



Commercial Nitrogen and Manure Fertilizer Selection and Management Practices Associated with Minnesota's 2014 Corn Crop

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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 promoting the adoption of associated BMPs. This survey was designed and conducted in partnership with the National Agricultural Statistics Service (NASS) to specifically assess the status of BMP awareness and adoption in relation to the use of nitrogen on corn acres through the use of commercial nitrogen and manure.

In Minnesota, nitrate is detected frequently in groundwater and surface water resources. Nitrate may exceed the drinking water standards in groundwater in some areas, and sometimes exceeds the drinking water standard in surface water. The MDA has invested considerable staff time in water monitoring, development of BMP education programs, and BMP assessment. Nitrogen is the primary focus of this survey and is present in commercial fertilizer and manure. Phone enumerators located at NASS attempted to contact 7,600 producers in early 2015. From this pool, approximately 2,100 farmers who raised corn during the 2014 growing season, or applied manure on corn acres were interviewed. Information collected included application 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. This included 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. In 2012, the survey was expanded to include additional analysis of corn acres applied with manure, while the wheat portion of the survey was not repeated. Readers are encouraged to visit the three reports from this survey: "2009 Survey of Nitrogen Fertilizer Use", the "Fertilizer and Manure Selection and Management Practices Associated with Minnesota's 2010 Corn and Wheat Production", and the

“Commercial Nitrogen and Manure Fertilizer Selection and Management Practices Associated with Minnesota’s 2012 Corn Crop” at:

<http://www.mda.state.mn.us/protecting/cleanwaterfund/gwdwprotection/nutrientmgmtsurvey.aspx>

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 2013 report can also 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 go 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 mechanism used to collect that data. Excellent participation and good record keeping practices by Minnesota farmers played a vital part in providing complete and detailed manure use information.

2014 Commercial Nitrogen and Manure Use Practices Summary and Highlights

This report summarizes survey results for a number of important practices associated with nitrogen and manure applications on Minnesota’s 2014 corn. Over 2,100 corn producers participated in the telephone survey and information was collected for 545,112 corn acres, representing approximately seven percent of Minnesota’s 7,550,000 harvested corn acres in 2014. Survey questions focused on the 98 percent of the respondents that fertilized corn with manure or nitrogen. This is the fourth 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/nitrogenbmps>. Regional nitrogen use information is used to help design and implement specific water quality monitoring and nitrogen educational programs.

Minnesota Nitrogen Best Management Practices Regions

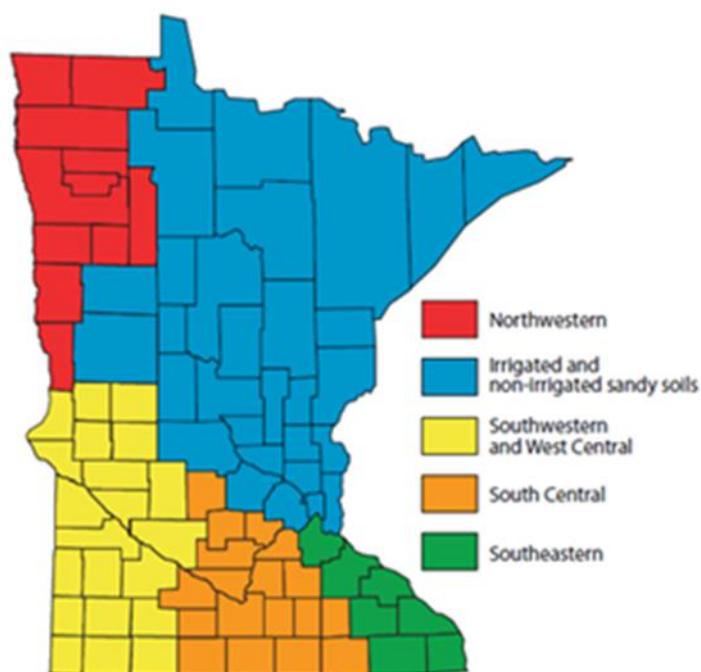


Figure 1. Minnesota nitrogen BMP Regions.

For the purpose of this report the Minnesota nitrogen BMP regions will be 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 2,100 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 pilot¹ 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 pilot² 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

¹ "Expanded Minnesota Agricultural Statistics Pesticide Use Data", 2003, by NASS and MDA.

² Unpublished data. From the September 20, 2003 EPA Report.

incomplete, follow-up calls were made to the pesticide dealer to complete the 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 February 2015. 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 certain columns will be slightly higher in the ‘Totals/Averages’ 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” Understanding Agricultural Statistics website at:
https://www.nass.usda.gov/Education_and_Outreach/Understanding_Statistics/index.php

Statewide Commercial Nitrogen Fertilizer and Manure Applications and Management on Corn

Information on nitrogen management and manure was gathered for an average corn field in the 2014 growing season. Information about management on all crop acres was not collected in this survey⁴. 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 2014?” Then farmers were asked “How many corn acres were planted for field corn in 2014?” Table 1 details the farmers who responded they grew corn and the corresponding acres of corn grown (NQ-1⁵). Counties with no responses are not shown in any table or figure.

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	19	9,274
Kittson	NW	7	525
Mahnomen	NW	**	**
Marshall	NW	6	1,091
Norman	NW	10	4,808
Pennington	NW	**	**
Polk	NW	13	3,133
Red Lake	NW	**	**
Roseau	NW	**	**
Wilkin	NW	15	6,616
Totals/Averages	NW	84	28,406
Anoka	IRR	5	500
Becker	IRR	11	2,736
Beltrami	IRR	6	585
Benton	IRR	24	2,086
Cass	IRR	6	224
Chisago	IRR	12	984
Crow Wing	IRR	6	882
Hennepin	IRR	**	**
Hubbard	IRR	**	**

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.

Commercial Fertilizer and Manure Applications on Corn

County	BMP Region	Number of Respondents	Number of Corn Acres
Isanti	IRR	14	3,039
Kanabec	IRR	11	830
Mille Lacs	IRR	11	1,257
Morrison	IRR	76	9,489
Otter Tail	IRR	71	10,015
Pine	IRR	18	1,892
Sherburne	IRR	8	2,998
Stearns	IRR	114	18,022
Todd	IRR	49	4,851
Wadena	IRR	13	937
Washington	IRR	12	2,104
Wright	IRR	32	4,685
Totals/Averages	IRR	506	68,775
Big Stone	SW	11	3,775
Chippewa	SW	28	10,161
Cottonwood	SW	34	11,272
Douglas	SW	34	6,222
Grant	SW	9	3,932
Jackson	SW	45	17,575
Kandiyohi	SW	28	10,186
Lac qui Parle	SW	28	9,099
Lincoln	SW	19	5,804
Lyon	SW	29	7,486
Murray	SW	35	11,799
Nobles	SW	52	13,531
Pipestone	SW	24	7,526
Pope	SW	29	9,544
Redwood	SW	61	18,011
Renville	SW	46	18,675
Rock	SW	23	6,480
Stevens	SW	26	11,176
Swift	SW	25	11,505
Traverse	SW	14	6,904
Yellow Medicine	SW	30	14,155
Totals/Averages	SW	630	214,818
Blue Earth	SC	46	16,662
Brown	SC	51	11,555
Carver	SC	26	2,461
Dodge	SC	20	5,116
Faribault	SC	32	13,185
Freeborn	SC	47	15,105
Le Sueur	SC	27	4,554
Martin	SC	34	12,387
McLeod	SC	32	8,149
Meeker	SC	30	9,072
Mower	SC	30	11,560
Nicollet	SC	33	12,547
Rice	SC	33	8,123
Scott	SC	18	3,353
Sibley	SC	39	8,625
Steele	SC	28	11,120
Waseca	SC	28	8,531

Commercial Fertilizer and Manure Applications on Corn

County	BMP Region	Number of Respondents	Number of Corn Acres
Watonwan	SC	26	9,508
Totals/Averages	SC	580	171,613
Dakota	SE	23	6,877
Fillmore	SE	54	12,985
Goodhue	SE	62	14,540
Houston	SE	33	3,758
Olmsted	SE	40	7,822
Wabasha	SE	42	8,022
Winona	SE	54	7,496
Totals/Averages	SE	308	61,500
Totals/Averages	State	2,108	545,112

** 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

Corn Acres Previously Planted to Soybeans in Minnesota

Farmers in the survey were then asked, “How many of your corn acres had been planted to soybeans in 2013?” (NQ-2) Table 2 details the farmers who answered yes to this question and the corresponding acres of corn following soybeans.

Table 2. Summary of respondents and corresponding corn acres by county and BMP region for all corn fields previously planted to soybeans in 2013.

County	BMP Region	Number of Corn Acres Previously Planted to Soybeans	Total Corn Acres Surveyed	Percent of Corn Acres Previously Planted to Soybeans
Clay	NW	5,145	9,274	55
Kittson	NW	**	**	**
Mahnomen	NW	**	**	**
Marshall	NW	**	**	**
Norman	NW	3,843	4,808	80
Pennington	NW	**	**	**
Polk	NW	2,232	3,133	71
Red Lake	NW	**	**	**
Roseau	NW	**	**	**
Wilkin	NW	2,781	6,616	42
Totals/Averages	NW	16,866	28,406	59
Anoka	IRR	**	**	**
Becker	IRR	**	**	**
Beltrami	IRR	**	**	**
Benton	IRR	787	2,086	38
Cass	IRR	**	**	**
Chisago	IRR	698	984	71
Crow Wing	IRR	**	**	**
Hennepin	IRR	**	**	**
Hubbard	IRR	**	**	**
Isanti	IRR	978	3,039	32
Kanabec	IRR	**	**	**
Mille Lacs	IRR	752	1,257	60
Morrison	IRR	2,482	9,489	26
Otter Tail	IRR	4,654	10,015	46
Pine	IRR	487	1,892	26
Sherburne	IRR	**	**	**
Stearns	IRR	7,721	18,022	43
Todd	IRR	2,303	4,851	47
Wadena	IRR	**	**	**
Washington	IRR	600	2,104	29
Wright	IRR	2,961	4,685	63
Totals/Averages	IRR	28,089	68,775	41
Big Stone	SW	2,438	3,775	65

Corn Acres Previously Planted to Soybeans In Minnesota

County	BMP Region	Number of Corn Acres Previously Planted to Soybeans	Total Corn Acres Surveyed	Percent of Corn Acres Previously Planted to Soybeans
Chippewa	SW	8,232	10,161	81
Cottonwood	SW	10,297	11,272	91
Douglas	SW	4,890	6,222	79
Grant	SW	1,972	3,932	50
Jackson	SW	13,122	17,575	75
Kandiyohi	SW	6,919	10,186	68
Lac qui Parle	SW	7,497	9,099	82
Lincoln	SW	5,261	5,804	91
Lyon	SW	6,680	7,486	89
Murray	SW	10,319	11,799	87
Nobles	SW	10,400	13,531	77
Pipestone	SW	6,181	7,526	82
Pope	SW	5,499	9,544	58
Redwood	SW	16,183	18,011	90
Renville	SW	11,159	18,675	60
Rock	SW	3,777	6,480	58
Stevens	SW	9,286	11,176	83
Swift	SW	5,077	11,505	44
Traverse	SW	5,702	6,904	83
Yellow Medicine	SW	11,774	14,155	83
Totals/Averages	SW	162,665	214,818	76
Blue Earth	SC	12,016	16,662	72
Brown	SC	6,630	11,555	57
Carver	SC	1,619	2,461	66
Dodge	SC	2,801	5,116	55
Faribault	SC	10,911	13,185	83
Freeborn	SC	9,493	15,105	63
Le Sueur	SC	3,145	4,554	69
Martin	SC	9,087	12,387	73
McLeod	SC	6,817	8,149	84
Meeker	SC	6,196	9,072	68
Mower	SC	8,385	11,560	73
Nicollet	SC	7,241	12,547	58
Rice	SC	4,751	8,123	58
Scott	SC	2,772	3,353	83
Sibley	SC	5,273	8,625	61
Steele	SC	7,123	11,120	64
Waseca	SC	5,179	8,531	61
Watonwan	SC	7,001	9,508	74
Totals/Averages	SC	116,440	171,613	68
Dakota	SE	3,530	6,877	51
Fillmore	SE	4,508	12,985	35
Goodhue	SE	8,955	14,540	62
Houston	SE	1,281	3,758	34
Olmsted	SE	2,755	7,822	35
Wabasha	SE	1,891	8,022	24
Winona	SE	2,632	7,496	35
Totals/Averages	SE	25,552	61,500	42
Totals/Averages	State	349,612	545,112	64

** 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.

Corn Acres Applied with Manure

Farmers in the survey were then asked, “How many acres of your corn acres had manure applied for the 2014 growing season, please include 2013 fall applications of manure?” (NQ-3) Table 3 details the farmers who answered yes to this question and the corresponding acres of corn acres following soybeans.

Table 3. Summary of respondents and corresponding corn acres by county and BMP region for all fields applied with manure for the 2014 crop year.

County	BMP Region	Number of Corn Acres with Manure Applied	Total Corn Acres Surveyed	Percent of Corn Acres Applied with Manure
Clay	NW	525	9,274	6
Kittson	NW	**	**	**
Mahnomen	NW	**	**	**
Marshall	NW	**	**	**
Norman	NW	**	**	**
Pennington	NW	**	**	**
Polk	NW	**	**	**
Red Lake	NW	**	**	**
Roseau	NW	**	**	**
Wilkin	NW	**	**	**
Totals/Averages	NW	1,581	28,406	6
Anoka	IRR	**	**	**
Becker	IRR	770	2,736	28
Beltrami	IRR	**	**	**
Benton	IRR	745	2,086	36
Cass	IRR	**	**	**
Chisago	IRR	**	**	**
Crow Wing	IRR	**	**	**
Hennepin	IRR	**	**	**
Hubbard	IRR	**	**	**
Isanti	IRR	**	**	**
Kanabec	IRR	280	830	34
Mille Lacs	IRR	**	**	**
Morrison	IRR	6,060	9,489	64
Otter Tail	IRR	2,658	10,015	27
Pine	IRR	649	1,892	34
Sherburne	IRR	**	**	**
Stearns	IRR	8,590	18,022	48
Todd	IRR	1,808	4,851	37
Wadena	IRR	307	937	33
Washington	IRR	**	**	**
Wright	IRR	1,018	4,685	22
Totals/Averages	IRR	24,435	68,775	36
Big Stone	SW	**	**	**
Chippewa	SW	732	10,161	7

County	BMP Region	Number of Corn Acres with Manure Applied	Total Corn Acres Surveyed	Percent of Corn Acres Applied with Manure
Cottonwood	SW	2,579	11,272	23
Douglas	SW	1,105	6,222	18
Grant	SW	**	**	**
Jackson	SW	2,218	17,575	13
Kandiyohi	SW	2,269	10,186	22
Lac qui Parle	SW	1,165	9,099	13
Lincoln	SW	1,396	5,804	24
Lyon	SW	1,195	7,486	16
Murray	SW	2,028	11,799	17
Nobles	SW	3,366	13,531	25
Pipestone	SW	1,842	7,526	24
Pope	SW	1,367	9,544	14
Redwood	SW	2,254	18,011	13
Renville	SW	1,695	18,675	9
Rock	SW	2,478	6,480	38
Stevens	SW	1,760	11,176	16
Swift	SW	1,692	11,505	15
Traverse	SW	**	**	**
Yellow Medicine	SW	2,220	14,155	16
Totals/Averages	SW	33,758	214,818	16
Blue Earth	SC	3,850	16,662	23
Brown	SC	2,075	11,555	18
Carver	SC	722	2,461	29
Dodge	SC	843	5,116	16
Faribault	SC	885	13,185	7
Freeborn	SC	2,187	15,105	14
Le Sueur	SC	615	4,554	14
Martin	SC	886	12,387	7
McLeod	SC	662	8,149	8
Meeker	SC	1,480	9,072	16
Mower	SC	2,431	11,560	21
Nicollet	SC	2,397	12,547	19
Rice	SC	1,332	8,123	16
Scott	SC	697	3,353	21
Sibley	SC	891	8,625	10
Steele	SC	1,273	11,120	11
Waseca	SC	2,036	8,531	24
Watonwan	SC	3,110	9,508	33
Totals/Averages	SC	28,372	171,613	17
Dakota	SE	575	6,877	8
Fillmore	SE	2,928	12,985	23
Goodhue	SE	1,290	14,540	9
Houston	SE	1,172	3,758	31
Olmsted	SE	1,417	7,822	18
Wabasha	SE	2,070	8,022	26
Winona	SE	2,593	7,496	35
Totals/Averages	SE	12,045	61,500	20
Totals/Averages	State	100,191	545,112	18

** 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 on Corn

Farmers in the survey were then asked “Do you have a corn field without manure applied in the last five years? (NQ-4)” Table 4 details the farmers who answered yes to this question and the corresponding acres of corn grown. All analysis in this commercial fertilizer section includes nitrogen applications from commercial fertilizer only.

Table 4. Summary of respondents and corresponding corn acres by county and BMP region for all fields without manure within last 5 years.

County	BMP Region	Number of Respondents	Number of Corn Acres
Clay	NW	16	8,495
Kittson	NW	6	415
Mahnomen	NW	**	**
Marshall	NW	**	**
Norman	NW	5	1,293
Pennington	NW	**	**
Polk	NW	7	1,857
Red Lake	NW	**	**
Roseau	NW	**	**
Wilkin	NW	13	6,266
Totals/Averages	NW	61	22,059
Anoka	IRR	**	**
Becker	IRR	5	1,786
Beltrami	IRR	**	**
Benton	IRR	14	1,349
Cass	IRR	5	179
Chisago	IRR	10	872
Crow Wing	IRR	5	837
Hennepin	IRR	**	**
Hubbard	IRR	**	**
Isanti	IRR	10	2,348
Kanabec	IRR	**	**
Mille Lacs	IRR	9	1,029
Morrison	IRR	34	2,975
Otter Tail	IRR	45	7,636
Pine	IRR	10	1,214
Sherburne	IRR	6	2,573
Stearns	IRR	40	6,741
Todd	IRR	32	3,735
Wadena	IRR	6	628
Washington	IRR	9	1,962
Wright	IRR	23	3,638
Totals/Averages	IRR	277	41,077
Big Stone	SW	9	3,460
Chippewa	SW	24	9,779
Cottonwood	SW	24	9,122
Douglas	SW	20	4,013

Commercial Fertilizer Applications on Corn

County	BMP Region	Number of Respondents	Number of Corn Acres
Grant	SW	9	3,932
Jackson	SW	37	16,062
Kandiyohi	SW	17	6,611
Lac qui Parle	SW	20	6,202
Lincoln	SW	14	4,459
Lyon	SW	24	6,601
Murray	SW	30	10,199
Nobles	SW	36	8,761
Pipestone	SW	17	4,861
Pope	SW	24	8,718
Redwood	SW	51	16,370
Renville	SW	36	15,816
Rock	SW	12	4,156
Stevens	SW	20	8,991
Swift	SW	18	9,473
Traverse	SW	11	6,705
Yellow Medicine	SW	25	12,729
Totals/Averages	SW	478	177,020
Blue Earth	SC	38	15,229
Brown	SC	33	8,156
Carver	SC	14	1,631
Dodge	SC	14	4,027
Faribault	SC	24	11,077
Freeborn	SC	40	14,476
Le Sueur	SC	20	3,582
Martin	SC	30	12,100
McLeod	SC	19	6,394
Meeker	SC	17	6,589
Mower	SC	21	9,105
Nicollet	SC	28	11,096
Rice	SC	26	5,654
Scott	SC	12	2,949
Sibley	SC	33	8,020
Steele	SC	17	9,728
Waseca	SC	18	6,046
Watonwan	SC	19	7,595
Totals/Averages	SC	423	143,454
Dakota	SE	17	6,184
Fillmore	SE	36	10,446
Goodhue	SE	46	12,381
Houston	SE	22	2,500
Olmsted	SE	28	5,445
Wabasha	SE	31	6,968
Winona	SE	36	4,874
Totals/Averages	SE	216	48,798
Totals/Averages	Without Manure	1,455	432,408

** 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 5 details the percent of farmers who had a corn field without manure applied by BMP region (NQ-4).

Table 5. Percent of respondents with a corn field without manure applied.

BMP Region	Corn Field Without Manure Applied	Percent of Respondents
Northwestern	Yes	73
Northwestern	No	27
Irrigated and Non-irrigated Sandy Soils	Yes	55
Irrigated and Non-irrigated Sandy Soils	No	45
South Western and West Central	Yes	76
South Western and West Central	No	24
South Central	Yes	73
South Central	No	27
Southeastern	Yes	70
Southeastern	No	30
Statewide	Yes	69
Statewide	No	31

Farmers were asked if they had an additional corn field without the same previous crop as the first corn field. If they did they went through the same process as for the first corn field. All corn fields are included in the analysis for all the following field specific tables. There were 1,672 fields in the commercial fertilizer on corn analysis.

Table 6 details the previous crop planted before the current corn crop by region and the corresponding yield (NQ-4, NQ-5, NQ-6 and NQ-7). For the previous crop of corn/alfalfa, the definition would be corn in 2014, corn in 2013 and alfalfa in 2012.

Table 6. Percent of fields by previous crop and the corresponding corn yields in 2014.

BMP Region	Previous Crop	Percent of Fields	Average Corn Yield Bushels per Acre
Northwestern	Soybeans	51	134
Northwestern	Corn	11	116
Northwestern	Corn/Alfalfa	**	**
Northwestern	Alfalfa	**	**
Northwestern	Small Grains	15	128
Northwestern	Other	18	134
Irrigated and Non-irrigated Sandy Soils	Soybeans	40	130
Irrigated and Non-irrigated Sandy Soils	Corn	33	125
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	6	138
Irrigated and Non-irrigated Sandy Soils	Alfalfa	9	127
Irrigated and Non-irrigated Sandy Soils	Small Grains	4	136
Irrigated and Non-irrigated Sandy Soils	Other	8	135
South Western and West Central	Soybeans	72	164
South Western and West Central	Corn	19	167
South Western and West Central	Corn/Alfalfa	2	175
South Western and West Central	Alfalfa	3	156
South Western and West Central	Small Grains	1	143
South Western and West Central	Other	3	154
South Central	Soybeans	67	169
South Central	Corn	24	171
South Central	Corn/Alfalfa	3	162
South Central	Alfalfa	1	172
South Central	Small Grains	1	172
South Central	Other	4	164
Southeastern	Soybeans	43	175
Southeastern	Corn	29	176
Southeastern	Corn/Alfalfa	11	164
Southeastern	Alfalfa	10	172
Southeastern	Small Grains	**	**
Southeastern	Other	6	166
Statewide	Soybeans	59	161
Statewide	Corn	24	158

BMP Region	Previous Crop	Percent of Fields	Average Corn Yield Bushels per Acre
Statewide	Corn/Alfalfa	5	157
Statewide	Alfalfa	5	151
Statewide	Small Grains	2	142
Statewide	Other	5	150

** Less than five responses

Table 7 details the percent of non-manured corn fields with nitrogen applied (NQ-8).

Table 7. Commercial fertilizer applications applied to non-manured corn fields.

BMP Region	Fertilizer Applied	Percent of Respondents
Northwestern	Yes	97
Northwestern	No	3
Irrigated and Non-irrigated Sandy Soils	Yes	92
Irrigated and Non-irrigated Sandy Soils	No	8
Southwestern and West Central	Yes	97
Southwestern and West Central	No	3
South Central	Yes	98
South Central	No	2
Southeastern	Yes	96
Southeastern	No	4
Statewide	Yes	96
Statewide	No	4

Table 8 details the percent of respondents using variable rate nitrogen applications for each BMP region (NQ-9).

Table 8. Variable rate nitrogen applications by BMP region.

BMP Region	Variable Rate Nitrogen Application	Percent of Respondents
Northwestern	Variable rate	50
Northwestern	One rate	50
Irrigated and Non-irrigated Sandy Soils	Variable rate	45
Irrigated and Non-irrigated Sandy Soils	One rate	55
Southwestern and West Central	Variable rate	52
Southwestern and West Central	One rate	48
South Central	Variable rate	51
South Central	One rate	49
Southeastern	Variable rate	49

BMP Region	Variable Rate Nitrogen Application	Percent of Respondents
Northwestern	Variable rate	50
Southeastern	One rate	51
Statewide	Variable rate	50
Statewide	One rate	50

Table 9 details the nitrogen rates and corresponding yields by BMP region (NQ-7 and NQ-10). These are nitrogen rates and yields on all corn acres, regardless of previous crop. Nitrogen rates are from commercial nitrogen fertilizer only.

Table 9. Nitrogen rates and average yields by BMP region.

BMP Region	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	130	131
Irrigated and Non-irrigated Sandy Soils	118	130
Southwestern and West Central	147	165
South Central	153	170
Southeastern	148	173
Statewide	143	160

Table 10 details the nitrogen fertilizer rates and corn yields by BMP region on corn following various crops (NQ-4, NQ-5 and NQ-10). These are corn fields applied with commercial nitrogen fertilizer but no manure applications. For the previous crop of Corn/Alfalfa, the definition would be corn in 2014, corn in 2013 and alfalfa in 2012.

Table 10. 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	134
Northwestern	Corn	145	119
Northwestern	Corn/Alfalfa	**	**
Northwestern	Alfalfa	**	**
Northwestern	Small Grains	119	128
Northwestern	Other	133	137
Irrigated and Non-irrigated Sandy Soils	Soybeans	121	131
Irrigated and Non-irrigated Sandy Soils	Corn	124	126
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	119	137
Irrigated and Non-irrigated Sandy Soils	Alfalfa	101	130
Irrigated and Non-irrigated Sandy Soils	Small Grains	85	134
Irrigated and Non-irrigated Sandy Soils	Other	113	136
Southwestern and West Central	Soybeans	146	165
Southwestern and West Central	Corn	160	167
Southwestern and West Central	Corn/Alfalfa	133	175
Southwestern and West Central	Alfalfa	98	157

Commercial Fertilizer Applications on Corn

BMP Region	Previous Crop	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Southwestern and West Central	Small Grains	124	143
Southwestern and West Central	Other	149	152
South Central	Soybeans	150	169
South Central	Corn	165	171
South Central	Corn/Alfalfa	126	163
South Central	Alfalfa	**	**
South Central	Small Grains	171	185
South Central	Other	145	164
Southeastern	Soybeans	147	175
Southeastern	Corn	164	175
Southeastern	Corn/Alfalfa	135	164
Southeastern	Alfalfa	117	173
Southeastern	Small Grains	**	**
Southeastern	Other	141	172
Statewide	Soybeans	144	162
Statewide	Corn	153	159
Statewide	Corn/Alfalfa	129	158
Statewide	Alfalfa	106	152
Statewide	Small Grains	119	142
Statewide	Other	134	152

Statewide: Corn Following Soybeans

Statewide, sixty 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 1,001 fields surveyed in Minnesota.

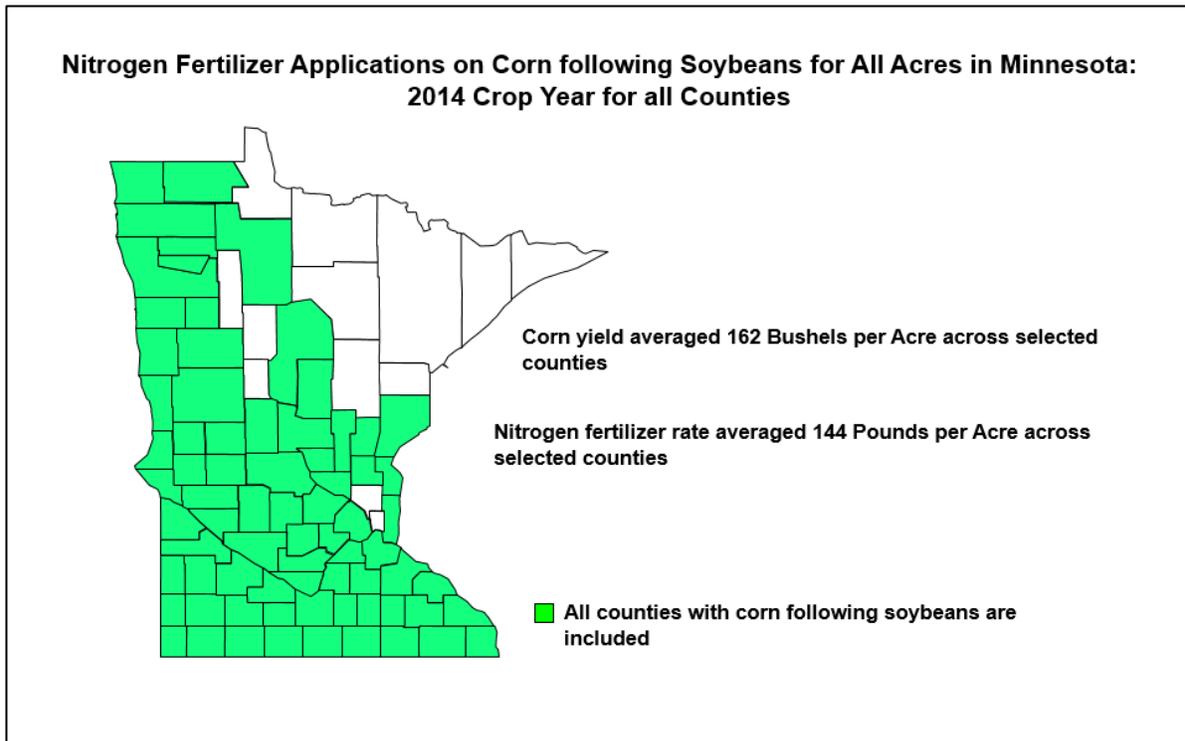


Figure 2. The corn yield averaged⁶ 162 bushels per acre and the nitrogen fertilizer rate averaged 144 pounds per acre on fields with corn following soybeans in Minnesota.

⁶ All averages are straight averages and are not weighted.

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

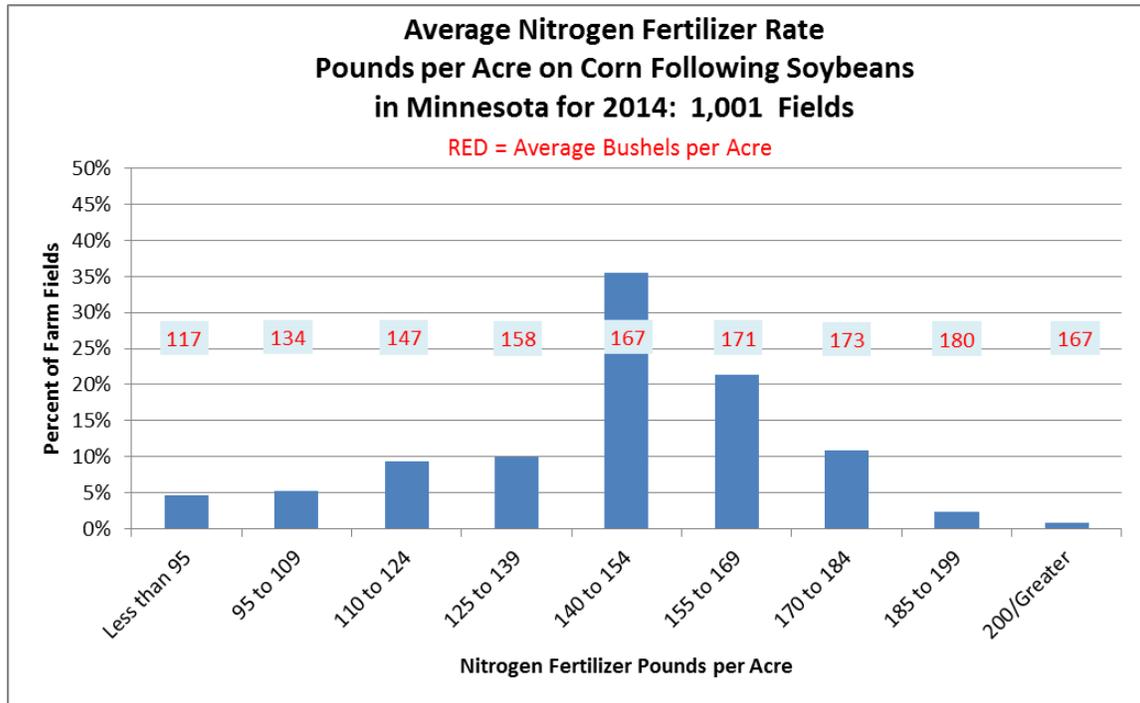


Figure 3. Average nitrogen fertilizer rates and yields on corn following soybeans in Minnesota for 2014: 1,001 fields.

Southeastern BMP Region: Corn Following Soybeans

There were 120 fields that were included in the SE BMP region for 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.

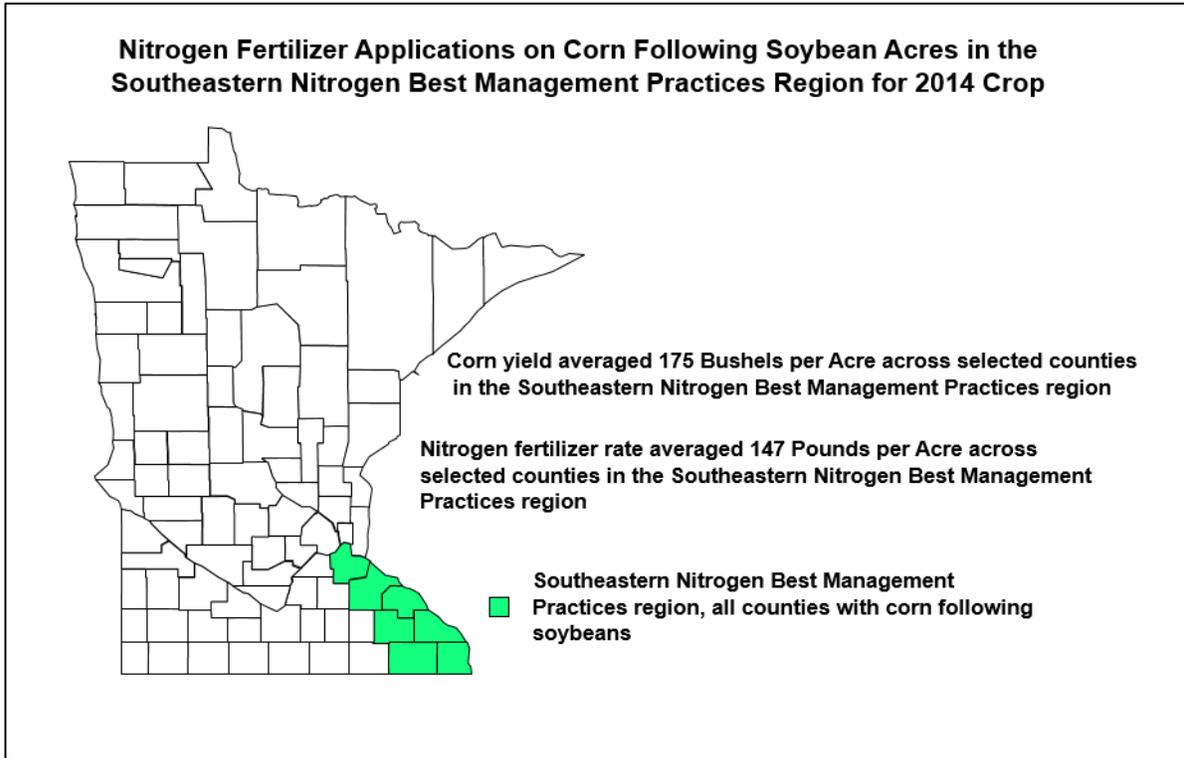


Figure 4. The corn yield averaged 175 bushels per acre and the nitrogen fertilizer rate averaged 147 pounds per acre in the SE BMP region.

