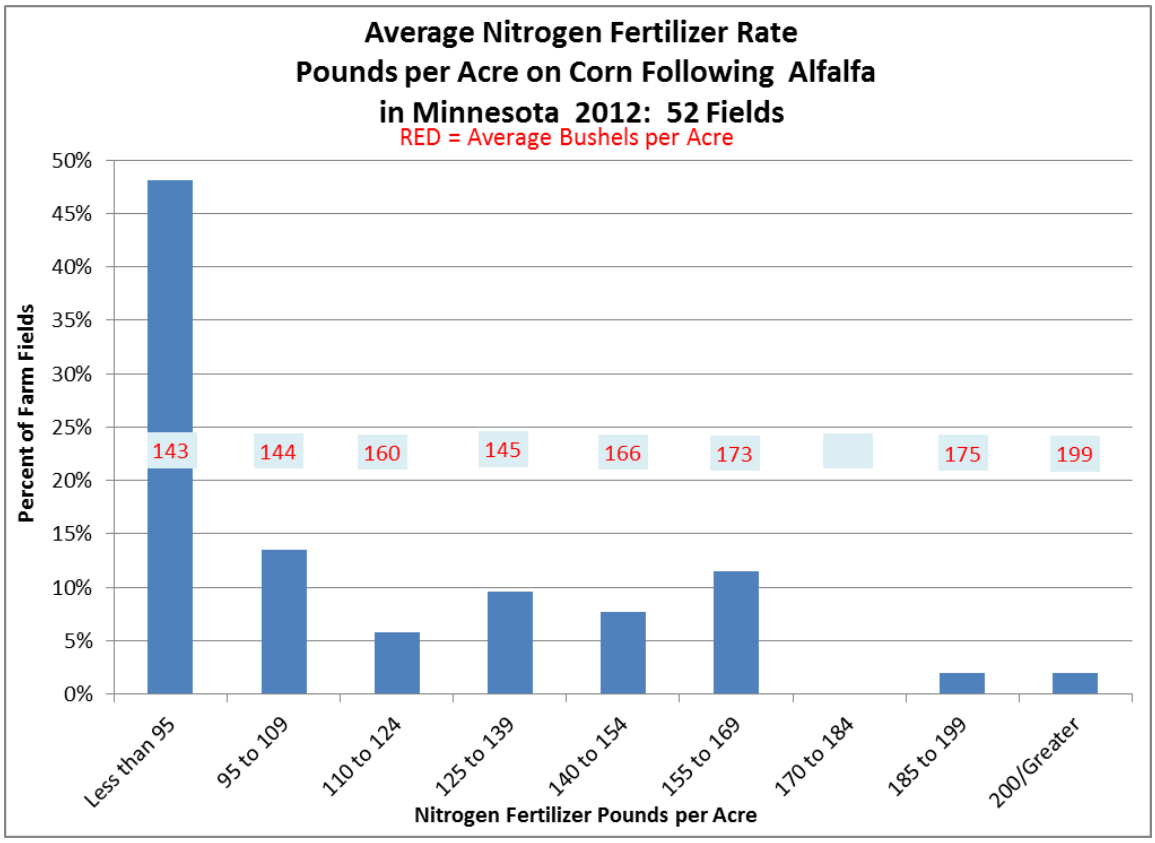

Figure 37. Average nitrogen fertilizer rates and yields on corn following alfalfa in Minnesota for 2012: 52 fields.

Southeastern BMP Region: Corn Following Alfalfa

There were 9 fields that were included in the SE BMP region corn following alfalfa analysis. Figure 38 details the location, average rate of nitrogen fertilizer and average yield for corn following alfalfa in the SE BMP region.

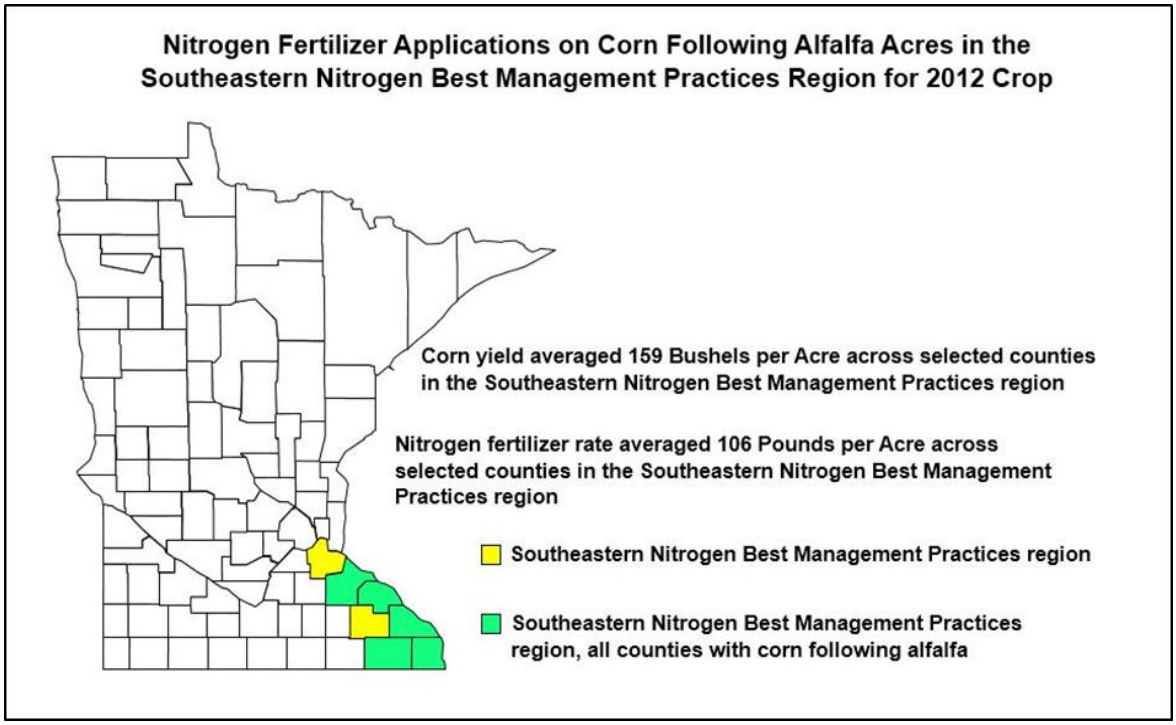

Figure 38. The corn yield averaged 159 bushels per acre and the nitrogen fertilizer rate averaged 106 pounds per acre in the SE BMP region.

Figure 39 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following alfalfa; the corresponding corn yields are detailed in red.

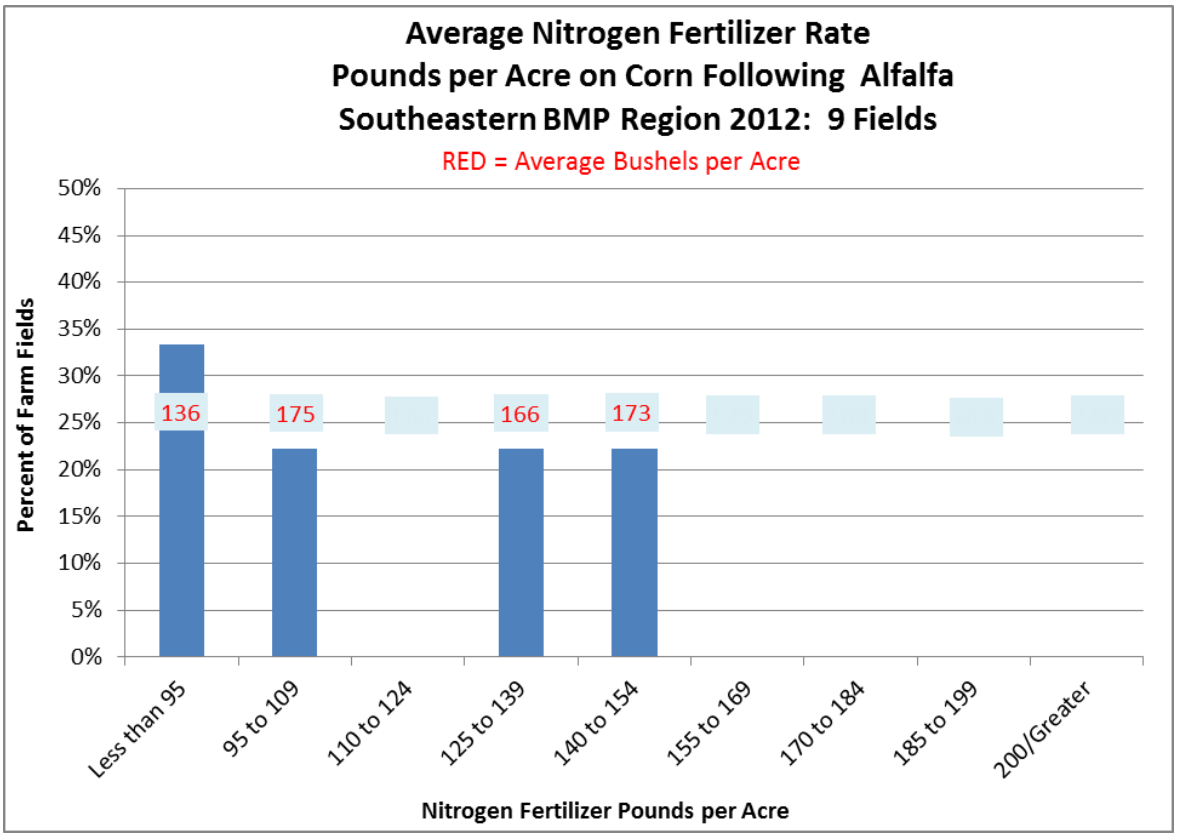

Figure 39. Average nitrogen fertilizer rates and yields on corn following alfalfa in the SE BMP region for 2012: 9 fields.

No counties had five or more responses in SE BMP region.

South Central BMP Region: Corn Following Alfalfa

There were 8 fields that were included in the SC BMP region corn following alfalfa analysis. Figure 40 details the location, average rate of nitrogen fertilizer and average yield for corn following alfalfa in the SC BMP region.

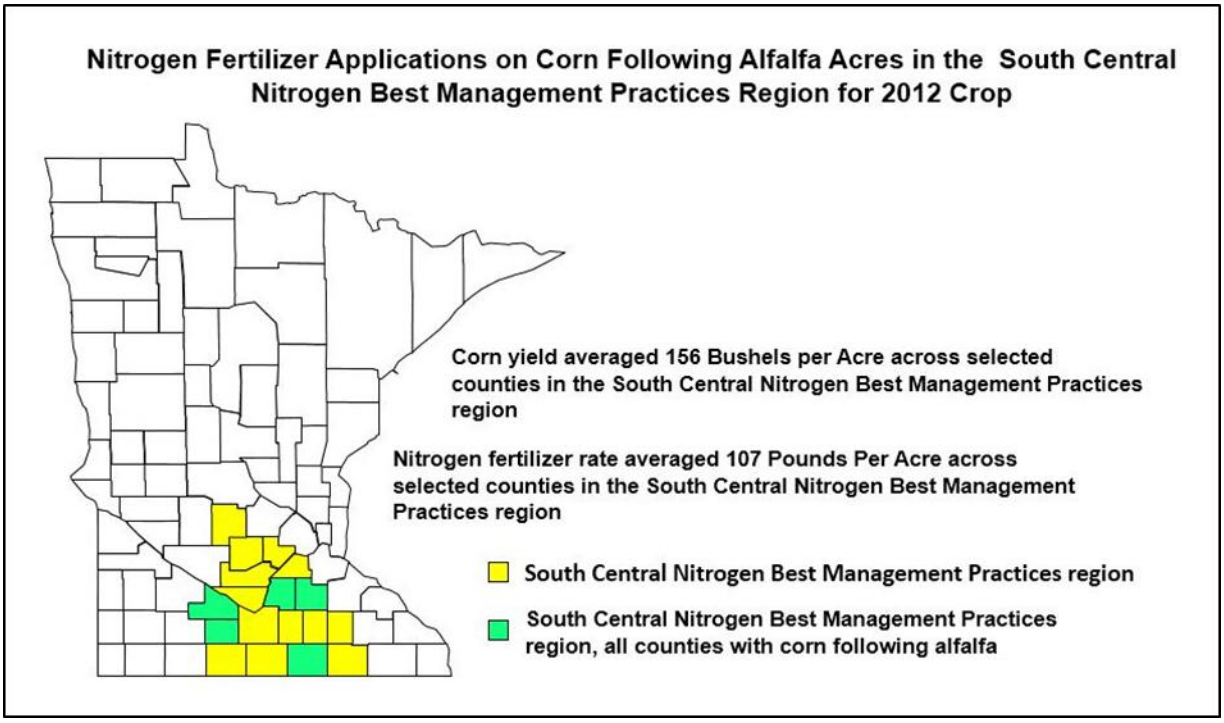

Figure 40. The corn yield averaged 156 bushels per acre and the nitrogen fertilizer rate averaged 107 pounds per acre in the SC BMP region.

Figure 41 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following alfalfa; the corresponding corn yields are detailed in red.

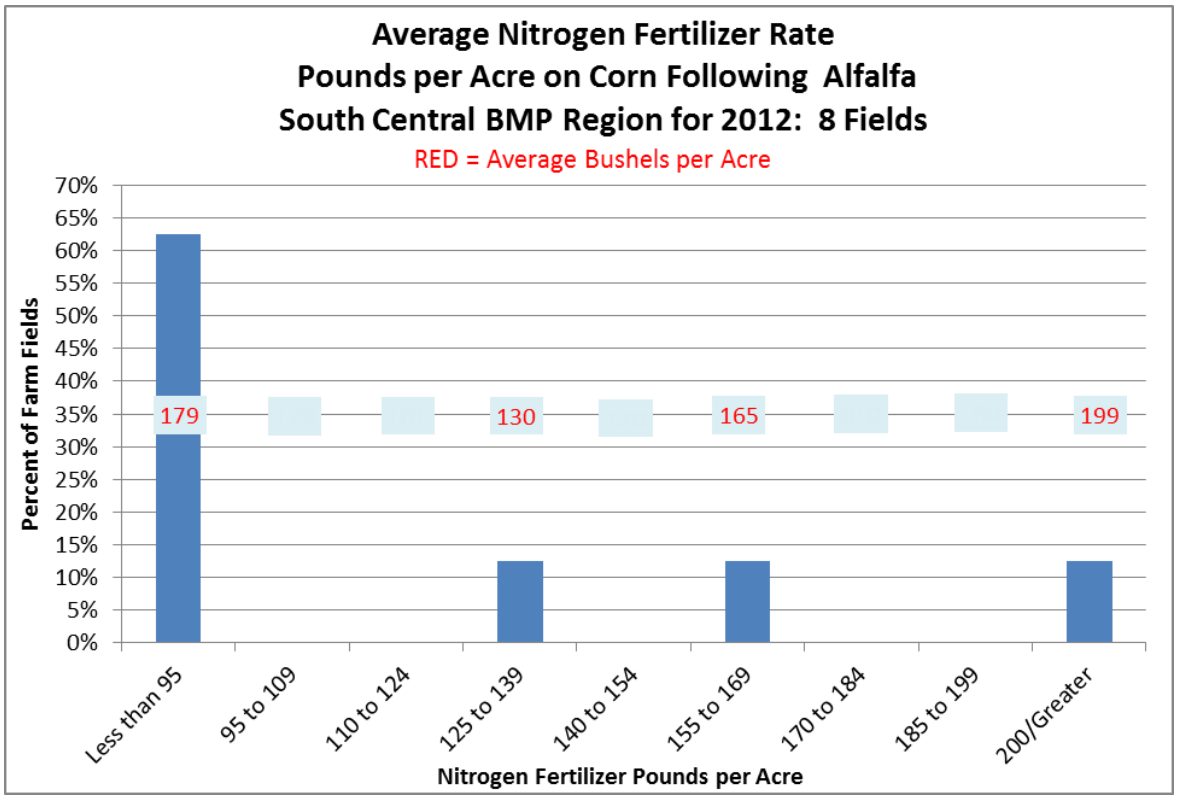

Figure 41. Average nitrogen fertilizer rates and yields on corn following alfalfa in the SC BMP region for 2012: 8 fields.

No counties had five or more responses in SC BMP region.

Southwestern and West Central BMP Region: Corn Following Alfalfa

There were 9 fields that were included in the SW BMP region corn following alfalfa analysis. Figure 42 details the location, average rate of nitrogen fertilizer and average yield for corn following alfalfa in the SW BMP region.

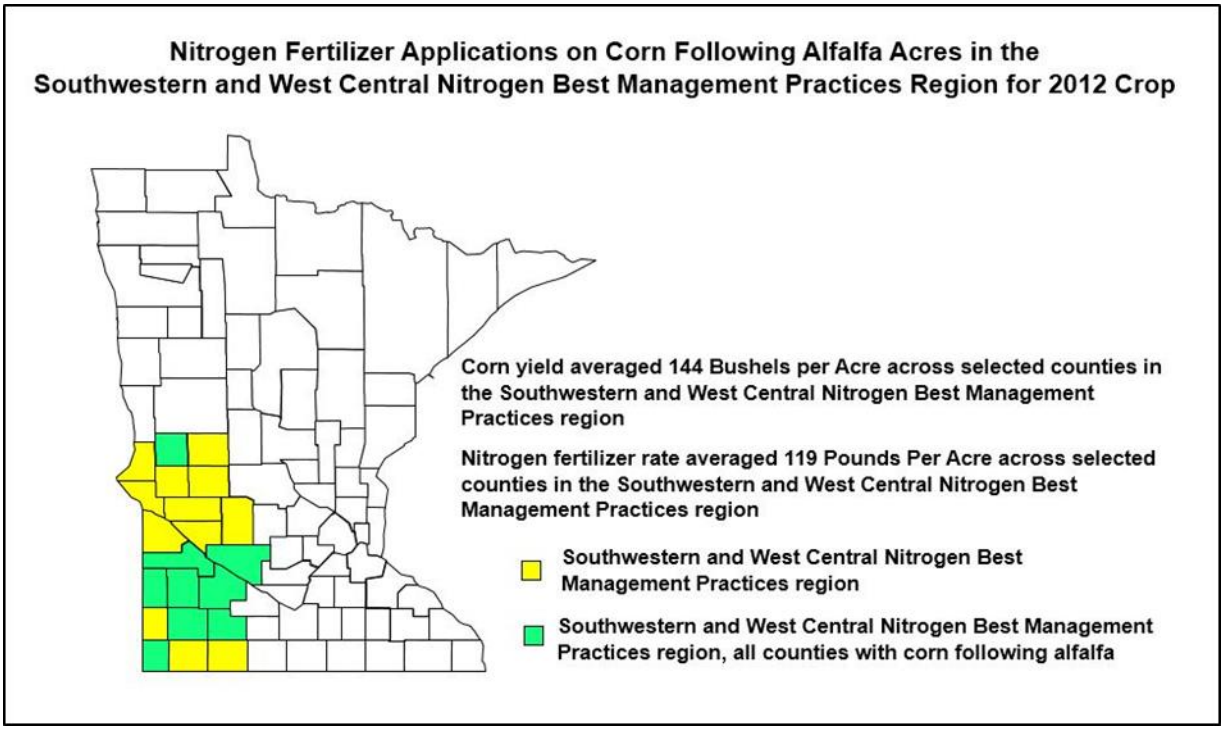

Figure 42. The corn yield averaged 144 bushels per acre and the nitrogen fertilizer rate averaged 119 pounds per acre in the SW BMP region.

Figure 43 details the distribution of nitrogen fertilizer rates in the SW BMP region for corn following alfalfa; the corresponding corn yields are detailed in red.

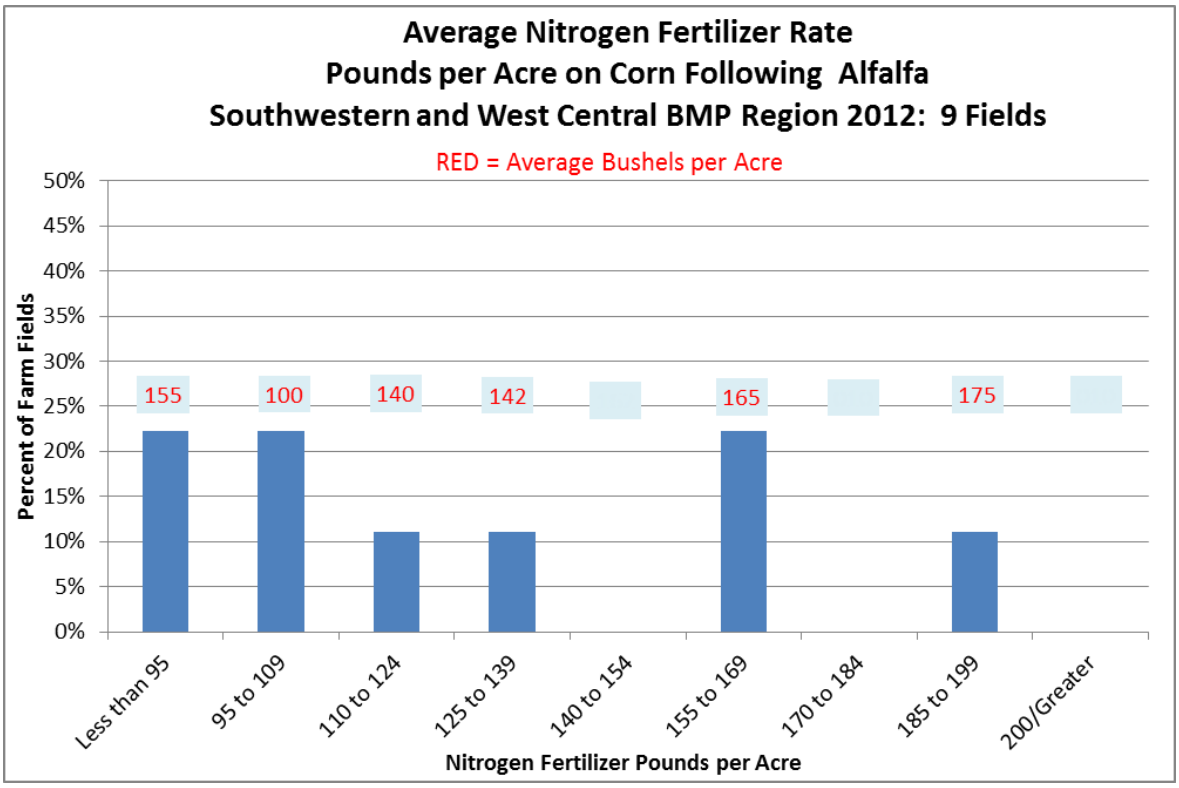

Figure 43. Average nitrogen fertilizer rates and yields on corn following alfalfa in the SW BMP region for 2012: 9 fields.

No counties had five or more responses in the SW BMP region.

Northwestern BMP Region: Corn Following Alfalfa

There were less than five fields that were included in the NW BMP region corn following alfalfa analysis.

Irrigated and Non-irrigated Sandy Soils BMP Region: Corn Following Alfalfa

There were 22 fields that were included in the IRR BMP region corn following alfalfa analysis. Figure 44 details the location, average rate of nitrogen fertilizer and average yield for corn following alfalfa in the IRR BMP region.

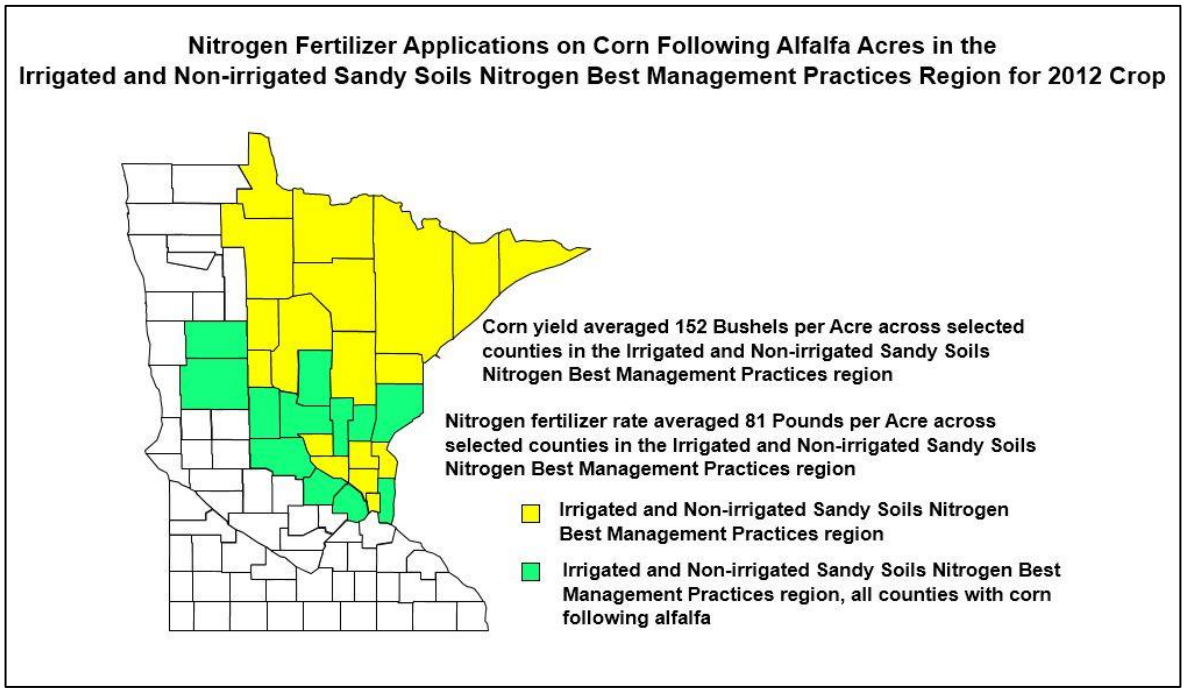

Figure 44. The corn yield averaged 152 bushels per acre and the nitrogen fertilizer rate averaged 81 pounds per acre in the IRR BMP region.

Figure 45 details the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following alfalfa; the corresponding corn yields are detailed in red.

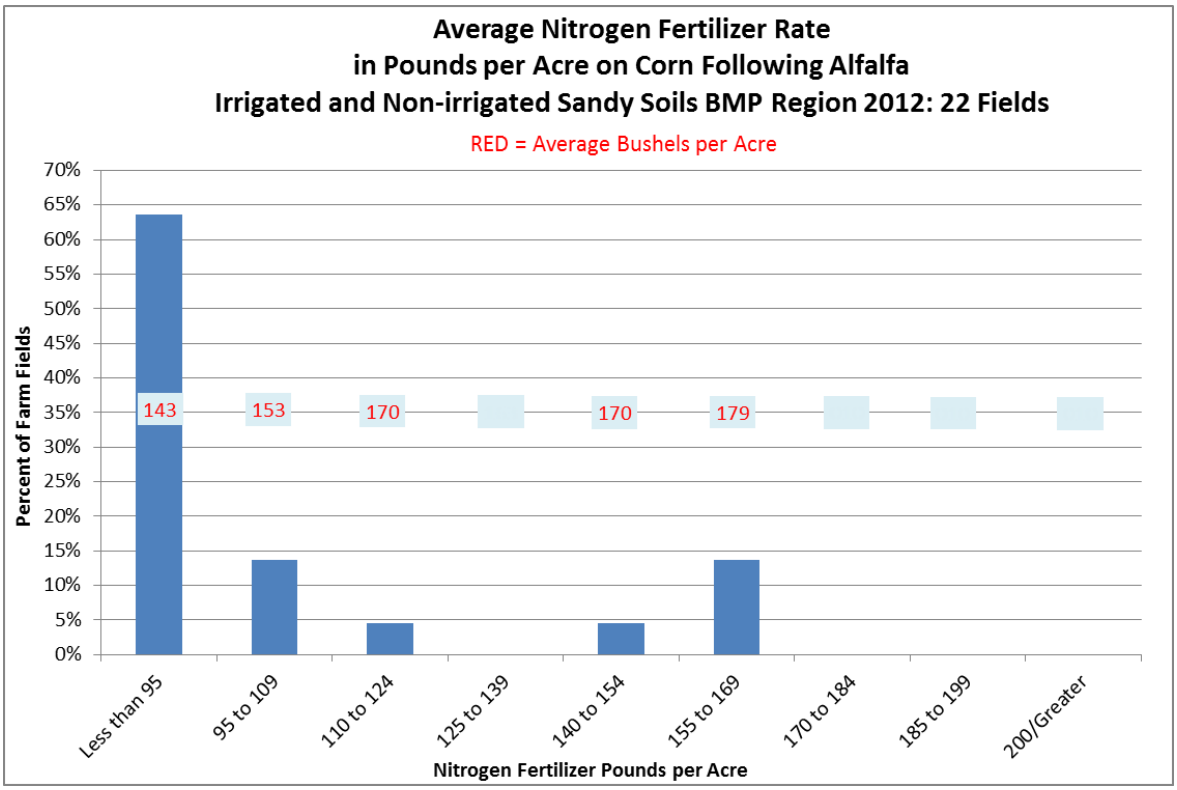

Figure 45. Average nitrogen fertilizer rates and yields on corn following alfalfa in the IRR BMP region for 2012: 22 fields.

One county had more than five responses in the IRR BMP region. Nitrogen fertilizer rates were an average of 95 pounds per acre in Stearns County as shown in Table 21.

Table 21.Average county nitrogen fertilizer rates and corn yields for the IRR BMP region for corn following alfalfa.

County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Becker	**	**	**
Crow Wing	**	**	**
Hennepin	**	**	**
Kanabec	**	**	**
Mille Lacs	**	**	**
Morrison	**	**	**
Otter Tail	**	**	**
Pine	**	**	**
Stearns	5	95	140
Todd	**	**	**
Washington	**	**	**
Wright	**	**	**

****** Less than five responses**.**

Statewide: Corn Following Small Grains

Statewide, two percent of the fields reported were corn following small grains. Figure 46 details the counties where farmers reported on fields with corn following small grains. There were 39 corn following small grains fields surveyed in Minnesota.

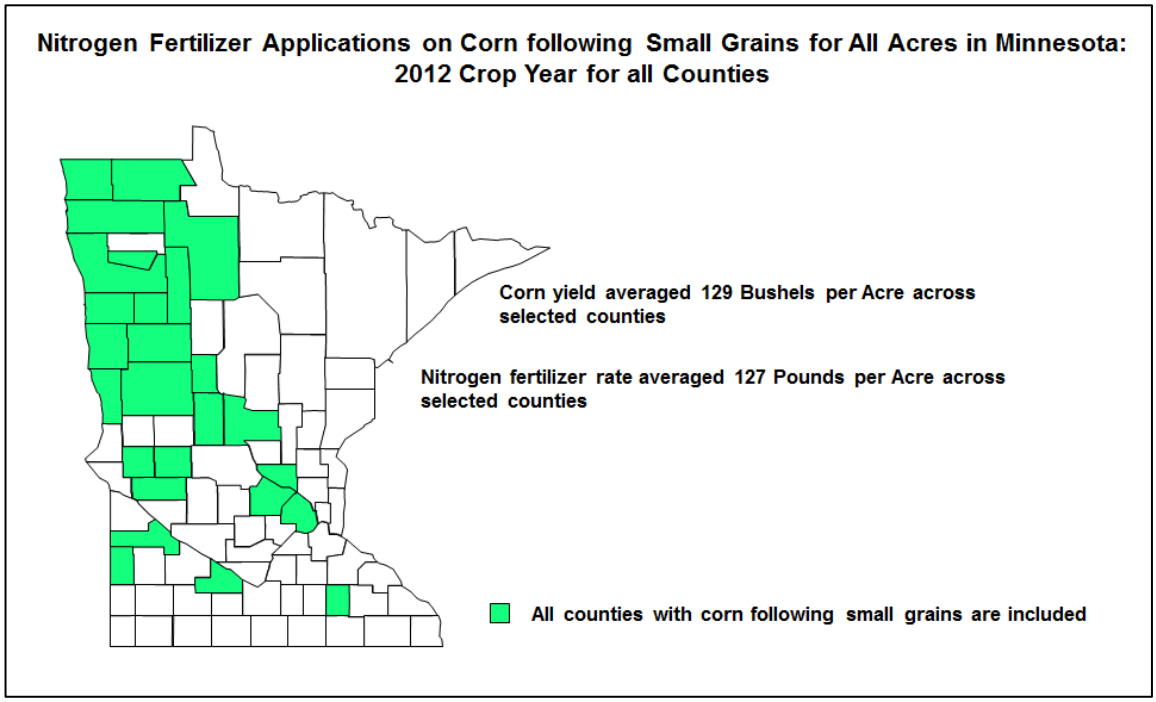

Figure 46. The corn yield averaged 129 bushels per acre and the nitrogen fertilizer rate averaged 127 pounds per acre on fields with corn following small grains in Minnesota.

Figure 47 details the distribution of average nitrogen fertilizer rates in Minnesota for corn following small grains; the corresponding corn yields are detailed in red.

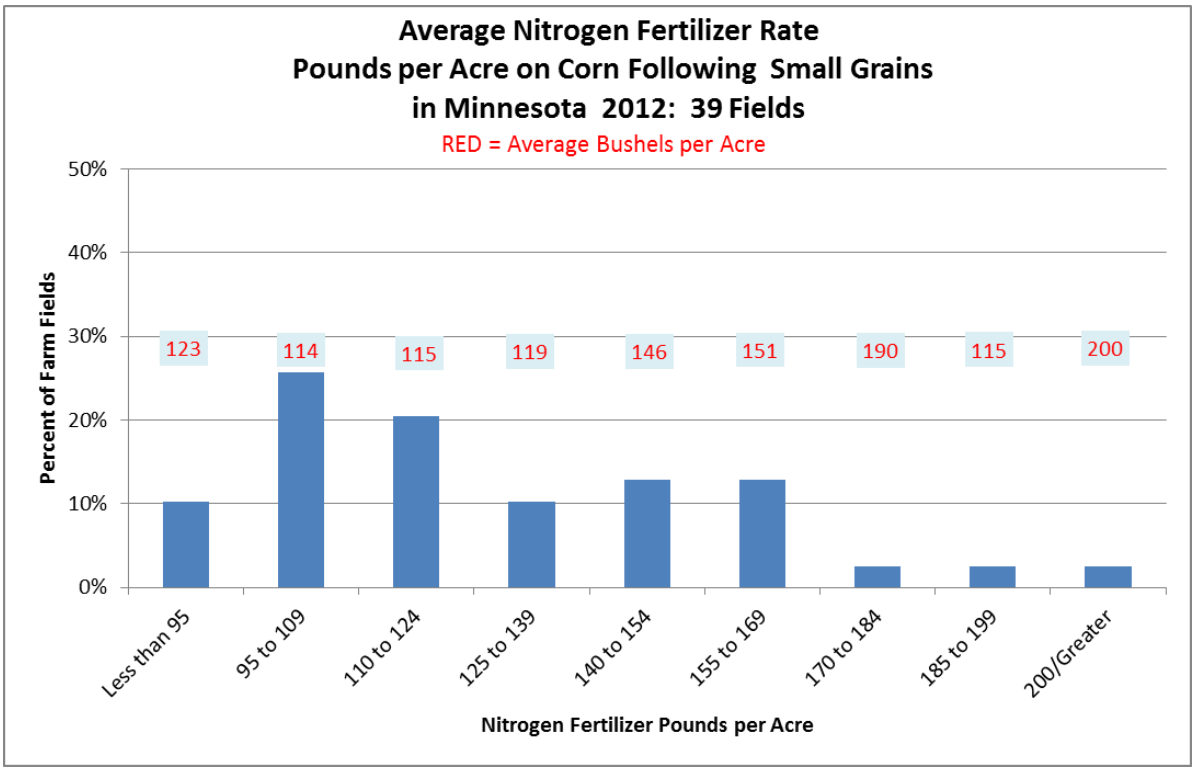

Figure 47. Average nitrogen fertilizer rates and yields on corn following small grains in Minnesota for 2012: 39 fields.

Southeastern BMP Region: Corn Following Small Grains

There were less than five fields that were included in the SE BMP region corn following small grains analysis.

South Central BMP Region: Corn Following Small Grains

There were less than five fields that were included in the SC BMP region corn following small grains analysis.

Southwestern and West Central BMP Region: Corn Following Small Grains

There were 7 fields that were included in the SW BMP region corn following small grains analysis. Figure 48 details the location, average rate of nitrogen fertilizer and average yield for corn following small grains in the SW BMP region.

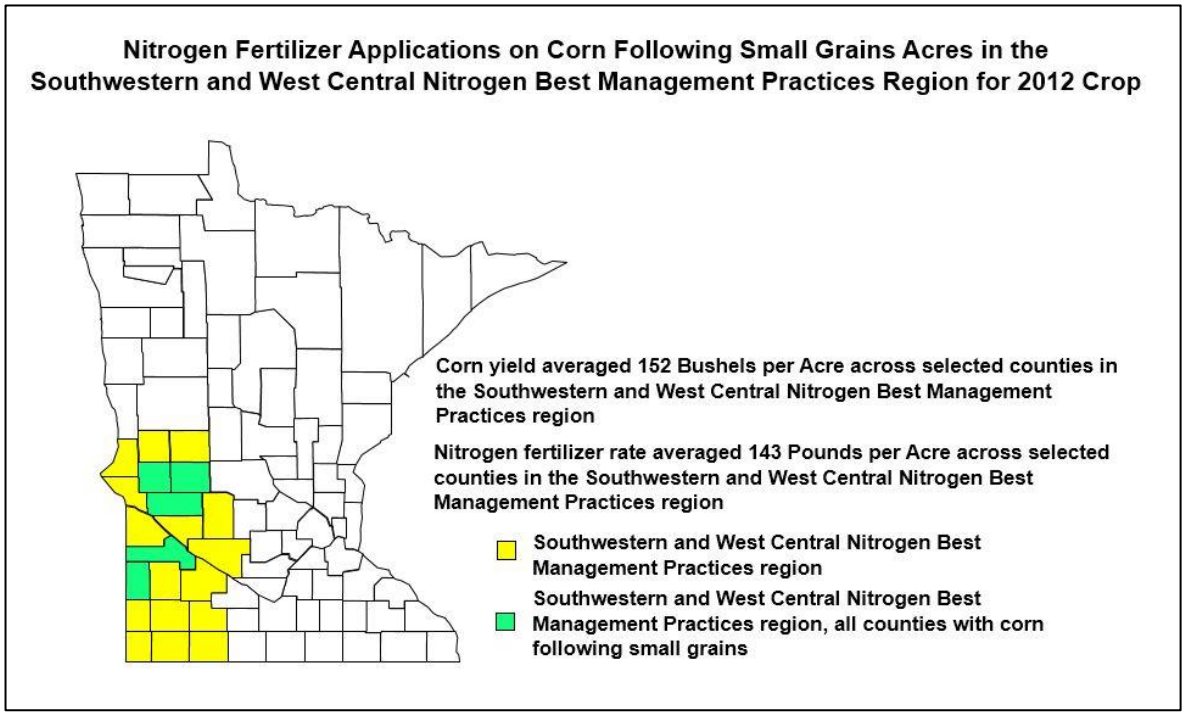

Figure 48. The corn yield averaged 152 bushels per acre and the nitrogen fertilizer rate averaged 143 pounds per acre in the SW BMP region.

Figure 49 details the distribution of nitrogen fertilizer rates in the SW BMP region for corn following small grains; the corresponding corn yields are detailed in red.

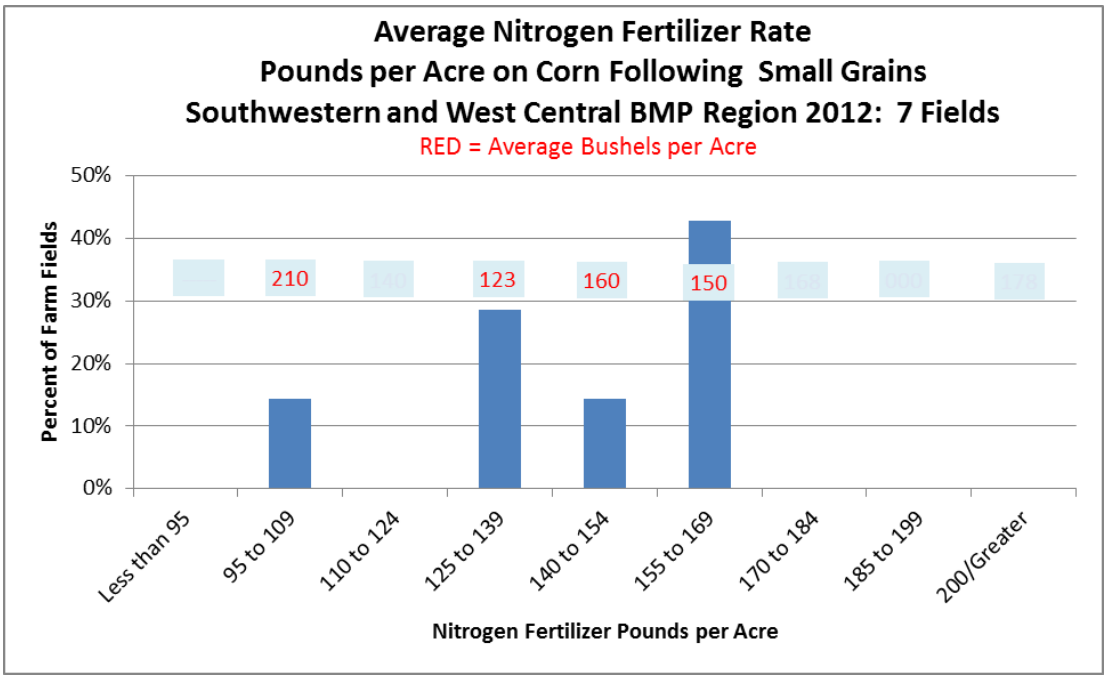

Figure 49. Average nitrogen fertilizer rates and yields on corn following small grains in the SW BMP region for 2012: 7 fields.

No counties had five or more responses in the SW BMP region.

Northwestern BMP Region: Corn Following Small Grains

There were 15 fields that were included in the NW BMP region corn following small grains analysis. Figure 50 details the location, average rate of nitrogen fertilizer and average yield for corn following small grains in the NW BMP region.

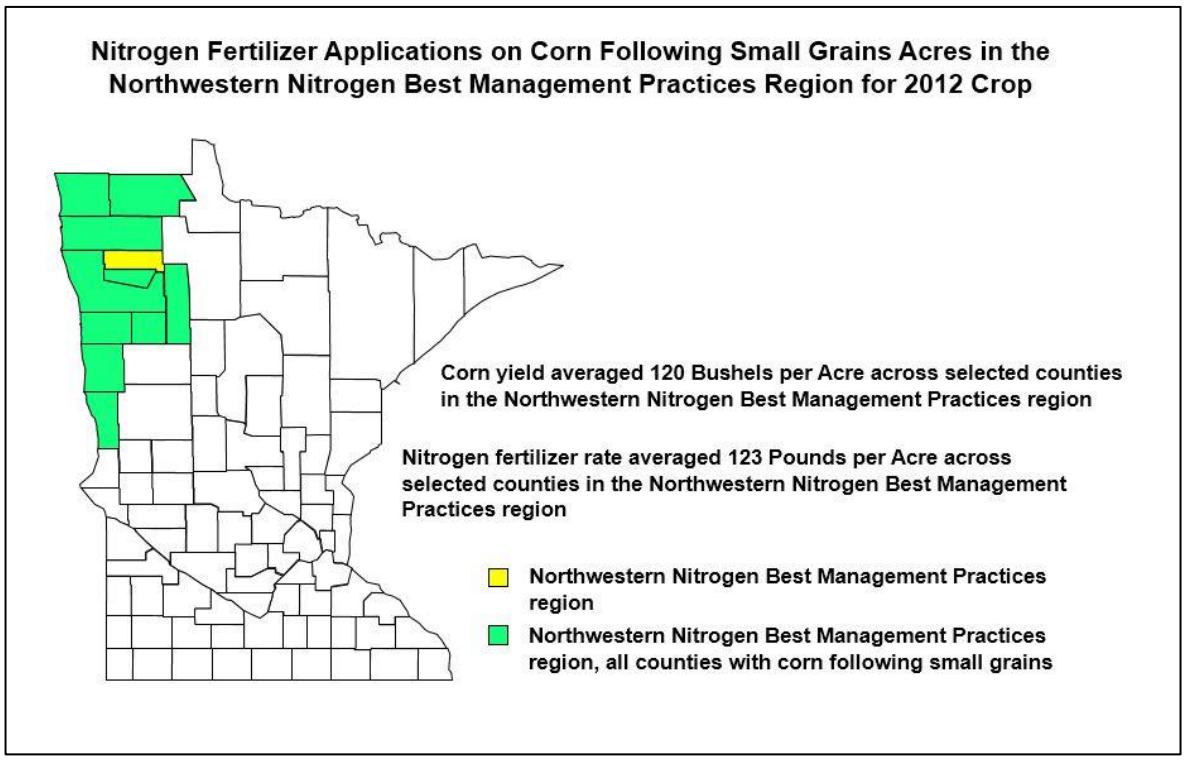

Figure 50. The corn yield averaged 120 bushels per acre and the nitrogen fertilizer rate averaged 123 pounds per acre in the NW BMP region.

Figure 51 details the distribution of nitrogen fertilizer rates in the NW BMP region for corn following small grains; the corresponding corn yields are detailed in red.

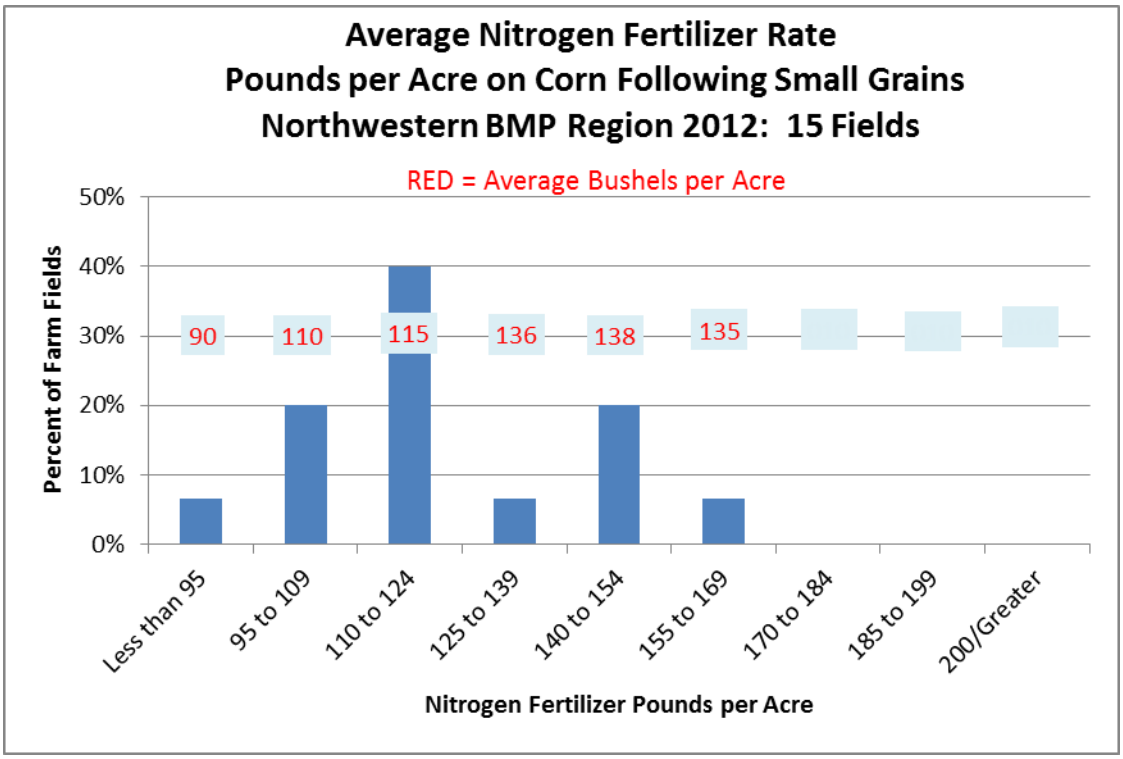

Figure 51. Average nitrogen fertilizer rates and yields on corn following small grains in the NW BMP region for 2012: 15 fields.

No counties had five or more responses in the NW BMP region.

Irrigated and Non-irrigated Sandy Soils BMP Region: Corn Following Small Grains

There were 15 fields that were included in the IRR BMP region corn following small grains analysis. Figure 52 details the location, average rate of nitrogen fertilizer and average yield for corn following small grains in the IRR BMP region.

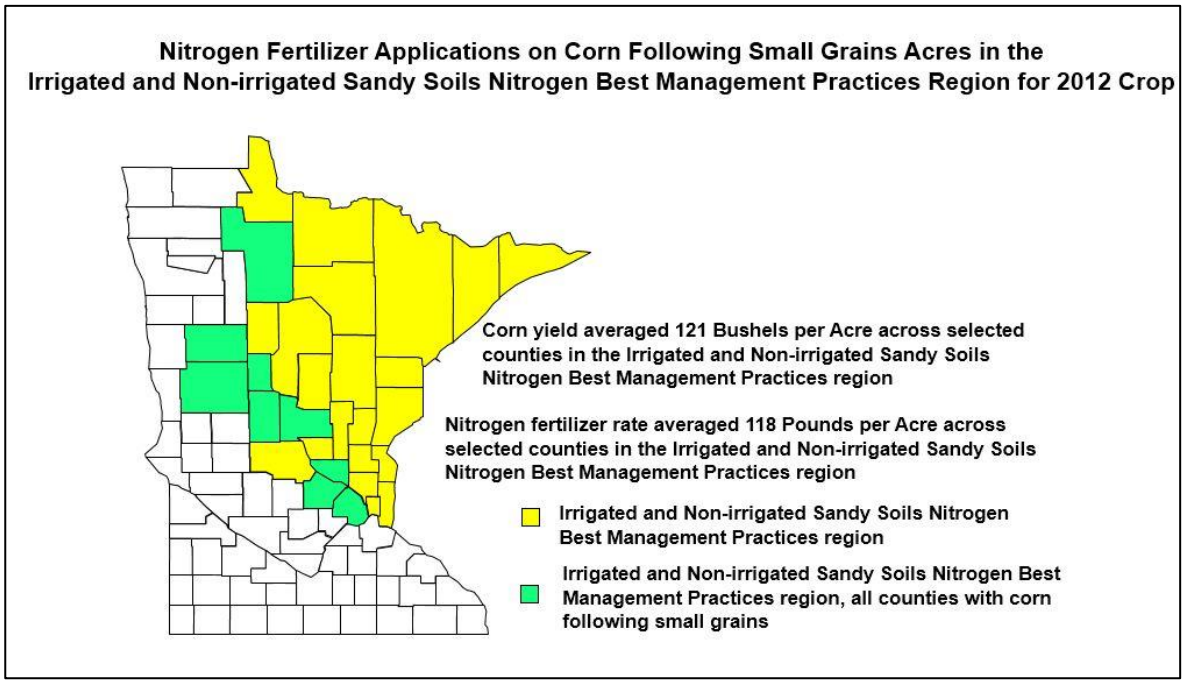

Figure 52. The corn yield averaged 121 bushels per acre and the nitrogen fertilizer rate averaged 118 pounds per acre in the IRR BMP region.