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

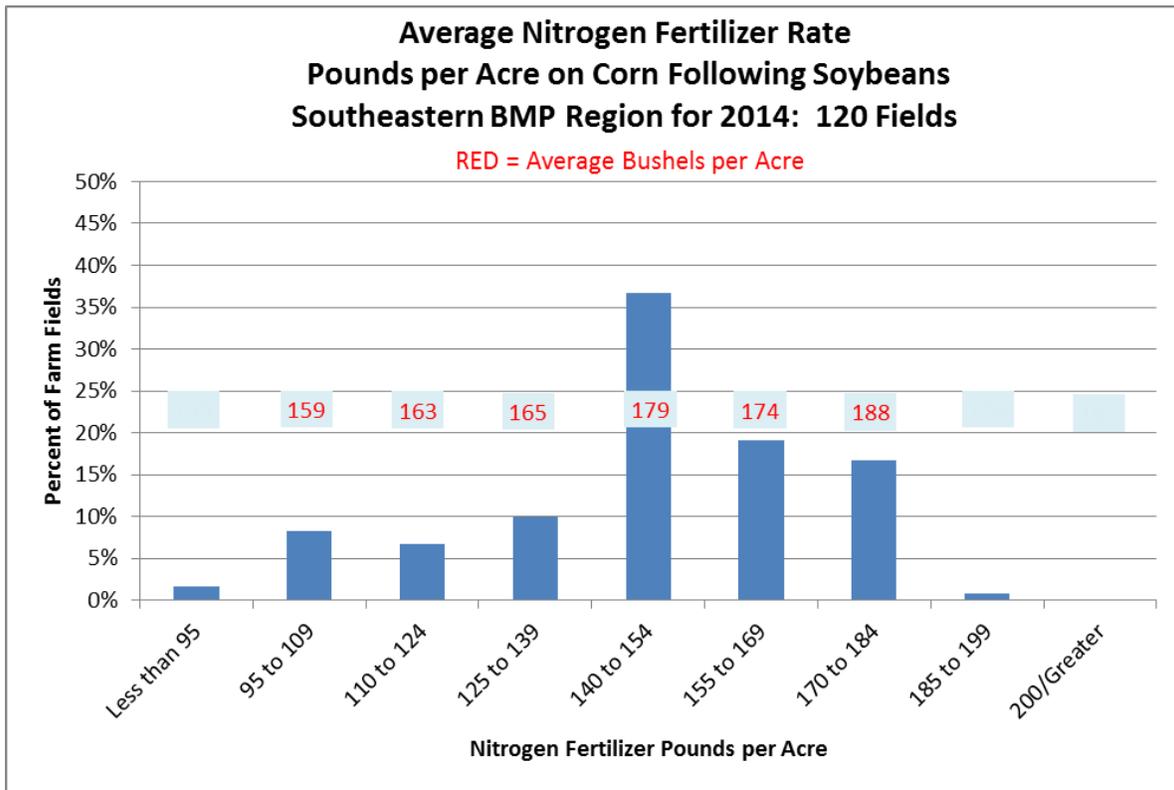


Figure 5. Average nitrogen fertilizer rates and yields on corn following soybeans in the SE BMP region for 2014: 120 fields.

In the SE BMP region, nitrogen fertilizer rates ranged from an average of 136 pounds per acre in Dakota County to 157 pounds per acre in Fillmore County as shown in Table 11.

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

Average County Nitrogen Fertilizer Rates 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	7	136	168
Fillmore	20	157	180
Goodhue	31	148	182
Houston	11	140	167
Olmsted	15	145	175
Wabasha	15	143	168
Winona	21	145	169

South Central BMP Region: Corn Following Soybeans

There were 334 fields that were included in the SC BMP region for 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.

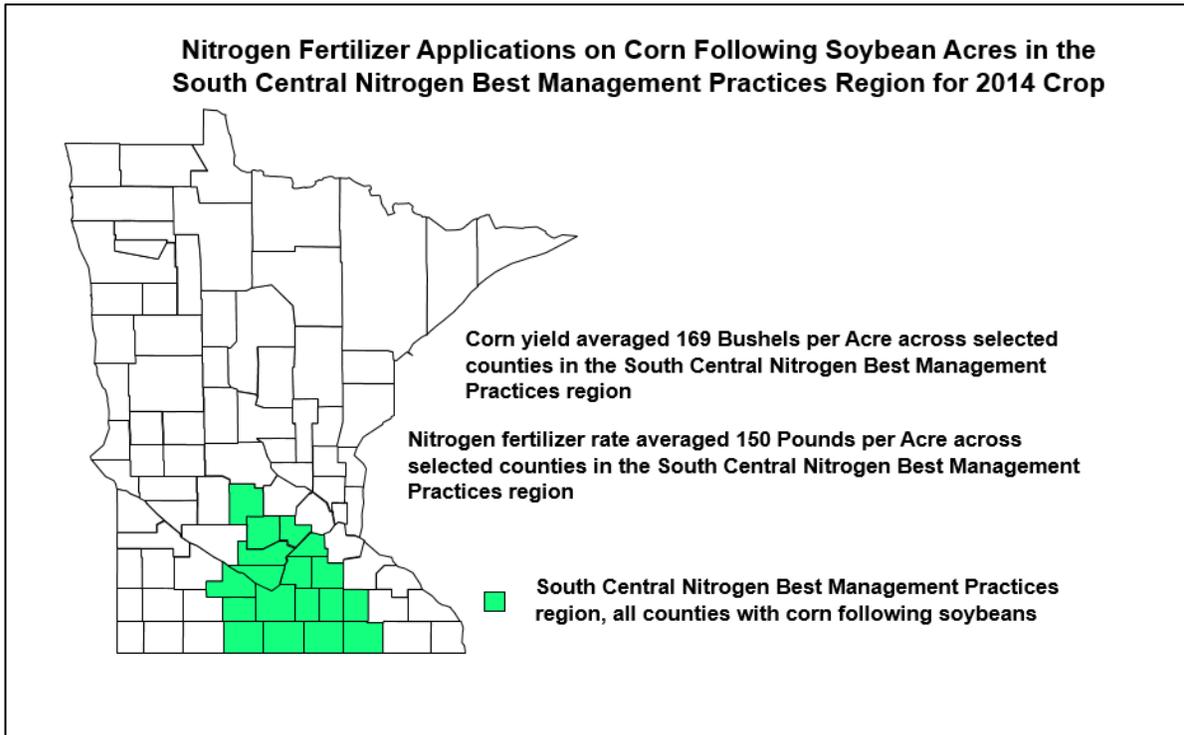


Figure 6. The corn yield averaged 169 bushels per acre and the nitrogen fertilizer rate averaged 150 pounds per acre in the SC BMP region.

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

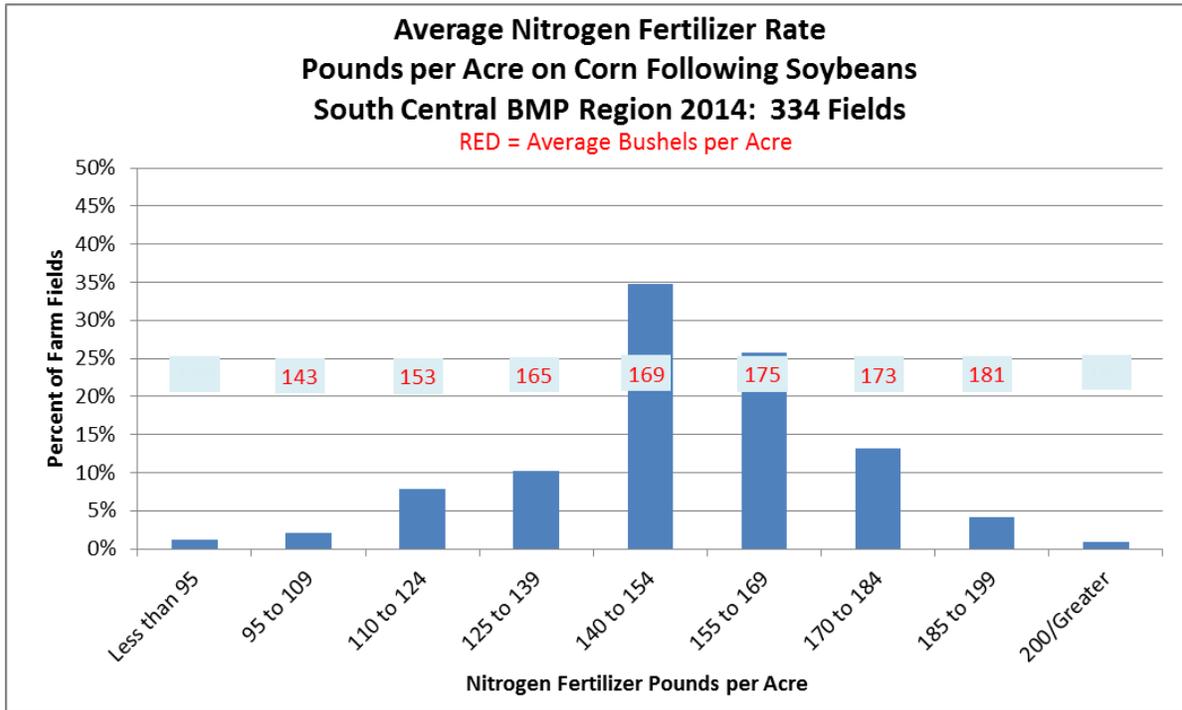


Figure 7. Average nitrogen fertilizer rates and yields on corn following soybeans in the SC BMP region for 2014: 334 fields.

In the SC BMP region, nitrogen fertilizer rates ranged from an average of 140 pounds per acre in Scott County to 163 pounds per acre in Meeker County as shown in Table 12.

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

Average County Nitrogen Fertilizer Rates for the SC BMP Region for Corn Following Soybeans			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Blue Earth	31	150	172
Brown	25	150	170
Carver	11	141	157
Dodge	9	147	176
Faribault	18	154	179
Freeborn	30	155	173
Le Sueur	14	149	157
Martin	22	152	179
McLeod	16	150	158
Meeker	13	163	170
Mower	17	153	167
Nicollet	24	144	167
Rice	21	141	157
Scott	12	140	169
Sibley	28	146	165
Steele	16	158	178
Waseca	11	159	170
Watonwan	16	155	175

Southwestern and West Central BMP Region: Corn Following Soybeans

There were 385 fields that were included in the SW BMP region for 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.

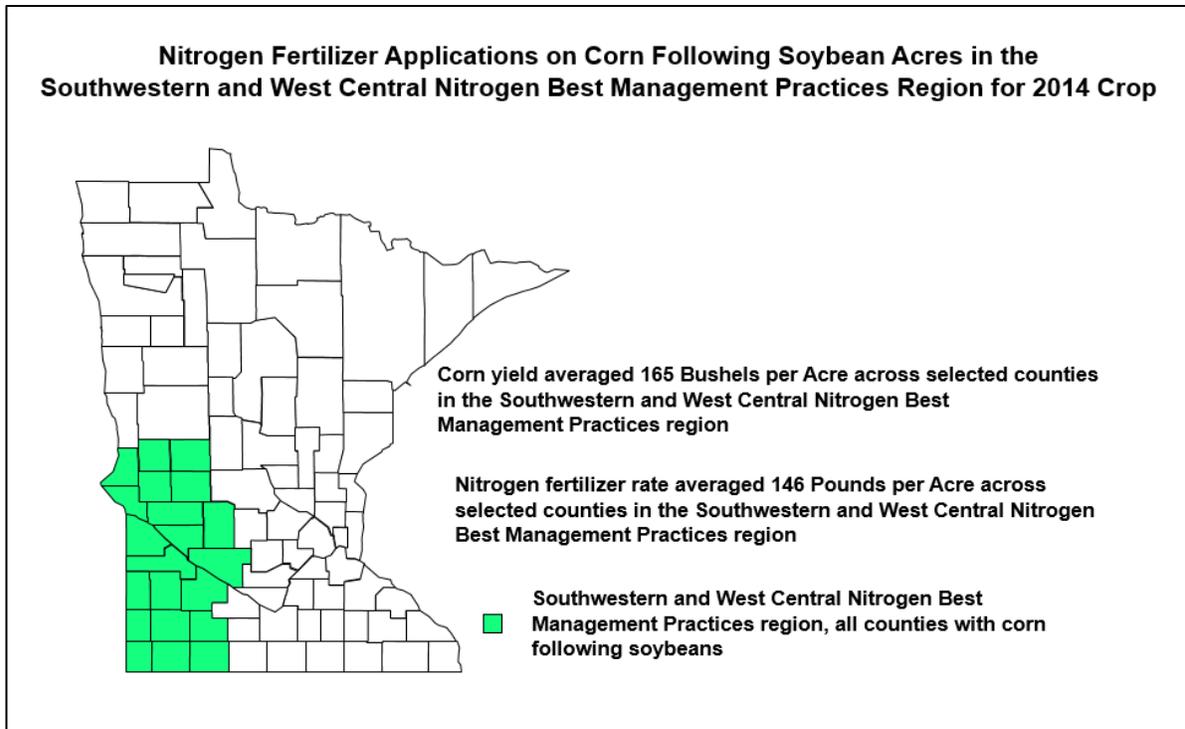


Figure 8. The corn yield averaged 165 bushels per acre and the nitrogen fertilizer rate averaged 146 pounds per acre in the SW BMP region.

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

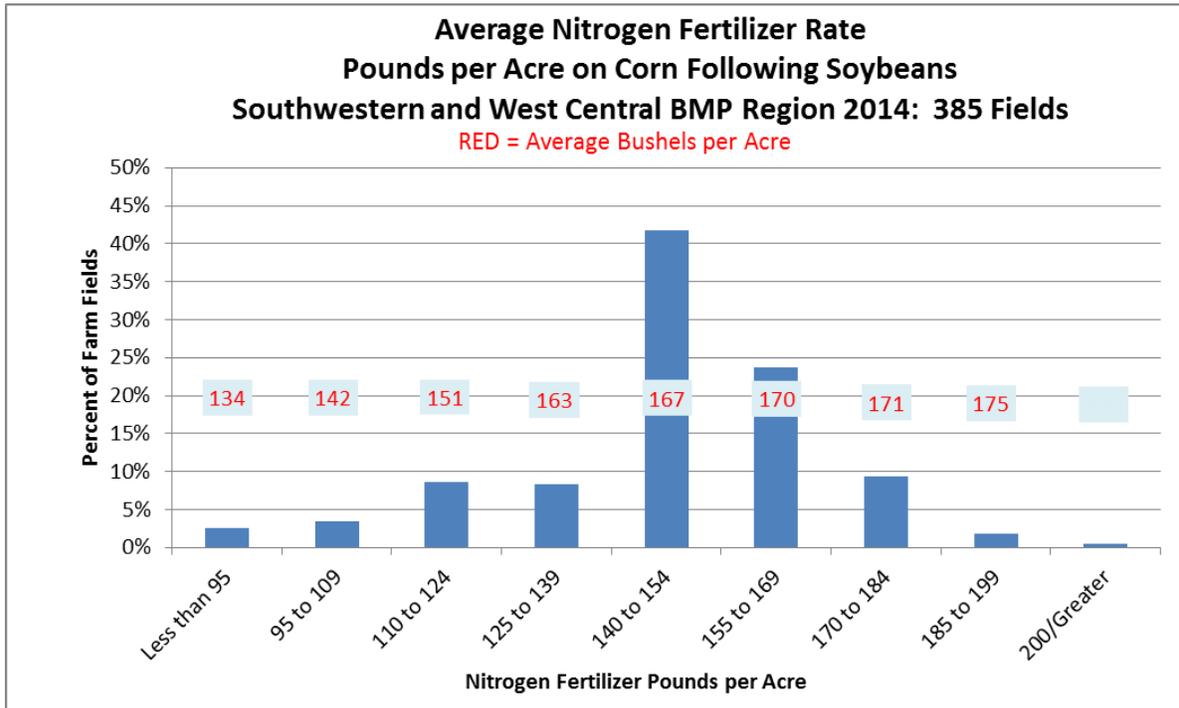


Figure 9. Average nitrogen fertilizer rates and yields on corn following soybeans in the SW BMP region for 2014: 385 fields.

In the SW BMP region, nitrogen fertilizer rates ranged from an average of 121 pounds per acre in Lincoln County to 157 pounds per acre in Redwood County as shown in Table 13.

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

Average County Nitrogen Fertilizer Rates for the SW BMP Region for corn following soybeans			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Big Stone	8	126	143
Chippewa	21	148	165
Cottonwood	23	148	172
Douglas	16	126	146
Grant	7	141	160
Jackson	29	151	175
Kandiyohi	14	146	167
Lac qui Parle	16	144	164
Lincoln	11	121	156
Lyon	22	145	158
Murray	23	150	171
Nobles	32	146	169
Pipestone	12	141	163
Pope	19	147	162
Redwood	38	157	173
Renville	31	150	159
Rock	5	151	181
Stevens	15	146	158
Swift	11	147	176
Traverse	11	152	156
Yellow Medicine	21	145	162

Northwestern BMP Region: Corn Following Soybeans

There were 37 fields that were included in the NW BMP region for 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.

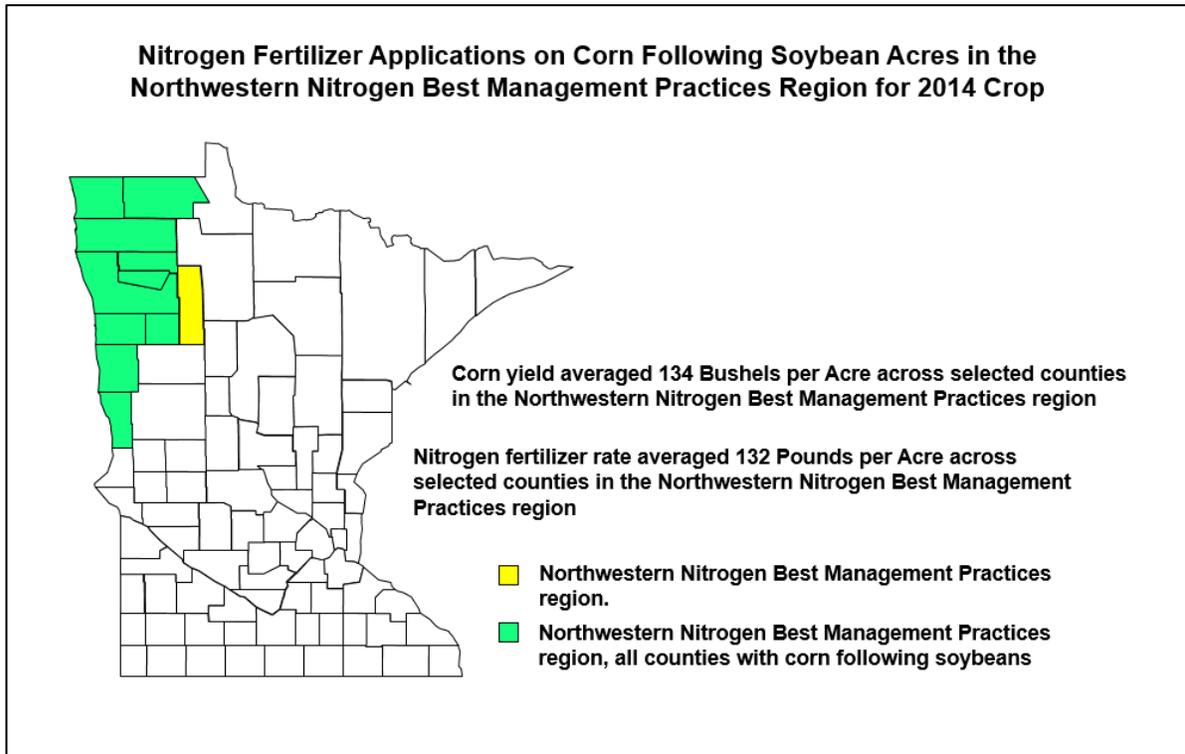


Figure 10. The corn yield averaged 134 bushels per acre and the nitrogen fertilizer rate averaged 132 pounds per acre in the NW BMP region.

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

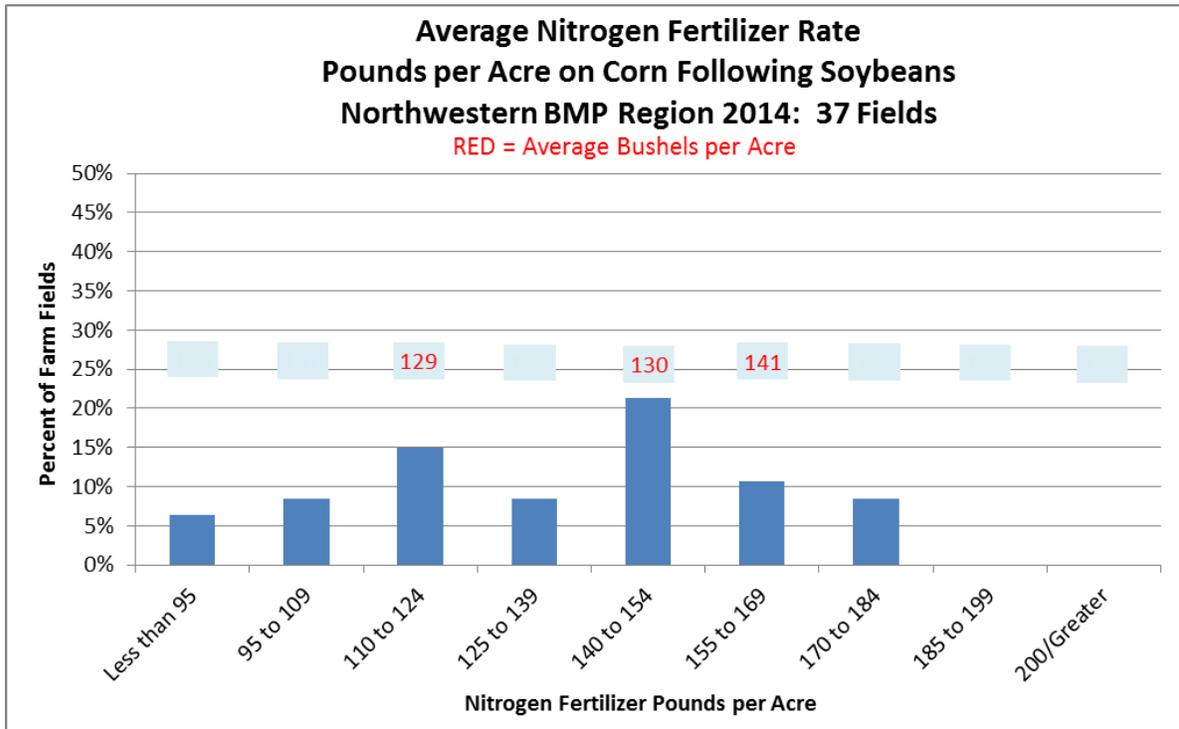


Figure 11. Average nitrogen fertilizer rates and yields on corn following soybeans in the NW BMP region for 2014: 37 fields.

Two counties had five or more responses in the NW BMP region. Nitrogen fertilizer rates ranged from an average of 134 pounds per acre in Wilkin County to 149 pounds per acre in Clay County as shown in Table 14.

Table 14. Average county nitrogen fertilizer rates and corn yields for the NW BMP region for corn following soybeans.

Average County Nitrogen Fertilizer Rates for the NW BMP Region for Corn Following Soybeans			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Clay	10	149	148
Kittson	**	**	**
Mahnomen	**	**	**
Marshall	**	**	**
Norman	**	**	**
Pennington	**	**	**
Polk	**	**	**
Red Lake	**	**	**
Roseau	**	**	**
Wilkin	8	134	146

** Less than five responses.

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

There were 125 fields that were included in the IRR BMP region for 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.

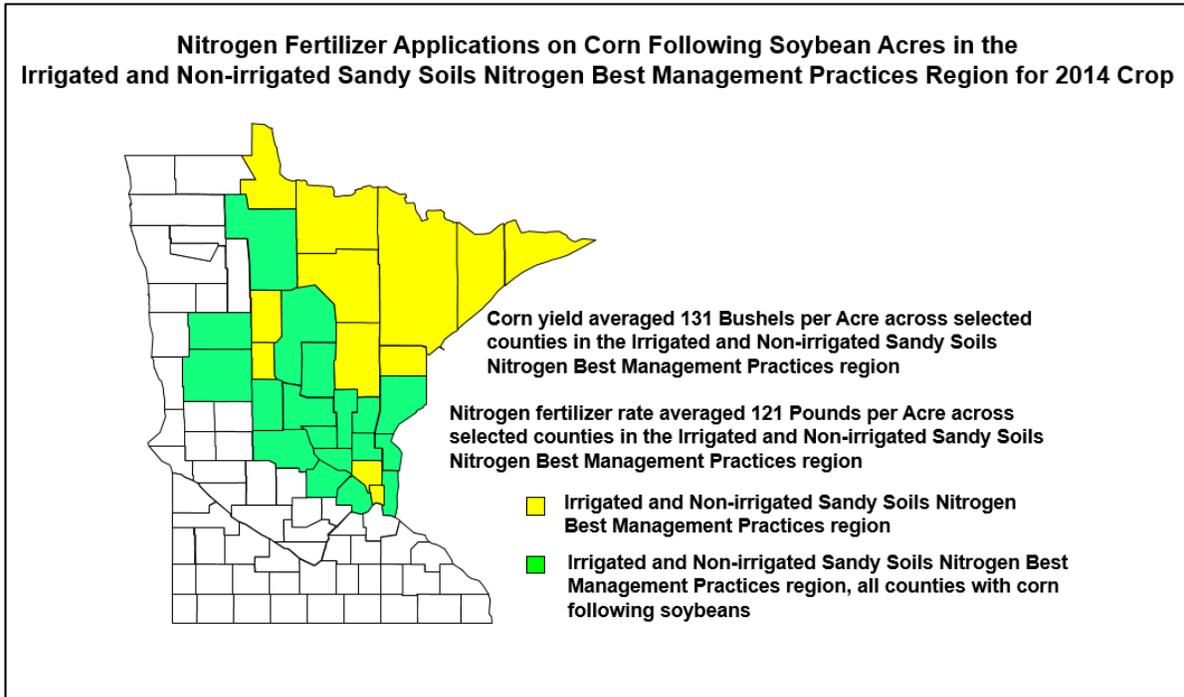


Figure 12. The corn yield averaged 131 bushels per acre and the nitrogen fertilizer rate averaged 121 pounds per acre in the IRR BMP region.

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

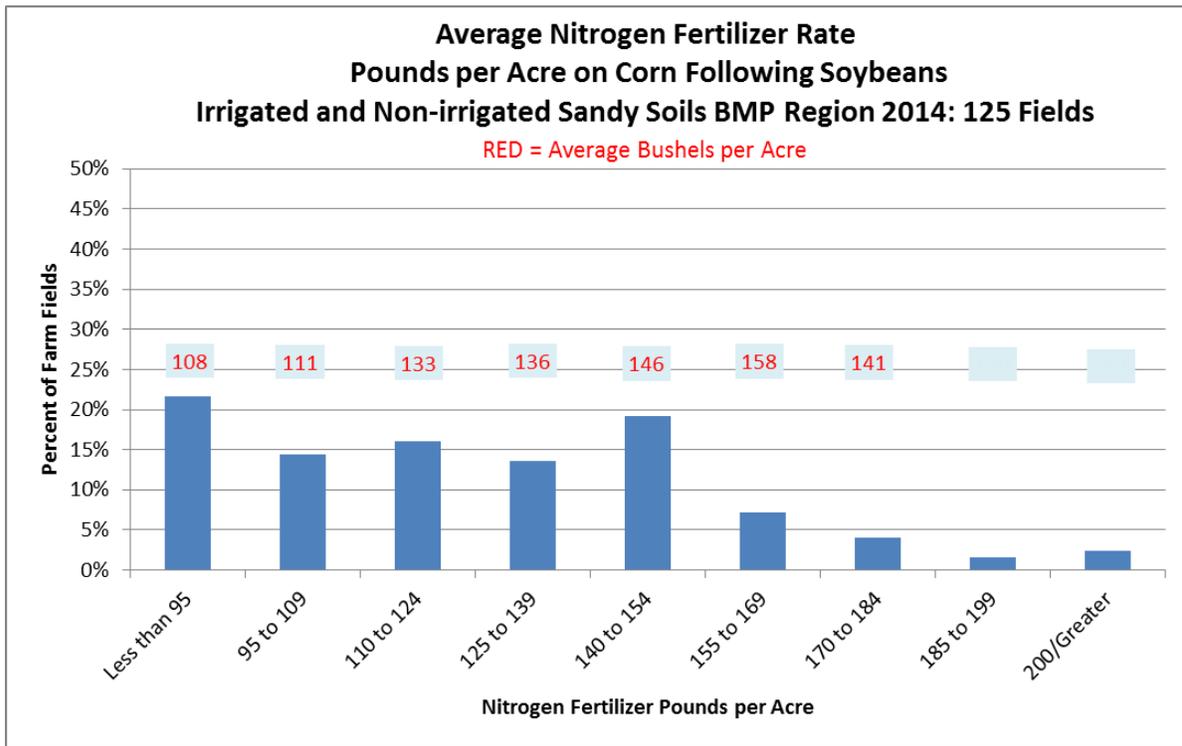


Figure 13. Average nitrogen fertilizer rates and yields on corn following soybeans in the IRR BMP region for 2014: 125 fields.

Eight counties had five or more responses in the IRR BMP region. Nitrogen fertilizer rates ranged from an average of 81 pounds per acre in Isanti County to 143 pounds per acre in Chisago County as shown in Table 15.

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

Average County Nitrogen Fertilizer Rates for the IRR BMP Region for Corn Following Soybeans			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Becker	**	**	**
Beltrami	**	**	**
Benton	6	119	119
Cass	**	**	**
Chisago	7	143	129
Crow Wing	**	**	**
Hennepin	**	**	**
Isanti	7	81	116
Kanabec	**	**	**
Mille Lacs	**	**	**
Morrison	13	112	128
Otter Tail	23	120	132
Pine	**	**	**
Sherburne	**	**	**
Stearns	18	131	151
Todd	10	109	101
Washington	**	**	**
Wright	18	140	144

** Less than five responses.

Statewide: Corn Following Corn

Statewide, twenty-five 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 414 corn following corn fields surveyed in Minnesota.

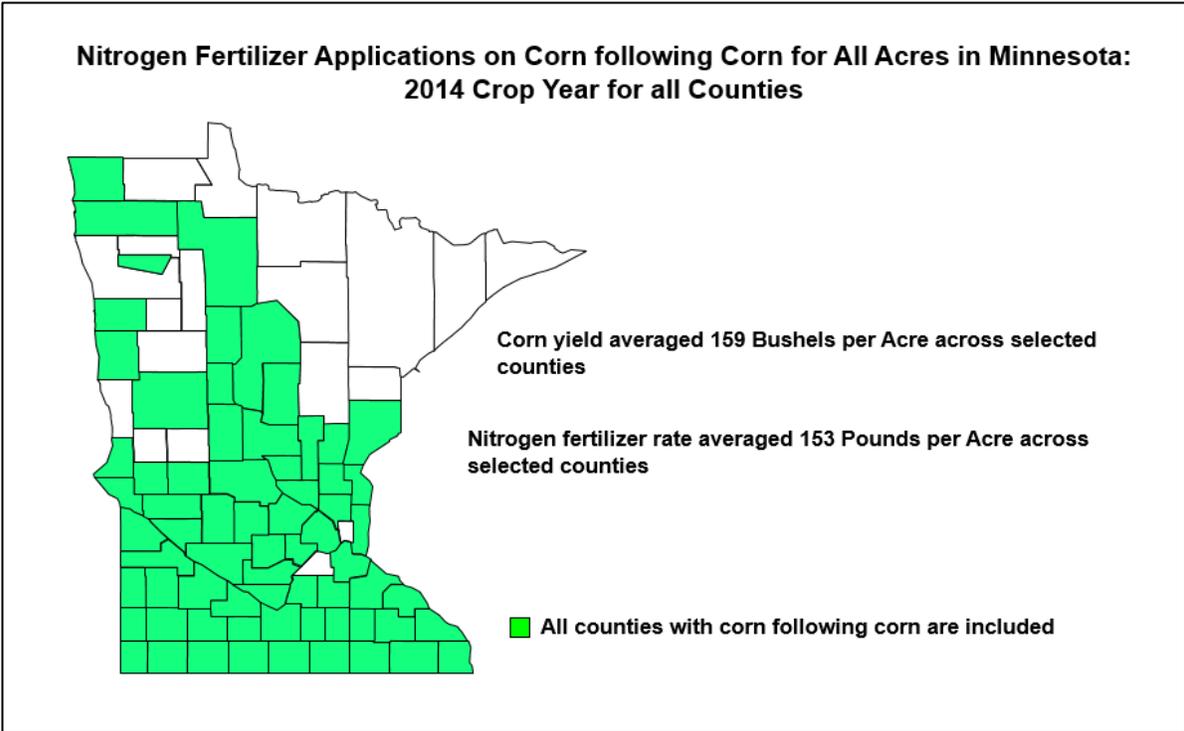


Figure 14. The corn yield averaged 159 bushels per acre and the nitrogen fertilizer rate averaged 153 pounds per acre on fields with corn following corn in Minnesota.

Figure 15 provides the distribution of average nitrogen fertilizer rates in Minnesota for the 414 corn following corn fields; the corresponding corn yields are detailed in red.

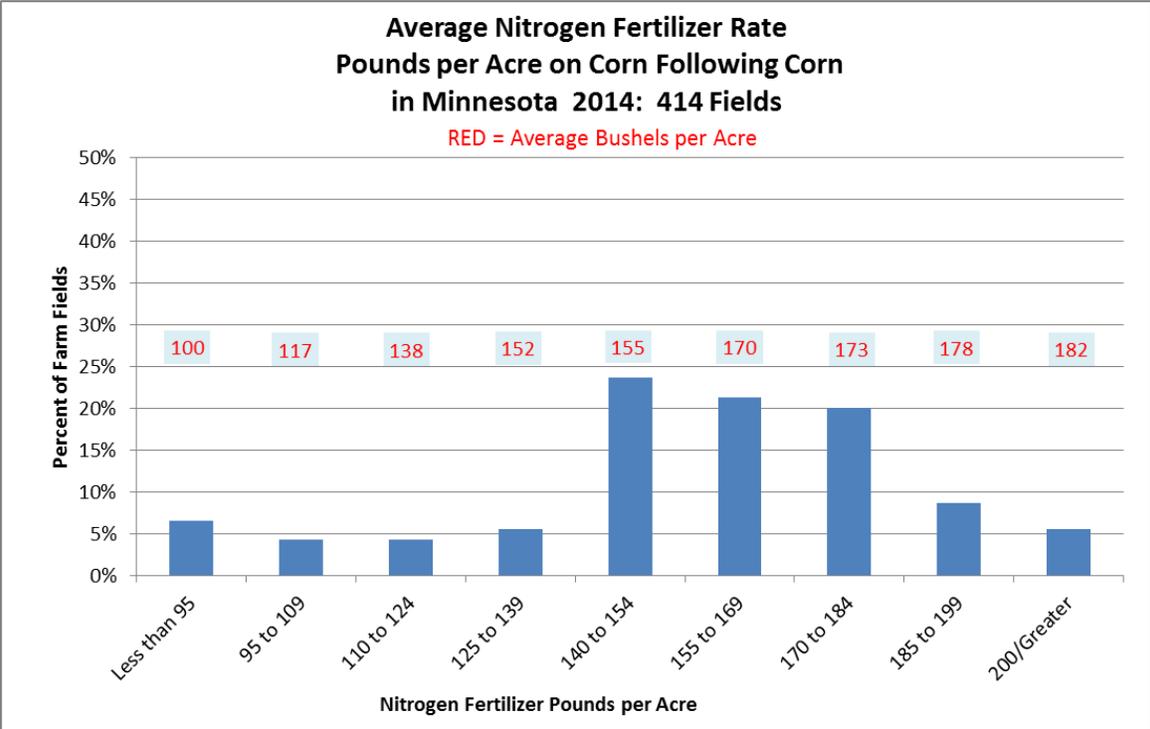


Figure 15. Average nitrogen fertilizer rates and yields on corn following corn in Minnesota for 2014: 414 fields.

Southeastern BMP Region: Corn Following Corn

There were 81 fields that were included in the SE BMP region for 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.

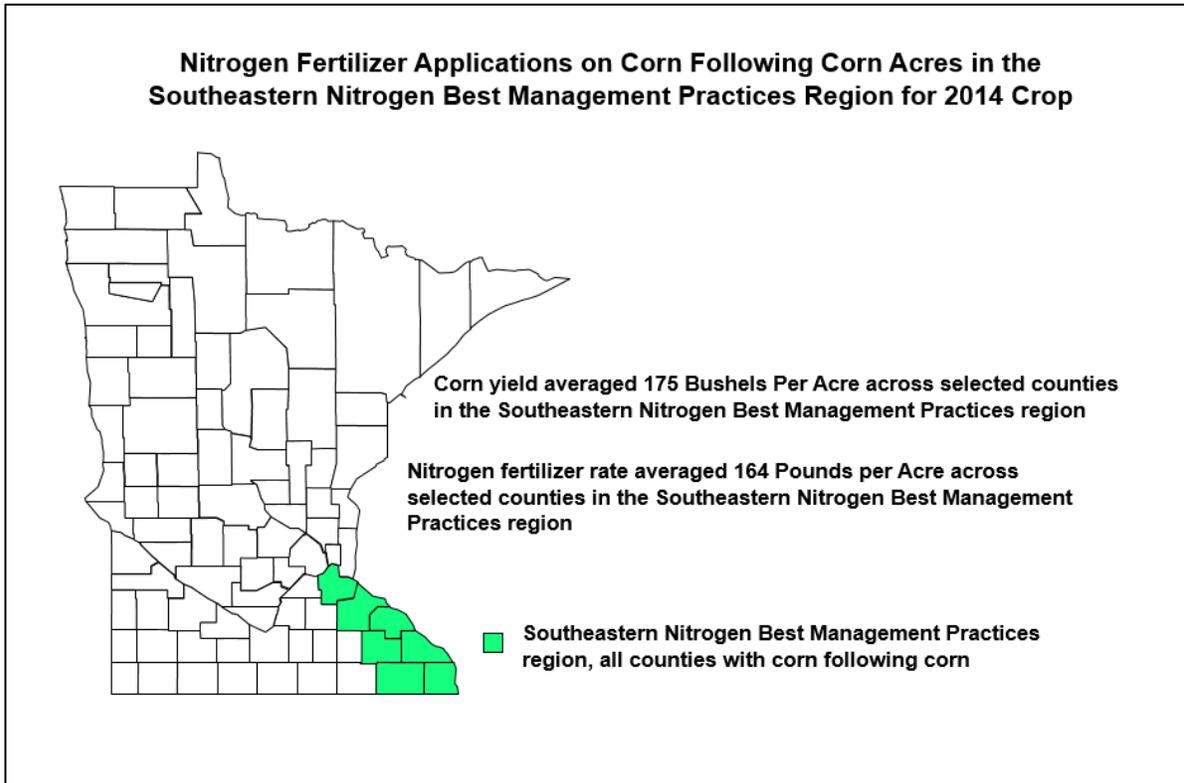


Figure 16. The corn yield averaged 175 bushels per acre and the nitrogen fertilizer rate averaged 164 pounds per acre in the SE BMP region.

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

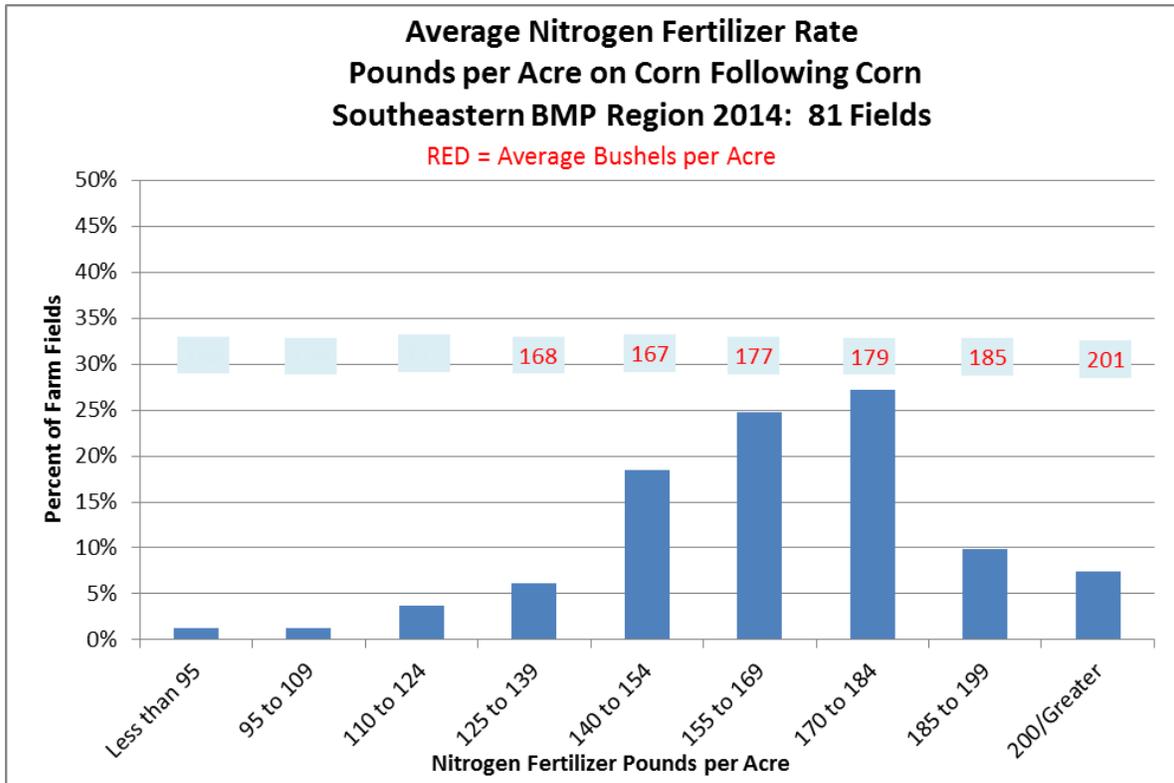


Figure 17. Average nitrogen fertilizer rates and yields on corn following corn in the SE BMP region for 2014: 81 fields.

In the SE BMP region, nitrogen fertilizer rates ranged from an average of 151 pounds per acre in Wabasha County to 169 pounds per acre in Fillmore County as shown in Table 16.

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

Average County Nitrogen Fertilizer Rates 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	7	165	173
Fillmore	15	169	174
Goodhue	19	165	179
Houston	9	165	174
Olmsted	8	169	184
Wabasha	11	151	172
Winona	12	164	172

South Central BMP Region: Corn Following Corn

There were 120 fields that were included in the SC BMP region for 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.

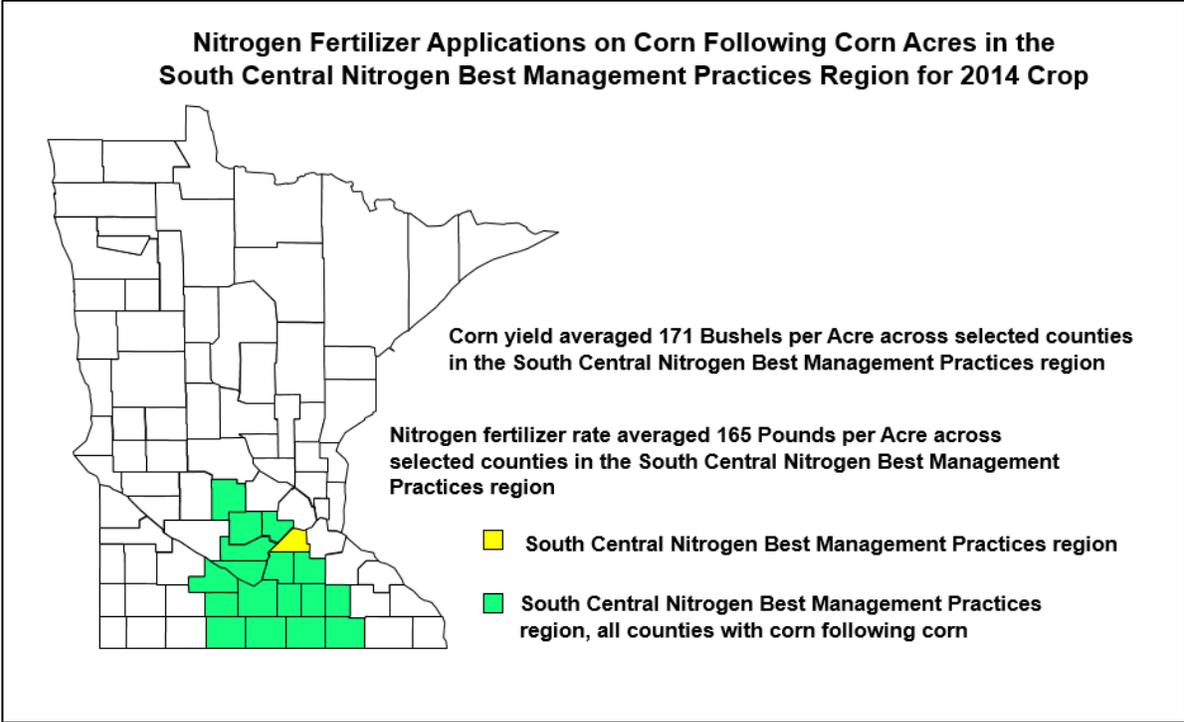


Figure 18. The corn yield averaged 171 bushels per acre and the nitrogen fertilizer rate averaged 165 pounds per acre in the SC BMP region.

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

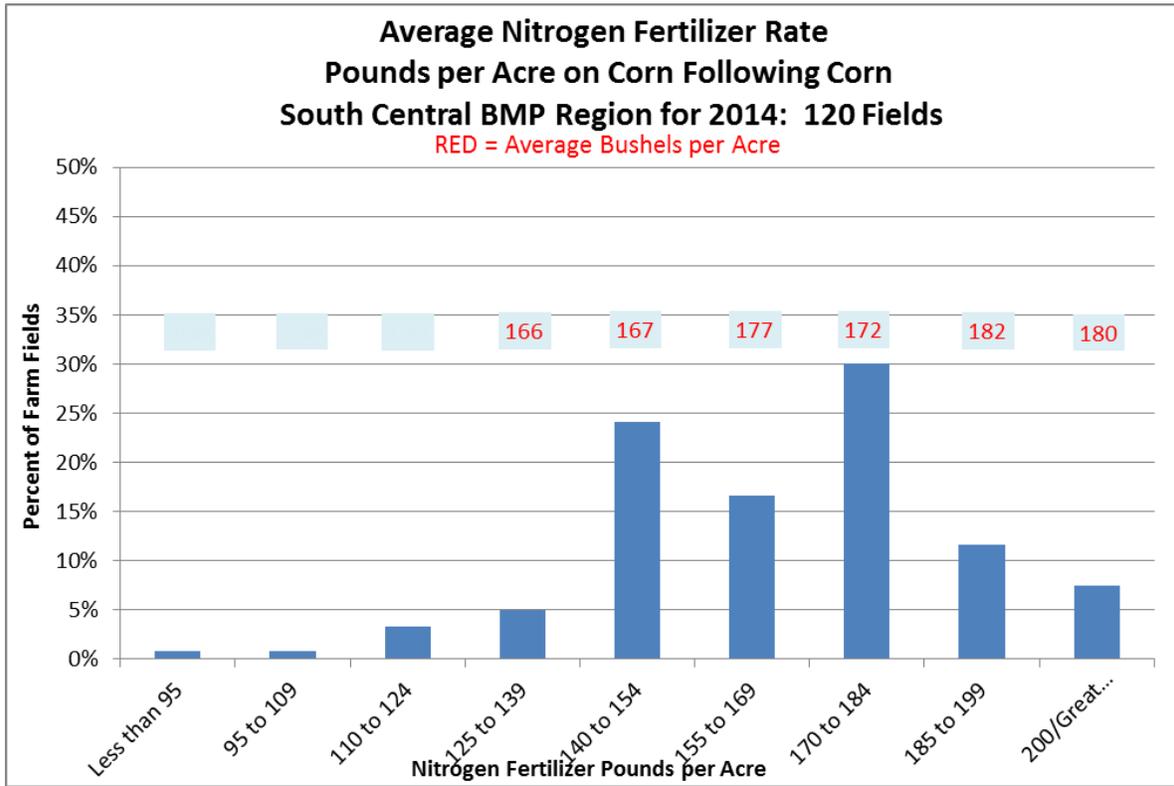


Figure 19. Average nitrogen fertilizer rates and yields on corn following corn in the SC BMP region for 2014: 120 fields.

Twelve counties had five or more responses in the SC BMP region. Nitrogen fertilizer rates ranged from an average of 153 pounds per acre in Nicollet County to 178 pounds per acre in Sibley County as shown in Table 17.

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

Average County Nitrogen Fertilizer Rates 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	14	167	176
Brown	8	173	178
Carver	**	**	**
Dodge	5	154	184
Faribault	11	159	171
Freeborn	12	167	174
Le Sueur	5	171	157
Martin	11	173	177
McLeod	**	**	**
Meeker	7	164	161
Mower	**	**	**
Nicollet	8	153	173
Rice	9	166	172
Sibley	6	178	173
Steele	5	177	177
Waseca	**	**	**
Watonwan	**	**	**

** Less than five responses.

Southwestern and West Central BMP Region: Corn Following Corn

There were 104 fields that were included in the SW BMP region for 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.

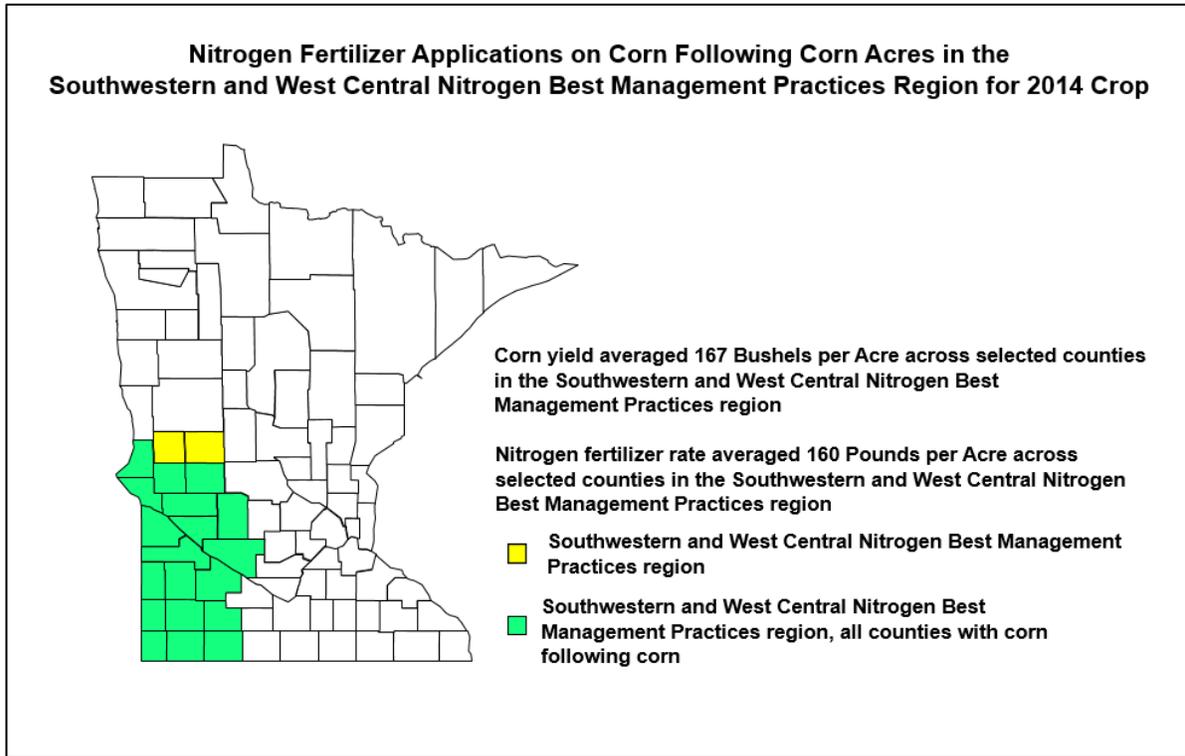


Figure 20. The corn yield averaged 167 bushels per acre and the nitrogen fertilizer rate averaged 160 pounds per acre in the SW BMP region.

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

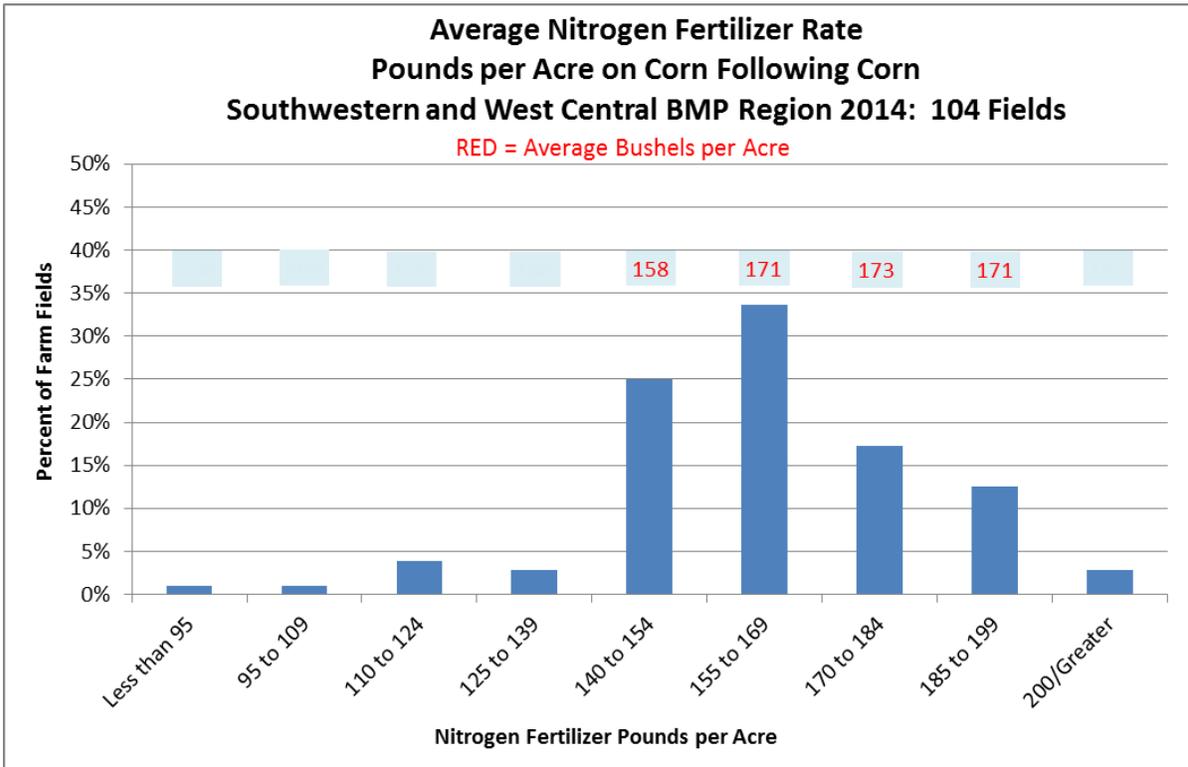


Figure 21. Average nitrogen fertilizer rates and yields on corn following corn in the SW BMP region for 2014: 104 fields.

Thirteen counties had five or more responses in SW BMP region. Nitrogen fertilizer rates ranged from an average of 138 pounds per acre in Lyon County to 177 pounds per acre in Renville County as shown in Table 18.

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

Average County Nitrogen Fertilizer Rates 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	**	**	**
Chippewa	5	173	169
Cottonwood	5	156	179
Jackson	10	164	176
Kandiyohi	6	165	157
Lac qui Parle	**	**	**
Lincoln	**	**	**
Lyon	5	138	157
Murray	9	166	173
Nobles	5	165	185
Pipestone	6	168	163
Pope	**	**	**
Redwood	15	157	168
Renville	5	177	164
Rock	6	165	176
Stevens	6	157	154
Swift	7	162	162
Traverse	**	**	**
Yellow Medicine	**	**	**

** Less than five responses.

Northwestern BMP Region: Corn Following Corn

There were 7 fields that were included in the NW BMP region for 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.

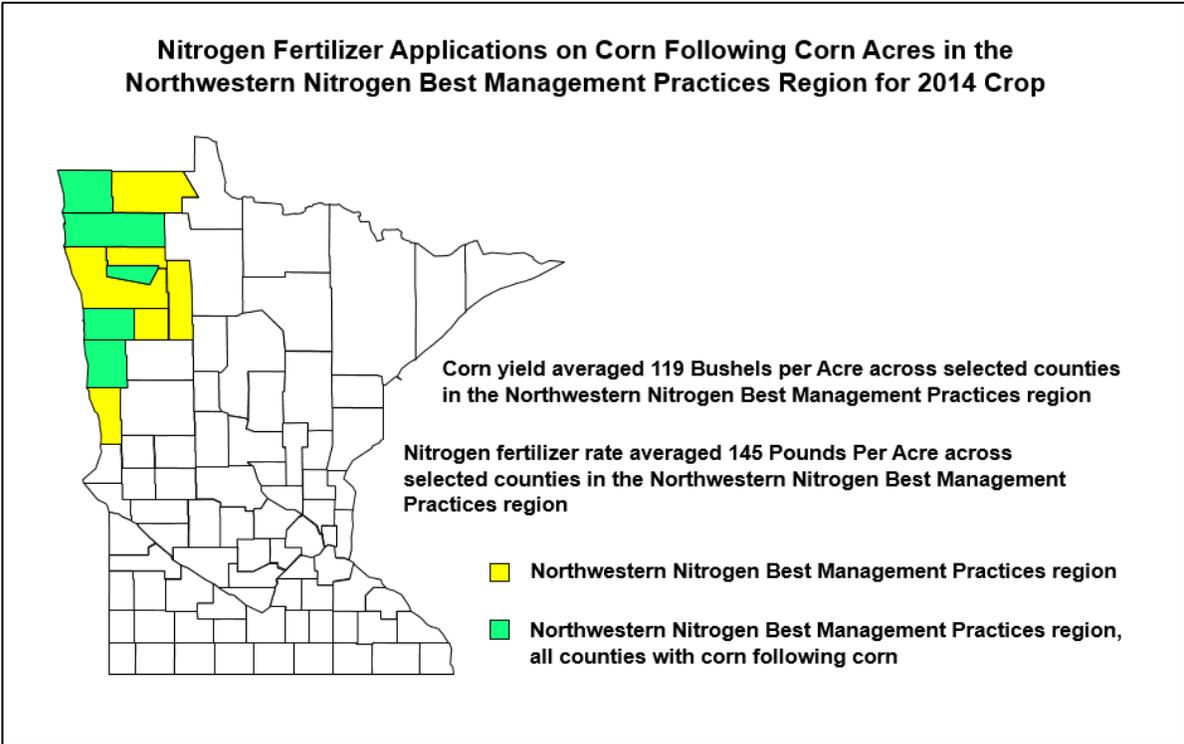


Figure 22. The corn yield averaged 119 bushels per acre and the nitrogen fertilizer rate averaged 145 pounds per acre in the NW BMP region.

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

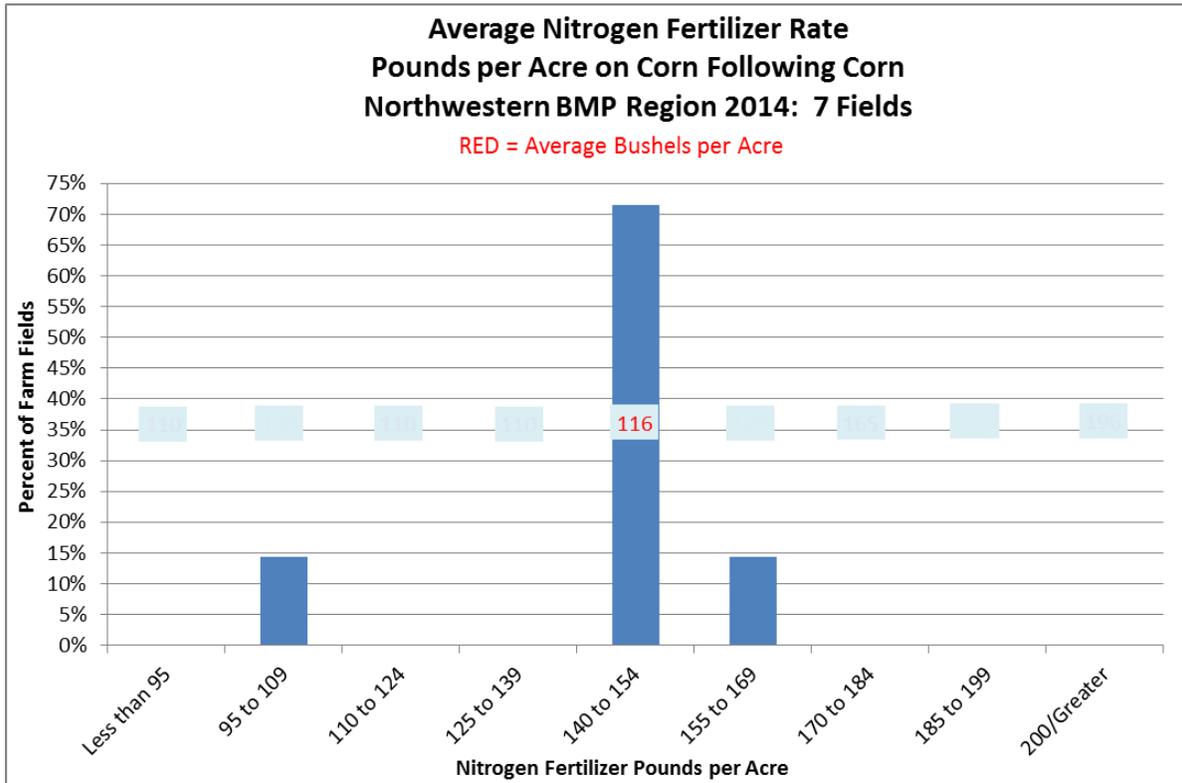


Figure 23. Average nitrogen fertilizer rates and yields on corn following corn in the NW BMP region for 2014: 7 fields.

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

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

There were 102 fields that were included in the IRR BMP region for 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.

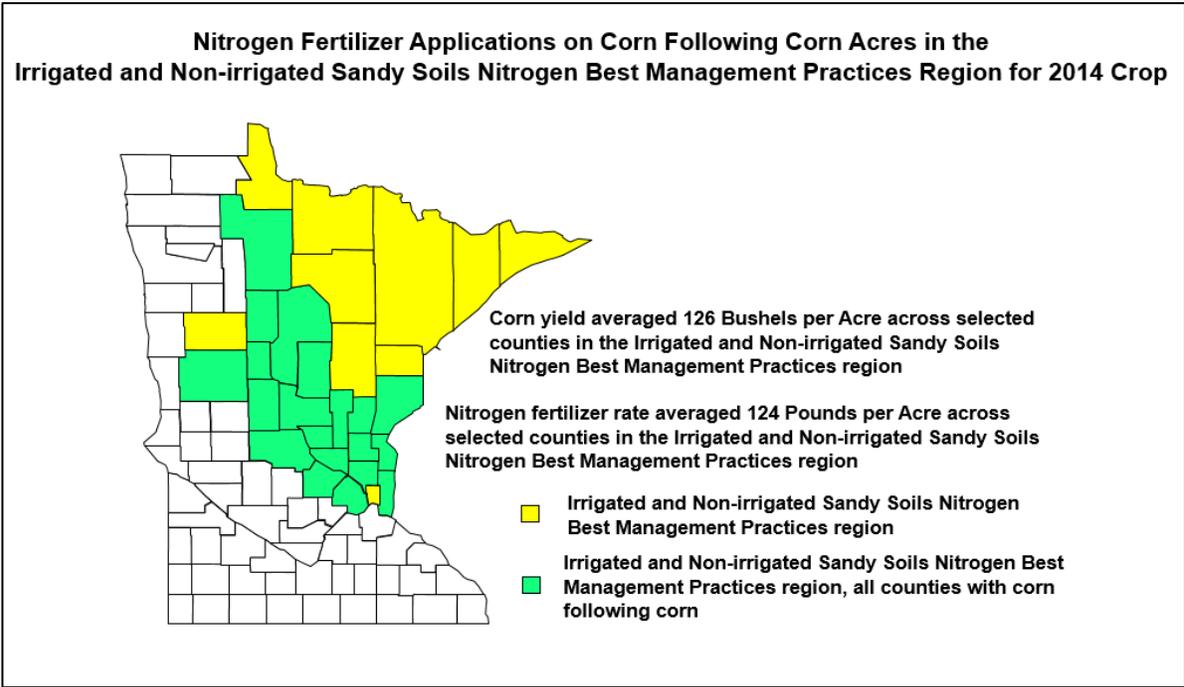


Figure 24. The corn yield averaged 126 bushels per acre and the nitrogen fertilizer rate averaged 124 pounds per acre in the IRR BMP region.

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

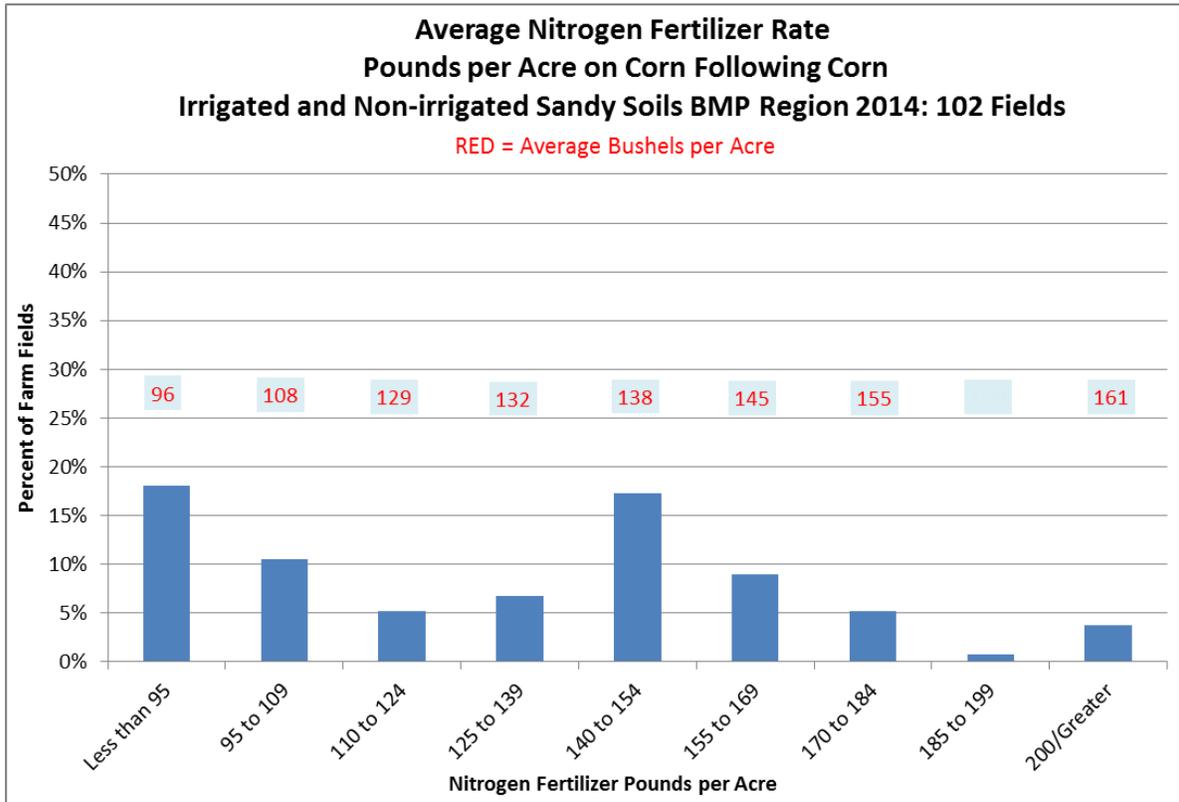


Figure 25. Average nitrogen fertilizer rates and yields on corn following corn in the IRR BMP region for 2014: 102 fields.