Figure 53 details the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following small grains; the corresponding corn yields are detailed in red.

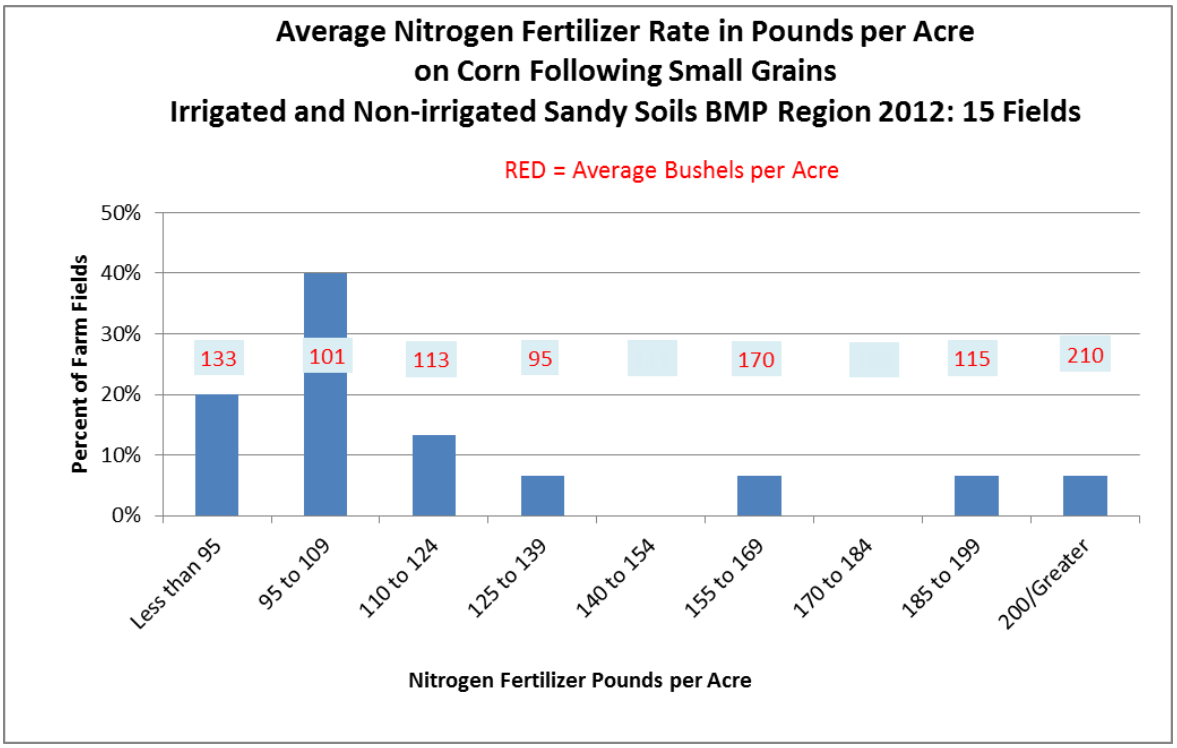

Figure 53. Average nitrogen fertilizer rates and yields on corn following small grains in the IRR BMP region for 2012: 15 fields.

No counties had five or more responses in the IRR BMP region.

Statewide: Corn Following Other Crops

Statewide, three percent of the fields reported was corn following other crops. Figure 54 details the counties where farmers reported on fields with corn following other crops. There were 57 corn following other crops fields surveyed in Minnesota.

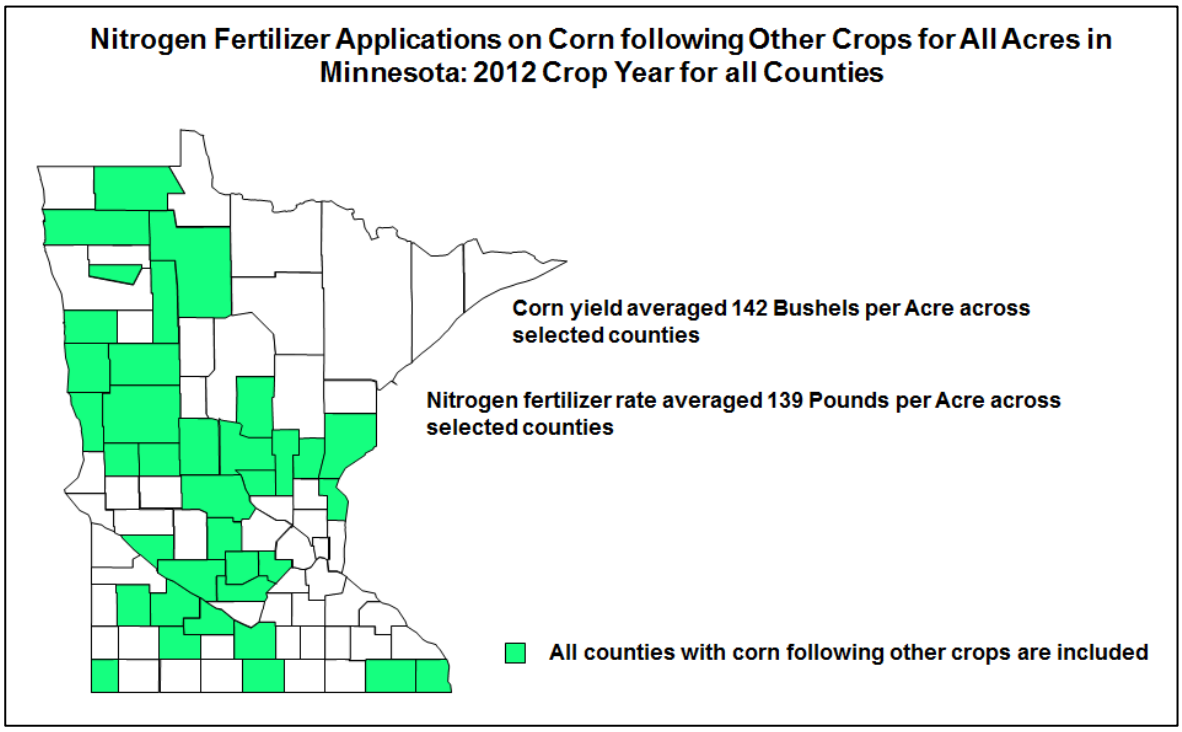

Figure 54. The corn yield averaged 142 bushels per acre and the nitrogen fertilizer rate averaged 139 pounds per acre on fields with corn following other crops in Minnesota.

Figure 55 details the distribution of average nitrogen fertilizer rates in Minnesota for corn following other crops; the corresponding corn yields are detailed in red.

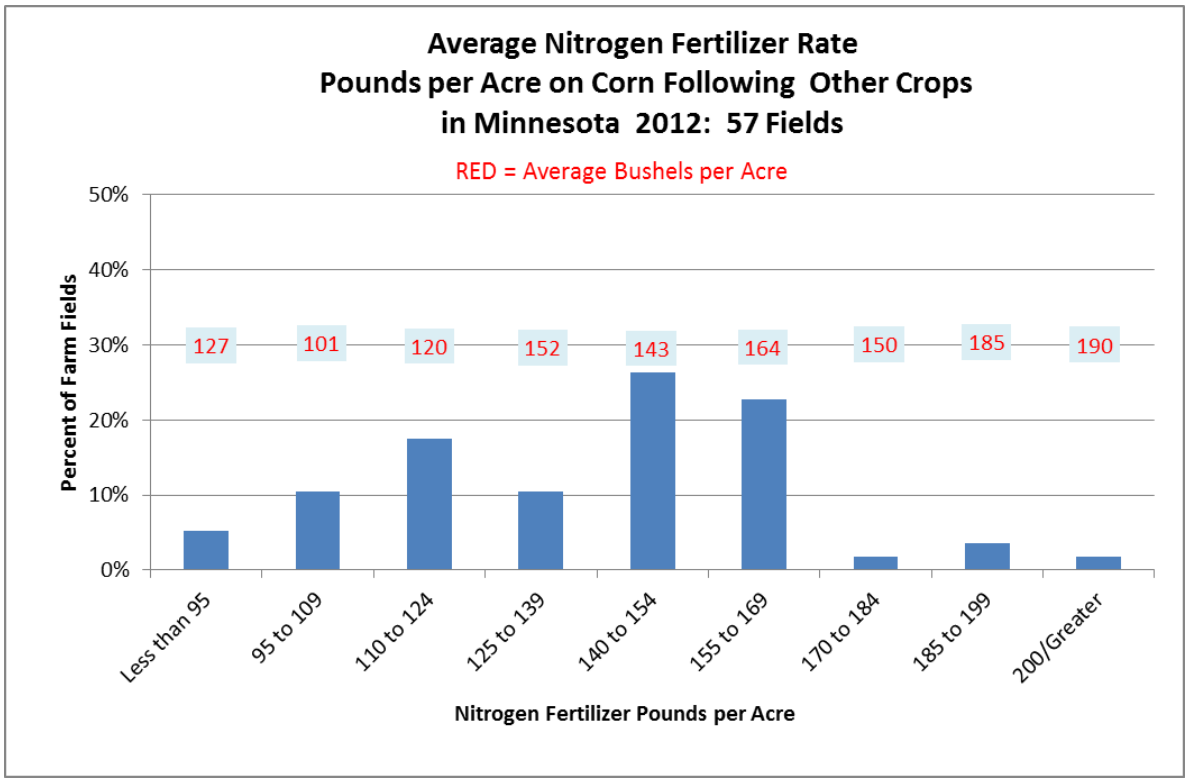

Figure 55. Average nitrogen fertilizer rates and yields on corn following other crops in Minnesota for 2012: 57 fields.

Southeastern BMP Region: Corn Following Other Crops

There were no counties with five or more fields that were included in the SE BMP region corn following other crops analysis.

South Central BMP Region: Corn Following Other Crops

There were 10 fields that were included in the SC BMP region corn following other crops analysis. Figure 56 details the location, average rate of nitrogen fertilizer and average yield for corn following other crops in the SC BMP region.

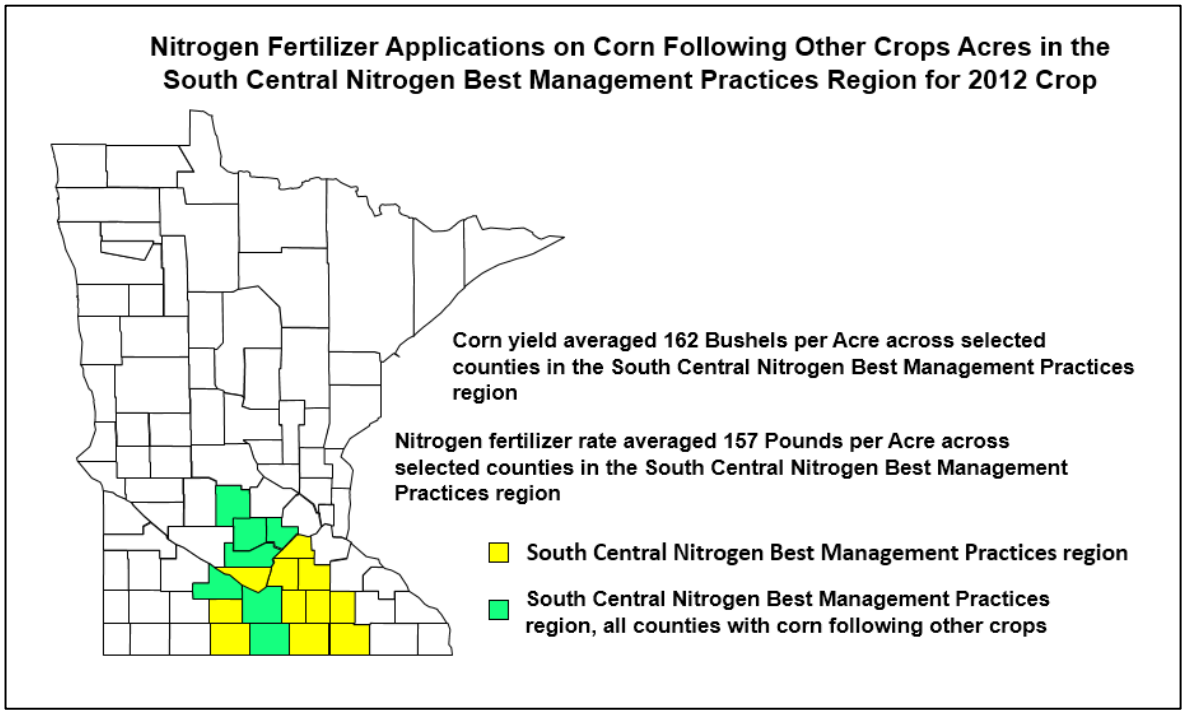

Figure 56. The corn yield averaged 162 bushels per acre and the nitrogen fertilizer rate averaged 157 pounds per acre in the SC BMP region.

Figure 57 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following other crops; the corresponding corn yields are detailed in red.

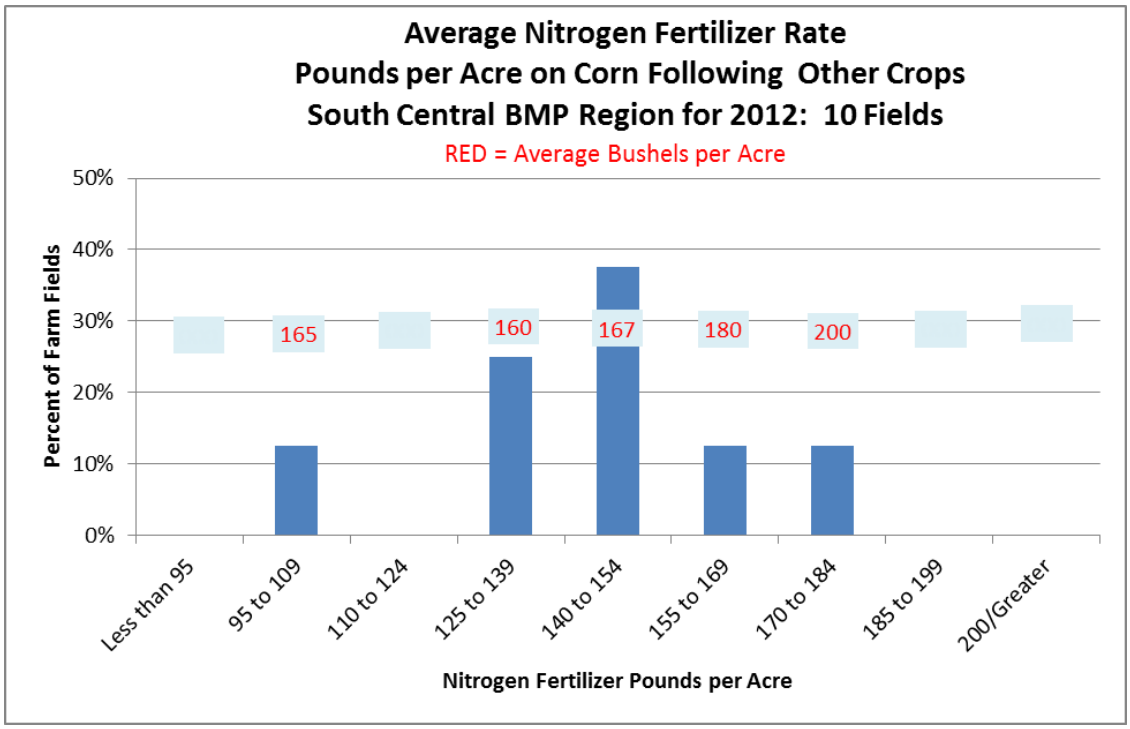

Figure 57. Average nitrogen fertilizer rates and yields on corn following other crops in the SC BMP region for 2012: 10 fields.

No counties had more than five responses in SC BMP region.

Southwestern and West Central BMP Region: Corn Following Other Crops

There were 10 fields that were included in the SW BMP region corn following other crops analysis. Figure 58 details the location, average rate of nitrogen fertilizer and average yield for corn following other crops in the SW BMP region.

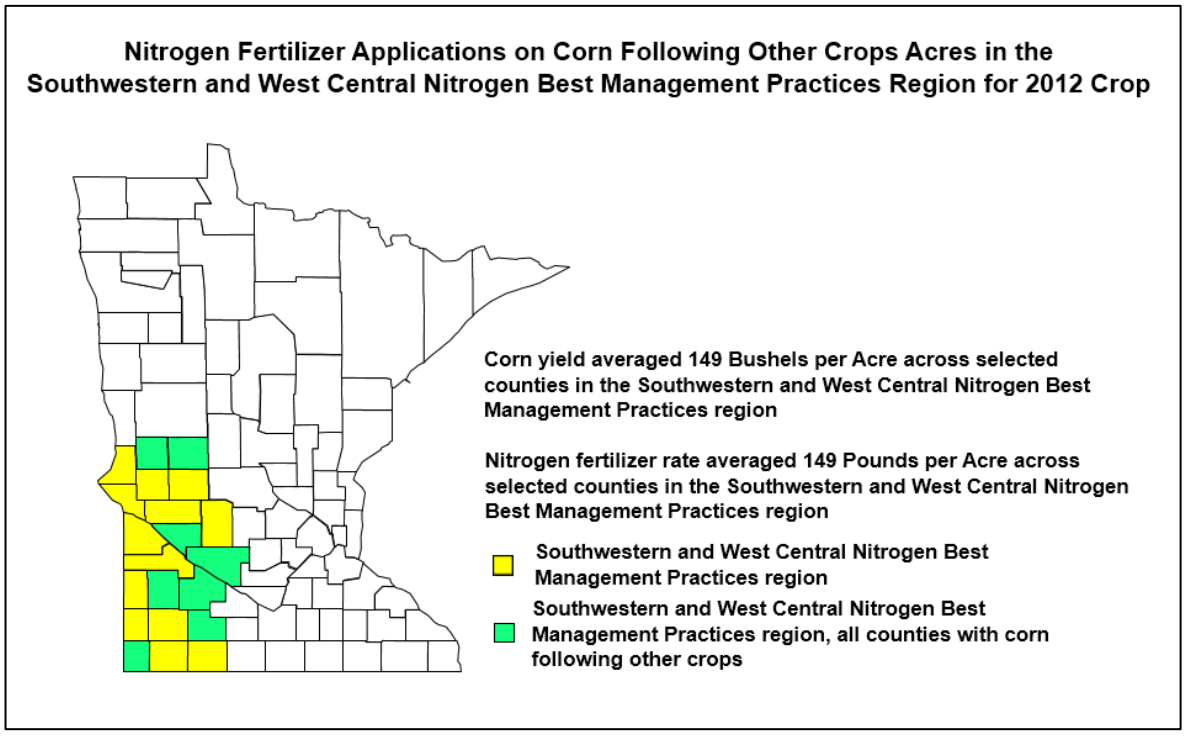

Figure 58. The corn yield averaged 149 bushels per acre and the nitrogen fertilizer rate averaged 149 pounds per acre in the SW BMP region.

Figure 59 details the distribution of nitrogen fertilizer rates in the SW BMP region for corn following other crops; the corresponding corn yields are detailed in red.

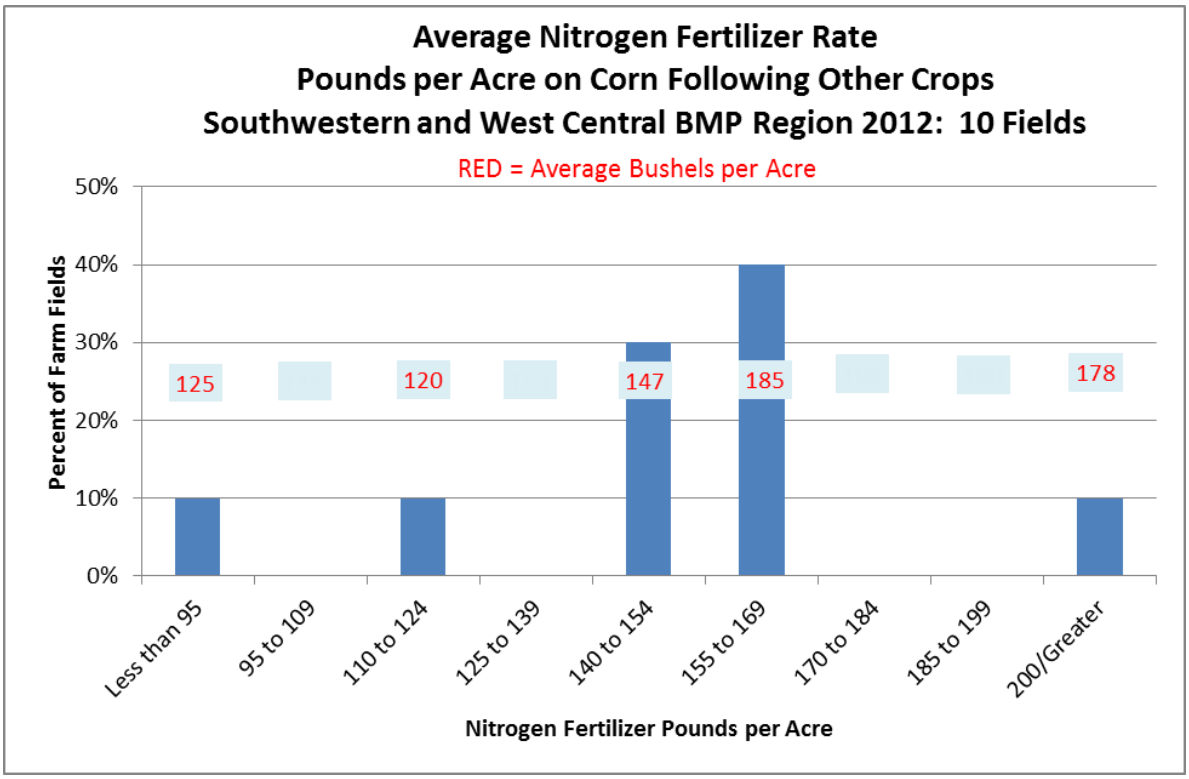

Figure 59. Average nitrogen fertilizer rates and yields on corn following other crops in the SW BMP region for 2012: 10 fields.

No counties had more than five responses in the SW BMP region.

Northwestern BMP Region: Corn Following Other Crops

There were 13 fields that were included in the NW BMP region corn following other crops analysis. Figure 60 details the location, average rate of nitrogen fertilizer and average yield for corn following other crops in the NW BMP region.

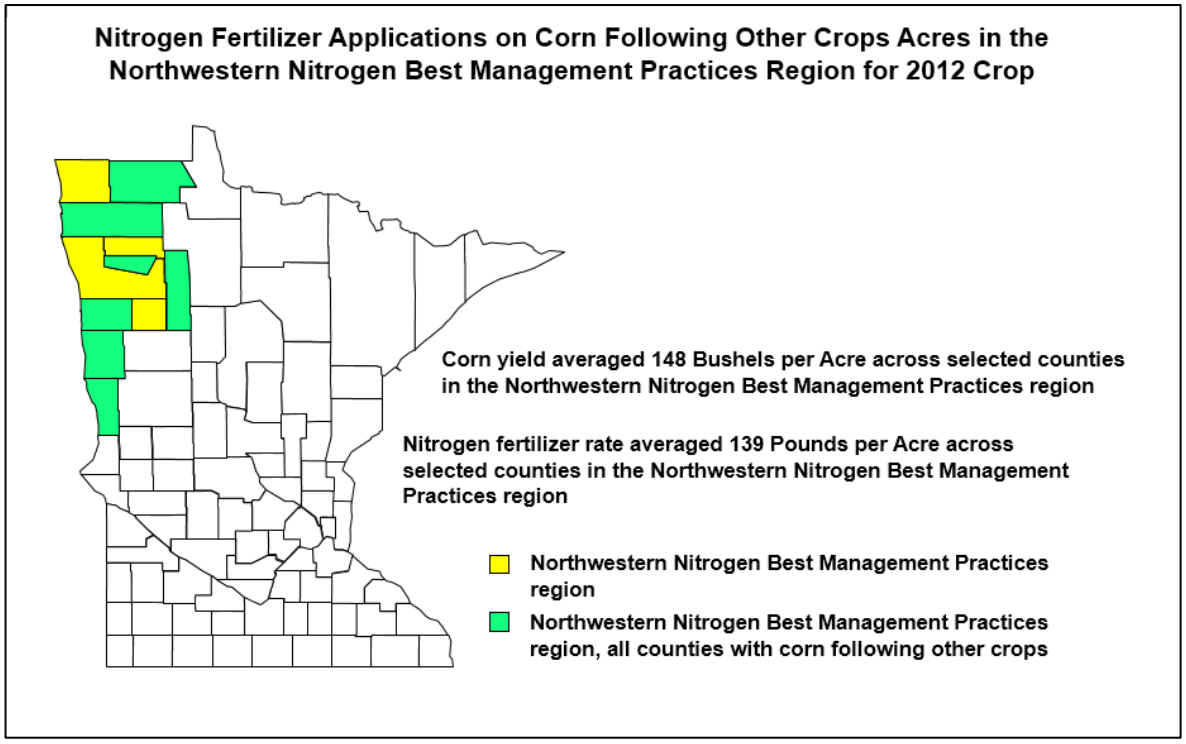

Figure 60. The corn yield averaged 148 bushels per acre and the nitrogen fertilizer rate averaged 139 pounds per acre in the NW BMP region.

Figure 61 details the distribution of nitrogen fertilizer rates in the NW BMP region for corn following other crops; the corresponding corn yields are detailed in red.

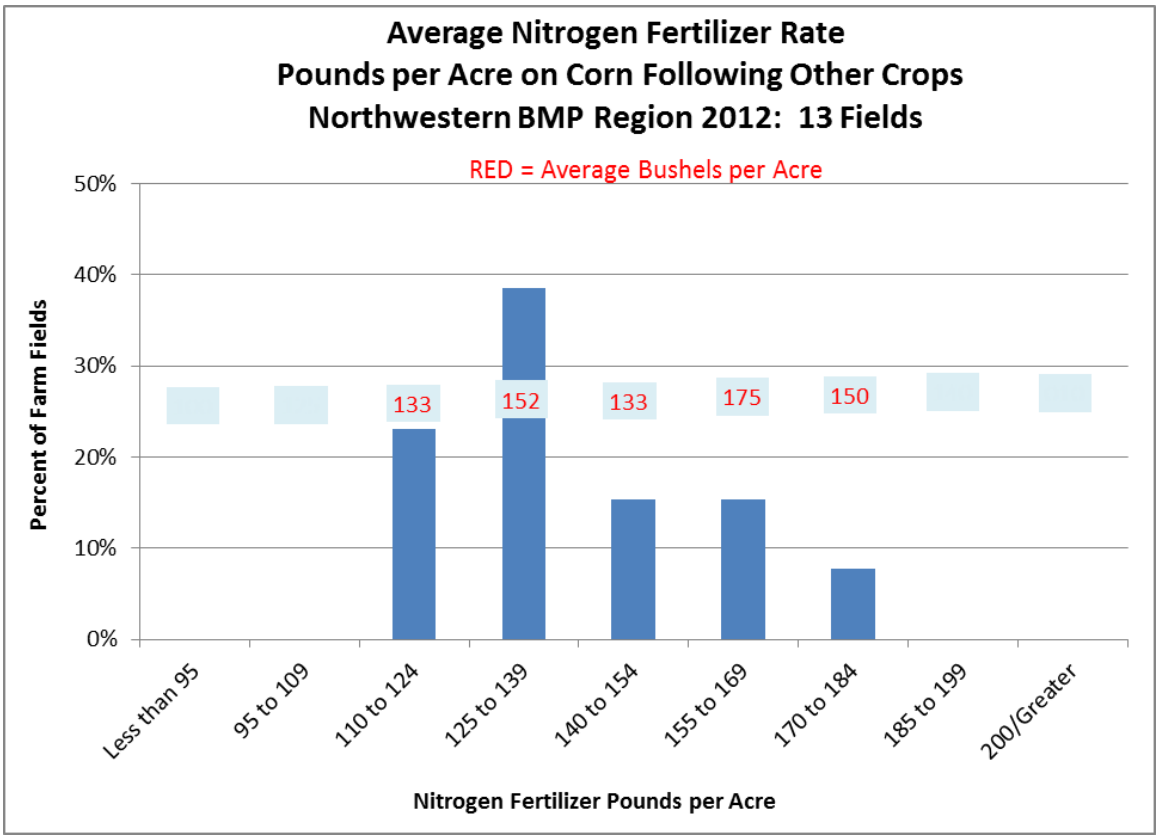

Figure 61. Average nitrogen fertilizer rates and yields on corn following other crops in the NW BMP region for 2012: 13 fields.

No counties had more than five responses in the NW BMP region.

Irrigated and Non-irrigated Sandy Soils BMP Region: Corn Following Other Crops

There were 22 fields that were included in the IRR BMP region corn following other crops analysis. Figure 62 details the location, average rate of nitrogen fertilizer and average yield for corn following other crops in the IRR BMP region.

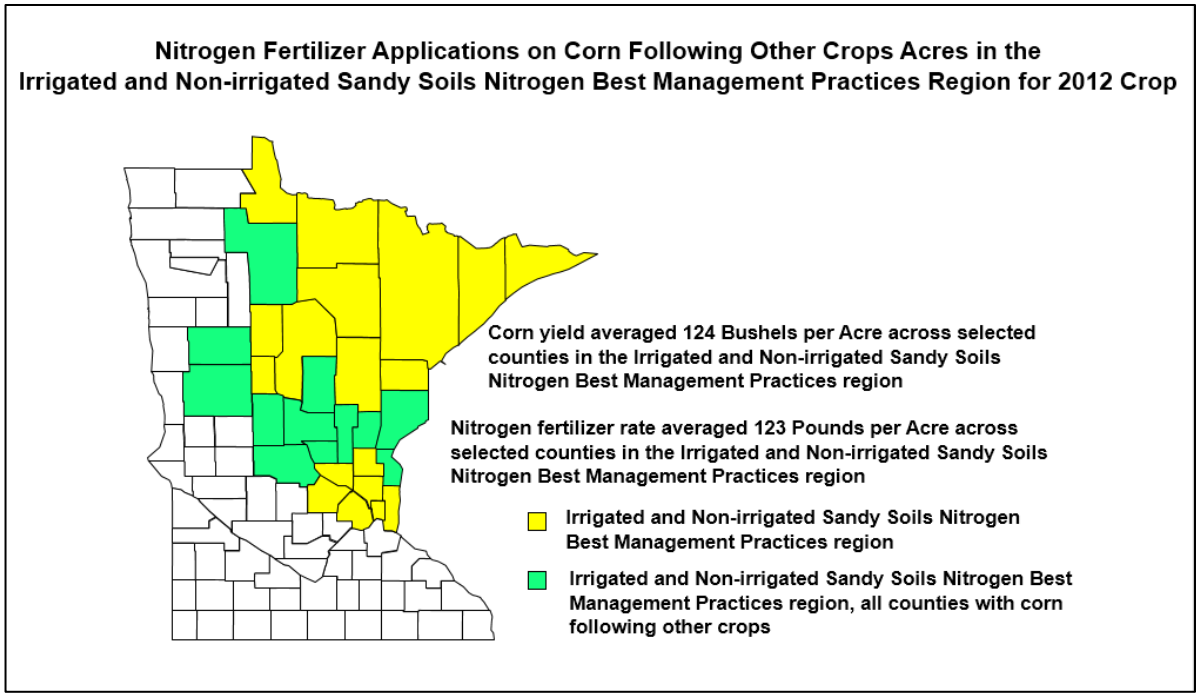

Figure 62. The corn yield averaged 124 bushels per acre and the nitrogen fertilizer rate averaged 123 pounds per acre in the IRR BMP region.

Figure 63 details the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following other crops; the corresponding corn yields are detailed in red.

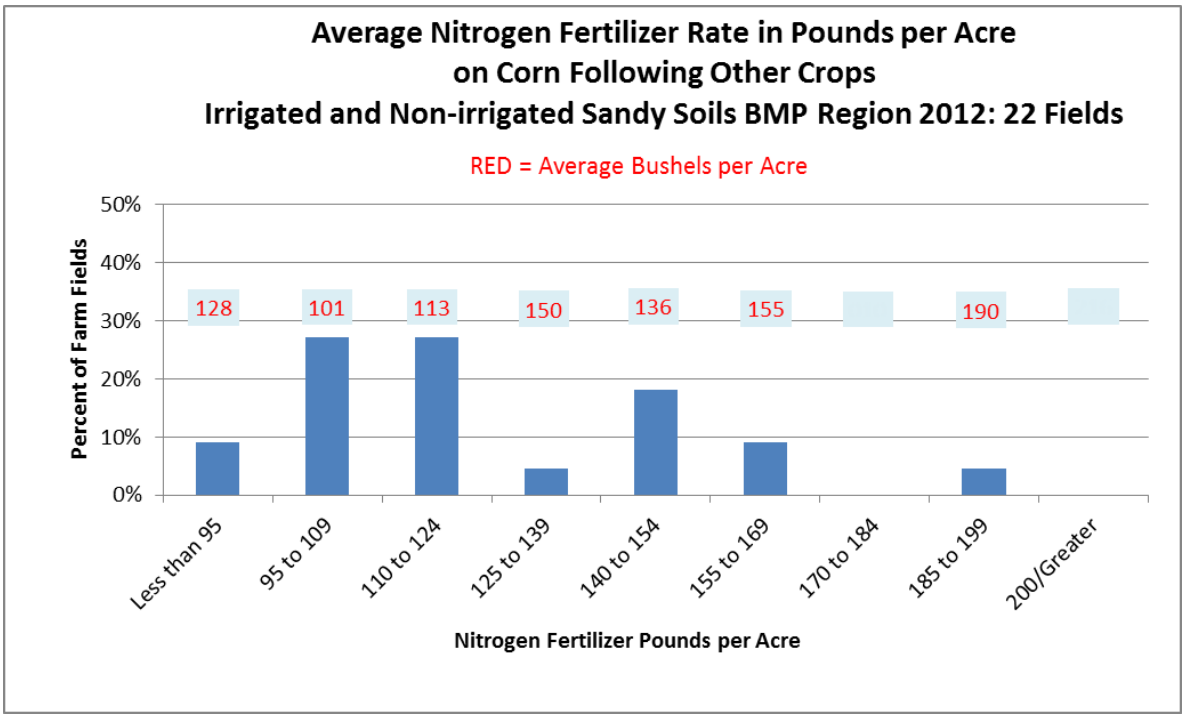

Figure 63. Average nitrogen fertilizer rates and yields on corn following other crops in the IRR BMP region for 2012: 22 fields.

No counties had more than five responses in the IRR BMP region.

Statewide: Nitrogen Timing and Source

Table 22 details the major form of nitrogen fertilizer applied in each BMP region and statewide, and also the percentage of respondents for those forms (NQ-9).

Table 22. The major form of nitrogen applied to the field.

BMP Region	Major Form of the Nitrogen Applied	Percentage of Respondents
Northwestern	Anhydrous Ammonia	25
Northwestern	Urea	62
Northwestern	Liquid Nitrogen	9
Northwestern	Other	4
Northwestern	Unknown	0
Irrigated and non-irrigated sandy soils	Anhydrous Ammonia	18
Irrigated and non-irrigated sandy soils	Urea	63
Irrigated and non-irrigated sandy soils	Liquid Nitrogen	7
Irrigated and non-irrigated sandy soils	Other	11
Irrigated and non-irrigated sandy soils	Unknown	1
Southwestern and West Central	Anhydrous Ammonia	41
Southwestern and West Central	Urea	51
Southwestern and West Central	Liquid Nitrogen	4
Southwestern and West Central	Other	2
Southwestern and West Central	Unknown	2
South Central	Anhydrous Ammonia	52
South Central	Urea	34
South Central	Liquid Nitrogen	12
South Central	Other	1
South Central	Unknown	1
Southeastern	Anhydrous Ammonia	29
Southeastern	Urea	57
Southeastern	Liquid Nitrogen	8
Southeastern	Other	2
Southeastern	Unknown	4
Statewide	Anhydrous Ammonia	36
Statewide	Urea	50
Statewide	Liquid Nitrogen	8
Statewide	Other	4
Statewide	Unknown	2

Table 23 details the major form of nitrogen, average corn yield and nitrogen rate for each form of nitrogen (NQ-5, NQ-8, and NQ-9).

Table 23. Average amount of nitrogen applied and corresponding yield by BMP region and type of nitrogen.

BMP Region	Type of Nitrogen	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Anhydrous Ammonia	127	131
Northwestern	Urea	140	144
Northwestern	Liquid Nitrogen	122	120
Northwestern	Other	113	112
Northwestern	Unknown	**	**
Irrigated and non-irrigated sandy soils	Anhydrous Ammonia	145	147
Irrigated and non-irrigated sandy soils	Urea	127	141
Irrigated and non-irrigated sandy soils	Liquid Nitrogen	134	153
Irrigated and non-irrigated sandy soils	Other	109	133
Irrigated and non-irrigated sandy soils	Unknown	**	**
Southwestern and West Central	Anhydrous Ammonia	154	167
Southwestern and West Central	Urea	147	161
Southwestern and West Central	Liquid Nitrogen	147	168
Southwestern and West Central	Other	132	157
Southwestern and West Central	Unknown	143	158
South Central	Anhydrous Ammonia	163	175
South Central	Urea	156	169
South Central	Liquid Nitrogen	150	173
South Central	Other	140	176
South Central	Unknown	144	166
Southeastern	Anhydrous Ammonia	156	179
Southeastern	Urea	156	172
Southeastern	Liquid Nitrogen	132	167
Southeastern	Other	**	**
Southeastern	Unknown	119	133
Statewide	Anhydrous Ammonia	156	168
Statewide	Urea	144	157
Statewide	Liquid Nitrogen	142	164
Statewide	Other	119	142
Statewide	Unknown	129	145

****** Less than five responses.

Table 24 details the commercial applications of 2011 fall fertilizer for the 2012 corn crop (NQ10).

Table 24. Fall applications of commercial nitrogen fertilizer in 2011 for the 2012 corn crop.

BMP Region	Application of Any Commercial Nitrogen Fertilizer in the Fall of 2011	Percentage of Respondents
Northwestern	Yes	25
Northwestern	No	75
Irrigated and non-irrigated sandy soils	Yes	7
Irrigated and non-irrigated sandy soils	No	93
Southwestern and West Central	Yes	44
Southwestern and West Central	No	56
South Central	Yes	46
South Central	No	54
Southeastern	Yes	9
Southeastern	No	91
Statewide	Yes	31
Statewide	No	69

Table 25 details the anhydrous ammonia applications in the fall of 2011 for the 2012 corn crop (NQ11).

Table 25. Applications of anhydrous ammonia in the fall of 2011 for the 2012 corn crop.

BMP Region	Anhydrous Ammonia Applications in the Fall of 2011	Percentage of Respondents
Northwestern	Yes	15
Northwestern	No	85
Irrigated and non-irrigated sandy soils	Yes	4
Irrigated and non-irrigated sandy soils	No	96
Southwestern and West Central	Yes	24
Southwestern and West Central	No	76
South Central	Yes	32
South Central	No	68
Southeastern	Yes	4
Southeastern	No	96
Statewide	Yes	19
Statewide	No	81

Table 26 details the urea applications in the fall of 2011 for the 2012 corn crop (NQ13).

Table 26. Applications of urea in the fall of 2011 for the 2012 corn crop.

BMP Region	Urea Applications in the Fall of 2011	Percentage of Respondents
Northwestern	Yes	6
Northwestern	No	94
Irrigated and non-irrigated sandy soils	Yes	0
Irrigated and non-irrigated sandy soils	No	100
Southwestern and West Central	Yes	13
Southwestern and West Central	No	87
South Central	Yes	4
South Central	No	96
Southeastern	Yes	0
Southeastern	No	100
Statewide	Yes	6
Statewide	No	94

Table 27 details the liquid nitrogen applications in the fall of 2011 for the 2012 corn crop (NQ15).

Table 27. Applications of liquid nitrogen in the fall of 2011 for the 2012 corn crop.

BMP Region	Liquid Nitrogen (28%, 32%) Applications in the Fall of 2011	Percentage of Respondents
Northwestern	Yes	0
Northwestern	No	100
Irrigated and non-irrigated sandy soils	Yes	0
Irrigated and non-irrigated sandy soils	No	100
Southwestern and West Central	Yes	0
Southwestern and West Central	No	100
South Central	Yes	0
South Central	No	100
Southeastern	Yes	0
Southeastern	No	100
Statewide	Yes	0
Statewide	No	100

Table 28 details the phosphorus applications in the fall of 2011 for the 2012 corn crop (NQ17). In Minnesota, over 99.8% of phosphorus fertilizers contain nitrogen as reported by fertilizer dealers to the MDA. Therefore, phosphorus applications are needed to determine the nitrogen contributions to the corn crop. A majority of the phosphorus applications in Minnesota are in the form of Monoammonium Phosphate (MAP) or Diammonium Phosphate (DAP).

Table 28. Applications of phosphorus fertilizers such as MAP or DAP in the fall of 2011 for the 2012 corn crop.

BMP region	Phosphorus Applications in the Fall of 2011	Percentage of Respondents
Northwestern	Yes	19
Northwestern	No	81
Irrigated and non-irrigated sandy soils	Yes	6
Irrigated and non-irrigated sandy soils	No	94
Southwestern and West Central	Yes	39
Southwestern and West Central	No	61
South Central	Yes	36
South Central	No	64
Southeastern	Yes	6
Southeastern	No	94
Statewide	Yes	26
Statewide	No	74

Table 29 details the applications of other fertilizers in the fall of 2011 for the 2012 corn crop (NQ19).

Table 29. Applications of other fertilizers containing nitrogen in the fall of 2011 for the 2012 corn crop.

BMP Region	Application of Other Sources of Fertilizer Containing Nitrogen in the Fall of 2011	Percentage of Respondents
Northwestern	Yes	2
Northwestern	No	98
Irrigated and non-irrigated sandy soils	Yes	1
Irrigated and non-irrigated sandy soils	No	99
Southwestern and West Central	Yes	6
Southwestern and West Central	No	94
South Central	Yes	8
South Central	No	92
Southeastern	Yes	1
Southeastern	No	99
Statewide	Yes	5
Statewide	No	95

Table 30 details the applications of commercial fertilizers in the spring as a preplant for the 2012 corn crop (NQ23).

Table 30. Applications of commercial nitrogen fertilizers in the spring as a preplant for the 2012 corn crop.

BMP Region	Application of Any Commercial Nitrogen Fertilizer in the Spring of 2012 as a Preplant	Percentage of Respondents
Northwestern	Yes	81
Northwestern	No	19
Irrigated and non-irrigated sandy soils	Yes	82
Irrigated and non-irrigated sandy soils	No	18
Southwestern and West Central	Yes	69
Southwestern and West Central	No	31
South Central	Yes	65
South Central	No	35
Southeastern	Yes	92
Southeastern	No	8
Statewide	Yes	74
Statewide	No	26

Table 31 details the applications of anhydrous ammonia in the spring as a preplant for the 2012 corn crop (NQ24).

Table 31. Applications of anhydrous ammonia in the spring as a preplant for the 2012 corn crop.

BMP Region	Application of Anhydrous as a Preplant in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	10
Northwestern	No	90
Irrigated and non-irrigated sandy soils	Yes	10
Irrigated and non-irrigated sandy soils	No	90
Southwestern and West Central	Yes	16
Southwestern and West Central	No	84
South Central	Yes	19
South Central	No	81
Southeastern	Yes	23
Southeastern	No	77
Statewide	Yes	16
Statewide	No	84

Table 32 details the applications of urea in the spring as a preplant for the 2012 corn crop (NQ26).

Table 32. Applications of urea in the spring as a preplant for the 2012 corn crop.

BMP Region	Application of Urea as a Preplant in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	57
Northwestern	No	43
Irrigated and non-irrigated sandy soils	Yes	53
Irrigated and non-irrigated sandy soils	No	47
Southwestern and West Central	Yes	41
Southwestern and West Central	No	59
South Central	Yes	30
South Central	No	70
Southeastern	Yes	59
Southeastern	No	41
Statewide	Yes	44
Statewide	No	56

Table 33 details the applications of liquid nitrogen in the spring as a preplant for the 2012 corn crop (NQ28).

Table 33. Applications of liquid nitrogen in the spring as a preplant for the 2012 corn crop.

BMP Region	Application of Liquid Nitrogen (28%, 32%) as a Preplant in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	11
Northwestern	No	89
Irrigated and non-irrigated sandy soils	Yes	8
Irrigated and non-irrigated sandy soils	No	92
Southwestern and West Central	Yes	5
Southwestern and West Central	No	95
South Central	Yes	13
South Central	No	87
Southeastern	Yes	10
Southeastern	No	90
Statewide	Yes	8
Statewide	No	92

Table 34 details the applications of phosphorus such as MAP or DAP in the spring as a preplant for the 2012 corn crop (NQ30).

Table 34. Applications of phosphorus in the spring as a preplant for the 2012 corn crop.

BMP Region	Application of Phosphorus as a Preplant in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	48
Northwestern	No	52
Irrigated and non-irrigated sandy soils	Yes	42
Irrigated and non-irrigated sandy soils	No	58
Southwestern and West Central	Yes	31
Southwestern and West Central	No	69
South Central	Yes	38
South Central	No	62
Southeastern	Yes	57
Southeastern	No	43
Statewide	Yes	40
Statewide	No	60

Table 35 details the applications of other fertilizers in the spring as a preplant for the 2012 corn crop (NQ32).

Table 35. Applications of other fertilizers that contained nitrogen in the spring as a preplant for the 2012 corn crop.

BMP Region	Application of Other Sources of Nitrogen Fertilizer as a Preplant in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	10
Northwestern	No	90
Irrigated and non-irrigated sandy soils	Yes	21
Irrigated and non-irrigated sandy soils	No	79
Southwestern and West Central	Yes	18
Southwestern and West Central	No	82
South Central	Yes	17
South Central	No	83
Southeastern	Yes	20
Southeastern	No	80
Statewide	Yes	18
Statewide	No	82

Table 36 details the applications of commercial fertilizers in the spring as a starter or at planting for the 2012 corn crop (NQ34).

Table 36. Applications of commercial nitrogen fertilizers in the spring as a starter or at planting for the 2012 corn crop.

BMP Region	Application of Commercial Nitrogen Fertilizer in the Spring as a Starter or at Planting	Percentage of Respondents
Northwestern	Yes	57
Northwestern	No	43
Irrigated and non-irrigated sandy soils	Yes	60
Irrigated and non-irrigated sandy soils	No	40
Southwestern and West Central	Yes	47
Southwestern and West Central	No	53
South Central	Yes	57
South Central	No	43
Southeastern	Yes	64
Southeastern	No	36
Statewide	Yes	56
Statewide	No	44

Table 37 details the applications of urea in the spring as a starter or at planting for the 2012 corn crop (NQ35).

Table 37. Applications of urea in the spring as a starter or at planting for the 2012 corn crop.

BMP Region	Application of Urea as a Starter or at Planting in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	11
Northwestern	No	89
Irrigated and non-irrigated sandy soils	Yes	25
Irrigated and non-irrigated sandy soils	No	75
Southwestern and West Central	Yes	5
Southwestern and West Central	No	95
South Central	Yes	5
South Central	No	95
Southeastern	Yes	8
Southeastern	No	92
Statewide	Yes	10
Statewide	No	90

Table 38 details the applications of liquid nitrogen in the spring as a starter or at planting for the 2012 corn crop (NQ37).

Table 38. Applications of liquid nitrogen in the spring as a starter or at planting for the 2012 corn crop.

BMP Region	Application of Liquid Nitrogen (28%, 32%) as a Starter or at Planting in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	28
Northwestern	No	72
Irrigated and non-irrigated sandy soils	Yes	21
Irrigated and non-irrigated sandy soils	No	79
Southwestern and West Central	Yes	30
Southwestern and West Central	No	70
South Central	Yes	36
South Central	No	64
Southeastern	Yes	39
Southeastern	No	61
Statewide	Yes	31
Statewide	No	69

Table 39 details the applications of phosphorus such as MAP or DAP in the spring as a starter or at planting for the 2012 corn crop (NQ39).

Table 39. Applications of phosphorus in the spring as a starter or at planting for the 2012 corn crop.

BMP Region	Application of Phosphorus as a Starter or at Planting in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	19
Northwestern	No	81
Irrigated and non-irrigated sandy soils	Yes	25
Irrigated and non-irrigated sandy soils	No	75
Southwestern and West Central	Yes	17
Southwestern and West Central	No	83
South Central	Yes	20
South Central	No	80
Southeastern	Yes	22
Southeastern	No	78
Statewide	Yes	20
Statewide	No	80

Table 40 details the applications of other fertilizers containing nitrogen in the spring as a starter or at planting for the 2012 corn crop (NQ41).

Table 40. Applications of other nitrogen fertilizer in the spring as a starter or at planting for the 2012 corn crop.

BMP Region	Application of Other Fertilizers Containing Nitrogen as a Starter or at Planting in the Spring of 2012	Percentage of Respondents
Northwestern	Yes	14
Northwestern	No	86
Irrigated and non-irrigated sandy soils	Yes	15
Irrigated and non-irrigated sandy soils	No	85
Southwestern and West Central	Yes	6
Southwestern and West Central	No	94
South Central	Yes	8
South Central	No	92
Southeastern	Yes	8
Southeastern	No	92
Statewide	Yes	9
Statewide	No	91

Table 41 details the applications of commercial fertilizers post planting or sidedress for the 2012 corn crop (NQ43).

Table 41. Applications of commercial nitrogen fertilizers at post planting or sidedress for the 2012 corn crop.

BMP Region	Application of Commercial Nitrogen Fertilizer After Planting such as a Sidedress	Percentage of Respondents
Northwestern	Yes	15
Northwestern	No	85
Irrigated and non-irrigated sandy soils	Yes	22
Irrigated and non-irrigated sandy soils	No	78
Southwestern and West Central	Yes	16
Southwestern and West Central	No	84
South Central	Yes	13
South Central	No	87
Southeastern	Yes	8
Southeastern	No	92
Statewide	Yes	15
Statewide	No	85

Table 42 details the applications of anhydrous ammonia as a post planting or sidedress for the 2012 corn crop (NQ44).

Table 42. Applications of anhydrous ammonia as a post planting or sidedress for the 2012 corn crop.

BMP Region	Application of Anhydrous Ammonia as a Post Planting or Sidedress in 2012	Percentage of Respondents
Northwestern	Yes	2
Northwestern	No	98
Irrigated and non-irrigated sandy soils	Yes	4
Irrigated and non-irrigated sandy soils	No	96
Southwestern and West Central	Yes	4
Southwestern and West Central	No	96
South Central	Yes	2
South Central	No	98
Southeastern	Yes	1
Southeastern	No	99
Statewide	Yes	3
Statewide	No	97

Table 43 details the applications of urea as a post planting or sidedress for the 2012 corn crop (N46).

Table 43. Applications of urea as a post planting or sidedress for the 2012 corn crop.