Seven counties had five or more responses in IRR BMP region. Nitrogen fertilizer rates ranged from an average of 106 pounds per acre in Morrison County to 161 pounds per acre in Wright County as shown in Table 19.

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

Average County Nitrogen Fertilizer Rates 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	**	**	**
Beltrami	**	**	**
Benton	5	133	149
Cass	**	**	**
Chisago	**	**	**
Crow Wing	**	**	**
Hennepin	**	**	**
Hubbard	**	**	**
Isanti	**	**	**
Kanabec	**	**	**
Mille Lacs	**	**	**
Morrison	19	106	120
Otter Tail	9	119	127
Pine	**	**	**
Sherburne	**	**	**
Stearns	15	138	138
Todd	12	128	128
Wadena	**	**	**
Washington	6	136	139
Wright	5	161	156

** Less than five responses.

Statewide: Corn Following Corn Following Alfalfa

Statewide, four percent of the fields reported were corn following corn following alfalfa. Figure 26 details the counties where farmers reported on fields with corn following corn following alfalfa. There were 75 corn following corn following alfalfa fields surveyed in Minnesota.

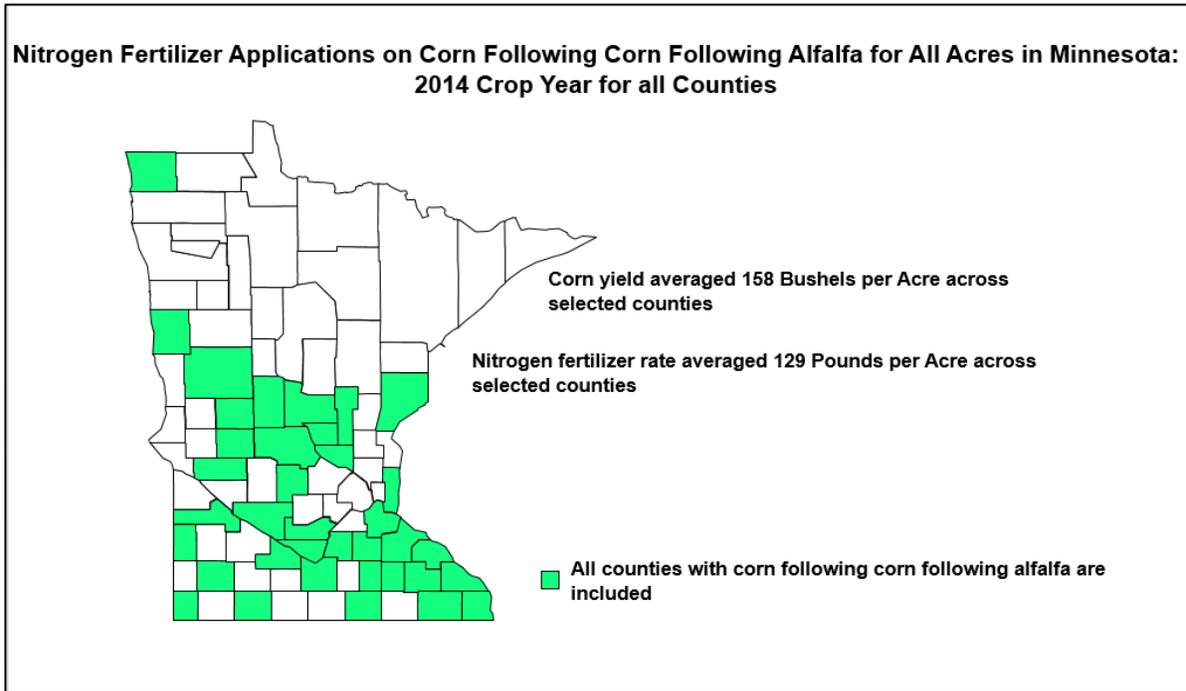


Figure 26. The corn yield averaged 158 bushels per acre and the nitrogen fertilizer rate averaged 129 pounds per acre on fields with corn following corn following alfalfa in Minnesota.

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

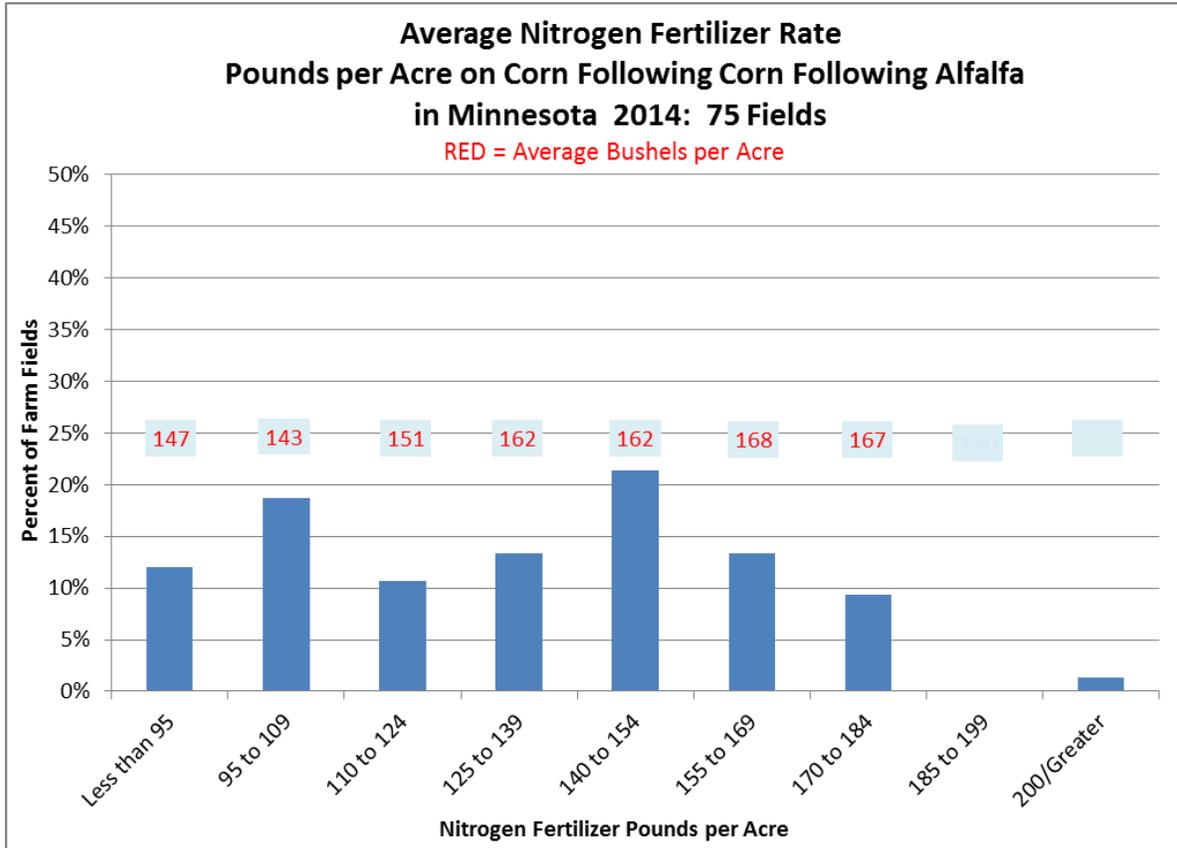


Figure 27. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in Minnesota for 2014: 75 fields.

Southeastern BMP Region: Corn Following Corn Following Alfalfa

There were 30 fields that were included in the SE BMP region for 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.

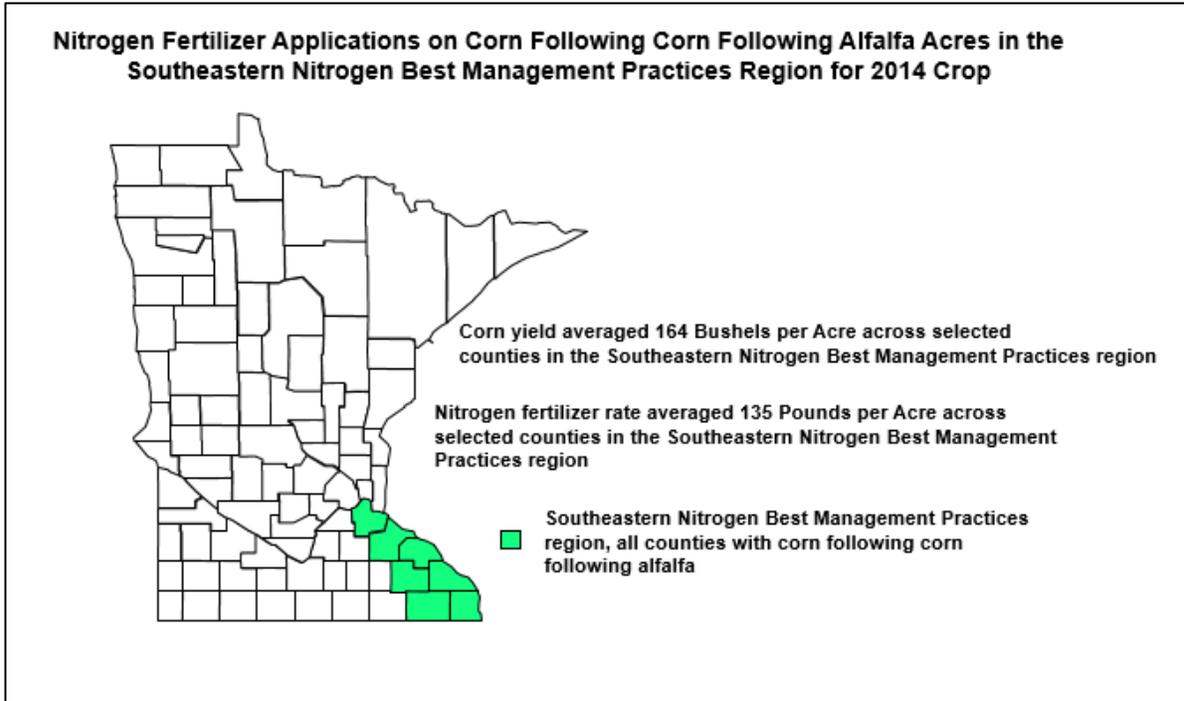


Figure 28. The corn yield averaged 164 bushels per acre and the nitrogen fertilizer rate averaged 135 pounds per acre in the SE BMP region.

Figure 29 provides 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.

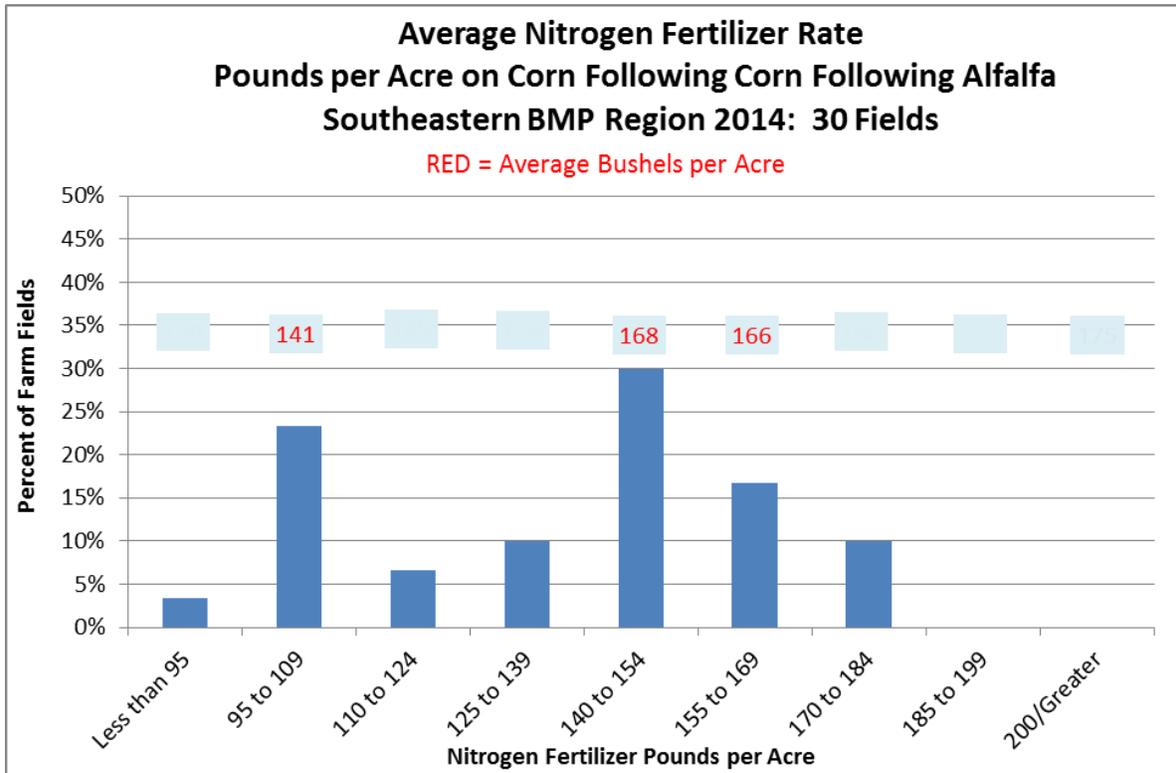


Figure 29. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the SE BMP region for 2014: 30 fields.

Two counties had five or more responses in the SE BMP region. Nitrogen fertilizer rates ranged from an average of 131 pounds per acre in Wabasha County to 147 pounds per acre in Fillmore County as shown in Table 20.

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

Average County Nitrogen Fertilizer Rates 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	6	147	170
Goodhue	**	**	**
Houston	**	**	**
Olmsted	**	**	**
Wabasha	7	131	171
Winona	**	**	**

** Less than five responses.

South Central BMP Region: Corn Following Corn Following Alfalfa

There were 14 fields that were included in the SC BMP region for 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.

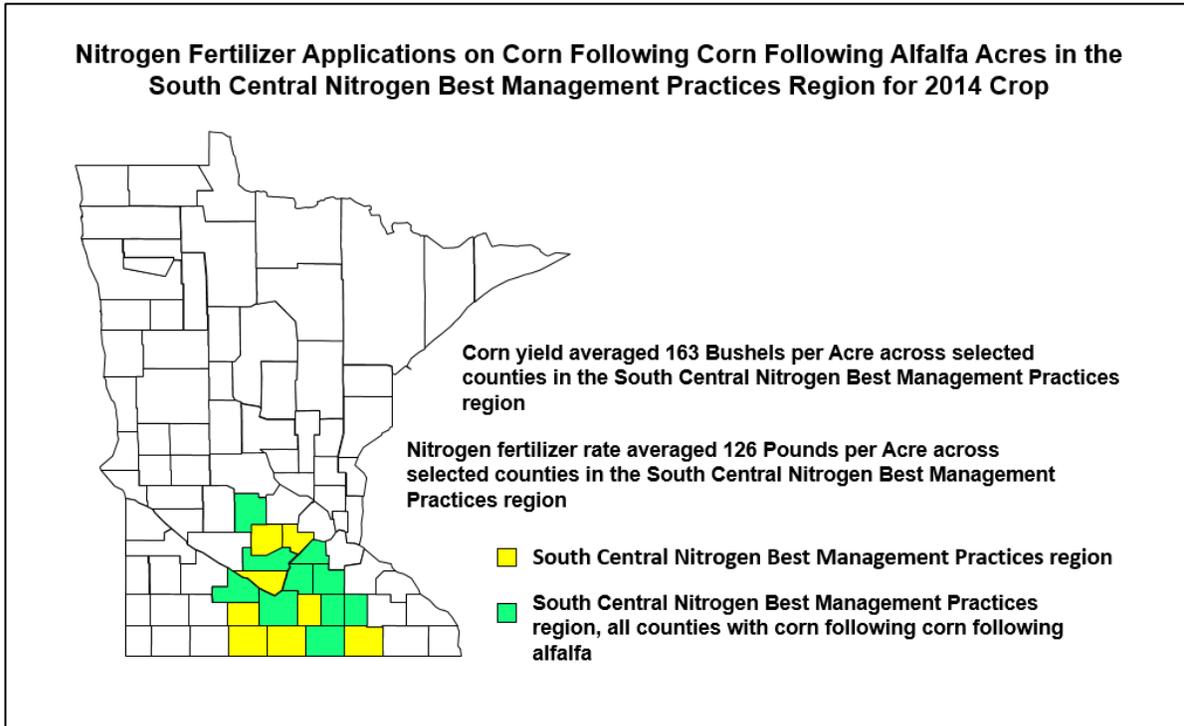


Figure 30. The corn yield averaged 163 bushels per acre and the nitrogen fertilizer rate averaged 126 pounds per acre in the SC BMP region.

Figure 31 provides 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.

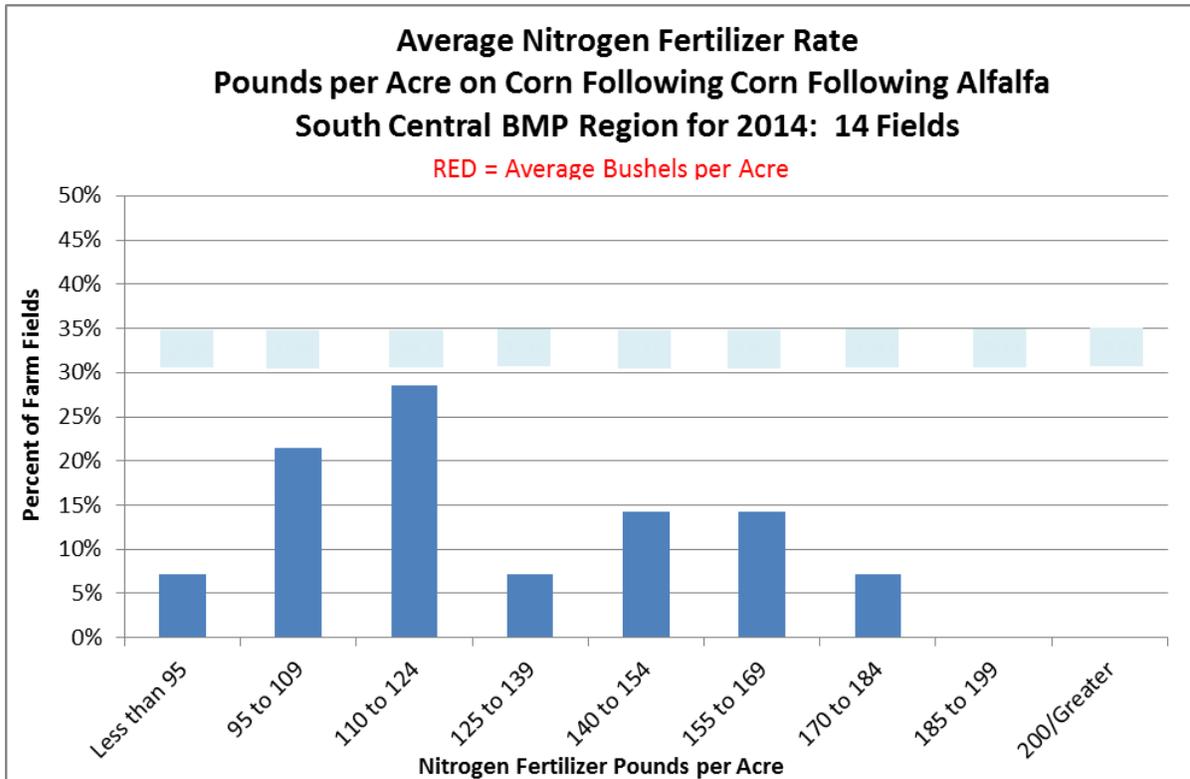


Figure 31. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the SC BMP region for 2014: 14 fields.

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

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

There were 12 fields that were included in the SW BMP region for 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.

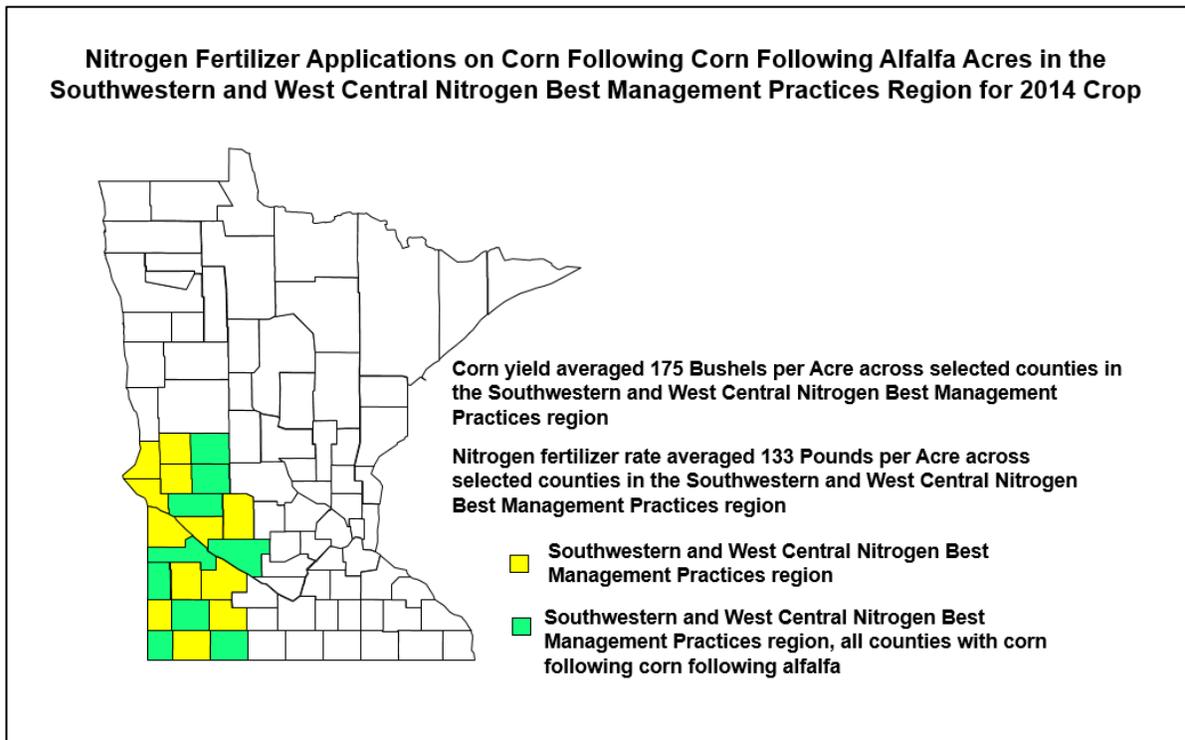


Figure 32. The corn yield averaged 175 bushels per acre and the nitrogen fertilizer rate averaged 133 pounds per acre in the SW BMP region.

Figure 33 provides 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.

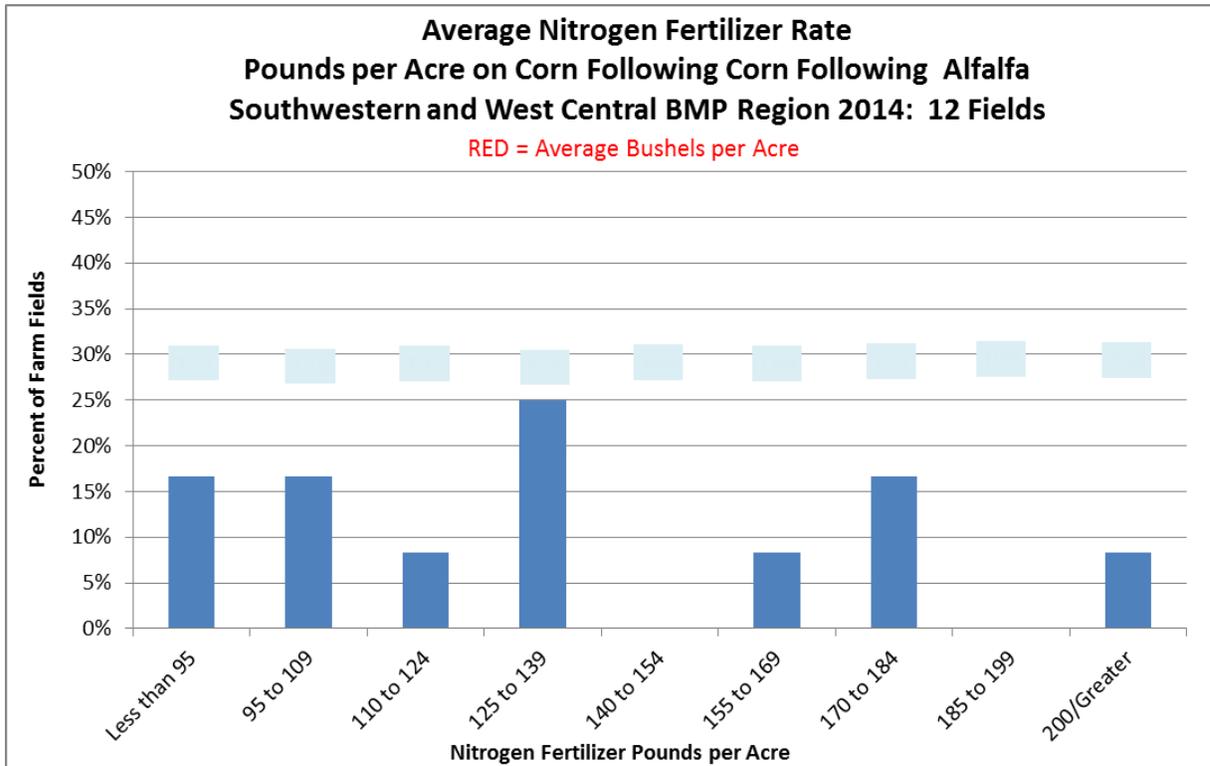


Figure 33. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the SW BMP region for 2014: 12 fields.

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

Northwestern BMP Region: Corn Following Corn Following Alfalfa

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

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

There were 17 fields that were included in the IRR BMP region for 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.

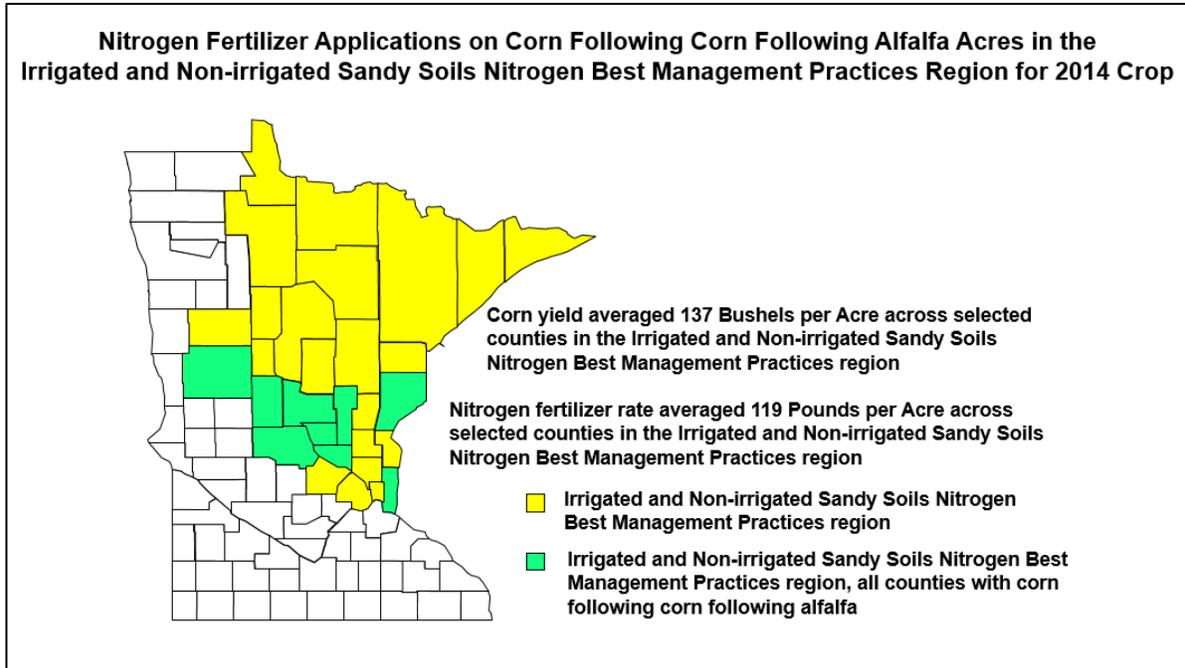


Figure 34. The corn yield averaged 137 bushels per acre and the nitrogen fertilizer rate averaged 119 pounds per acre in the IRR BMP region.

Figure 35 provides 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.

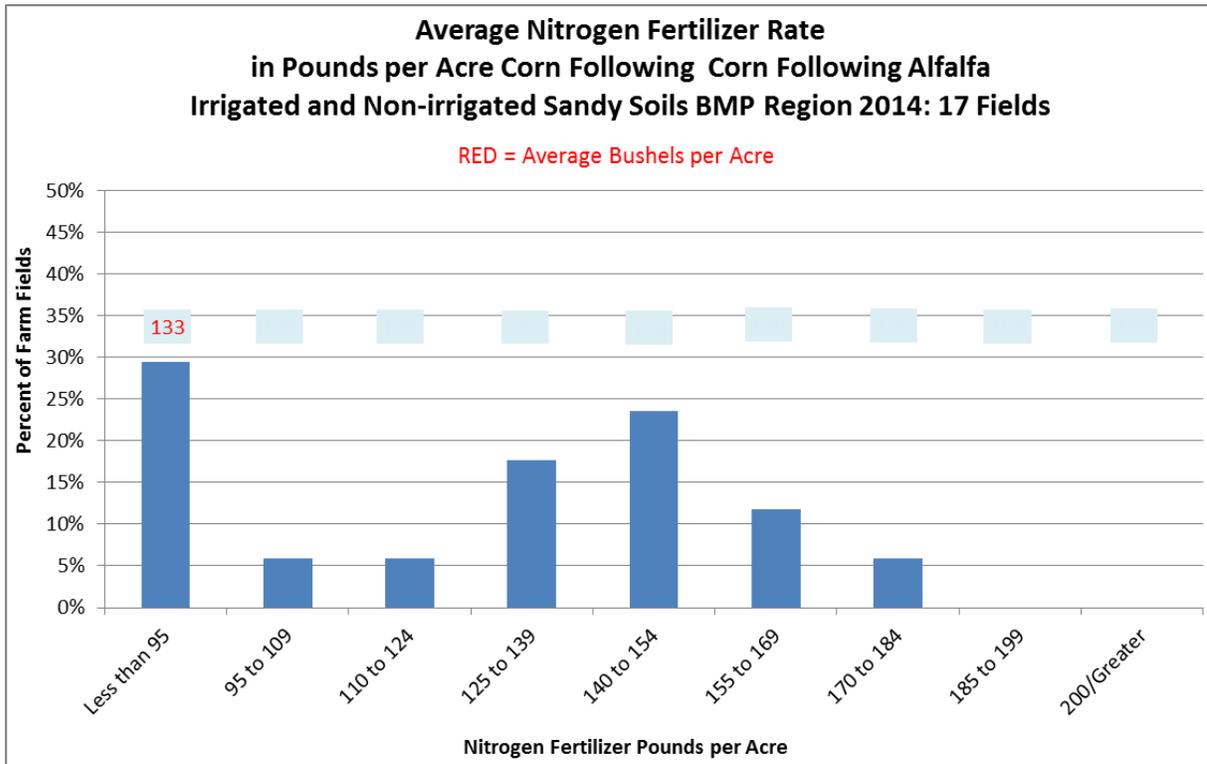


Figure 35. Average nitrogen fertilizer rates and yields on corn following corn following alfalfa in the IRR BMP region for 2014: 17 fields.

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

Statewide: Corn Following Alfalfa

Statewide, four 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 59 corn following alfalfa fields surveyed in Minnesota.

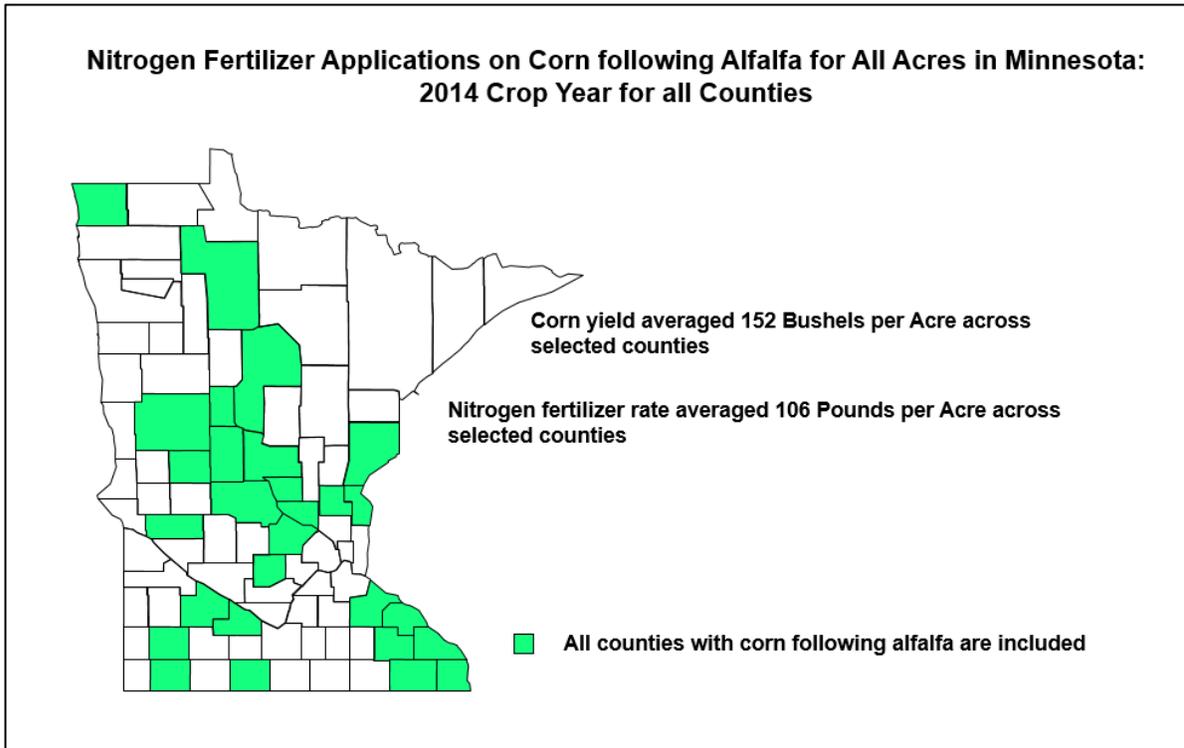


Figure 36. The corn yield averaged 152 bushels per acre and the nitrogen fertilizer rate averaged 106 pounds per acre on fields with corn following alfalfa in Minnesota.

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

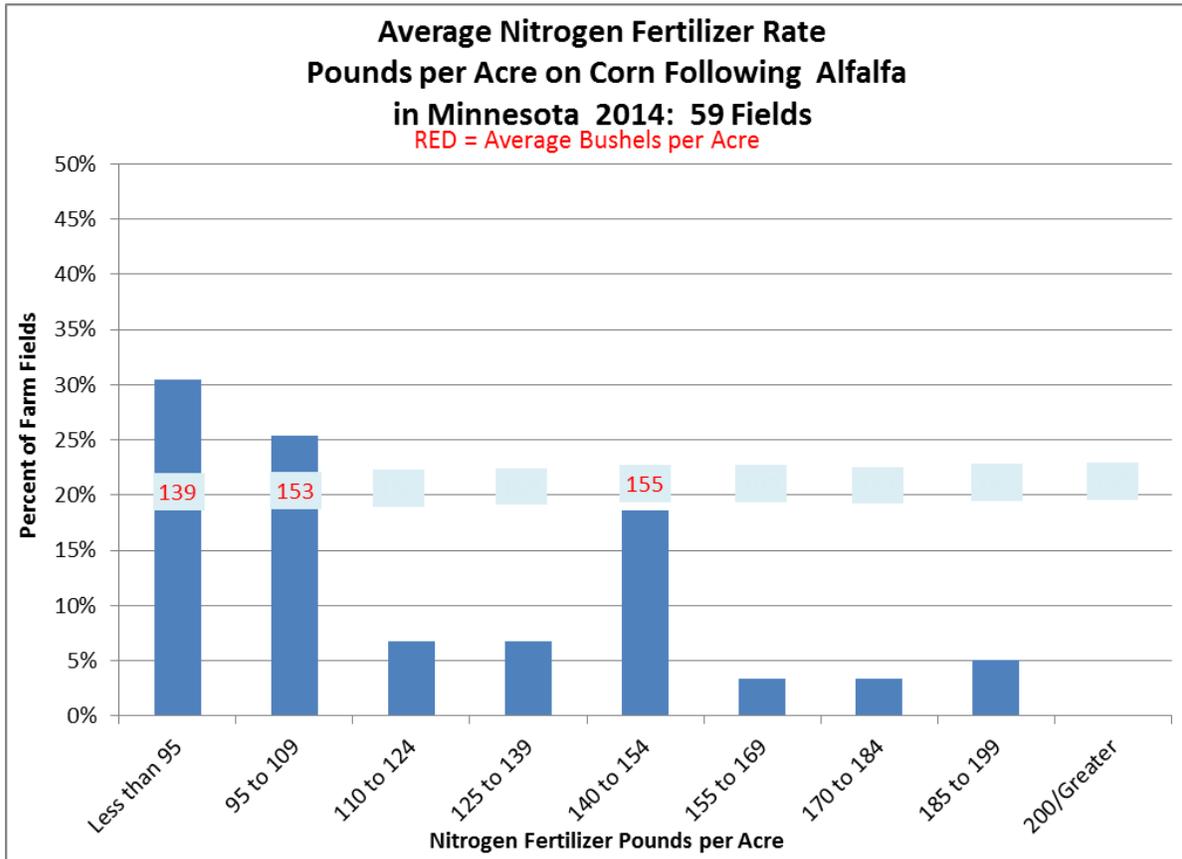


Figure 37. Average nitrogen fertilizer rates and yields on corn following alfalfa in Minnesota for 2014: 59 fields.

Southeastern BMP Region: Corn Following Alfalfa

There were 21 fields that were included in the SE BMP region for 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.

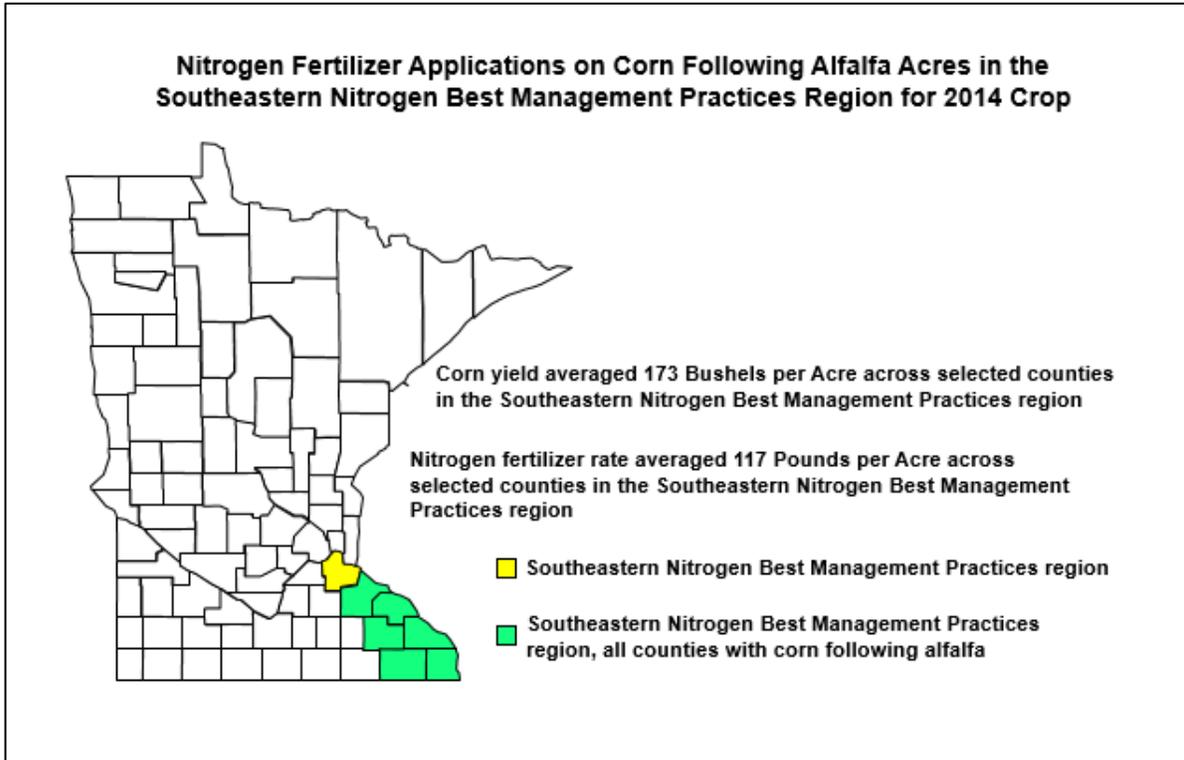


Figure 38. The corn yield averaged 173 bushels per acre and the nitrogen fertilizer rate averaged 117 pounds per acre in the SE BMP region.

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

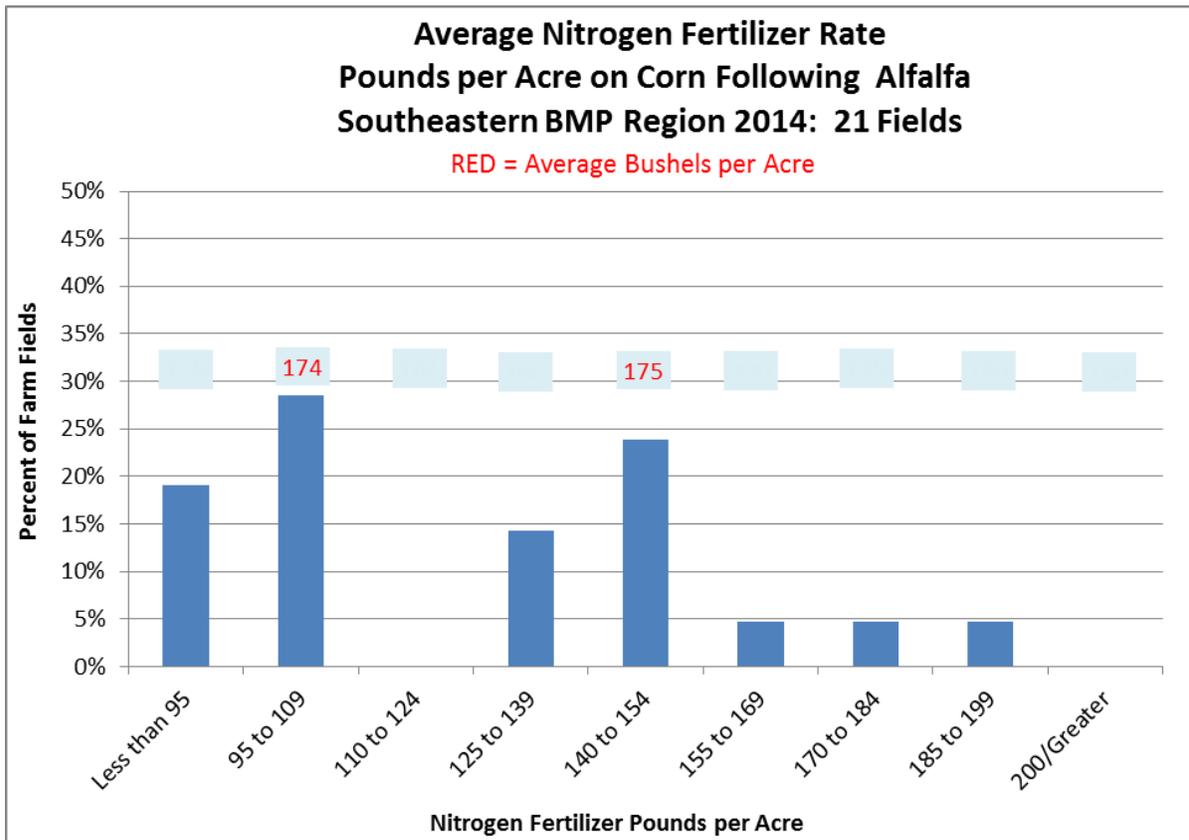


Figure 39. Average nitrogen fertilizer rates and yields on corn following alfalfa in the SE BMP region for 2014: 21 fields.

Two counties had five or more responses in the SE BMP region. Nitrogen fertilizer rates were an average of 123 pounds per acre in Wabasha and Winona Counties in Table 21.

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

Average County Nitrogen Fertilizer Rates for the SE BMP Region for Corn Following Alfalfa			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Fillmore	**	**	**
Goodhue	**	**	**
Houston	**	**	**
Olmsted	**	**	**
Wabasha	6	123	169
Winona	6	123	180

** Less than five responses.

South Central BMP Region: Corn Following Alfalfa

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

Southwestern and West Central BMP Region: Corn Following Alfalfa

There were 11 fields that were included in the SW BMP region for corn following alfalfa analysis. Figure 40 details the location, average rate of nitrogen fertilizer and average yield for corn following alfalfa in the SW BMP region.

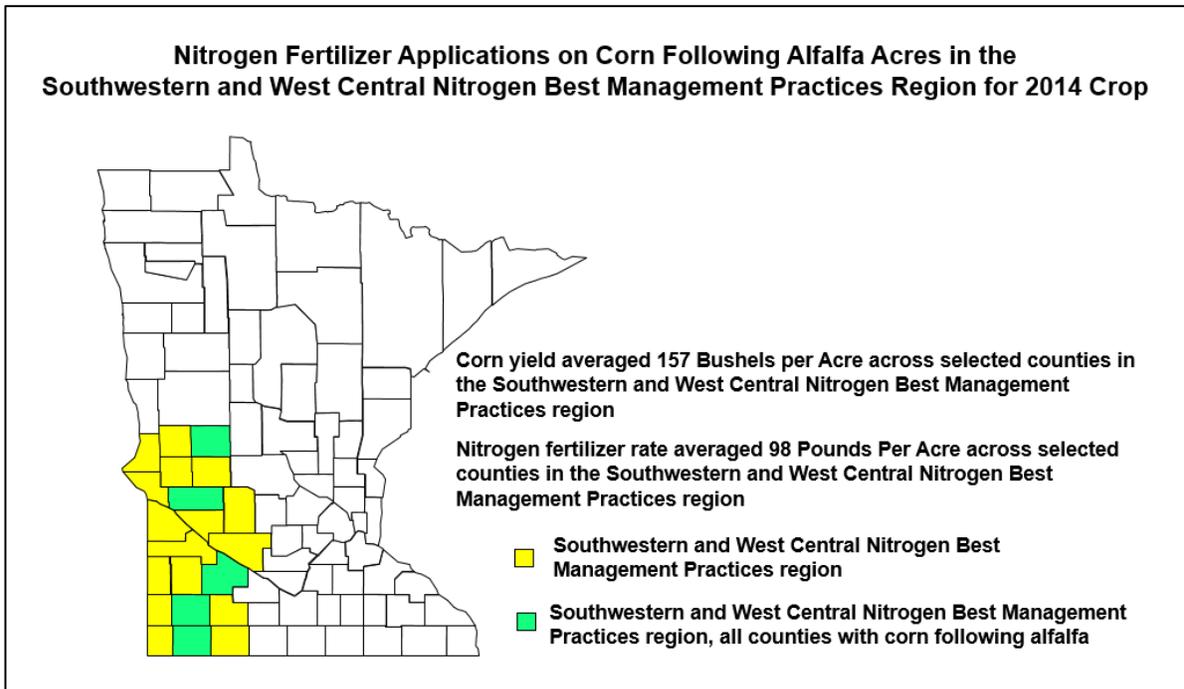


Figure 40. The corn yield averaged 157 bushels per acre and the nitrogen fertilizer rate averaged 98 pounds per acre in the SW BMP region.

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

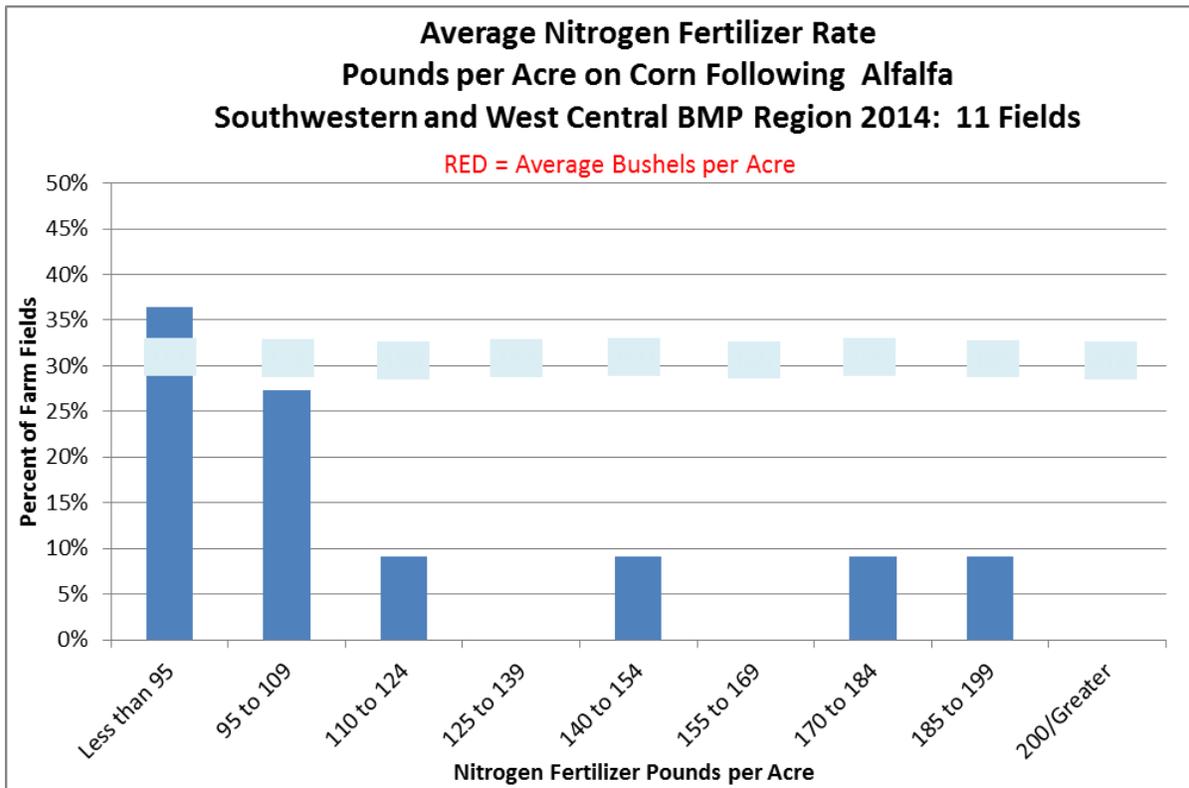


Figure 41. Average nitrogen fertilizer rates and yields on corn following alfalfa in the SW BMP region for 2014: 11 fields.

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 for 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 for corn following alfalfa analysis. Figure 42 details the location, average rate of nitrogen fertilizer and average yield for corn following alfalfa in the IRR BMP region.

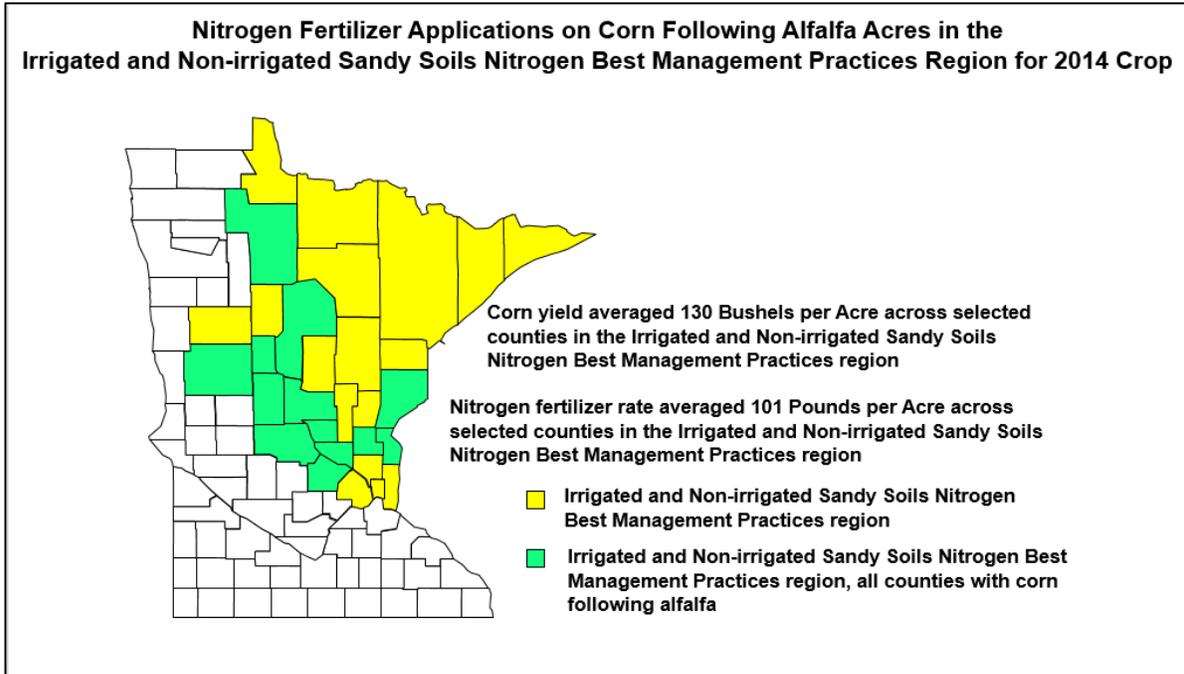


Figure 42. The corn yield averaged 130 bushels per acre and the nitrogen fertilizer rate averaged 101 pounds per acre in the IRR BMP region.

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

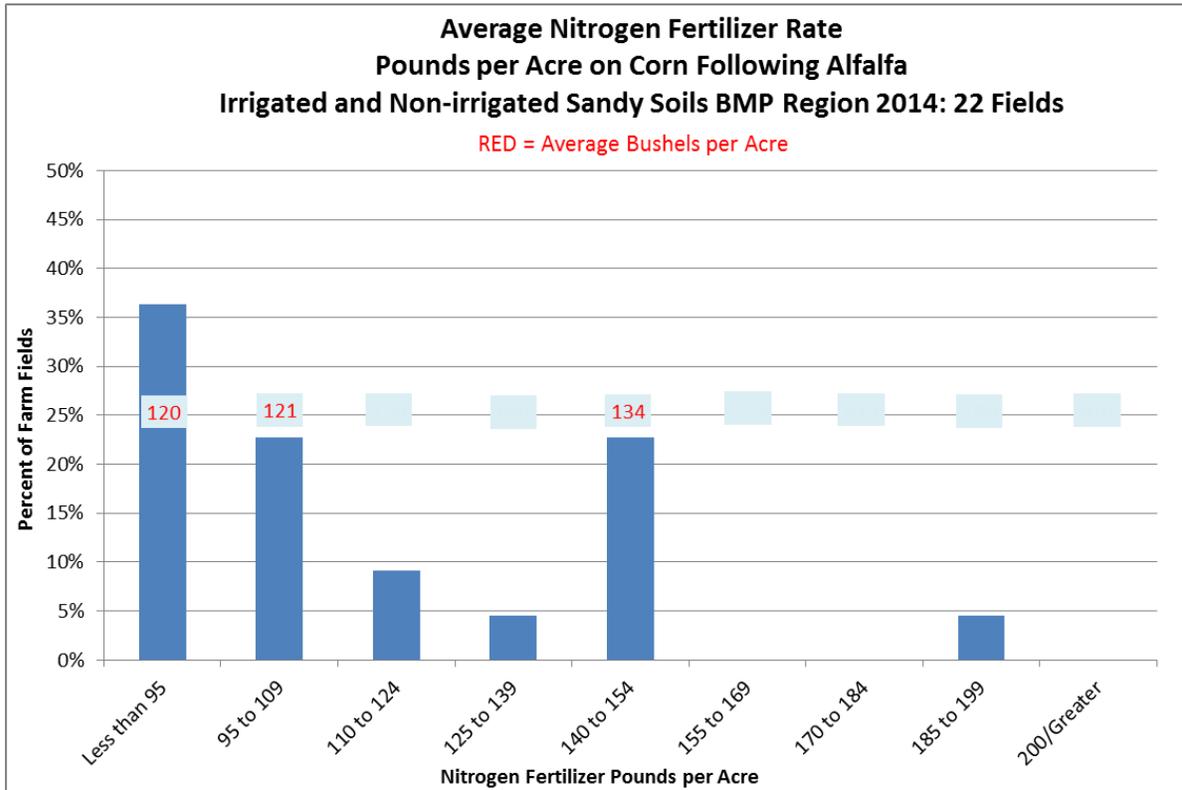


Figure 43. Average nitrogen fertilizer rates and yields on corn following alfalfa in the IRR BMP region for 2014: 22 fields.

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

Statewide: Corn Following Small Grains

Statewide, two percent of the fields reported were corn following small grains. Figure 44 details the counties where farmers reported on fields with corn following small grains. There were 38 corn following small grains fields surveyed in Minnesota.

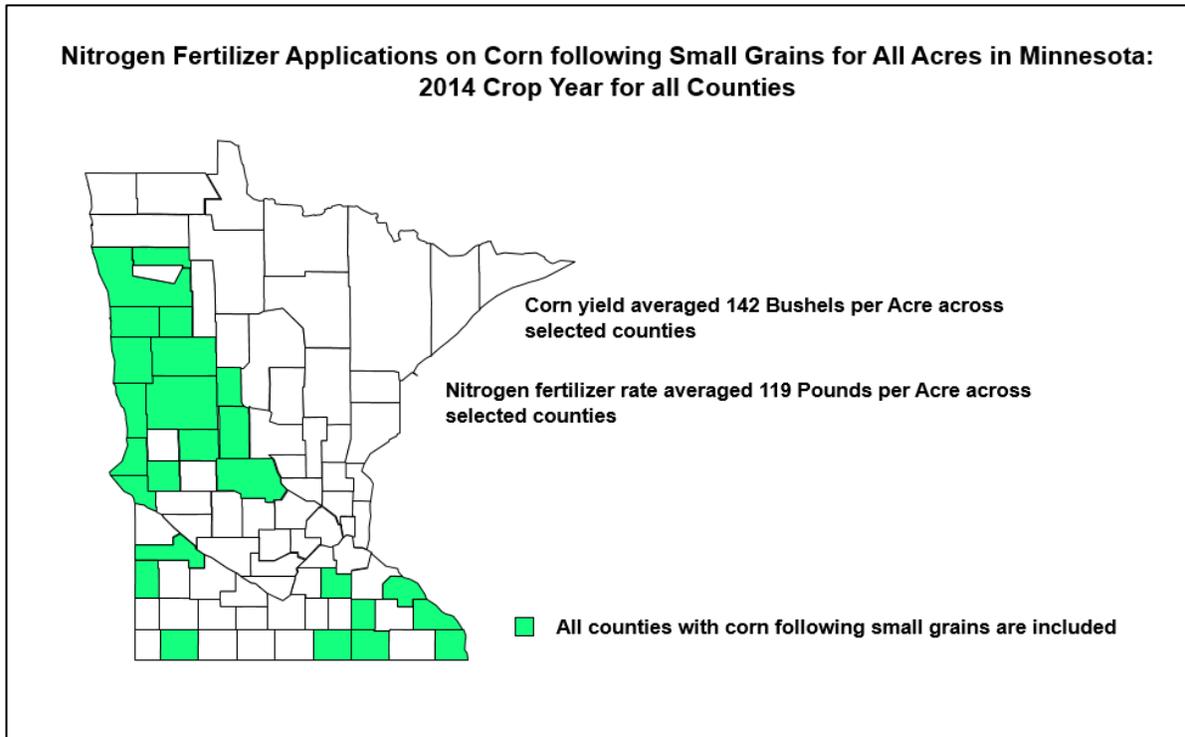


Figure 44. The corn yield averaged 142 bushels per acre and the nitrogen fertilizer rate averaged 119 pounds per acre on fields with corn following small grains in Minnesota.

Figure 45 provides the distribution of average nitrogen fertilizer rates in Minnesota for corn following small grains; the corresponding corn yields are detailed in red.

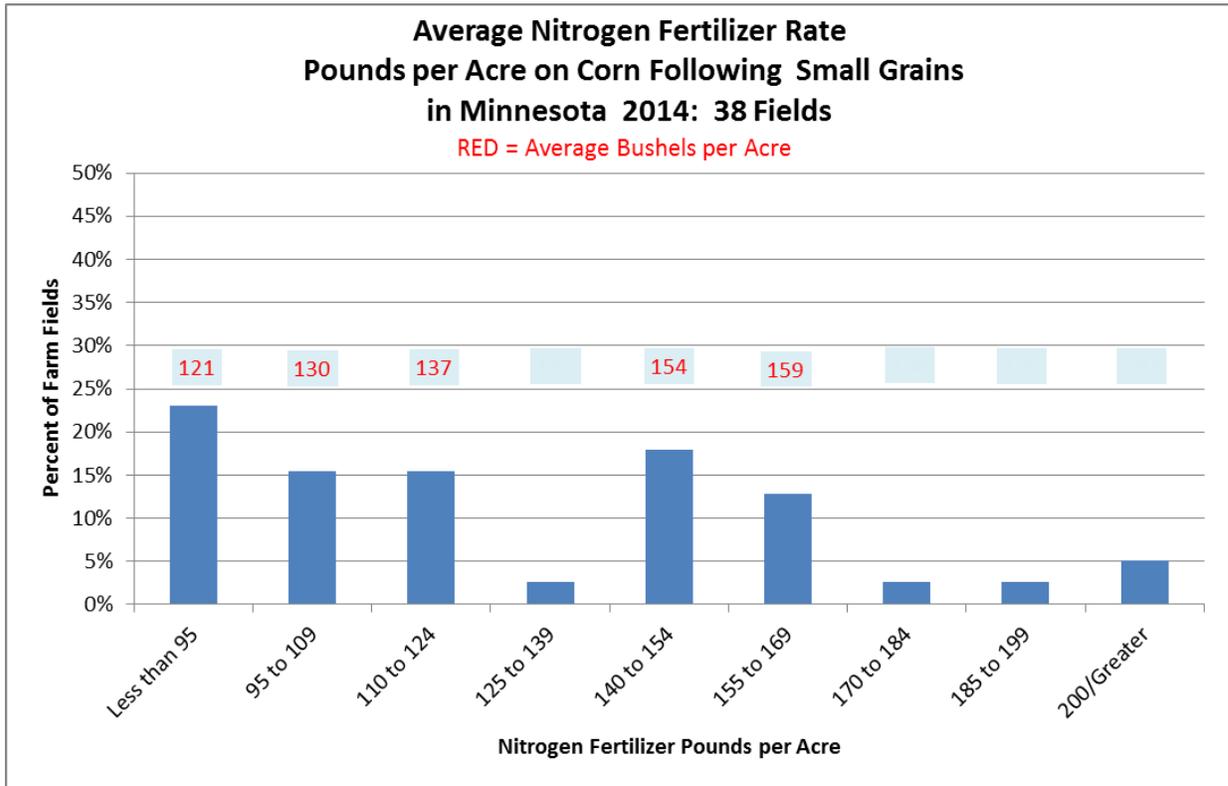


Figure 45. Average nitrogen fertilizer rates and yields on corn following small grains in Minnesota for 2014: 38 fields.

Southeastern BMP Region: Corn Following Small Grains

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

South Central BMP Region: Corn Following Small Grains

There were 5 fields that were included in the SC BMP region for corn following small grains analysis. Figure 46 details the location, average rate of nitrogen fertilizer and average yield for corn following small grains in the SC BMP region.

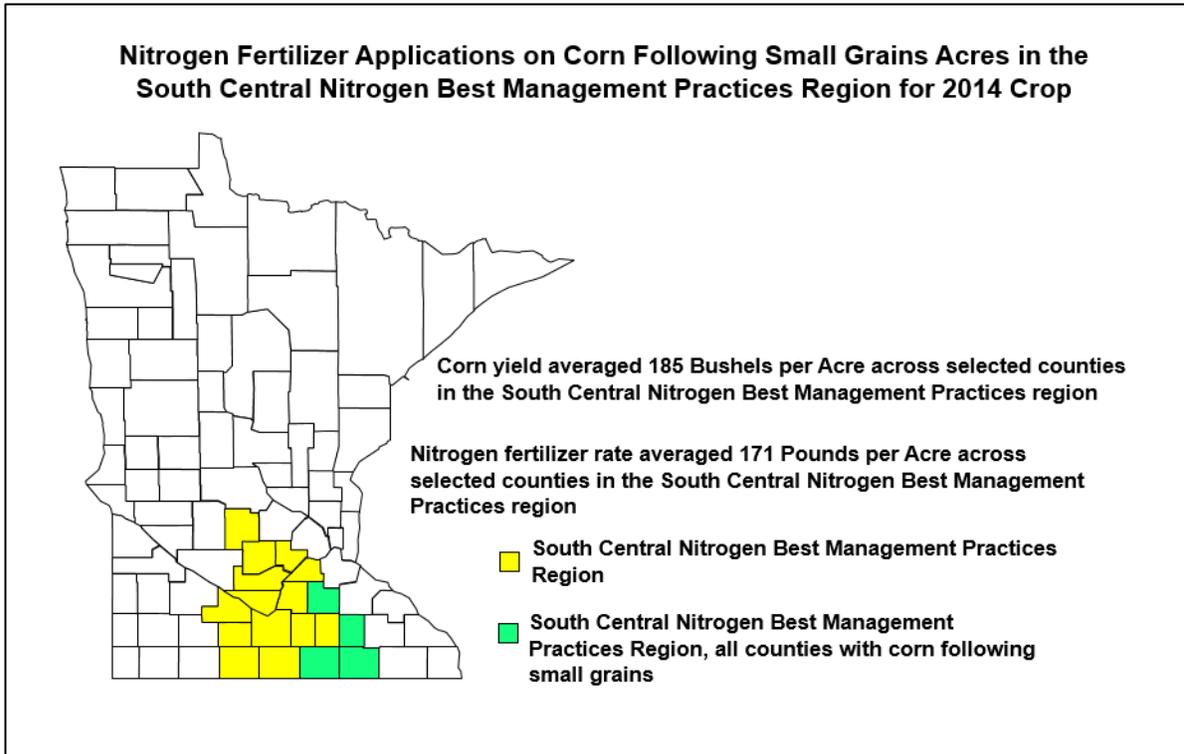


Figure 46. The corn yield averaged 185 bushels per acre and the nitrogen fertilizer rate averaged 171 pounds per acre in the SC BMP region.

Figure 47 provides the distribution of nitrogen fertilizer rates in the SC BMP region for corn following small grains; the corresponding corn yields are detailed in red.