BMP Region	Application of Urea as a Post Planting or Sidedress in 2012	Percentage of Respondents
Northwestern	Yes	3
Northwestern	No	97
Irrigated and non-irrigated sandy soils	Yes	10
Irrigated and non-irrigated sandy soils	No	90
Southwestern and West Central	Yes	5
Southwestern and West Central	No	95
South Central	Yes	4
South Central	No	96
Southeastern	Yes	1
Southeastern	No	99
Statewide	Yes	5
Statewide	No	95

Table 44 details the applications of liquid nitrogen as a post planting or sidedress for the 2012 corn crop (NQ48).

Table 44. Applications of liquid nitrogen as a post planting or sidedress for the 2012 corn crop.

BMP Region	Application of Liquid Nitrogen (28%, 32%) as a Post Planting or Sidedress in 2012	Percentage of Respondents
Northwestern	Yes	3
Northwestern	No	97
Irrigated and non-irrigated sandy soils	Yes	5
Irrigated and non-irrigated sandy soils	No	95
Southwestern and West Central	Yes	4
Southwestern and West Central	No	96
South Central	Yes	5
South Central	No	95
Southeastern	Yes	4
Southeastern	No	96
Statewide	Yes	4
Statewide	No	96

Table 45 details the applications of phosphorus such as MAP or DAP as a post planting or sidedress for the 2012 corn crop (NQ50).

Table 45. Applications of phosphorus as a post planting or sidedress for the 2012 corn crop.

BMP Region	Application of Phosphorus as a Post Planting or Sidedress	Percentage of Respondents
Northwestern	Yes	0
Northwestern	No	100
Irrigated and non-irrigated sandy soils	Yes	1
Irrigated and non-irrigated sandy soils	No	99
Southwestern and West Central	Yes	1
Southwestern and West Central	No	99
South Central	Yes	0
South Central	No	100
Southeastern	Yes	0
Southeastern	No	100
Statewide	Yes	1
Statewide	No	99

Table 46 details the applications other fertilizers as a post planting or sidedress for the 2012 corn crop (NQ52).

Table 46. Applications of other nitrogen fertilizers as a post planting or sidedress for the 2012 corn crop.

BMP Region	Application of Other Fertilizers Containing Nitrogen as a Post Planting or Sidedress	Percentage of Respondents
Northwestern	Yes	1
Northwestern	No	99
Irrigated and non-irrigated sandy soils	Yes	1
Irrigated and non-irrigated sandy soils	No	99
Southwestern and West Central	Yes	1
Southwestern and West Central	No	99
South Central	Yes	0
South Central	No	100
Southeastern	Yes	1
Southeastern	No	99
Statewide	Yes	1
Statewide	No	99

Figure 64 details the form of nitrogen that was applied to corn acres statewide based on total pounds of nitrogen applied (NQ-9).

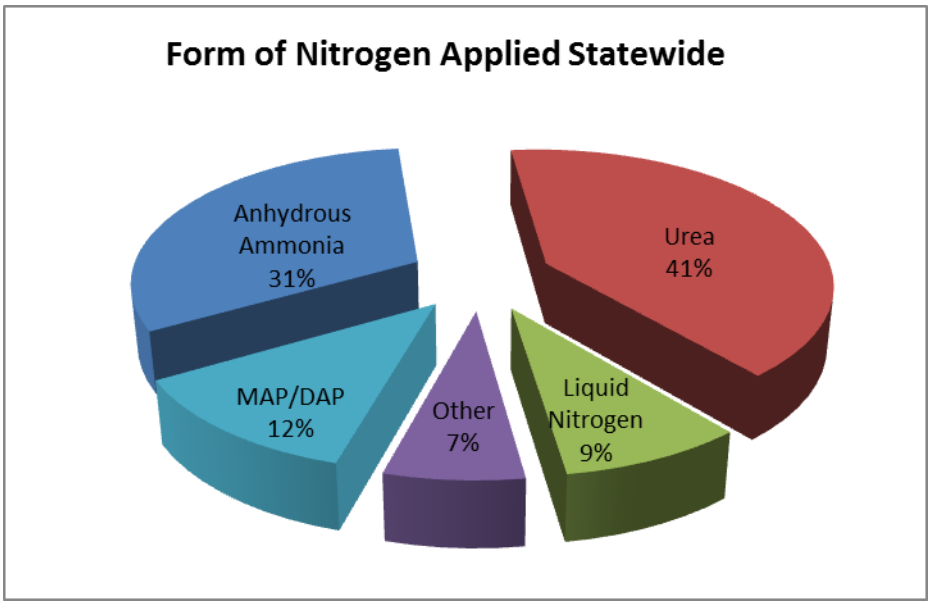

Figure 64. The form of the nitrogen applied to corn acres in the state for the 2012 survey for all fields applied with nitrogen fertilizer (based on total pounds of nitrogen applied).

Figure 65 details the form of nitrogen that was applied to corn acres in the SE BMP region (NQ-9).

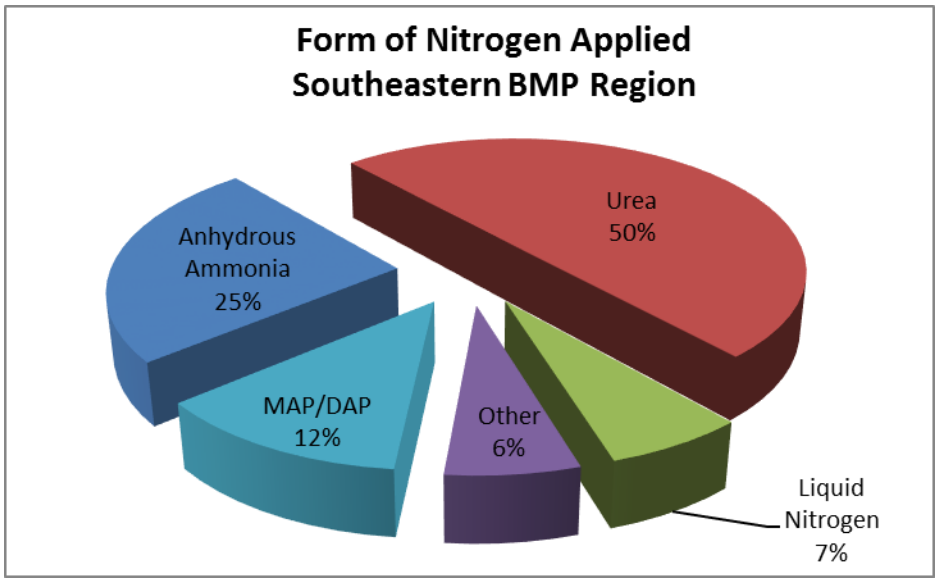

Figure 65. The form of the nitrogen applied to corn acres in the SE BMP region for the 2012 survey for all fields applied with nitrogen fertilizer.

Figure 66 details the form of nitrogen that was applied to corn acres in the SC BMP region (NQ-9).

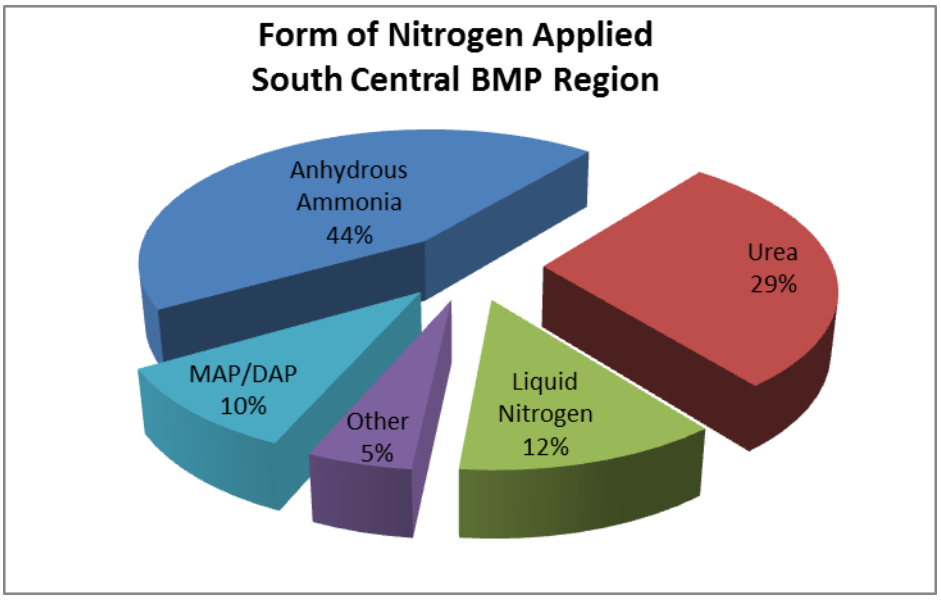

Figure 66. The form of the nitrogen applied to corn acres in the SC BMP region for the 2012 survey for all fields applied with nitrogen fertilizer.

Figure 67 details the form of nitrogen that was applied to corn acres in the SW BMP region (NQ-9).

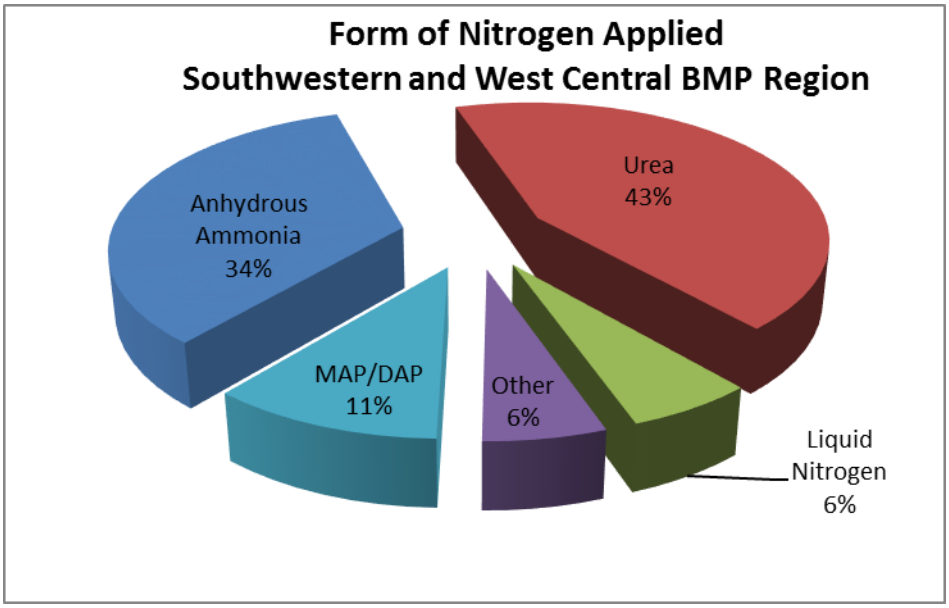

Figure 67. The form of the nitrogen applied to corn acres in the SW BMP region for the 2012 survey for all fields applied with nitrogen fertilizer.

Figure 68 details the form of nitrogen that was applied to corn acres in the NW BMP region (NQ-9).

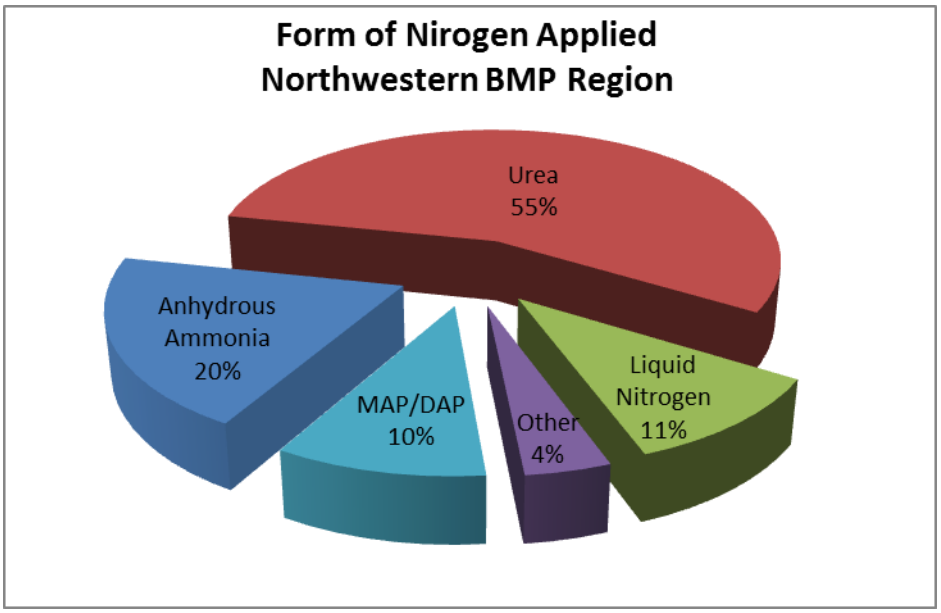

Figure 68. The form of the nitrogen applied to corn acres in the NW BMP region for the 2012 survey for all fields applied with nitrogen fertilizer.

Figure 69 details the form of nitrogen that was applied to corn acres in the IRR BMP region (NQ-9).

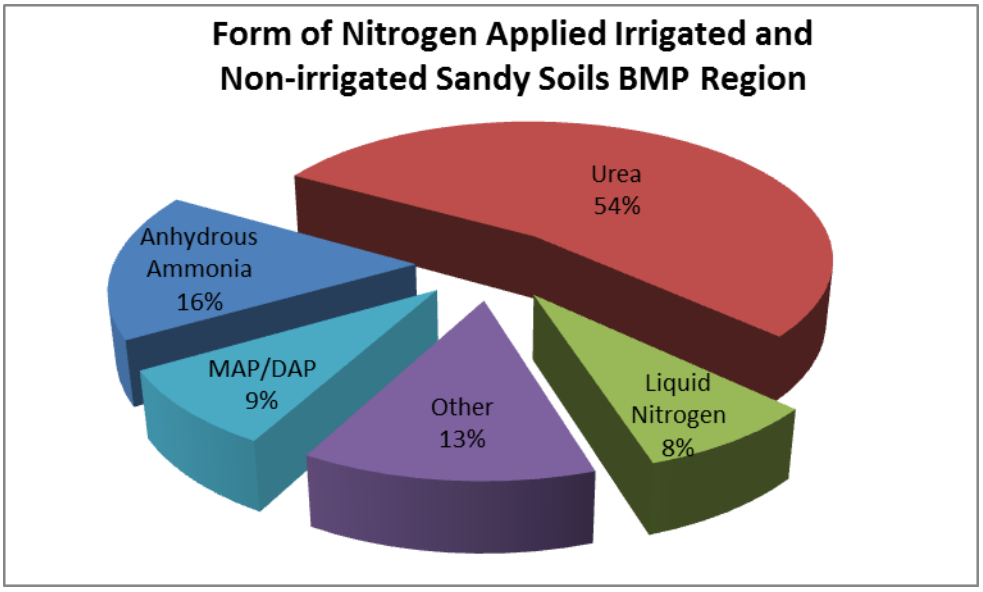

Figure 69. The form of the nitrogen applied to corn acres in the IRR BMP region for the 2012 survey for all fields applied with nitrogen fertilizer.

Figure 70 details the timing of anhydrous ammonia applications on corn acres in the state of Minnesota for an average field by pounds of nitrogen applied (NQ-12, NQ-25, NQ-45).

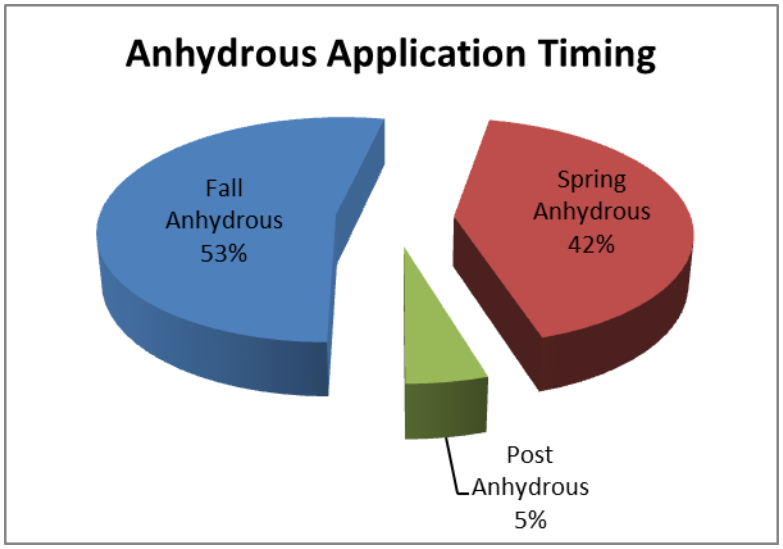

Figure 70. Timing of anhydrous ammonia applications to corn acres in Minnesota by pounds of nitrogen fertilizer applied for the 2012 corn crop.

Figure 71 details the timing of urea applications on corn acres in the state for an average field by pounds of nitrogen applied (NQ-14, NQ-27, NQ-35, NQ-47).

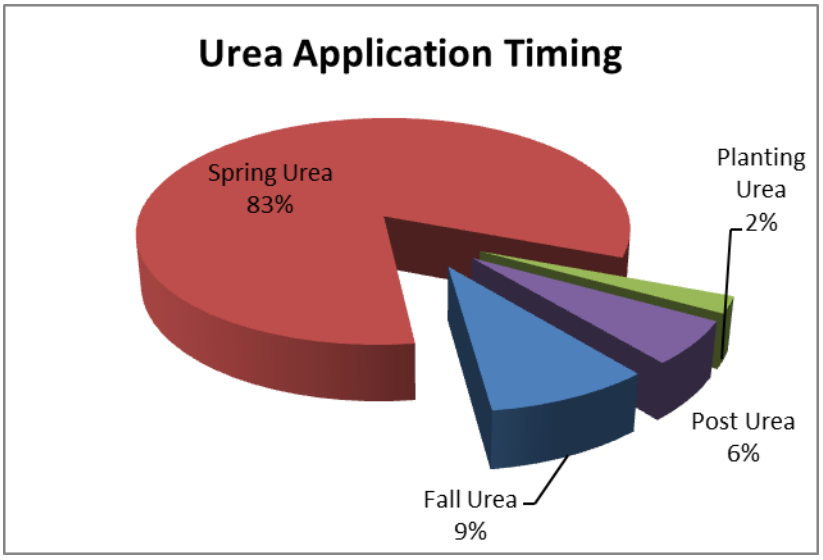

Figure 71. Timing of urea applications to corn acres in Minnesota by pounds of nitrogen applied in the 2012 survey.

Figure 72 details the timing of MAP/DAP nitrogen applications on corn acres in the state for an average field by pounds of nitrogen applied (NQ-18, NQ-31, NQ-40, NQ-51).

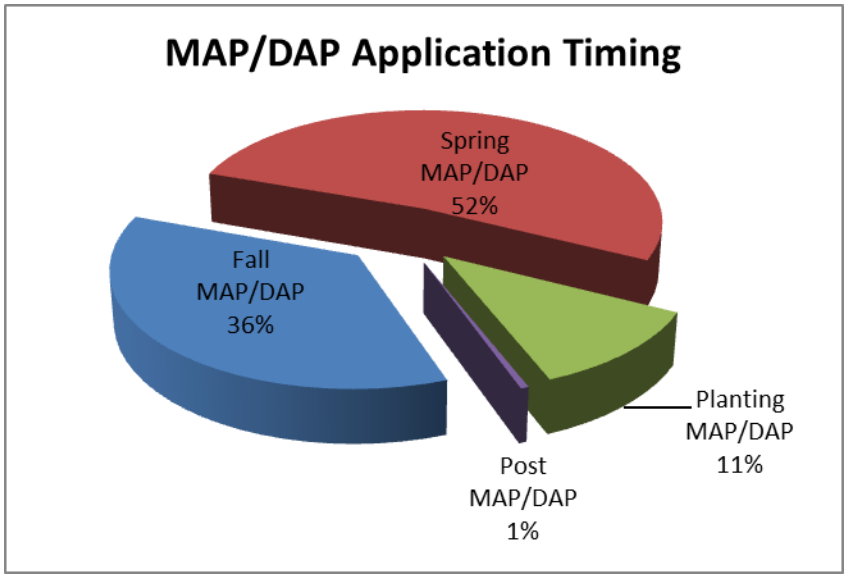

Figure 72. Timing of MAP/DAP nitrogen applications to corn acres in Minnesota by pounds of nitrogen applied in the 2012 survey.

Figure 73 details the timing of liquid nitrogen applications on corn acres in the state for an average field by pounds of nitrogen applied (NQ-16, NQ-29, NQ-38, NQ-49).

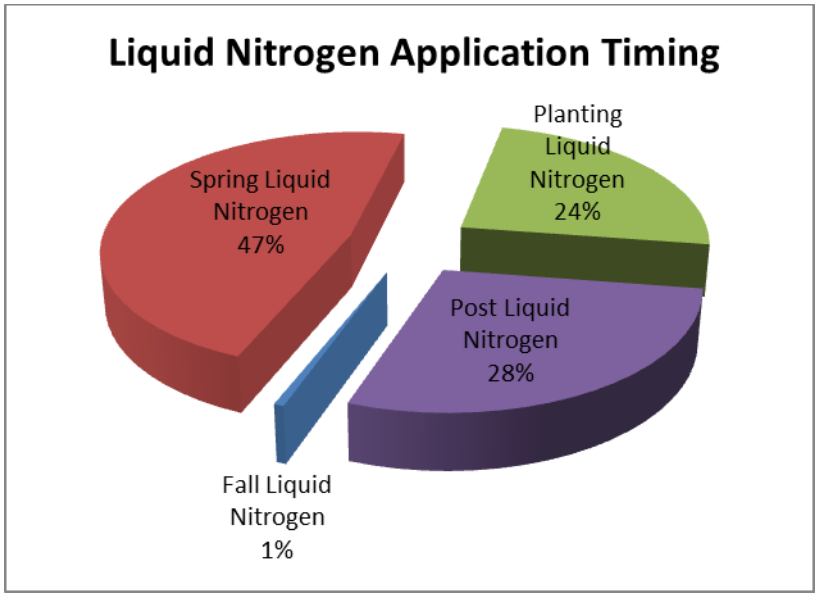

Figure 73. Timing of liquid nitrogen applications to corn acres in Minnesota by pounds of nitrogen applied in the 2012 survey.

Figure 74 details the timing of other nitrogen applications on corn acres in the state for an average field by pounds of nitrogen applied (NQ-20, NQ-33, NQ-42, NQ-53).

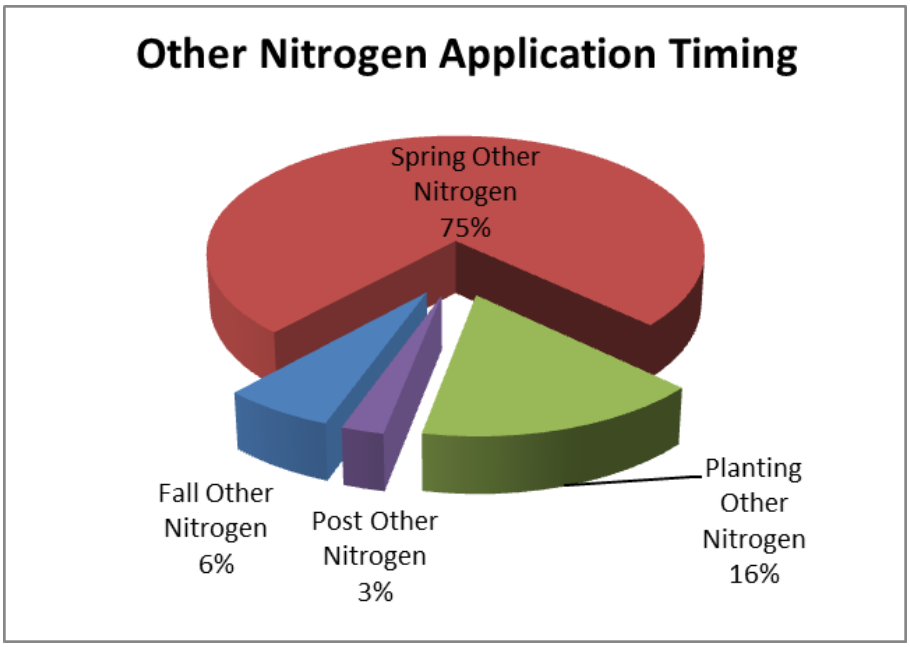

Figure 74. Timing of other nitrogen applications to corn acres in Minnesota by pounds of nitrogen applied in the 2012 survey.

2012 Manure Use Practices Summary and Highlights

Manure is a valuable source of nitrogen (and other nutrients) for Minnesota corn farmers. The primary purpose of this portion of the survey was to obtain an understanding of basic manure management practices associated with corn production.

This report summarizes survey results for a number of important practices associated with manure use on Minnesota's 2012 corn acres. Over 850 producers with manured acres, totaling approximately 196,000 acres, participated in the telephone survey.

NASS developed a sampling population of 7,600 farms by randomly drawing from its entire database of all corn growers in Minnesota. There were approximately 850 farmers surveyed that applied manure sometime between the fall of 2011 and the spring of 2012 for the 2012 corn growing season who completed the survey. All growers were asked basic questions regarding manure use and management.

Data Reporting and Limitations

The primary purpose of this survey was to obtain an understanding of manure management practices used by Minnesota corn farmers.

Due to the simplified method used to collect what is typically considered complex data, it is imperative that the reader understand the limitations of the data sets. Many surveys conducted by NASS employ advanced sampling strategies which are designed to statistically represent a non-homogenous population, thus "weighting" the data to account for sample size, county size, and crop acreage, etc. Such strategies can be very expensive and are not without their own limitations.[6] This survey did not employ such strategies; rather, corn farmers who applied manure were randomly selected throughout Minnesota. Therefore, weighting in areas or counties was not performed. The MDA can be contacted to further discuss interpretation of the survey data.

[6] For an explanation of survey methods and data quality associated with annual county-level data, visit the NASS "Quick Stats" Frequently Asked Questions website at: http://www.nass.usda.gov/QuickStats/Screens/faqs.htm

Manure Applications in Minnesota

Table 47 details the counties and BMP regions where the total number of corn acres were planted for the 2012 corn crop by farmers who applied manure to their fields (MQ-1 and MQ-2). All fields surveyed that had corn planted in 2012 without manure are excluded from the following analysis.

Table 47. Summary of respondents and corresponding manure applied corn acres by county and BMP region.

County	BMP Region	Number of Respondents	Number of Corn Acres
Clay	NW	**	**
Clearwater	NW	**	**
Mahnomen	NW	**	**
Norman	NW	6	745
Pennington	NW	**	**
Polk	NW	**	**
Red Lake	NW	**	**
Roseau	NW	**	**
Totals	**NW**	**18**	**6,405**
Aitkin	IRR	**	**
Anoka	IRR	**	**
Becker	IRR	12	1,216
Beltrami	IRR	**	**
Benton	IRR	21	2,017
Carlton	IRR	**	**
Cass	IRR	5	338
Chisago	IRR	**	**
Crow Wing	IRR	5	1,296
Hennepin	IRR	9	1,390
Hubbard	IRR	**	**
Isanti	IRR	5	529
Itasca	IRR	**	**
Kanabec	IRR	**	**
Mille Lacs	IRR	7	554
Morrison	IRR	48	5,198
Otter Tail	IRR	26	5,875
Pine	IRR	6	596
Sherburne	IRR	**	**
Stearns	IRR	77	9,515
Todd	IRR	31	4,233
Wadena	IRR	9	1,103
Washington	IRR	**	**
Wright	IRR	17	2,800
Totals	**IRR**	**304**	**39,079**
Big Stone	SW	**	**
Chippewa	SW	**	**
Cottonwood	SW	10	2,934
Douglas	SW	9	876

County	BMP Region	Number of Respondents	Number of Corn Acres
Jackson	SW	9	1,380
Kandiyohi	SW	10	2,706
Lac qui Parle	SW	7	3,180
Lincoln	SW	10	3,244
Lyon	SW	13	6,053
Murray	SW	18	6,080
Nobles	SW	11	3,473
Pipestone	SW	12	3,283
Pope	SW	11	1,216
Redwood	SW	19	11,936
Renville	SW	13	6,737
Rock	SW	12	3,605
Stevens	SW	**	**
Swift	SW	9	4,573
Traverse	SW	**	**
Yellow Medicine	SW	11	10,481
Totals	**SW**	**197**	**76,897**
Blue Earth	SC	8	3,707
Brown	SC	25	4,710
Carver	SC	14	1,553
Dodge	SC	10	1,059
Faribault	SC	**	**
Freeborn	SC	14	5,137
Le Sueur	SC	10	3,049
Martin	SC	9	6,708
McLeod	SC	13	2,682
Meeker	SC	13	5,346
Mower	SC	11	1,895
Nicollet	SC	9	1,359
Rice	SC	16	2,325
Scott	SC	7	642
Sibley	SC	16	2,213
Steele	SC	6	778
Waseca	SC	6	510
Watonwan	SC	**	**
Totals	**SC**	**195**	**48,137**
Dakota	SE	9	3,898
Fillmore	SE	23	7,051
Goodhue	SE	23	3,020
Houston	SE	12	1,594
Olmsted	SE	14	1,853
Wabasha	SE	29	5,051
Winona	SE	33	3,127
Totals	**SE**	**143**	**25,594**
State	**All**	**857**	**196,112**

** Less than five responses

Statewide Manure Applications and Management on Corn

Information on manure management was gathered on a typical corn field for the 2012 growing season. Information about management on all corn crop acres was not collected in this section of the survey. Manure applications on crops other than corn were not collected in this survey. Typically in Minnesota, the vast amount of manure is applied previous to the planting of a corn crop. Manure is generally applied after the previous crop is harvested and before a corn crop is planted, usually in the fall or spring. Manure information was collected at the same time as pesticide and commercial nitrogen fertilizer information during the survey, thus limiting the amount of information that could be gathered due to time constraints for the farmer. If manure was not used, then the survey on manure was concluded.

Participants who grew corn were asked if they had a corn field that was applied with manure. If yes, they were then asked the size of the field, the average yield of the field during the past three corn crops and if the whole field was applied with manure. Table 48 summarizes the percent of corn farmers' previous crop on the field, percent of manured acres in each region by previous crop and average corn yield (MQ-1 and MQ-3). Table 49 details the average size of the field, average corn yield, and percent of fields with complete manure coverage (MQ-2, MQ-3 & MQ-4).

Table 48 details the previous crop planted before the current corn crop by region and the corresponding corn yield over the last three corn crops (MQ-1, MQ-1a, MQ-1b, and MQ-3).

Table 48. Percent of acres by previous crop and the corresponding yields.

BMP Region	Previous Crop	Percentage of Fields	Average Corn Yield Bushels per Acre
Northwestern	Soybeans	28	142
Northwestern	Corn	28	137
Northwestern	Corn/Alfalfa	**	**
Northwestern	Small Grains	**	**
Northwestern	Other	**	**
Irrigated and non-irrigated sandy soils	Soybeans	17	150
Irrigated and non-irrigated sandy soils	Corn	43	135
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	22	142
Irrigated and non-irrigated sandy soils	Alfalfa	10	143
Irrigated and non-irrigated sandy soils	Small Grains	3	153
Irrigated and non-irrigated sandy soils	Other	5	135
South Western and West Central	Soybeans	52	161
South Western and West Central	Corn	31	166
South Western and West Central	Corn/Alfalfa	8	157
South Western and West Central	Alfalfa	**	**
South Western and West Central	Small Grains	3	157
South Western and West Central	Other	5	162
South Central	Soybeans	51	173
South Central	Corn	27	173
South Central	Corn/Alfalfa	11	167
South Central	Alfalfa	7	165
South Central	Small Grains	3	157
South Central	Other	**	**
Southeastern	Soybeans	20	172
Southeastern	Corn	35	180
Southeastern	Corn/Alfalfa	32	172
Southeastern	Alfalfa	10	170
Southeastern	Other	**	**
Statewide	Soybeans	33	164
Statewide	Corn	35	156
Statewide	Corn/Alfalfa	18	156
Statewide	Alfalfa	7	155
Statewide	Small Grains	3	153
Statewide	Other	4	148

** Less than five responses

Table 49 details average field size where manure is applied, average yield over the last three corn crops, and manure coverage of the manured fields. Fields without manure were excluded from this analysis (MQ-2, MQ-3, and MQ-4). The average corn yield represents all fields that had complete manure coverage for the 2012 corn crop.

Table 49. Acres of the average corn field by BMP region, average yield over the last three corn crops for corn fields with 100 percent manure coverage and percent of corn fields with complete manure coverage.

BMP Region	Average Size of Field Acres	Average Corn Yield Bushels per Acre	Percent of Fields with Complete Manure Coverage
Northwestern	61	144	78
Irrigated and non-irrigated sandy soils	39	140	84
Southwestern and West Central	124	163	76
South Central	74	175	72
Southeastern	34	175	88
Statewide	65	158	80

Table 50 details all corn fields with manure or with manure and commercial nitrogen fertilizer and average yield for the last three corn crops regardless of the percentage of manure coverage on the corn field for the 2012 corn crop (MQ-1, MQ-3).

Table 50. Average corn yield over the last three corn crops on corn fields applied with manure or manure and commercial nitrogen fertilizer.

BMP Region	Average Corn Yield Bushels per Acre
Northwestern	141
Irrigated and non-irrigated sandy soils	143
Southwestern and West Central	162
South Central	171
Southeastern	174
Statewide	158

Table 51 details the percentage of respondents that had at least one field with manure applied for the 2012 corn crop season (MQ-1).

Table 51. Percentage of respondents that applied manure on their corn acres.

BMP Region	Corn Field Applied with Manure	Percentage of Respondents
Northwestern	Yes	25
Northwestern	No	75
Irrigated and non-irrigated sandy soils	Yes	66
Irrigated and non-irrigated sandy soils	No	34
South Western and West Central	Yes	44
South Western and West Central	No	56
South Central	Yes	43
South Central	No	57
Southeastern	Yes	65
Southeastern	No	35
Statewide	Yes	52
Statewide	No	48

Table 52 details the percentage of respondents main source of manure applied on the corn field for the 2012 corn crop (MQ-5).

Table 52. The main source of manure applied to the corn field by livestock type.

BMP Region	Main Source of Manure	Percentage of Respondents
Northwestern	Dairy	11
Northwestern	Beef	61
Northwestern	Hog	11
Northwestern	Poultry	17
Irrigated and non-irrigated sandy soils	Dairy	48
Irrigated and non-irrigated sandy soils	Beef	42
Irrigated and non-irrigated sandy soils	Hog	2
Irrigated and non-irrigated sandy soils	Poultry	5
Irrigated and non-irrigated sandy soils	Other	3
Southwestern and West Central	Dairy	22
Southwestern and West Central	Beef	43
Southwestern and West Central	Hog	26
Southwestern and West Central	Poultry	4
Southwestern and West Central	Other	5
South Central	Dairy	34
South Central	Beef	31
South Central	Hog	26
South Central	Poultry	4
South Central	Other	5
Southeastern	Dairy	51
Southeastern	Beef	38
Southeastern	Hog	6
Southeastern	Poultry	1
Southeastern	Other	4
Statewide	Dairy	39
Statewide	Beef	39
Statewide	Hog	14
Statewide	Poultry	4
Statewide	Other	4

Table 53 details the percentage of respondents that applied liquid or solid manure to their corn acres (MQ-6).

Table 53. Percentage of respondents that applied liquid or solid manure to the surveyed corn acres.

BMP Region	Solid or Liquid	Percentage of Respondents
Northwestern	Solid	89
Northwestern	Liquid	11
Irrigated and non-irrigated sandy soils	Solid	78
Irrigated and non-irrigated sandy soils	Liquid	22
South Western and West Central	Solid	66
South Western and West Central	Liquid	34
South Central	Solid	60
South Central	Liquid	40
Southeastern	Solid	74
Southeastern	Liquid	26
Statewide	Solid	71
Statewide	Liquid	29

Table 54 details the percentage of respondents method of application for liquid manure (MQ-6a).

Table 54. Method of application of liquid manure and corresponding percentage of respondents.

BMP Region	Method of Application for Liquid Manure	Percentage of Respondents
Northwestern	Knife Injection	50
Northwestern	Broadcast over 4 days	50
Irrigated and non-irrigated sandy soils	Sweep Injection	19
Irrigated and non-irrigated sandy soils	Knife Injection	18
Irrigated and non-irrigated sandy soils	Disc Injection	9
Irrigated and non-irrigated sandy soils	Broadcast Incorporation within one day	27
Irrigated and non-irrigated sandy soils	Broadcast Incorporation within two to four days	14
Irrigated and non-irrigated sandy soils	Broadcast Incorporation over 4 days	11
Irrigated and non-irrigated sandy soils	Broadcast No Incorporation	2
Southwestern and West Central	Sweep Injection	10
Southwestern and West Central	Knife Injection	22
Southwestern and West Central	Disc Injection	46
Southwestern and West Central	Broadcast Incorporation within one day	12
Southwestern and West Central	Broadcast Incorporation within two to four days	5
Southwestern and West Central	Broadcast Incorporation over 4 days	2
Southwestern and West Central	Broadcast No Incorporation	3
South Central	Sweep Injection	13
South Central	Knife Injection	55
South Central	Disc Injection	25
South Central	Broadcast Incorporation within one day	3
South Central	Broadcast Incorporation over 4 days	4
Southeastern	Sweep Injection	14
Southeastern	Knife Injection	35
Southeastern	Disc Injection	17
Southeastern	Broadcast Incorporation within one day	10
Southeastern	Broadcast Incorporation within two to four days	10
Southeastern	Broadcast Incorporation over 4 days	4
Southeastern	Broadcast No Incorporation	10
Statewide	Sweep Injection	14
Statewide	Knife Injection	33
Statewide	Disc Injection	25
Statewide	Broadcast Incorporation within one day	13
Statewide	Broadcast Incorporation within two to four days	6
Statewide	Broadcast Incorporation over 4 days	6
Statewide	Broadcast No Incorporation	3

Table 55 details the percentage of respondents method of application for solid manure (MQ-6b).

Table 55. The method of application of solid manure and corresponding percentage of respondents.

BMP Region	Method of Application for Solid Manure	Percentage of Respondents
Northwestern	Broadcast Incorporation within one day	19
Northwestern	Broadcast Incorporation within two to four days	44
Northwestern	Broadcast Incorporation over 4 days	25
Northwestern	Broadcast No Incorporation	12
Irrigated and non-irrigated sandy soils	Broadcast Incorporation within one day	14
Irrigated and non-irrigated sandy soils	Broadcast Incorporation within two to four days	23
Irrigated and non-irrigated sandy soils	Broadcast Incorporation over 4 days	40
Irrigated and non-irrigated sandy soils	Broadcast No Incorporation	23
Southwestern and West Central	Broadcast Incorporation within one day	13
Southwestern and West Central	Broadcast Incorporation within two to four days	30
Southwestern and West Central	Broadcast Incorporation over 4 days	38
Southwestern and West Central	Broadcast No Incorporation	19
South Central	Broadcast Incorporation within one day	18
South Central	Broadcast Incorporation within two to four days	21
South Central	Broadcast Incorporation over 4 days	40
South Central	Broadcast No Incorporation	21
Southeastern	Broadcast Incorporation within one day	7
Southeastern	Broadcast Incorporation within two to four days	22
Southeastern	Broadcast Incorporation over 4 days	48
Southeastern	Broadcast No Incorporation	23
Statewide	Broadcast Incorporation within one day	14
Statewide	Broadcast Incorporation within two to four days	24
Statewide	Broadcast Incorporation over 4 days	41
Statewide	Broadcast No Incorporation	21

Table 56 details the percentage of respondents on how often the manure was applied to their corn field (MQ-7). Farmers can apply manure on a field all at one time (approximate date) or manure applications can be over a period of time, such as daily or weekly.

Table 56. Timing of manure applications by approximate date or over time.

BMP Region	Manure Application Frequency: Approximate Date or Over Time	Percentage of Respondents
Northwestern	Approximate date	61
Northwestern	Over a period of time	39
Irrigated and non-irrigated sandy soils	Approximate date	56
Irrigated and non-irrigated sandy soils	Over a period of time	44
Southwestern and West Central	Approximate date	57
Southwestern and West Central	Over a period of time	43
South Central	Approximate date	61
South Central	Over a period of time	39
Southeastern	Approximate date	52
Southeastern	Over a period of time	48
Statewide	Approximate date	57
Statewide	Over a period of time	43

Table 57 details the percentage of respondents that applied manure on a specific date as to when the manure was applied in regards to the general season (MQ-7). If a farmer applied manure on two or more specific dates, then the date was classified as “all year”, or if the farmer didn’t recall the date of manure application, then their response was classified as “don’t know”.

Table 57. Seasonal timing for those farmers who applied manure on a specific date.

BMP Region	Approximate Date of the Manure Application	Percentage of Respondents
Northwestern	Fall 2011	56
Northwestern	Winter 2011	11
Northwestern	Spring 2012	33
Irrigated and non-irrigated sandy soils	All Year	3
Irrigated and non-irrigated sandy soils	Don't know	2
Irrigated and non-irrigated sandy soils	Summer 2011	1
Irrigated and non-irrigated sandy soils	Fall 2011	45
Irrigated and non-irrigated sandy soils	Winter 2011	1
Irrigated and non-irrigated sandy soils	Spring 2012	48
Southwestern and West Central	All Year	1
Southwestern and West Central	Don't know	2
Southwestern and West Central	Summer 2011	2
Southwestern and West Central	Fall 2011	71
Southwestern and West Central	Winter 2011	4
Southwestern and West Central	Spring 2012	20
South Central	All Year	1
South Central	Don't know	2
South Central	Summer 2011	2
South Central	Fall 2011	61
South Central	Winter 2011	5
South Central	Spring 2012	29
Southeastern	All Year	2
Southeastern	Don't know	3
Southeastern	Fall 2011	48
Southeastern	Winter 2011	12
Southeastern	Spring 2012	35
Statewide	All Year	2
Statewide	Don't know	3
Statewide	Summer 2011	2
Statewide	Fall 2011	48
Statewide	Winter 2011	5
Statewide	Spring 2012	40

Table 58 details the percentage of respondents on how often the manure was applied for those farmers who applied manure over a period of time (MQ-7).

Table 58. The frequency of manure applications for farmers who applied manure over a period of time.

BMP Region	Manure Application Frequency	Percentage of Respondents
Northwestern	Daily	29
Northwestern	Weekly	29
Northwestern	Monthly	14
Northwestern	Other	28
Irrigated and non-irrigated sandy soils	Daily	33
Irrigated and non-irrigated sandy soils	Weekly	24
Irrigated and non-irrigated sandy soils	Monthly	18
Irrigated and non-irrigated sandy soils	Other	25
Southwestern and West Central	Daily	24
Southwestern and West Central	Weekly	27
Southwestern and West Central	Monthly	23
Southwestern and West Central	Other	26
South Central	Daily	31
South Central	Weekly	18
South Central	Monthly	21
South Central	Other	30
Southeastern	Daily	36
Southeastern	Weekly	26
Southeastern	Monthly	22
Southeastern	Other	16
Statewide	Daily	31
Statewide	Weekly	24
Statewide	Monthly	20
Statewide	Other	25

Table 59 details the percentage of respondents to last time manure was applied on the corn field surveyed, before the current manure application for the 2012 corn crop (MQ-8).

Table 59. The date of last manure application before the 2012 manure application for the 2012 corn crop.

BMP Region	Last Application of Manure on this Field	Percentage of Respondents
Northwestern	2006 and before	50
Northwestern	2009	12
Northwestern	2010	25
Northwestern	2011	13
Irrigated and non-irrigated sandy soils	2006 and before	29
Irrigated and non-irrigated sandy soils	2007	11
Irrigated and non-irrigated sandy soils	2008	10
Irrigated and non-irrigated sandy soils	2009	12
Irrigated and non-irrigated sandy soils	2010	31
Irrigated and non-irrigated sandy soils	2011	7
Southwestern and West Central	2006 and before	35
Southwestern and West Central	2007	13
Southwestern and West Central	2008	10
Southwestern and West Central	2009	19
Southwestern and West Central	2010	23
South Central	2006 and before	26
South Central	2007	5
South Central	2008	11
South Central	2009	13
South Central	2010	40
South Central	2011	5
Southeastern	2006 and before	32
Southeastern	2007	3
Southeastern	2008	3
Southeastern	2009	18
Southeastern	2010	32
Southeastern	2011	12
Statewide	2006 and before	31
Statewide	2007	8
Statewide	2008	8
Statewide	2009	15
Statewide	2010	31
Statewide	2011	7

Table 60 details the average miles traveled from the manure source to the corn field applied with manure (MQ-9).

Table 60. Distance to the field for manure applications by composition of manure.

BMP Region	Liquid or Solid Manure	Average Miles to the Field
Northwestern	Solid	3.53
Northwestern	Liquid	0.85
Northwestern	All	3.23
Irrigated and non-irrigated sandy soils	Solid	1.35
Irrigated and non-irrigated sandy soils	Liquid	1.09
Irrigated and non-irrigated sandy soils	All	1.29
Southwestern and West Central	Solid	2.46
Southwestern and West Central	Liquid	3.07
Southwestern and West Central	All	2.66
South Central	Solid	2.27
South Central	Liquid	1.69
South Central	All	2.04
Southeastern	Solid	1.14
Southeastern	Liquid	1.29
Southeastern	All	1.18
Statewide	Solid	1.79
Statewide	Liquid	1.83
Statewide	All	1.80

Table 61 details the average miles travelled to the corn field from the manure source by animal type (MQ-5 and MQ-9).

Table 61. Distance to the field for manure applications by animal type.

BMP Region	Animal Type	Average Miles to the Field
Northwestern	Dairy	1.00
Northwestern	Beef	1.04
Northwestern	Hog	1.35
Northwestern	Poultry	14.00
Irrigated and non-irrigated sandy soils	Dairy	1.12
Irrigated and non-irrigated sandy soils	Beef	0.93
Irrigated and non-irrigated sandy soils	Hog	1.18
Irrigated and non-irrigated sandy soils	Poultry	5.85
Irrigated and non-irrigated sandy soils	Other	1.05
Irrigated and non-irrigated sandy soils	Don't Know	2.00
Southwestern and West Central	Dairy	1.21
Southwestern and West Central	Beef	1.71
Southwestern and West Central	Hog	2.09
Southwestern and West Central	Poultry	24.38
Southwestern and West Central	Other	2.89
Southwestern and West Central	Don't Know	0.00
South Central	Dairy	1.24
South Central	Beef	0.81
South Central	Hog	1.70
South Central	Poultry	23.50
South Central	Other	1.49
South Central	Don't Know	1.00
Southeastern	Dairy	1.32
Southeastern	Beef	0.99
Southeastern	Hog	0.81
Southeastern	Poultry	2.00
Southeastern	Other	1.50
Statewide	Dairy	1.20
Statewide	Beef	1.12
Statewide	Hog	1.78
Statewide	Poultry	14.20
Statewide	Other	1.73
Statewide	Don't Know	1.00

Table 62 details the percentage of respondents on if the farmer knew the amount of nitrogen that is in the manure applied for the 2012 corn crop (MQ-10).

Table 62. The farmers' knowledge of nitrogen content of manure being applied for the 2012 corn crop.

BMP Region	Knowledge of the Actual Amount of Nitrogen Applied	Percentage of Respondents
Northwestern	Yes	11
Northwestern	No	89
Irrigated and non-irrigated sandy soils	Yes	18
Irrigated and non-irrigated sandy soils	No	82
Southwestern and West Central	Yes	35
Southwestern and West Central	No	65
South Central	Yes	28
South Central	No	72
Southeastern	Yes	26
Southeastern	No	74
Statewide	Yes	25
Statewide	No	75

[§] Percent was calculated using only those respondents who answered yes or no to the question.

Table 63 details the amount of nitrogen applied per acre by type of livestock manure when the farmer knew the amount of nitrogen in the manure applied (MQ-5, MQ-10, and MQ-11).

Table 63. Average amount of nitrogen applied per acre from manure by livestock type when the farmer knew the amount of nitrogen in the manure source.

BMP Region	Main Source of Manure	Average Nitrogen Rate Applied From Manure in Pounds per Acre
Northwestern	All	125
Northwestern	Dairy	150
Northwestern	Beef	100
Irrigated and non-irrigated sandy soils	All	120
Irrigated and non-irrigated sandy soils	Dairy	129
Irrigated and non-irrigated sandy soils	Beef	102
Irrigated and non-irrigated sandy soils	Hog	120
Irrigated and non-irrigated sandy soils	Poultry	112
Irrigated and non-irrigated sandy soils	Other	70
Southwestern and West Central	All	124
Southwestern and West Central	Dairy	104
Southwestern and West Central	Beef	117
Southwestern and West Central	Hog	135
Southwestern and West Central	Poultry	167
Southwestern and West Central	Other	88
South Central	All	140
South Central	Dairy	150
South Central	Beef	131
South Central	Hog	132
South Central	Poultry	161
South Central	Other	150
Southeastern	All	128
Southeastern	Dairy	138
Southeastern	Beef	86
Southeastern	Hog	133
Southeastern	Poultry	105
Southeastern	Other	160
Statewide	All	128
Statewide	Dairy	130
Statewide	Beef	109
Statewide	Hog	133
Statewide	Poultry	139
Statewide	Other	104

Average Nitrogen Rate from Manure Applications

Figure 75 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure[7] and does not include nitrogen from additional commercial nitrogen fertilizer applied to the 2012 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

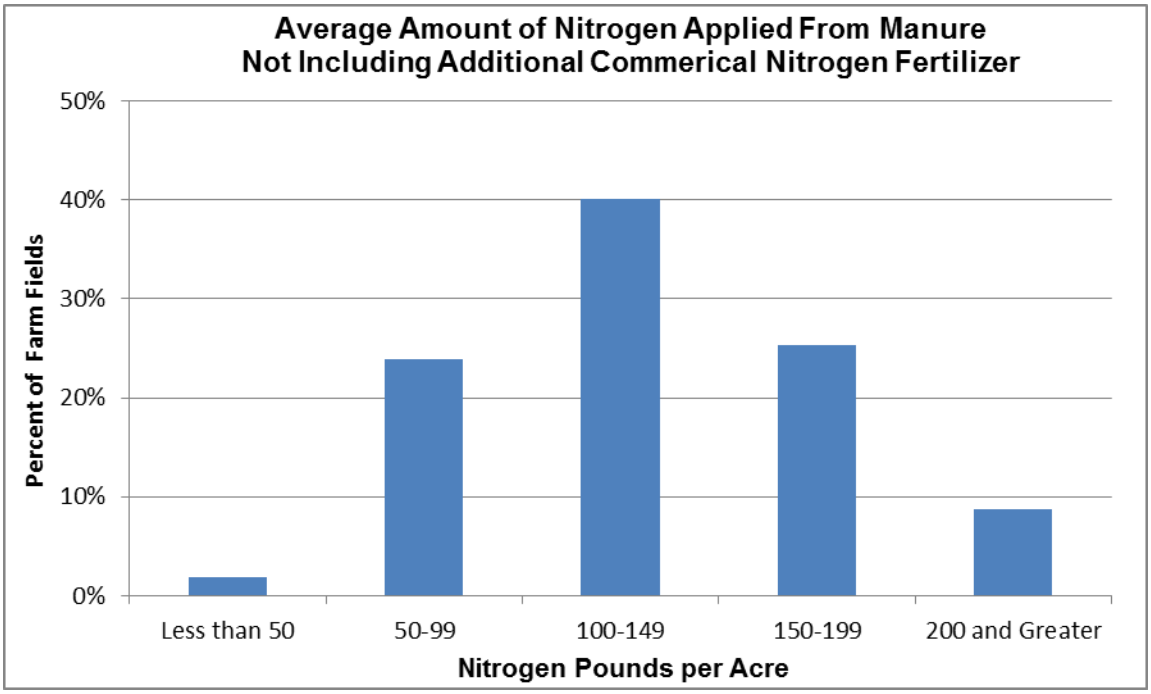

Figure 75. Average nitrogen rates applied to fields from manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2012: 211 fields.