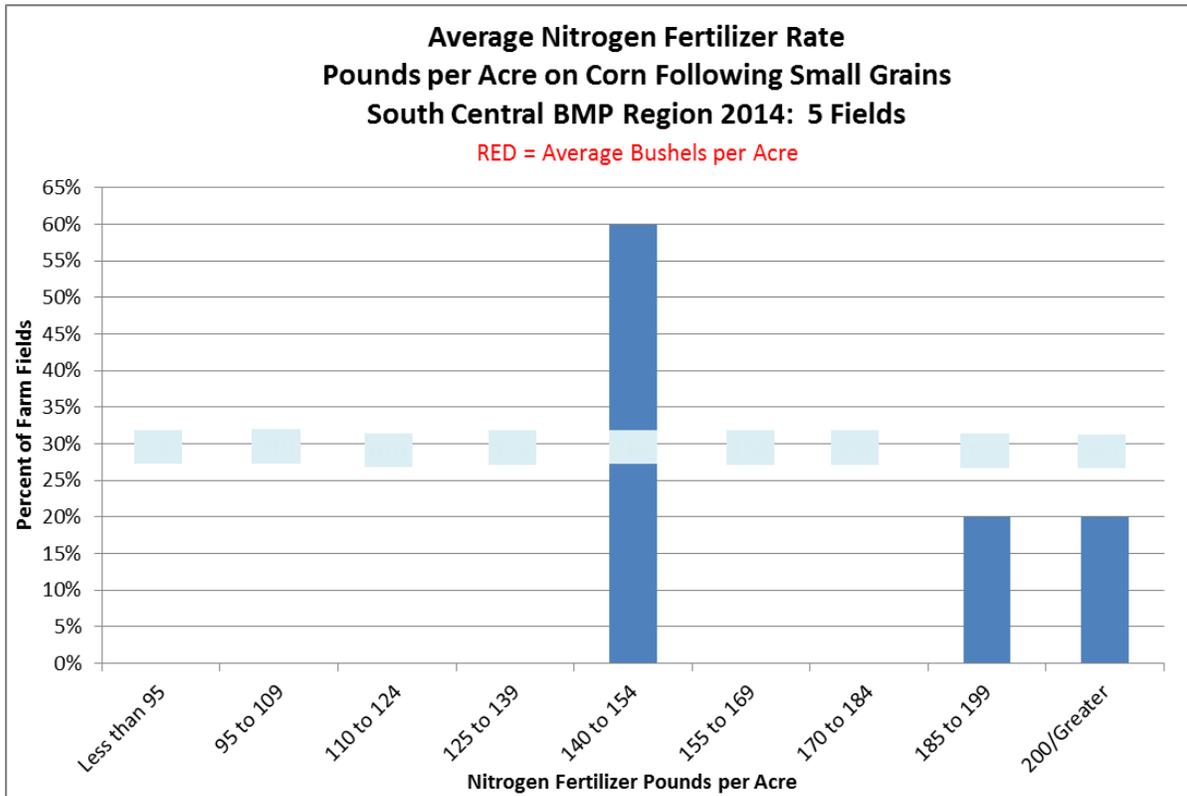


Figure 47. Average nitrogen fertilizer rates and yields on corn following small grains in the SC BMP region for 2014: 5 fields.

Southwestern and West Central BMP Region: Corn Following Small Grains

There were 8 fields that were included in the SW BMP region for 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.

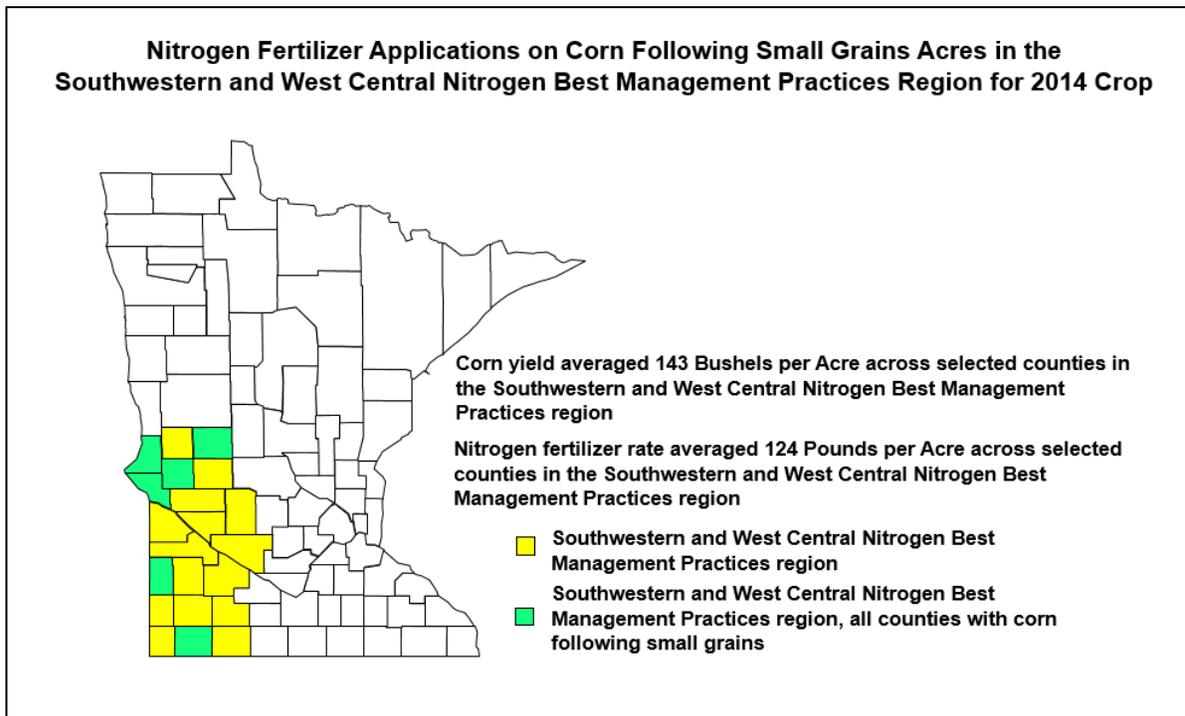


Figure 48. The corn yield averaged 143 bushels per acre and the nitrogen fertilizer rate averaged 124 pounds per acre in the SW BMP region.

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

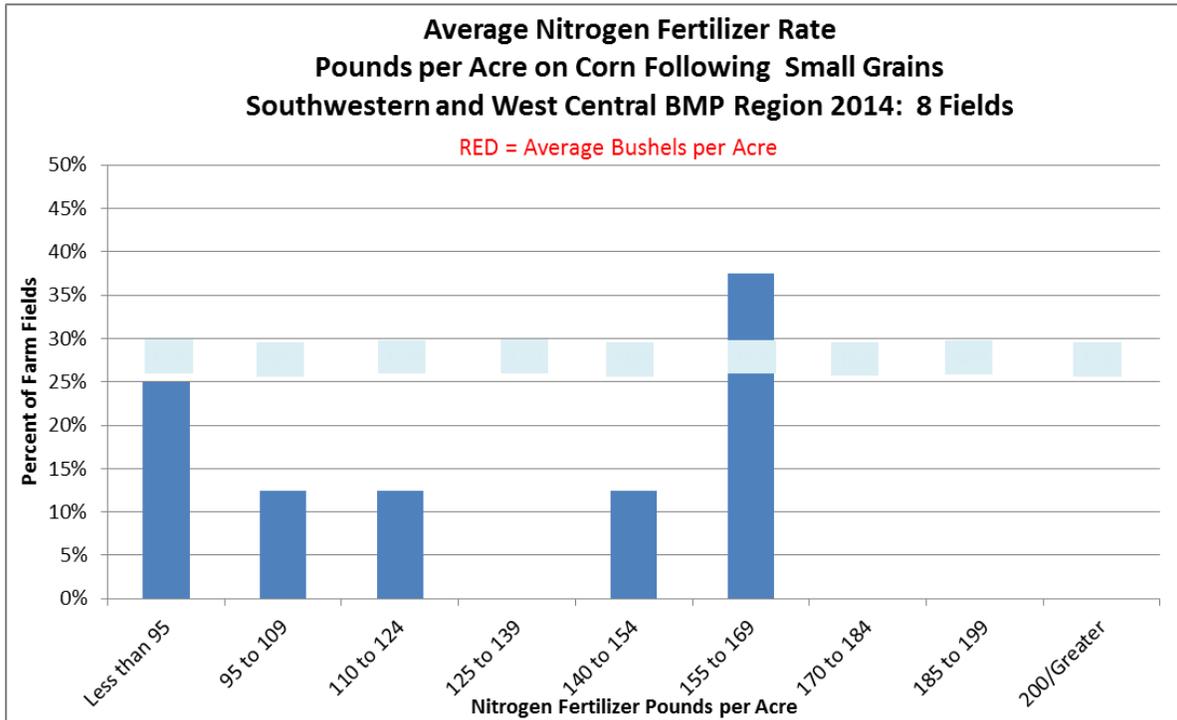


Figure 49. Average nitrogen fertilizer rates and yields on corn following small grains in the SW BMP region for 2014: 8 fields.

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

Northwestern BMP Region: Corn Following Small Grains

There were 11 fields that were included in the NW BMP region for 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.

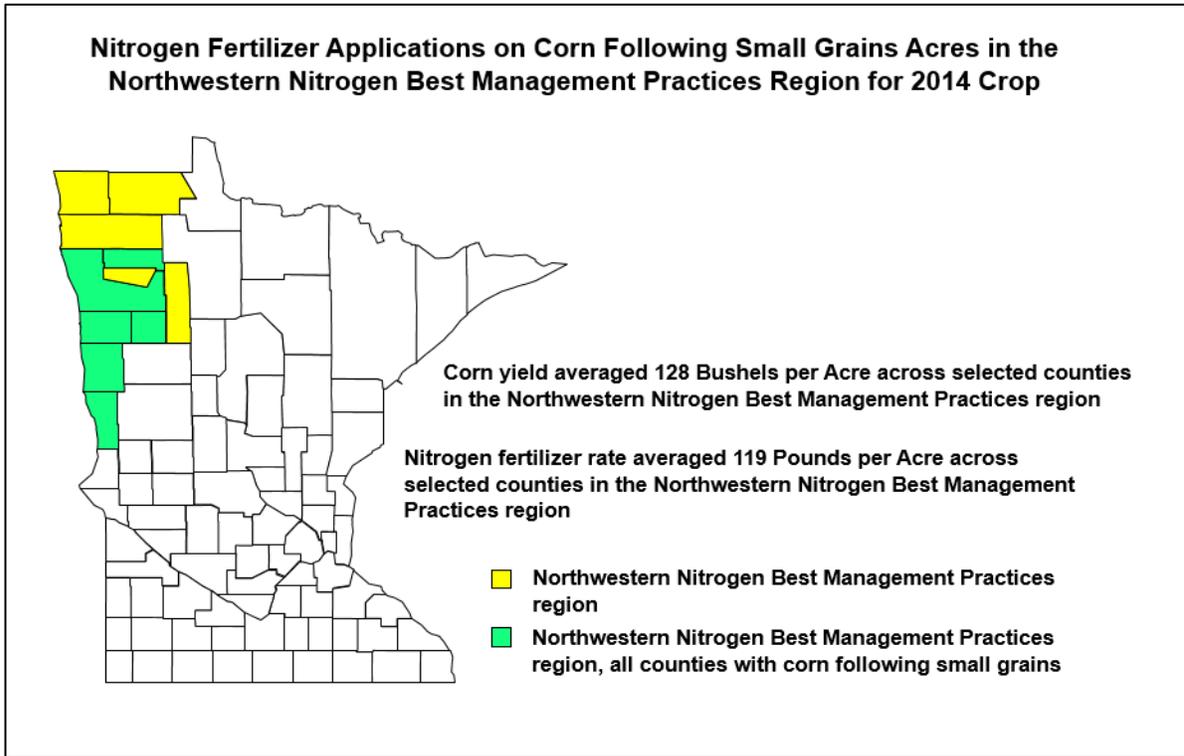


Figure 50. The corn yield averaged 128 bushels per acre and the nitrogen fertilizer rate averaged 119 pounds per acre in the NW BMP region.

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

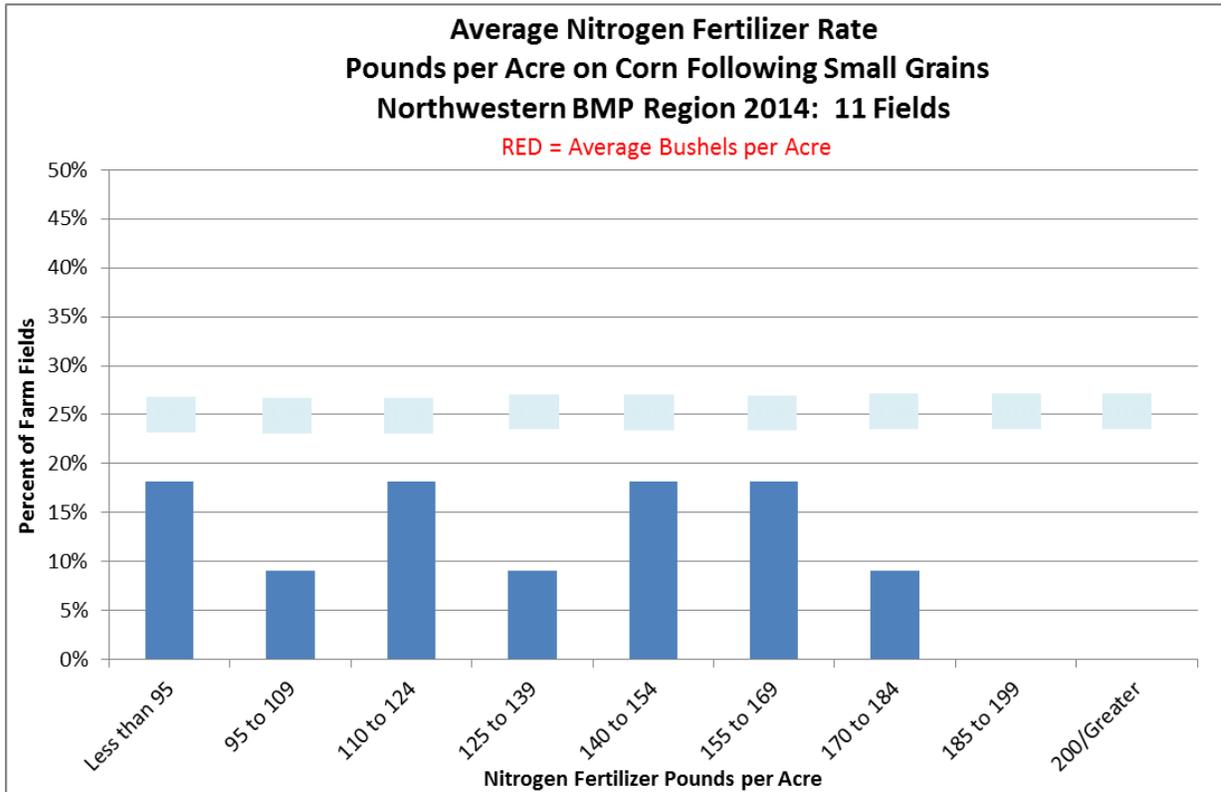


Figure 51. Average nitrogen fertilizer rates and yields on corn following small grains in the NW BMP region for 2014: 11 fields.

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 11 fields that were included in the IRR BMP region for 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.

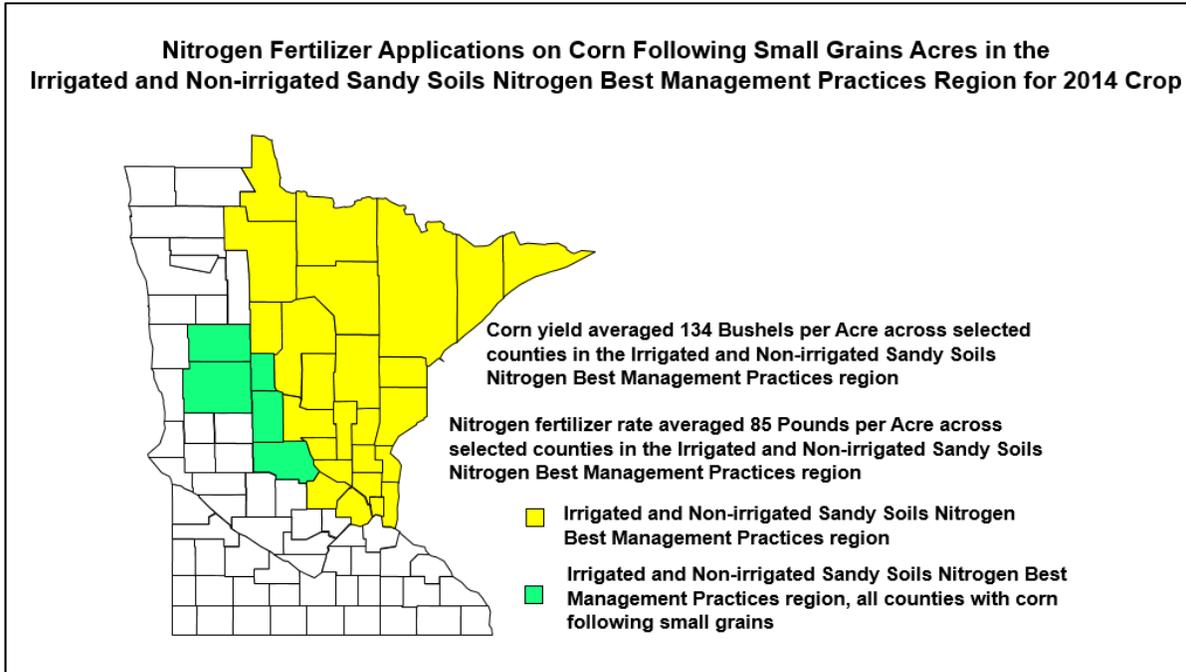


Figure 52. The corn yield averaged 134 bushels per acre and the nitrogen fertilizer rate averaged 85 pounds per acre in the IRR BMP region.

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

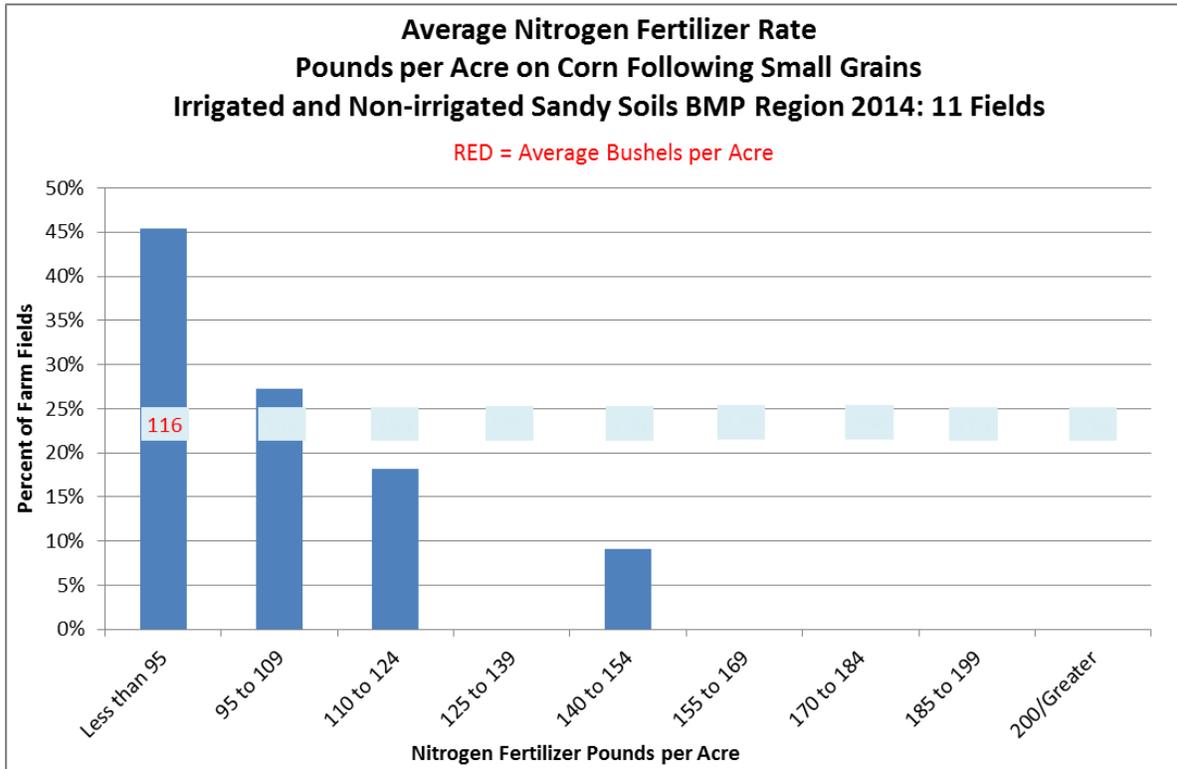


Figure 53. Average nitrogen fertilizer rates and yields on corn following small grains in the IRR BMP region for 2014: 11 fields.

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

Statewide: Corn Following Other Crops

Statewide, five percent of the fields reported were corn following other crops. Figure 54 details the counties where farmers reported on fields with corn following other crops. There were 85 corn following other crops fields surveyed in Minnesota.

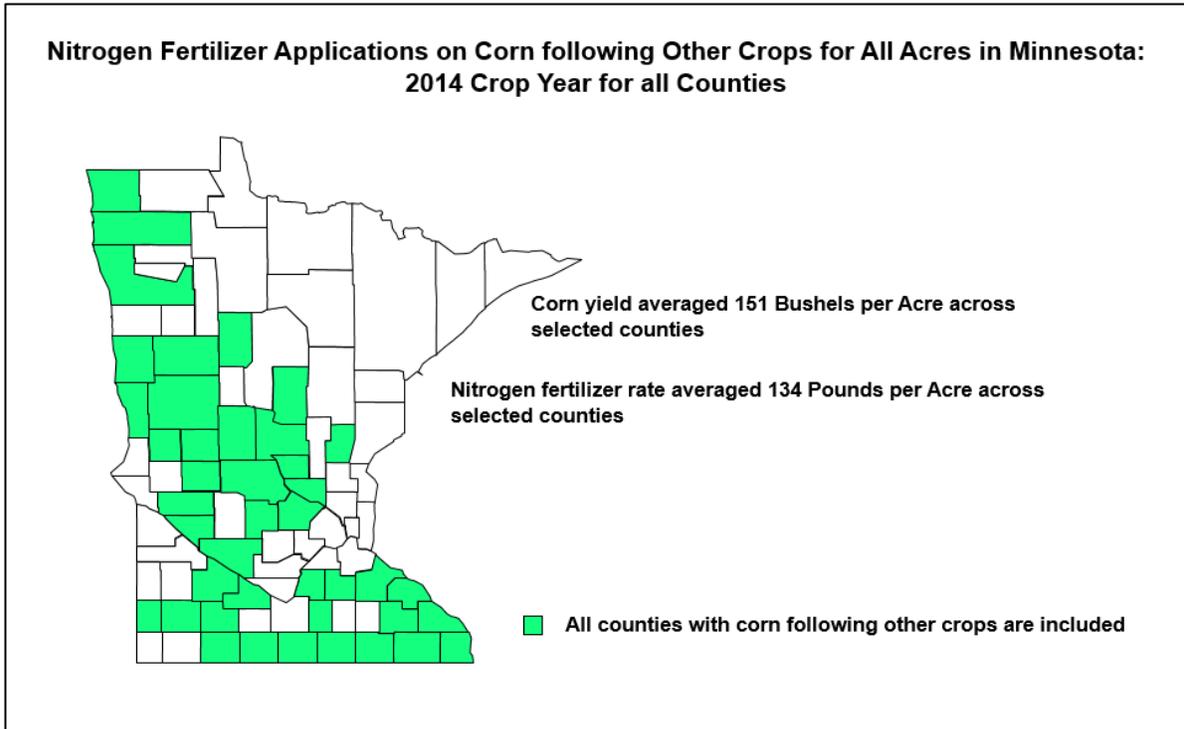


Figure 54. The corn yield averaged 151 bushels per acre and the nitrogen fertilizer rate averaged 134 pounds per acre on fields with corn following other crops in Minnesota.

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

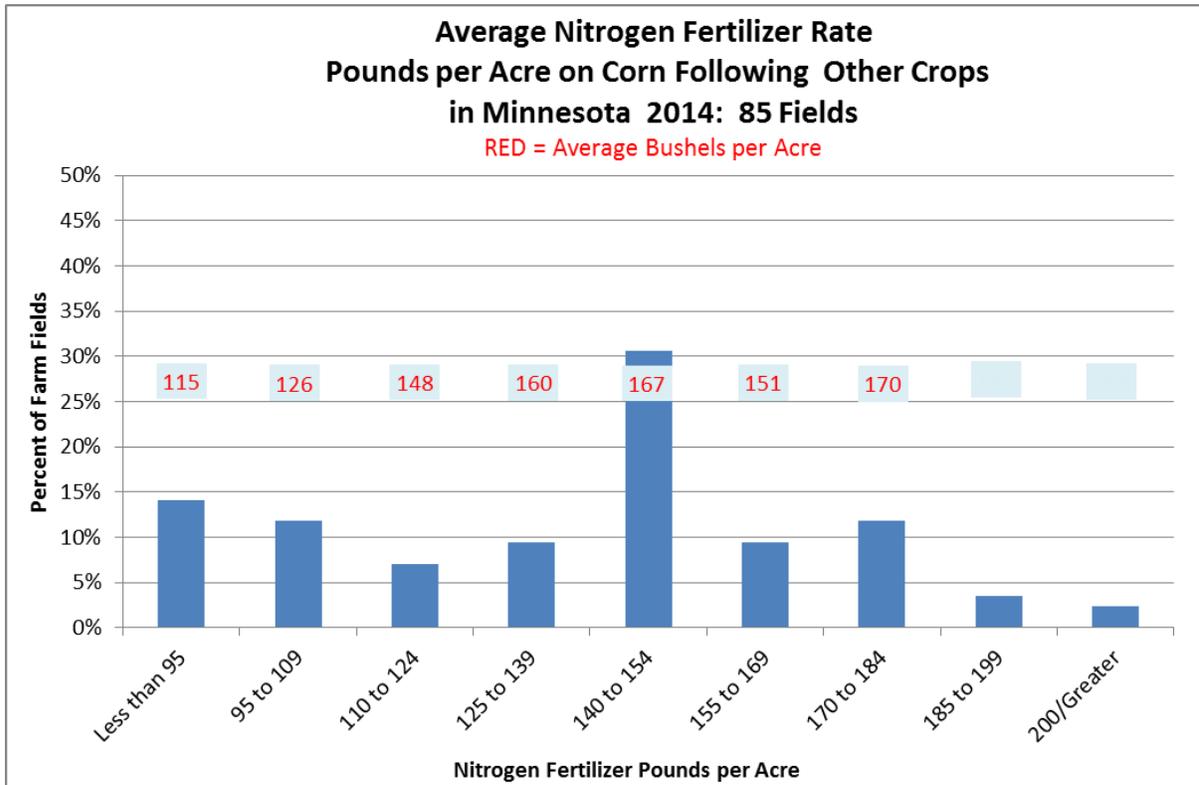


Figure 55. Average nitrogen fertilizer rates and yields on corn following other crops in Minnesota for 2014: 85 fields.

Southeastern BMP Region: Corn Following Other Crops

There were 16 fields that were included in the SE BMP region for 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 SE BMP region.

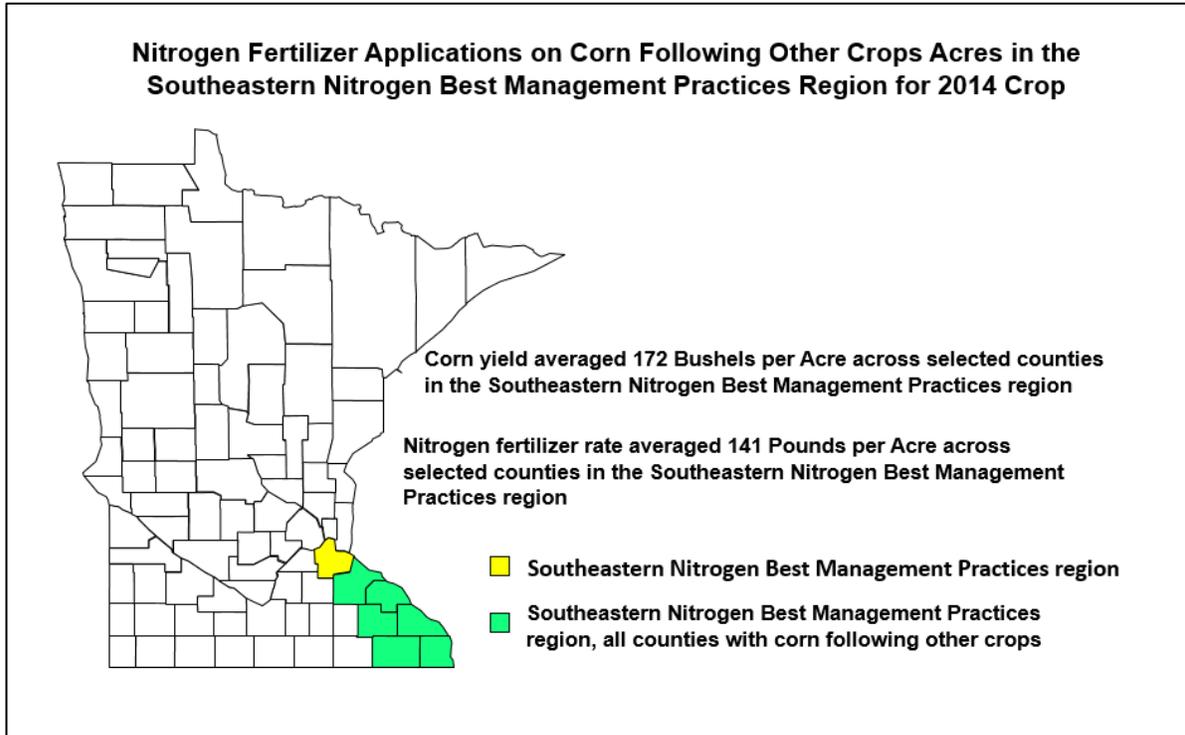


Figure 56. The corn yield averaged 172 bushels per acre and the nitrogen fertilizer rate averaged 141 pounds per acre in the SE BMP region.

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

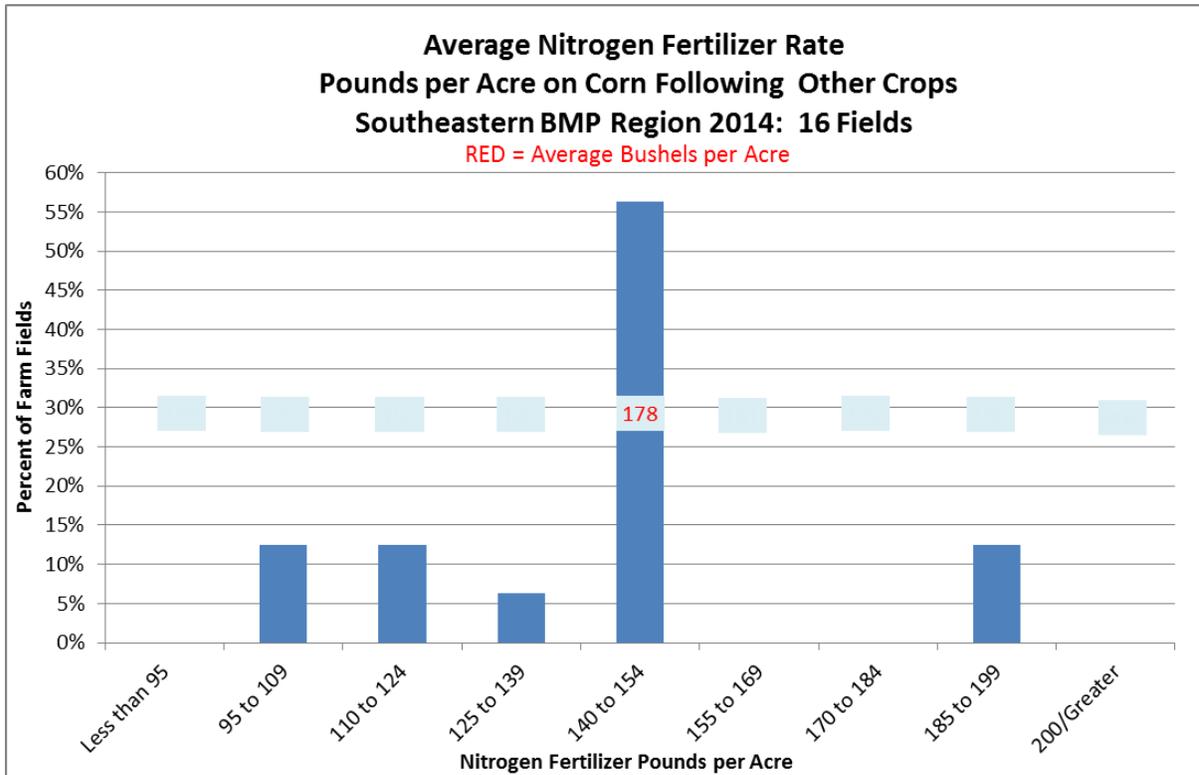


Figure 57. Average nitrogen fertilizer rates and yields on corn following other crops in SE BMP region for 2014: 16 fields.

One county had five or more responses in the SE BMP region. Nitrogen fertilizer rates were an average of 138 pounds per acre in Olmstead County in Table 22.

Table 22. Average county nitrogen fertilizer rates and corn yields for the SE BMP region for corn following other crops.

Average County Nitrogen Fertilizer Rates for the SE BMP Region for Corn Following Other Crops			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Fillmore	**	**	**
Goodhue	**	**	**
Houston	**	**	**
Olmsted	5	138	173
Wabasha	**	**	**
Winona	**	**	**

** Less than five responses.

South Central BMP Region: Corn Following Other Crops

There were 18 fields that were included in the SC BMP region for 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 SC BMP region.