[7] Manure is from all manure sources

Figure 76 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and does not include nitrogen from additional commercial nitrogen fertilizer applied to the 2012 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

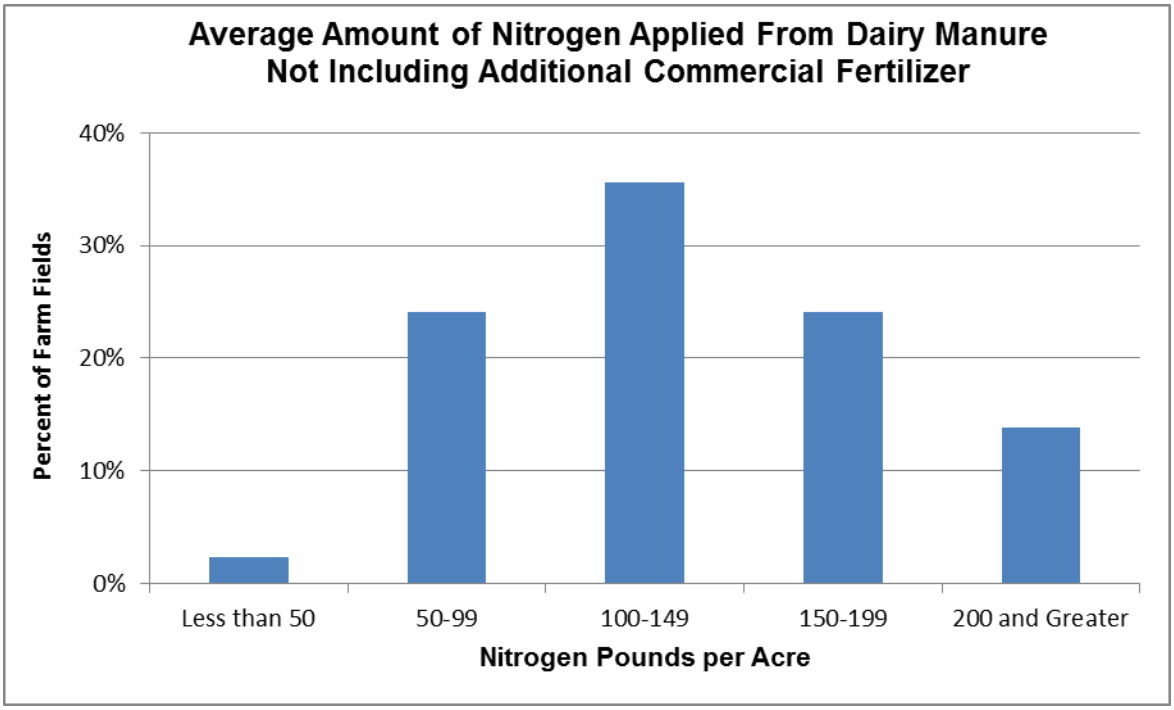

Figure 76. Average nitrogen rates applied to fields from dairy manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2012: 87 fields.

Figure 77 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and does not include nitrogen from additional commercial nitrogen fertilizer applied to the 2012 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

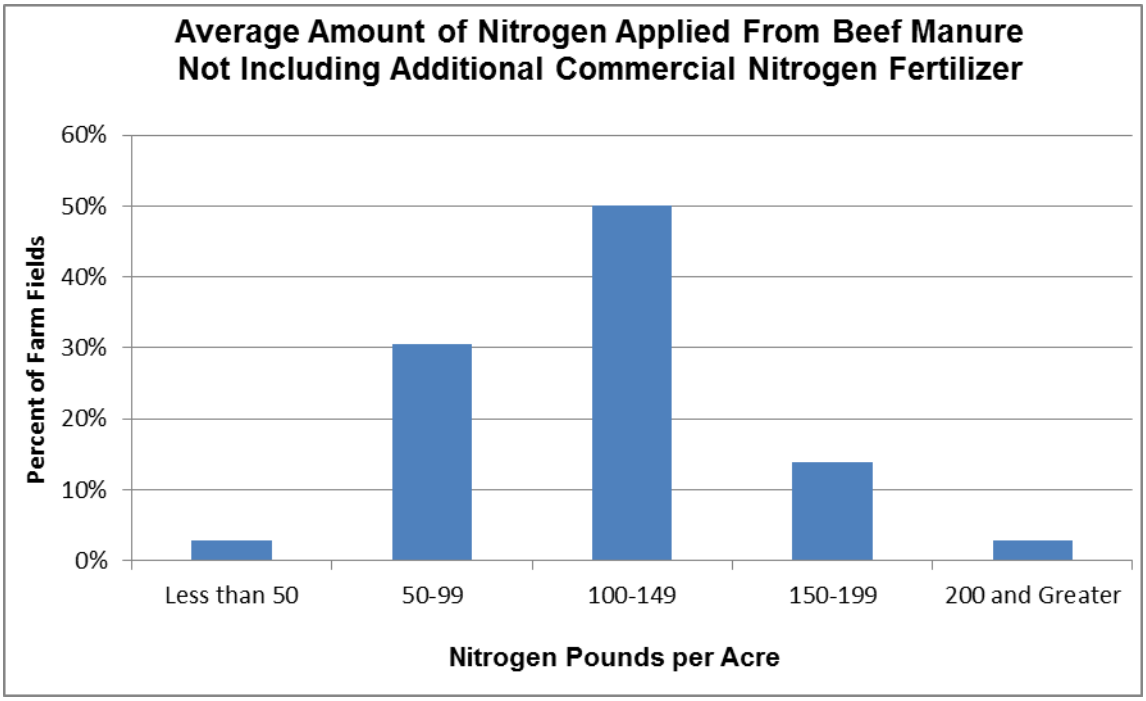

Figure 77. Average nitrogen rates applied to fields from beef manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2012: 36 fields.

Figure 78 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and does not include nitrogen from additional commercial nitrogen fertilizer applied to the 2012 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

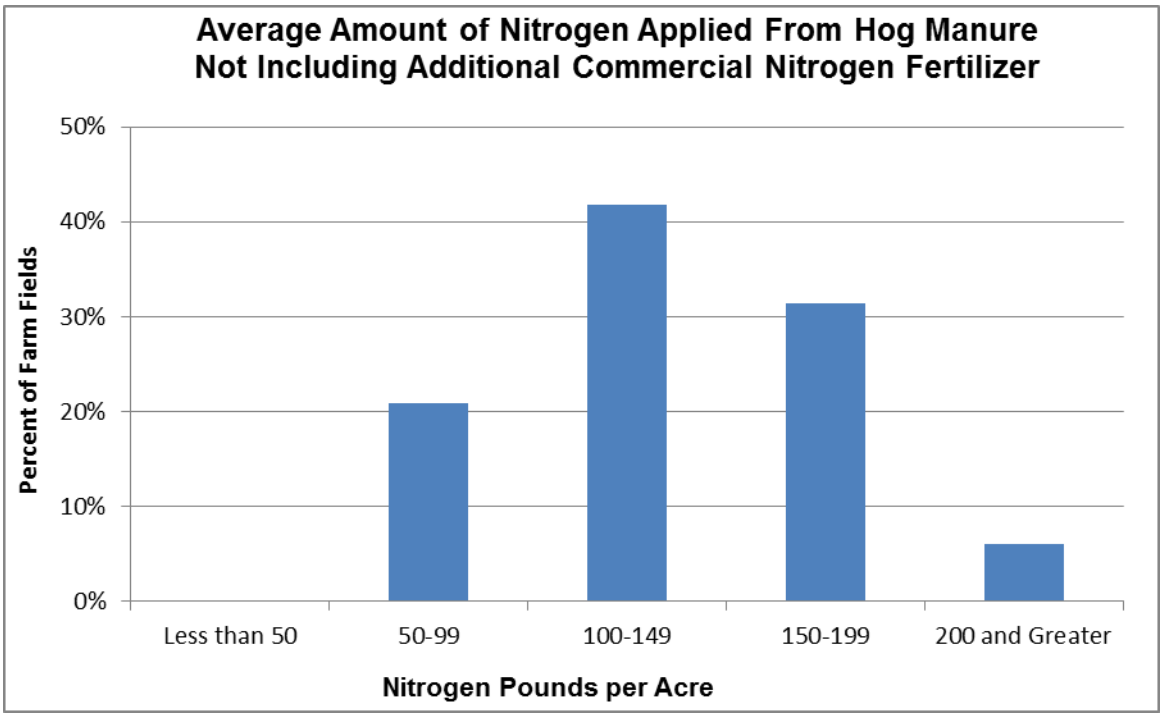

Figure 78. Average nitrogen rates applied to fields from hog manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2012: 67 fields.

Figure 79 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure and does not include nitrogen from additional commercial nitrogen fertilizer applied to the 2012 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

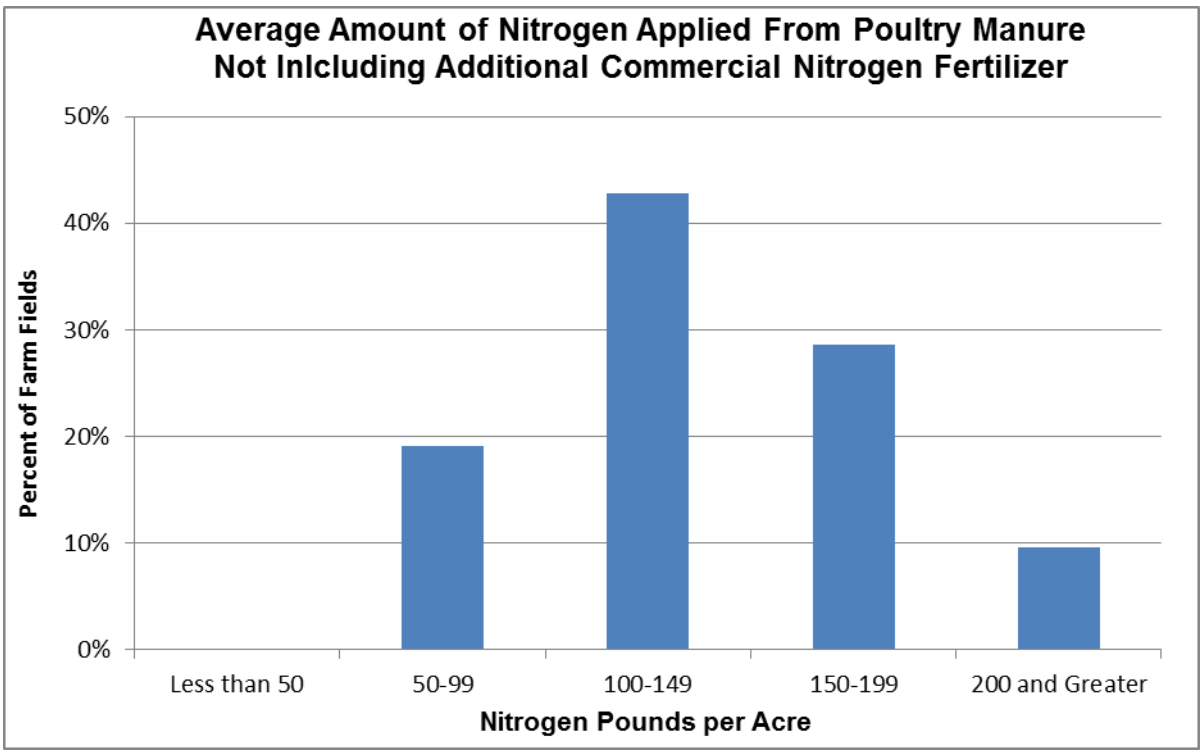

Figure 79. Average nitrogen rates applied to fields from poultry manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2012: 21 fields.

Average Nitrogen Rate from Manure and Commercial Nitrogen Fertilizer Applications

Figure 80 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure[8] and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 169 bushels per acre. The average nitrogen rate applied from manure was 120 pounds per acre, and the average commercial nitrogen fertilizer rate was 76 pounds per acre for an average total of 196 pounds of nitrogen per acre.

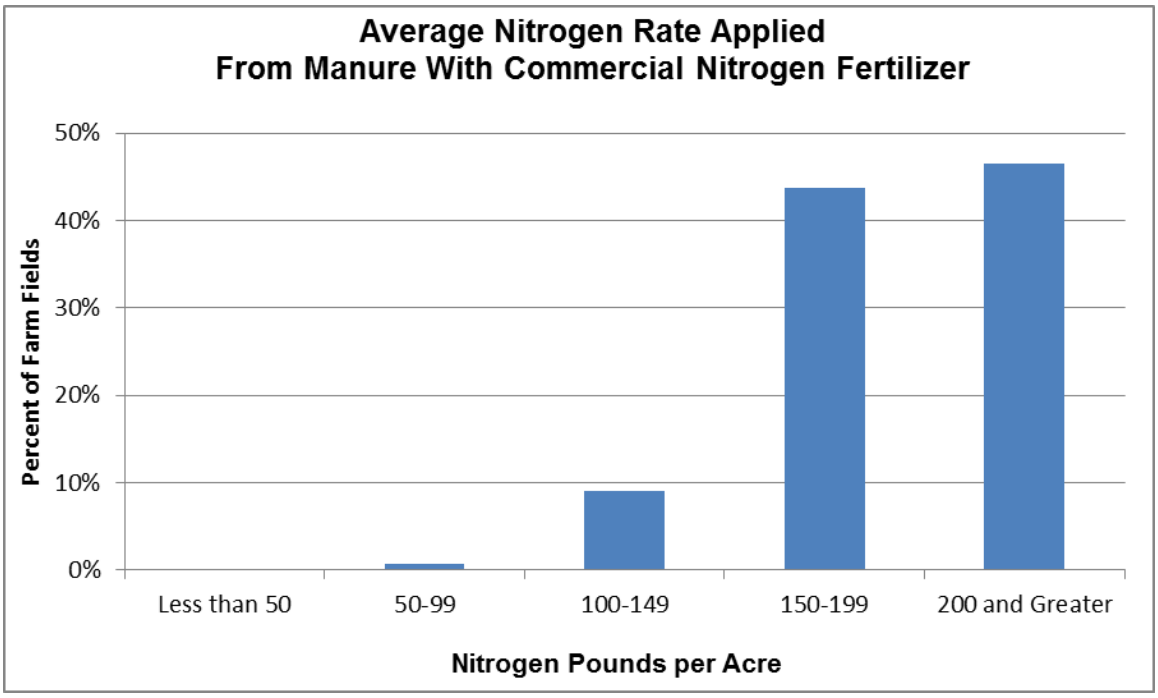

Figure 80. Average nitrogen rates applied to corn from manure and commercial nitrogen fertilizer in Minnesota for 2012: 144 fields.

[8] Manure is from all manure sources

Figure 81 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 168 bushels per acre. The average nitrogen rate applied from dairy manure was 127 pounds per acre, and the average commercial nitrogen fertilizer rate was 71 pounds per acre for an average total of 198 pounds of nitrogen per acre.

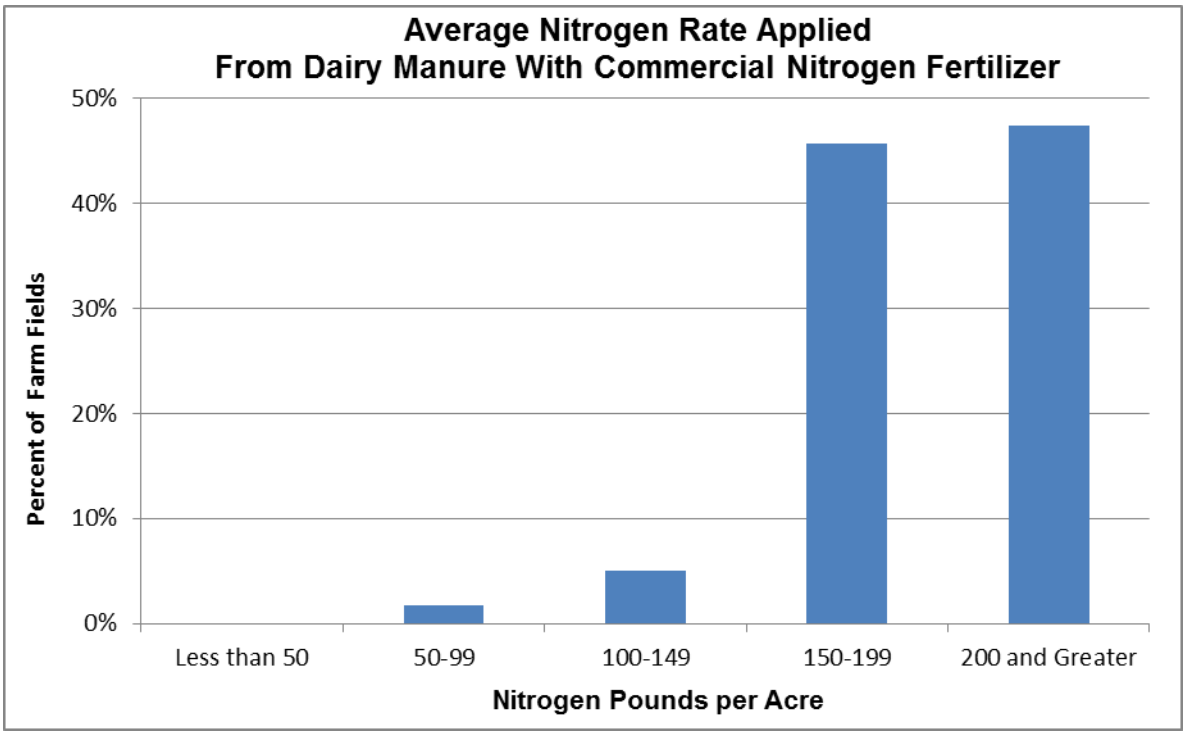

Figure 81. Average nitrogen rates applied to corn from dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 59 fields.

Figure 82 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 155 bushels per acre. The average nitrogen rate applied from beef manure was 98 pounds per acre, and the average commercial nitrogen fertilizer rate was 83 pounds per acre for an average total of 181 pounds of nitrogen per acre.

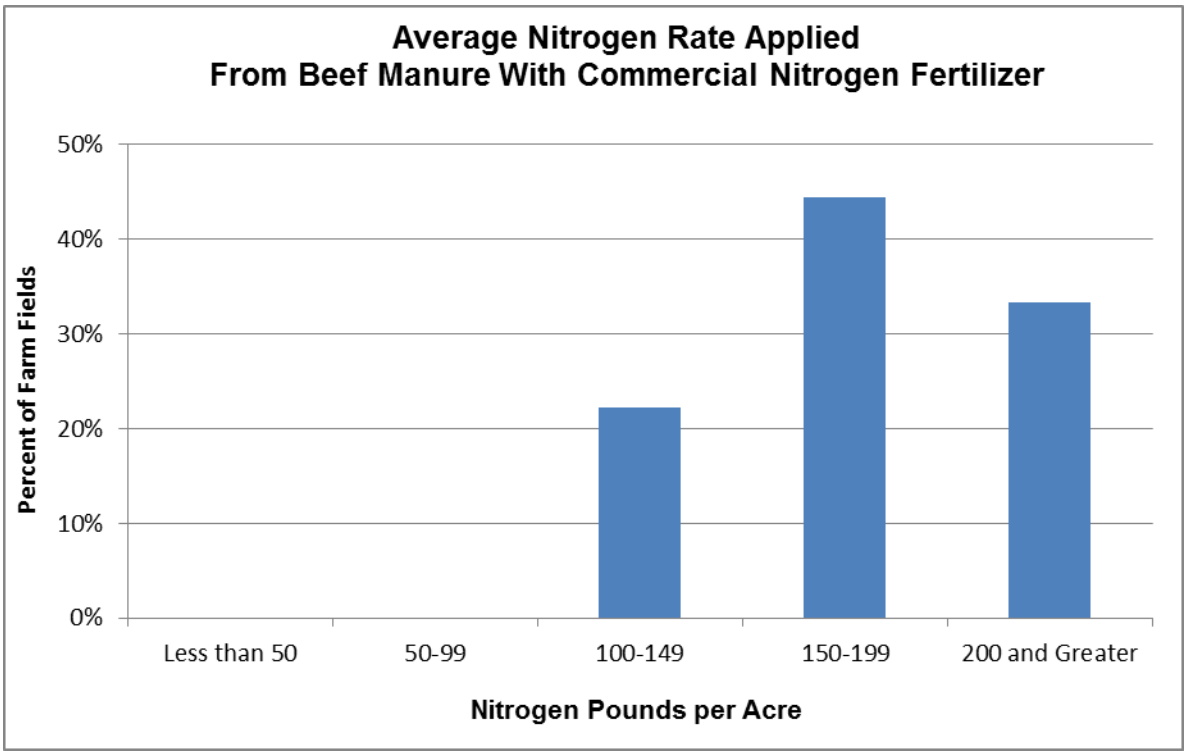

Figure 82. Average nitrogen rates applied to corn from beef manure and commercial nitrogen fertilizer in Minnesota for 2012: 27 fields.

Figure 83 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 180 bushels per acre. The average nitrogen rate applied from hog manure was 125 pounds per acre, and the average commercial nitrogen fertilizer rate was 73 pounds per acre for an average total of 197 pounds of nitrogen per acre.

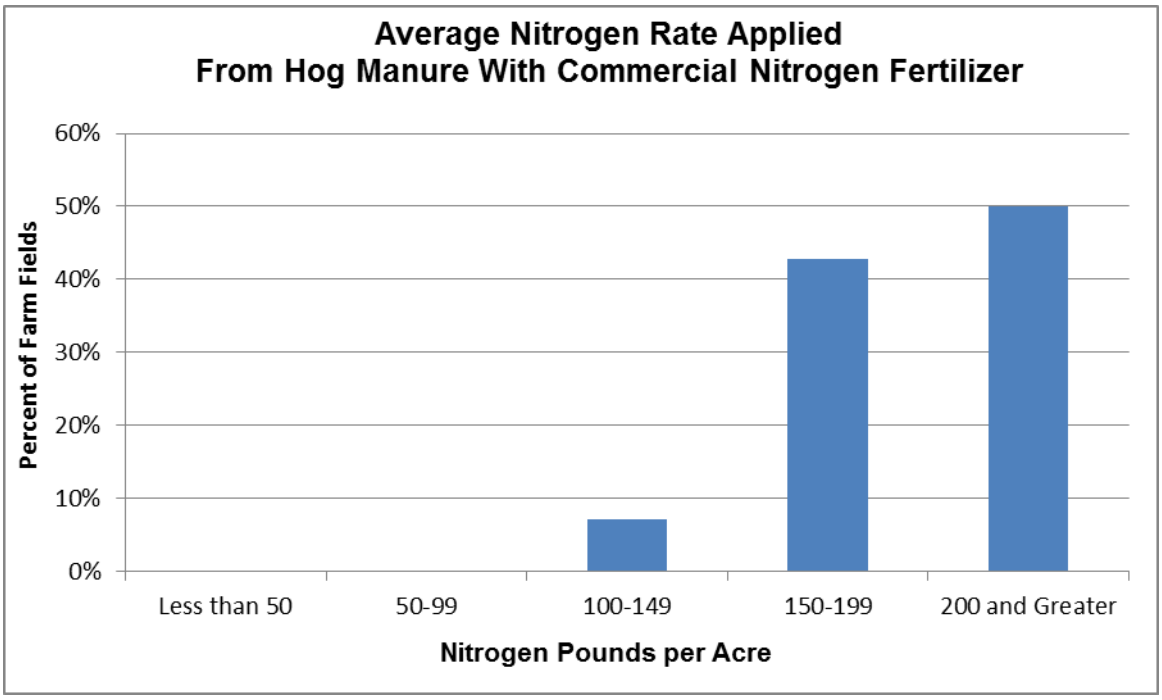

Figure 83. Average nitrogen rates applied to corn from hog manure and commercial nitrogen fertilizer in Minnesota for 2012: 42 fields.

Figure 84 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 160 bushels per acre. The average nitrogen rate applied from poultry manure was 120 pounds per acre, and the average commercial nitrogen fertilizer rate was 91 pounds per acre for an average total of 212 pounds of nitrogen per acre.

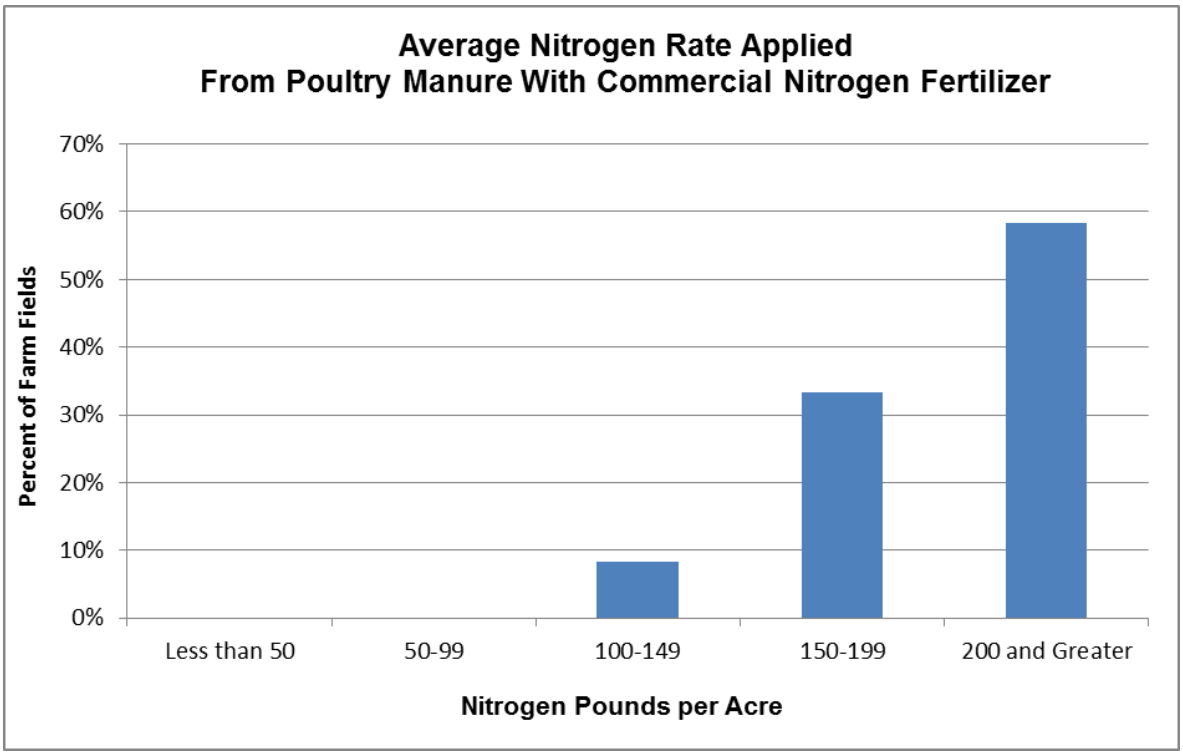

Figure 84. Average nitrogen rates applied to corn from poultry manure and commercial nitrogen fertilizer in Minnesota for 2012: 12 fields.

Nitrogen Rates and Average Corn Yields on Manured Fields

Table 64 details the nitrogen rates and corn yields by BMP region on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with manure[9] or manure and commercial nitrogen fertilizer.

Table 64. Average amount of nitrogen applied from manure or manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Manure or Manure and Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Northwestern	Small Grains	**	**
Irrigated and non-irrigated sandy soils	Soybeans	199	164
Irrigated and non-irrigated sandy soils	Corn	177	147
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	147	135
Irrigated and non-irrigated sandy soils	Alfalfa	182	160
Irrigated and non-irrigated sandy soils	Small Grains	**	**
Irrigated and non-irrigated sandy soils	Other	**	**
Southwestern and West Central	Soybeans	169	169
Southwestern and West Central	Corn	189	173
Southwestern and West Central	Corn/Alfalfa	138	165
Southwestern and West Central	Alfalfa	**	**
Southwestern and West Central	Small Grains	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	176	177
South Central	Corn	166	182
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
South Central	Small Grains	**	**
South Central	Other	**	**
Southeastern	Soybeans	180	169
Southeastern	Corn	192	182
Southeastern	Corn/Alfalfa	175	178

[9] Manure is from all manure sources

BMP Region	Previous Crop	Average Nitrogen Rate From Manure or Manure and Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Southeastern	Alfalfa	**	**
Statewide	Soybeans	177	171
Statewide	Corn	182	171
Statewide	Corn/Alfalfa	165	157
Statewide	Alfalfa	178	171
Statewide	Small Grains	174	160
Statewide	Other	223	183

****** Less than five responses**.**

Table 65 details the nitrogen rates and corn yields by BMP region on corn following various crops (MQ-1a, MQ-1b, MQ-10, and MQ-11). These are corn fields applied with manure and no commercial nitrogen fertilizer.

Table 65. Average amount of nitrogen applied from manure and no commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Nitrogen Rate From Manure Only Pounds per Acre	Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Irrigated and non-irrigated sandy soils	Corn	**	**
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	114	142
Irrigated and non-irrigated sandy soils	Alfalfa	**	**
Southwestern and West Central	Soybeans	138	167
Southwestern and West Central	Corn	146	173
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Small Grains	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	157	177
South Central	Corn	144	180
South Central	Alfalfa	**	**
South Central	Small Grains	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Statewide	Soybeans	148	173
Statewide	Corn	132	173
Statewide	Corn/Alfalfa	133	158

BMP Region	Previous Crop	Nitrogen Rate From Manure Only Pounds per Acre	Corn Yield Bushels per Acre
Statewide	Alfalfa	158	167
Statewide	Small Grains	**	**
Statewide	Other	**	**

****** Less than five responses**.**

Table 66 details the nitrogen rates and corn yields by BMP region on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with manure and commercial nitrogen fertilizer.

Table 66. Average amount of nitrogen applied from manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Northwestern	Small Grains	**	**
Irrigated and non-irrigated sandy soils	Soybeans	219	165
Irrigated and non-irrigated sandy soils	Corn	196	145
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	171	130
Irrigated and non-irrigated sandy soils	Alfalfa	**	**
Irrigated and non-irrigated sandy soils	Small Grains	**	**
Irrigated and non-irrigated sandy soils	Other	**	**
Southwestern and West Central	Soybeans	185	170
Southwestern and West Central	Corn	208	173
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Alfalfa	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	194	177
South Central	Corn	182	183
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
South Central	Other	**	**
Southeastern	Soybeans	188	165
Southeastern	Corn	216	190
Southeastern	Corn/Alfalfa	173	175
Southeastern	Alfalfa	**	**
Statewide	Soybeans	193	171
Statewide	Corn	202	170
Statewide	Corn/Alfalfa	183	157
Statewide	Alfalfa	196	174
Statewide	Small Grains	**	**
Statewide	Other	211	183

****** Less than five responses**.**

Table 67 details the nitrogen rates and corn yields by BMP region on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with dairy manure or dairy manure and commercial nitrogen fertilizer.

Table 67. Average amount of nitrogen applied from dairy manure or dairy manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Dairy Manure or Manure and Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Irrigated and non-irrigated sandy soils	Soybeans	211	162
Irrigated and non-irrigated sandy soils	Corn	172	148
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	152	142
Irrigated and non-irrigated sandy soils	Alfalfa	182	158
Irrigated and non-irrigated sandy soils	Small Grains	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	172	168
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	176	181
South Central	Corn	**	**
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
Southeastern	Small Grains	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	203	192
Southeastern	Corn/Alfalfa	180	183
Southeastern	Alfalfa	**	**
Statewide	Soybeans	180	172
Statewide	Corn	180	165
Statewide	Corn/Alfalfa	172	164
Statewide	Alfalfa	182	176
Statewide	Small Grains	**	**
Statewide	Other	**	**

** Less than five responses

Table 68 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, and MQ-11). These are corn fields applied with dairy manure and no commercial nitrogen fertilizer.

Table 68. Average amount of nitrogen applied from dairy manure and no commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Dairy Manure Only Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Corn	**	**
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	127	144
Irrigated and non-irrigated sandy soils	Alfalfa	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	**	**
Southwestern and West Central	Corn/Alfalfa	**	**
South Central	Soybeans	**	**
South Central	Alfalfa	**	**
South Central	Small Grains	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Statewide	Soybeans	132	177
Statewide	Corn	96	164
Statewide	Corn/Alfalfa	141	163
Statewide	Alfalfa	168	175
Statewide	Small Grains	**	**

** Less than five responses

Table 69 details the nitrogen rates and corn yields by BMP region on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with dairy manure and commercial nitrogen fertilizer. For the previous crop of Corn/Alfalfa, the definition would be corn in 2012, corn in 2011 and alfalfa in 2010.

Table 69. Average amount of nitrogen applied from dairy manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Dairy Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Irrigated and non-irrigated sandy soils	Soybeans	211	162
Irrigated and non-irrigated sandy soils	Corn	191	139
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	177	146
Irrigated and non-irrigated sandy soils	Alfalfa	**	**
Irrigated and non-irrigated sandy soils	Small Grains	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	195	171
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	235	183
Southeastern	Corn/Alfalfa	180	196
Southeastern	Alfalfa	**	**
Statewide	Soybeans	200	170
Statewide	Corn	201	164
Statewide	Corn/Alfalfa	193	165
Statewide	Alfalfa	197	177
Statewide	Small Grains	**	**
Statewide	Other	**	**

** Less than five responses

Table 70 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with beef manure or beef manure and commercial nitrogen fertilizer.

Table 70. Average amount of nitrogen applied from beef manure or beef manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Beef Manure or Manure and Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Irrigated and non-irrigated sandy soils	Corn	**	**
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	**	**
Irrigated and non-irrigated sandy soils	Alfalfa	**	**
Irrigated and non-irrigated sandy soils	Small Grains	**	**
Southwestern and West Central	Soybeans	171	165
Southwestern and West Central	Corn	191	181
Southwestern and West Central	Corn/Alfalfa	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Statewide	Soybeans	153	148
Statewide	Corn	190	176
Statewide	Corn/Alfalfa	144	130
Statewide	Alfalfa	**	**
Statewide	Small Grains	**	**
Statewide	Other	**	**

** Less than five responses

Table 71 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, and MQ-11). These are corn fields applied with beef manure and no commercial nitrogen fertilizer.

Table 71. Average amount of nitrogen applied from beef manure and no commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Beef Manure Only Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	195	182
Southwestern and West Central	Corn/Alfalfa	**	**
South Central	Corn	**	**
Statewide	Soybeans	**	**
Statewide	Corn	151	179
Statewide	Corn/Alfalfa	**	**

** Less than five responses

Table 72 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with beef manure and commercial nitrogen fertilizer.

Table 72. Average amount of nitrogen applied from beef manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Beef Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Small Grains	**	**
Irrigated and non-irrigated sandy soils	Corn	**	**
Irrigated and non-irrigated sandy soils	Corn/Alfalfa	**	**
Irrigated and non-irrigated sandy soils	Alfalfa	**	**
Southwestern and West Central	Soybeans	152	165
Southwestern and West Central	Corn	223	182
Southwestern and West Central	Corn/Alfalfa	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Statewide	Soybeans	165	148
Statewide	Corn	215	174
Statewide	Corn/Alfalfa	145	127
Statewide	Alfalfa	**	**
Statewide	Small Grains	**	**
Statewide	Other	**	**

** Less than five responses

Table 73 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with hog manure or hog manure and commercial nitrogen fertilizer.

Table 73. Average amount of nitrogen applied from hog manure or hog manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Hog Manure or Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Southwestern and West Central	Soybeans	183	175
Southwestern and West Central	Corn	203	167
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Alfalfa	**	**
Southwestern and West Central	Small Grains	**	**
South Central	Soybeans	173	180
South Central	Corn	162	183
South Central	Other	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Statewide	Soybeans	179	179
Statewide	Corn	177	179
Statewide	Corn/Alfalfa	**	**
Statewide	Alfalfa	**	**
Statewide	Small Grains	**	**
Statewide	Other	**	**

****** Less than five responses**.**

Table 74 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, and MQ-11). These are corn fields applied with hog manure and no commercial nitrogen fertilizer.

Table 74. Average amount of nitrogen applied from hog manure and no commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Hog Manure Only Pounds per Acre	Average Corn Yield Bushels per Acre
Southwestern and West Central	Soybeans	157	173
Southwestern and West Central	Corn	**	**
Southwestern and West Central	Small Grains	**	**
South Central	Soybeans	158	177
South Central	Corn	122	180
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Statewide	Soybeans	157	175
Statewide	Corn	133	182
Statewide	Small Grains	**	**

****** Less than five responses**.**

Table 75 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with hog manure and commercial nitrogen fertilizer.

Table 75. Average amount of nitrogen applied from hog manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Hog Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Southwestern and West Central	Soybeans	202	177
Southwestern and West Central	Corn	207	167
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Alfalfa	**	**
South Central	Soybeans	190	183
South Central	Corn	184	184
South Central	Other	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Statewide	Soybeans	197	182
Statewide	Corn	196	178
Statewide	Other	**	**

****** Less than five responses**.**

Table 76 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with poultry manure or poultry manure and commercial nitrogen fertilizer.

Table 76. Average amount of nitrogen applied from poultry manure or poultry and commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Poultry Manure or Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Irrigated and non-irrigated sandy soils	Corn	188	141
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
South Central	Alfalfa	**	**
Southeastern	Corn	**	**
Statewide	Soybeans	179	162
Statewide	Corn	191	151
Statewide	Alfalfa	**	**
Statewide	Other	**	**

****** Less than five responses**.**

Table 77 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, and MQ-11). These are corn fields applied with poultry manure and no commercial nitrogen fertilizer.

Table 77. Average amount of nitrogen applied from poultry manure and no commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Poultry Manure Only Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Irrigated and non-irrigated sandy soils	Corn	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
Statewide	Soybeans	151	162
Statewide	Corn	**	**
Statewide	Other	**	**

****** Less than five responses**.**

Table 78 details the nitrogen rates and corn yields in Minnesota on corn following various crops (MQ-1a, MQ-1b, MQ-10, MQ-11, and MQ-16). These are corn fields applied with poultry manure and commercial nitrogen fertilizer.

Table 78. Average amount of nitrogen applied from poultry manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops in Minnesota.

BMP Region	Previous Crop	Average Nitrogen Rate From Poultry Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and non-irrigated sandy soils	Soybeans	**	**
Irrigated and non-irrigated sandy soils	Corn	210	149
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
South Central	Alfalfa	**	**
Statewide	Soybeans	**	**
Statewide	Corn	197	152
Statewide	Alfalfa	**	**
Statewide	Other	**	**

****** Less than five responses**.**

Manure Applications from All Manure Sources

Figure 85 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure[10] or manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 171 bushels per acre. The average nitrogen rate applied from manure was 132 pounds per acre, and the average commercial nitrogen fertilizer rate was 45 pounds per acre for an average total of 177 pounds of nitrogen per acre.

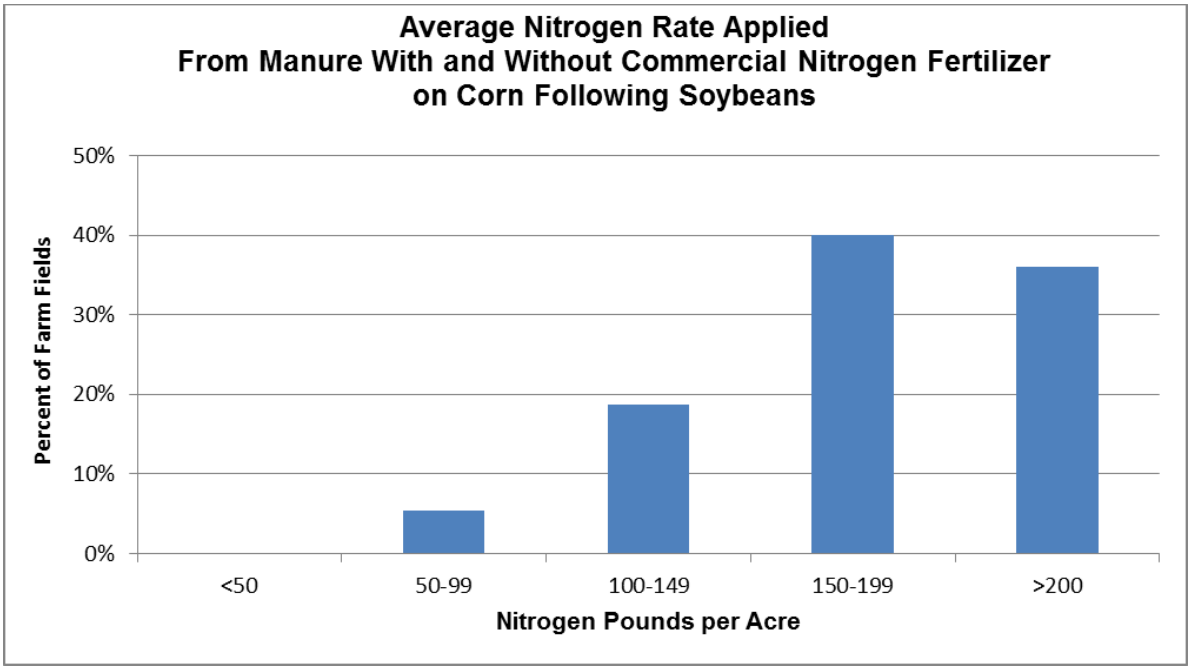

Figure 85. Average nitrogen rates applied to corn following soybeans from manure or manure and commercial nitrogen fertilizer in Minnesota for 2012: 75 fields.

[10] Manure is from all manure sources

Figure 86 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and no commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, and MQ-11). The average corn yield was 173 bushels per acre. The average nitrogen rate applied from manure was 148 pounds per acre.

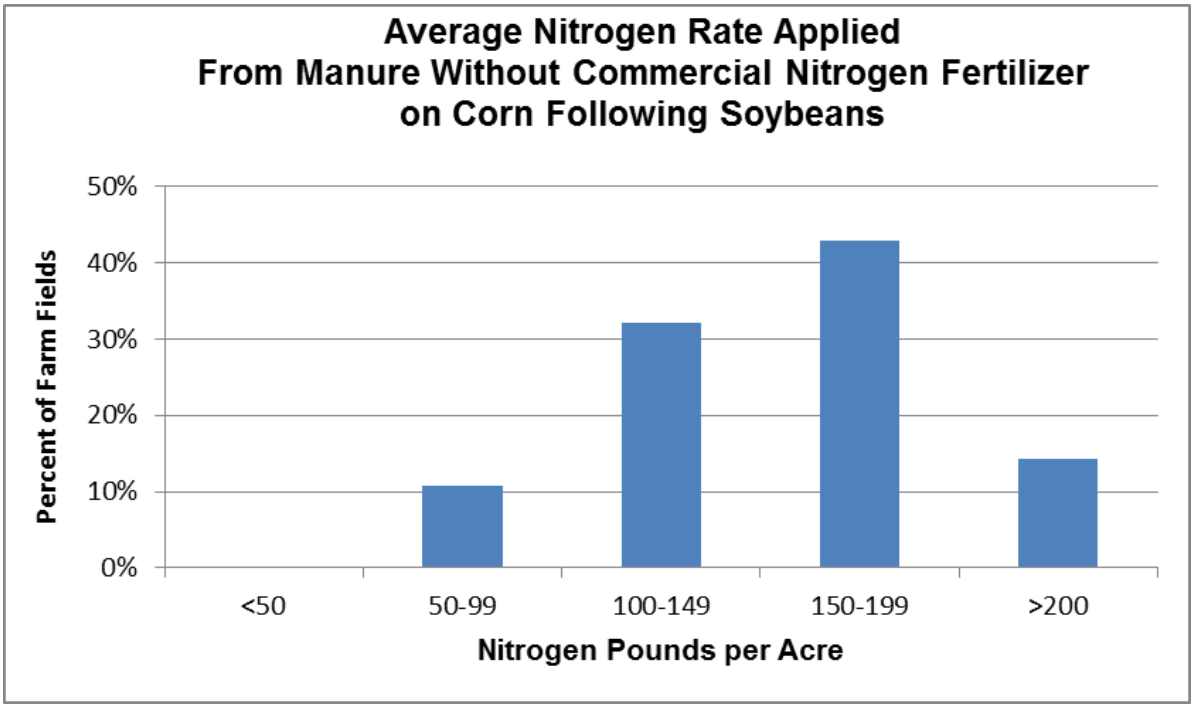

Figure 86. Average nitrogen rates applied to corn following soybeans from manure and no commercial nitrogen fertilizer in Minnesota for 2012: 28 fields.

Figure 87 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 171 bushels per acre. The average nitrogen rate applied from manure was 121 pounds per acre, and the average commercial nitrogen fertilizer rate was 72 pounds per acre for an average total of 193 pounds of nitrogen per acre.

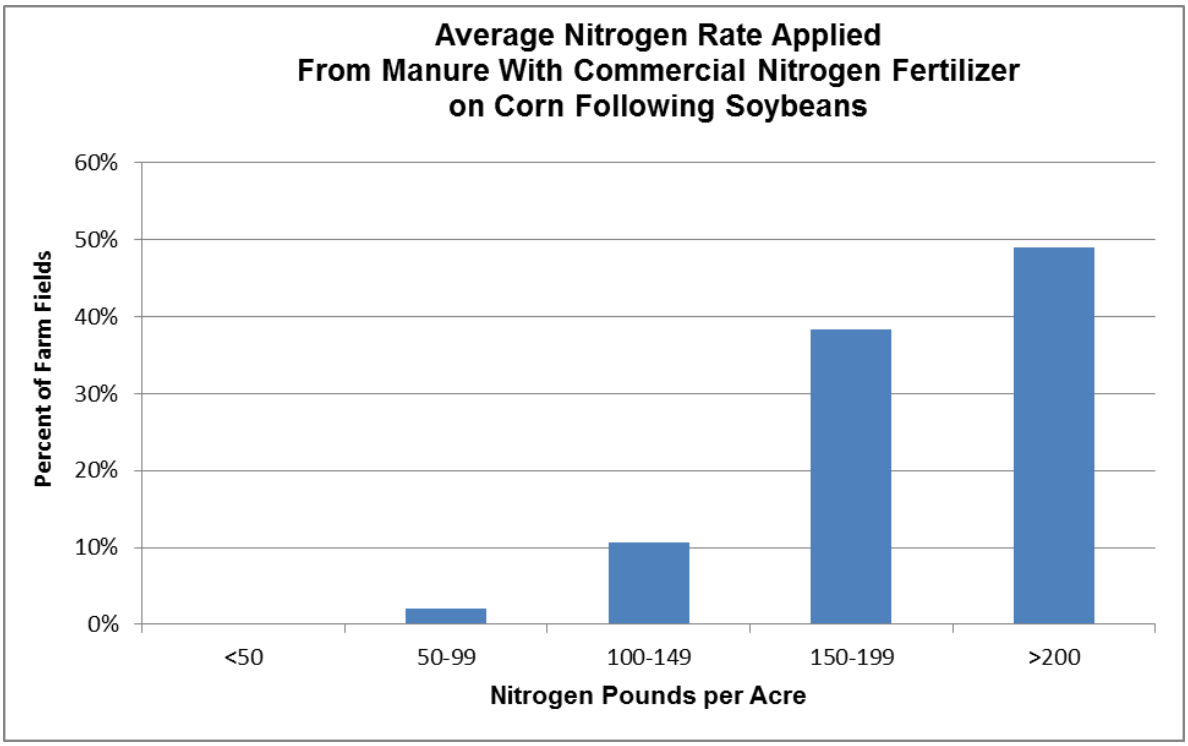

Figure 87. Average nitrogen rates applied to corn following soybeans from manure and commercial nitrogen fertilizer in Minnesota for 2012: 47 fields.

Figure 88 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following soybeans when the farmer did not know the nitrogen content of the manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of manure applied to the field is not known. The average corn yield was 164 bushels per acre. The average commercial nitrogen fertilizer rate was 118 pounds per acre.

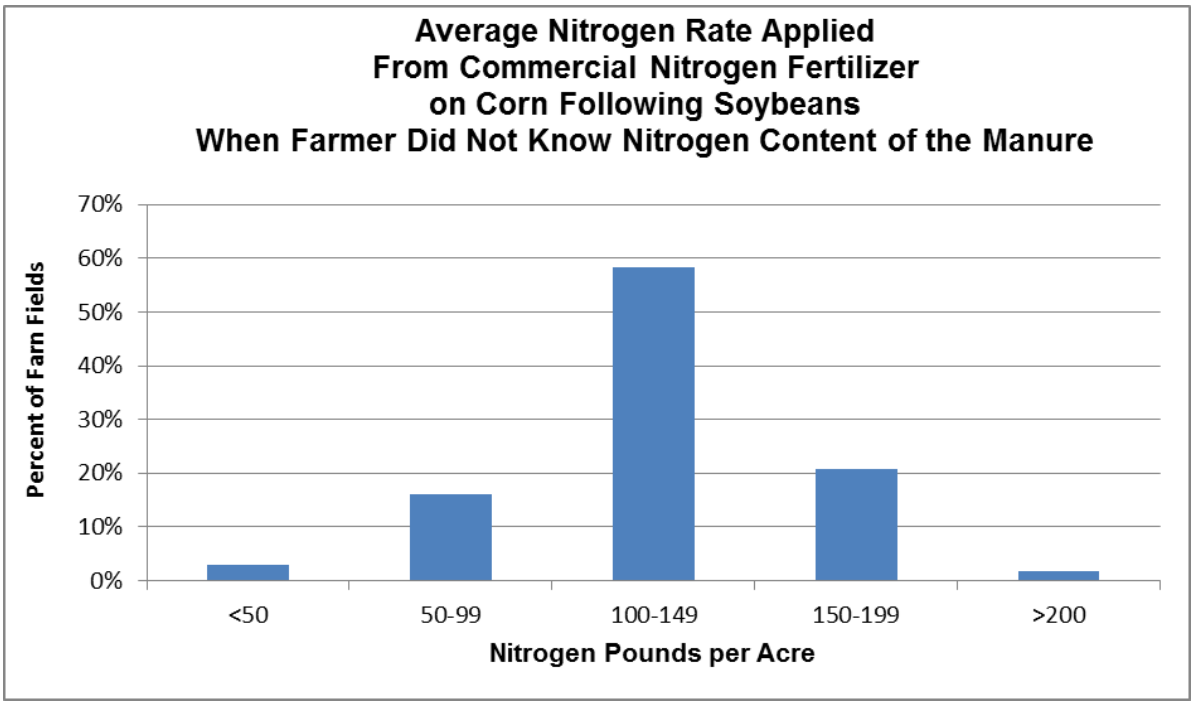

Figure 88. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2012 when the manure nitrogen content is unknown: 75 fields.

Figure 89 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure or manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 171 bushels per acre. The average nitrogen rate applied from manure was 117 pounds per acre, and the average commercial nitrogen fertilizer rate was 65 pounds per acre for an average total of 182 pounds of nitrogen per acre.