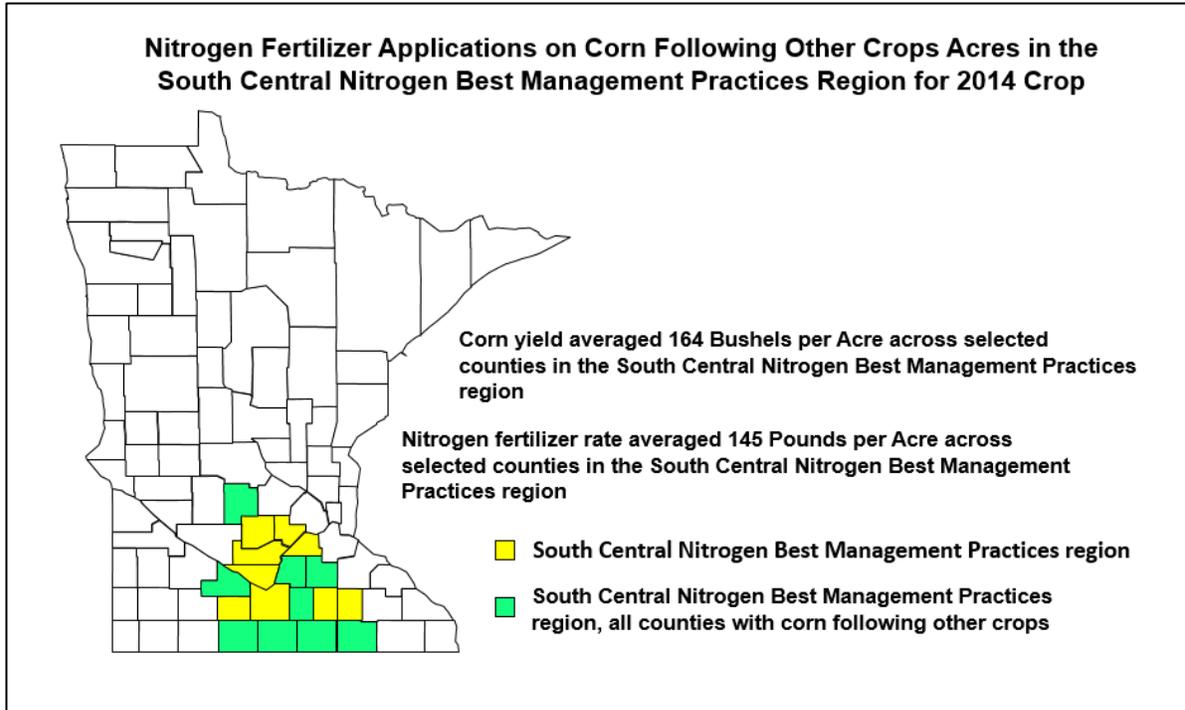


Figure 58. The corn yield averaged 164 bushels per acre and the nitrogen fertilizer rate averaged 145 pounds per acre in the SC BMP region.

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

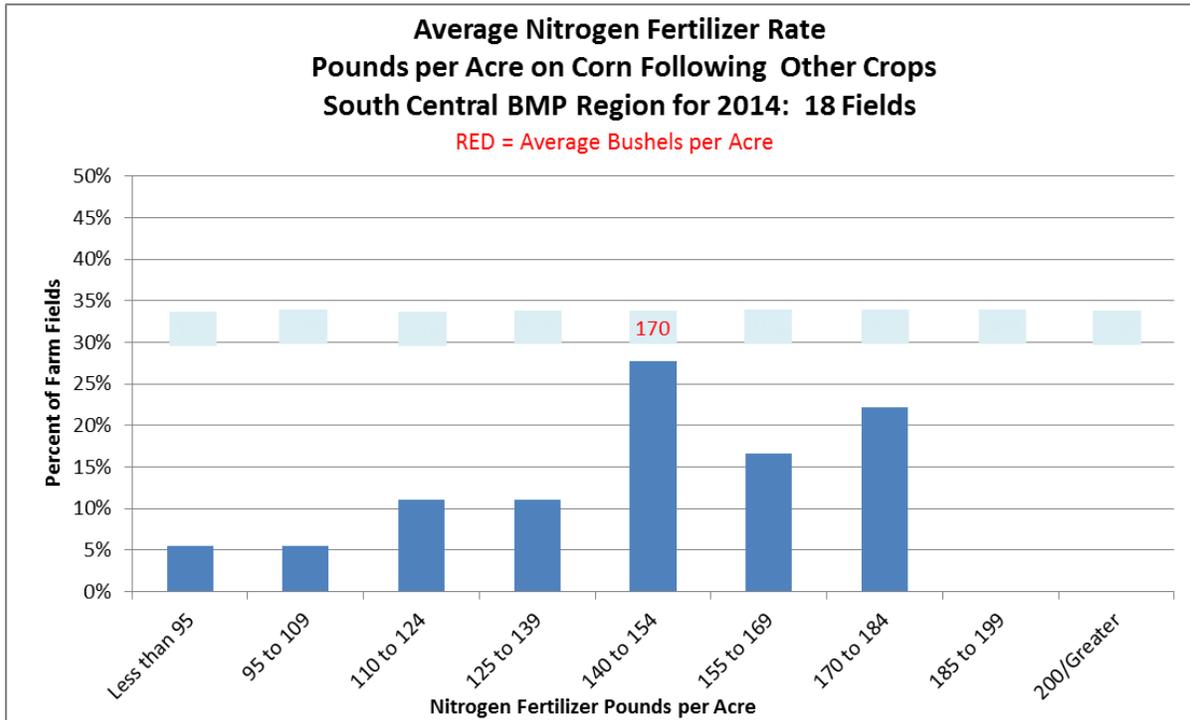


Figure 59. Average nitrogen fertilizer rates and yields on corn following other crops in the SC BMP region for 2014: 18 fields.

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

Southwestern and West Central BMP Region: Corn Following Other Crops

There were 15 fields that were included in the SW BMP region for 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 SW BMP region.

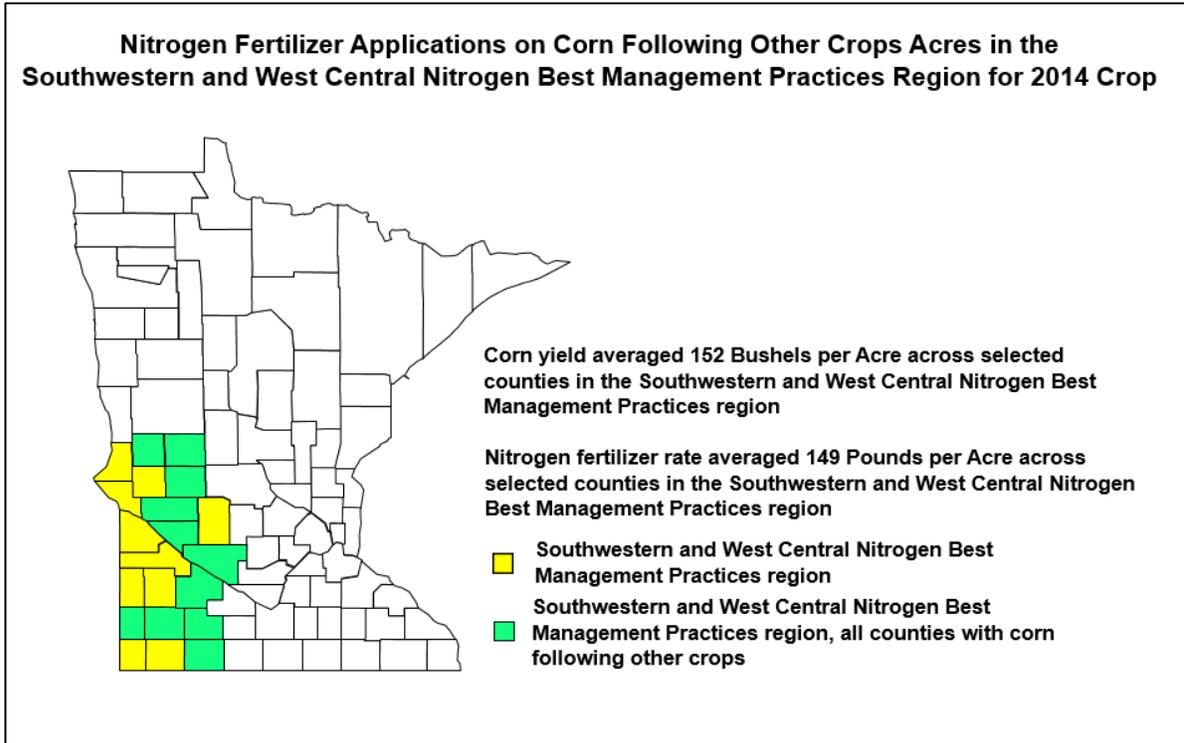


Figure 60. The corn yield averaged 152 bushels per acre and the nitrogen fertilizer rate averaged 149 pounds per acre in the SW BMP region.

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

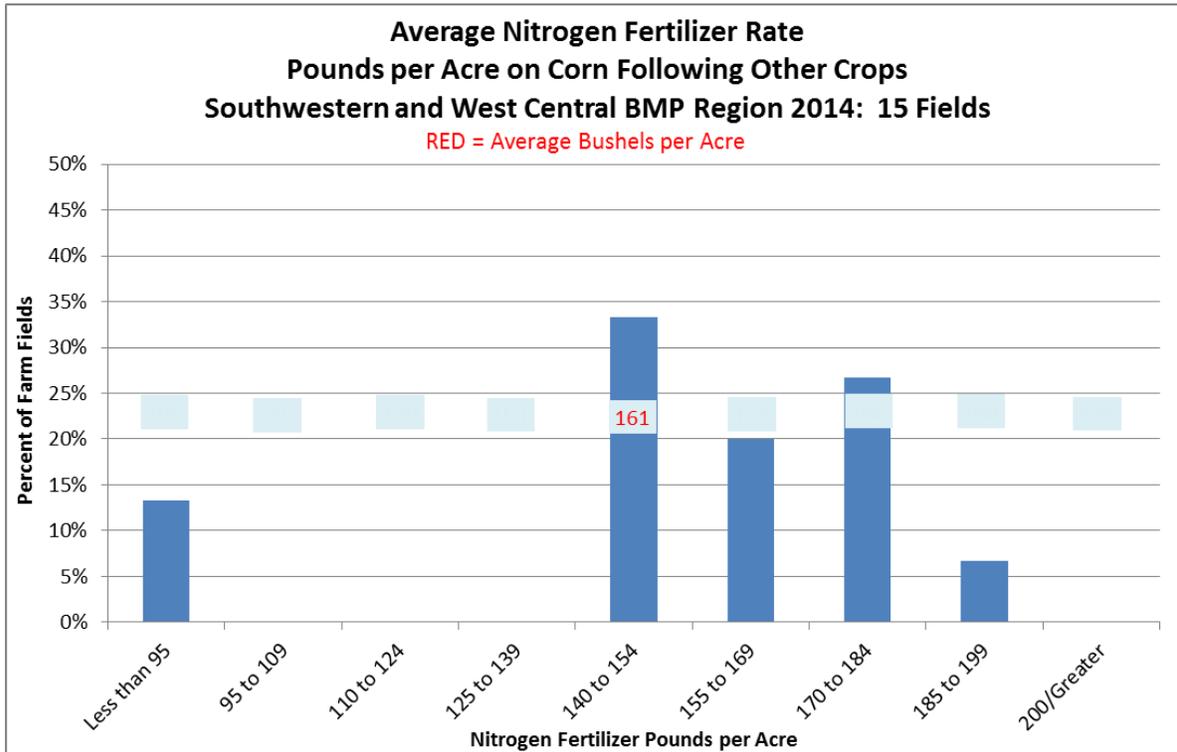


Figure 61. Average nitrogen fertilizer rates and yields on corn following other crops in the SW BMP region for 2014: 15 fields.

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

Northwestern BMP Region: Corn Following Other Crops

There were 12 fields that were included in the NW BMP region for 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 NW BMP region.

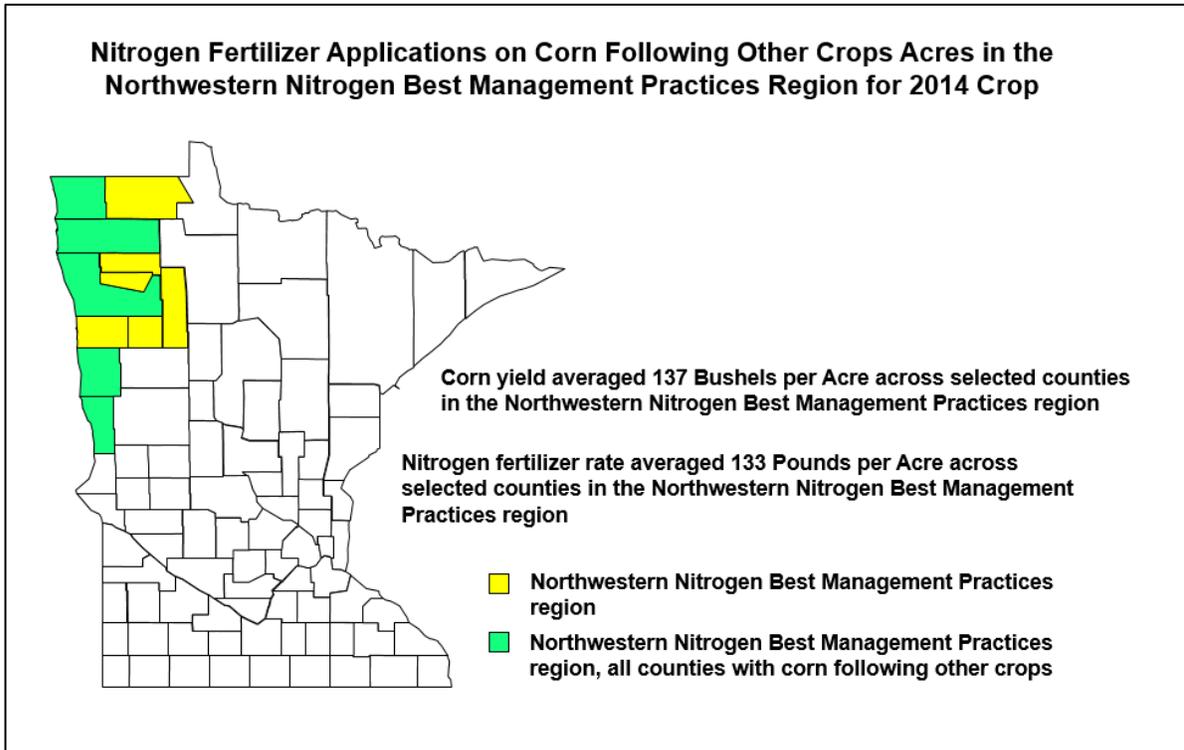


Figure 62. The corn yield averaged 137 bushels per acre and the nitrogen fertilizer rate averaged 133 pounds per acre in the NW BMP region.

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

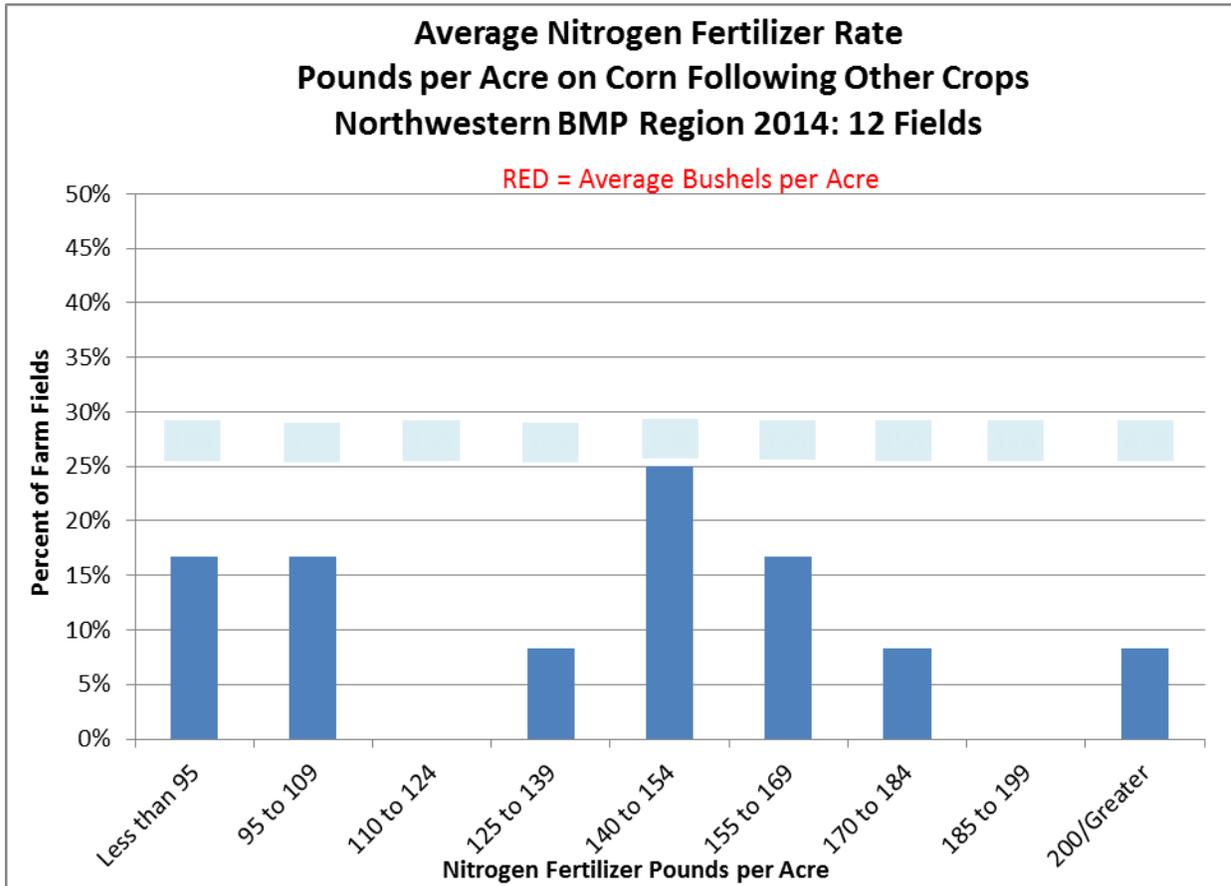


Figure 63. Average nitrogen fertilizer rates and yields on corn following other crops in the NW BMP region for 2014: 12 fields.

One county had five or more responses in the NW BMP region. Nitrogen fertilizer rates were an average of 140 pounds per acre in Clay County in Table 23.

Table 23. Average county nitrogen fertilizer rates and corn yields for the NW BMP region for corn following other crops.

Average County Nitrogen Fertilizer Rates for the NW BMP Region for Corn Following Other Crops			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Clay	5	140	145
Kittson	**	**	**
Marshall	**	**	**
Polk	**	**	**
Wilkin	**	**	**

** Less than five responses.

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

There were 24 fields that were included in the IRR BMP region for corn following other crops analysis. Figure 64 details the location, average rate of nitrogen fertilizer and average yield for corn following other crops in the IRR BMP region.

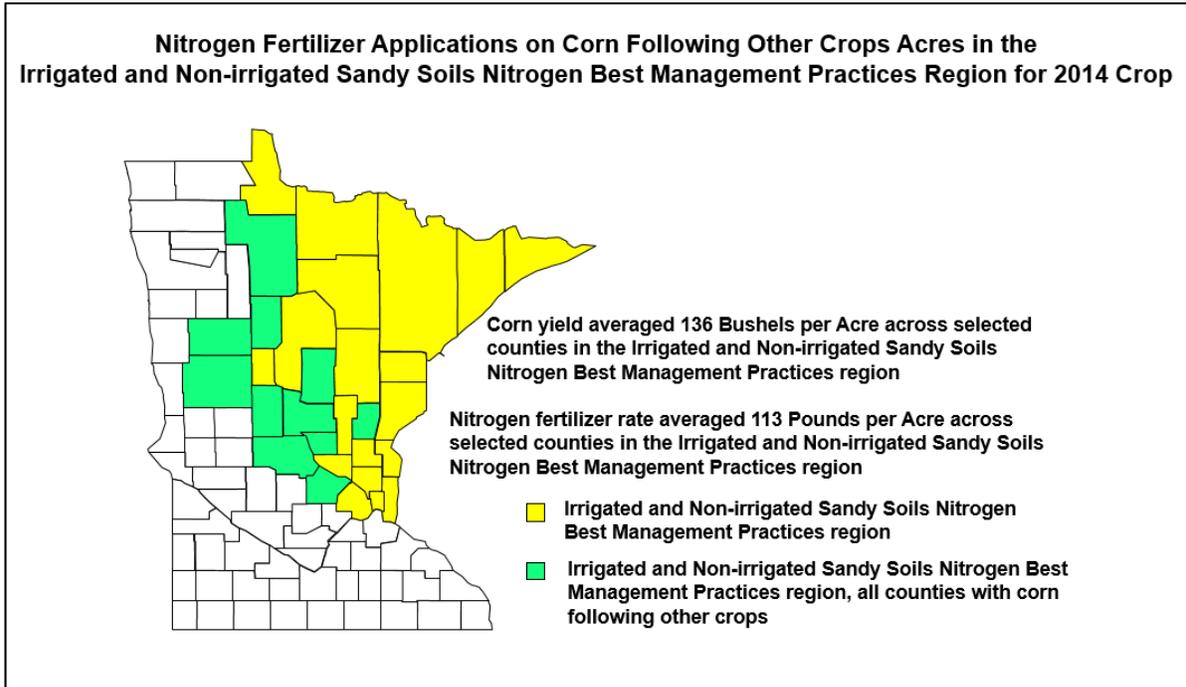


Figure 64. The corn yield averaged 136 bushels per acre and the nitrogen fertilizer rate averaged 113 pounds per acre in the IRR BMP region.

Figure 65 provides the distribution of nitrogen fertilizer rates in the IRR BMP region for corn following other crops; the corresponding corn yields are detailed in red.

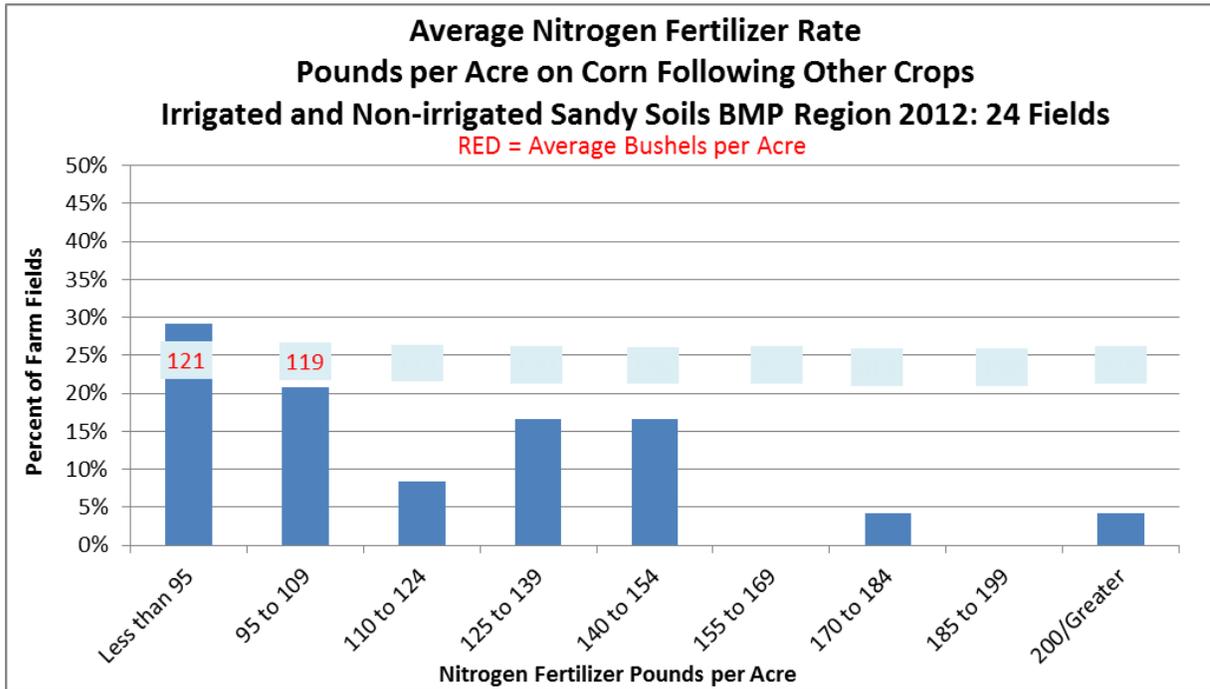


Figure 65. Average nitrogen fertilizer rates and yields on corn following other crops in the IRR BMP region for 2014: 24 fields.

Two counties had five or more responses in the IRR BMP region. Nitrogen fertilizer rates ranged from an average of 98 pounds per acre in Todd County to 115 pounds per acre in Otter Tail County as shown in Table 24.

Table 24. Average county nitrogen fertilizer rates and corn yields for the IRR BMP region for corn following other crops.

Average County Nitrogen Fertilizer Rates for the IRR BMP Region for Corn Following Other Crops			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Becker	**	**	**
Benton	**	**	**
Crow Wing	**	**	**
Hubbard	**	**	**
Kanabec	**	**	**
Morrison	**	**	**
Otter Tail	7	115	143
Sherburne	**	**	**
Stearns	**	**	**
Todd	7	98	126
Wright	**	**	**

** Less than five responses.

Statewide: Nitrogen Timing and Source

Table 25 details the major form of nitrogen fertilizer applied in each BMP region and statewide and the percent of respondents for those forms (NQ-11).

Table 25. The major form of nitrogen applied to the field.

BMP Region	Major Form of the Nitrogen Applied	Percent of Respondents
Northwestern	Anhydrous Ammonia	15
Northwestern	Urea	77
Northwestern	Liquid Nitrogen	1
Northwestern	Other	6
Northwestern	Unknown	1
Irrigated and Non-irrigated Sandy Soils	Anhydrous Ammonia	10
Irrigated and Non-irrigated Sandy Soils	Urea	71
Irrigated and Non-irrigated Sandy Soils	Liquid Nitrogen	7
Irrigated and Non-irrigated Sandy Soils	Other	10
Irrigated and Non-irrigated Sandy Soils	Unknown	2
Southwestern and West Central	Anhydrous Ammonia	34
Southwestern and West Central	Urea	56
Southwestern and West Central	Liquid Nitrogen	7
Southwestern and West Central	Other	2
Southwestern and West Central	Unknown	1
South Central	Anhydrous Ammonia	50
South Central	Urea	39
South Central	Liquid Nitrogen	10
South Central	Other	1
South Central	Unknown	0
Southeastern	Anhydrous Ammonia	33
Southeastern	Urea	54
Southeastern	Liquid Nitrogen	8
Southeastern	Other	3
Southeastern	Unknown	2
Statewide	Anhydrous Ammonia	33
Statewide	Urea	54
Statewide	Liquid Nitrogen	8
Statewide	Other	4
Statewide	Unknown	1

Table 26 details the major form of nitrogen, average corn yield and nitrogen rate for those forms (NQ-7, NQ-10, and NQ-11).

Table 26. 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	134	124
Northwestern	Urea	136	135
Northwestern	Liquid Nitrogen	**	**
Northwestern	Other	**	**
Northwestern	Unknown	**	**
Irrigated and Non-irrigated Sandy Soils	Anhydrous Ammonia	150	152
Irrigated and Non-irrigated Sandy Soils	Urea	121	129
Irrigated and Non-irrigated Sandy Soils	Liquid Nitrogen	95	120
Irrigated and Non-irrigated Sandy Soils	Other	95	125
Irrigated and Non-irrigated Sandy Soils	Unknown	85	118
Southwestern and West Central	Anhydrous Ammonia	154	169
Southwestern and West Central	Urea	146	162
Southwestern and West Central	Liquid Nitrogen	146	169
Southwestern and West Central	Other	117	148
Southwestern and West Central	Unknown	**	**
South Central	Anhydrous Ammonia	160	173
South Central	Urea	147	165
South Central	Liquid Nitrogen	145	171
South Central	Other	142	163
South Central	Unknown	**	**
Southeastern	Anhydrous Ammonia	155	178
Southeastern	Urea	147	171
Southeastern	Liquid Nitrogen	131	170
Southeastern	Other	126	162
Southeastern	Unknown	149	175
Statewide	Anhydrous Ammonia	156	171
Statewide	Urea	140	155
Statewide	Liquid Nitrogen	135	162
Statewide	Other	106	136
Statewide	Unknown	115	139

** Less than five responses.

Table 27 details the commercial applications of 2013 fall fertilizer for the 2014 corn crop (NQ-12).

Table 27. Fall applications of commercial nitrogen fertilizer in 2013 for the 2014 corn crop.

BMP Region	Application of Any Commercial Nitrogen Fertilizer in the Fall of 2013	Percent of Respondents
Northwestern	Yes	24
Northwestern	No	76
Irrigated and Non-irrigated Sandy Soils	Yes	7
Irrigated and Non-irrigated Sandy Soils	No	93
Southwestern and West Central	Yes	50
Southwestern and West Central	No	50
South Central	Yes	47
South Central	No	53
Southeastern	Yes	11
Southeastern	No	89
Statewide	Yes	34
Statewide	No	66

Table 28 details the anhydrous ammonia applications in the fall of 2013 for the 2014 corn crop (NQ-13).

Table 28. Applications of anhydrous ammonia in the fall of 2013 for the 2014 corn crop.

BMP Region	Anhydrous Ammonia Applications in the Fall of 2013	Percent of Respondents
Northwestern	Yes	3
Northwestern	No	97
Irrigated and Non-irrigated Sandy Soils	Yes	4
Irrigated and Non-irrigated Sandy Soils	No	96
Southwestern and West Central	Yes	28
Southwestern and West Central	No	72
South Central	Yes	32
South Central	No	68
Southeastern	Yes	6
Southeastern	No	94
Statewide	Yes	20
Statewide	No	80

Table 29 details the urea applications in the fall of 2013 for the 2014 corn crop (NQ-15).

Table 29. Applications of urea in the fall of 2013 for the 2014 corn crop.

BMP Region	Urea Applications in the Fall of 2013	Percent of Respondents
Northwestern	Yes	13
Northwestern	No	87
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	3
South Central	No	97
Southeastern	Yes	0
Southeastern	No	100
Statewide	Yes	6
Statewide	No	94

Table 30 details the liquid nitrogen applications in the fall of 2013 for the 2014 corn crop (NQ-17).

Table 30. Applications of liquid nitrogen in the fall of 2013 for the 2014 corn crop.

BMP Region	Liquid Nitrogen (28%, 32%) Applications in the Fall of 2013	Percent 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	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 31 details the phosphorus applications in the fall of 2013 for the 2014 corn crop (NQ-19). In Minnesota, over 99.3% 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 31. Applications of phosphorus fertilizers such as MAP or DAP in the fall of 2013 for the 2014 corn crop.

BMP region	Phosphorus Applications in the Fall of 2013	Percent of Respondents
Northwestern	Yes	20
Northwestern	No	80
Irrigated and Non-irrigated Sandy Soils	Yes	5
Irrigated and Non-irrigated Sandy Soils	No	95
Southwestern and West Central	Yes	39
Southwestern and West Central	No	61
South Central	Yes	37
South Central	No	63
Southeastern	Yes	7
Southeastern	No	93
Statewide	Yes	26
Statewide	No	74

Table 32 details the applications of other fertilizers in the fall of 2013 for the 2014 corn crop (NQ-21).

Table 32. Applications of other fertilizers containing nitrogen in the fall of 2013 for the 2014 corn crop.

BMP Region	Application of Other Sources of Fertilizer Containing Nitrogen in the Fall of 2013	Percent 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	4
Southwestern and West Central	No	96
South Central	Yes	3
South Central	No	97
Southeastern	Yes	1
Southeastern	No	99
Statewide	Yes	3
Statewide	No	97

Table 33 details the applications of commercial fertilizers in the spring as a preplant for the 2014 corn crop (NQ-25).

Table 33. Applications of commercial nitrogen fertilizers in the spring as a preplant for the 2014 corn crop.

BMP Region	Application of Any Commercial Nitrogen Fertilizer in the Spring of 2014 as a Preplant	Percent of Respondents
Northwestern	Yes	84
Northwestern	No	16
Irrigated and Non-irrigated Sandy Soils	Yes	73
Irrigated and Non-irrigated Sandy Soils	No	27
Southwestern and West Central	Yes	59
Southwestern and West Central	No	41
South Central	Yes	66
South Central	No	34
Southeastern	Yes	90
Southeastern	No	10
Statewide	Yes	69
Statewide	No	31

Table 34 details the applications of anhydrous ammonia in the spring as a preplant for the 2014 corn crop (NQ-26).

Table 34. Applications of anhydrous ammonia in the spring as a preplant for the 2014 corn crop.

BMP Region	Application of Anhydrous as a Preplant in the Spring of 2014	Percent of Respondents
Northwestern	Yes	7
Northwestern	No	93
Irrigated and Non-irrigated Sandy Soils	Yes	4
Irrigated and Non-irrigated Sandy Soils	No	96
Southwestern and West Central	Yes	5
Southwestern and West Central	No	95
South Central	Yes	17
South Central	No	83
Southeastern	Yes	25
Southeastern	No	75
Statewide	Yes	12
Statewide	No	88

Table 35 details the applications of urea in the spring as a preplant for the 2014 corn crop (NQ-28).

Table 35. Applications of urea in the spring as a preplant for the 2014 corn crop.

BMP Region	Application of Urea as a Preplant in the Spring of 2014	Percent of Respondents
Northwestern	Yes	69
Northwestern	No	31
Irrigated and Non-irrigated Sandy Soils	Yes	55
Irrigated and Non-irrigated Sandy Soils	No	45
Southwestern and West Central	Yes	43
Southwestern and West Central	No	57
South Central	Yes	37
South Central	No	63
Southeastern	Yes	52
Southeastern	No	48
Statewide	Yes	46
Statewide	No	54

Table 36 details the applications of liquid nitrogen in the spring as a preplant for the 2014 corn crop (NQ-30).

Table 36. Applications of liquid nitrogen in the spring as a preplant for the 2014 corn crop.

BMP Region	Application of Liquid Nitrogen (28%, 32%) as a Preplant in the Spring of 2014	Percent of Respondents
Northwestern	Yes	1
Northwestern	No	99
Irrigated and Non-irrigated Sandy Soils	Yes	4
Irrigated and Non-irrigated Sandy Soils	No	96
Southwestern and West Central	Yes	8
Southwestern and West Central	No	92
South Central	Yes	9
South Central	No	91
Southeastern	Yes	7
Southeastern	No	93
Statewide	Yes	7
Statewide	No	93

Table 37 details the applications of phosphorus such as MAP or DAP in the spring as a preplant for the 2014 corn crop (NQ-32).

Table 37. Applications of phosphorus in the spring as a preplant for the 2014 corn crop.

BMP Region	Application of Phosphorus as a Preplant in the Spring of 2014	Percent of Respondents
Northwestern	Yes	50
Northwestern	No	50
Irrigated and Non-irrigated Sandy Soils	Yes	27
Irrigated and Non-irrigated Sandy Soils	No	73
Southwestern and West Central	Yes	31
Southwestern and West Central	No	69
South Central	Yes	28
South Central	No	72
Southeastern	Yes	41
Southeastern	No	59
Statewide	Yes	32
Statewide	No	68

Table 38 details the applications of other fertilizers in the spring as a preplant for the 2014 corn crop (NQ-34).