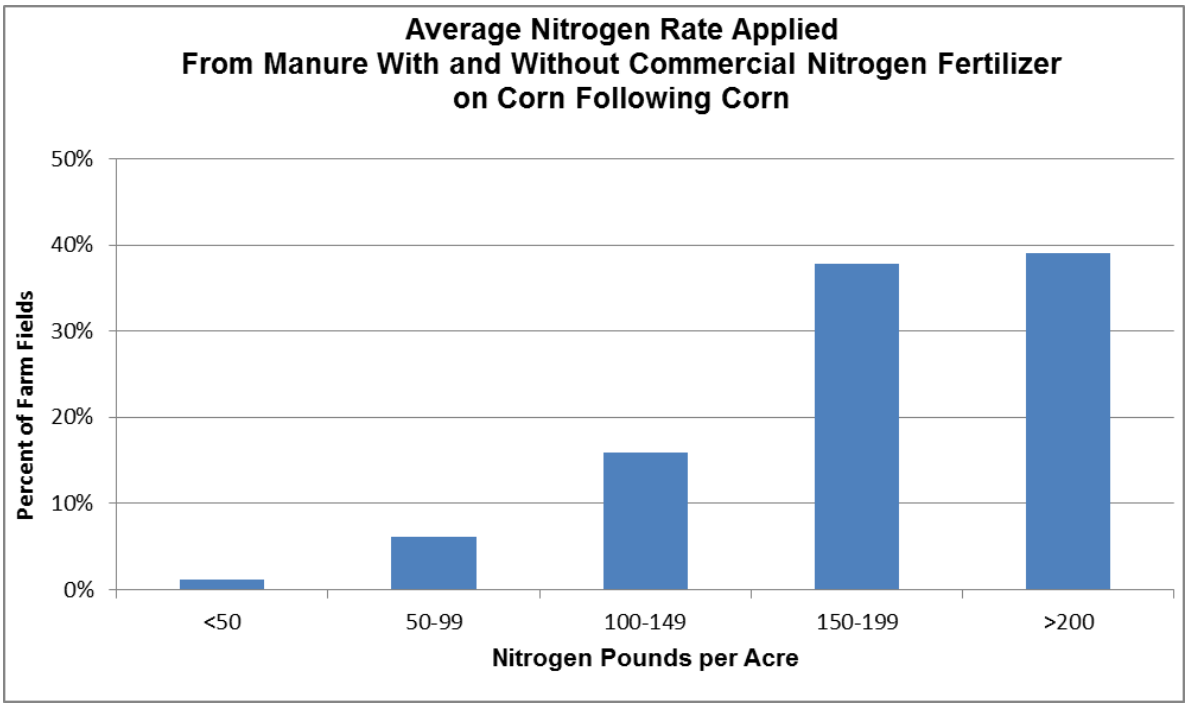

Figure 89. Average nitrogen rates applied to corn following corn from manure or manure and commercial nitrogen fertilizer in Minnesota for 2012: 82 fields.

Figure 90 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and no commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, and MQ-11). The average corn yield was 173 bushels per acre. The average nitrogen rate applied from manure was 132 pounds per acre.

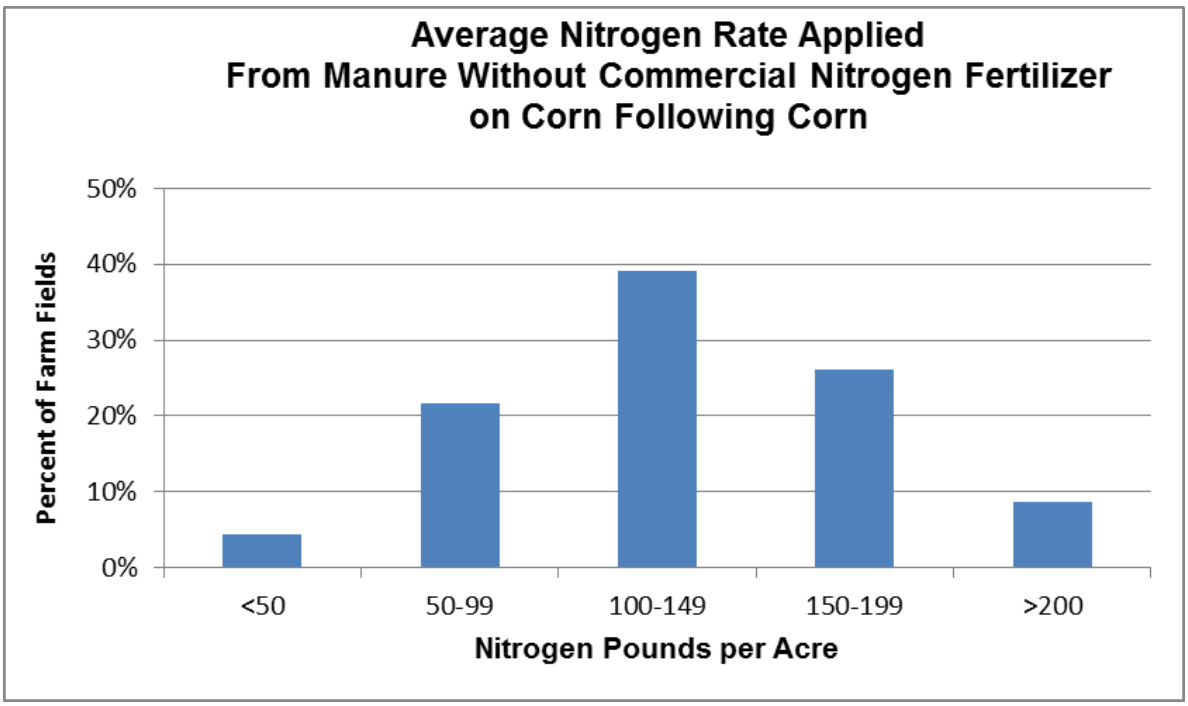

Figure 90. Average nitrogen rates applied to corn following corn from manure and no commercial nitrogen fertilizer in Minnesota for 2012: 23 fields.

Figure 91 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 170 bushels per acre. The average nitrogen rate applied from manure was 112 pounds per acre, and the average commercial nitrogen fertilizer rate was 90 pounds per acre for an average total of 202 pounds of nitrogen per acre.

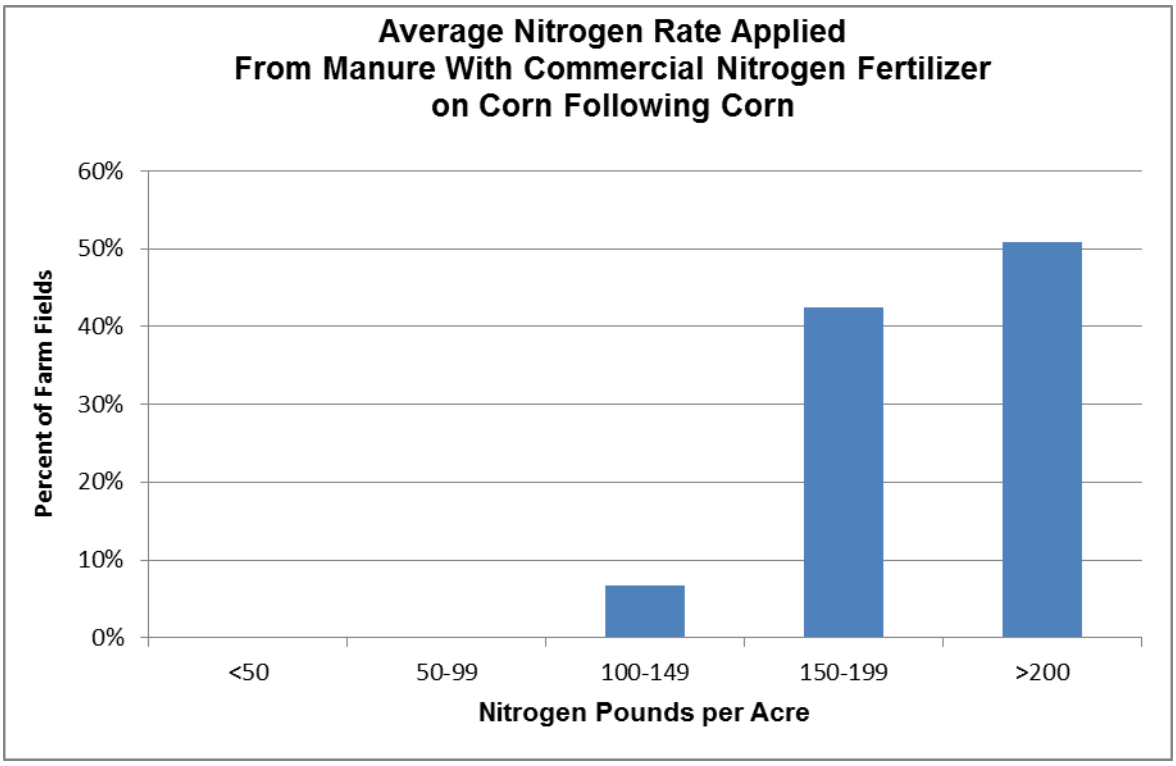

Figure 91. Average nitrogen rates applied to corn following corn from manure and commercial nitrogen fertilizer in Minnesota for 2012: 59 fields.

Figure 92 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following corn when the farmer did not know the nitrogen content of the manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of manure applied to the field is not known. The average corn yield was 150 bushels per acre. The average commercial nitrogen fertilizer rate was 116 pounds per acre.

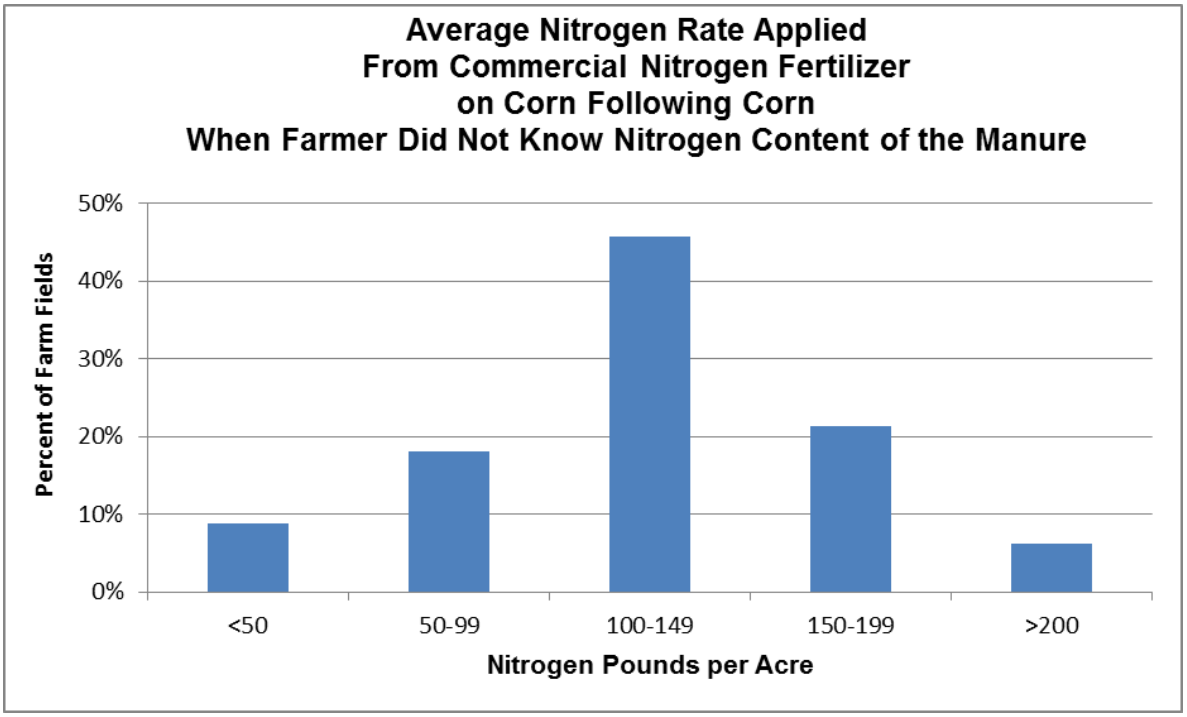

Figure 92. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2012 when the manure nitrogen content is unknown: 160 fields.

Figure 93 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure or manure and commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 157 bushels per acre. The average nitrogen rate applied from manure was 132 pounds per acre, and the average commercial nitrogen fertilizer rate was 33 pounds per acre for an average total of 165 pounds of nitrogen per acre.

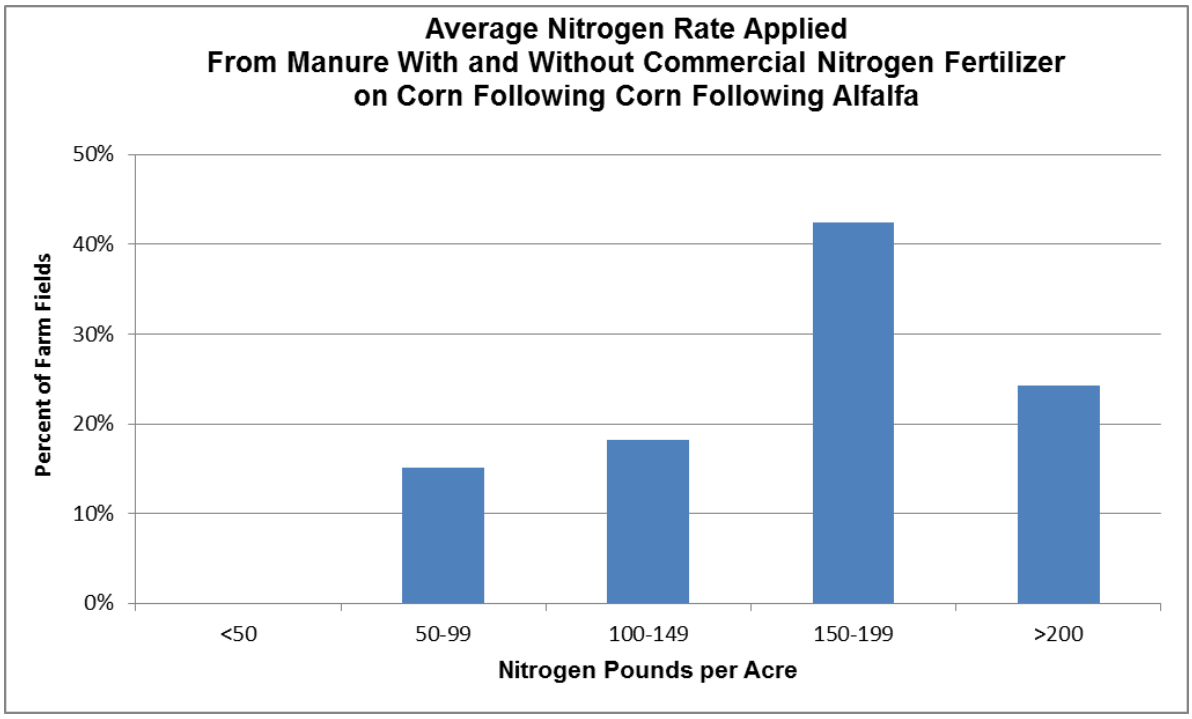

Figure 93. Average nitrogen rates applied to corn following corn following alfalfa from manure or manure and commercial nitrogen fertilizer in Minnesota for 2012: 33 fields.

Figure 94 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and no commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, and MQ-11). The average corn yield was 158 bushels per acre. The average nitrogen rate applied from manure was 133 pounds per acre.

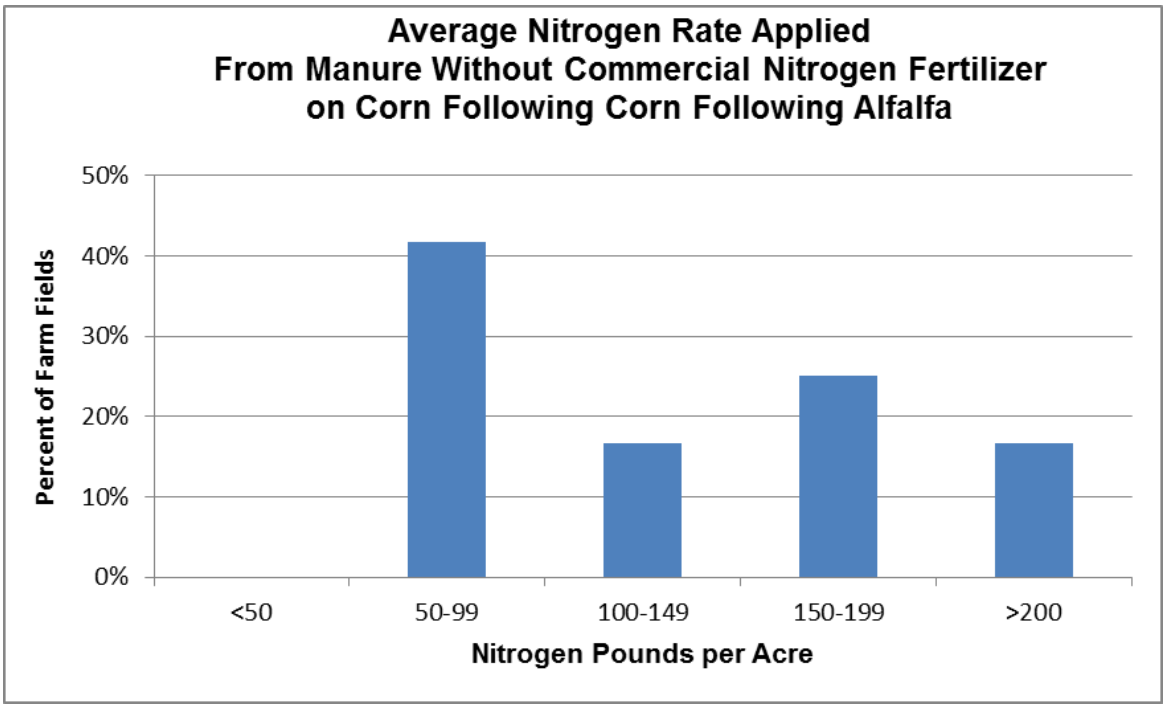

Figure 94. Average nitrogen rates applied to corn following corn following alfalfa from manure and no commercial nitrogen fertilizer in Minnesota for 2012: 12 fields.

Figure 95 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 157 bushels per acre. The average nitrogen rate applied from manure was 132 pounds per acre, and the average commercial nitrogen fertilizer rate was 51 pounds per acre for an average total of 183 pounds of nitrogen per acre.

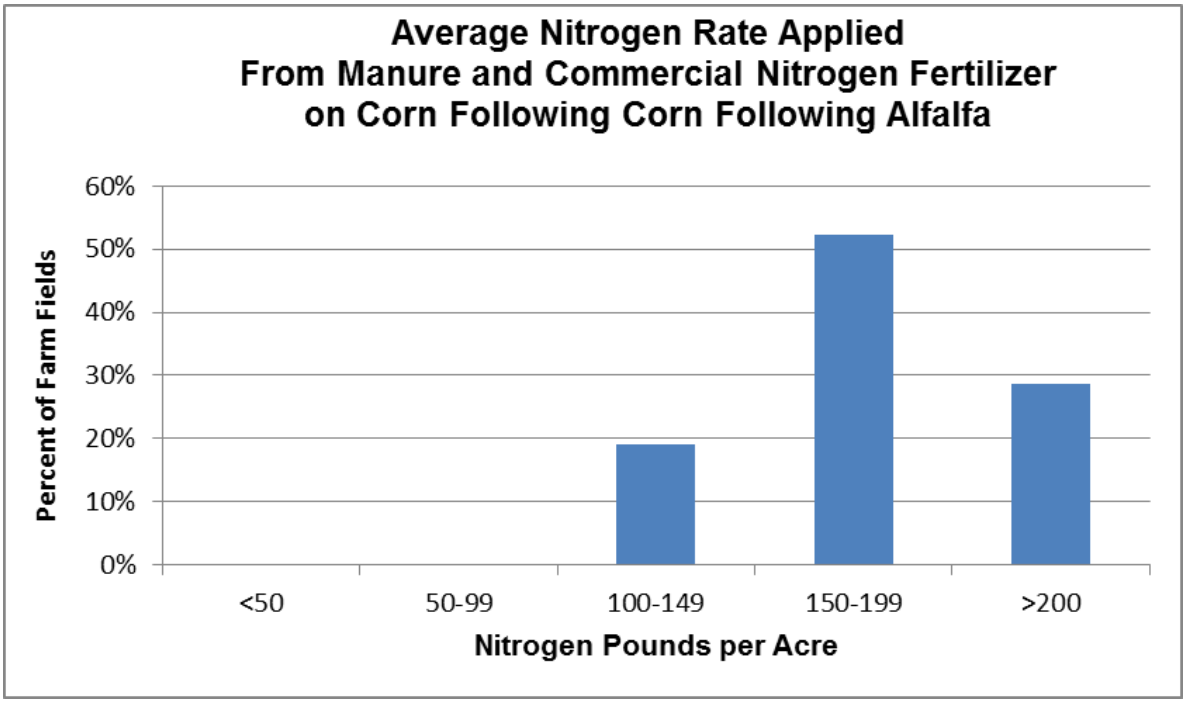

Figure 95. Average nitrogen rates applied to corn following corn following alfalfa from manure and commercial nitrogen fertilizer in Minnesota for 2012: 21 fields.

Figure 96 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following corn following alfalfa when the farmer did not know the nitrogen content of the manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of manure applied to the field is not known. The average corn yield was 154 bushels per acre. The average commercial nitrogen fertilizer rate was 112 pounds per acre.

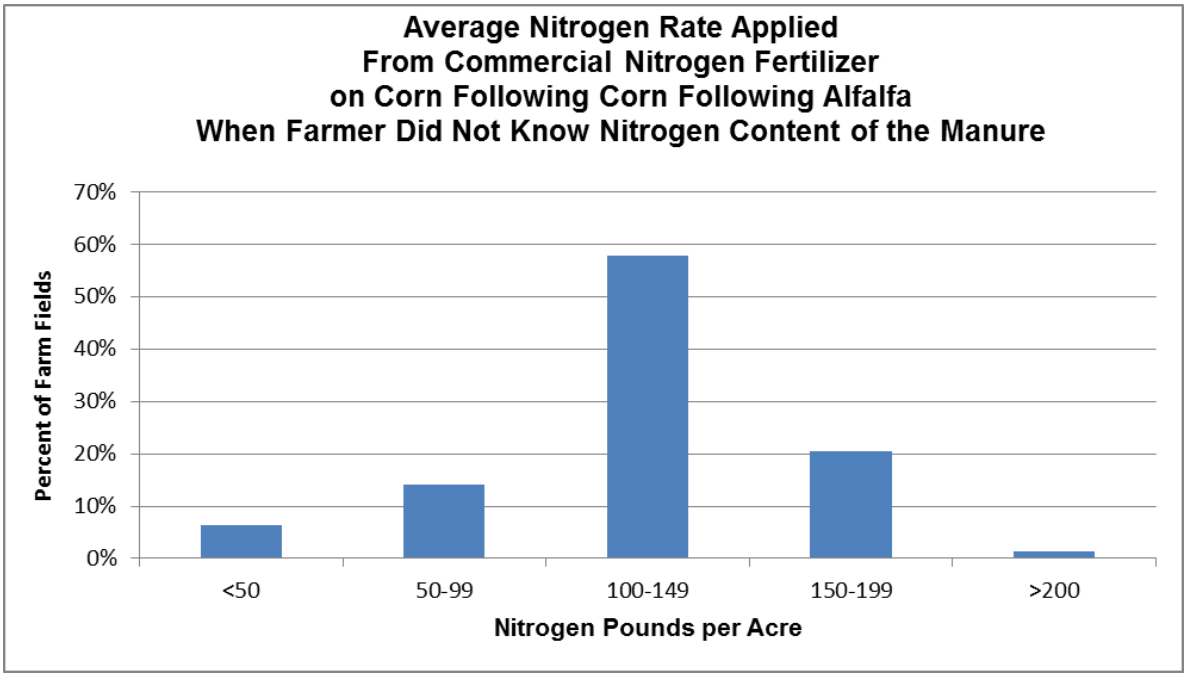

Figure 96. Average nitrogen rates applied to corn following corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2012 when the manure nitrogen content is unknown: 78 fields.

Figure 97 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure or manure and commercial nitrogen fertilizer to corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 171 bushels per acre. The average nitrogen rate applied from manure was 144 pounds per acre, and the average commercial nitrogen fertilizer rate was 34 pounds per acre for an average total of 178 pounds of nitrogen per acre.

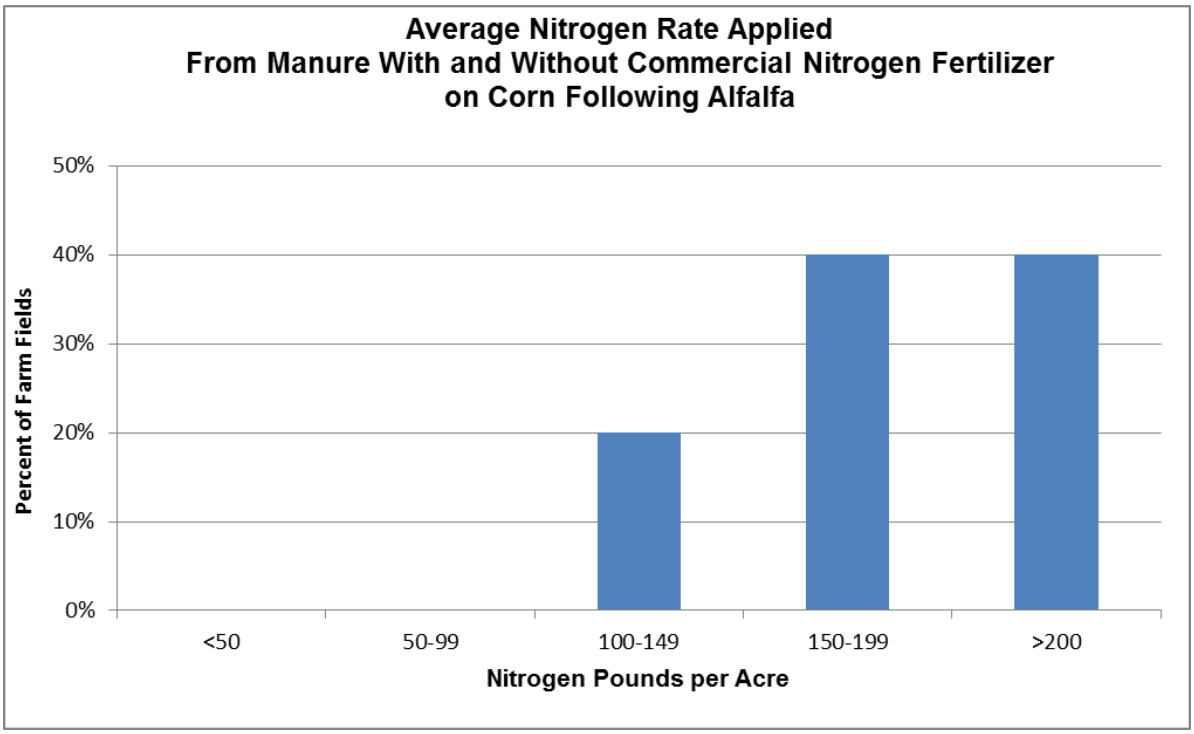

Figure 97. Average nitrogen rates applied to corn following alfalfa from manure or manure and commercial nitrogen fertilizer in Minnesota for 2012: 15 fields.

Figure 98 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and no commercial nitrogen fertilizer to corn following alfalfa (MQ-1a, MQ-5, and MQ-11). The average corn yield was 167 bushels per acre. The average nitrogen rate applied from manure was 158 pounds per acre.

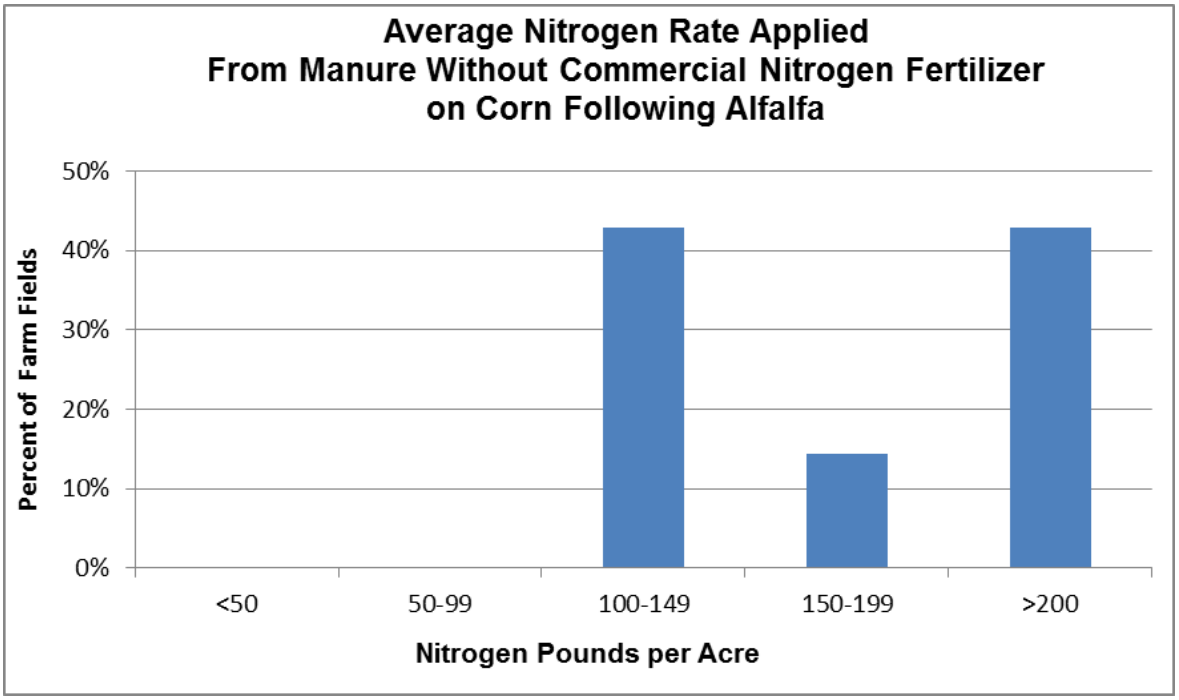

Figure 98. Average nitrogen rates applied to corn following alfalfa from manure and no commercial nitrogen fertilizer in Minnesota for 2012: 7 fields.

Figure 99 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 174 bushels per acre. The average nitrogen rate applied from manure was 133 pounds per acre, and the average commercial nitrogen fertilizer rate was 63 pounds per acre for an average total of 196 pounds of nitrogen per acre.

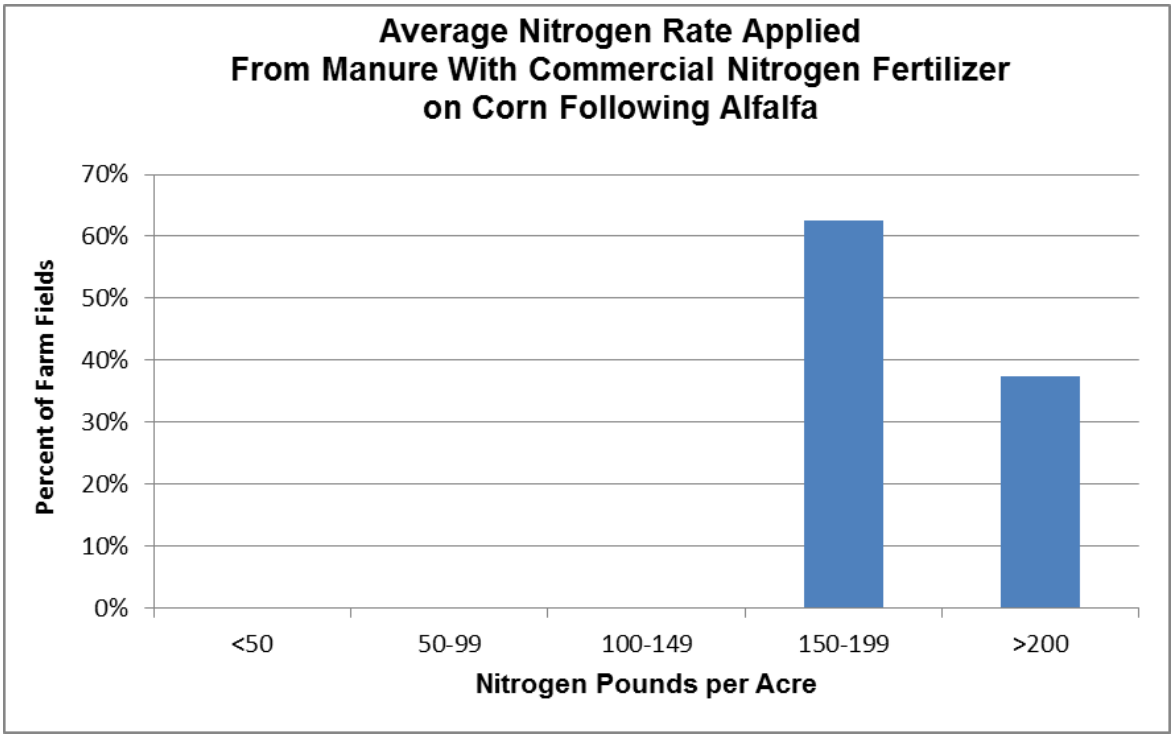

Figure 99. Average nitrogen rates applied to corn following alfalfa from manure and commercial nitrogen fertilizer in Minnesota for 2012: 8 fields.

Figure 100 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following alfalfa when the farmer did not know the nitrogen content of the manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of manure applied to the field is not known. The average corn yield was 154 bushels per acre. The average commercial nitrogen fertilizer rate was 98 pounds per acre.

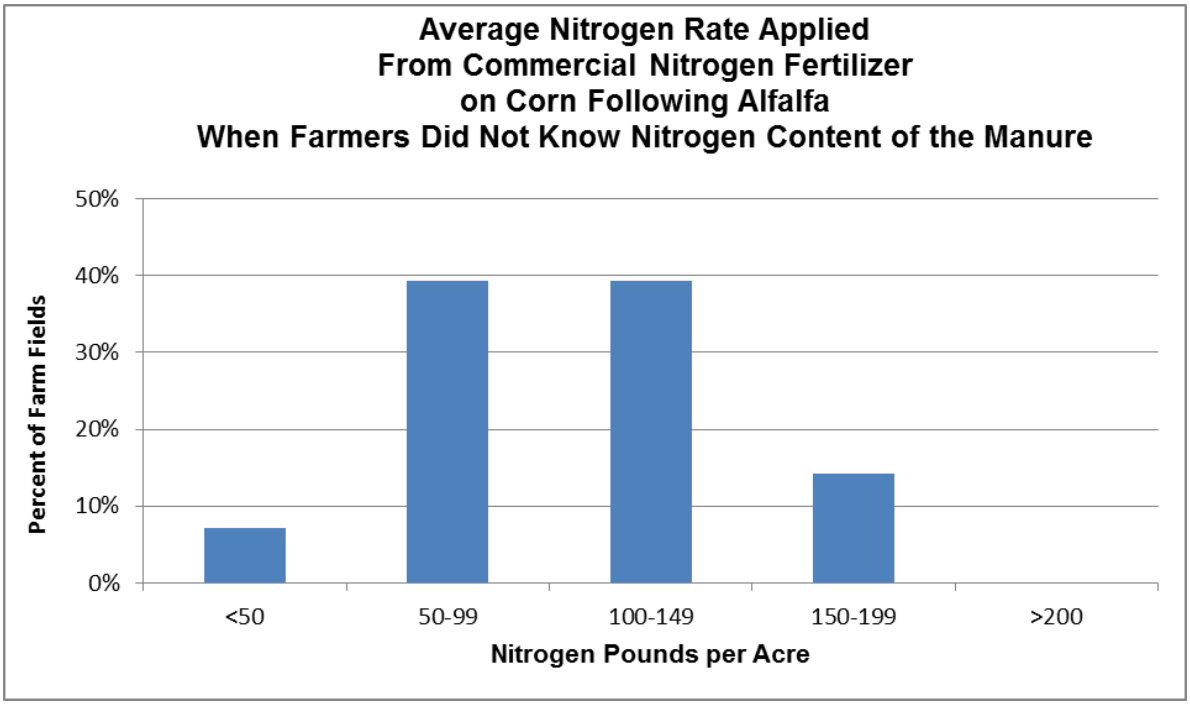

Figure 100. Average nitrogen rates applied to corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2012 when the manure nitrogen content is unknown: 28 fields.

Figure 101 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure or manure and commercial nitrogen fertilizer to corn following small grains (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 160 bushels per acre. The average nitrogen rate applied from manure was 121 pounds per acre, and the average commercial nitrogen fertilizer rate was 53 pounds per acre for an average total of 174 pounds of nitrogen per acre.

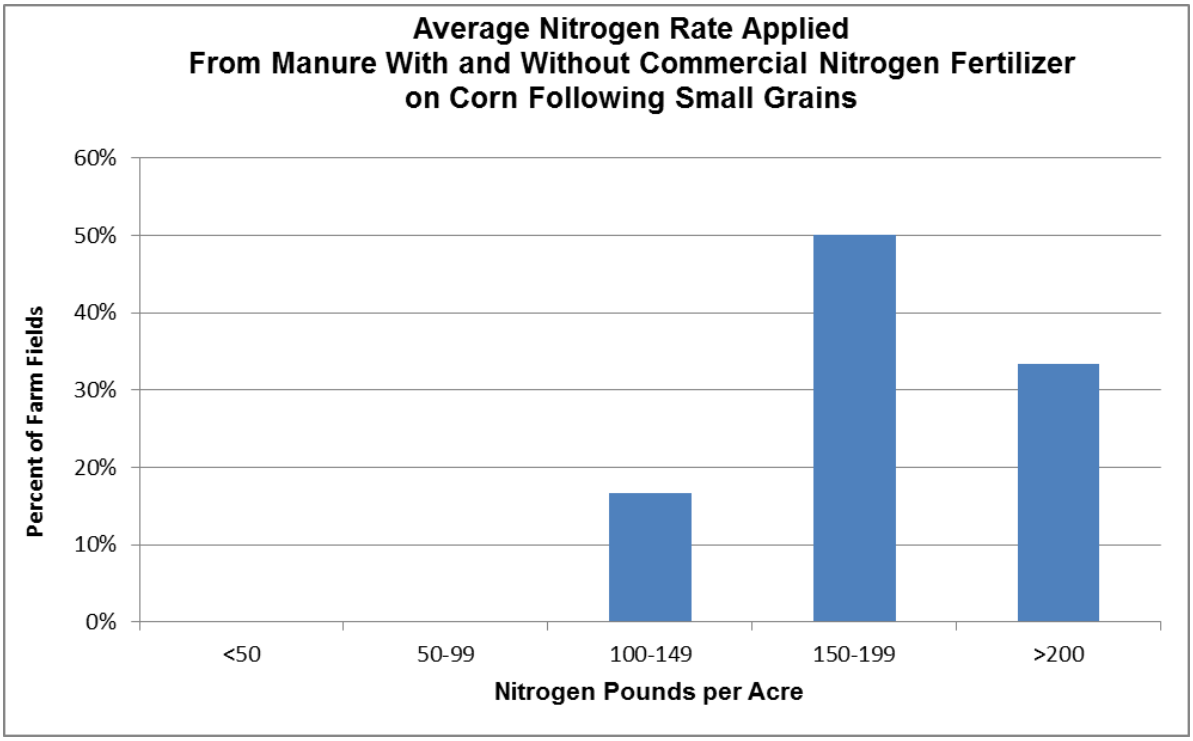

Figure 101. Average nitrogen rates applied to corn following small grains from manure or manure and commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Less than five farmers reported planting corn following small grains in Minnesota on fields applied:

- With manure and no commercial nitrogen fertilizer.
- With manure and commercial nitrogen fertilizer.

Figure 102 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following small grains when the farmer did not know the nitrogen content of the manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of manure applied to the field is not known. The average corn yield was 154 bushels per acre. The average commercial nitrogen fertilizer rate was 98 pounds per acre.

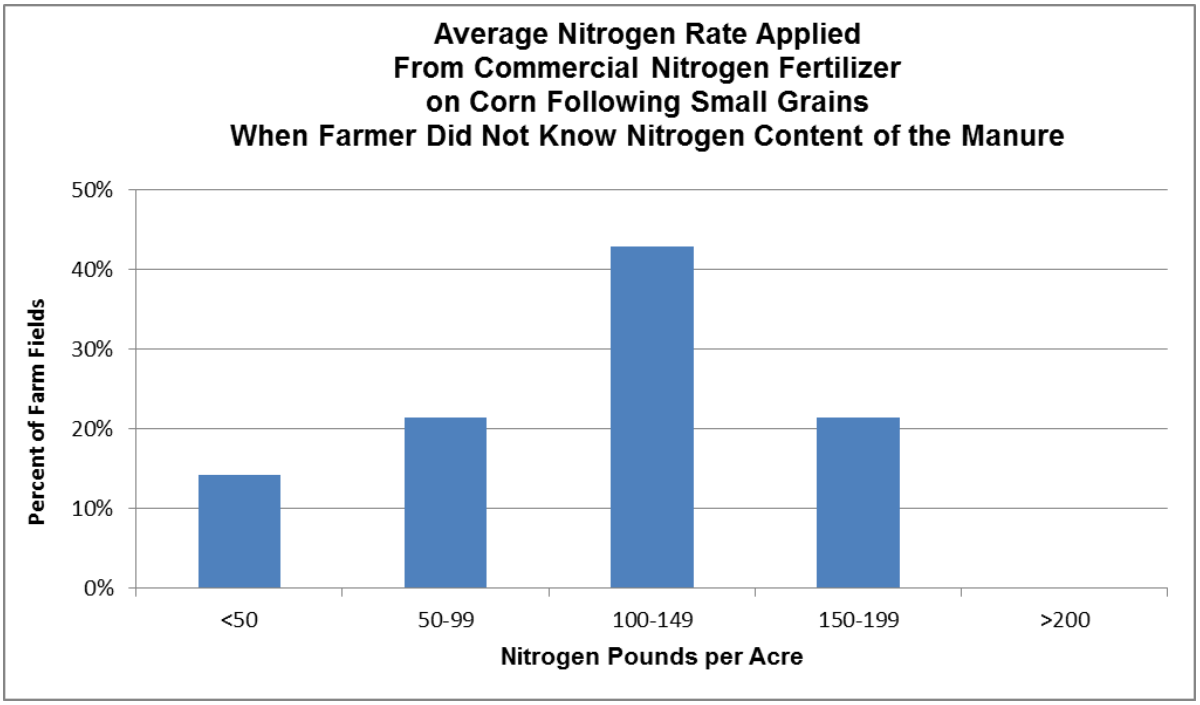

Figure 102. Average nitrogen rates applied to corn following small grains from commercial nitrogen fertilizer in Minnesota for 2012 when the manure nitrogen content is unknown: 14 fields.

Figure 103 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure or manure and commercial nitrogen fertilizer to corn following other crops (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 183 bushels per acre. The average nitrogen rate applied from manure was 164 pounds per acre, and the average commercial nitrogen fertilizer rate was 59 pounds per acre for an average total of 223 pounds of nitrogen per acre.

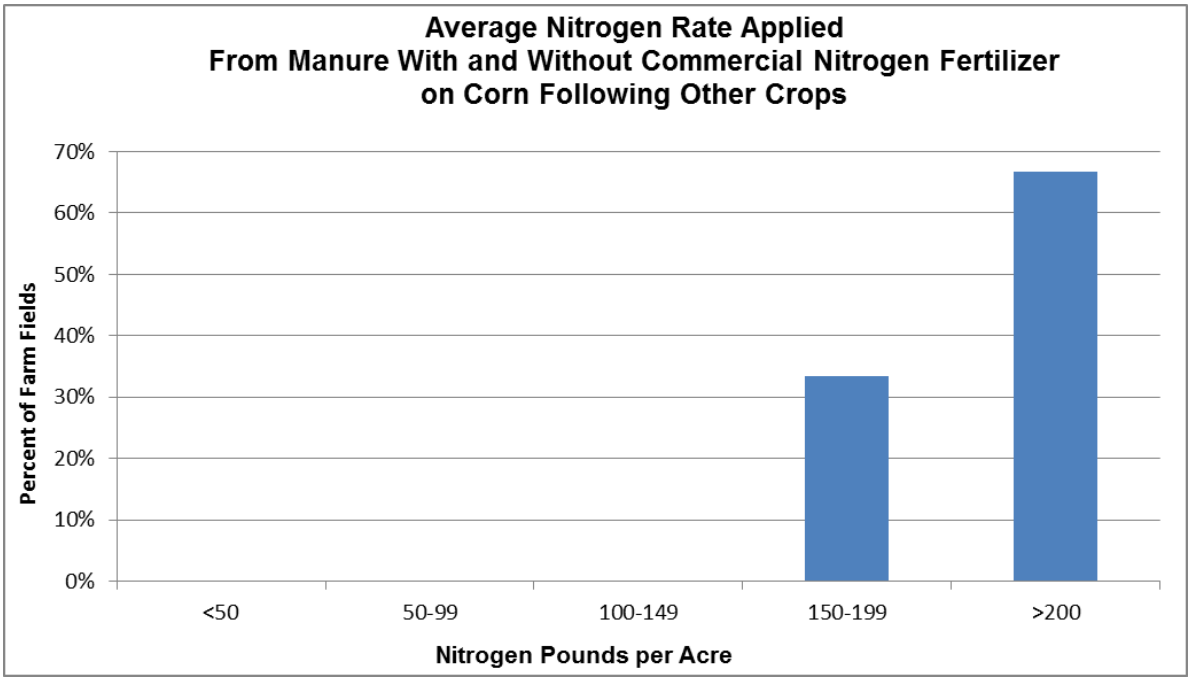

Figure 103. Average nitrogen rates applied to corn following other crops from manure or manure and commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Less than five farmers reported planting corn following other crops in Minnesota on fields applied with manure and no commercial nitrogen fertilizer.

Figure 104 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following other crops (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 183 bushels per acre. The average nitrogen rate applied from manure was 140 pounds per acre, and the average commercial nitrogen fertilizer rate was 71 pounds per acre for an average total of 211 pounds of nitrogen per acre.

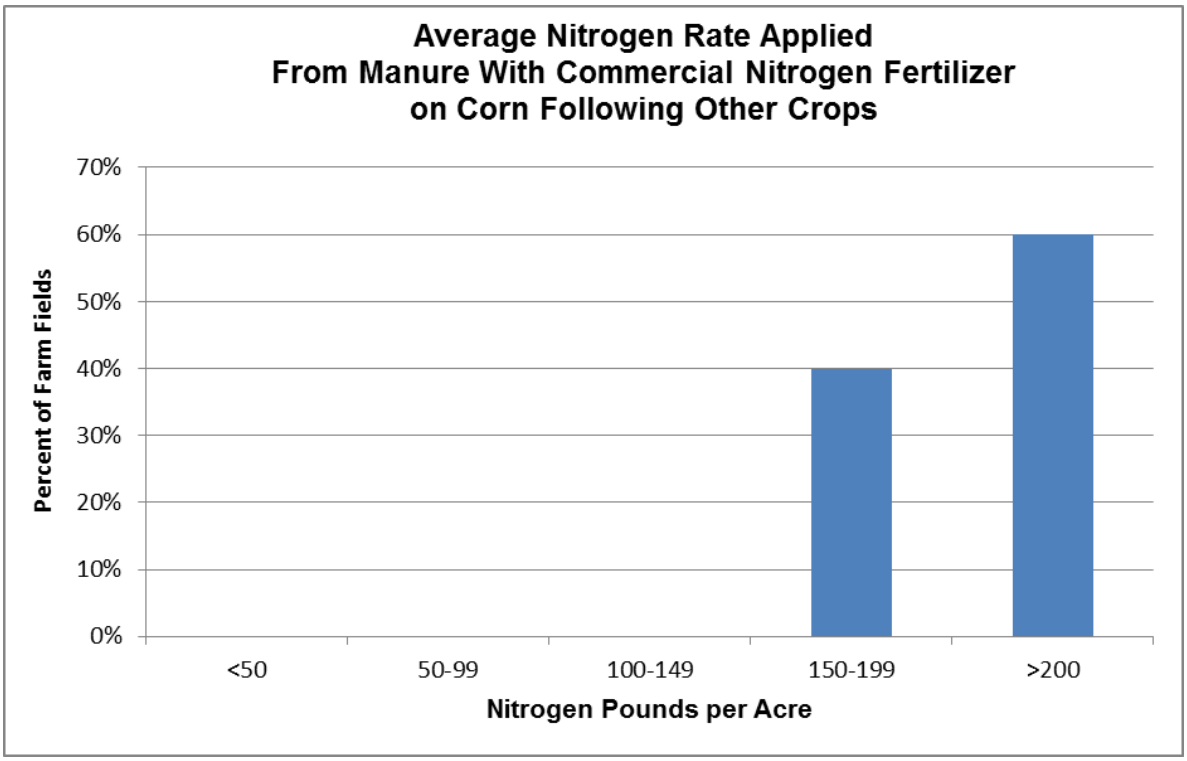

Figure 104. Average nitrogen rates applied to corn following other crops from manure and commercial nitrogen fertilizer in Minnesota for 2012: 5 fields.

Figure 105 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following other crops when the farmer did not know the nitrogen content of the manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of manure applied to the field is not known. The average corn yield was 143 bushels per acre. The average commercial nitrogen fertilizer rate was 106 pounds per acre.

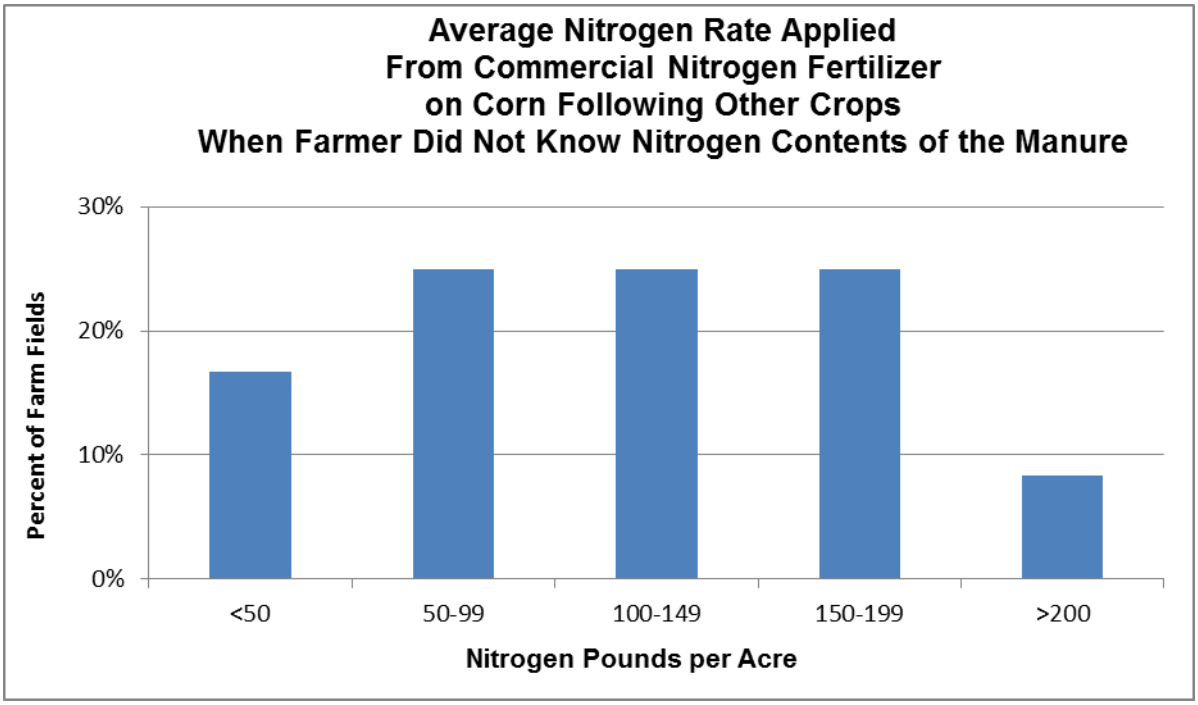

Figure 105. Average nitrogen rates applied to corn following other crops from commercial nitrogen fertilizer in Minnesota for 2012 when the manure nitrogen content is unknown: 12 fields.

Manure Applications from Dairy Manure

Figure 106 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure or dairy manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 172 bushels per acre. The average nitrogen rate applied from dairy manure was 130 pounds per acre, and the average commercial nitrogen fertilizer rate was 50 pounds per acre for an average total of 180 pounds of nitrogen per acre.

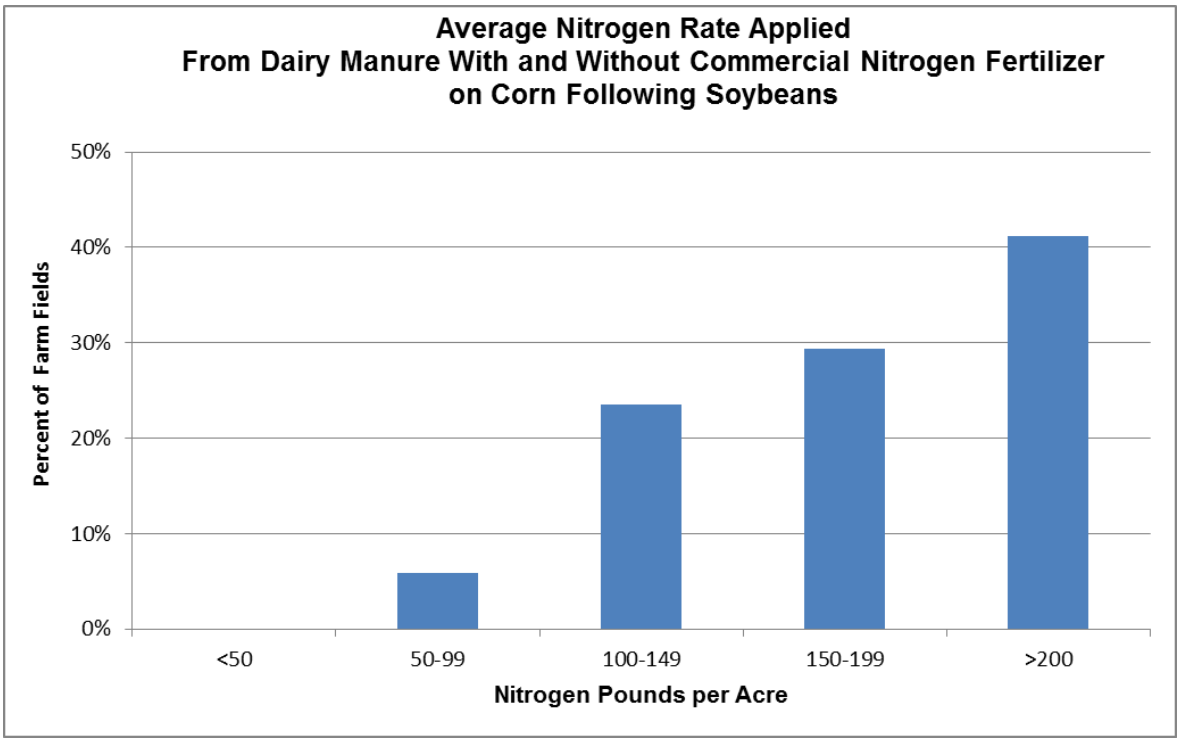

Figure 106. Average nitrogen rates applied to corn following soybeans from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 17 fields.

Figure 107 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and no commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, and MQ-11). The average corn yield was 177 bushels per acre. The average nitrogen rate applied from dairy manure was 132 pounds per acre.

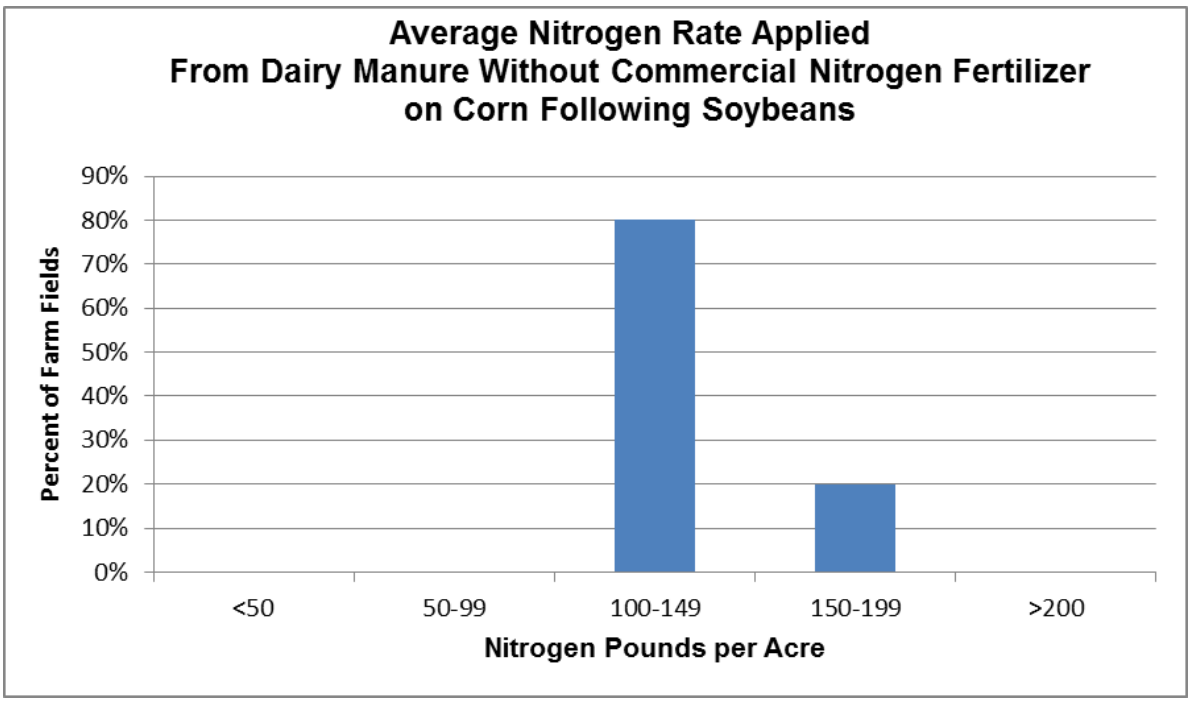

Figure 107. Average nitrogen rates applied to corn following soybeans from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2012: 5 fields.

Figure 108 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 170 bushels per acre. The average nitrogen rate applied from dairy manure was 129 pounds per acre, and the average commercial nitrogen fertilizer rate was 71 pounds per acre for an average total of 200 pounds of nitrogen per acre.

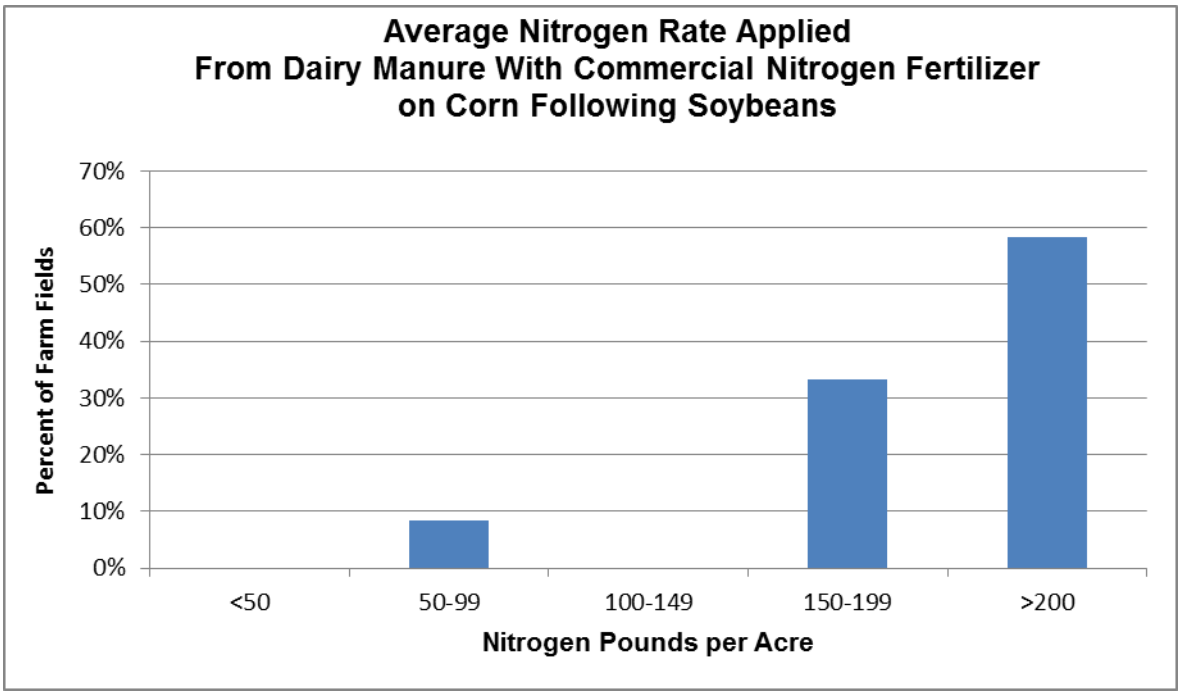

Figure 108. Average nitrogen rates applied to corn following soybeans from dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 12 fields.

Figure 109 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following soybeans when the farmer did not know the nitrogen content of the dairy manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of dairy manure applied to the field is not known. The average corn yield was 171 bushels per acre. The average commercial nitrogen fertilizer rate was 110 pounds per acre.

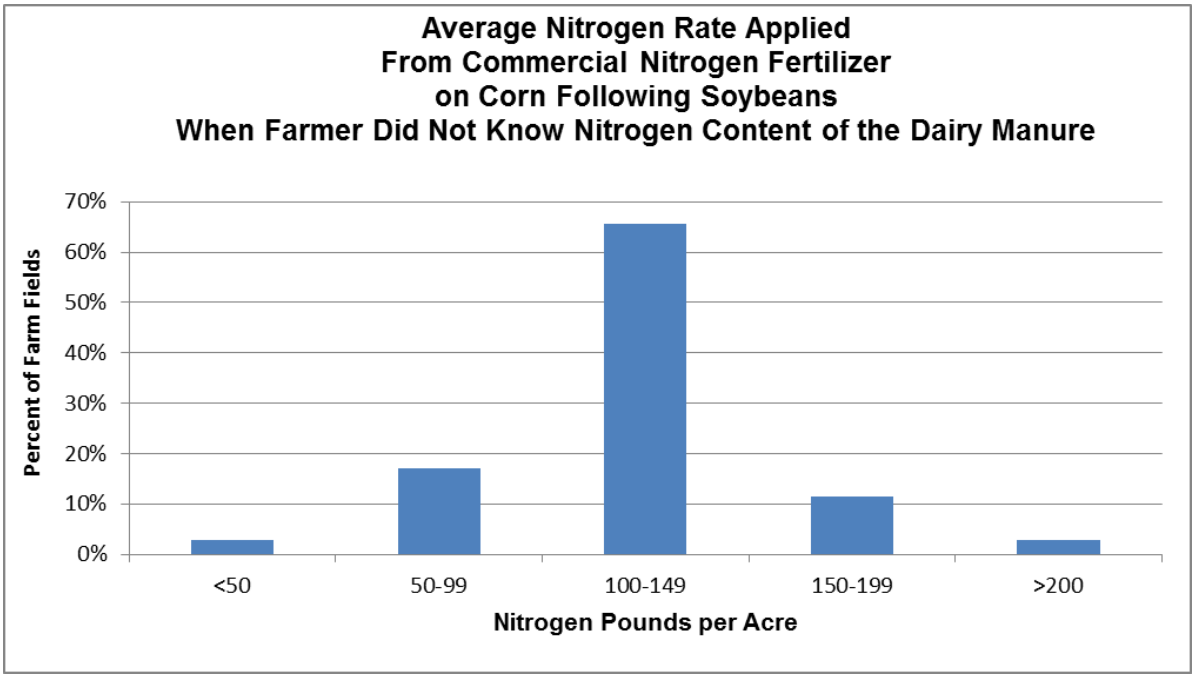

Figure 109. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2012 when the dairy manure nitrogen content is unknown: 35 fields.

Figure 110 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure or dairy manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 165 bushels per acre. The average nitrogen rate applied from dairy manure was 110 pounds per acre, and the average commercial nitrogen fertilizer rate was 70 pounds per acre for an average total of 180 pounds of nitrogen per acre.

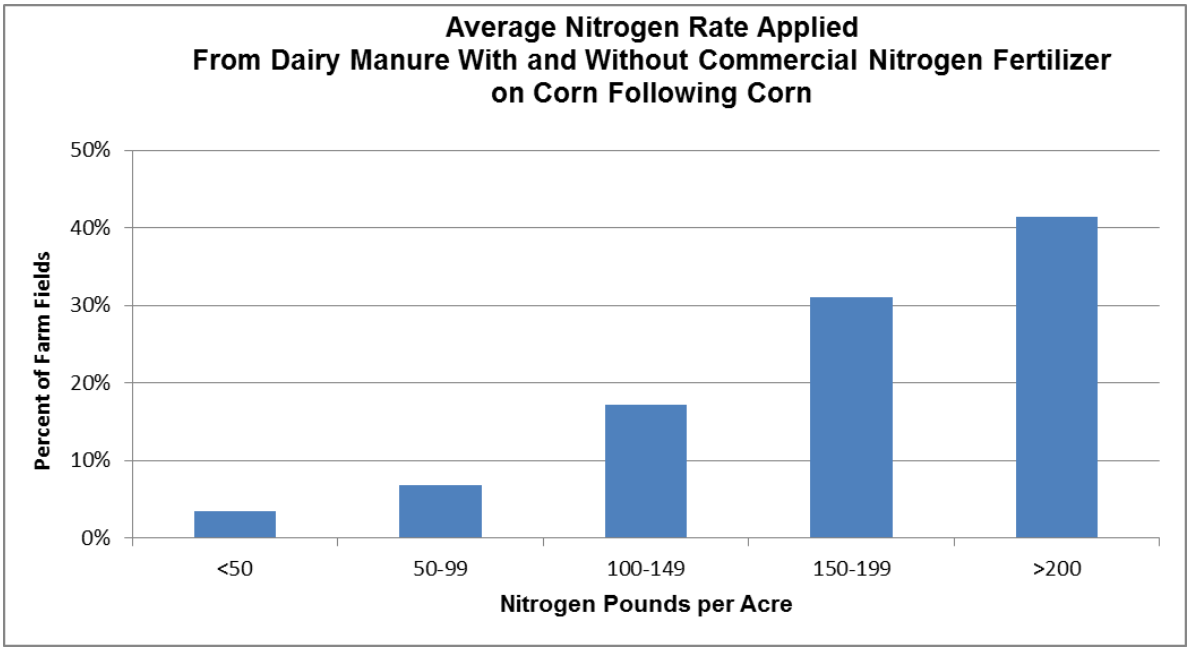

Figure 110. Average nitrogen rates applied to corn following corn from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 29 fields.

Figure 111 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and no commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-1b, MQ-5, and MQ-11). The average corn yield was 164 bushels per acre. The average nitrogen rate applied from dairy manure was 96 pounds per acre.

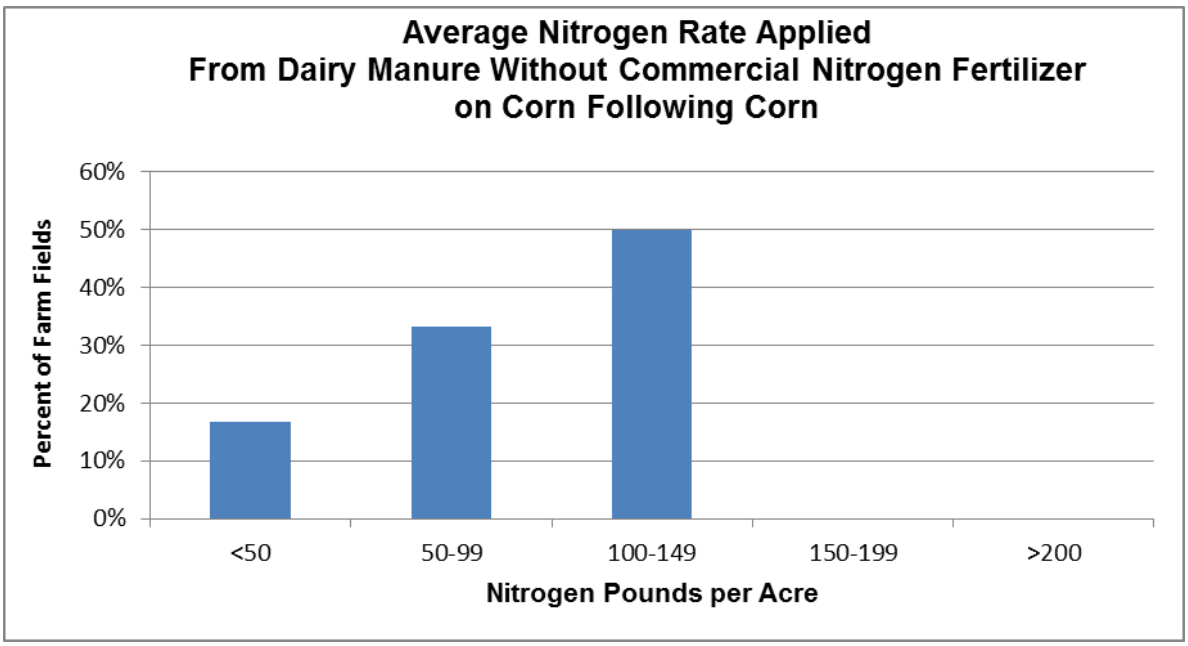

Figure 111. Average nitrogen rates applied to corn following corn from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Figure 112 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 165 bushels per acre. The average nitrogen rate applied from dairy manure was 113 pounds per acre, and the average commercial nitrogen fertilizer rate was 88 pounds per acre for an average total of 201 pounds of nitrogen per acre.

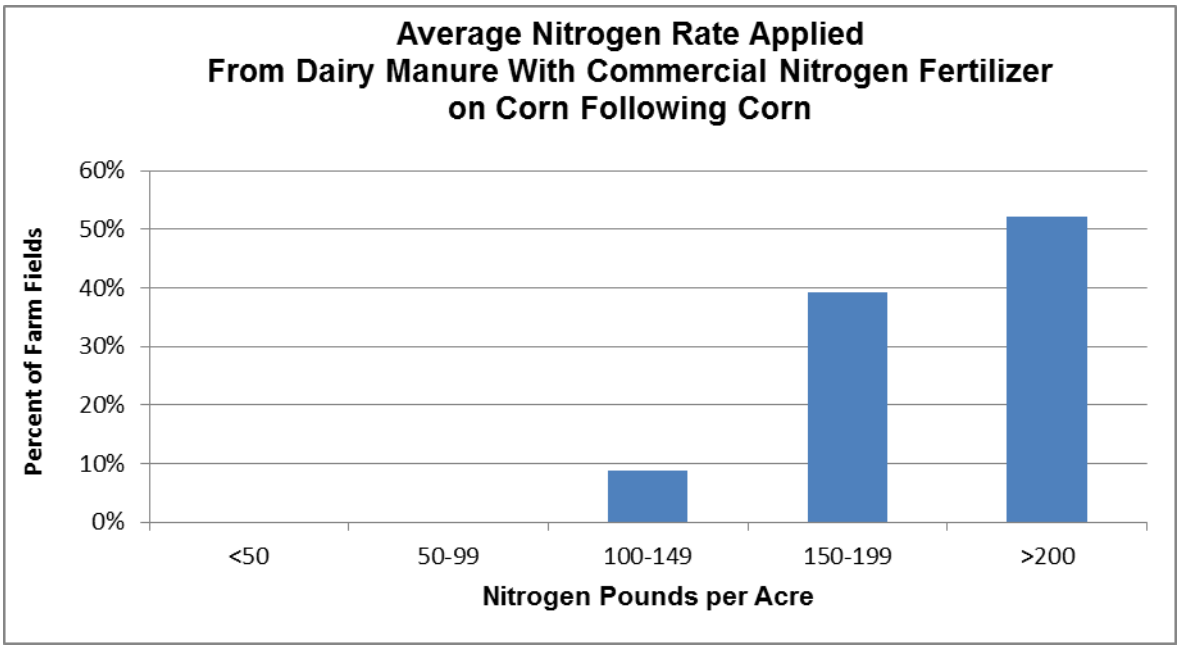

Figure 112. Average nitrogen rates applied to corn following corn from dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 23 fields.

Figure 113 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following corn when the farmer did not know the nitrogen content of the dairy manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of dairy manure applied to the field is not known. The average corn yield was 150 bushels per acre. The average commercial nitrogen fertilizer rate was 114 pounds per acre.

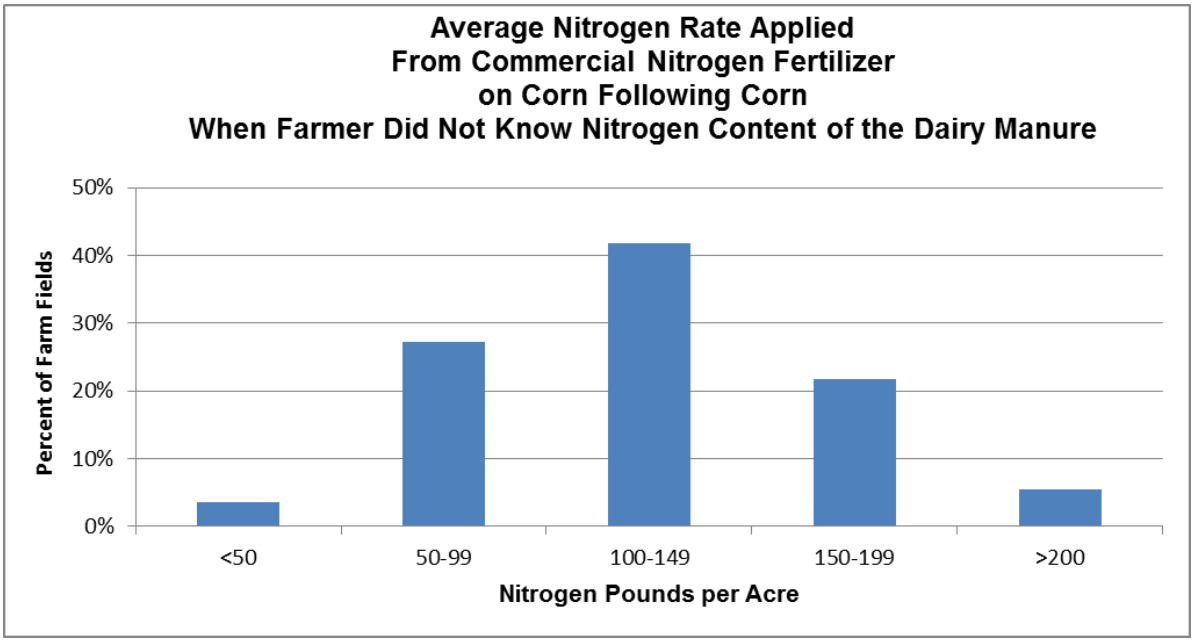

Figure 113. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2012 when the dairy manure nitrogen content is unknown: 55 fields.

Figure 114 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure or dairy manure and commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 164 bushels per acre. The average nitrogen rate applied from dairy manure was 142 pounds per acre, and the average commercial nitrogen fertilizer rate was 30 pounds per acre for an average total of 172 pounds of nitrogen per acre.

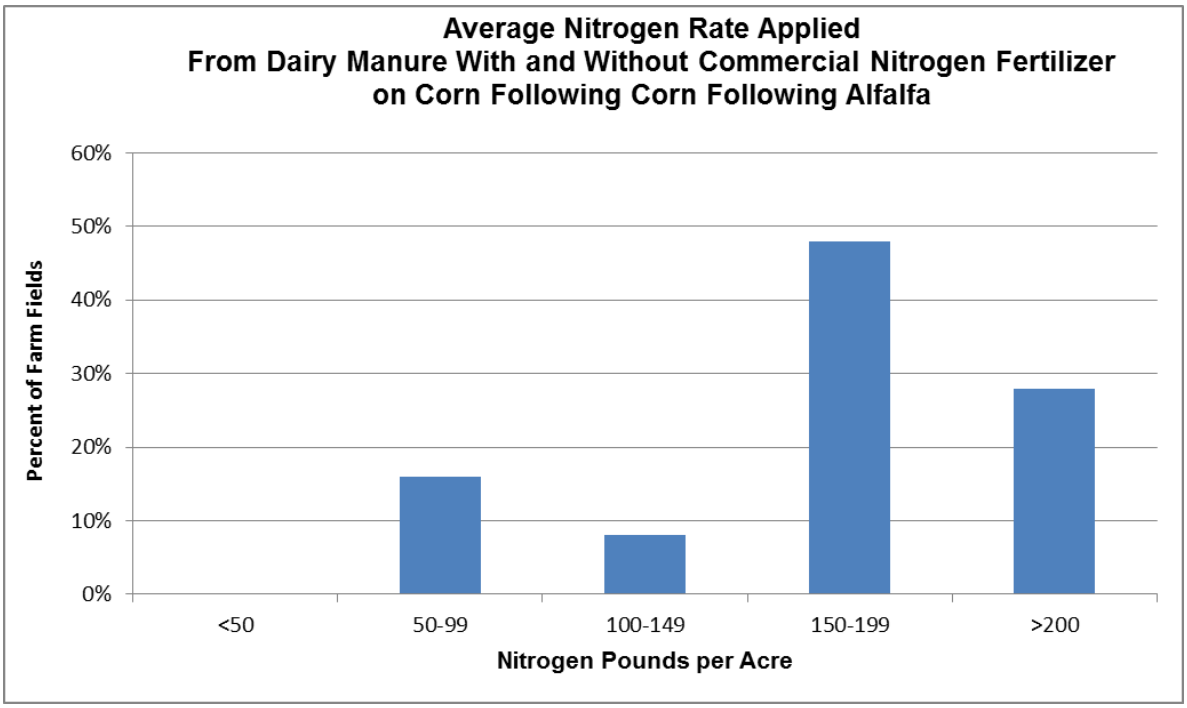

Figure 114. Average nitrogen rates applied to corn following corn following alfalfa from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 25 fields.

Figure 115 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and no commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, and MQ-11). The average corn yield was 163 bushels per acre. The average nitrogen rate applied from dairy manure was 141 pounds per acre.

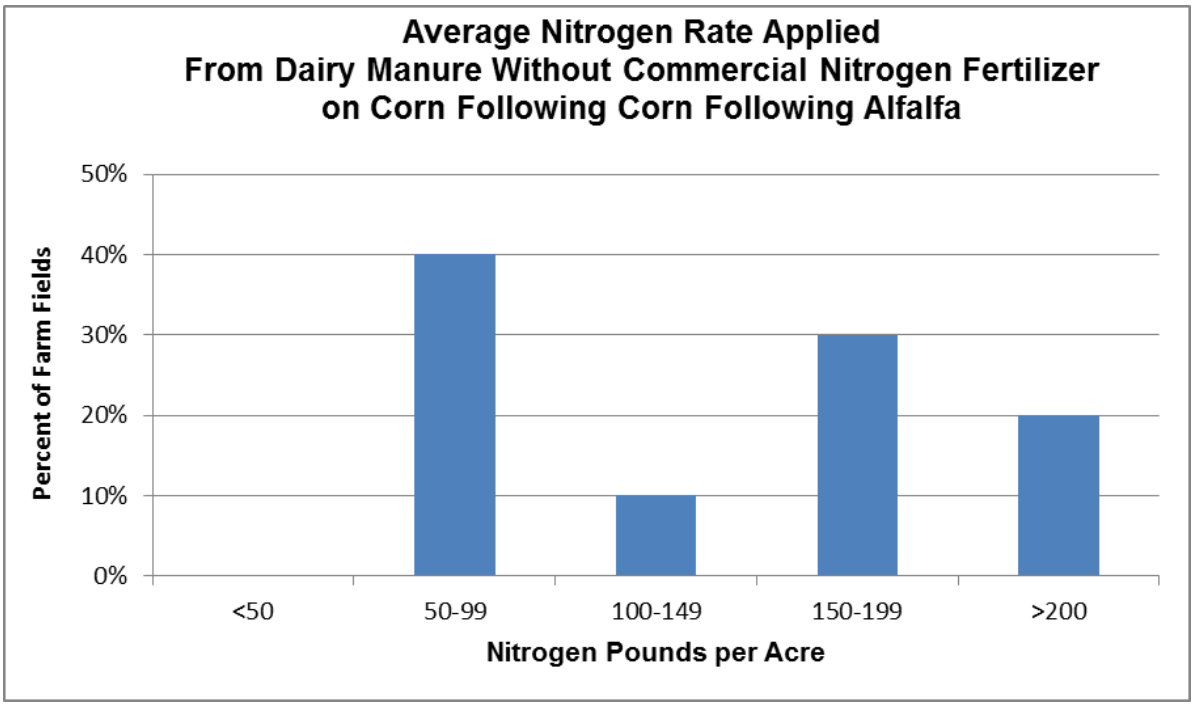

Figure 115. Average nitrogen rates applied to corn following corn following alfalfa from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2012: 10 fields.

Figure 115 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 164 bushels per acre. The average nitrogen rate applied from dairy manure was 143 pounds per acre, and the average commercial nitrogen fertilizer rate was 50 pounds per acre for an average total of 193 pounds of nitrogen per acre.

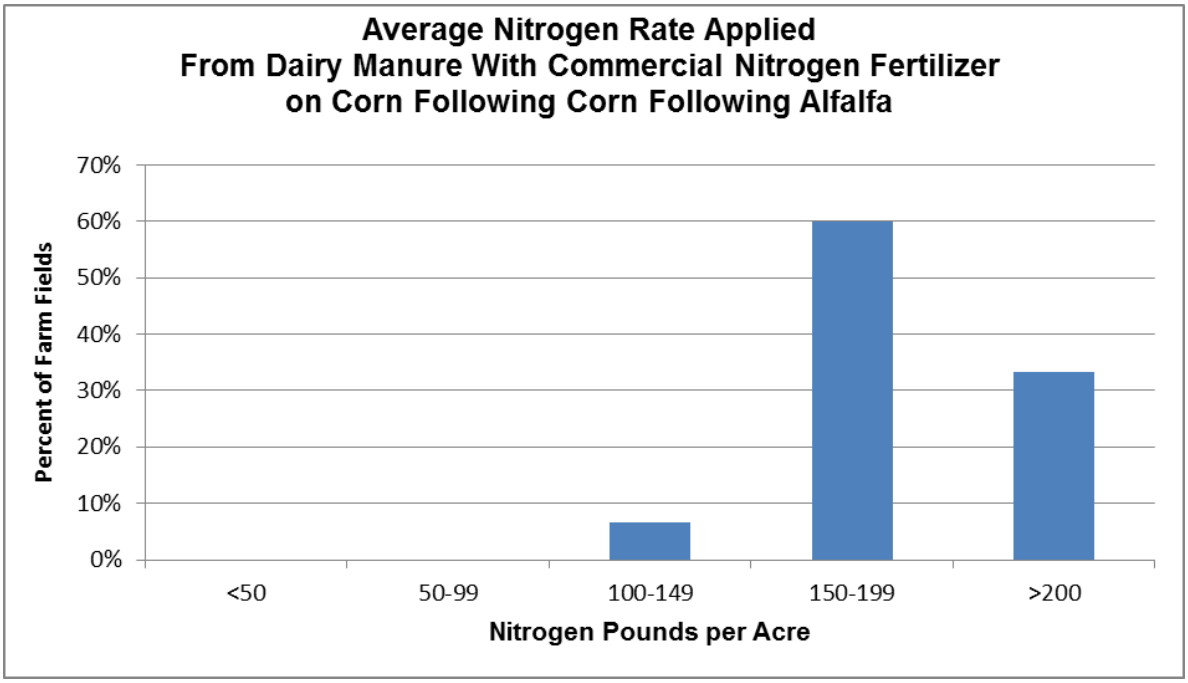

Figure 116. Average nitrogen rates applied to corn following corn following alfalfa from dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 15 fields.

Figure 117 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following corn following alfalfa when the farmer did not know the nitrogen content of the dairy manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of dairy manure applied to the field is not known. The average corn yield was 158 bushels per acre. The average commercial nitrogen fertilizer rate was 113 pounds per acre.

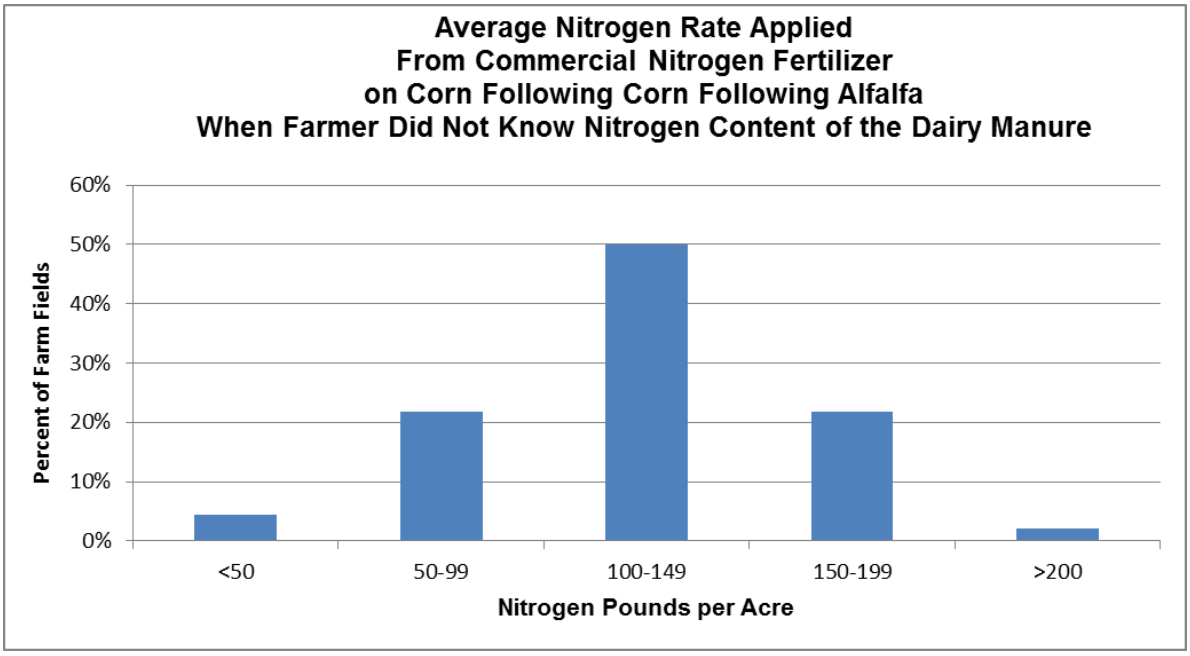

Figure 117. Average nitrogen rates applied to corn following corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2012 when the dairy manure nitrogen content is unknown: 46 fields.

Figure 118 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure or dairy manure and commercial nitrogen fertilizer to corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 176 bushels per acre. The average nitrogen rate applied from dairy manure was 152 pounds per acre, and the average commercial nitrogen fertilizer rate was 30 pounds per acre for an average total of 182 pounds of nitrogen per acre.

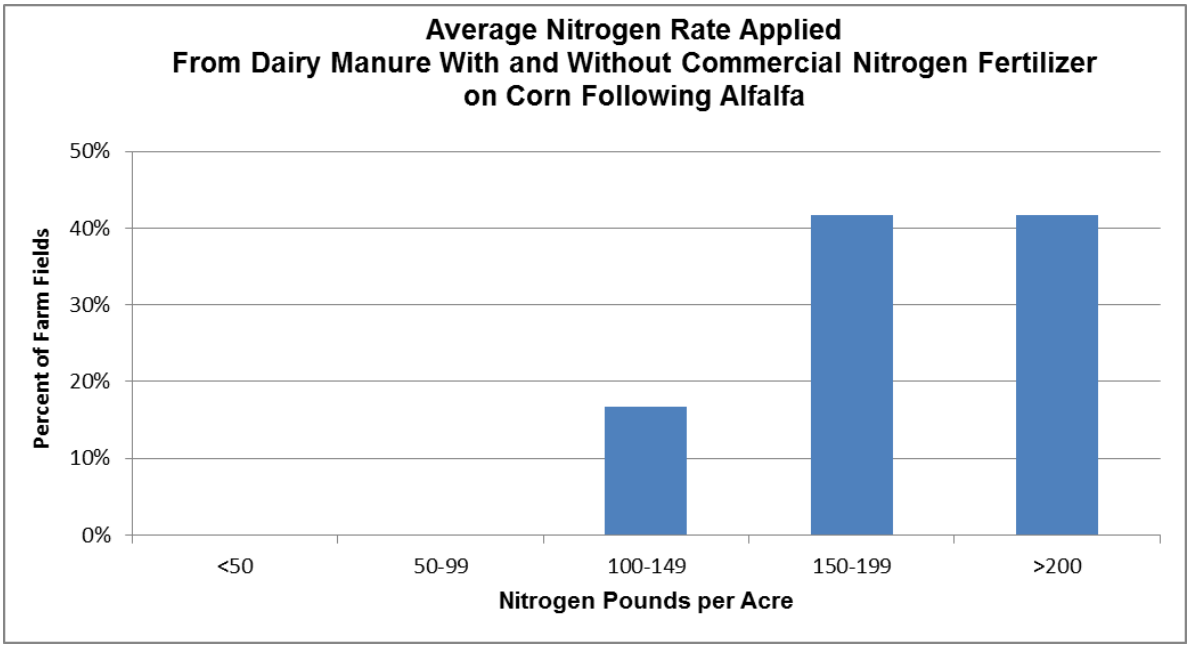

Figure 118. Average nitrogen rates applied to corn following alfalfa from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 12 fields.

Figure 119 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and no commercial nitrogen fertilizer to corn following alfalfa (MQ-1a, MQ-5, and MQ-11). The average corn yield was 175 bushels per acre. The average nitrogen rate applied from dairy manure was 168 pounds per acre.

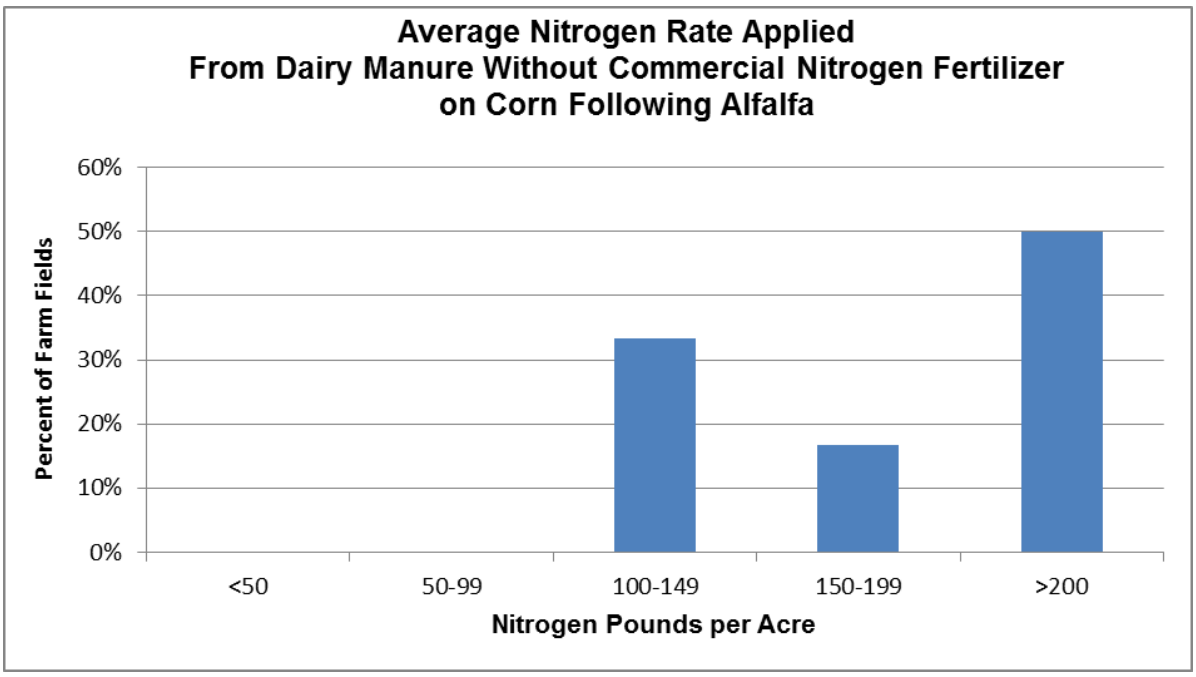

Figure 119. Average nitrogen rates applied to corn following alfalfa from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Figure 120 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 177 bushels per acre. The average nitrogen rate applied from dairy manure was 137 pounds per acre, and the average commercial nitrogen fertilizer rate was 60 pounds per acre for an average total of 197 pounds of nitrogen per acre.

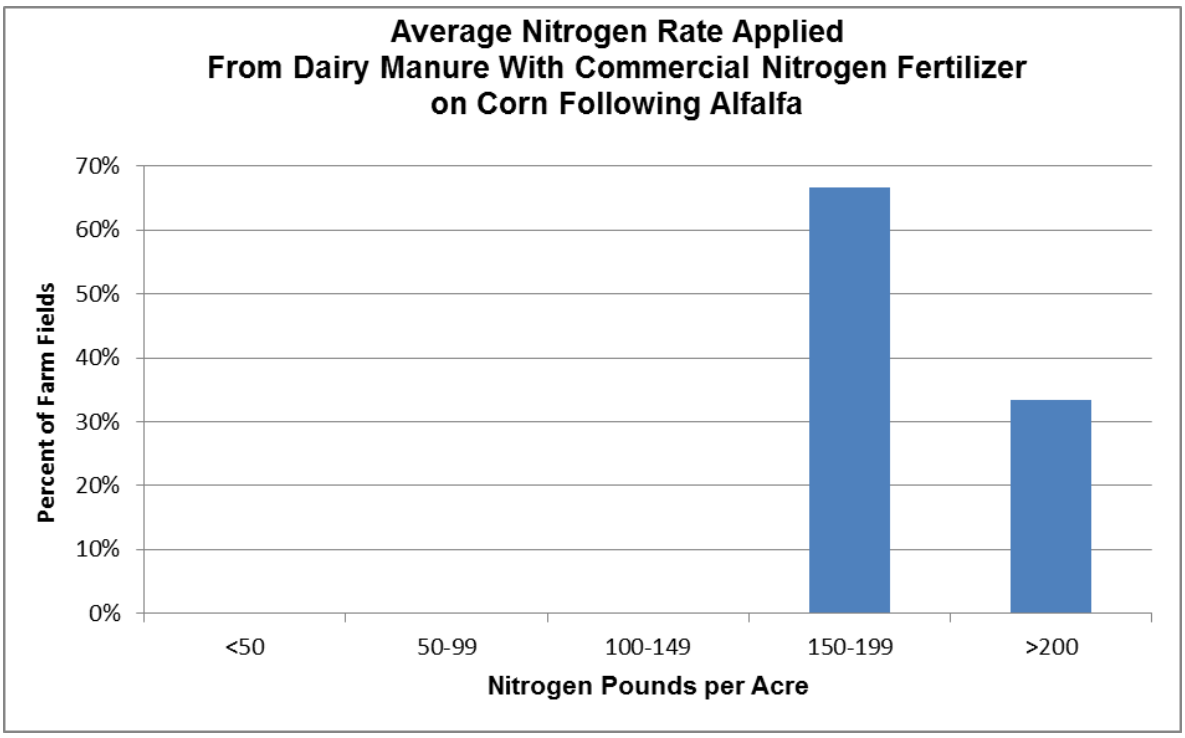

Figure 120. Average nitrogen rates applied to corn following alfalfa from dairy manure and commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Figure 121 details the distribution of average nitrogen rates in Minnesota from farmers that applied dairy manure and commercial nitrogen fertilizer to corn following alfalfa when the farmer did not know the nitrogen content of the dairy manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of dairy manure applied to the field is not known. The average corn yield was 148 bushels per acre. The average commercial nitrogen fertilizer rate was 104 pounds per acre.

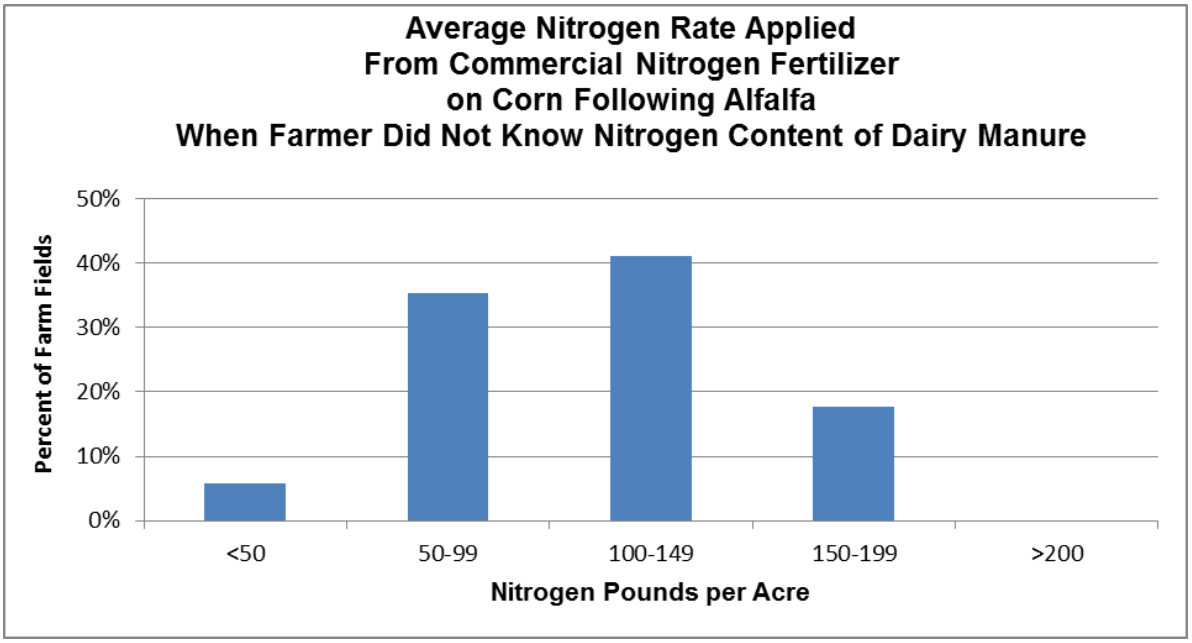

Figure 121. Average nitrogen rates applied to corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2012 when the dairy manure nitrogen content is unknown: 17 fields.

Less than five farmers reported planting corn following small grains in Minnesota on fields applied:

- With dairy manure or with dairy manure and commercial nitrogen fertilizer.
- With dairy manure and no commercial nitrogen fertilizer.
- With dairy manure and commercial nitrogen fertilizer.
- With dairy manure and commercial nitrogen fertilizer when the nitrogen content of the dairy manure is not known.

Less than five farmers reported planting corn following other crops in Minnesota on fields applied:

- With dairy manure or with dairy manure and commercial nitrogen fertilizer.
- With dairy manure and no commercial nitrogen fertilizer.
- With dairy manure and commercial nitrogen fertilizer.
- With dairy manure and commercial nitrogen fertilizer when the nitrogen content of the dairy manure is not known.

Manure Applications from Beef Manure

Figure 122 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure or beef manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 148 bushels per acre. The average nitrogen rate applied from beef manure was 98 pounds per acre, and the average commercial nitrogen fertilizer rate was 55 pounds per acre for an average total of 153 pounds of nitrogen per acre.

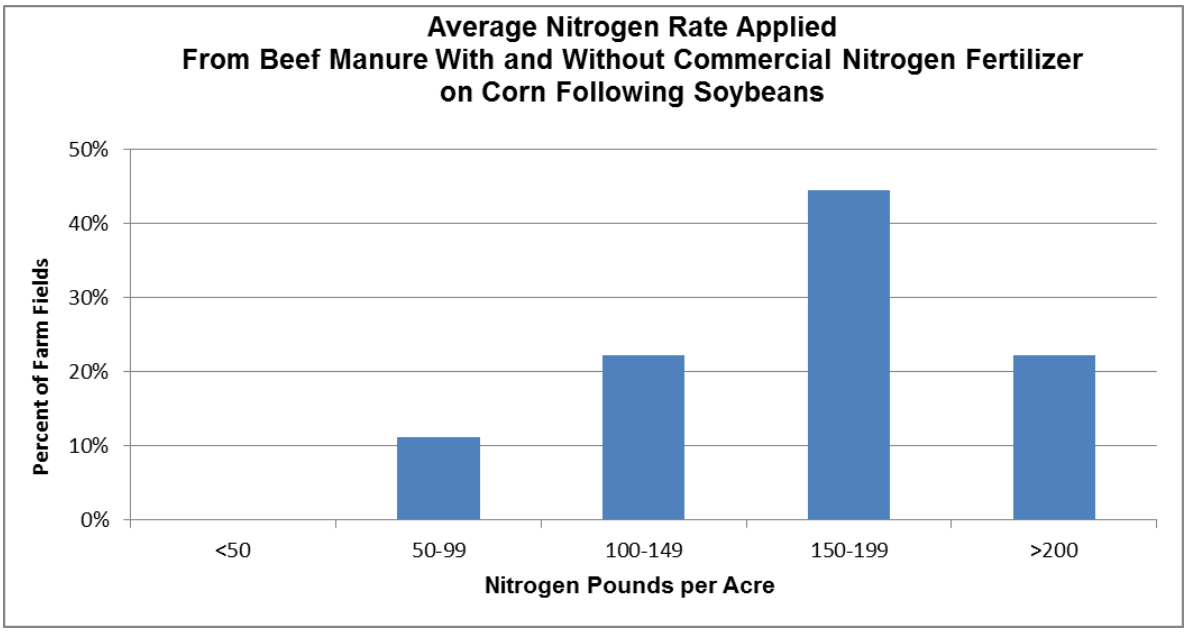

Figure 122. Average nitrogen rates applied to corn following soybeans from beef manure or beef manure and commercial nitrogen fertilizer in Minnesota for 2012: 9 fields.

Less than five farmers reported applying beef manure without commercial fertilizer to corn following soybeans.

Figure 123 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 148 bushels per acre. The average nitrogen rate applied from beef manure was 103 pounds per acre, and the average commercial nitrogen fertilizer rate was 62 pounds per acre for an average total of 165 pounds of nitrogen per acre.

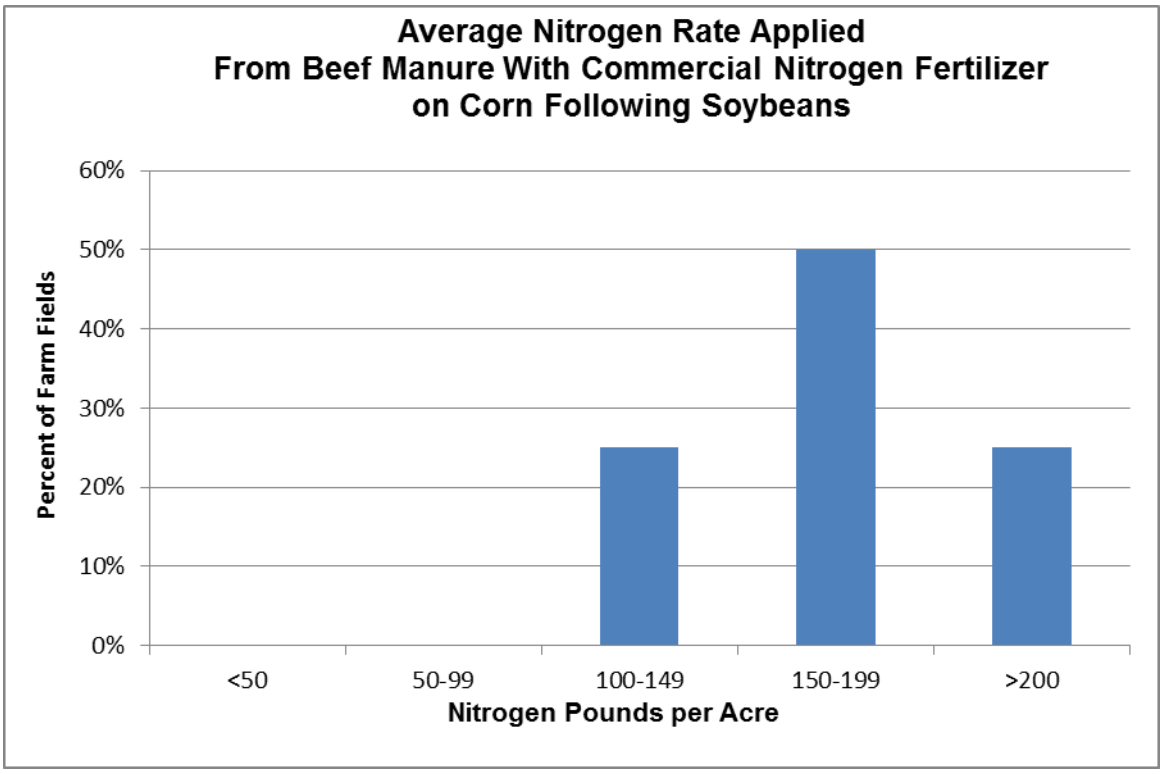

Figure 123. Average nitrogen rates applied to corn following soybeans from beef manure and commercial nitrogen fertilizer in Minnesota for 2012: 8 fields.

Figure 124 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following soybeans when the farmer did not know the nitrogen content of the beef manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of beef manure applied to the field is not known. The average corn yield was 163 bushels per acre. The average commercial nitrogen fertilizer rate was 124 pounds per acre.

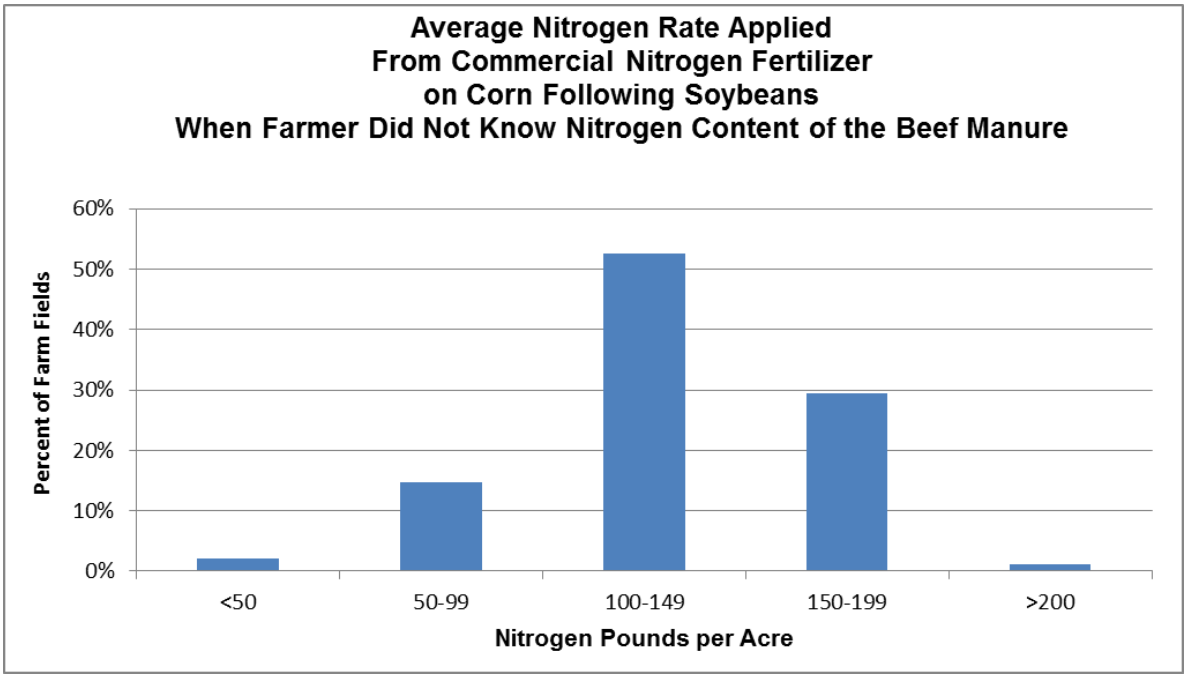

Figure 124 Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2012 when the beef manure nitrogen content is unknown: 95 fields.

Figure 125 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure or beef manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 176 bushels per acre. The average nitrogen rate applied from beef manure was 121 pounds per acre, and the average commercial nitrogen fertilizer rate was 69 pounds per acre for an average total of 190 pounds of nitrogen per acre.

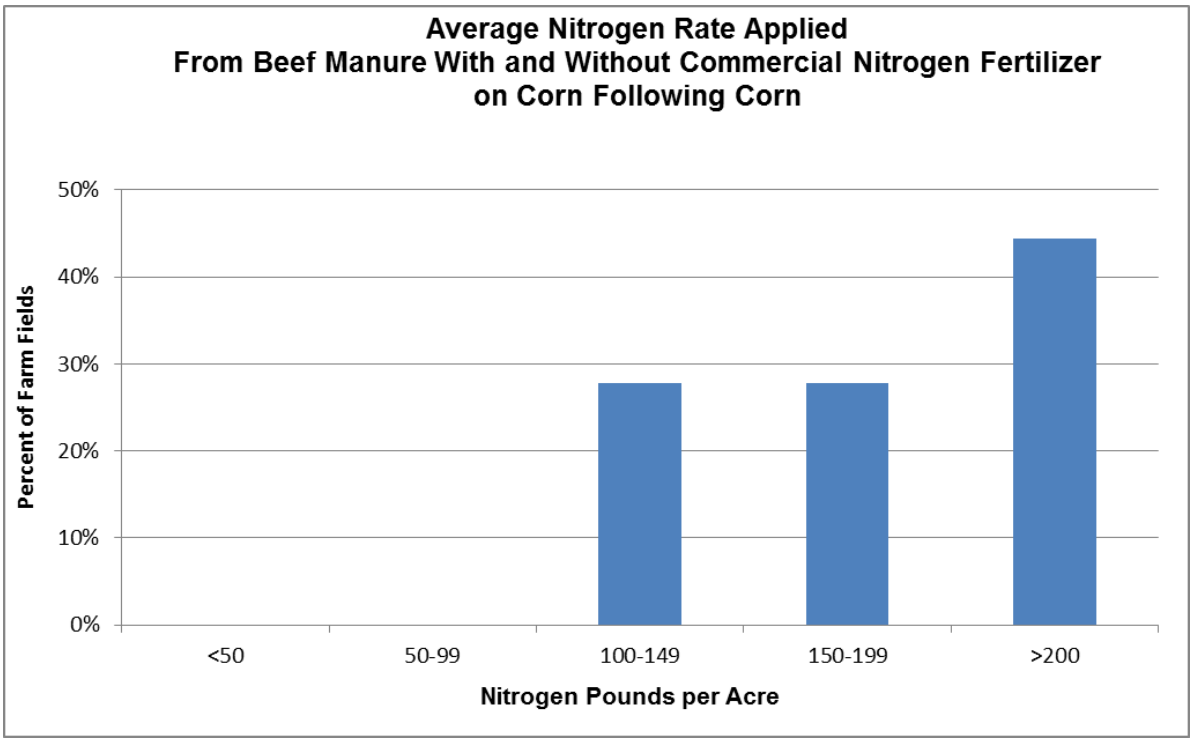

Figure 125. Average nitrogen rates applied to corn following corn from beef manure or beef manure and commercial nitrogen fertilizer in Minnesota for 2012: 18 fields.

Figure 126 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and no commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, and MQ-11). The average corn yield was 179 bushels per acre. The average nitrogen rate applied from beef manure was 151 pounds per acre.

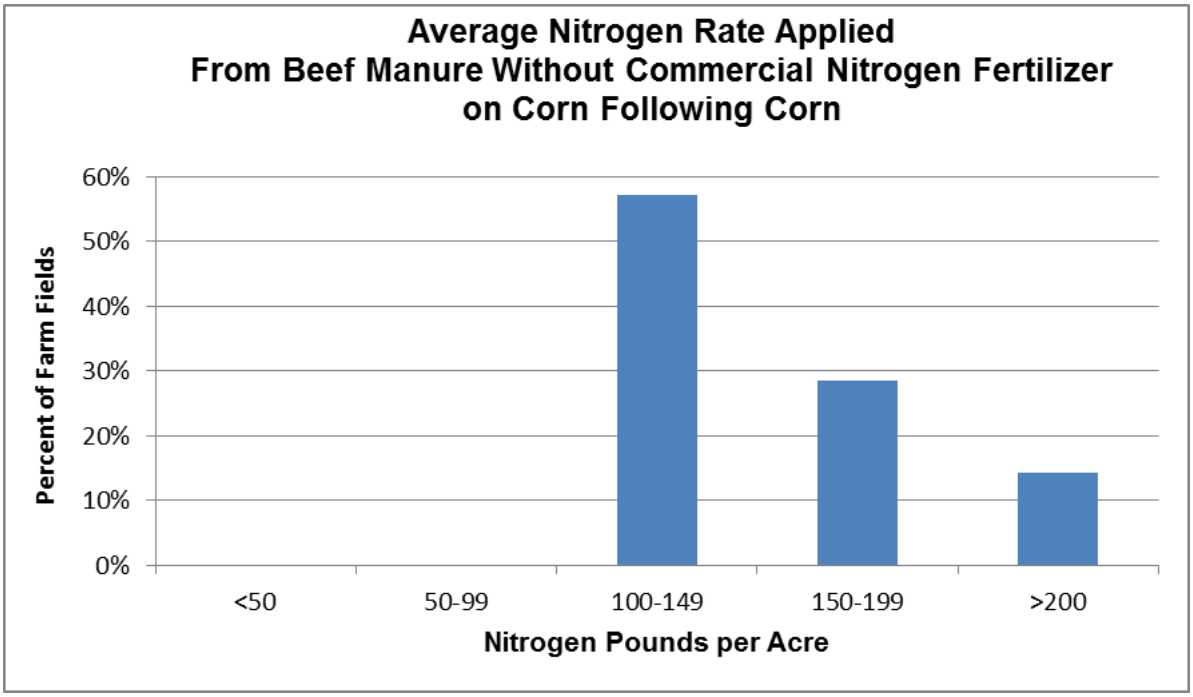

Figure 126. Average nitrogen rates applied to corn following corn from beef manure and no commercial nitrogen fertilizer in Minnesota for 2012: 7 fields.

Figure 127 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 174 bushels per acre. The average nitrogen rate applied from beef manure was 102 pounds per acre, and the average commercial nitrogen fertilizer rate was 113 pounds per acre for an average total of 215 pounds of nitrogen per acre.

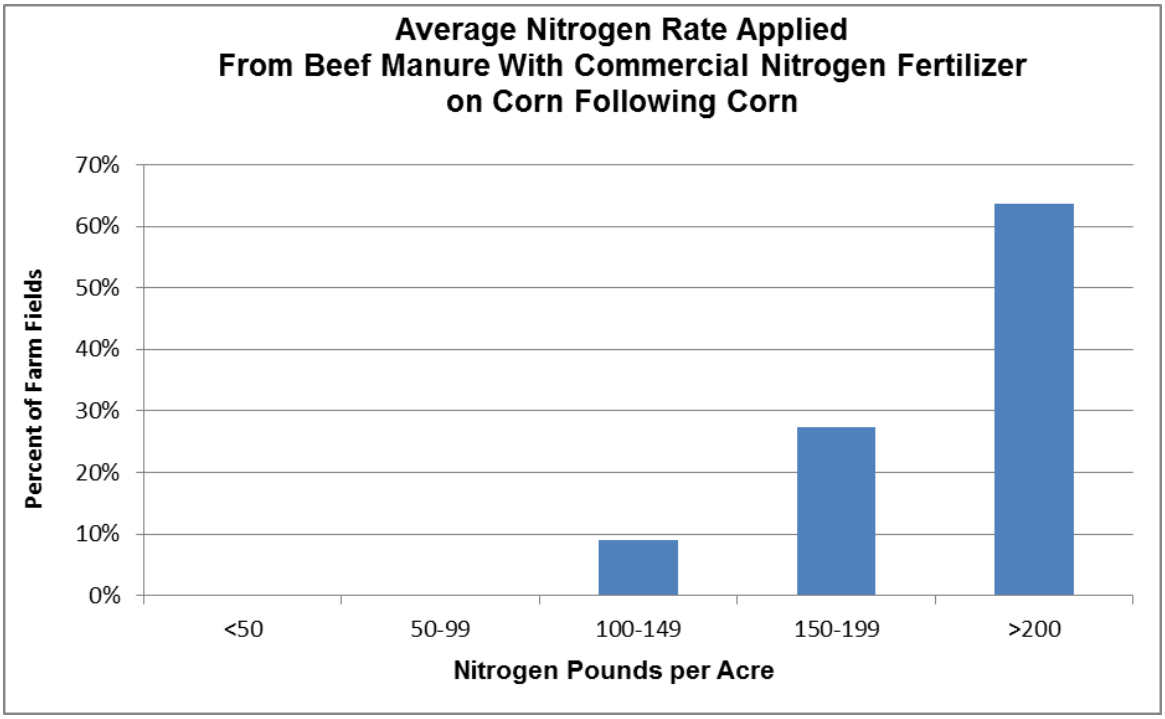

Figure 127. Average nitrogen rates applied to corn following corn from beef manure and commercial nitrogen fertilizer in Minnesota for 2012: 11 fields.

Figure 128 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following corn when the farmer did not know the nitrogen content of the beef manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of beef manure applied to the field is not known. The average corn yield was 149 bushels per acre. The average commercial nitrogen fertilizer rate was 119 pounds per acre.

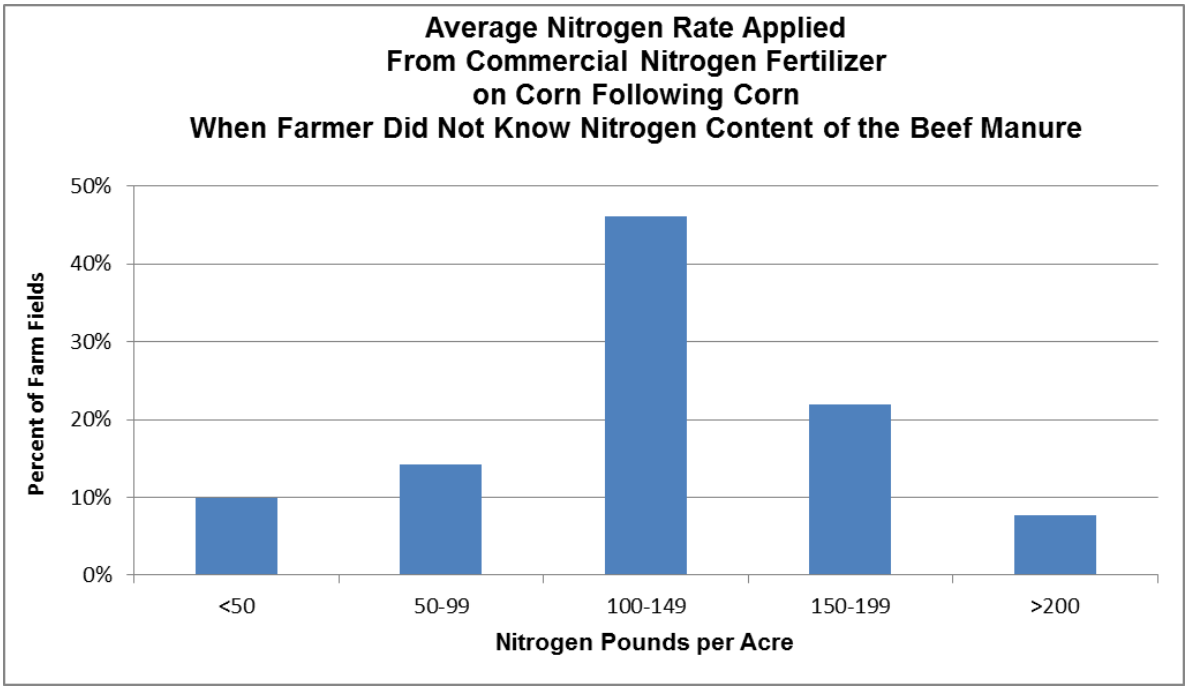

Figure 128. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2012 when the beef manure nitrogen content is unknown: 91 fields.

Figure 129 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure or beef manure and commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 130 bushels per acre. The average nitrogen rate applied from beef manure was 101 pounds per acre, and the average commercial nitrogen fertilizer rate was 43 pounds per acre for an average total of 144 pounds of nitrogen per acre.

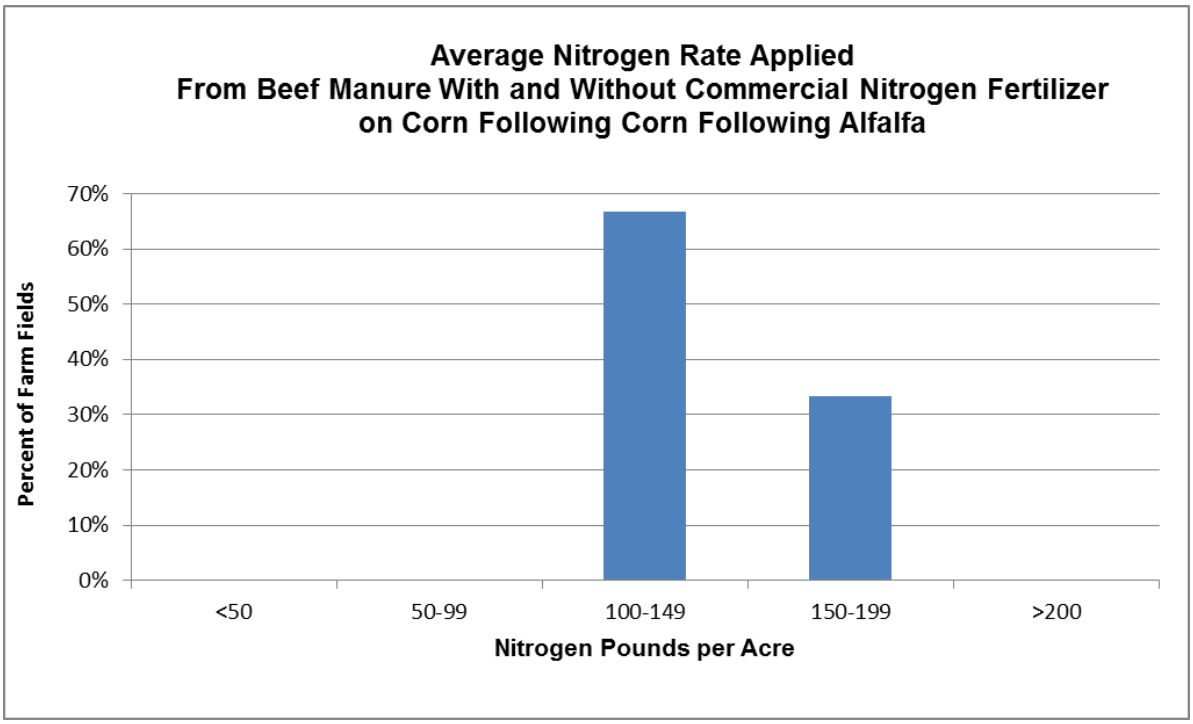

Figure 129. Average nitrogen rates applied to corn following corn following alfalfa from beef manure or beef manure and commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Less than five farmers reported planting corn following corn following alfalfa in Minnesota on fields applied with beef manure and no commercial nitrogen fertilizer.

Figure 130 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 127 bushels per acre. The average nitrogen rate applied from beef manure was 93 pounds per acre, and the average commercial nitrogen fertilizer rate was 52 pounds per acre for an average total of 145 pounds of nitrogen per acre.

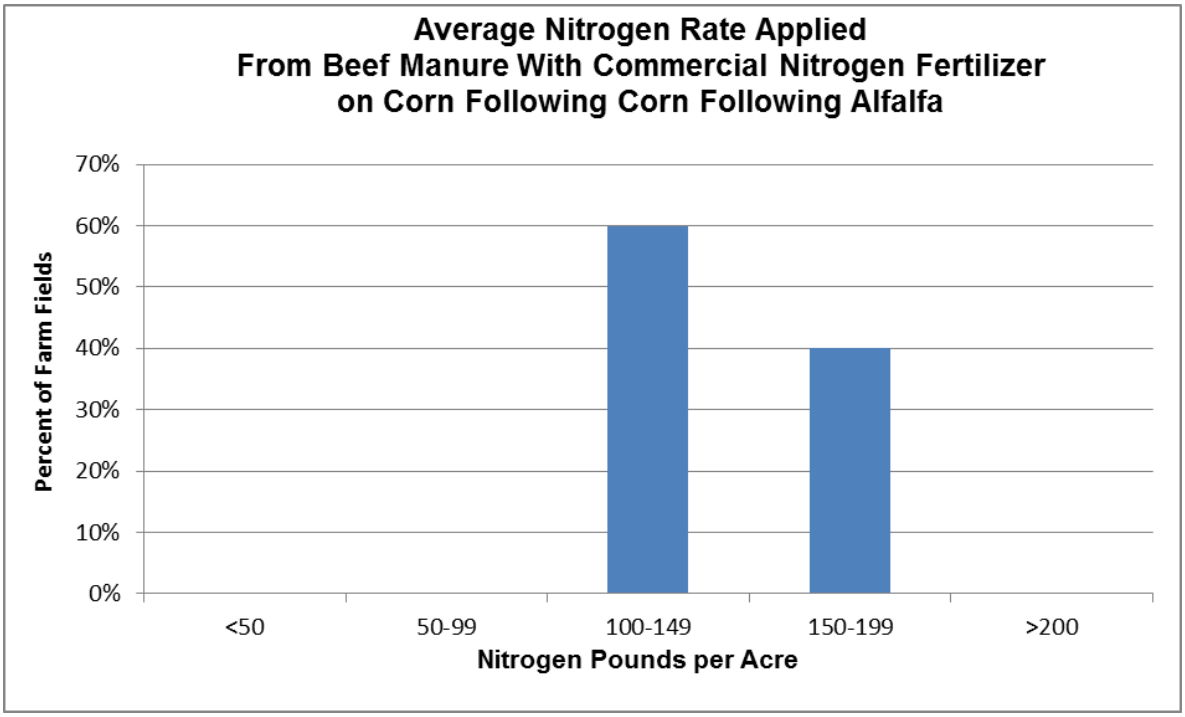

Figure 130. Percentage of fields and amount of nitrogen applied on corn following corn following alfalfa with beef manure and commercial fertilizer: 5 fields.

Figure 131 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following corn following alfalfa when the farmer did not know the nitrogen content of the beef manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of beef manure applied to the field is not known. The average corn yield was 148 bushels per acre. The average commercial nitrogen fertilizer rate was 118 pounds per acre.

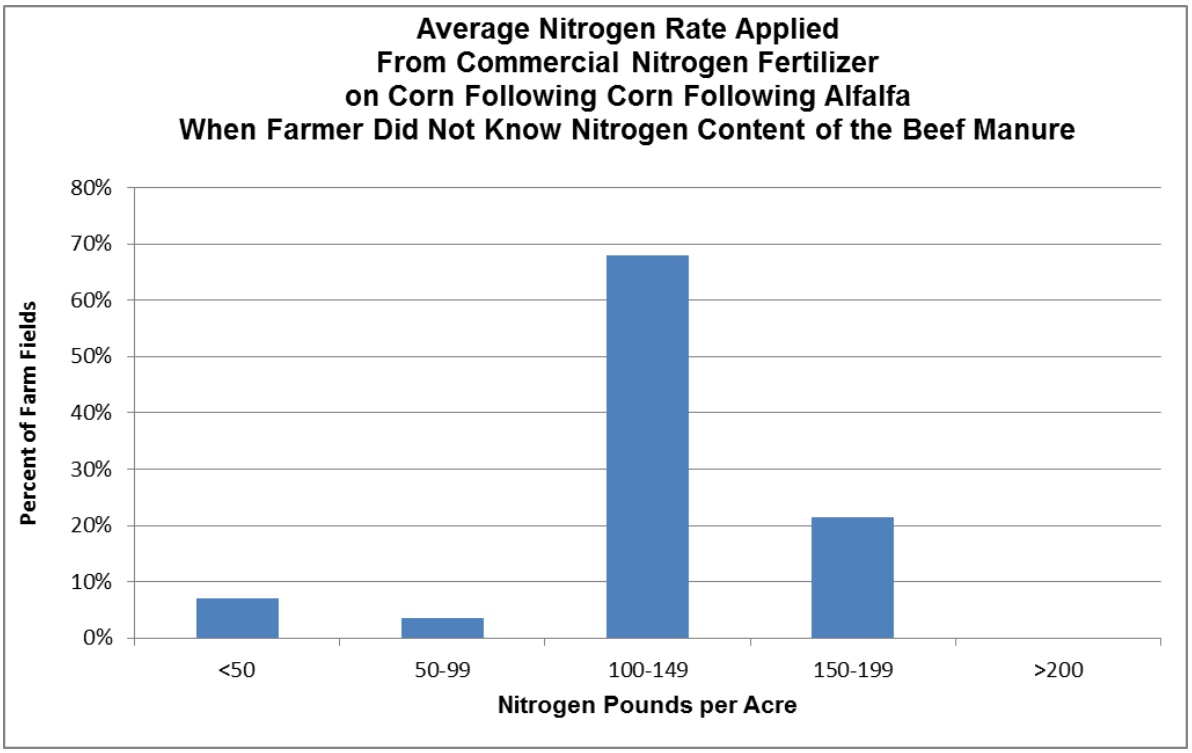

Figure 131. Average nitrogen rates applied to corn following corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2012 when the beef manure nitrogen content is unknown: 28 fields.

Less than five farmers reported planting corn following alfalfa in Minnesota on fields applied:

- With beef manure or with beef manure and commercial nitrogen fertilizer.
- With beef manure and no commercial nitrogen fertilizer.
- With beef manure and commercial nitrogen fertilizer.

Figure 132 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following alfalfa when the farmer did not know the nitrogen content of the beef manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of beef manure applied to the field is not known. The average corn yield was 164 bushels per acre. The average commercial nitrogen fertilizer rate was 89 pounds per acre.

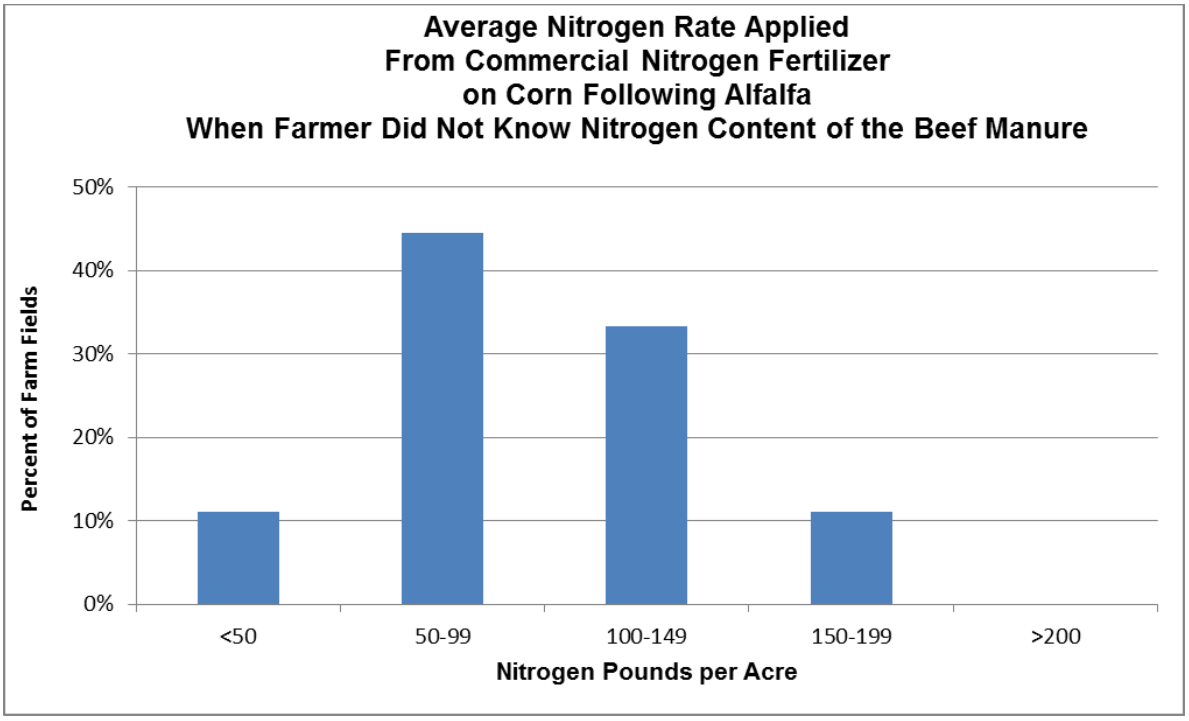

Figure 132. Average nitrogen rates applied to corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2012 when the beef manure nitrogen content is unknown: 9 fields.

Less than five farmers reported planting corn following small grains in Minnesota on fields applied:

- With beef manure or with beef manure and commercial nitrogen fertilizer.
- With beef manure and no commercial nitrogen fertilizer.
- With beef manure and commercial nitrogen fertilizer.

Figure 133 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following small grains when the farmer did not know the nitrogen content of the beef manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of beef manure applied to the field is not known. The average corn yield was 154 bushels per acre. The average commercial nitrogen fertilizer rate was 100 pounds per acre.

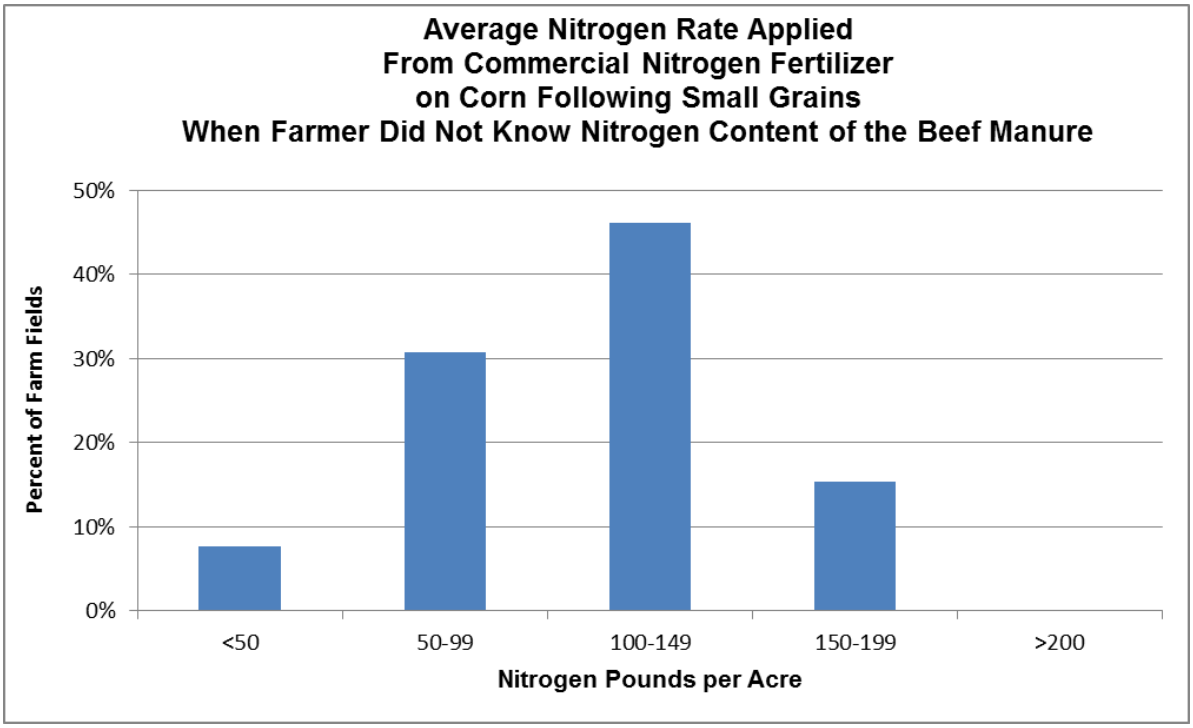

Figure 133. Average nitrogen rates applied to corn following small grains from commercial nitrogen fertilizer in Minnesota for 2012 when the beef manure nitrogen content is unknown: 13 fields.

Less than five farmers reported planting corn following other crops in Minnesota on fields applied:

- With beef manure or with beef manure and commercial nitrogen fertilizer.
- With beef manure and no commercial nitrogen fertilizer.
- With beef manure and commercial nitrogen fertilizer.

Figure 134 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef manure and commercial nitrogen fertilizer to corn following other crops when the farmer did not know the nitrogen content of the beef manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of beef manure applied to the field is not known. The average corn yield was 147 bushels per acre. The average commercial nitrogen fertilizer rate was 116 pounds per acre.

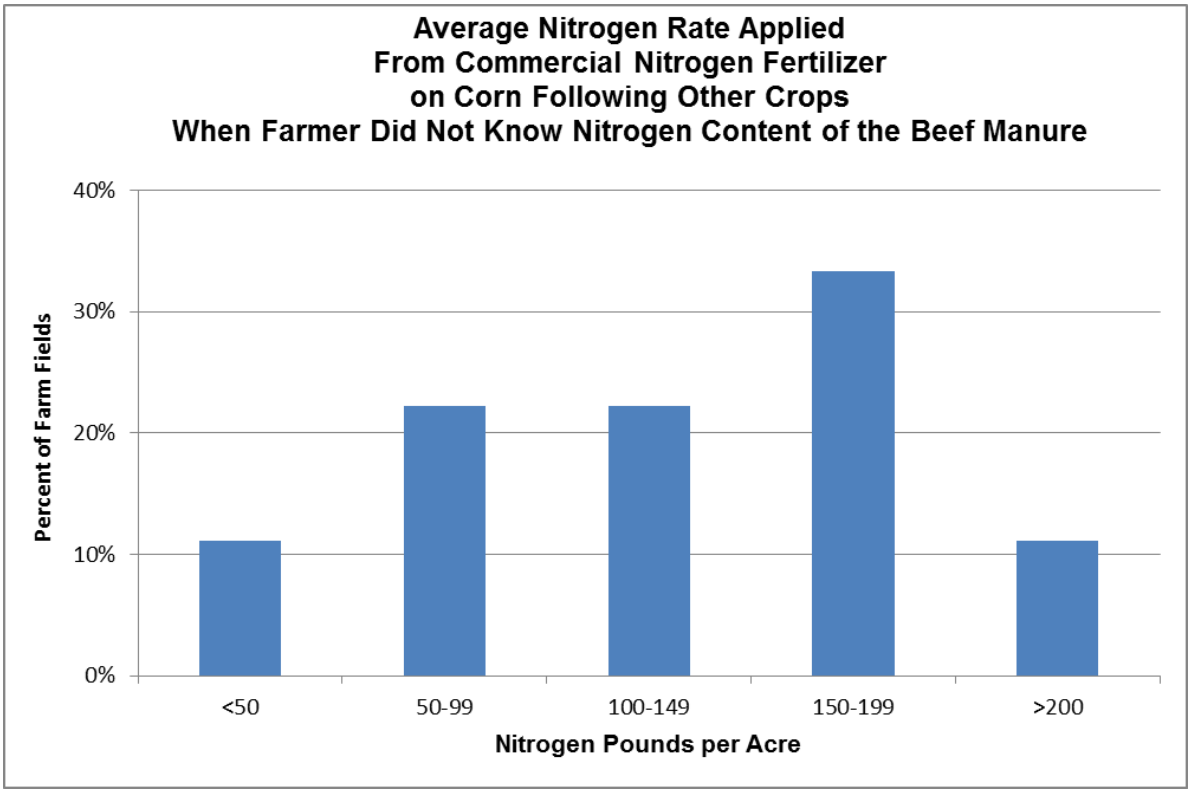

Figure 134. Average nitrogen rates applied to corn following other crops from commercial nitrogen fertilizer in Minnesota for 2012 when the beef manure nitrogen content is unknown: 9 fields.

Manure Applications from Hog Manure

Figure 135 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure or hog manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 179 bushels per acre. The average nitrogen rate applied from hog manure was 141 pounds per acre, and the average commercial nitrogen fertilizer rate was 38 pounds per acre for an average total of 179 pounds of nitrogen per acre.

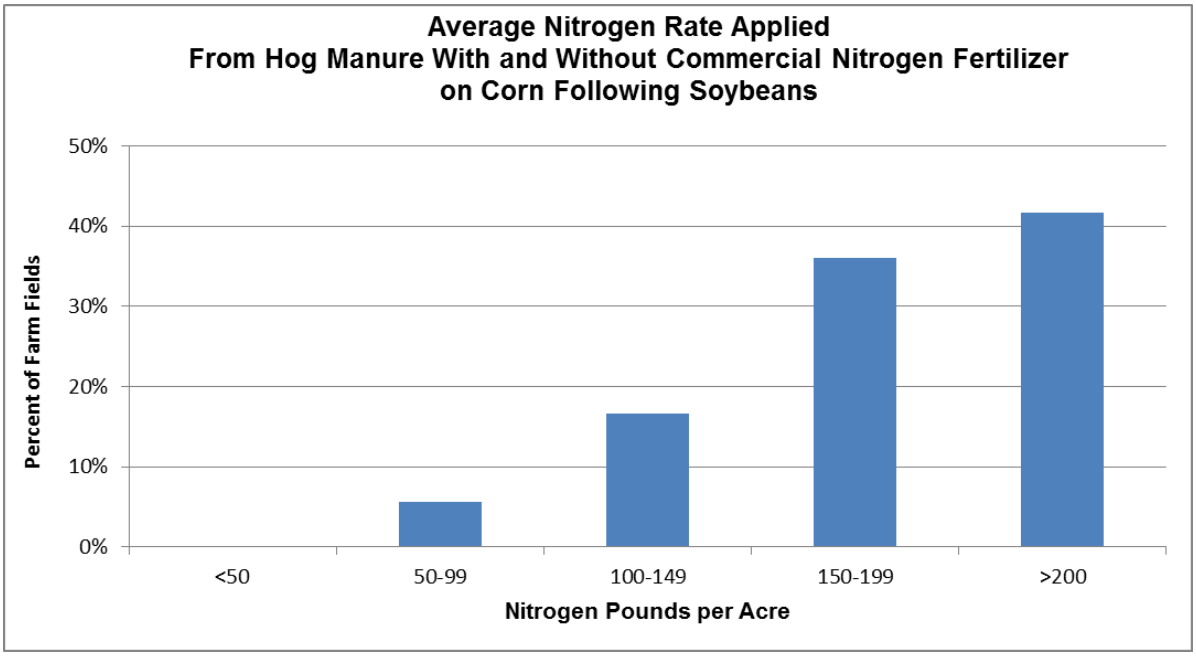

Figure 135. Average nitrogen rates applied to corn following soybeans from hog manure or hog manure and commercial nitrogen fertilizer in Minnesota for 2012: 36 fields.

Figure 136 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and no commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, and MQ-11). The average corn yield was 175 bushels per acre. The average nitrogen rate applied from hog manure was 157 pounds per acre.

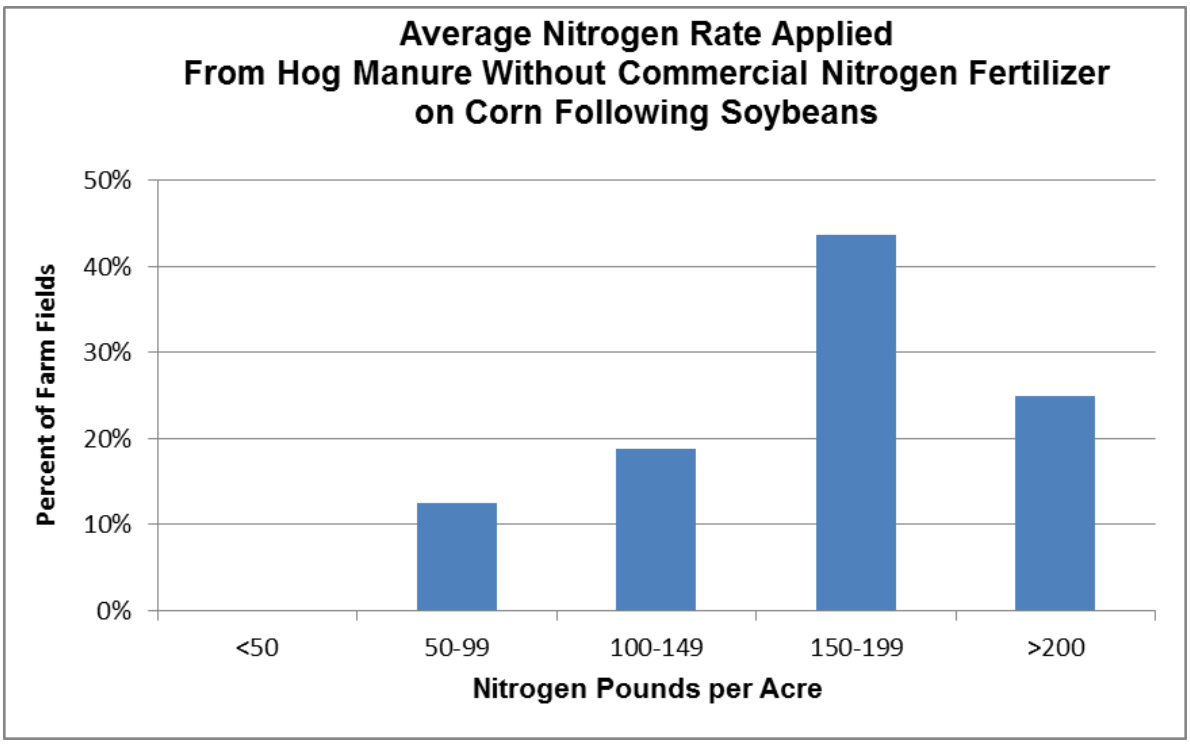

Figure 136. Average nitrogen rates applied to corn following soybeans from hog manure and no commercial nitrogen fertilizer in Minnesota for 2012: 16 fields.

Figure 137 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 182 bushels per acre. The average nitrogen rate applied from hog manure was 129 pounds per acre, and the average commercial nitrogen fertilizer rate was 68 pounds per acre for an average total of 197 pounds of nitrogen per acre.

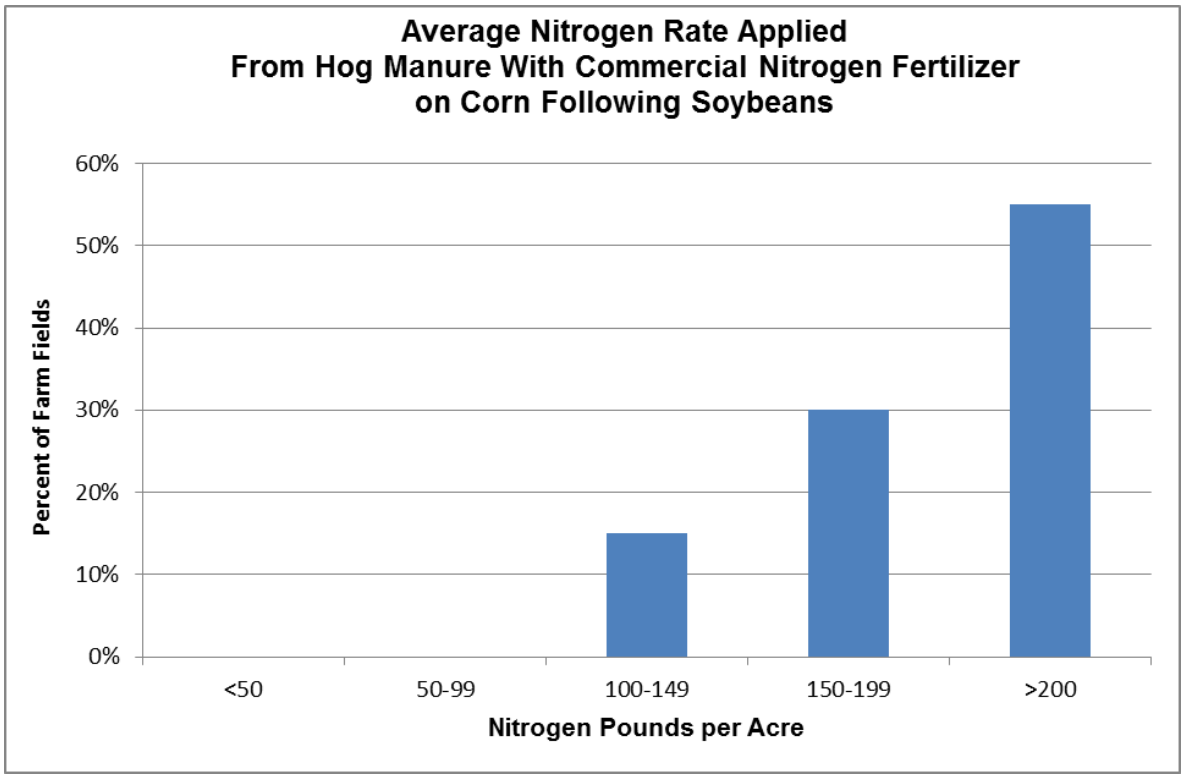

Figure 137. Average nitrogen rates applied to corn following soybeans from hog manure and commercial nitrogen fertilizer in Minnesota for 2012: 20 fields.

Figure 138 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and commercial nitrogen fertilizer to corn following soybeans when the farmer did not know the nitrogen content of the hog manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of hog manure applied to the field is not known. The average corn yield was 168 bushels per acre. The average commercial nitrogen fertilizer rate was 109 pounds per acre.

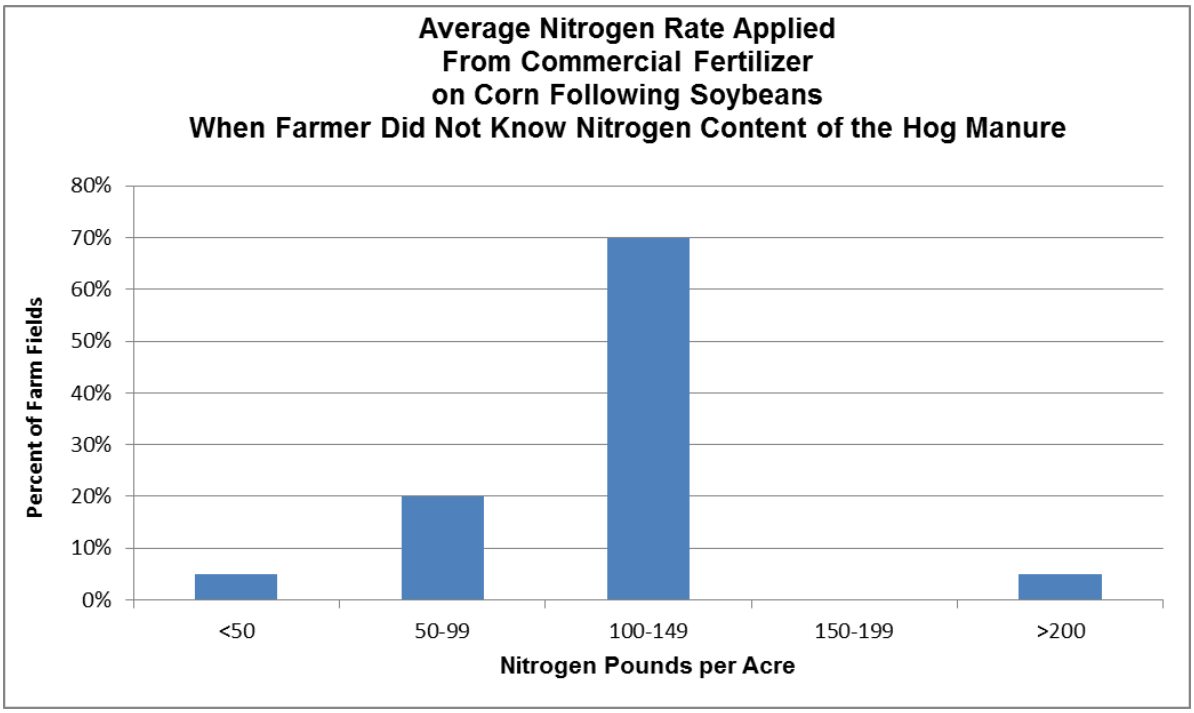

Figure 138. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2012 when the hog manure nitrogen content is unknown: 20 fields.

Figure 139 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure or hog manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 179 bushels per acre. The average nitrogen rate applied from hog manure was 121 pounds per acre, and the average commercial nitrogen fertilizer rate was 56 pounds per acre for an average total of 177 pounds of nitrogen per acre.

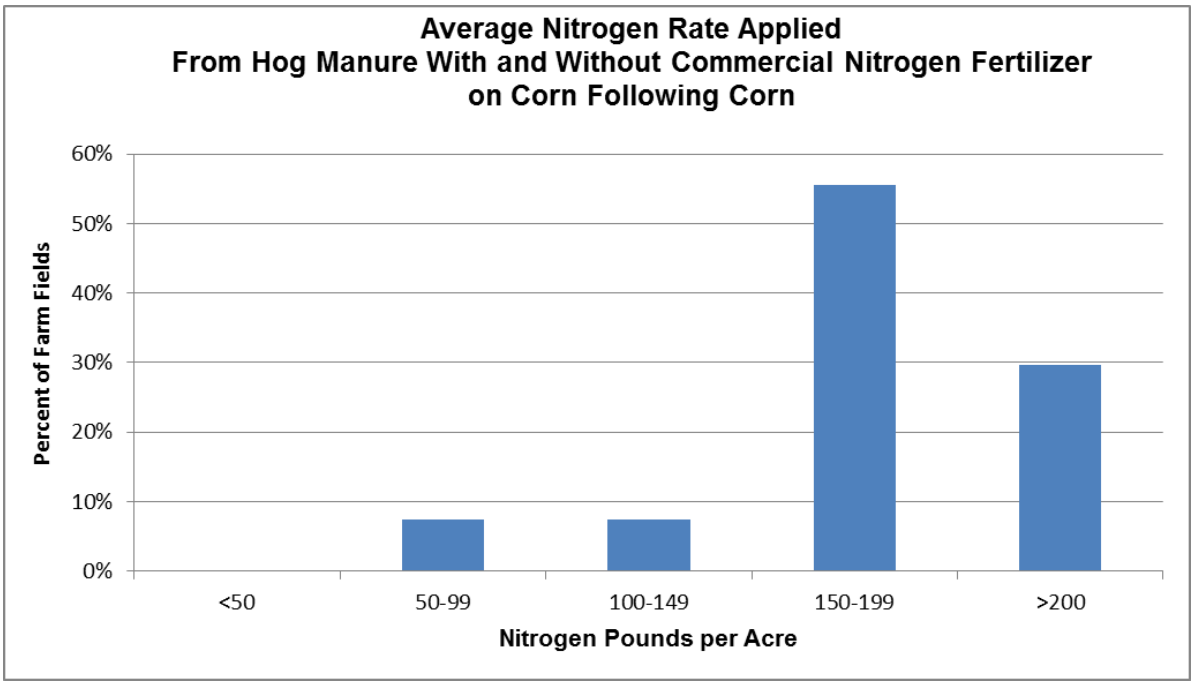

Figure 139. Average nitrogen rates applied to corn following corn from hog manure or hog manure and commercial nitrogen fertilizer in Minnesota for 2012: 27 fields.

Figure 140 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and no commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, and MQ-11). The average corn yield was 182 bushels per acre. The average nitrogen rate applied from hog manure was 133 pounds per acre.

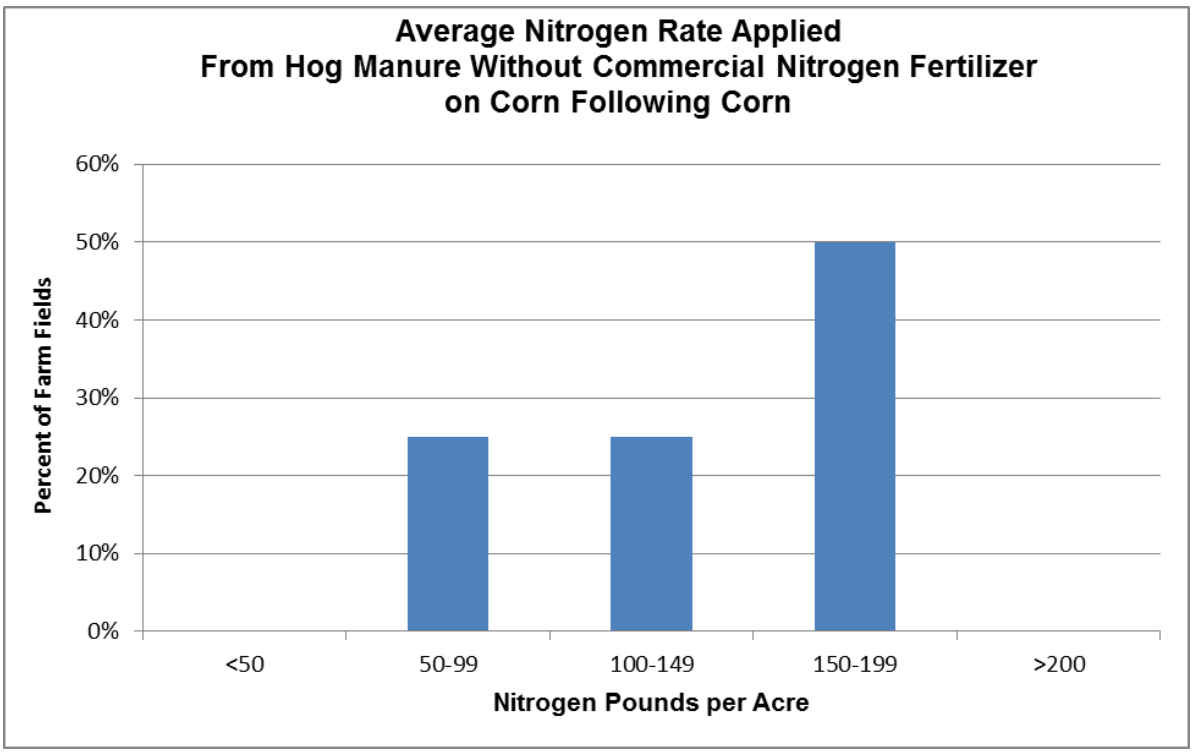

Figure 140. Average nitrogen rates applied to corn following corn from hog manure and no commercial nitrogen fertilizer in Minnesota for 2012: 8 fields.

Figure 141 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 178 bushels per acre. The average nitrogen rate applied from hog manure was 117 pounds per acre, and the average commercial nitrogen fertilizer rate was 79 pounds per acre for an average total of 196 pounds of nitrogen per acre.

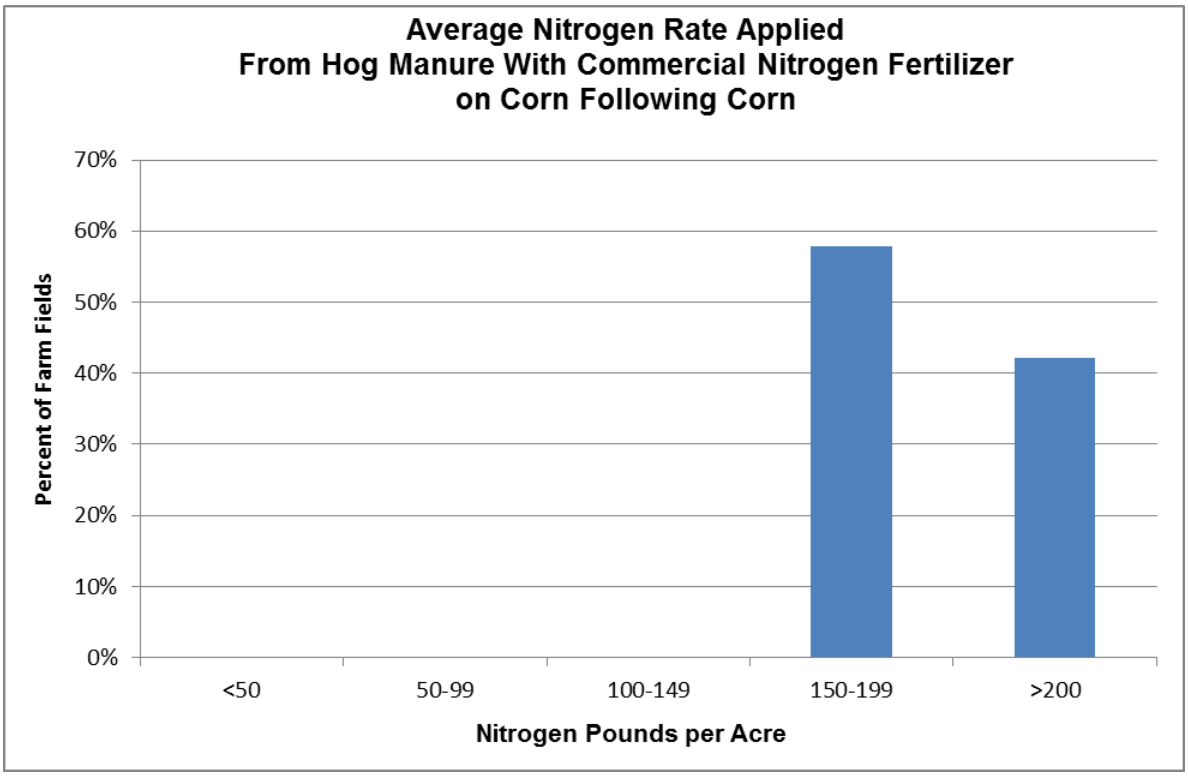

Figure 141. Average nitrogen rates applied to corn following corn from hog manure and commercial nitrogen fertilizer in Minnesota for 2012: 19 fields.

Figure 142 details the distribution of average nitrogen rates in Minnesota from farmers that applied hog manure and commercial nitrogen fertilizer to corn following corn when the farmer did not know the nitrogen content of the hog manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of hog manure applied to the field is not known. The average corn yield was 161 bushels per acre. The average commercial nitrogen fertilizer rate was 113 pounds per acre.

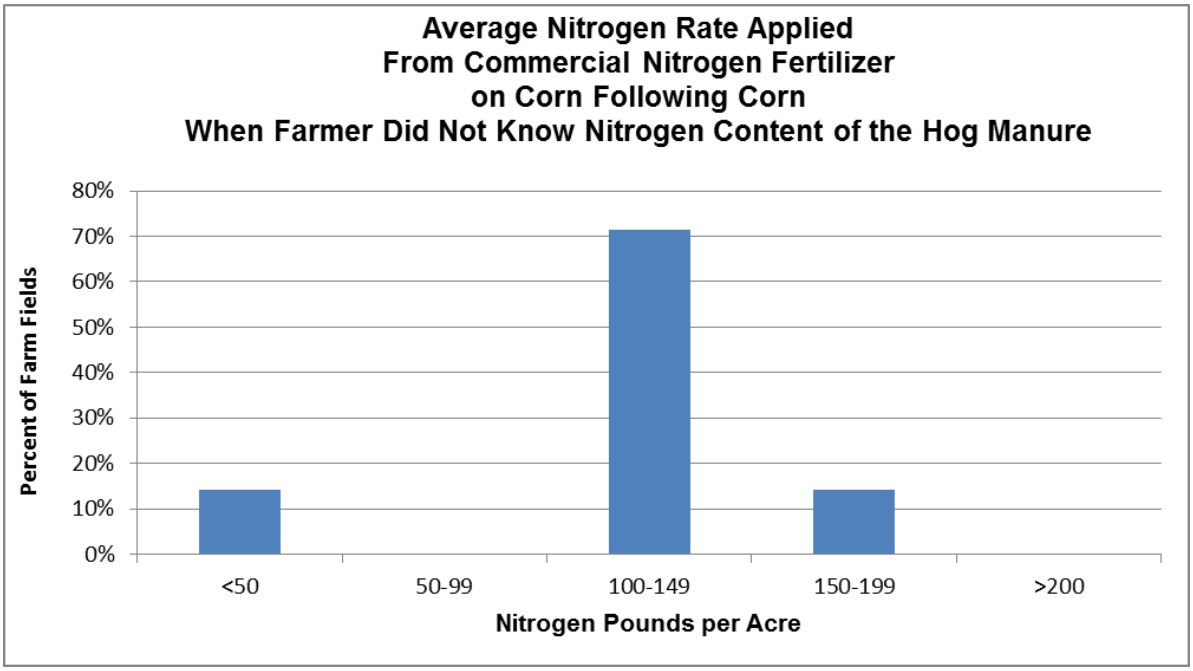

Figure 142. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2012 when the hog manure nitrogen content is unknown: 7 fields.

Other survey results:

Less than five farmers reported planting corn following corn following alfalfa in Minnesota on fields applied:

- With hog manure or with hog manure and commercial nitrogen fertilizer.
- With hog manure and no commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer when the nitrogen content of the hog manure is not known.

Other survey results:

Less than five farmers reported planting corn following alfalfa in Minnesota on fields applied:

- With hog manure or with hog manure and commercial nitrogen fertilizer.
- With hog manure and no commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer when the nitrogen content of the hog manure is not known.

Other survey results:

Less than five farmers reported planting corn following small grains in Minnesota on fields applied:

- With hog manure or with hog manure and commercial nitrogen fertilizer.
- With hog manure and no commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer when the nitrogen content of the hog manure is not known.

Other survey results:

Less than five farmers reported planting corn following other crops in Minnesota on fields applied:

- With hog manure or with hog manure and commercial nitrogen fertilizer.
- With hog manure and no commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer.
- With hog manure and commercial nitrogen fertilizer when the nitrogen content of the hog manure is not known.

Manure Applications from Poultry Manure

Figure 143 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure or poultry manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 139 bushels per acre. The average nitrogen rate applied from poultry manure was 156 pounds per acre, and the average commercial nitrogen fertilizer rate was 23 pounds per acre for an average total of 179 pounds of nitrogen per acre.

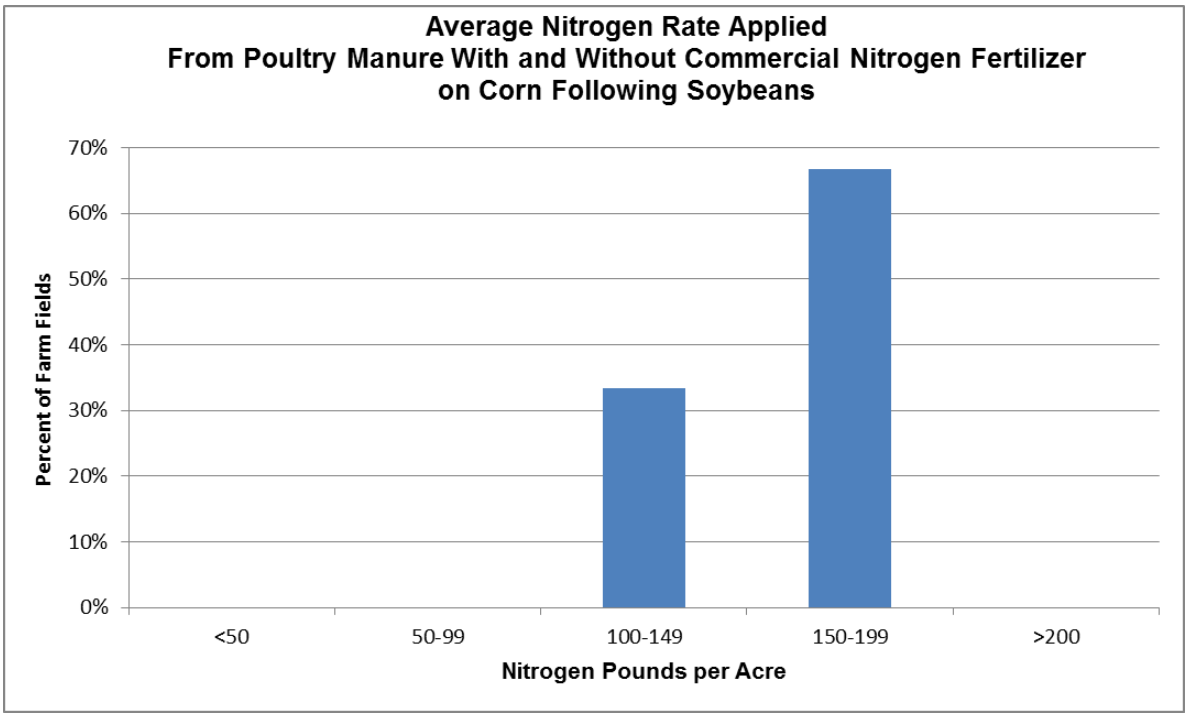

Figure 143. Average nitrogen rates applied to corn following soybeans from poultry manure or poultry manure and commercial nitrogen fertilizer in Minnesota for 2012: 9 fields.

Figure 144 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure and no commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, and MQ-11). The average corn yield was 162 bushels per acre. The average nitrogen rate applied from poultry manure was 151 pounds per acre.

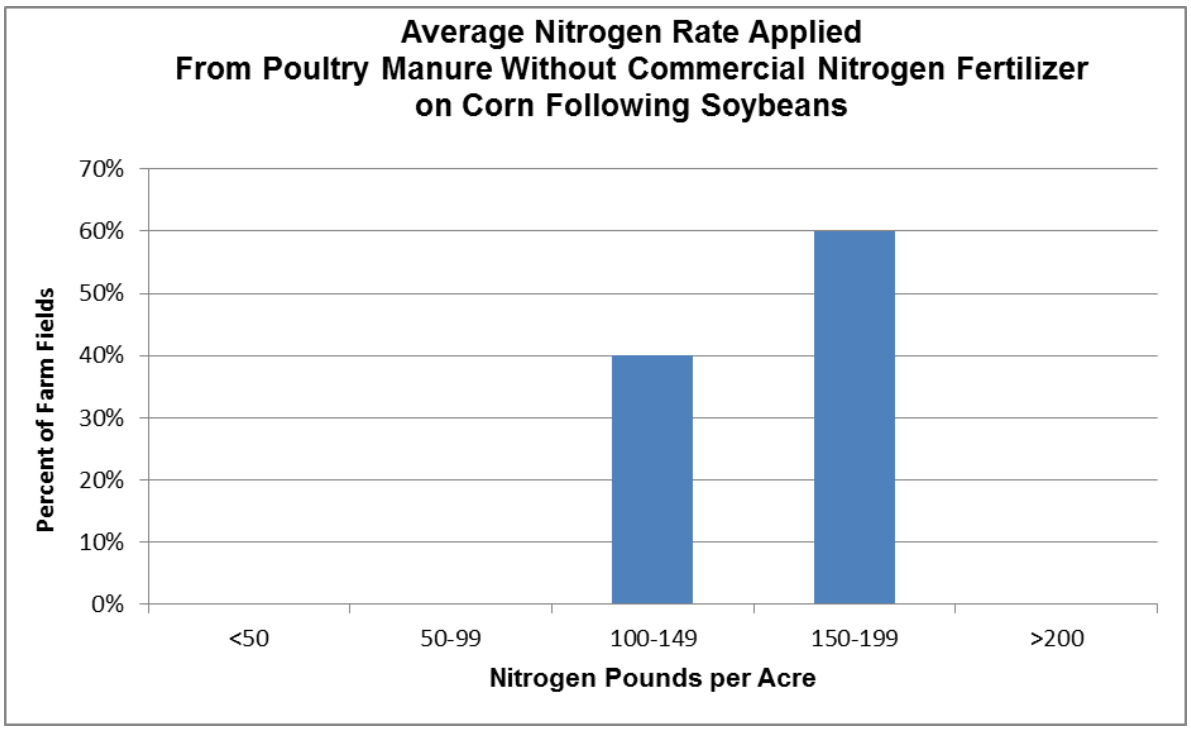

Figure 144. Average nitrogen rates applied to corn following soybeans from poultry manure and no commercial nitrogen fertilizer in Minnesota for 2012: 5 fields.

Less than five farmers reported planting corn following soybeans in Minnesota on fields applied with poultry manure and commercial nitrogen fertilizer.

Figure 145 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure and commercial nitrogen fertilizer to corn following soybeans when the farmer did not know the nitrogen content of the poultry manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of poultry manure applied to the field is not known. The average corn yield was 149 bushels per acre. The average commercial nitrogen fertilizer rate was 116 pounds per acre.

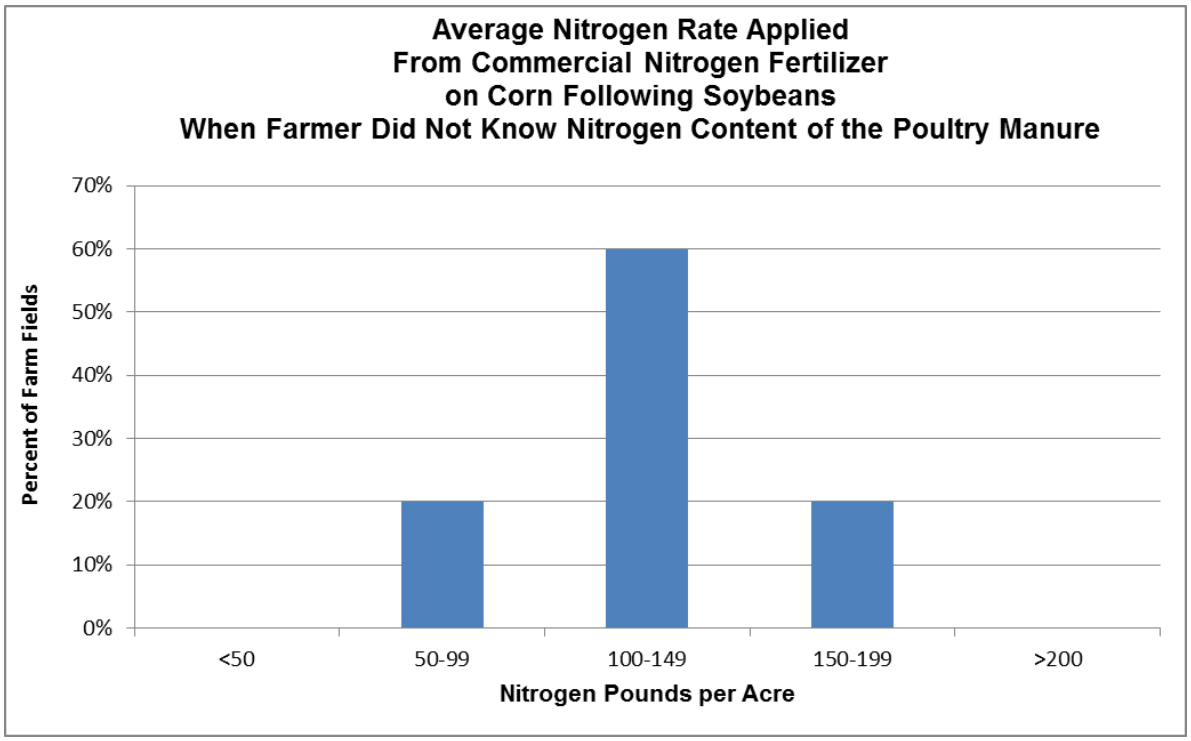

Figure 145. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2012 when the poultry manure nitrogen content is unknown: 5 fields.

Figure 146 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure or poultry manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 151 bushels per acre. The average nitrogen rate applied from poultry manure was 127 pounds per acre, and the average commercial nitrogen fertilizer rate was 64 pounds per acre for an average total of 191 pounds of nitrogen per acre.

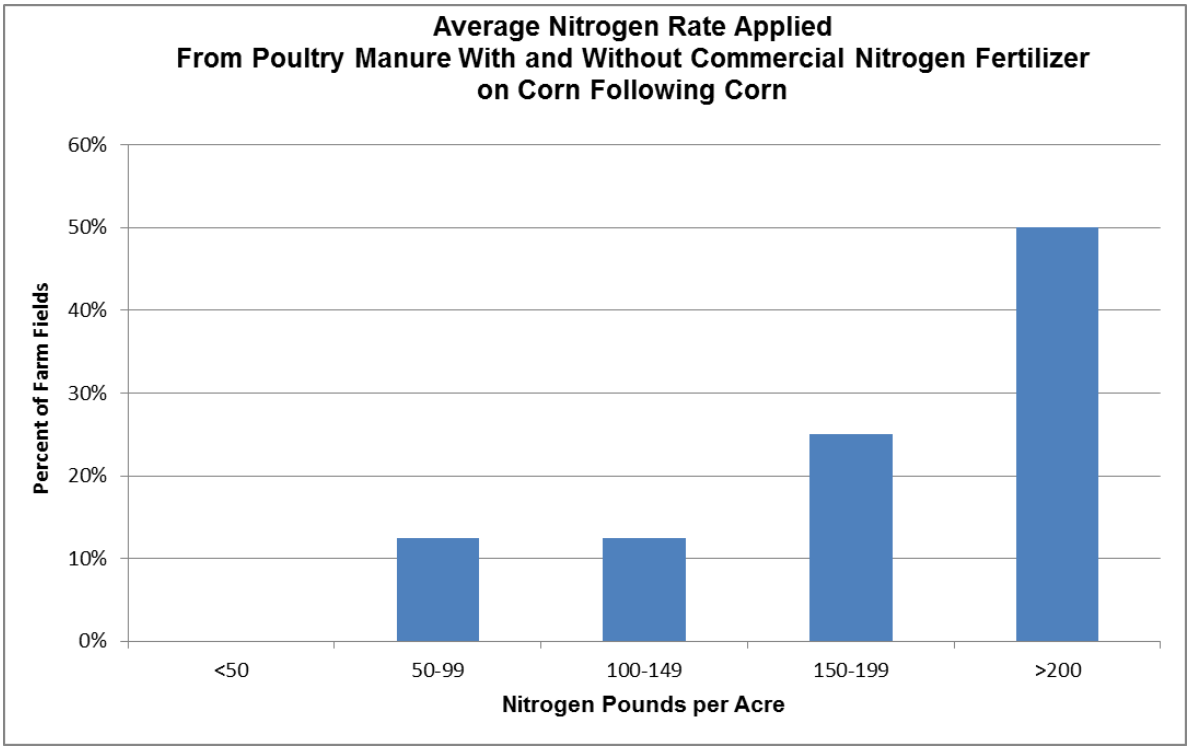

Figure 146. Average nitrogen rates applied to corn following corn from poultry manure or poultry manure and commercial nitrogen fertilizer in Minnesota for 2012: 8 fields.

Less than five farmers reported planting corn following corn in Minnesota on fields applied with poultry manure and no commercial nitrogen fertilizer.

Figure 147 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 152 bushels per acre. The average nitrogen rate applied from poultry manure was 112 pounds per acre, and the average commercial nitrogen fertilizer rate was 85 pounds per acre for an average total of 197 pounds of nitrogen per acre.

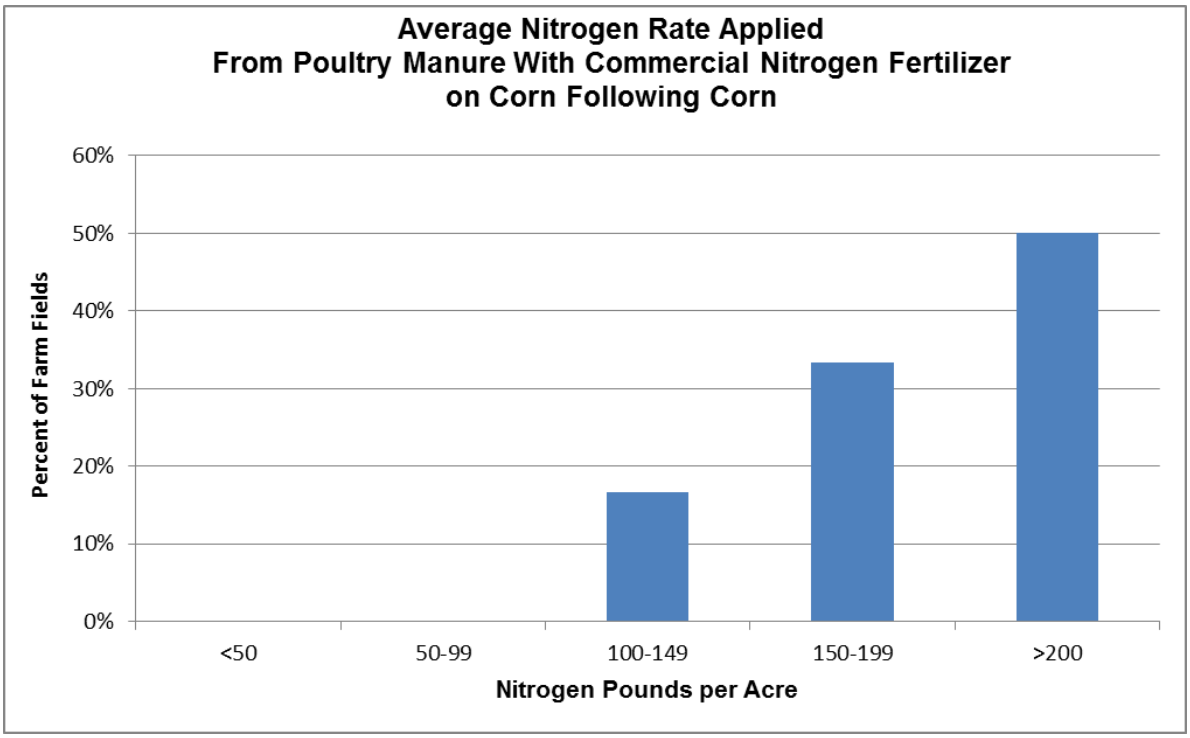

Figure 147. Average nitrogen rates applied to corn following corn from poultry manure and commercial nitrogen fertilizer in Minnesota for 2012: 6 fields.

Less than five farmers reported planting corn following corn in Minnesota on fields applied with poultry manure and commercial nitrogen fertilizer when the nitrogen content of the poultry manure is not known.

Other survey results:

Less than five farmers reported planting corn following corn following alfalfa in Minnesota on fields applied:

- With poultry manure or with poultry manure and commercial nitrogen fertilizer.
- With poultry manure and no commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer when the nitrogen content of the poultry manure is not known.

Other survey results:

Less than five farmers reported planting corn following alfalfa in Minnesota on fields applied:

- With poultry manure or with poultry manure and commercial nitrogen fertilizer.
- With poultry manure and no commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer when the nitrogen content of the poultry manure is not known.

Other survey results:

Less than five farmers reported planting corn following small grains in Minnesota on fields applied:

- With poultry manure or with poultry manure and commercial nitrogen fertilizer.
- With poultry manure and no commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer when the nitrogen content of the poultry manure is not known.

Other survey results:

Less than five farmers reported planting corn following other crops in Minnesota on fields applied:

- With poultry manure or with poultry manure and commercial nitrogen fertilizer.
- With poultry manure and no commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer.
- With poultry manure and commercial nitrogen fertilizer when the nitrogen content of the poultry manure is not known.

Statewide Manure Use and Practices

Table 79 details the percentage of respondents that applied manure using variable rate technology (MQ-12).

Table 79. Manure applications using variable rate technology.

BMP Region	Manure Applications Using Variable Rate	Percentage of Respondents
Northwestern	Yes	11
Northwestern	No	89
Irrigated and non-irrigated sandy soils	Yes	15
Irrigated and non-irrigated sandy soils	No	85
Southwestern and West Central	Yes	12
Southwestern and West Central	No	88
South Central	Yes	19
South Central	No	81
Southeastern	Yes	17
Southeastern	No	83
Statewide	Yes	16
Statewide	No	84

Table 80 details the percentage of respondents that knew the manure application rate (MQ-13).

Table 80. Farmer's knowledge of manure application rates.

BMP Region	Knowledge of Manure Application Rates	Percentage of Respondents
Northwestern	Yes	50
Northwestern	No	50
Irrigated and non-irrigated sandy soils	Yes	38
Irrigated and non-irrigated sandy soils	No	62
Southwestern and West Central	Yes	48
Southwestern and West Central	No	52
South Central	Yes	46
South Central	No	54
Southeastern	Yes	44
Southeastern	No	56
Statewide	Yes	44
Statewide	No	56

Table 81 details the application rate for liquid manure, if known by the farmer (MQ-14).

Table 81. Rates for liquid manure applications by region.

BMP Region	Average Gallons per Acre
Northwestern	6,500
Irrigated and non-irrigated sandy soils	7,235
Southwestern and West Central	4,938
South Central	4,944
Southeastern	6,559
Statewide	5,840

Table 82 details the application rate for solid manure, if known by the farmer (MQ-14).

Table 82. Rates for solid manure applications by region.

BMP Region	Average Tons per Acre
Northwestern	8.29
Irrigated and non-irrigated sandy soils	6.55
Southwestern and West Central	6.54
South Central	6.00
Southeastern	8.41
Statewide	6.83

Table 83 details the percent of farmers who applied commercial fertilizer on the manured field (MQ-15).

Table 83. Commercial fertilizer applications on manured fields by region.

BMP Region	Application of Commercial Fertilizer to Manured Field	Percentage of Respondents
Northwestern	Yes	67
Northwestern	No	33
Irrigated and non-irrigated sandy soils	Yes	72
Irrigated and non-irrigated sandy soils	No	28
Southwestern and West Central	Yes	69
Southwestern and West Central	No	31
South Central	Yes	69
South Central	No	31
Southeastern	Yes	71
Southeastern	No	29
Statewide	Yes	70
Statewide	No	30

Table 84 details the amount of nitrogen applied to the manured field from commercial nitrogen by livestock type (MQ-16).

Table 84. Average amount of nitrogen from commercial fertilizer applied to manured fields by livestock type.

BMP Region	Main Source of Manure	Average Nitrogen Rate From Commercial Fertilizer Pounds per Acre
Northwestern	All	109
Northwestern	Dairy	**
Northwestern	Beef	105
Northwestern	Hog	**
Northwestern	Poultry	**
Irrigated and non-irrigated sandy soils	All	100
Irrigated and non-irrigated sandy soils	Dairy	94
Irrigated and non-irrigated sandy soils	Beef	106
Irrigated and non-irrigated sandy soils	Hog	102
Irrigated and non-irrigated sandy soils	Poultry	95
Irrigated and non-irrigated sandy soils	Other	94
Southwestern and West Central	All	102
Southwestern and West Central	Dairy	111
Southwestern and West Central	Beef	107
Southwestern and West Central	Hog	89
Southwestern and West Central	Poultry	**
Southwestern and West Central	Other	106
South Central	All	115
South Central	Dairy	109
South Central	Beef	135
South Central	Hog	86
South Central	Poultry	**
South Central	Other	117
Southeastern	All	108
Southeastern	Dairy	99
Southeastern	Beef	122
Southeastern	Hog	66
Southeastern	Poultry	**
Southeastern	Other	**
Statewide	All	105
Statewide	Dairy	100
Statewide	Beef	115
Statewide	Hog	88
Statewide	Poultry	95
Statewide	Other	107

****** Less than five responses**.**

Table 85 details the total amount of nitrogen applied to fields from both manure and commercial nitrogen (MQ-10 and MQ-16).

Table 85. Average amount of nitrogen applied to fields from both commercial fertilizer and manure.

BMP Region	Main Source of Manure	Average Nitrogen Rate From Manure And Commercial Fertilizer Pounds per Acre
Northwestern	All	**
Northwestern	Beef	**
Northwestern	Hog	**
Irrigated and non-irrigated sandy soils	All	194
Irrigated and non-irrigated sandy soils	Dairy	192
Irrigated and non-irrigated sandy soils	Beef	170
Irrigated and non-irrigated sandy soils	Hog	**
Irrigated and non-irrigated sandy soils	Poultry	215
Irrigated and non-irrigated sandy soils	Other	**
South Western and West Central	All	198
South Western and West Central	Dairy	190
South Western and West Central	Beef	184
South Western and West Central	Hog	206
South Western and West Central	Poultry	**
South Western and West Central	Other	**
South Central	All	195
South Central	Dairy	212
South Central	Beef	**
South Central	Hog	187
South Central	Poultry	**
South Central	Other	**
Southeastern	All	197
Southeastern	Dairy	204
Southeastern	Beef	196
Southeastern	Hog	193
Southeastern	Poultry	**
Statewide	All	196
Statewide	Dairy	198
Statewide	Beef	181
Statewide	Hog	197
Statewide	Poultry	212
Statewide	Other	**

****** Less than five responses**.**

Table 86 details if the manure applied was from the farmer's livestock (MQ-17).

Table 86. Origin of the manure in regards to livestock ownership source.

BMP Region	Manure From the Farmer's Livestock	Percentage of Respondents
Northwestern	Yes	78
Northwestern	No	22
Irrigated and non-irrigated sandy soils	Yes	91
Irrigated and non-irrigated sandy soils	No	9
Southwestern and West Central	Yes	79
Southwestern and West Central	No	21
South Central	Yes	82
South Central	No	18
Southeastern	Yes	96
Southeastern	No	4
Statewide	Yes	87
Statewide	No	13

Table 87 details when the manure was last tested for nutrients (MQ-18).

Table 87. Date of last test for manure nutrient content.

BMP Region	Last Manure Test	Percentage of Respondents
Northwestern	This Year	7
Northwestern	Last 3 Years	7
Northwestern	Over 3 Years ago	22
Northwestern	Don't Test	64
Irrigated and non-irrigated sandy soils	This year	14
Irrigated and non-irrigated sandy soils	Last 3 years	10
Irrigated and non-irrigated sandy soils	Over 3 years ago	14
Irrigated and non-irrigated sandy soils	Don't test	62
Southwestern and West Central	This year	34
Southwestern and West Central	Last 3 years	14
Southwestern and West Central	Over 3 years ago	13
Southwestern and West Central	Don't test	39
South Central	This year	28
South Central	Last 3 years	6
South Central	Over 3 Years ago	9
South Central	Don't test	57
Southeastern	This year	17
Southeastern	Last 3 ears	17
Southeastern	Over 3 years ago	13
Southeastern	Don't Test	53
Statewide	This year	22
Statewide	Last 3 years	11
Statewide	Over 3 years ago	13
Statewide	Don't test	54

Table 88 details the type of soil test the farmer used in the last five years (MQ-19). The percentage can equal greater than 100 pecent due to some farmers conducting mulitple soils tests within the five year time frame.

Table 88. Types of soil test used in the last five years.

BMP Region	Type of Soil Testing	Percentage of Respondents
Northwestern	Traditional	56
Northwestern	Grid	17
Northwestern	Other	11
Northwestern	None	22
Irrigated and non-irrigated sandy soils	Traditional	64
Irrigated and non-irrigated sandy soils	Grid	11
Irrigated and non-irrigated sandy soils	Zone	2
Irrigated and non-irrigated sandy soils	Other	7
Irrigated and non-irrigated sandy soils	None	25
Southwestern and West Central	Traditional	47
Southwestern and West Central	Grid	36
Southwestern and West Central	Zone	11
Southwestern and West Central	Other	4
Southwestern and West Central	None	13
South Central	Traditional	45
South Central	Grid	29
South Central	Zone	9
South Central	Other	4
South Central	None	14
Southeastern	Traditional	61
Southeastern	Grid	23
Southeastern	Zone	3
Southeastern	Other	6
Southeastern	None	14
Statewide	Traditional	55
Statewide	Grid	23
Statewide	Zone	6
Statewide	Other	6
Statewide	None	20

[§] Totals may be greater than 100 percent

Appendix 1. Survey Form

Survey questions for fertilizer and manure start after the farmer is questioned about pesticide use.

Fertilizer Use Questions Field 1 2012 Crop Season

FIELDS MP102 Part 2 (Corn Field 1)

Setup Question Verify Acres Earlier you reported you planted XXXX acres of corn in 2012. Is that correct? Yes No

Setup Question Ask Acres Earlier you reported that you did NOT plan any corn in 2012. Is that correct? Yes No

Setup Question Corn Did you grow CORN on your operation in 2012? Yes no

N Question 1 Corn Acre How many corn acres were planted for FIELD CORN in 2012?

LeadIn1 I now will ask you questions about your fertilizer and manure inputs on corn acres. First on a corn field or two without manure in the last five years and then on a corn field with manure applied for the 2012 growing season.

N Question 2 No Manure Do you have a corn field WITHOUT manure applied in the last 5 years? Yes No

LeadIn2 Think about an average corn field you planted in 2012 with NO manure or compost applied in the last five years. I will ask you questions about that specific field. All questions should be in relation to that specific field.

N Question 3 Prev Crop What was the crop planted on this field 2012?

Prev Crop =

Soybeans (1) "Soybeans",

Corn (2) "Corn",

Alfalfa (3) "Alfalfa",

Small Grains (4) "Small Grains",

Other (99) "Other"

N Question 3b If Corn was planted, was alfalfa planted in 2011? Yes, no, DK, RF

N Question 4 If Corn Acres How many acres are in this field?

N Question 5 Ave Yield What was the average yield of this field over the last 3 corn crops? Bushels per Acre, DK, RF

N Question 6 Fert Applied Was any commercial nitrogen fertilizer applied to this corn field in 2012? Please include fall applications in 2011 for the 2012 crop year. Yes No

N Question 7 Fert Rate Was any commercial nitrogen fertilizer applied on this field at more than one rate or a variable rate? If yes, use a field average. Yes, No, DK, RF

LeadIn3 I will now ask you for all your commercial fertilizer applications made to this field for the 2012 crop year. These will include fall applications in 2011 for the 2012 crop year, pre-plant and post plant applications including any nitrogen in starters, phosphorus or sulfur sources made for the 2012 crop.

N Question 8 Total N What was the total amount of nitrogen applied PER ACRE on this field? Pounds per Acre, DK, RF

Total N Revised: This is a storage field if respondent corrects Total N pounds in later questions.

N Question 9 N Form What form was the majority of the nitrogen applied on this field?

AnhydAmm (10) Anhydrous Ammonia

Urea (11) "Urea and coated urea such as ESN,

LiquidN (12) "Liquid N such as 28%N, 32%N, or other UAN solutions,

Other (13) "Other",

UNKNOWN (99) "I don't know"

{****Fall Applications Follow****}

N Question 10 FallFert Did you apply any commercial fertilizer in the fall of 2011 for the 2012 crop season? Yes No

N Question 11 FallAnhydrous Did you apply Anhydrous Ammonia in the fall of 2011? Yes No

N Question 12 FallAnhydrous How many pounds per acre of nitrogen were applied as Anhydrous Ammonia? Pounds per Acre, DK, RF

N Question13 FallUrea Did you apply Urea in the fall of 2011? Yes No

N Question 14 FallUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question15 FallLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions in the fall of 2011? Yes No

N Question16 FallLiq_Lb How many pound per acre of nitrogen was applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question17 FallMAP Did you apply any phosphorus sources such as MAP or DAP in the fall of 2011? Yes No

N Question18 FallMAP_Lb How many pounds of nitrogen were applied as MAP or DAP? Pounds per Acre, DK, RF

N Question19 FallOtherN Did you apply other sources of fertilizer in the fall of 2011 that included nitrogen? (Not Potash) Yes No

N Question 20 FallOtherN_Lb How many pounds per acre of nitrogen were applied from other sources of fertilizer? Pounds per Acre, DK, RF

N Question 21 FallVerify_Lb Were all fall sources included in the total nitrogen that you stated earlier? Yes No

N Question 22 FixFall_Lb Originally reported: XXXXXX What is the correct total amount of Nitrogen applied? Yes, No, DK, RF

{****Preplant Applications Follow****}

N Question 23 SprFert Did you apply any commercial fertilizer in the spring as a preplant for the crop season? Yes No

N Question 24 SprAnhydrous Did you apply Anhydrous Ammonia in the spring of 2012? Yes No

N Question 25 SprAnhydrous_Lb How many pounds per acre of nitrogen were applied as Anhydrous Ammonia? Pounds per Acre, DK, RF

N Question 26 SprUrea Did you apply Urea in the spring as a preplant? Yes No

N Question 27 SprUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 28 SprLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions in the spring as a preplant?" Yes No

N Question 29 SprLiq_Lb How many pounds per acre of nitrogen were applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 30 SprMAP Did you apply any phosphorus sources such as MAP or DAP or other dry fertilizer in the spring as a preplant? Yes No

N Question 31 SprMAP_Lb How many pounds per acre of nitrogen were applied as MAP or DAP or other dry fertilizer? Pounds per Acres, DK, RF

N Question 32 SprOtherN Did you apply other sources of fertilizer in the spring as a preplant that included nitrogen? (Not Potash) Yes No

N Question 33 SprOtherN_Lb How many pounds per acre of nitrogen were applied from other sources of fertilizer? Pounds per Acre, DK, RF

Setup Question SprVerify_Lb Were all spring preplant sources included in the total nitrogen Revised pounds that you stated earlier?" Yes No

Setup Question FixSpr What is the correct total amount of nitrogen applied? Pounds per Acre, DK, RF

{****Applications at Planting Follow****}

N Question 34 PltFert Did you apply any commercial fertilizer in the spring as a starter or at planting for the crop season? Yes No

N Question 35 PltUrea Did you apply Urea in the spring as a starter or at planting? Yes No

N Question 36 PltUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 37 PltLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions in the spring as a starter or at planting? Yes No

N Question 38 PltLiq_Lb How many pounds per acre of nitrogen were applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 39 PltMAP Did you apply any phosphorus sources such as MAP or DAP, or 10-34-0 or other dry fertilizer in the spring as a starter or at planting? Yes No

N Question 40 PltMAP_Lb How many pounds per acre of nitrogen were applied as MAP or DAP or other dry fertilizer containing phosphorus? Pounds per Acre, DK, RF

N Question 41 PltOtherN Did you apply other sources of fertilizer in the spring as a starter or at planting that included nitrogen? (Not Potash) Yes No

N Question 42 PltOtherN_Lb How many pounds per acre of nitrogen were applied from other sources of fertilizer? Pounds per Acre, DK, RF

Setup Question PltVerify_Lb Were all planting and starter sources included in the total nitrogen total N revised pounds that you stated earlier?" : Yes No

Setup Question FixPlt_Lb What is the correct total amount of Nitrogen applied? Pounds per Acre, DK, RF

{****Applications at Post Planting Follow****}

N Question 43 PostFert Did you apply any commercial fertilizer after planting such as a sidedress for the crop season? Yes No

N Question 44 PostAnhydrous Did you apply Anhydrous Ammonia post planting such as a sidedress? Yes No

N Question 45 PostAnhydrous_Lb How many pounds per acre of nitrogen were applied as Anhydrous Ammonia? Pounds per Acre, DK, RF

N Question 46 PostUrea Did you apply Urea in the spring as a sidedress? Yes No

N Question 47 PostUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 48 PostLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions after planting such as a sidedress? Yes No

N Question 49 PostLiq_Lb How many pounds per acre of nitrogen were applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 50 PostMAP Did you apply any phosphorus sources such as MAP or DAP or other dry fertilizer after planting such as a sidedress? Yes No

N Question 51 PostMAP_Lb How many pounds per acre of @Bnitrogen@B were applied as MAP or DAP or other dry fertilizer? Pounds per Acre, DK, RF

N Question 52 PostOtherN Did you apply Other sources of fertilizer after planting such as a sidedress that included nitrogen? (Not Potash) Yes No

N Question 53 PostOtherN_Lb How many pounds per acre of @Bnitrogen@B were applied from Other sources of fertilizer? Pounds per Acre, DK, RF

Setup Question **PostVerify_Lb** Were all post plant and sidedress sources included in the total nitrogen that you stated earlier? Yes No

Setup Question **FixPost_Lb** What is the correct total amount of Nitrogen applied? Pounds per Acre, DK, RF

Setup Question **AnotherField** Do you have a corn field with a different crop planted in 2011 than the field we just talked about. It also should NOT have had manure in the past 5 years. For instance, if the field we talked about was corn following corn, do you have a field of corn following soybeans? Yes No

If yes the same nitrogen questions were asked for the second field of corn.

2012 Manure use report

Manure Use Questions 2012 Crop Season

M Question 1. Do you have a corn field that was applied with manure for the 2012 crop year, including manure applied in the fall of 2011? Yes No

M Question 1a. What was the previous crop planted on this field in 2012?

Prev Crop =

Soybeans (1) "Soybeans",

Corn (2) "Corn",

Alfalfa (3) "Alfalfa",

Small Grains (4) "Small Grains",

Other (99) "Other"

M Question 1b. Was alfalfa planted on this field in 2011? Yes No

LeadIn2, Think about an average corn field you planted in 2012 with manure applied for the 2012 growing season. (Includes manure applications in the fall of 2011 for the 2012 crop.) I will ask you questions about that specific field. All questions should be in relation to that specific field.

M Question 2. ManAcre, How many acres are in the field?

M Question 3. ManYld, What was the average yield of this field over the last three corn crops?

M Question 4. ManWhole, Did the whole field receive manure? Yes No

M Question 5. ManSource, What is the main source of manure used on this field?

Dairy (1) "Dairy",
Beef (2) "Beef",
Hog (3) "Hog",
Poultry (4) "Poultry",
Other (5) "Other",
DoNotKnow (99) "Don't Know"

M Question 6. ManType, Was the manure applied solid or liquid?

Solid (1) "Solid",
Liquid (2) "Liquid"

M Question 6a. ManLiquidMethod, What was the method of application of manure on this field?

Sweep (1) "Sweep Injection",
Knife (2) "Knife Injection",
Disc (3) "Disc Injection",
BroadCast1 (4) "Broadcast Incorporation within one day",
BroadCast2 (5) "Broadcast Incorporation within two to four days",
BroadCast4 (6) "Broadcast Incorporation over 4 days",
Broadcast None (7) Broadcast any Incorporation

M Question 6b. ManSolidMethod, What was the method of application of manure on this field?

BroadCast1 (4) "Broadcast Incorporation within one day",
BroadCast2 (5) "Broadcast Incorporation within two to four days",
BroadCast4 (6) "Broadcast Incorporation over 4 days",
Broadcast None (7) Broadcast any Incorporation

M Question 7. ManAppDate, What was the approximate date of the manure application

Date (1) "Approximate Date",
Periodic (2) "Over a period of time"

M Question 7a. ManOneDate, What was the approximate date the manure was applied?

M Question 7b. ManPeriodic, When was the manure applied?

Daily (1) "Daily",
Weekly (2) "Weekly",
Monthly (3) "Monthly",
Other (4) "Other"

M Question 8. ManPrior, Prior to the manure application for the 2012 season, when was the last application of manure on this field?

M Question 9. ManMiles, How many miles from the manure storage/source to the field?

M Question 10. ManN, Do you know the actual amount of Nitrogen applied from this manure? Yes No

M Question 11. ManN_Lb, What is the total Nitrogen applied from the manure as pounds per acre?

M Question 12. ManVarTech, Was the manure on this field applied using variable rate technology? Yes No

M Question 13. ManRate, do you know the manure application rate in gallons per acre or tons per acre? Yes No

M Question 14. ManRateAmt, what is the application rate on this field?

M Question 14a. ManRateUnit, what is the unit?
Gallons (1) "Gallons per Acre",
Tons (2) "Tons per Acre"

M Question 15. ManFert, did you also apply commercial fertilizers to this field for the 2012crop year? Yes No

M Question 16. ManFertAmt, what was the total amount of Nitrogen applied PER ACRE to this field from commercial fertilizer for the 2012 crop year, including all sources. Don't forget the starter may include Nitrogen as well as phosphorus or sulfur sources.

M Question 17. ManOwn, Was this manure from your own farm operation? Yes No

M Question 18. ManTest, When was your manure last tested for nutrient content?
This Year (1) "This year (include 2011 applications for the 2012 crop year)",
Last3 (2) "Last 3 years",
Over3 (3) "Over 3 years ago"
Don't Test (4) "Don't Test"

M Question 19. SoilSamp1 - SoilSamp5, What type of soil sampling do you use? List all that you used in the last 5 years.
Traditional (1) "Traditional",
Grid (2) "Grid",
Zone (3) "Zone",
Other (4) "Other",
None (5) "None"