Table 38. Applications of other fertilizers that contained nitrogen in the spring as a preplant for the 2014 corn crop.

BMP Region	Application of Other Sources of Nitrogen Fertilizer as a Preplant in the Spring of 2014	Percent of Respondents
Northwestern	Yes	13
Northwestern	No	87
Irrigated and Non-irrigated Sandy Soils	Yes	16
Irrigated and Non-irrigated Sandy Soils	No	84
Southwestern and West Central	Yes	7
Southwestern and West Central	No	93
South Central	Yes	9
South Central	No	91
Southeastern	Yes	16
Southeastern	No	84
Statewide	Yes	11
Statewide	No	89

Table 39 details the applications of commercial fertilizers in the spring as a starter or at planting for the 2014 corn crop (NQ-36).

Table 39. Applications of commercial nitrogen fertilizers in the spring as a starter or at planting for the 2014 corn crop.

BMP Region	Application of Commercial Nitrogen Fertilizer in the Spring as a Starter or at Planting of 2014	Percent of Respondents
Northwestern	Yes	60
Northwestern	No	40
Irrigated and Non-irrigated Sandy Soils	Yes	68
Irrigated and Non-irrigated Sandy Soils	No	32
Southwestern and West Central	Yes	34
Southwestern and West Central	No	66
South Central	Yes	47
South Central	No	53
Southeastern	Yes	64
Southeastern	No	36
Statewide	Yes	50
Statewide	No	50

Table 40 details the applications of urea in the spring as a starter or at planting for the 2014 corn crop (NQ-37).

Table 40. Applications of urea in the spring as a starter or at planting for the 2014 corn crop.

BMP Region	Application of Urea as a Starter or at Planting in the Spring of 2014	Percent of Respondents
Northwestern	Yes	14
Northwestern	No	86
Irrigated and Non-irrigated Sandy Soils	Yes	29
Irrigated and Non-irrigated Sandy Soils	No	71
Southwestern and West Central	Yes	9
Southwestern and West Central	No	91
South Central	Yes	8
South Central	No	92
Southeastern	Yes	17
Southeastern	No	83
Statewide	Yes	14
Statewide	No	86

Table 41 details the applications of liquid nitrogen in the spring as a starter or at planting for the 2014 corn crop (NQ-39).

Table 41. Applications of liquid nitrogen in the spring as a starter or at planting for the 2014 corn crop.

BMP Region	Application of Liquid Nitrogen (28%, 32%) as a Starter or at Planting in the Spring of 2014	Percent of Respondents
Northwestern	Yes	34
Northwestern	No	66
Irrigated and Non-irrigated Sandy Soils	Yes	13
Irrigated and Non-irrigated Sandy Soils	No	87
Southwestern and West Central	Yes	15
Southwestern and West Central	No	85
South Central	Yes	20
South Central	No	80
Southeastern	Yes	16
Southeastern	No	84
Statewide	Yes	17
Statewide	No	83

Table 42 details the applications of phosphorus such as MAP or DAP in the spring as a starter or at planting for the 2014 corn crop (NQ-41).

Table 42. Applications of phosphorus in the spring as a starter or at planting for the 2014 corn crop.

BMP Region	Application of Phosphorus as a Starter or at Planting in the Spring of 2014	Percent of Respondents
Northwestern	Yes	24
Northwestern	No	76
Irrigated and Non-irrigated Sandy Soils	Yes	35
Irrigated and Non-irrigated Sandy Soils	No	65
Southwestern and West Central	Yes	14
Southwestern and West Central	No	86
South Central	Yes	23
South Central	No	77
Southeastern	Yes	34
Southeastern	No	66
Statewide	Yes	24
Statewide	No	76

Table 43 details the applications of other fertilizers containing nitrogen in the spring as a starter or at planting for the 2014 corn crop (NQ-43).

Table 43. Applications of other nitrogen fertilizer in the spring as a starter or at planting for the 2014 corn crop.

BMP Region	Application of Other Fertilizers Containing Nitrogen as a Starter or at Planting in the Spring of 2014	Percent of Respondents
Northwestern	Yes	4
Northwestern	No	96
Irrigated and Non-irrigated Sandy Soils	Yes	14
Irrigated and Non-irrigated Sandy Soils	No	86
Southwestern and West Central	Yes	5
Southwestern and West Central	No	95
South Central	Yes	7
South Central	No	93
Southeastern	Yes	14
Southeastern	No	86
Statewide	Yes	8
Statewide	No	92

Table 44 details the applications of commercial fertilizers post planting or sidedress for the 2014 corn crop (NQ-45).

Table 44. Applications of commercial nitrogen fertilizers at post planting or sidedress for the 2014 corn crop.

BMP Region	Application of Commercial Nitrogen Fertilizer After Planting such as a Sidedress	Percent of Respondents
Northwestern	Yes	21
Northwestern	No	79
Irrigated and Non-irrigated Sandy Soils	Yes	34
Irrigated and Non-irrigated Sandy Soils	No	66
Southwestern and West Central	Yes	17
Southwestern and West Central	No	83
South Central	Yes	24
South Central	No	76
Southeastern	Yes	18
Southeastern	No	82
Statewide	Yes	22
Statewide	No	78

Table 45 details the applications of anhydrous ammonia as a post planting or sidedress for the 2014 corn crop (NQ-46).

Table 45. Applications of anhydrous ammonia as a post planting or sidedress for the 2014 corn crop.

BMP Region	Application of Anhydrous Ammonia as a Post Planting or Sidedress in 2014	Percent of Respondents
Northwestern	Yes	4
Northwestern	No	96
Irrigated and Non-irrigated Sandy Soils	Yes	4
Irrigated and Non-irrigated Sandy Soils	No	96
Southwestern and West Central	Yes	3
Southwestern and West Central	No	97
South Central	Yes	3
South Central	No	97
Southeastern	Yes	2
Southeastern	No	98
Statewide	Yes	3
Statewide	No	97

Table 46 details the applications of urea as a post planting or sidedress for the 2014 corn crop (NQ-48).

Table 46. Applications of urea as a post planting or sidedress for the 2014 corn crop.

BMP Region	Application of Urea as a Post Planting or Sidedress in 2014	Percent of Respondents
Northwestern	Yes	1
Northwestern	No	99
Irrigated and Non-irrigated Sandy Soils	Yes	22
Irrigated and Non-irrigated Sandy Soils	No	78
Southwestern and West Central	Yes	3
Southwestern and West Central	No	97
South Central	Yes	5
South Central	No	95
Southeastern	Yes	7
Southeastern	No	93
Statewide	Yes	8
Statewide	No	92

Table 47 details the applications of liquid nitrogen as a post planting or sidedress for the 2014 corn crop (NQ-50).

Table 47. Applications of liquid nitrogen as a post planting or sidedress for the 2014 corn crop.

BMP Region	Application of Liquid Nitrogen (28%, 32%) as a Post Planting or Sidedress in 2014	Percent of Respondents
Northwestern	Yes	14
Northwestern	No	86
Irrigated and Non-irrigated Sandy Soils	Yes	6
Irrigated and Non-irrigated Sandy Soils	No	94
Southwestern and West Central	Yes	10
Southwestern and West Central	No	90
South Central	Yes	16
South Central	No	84
Southeastern	Yes	8
Southeastern	No	92
Statewide	Yes	11
Statewide	No	89

Table 48 details the applications of phosphorus such as MAP or DAP as a post planting or sidedress for the 2014 corn crop (NQ-52).

Table 48. Applications of phosphorus as a post planting or sidedress for the 2014 corn crop.

BMP Region	Application of Phosphorus as a Post Planting or Sidedress	Percent 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 49 details the applications of other fertilizers containing nitrogen as a post planting or sidedress for the 2014 corn crop (NQ-54).

Table 49. Applications of other nitrogen fertilizers as a post planting or sidedress for the 2014 corn crop.

BMP Region	Application of Other Fertilizers Containing Nitrogen as a Post Planting or Sidedress	Percent of Respondents
Northwestern	Yes	1
Northwestern	No	99
Irrigated and Non-irrigated Sandy Soils	Yes	5
Irrigated and Non-irrigated Sandy Soils	No	95
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

Figure 66 details the form of nitrogen that was applied to corn acres statewide based on total pounds of nitrogen applied (NQ-11).

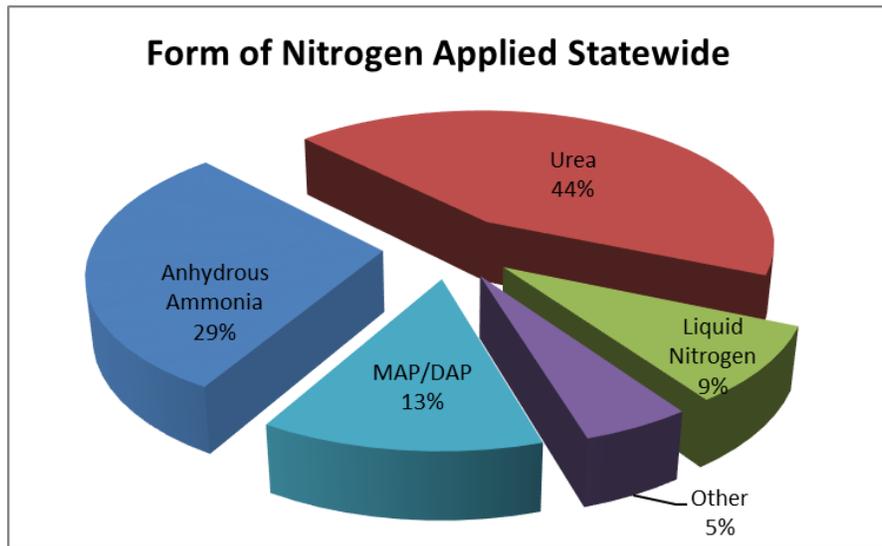


Figure 66. The form of the nitrogen applied to corn acres in the state for the 2014 survey for all fields applied with nitrogen fertilizer (Based on total pounds of nitrogen applied).

Figure 67 details the form of nitrogen that was applied to corn acres in the SE BMP region (NQ-11).

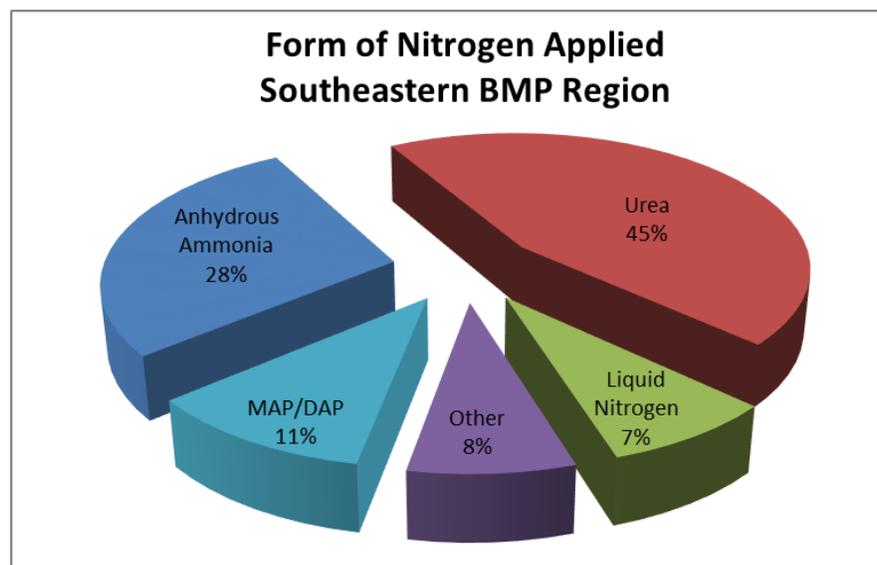


Figure 67. The form of the nitrogen applied to corn acres in the SE BMP region for the 2014 survey for all fields applied with nitrogen fertilizer.

Figure 68 details the form of nitrogen that was applied to corn acres in the SC BMP region (NQ-11).

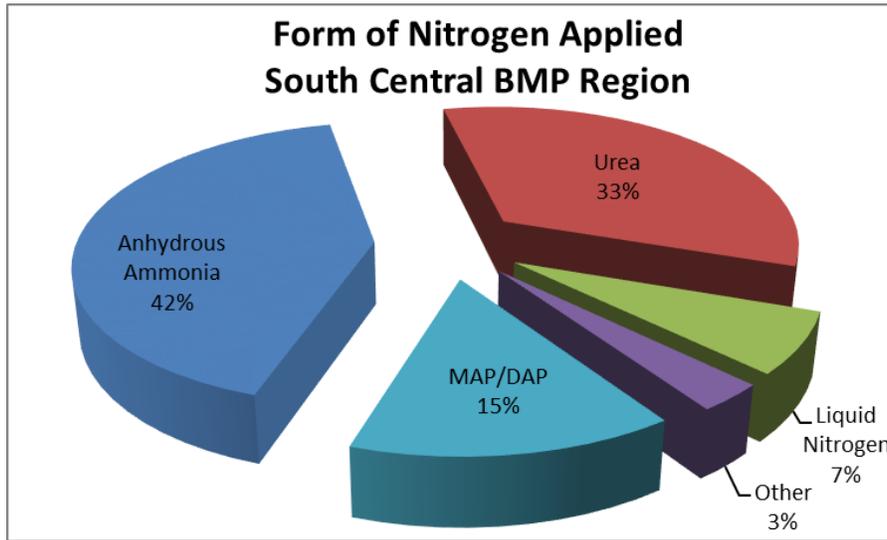


Figure 68. The form of the nitrogen applied to corn acres in the SC BMP region for the 2014 survey for all fields applied with nitrogen fertilizer.

Figure 69 details the form of nitrogen that was applied to corn acres in the SW BMP region (NQ-11).

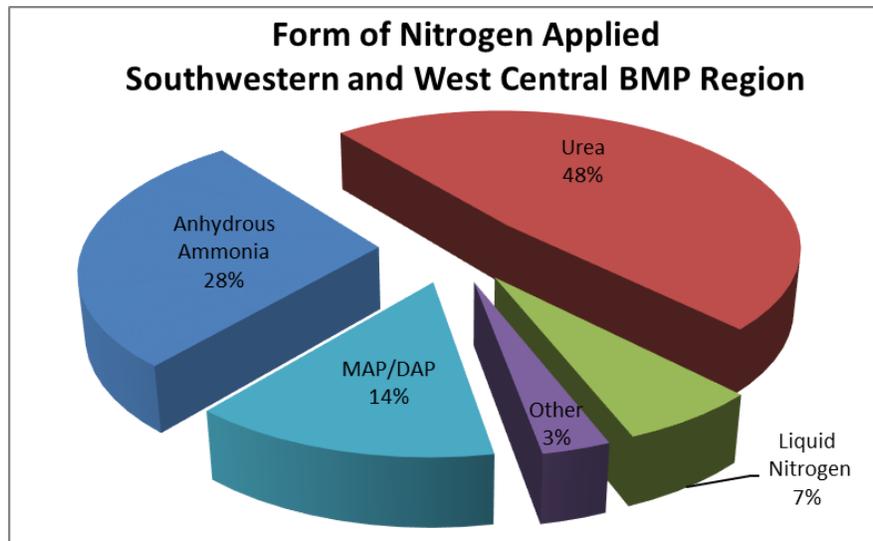


Figure 69. The form of the nitrogen applied to corn acres in the SW BMP region for the 2014 survey for all fields applied with nitrogen fertilizer.

Figure 70 details the form of nitrogen that was applied to corn acres in the NW BMP region (NQ-11).

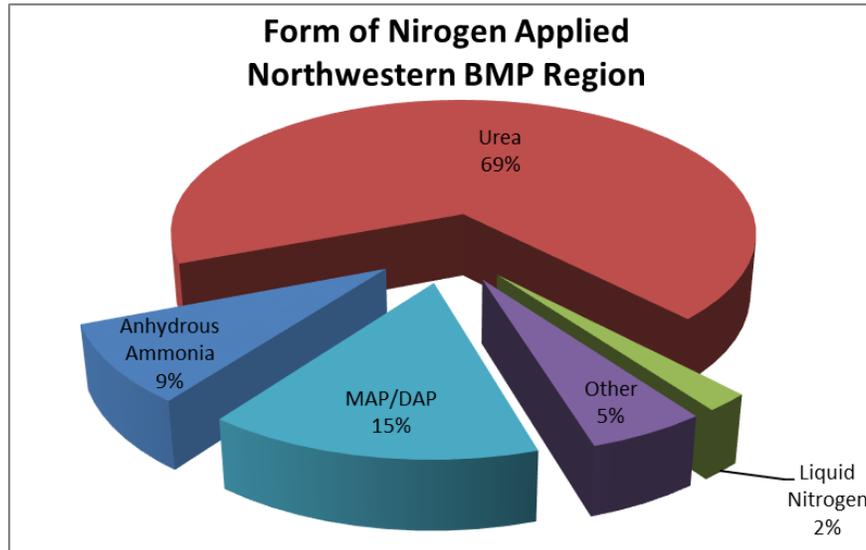


Figure 70. The form of the nitrogen applied to corn acres in the NW BMP region for the 2014 survey for all fields applied with nitrogen fertilizer.

Figure 71 details the form of nitrogen that was applied to corn acres in the IRR BMP region (NQ-11).

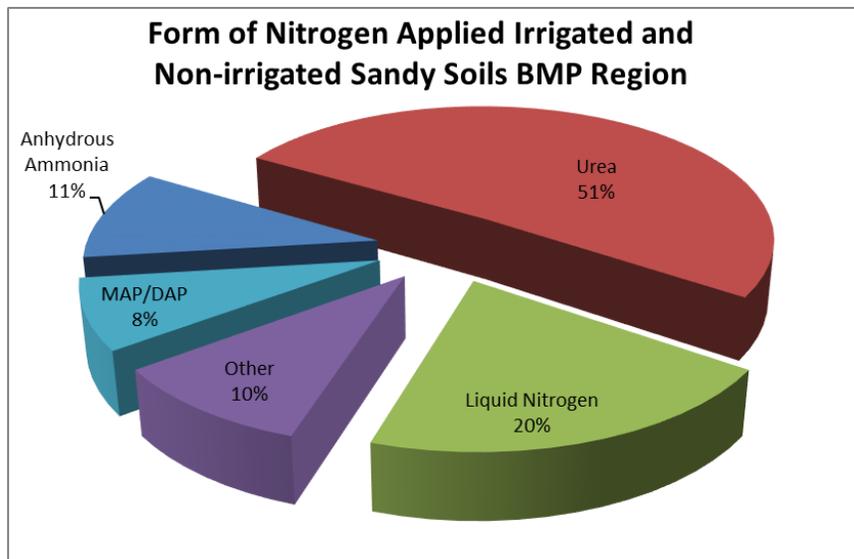


Figure 71. The form of the nitrogen applied to corn acres in the IRR BMP region for the 2014 survey for all fields applied with nitrogen fertilizer.

Figure 72 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-14, NQ-27, NQ-47).

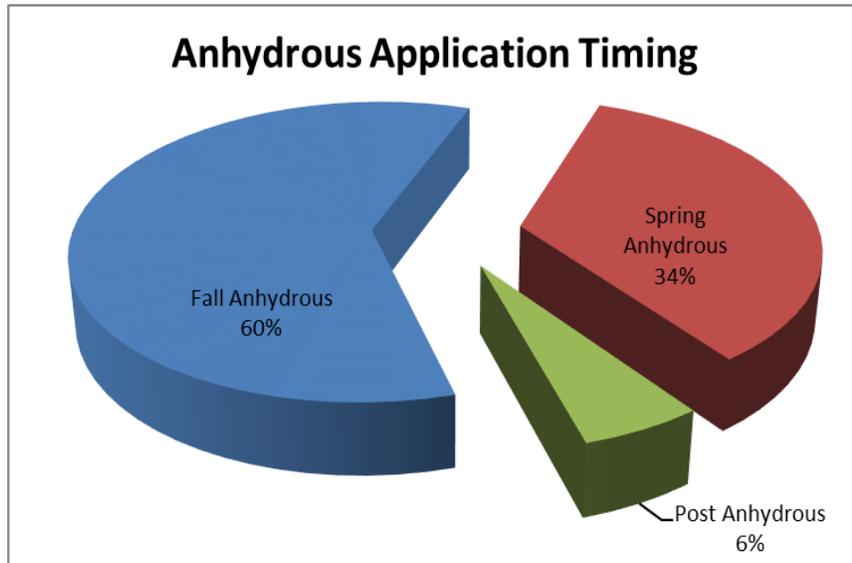


Figure 72. Timing of anhydrous ammonia applications to corn acres in Minnesota by pounds of nitrogen fertilizer applied for the 2014 corn crop.

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

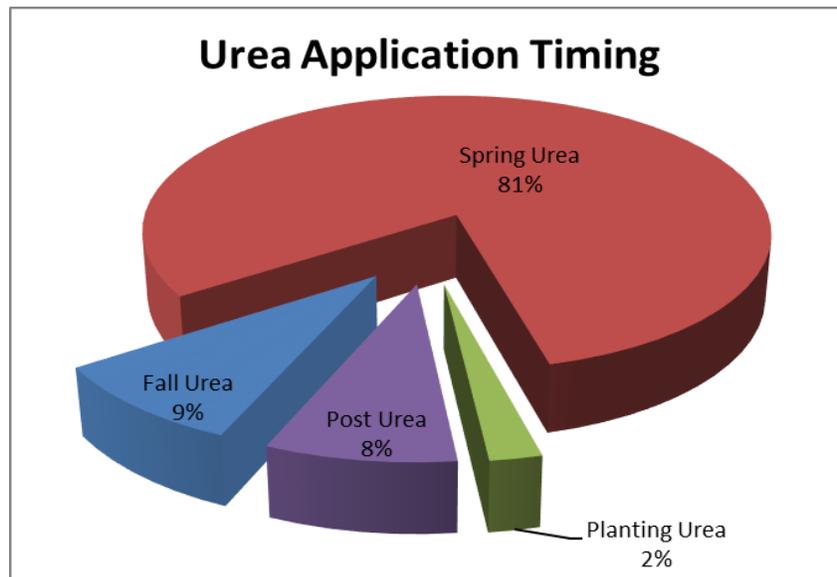


Figure 73. Timing of urea applications to corn acres in Minnesota by pounds of nitrogen applied in the 2014 survey.

Figure 74 details the timing of MAP/DAP 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).

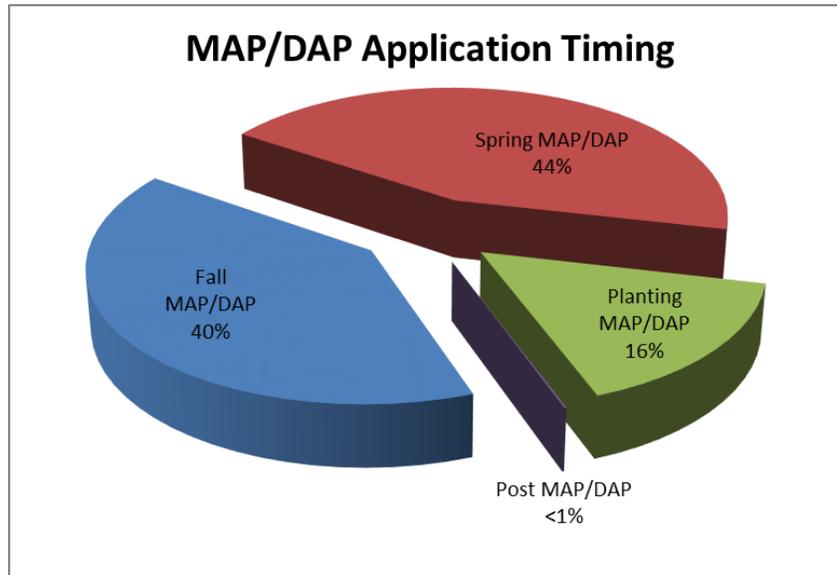


Figure 74. Timing of MAP/DAP nitrogen applications to corn acres in Minnesota by pounds of nitrogen applied in the 2014 survey.

Figure 75 details the timing of liquid 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).

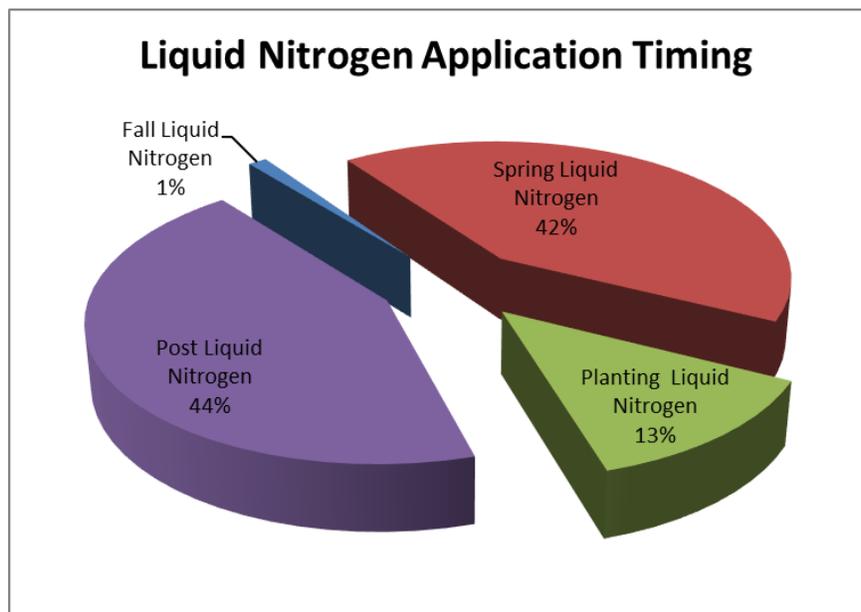


Figure 75. Timing of liquid nitrogen applications to corn acres in Minnesota by pounds of nitrogen applied in the 2014 survey.

Figure 76 details the timing of other nitrogen applications on corn acres in the state for an average field by pounds of nitrogen applied (NQ-22, NQ-35, NQ-44, NQ-55).

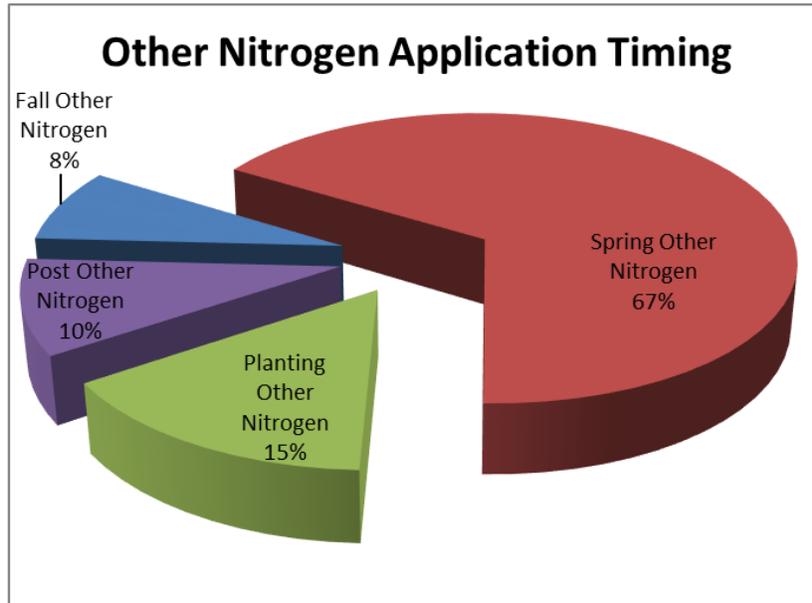


Figure 76. Timing of other nitrogen applications to corn acres in Minnesota by pounds of nitrogen applied in the 2014 survey.

Table 50 details the applications of nitrogen enhancing products or inhibitors on the corn field (NQ-56).

Table 50. Use of nitrogen enhancing products or inhibitors on the corn field.

BMP Region	Application of nitrogen enhancing products or inhibitors in 2014	Percent of Respondents
Northwestern	Yes	18
Northwestern	No	82
Irrigated and Non-irrigated Sandy Soils	Yes	20
Irrigated and Non-irrigated Sandy Soils	No	80
Southwestern and West Central	Yes	17
Southwestern and West Central	No	83
South Central	Yes	22
South Central	No	78
Southeastern	Yes	20
Southeastern	No	80
Statewide	Yes	19
Statewide	No	81

Manure Applications and Management on Corn

2014 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 2014 corn acres. Over 960 producers with manured acres, totaling approximately 100,191 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 960 farmers surveyed that applied manure sometime between the fall of 2013 and the spring of 2014 for the 2014 corn growing season and also 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.⁷ 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.

⁷ 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>

Table 51 details the counties and BMP region where the total number of corn acres were planted for the 2014 corn crop by farmers who applied manure to their fields (MQ-1 and MQ-2). All fields surveyed that had corn planted in 2014 without manure are excluded from the following analysis.

Table 51. 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	7	525
Kittson	NW	**	**
Mahnomen	NW	**	**
Marshall	NW	**	**
Norman	NW	**	**
Polk	NW	**	**
Red Lake	NW	**	**
Roseau	NW	**	**
Wilkin	NW	**	**
Totals/Averages	NW	24	1,581
Anoka	IRR	**	**
Becker	IRR	6	770
Beltrami	IRR	**	**
Benton	IRR	15	745
Cass	IRR	**	**
Chisago	IRR	**	**
Crow Wing	IRR	**	**
Hennepin	IRR	**	**
Hubbard	IRR	**	**
Isanti	IRR	**	**
Kanabec	IRR	9	280
Mille Lacs	IRR	**	**
Morrison	IRR	52	6,060
Otter Tail	IRR	37	2,658
Pine	IRR	8	649
Sherburne	IRR	**	**
Stearns	IRR	85	8,590
Todd	IRR	28	1,808
Wadena	IRR	8	307
Washington	IRR	**	**
Wright	IRR	17	1,018
Totals/Averages	IRR	294	24,435
Big Stone	SW	**	**
Chippewa	SW	8	732
Cottonwood	SW	15	2,579
Douglas	SW	16	1,105
Grant	SW	**	**
Jackson	SW	12	2,218
Kandiyohi	SW	12	2,269
Lac qui Parle	SW	10	1,165

County	BMP Region	Number of Respondents	Number of Corn Acres
Lincoln	SW	13	1,396
Lyon	SW	12	1,195
Murray	SW	16	2,028
Nobles	SW	22	3,366
Pipestone	SW	10	1,842
Pope	SW	13	1,367
Redwood	SW	21	2,254
Renville	SW	14	1,695
Rock	SW	14	2,478
Stevens	SW	9	1,760
Swift	SW	10	1,692
Traverse	SW	**	**
Yellow Medicine	SW	10	2,220
Totals/Averages	SW	242	33,758
Blue Earth	SC	16	3,850
Brown	SC	21	2,075
Carver	SC	15	722
Dodge	SC	7	843
Faribault	SC	8	885
Freeborn	SC	19	2,187
Le Sueur	SC	13	615
Martin	SC	10	886
McLeod	SC	13	662
Meeker	SC	16	1,480
Mower	SC	11	2,431
Nicollet	SC	13	2,397
Rice	SC	15	1,332
Scott	SC	9	697
Sibley	SC	16	891
Steele	SC	11	1,273
Waseca	SC	12	2,036
Watonwan	SC	11	3,110
Totals/Averages	SC	236	28,372
Dakota	SE	11	575
Fillmore	SE	35	2,928
Goodhue	SE	27	1,290
Houston	SE	21	1,172
Olmsted	SE	18	1,417
Wabasha	SE	25	2,070
Winona	SE	35	2,593
Totals/Averages	SE	172	12,045
State	All	968	100,191

** Less than five responses

Statewide Manure Applications and Management on Corn

Information on manure management was gathered on a typical corn field for the 2014 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 applied is for the 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 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 52 summarizes the percent of corn fields by previous crop and percent of manured acres in each region by previous crop and average corn yield (MQ-1 and MQ-3). Table 53 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 52 details the previous crop planted before the 2014 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 52. Percent of acres by previous crop and the corresponding yields in manured fields.

BMP Region	Previous Crop	Percent of Manured Fields	Average Corn Yield Bushels per Acre
Northwestern	Soybeans	29	134
Northwestern	Corn	33	147
Northwestern	Corn/Alfalfa	**	**
Northwestern	Alfalfa	**	**
Northwestern	Small Grains	21	161
Irrigated and Non-irrigated Sandy Soils	Soybeans	21	146
Irrigated and Non-irrigated Sandy Soils	Corn	40	137
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	21	132
Irrigated and Non-irrigated Sandy Soils	Alfalfa	8	137
Irrigated and Non-irrigated Sandy Soils	Small Grains	6	142
Irrigated and Non-irrigated Sandy Soils	Other	4	126
South Western and West Central	Soybeans	60	172
South Western and West Central	Corn	27	167
South Western and West Central	Corn/Alfalfa	5	162
South Western and West Central	Alfalfa	3	148
South Western and West Central	Small Grains	**	**
South Western and West Central	Other	3	175
South Central	Soybeans	52	169
South Central	Corn	30	172
South Central	Corn/Alfalfa	6	183
South Central	Alfalfa	5	148
South Central	Small Grains	2	158
South Central	Other	5	166
Southeastern	Soybeans	28	177
Southeastern	Corn	34	179
Southeastern	Corn/Alfalfa	25	173
Southeastern	Alfalfa	8	176
Southeastern	Small Grains	**	**
Southeastern	Other	5	169
Statewide	Soybeans	40	167
Statewide	Corn	33	159
Statewide	Corn/Alfalfa	14	154
Statewide	Alfalfa	6	149
Statewide	Small Grains	3	151
Statewide	Other	4	157

** Less than five responses

Table 53 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 2014 corn crop.

Table 53. 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	49	148	79
Irrigated and Non-irrigated Sandy Soils	33	137	84
Southwestern and West Central	87	170	77
South Central	65	170	78
Southeastern	31	178	80
Statewide	54	161	80

Table 54 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 percent of manure coverage on the corn field for the 2014 corn crop (MQ-1, MQ-3).

Table 54. 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	142
Irrigated and Non-irrigated Sandy Soils	138
Southwestern and West Central	170
South Central	169
Southeastern	176
Statewide	160

Table 55 details the number of respondents that had at least one field with manure applied for the 2014 corn crop season (MQ-1).

Table 55. Percent of respondents that applied manure on their corn acres.

BMP Region	Corn Field Applied with Manure	Percent of Respondents
Northwestern	Yes	31
Northwestern	No	69
Irrigated and Non-irrigated Sandy Soils	Yes	68
Irrigated and Non-irrigated Sandy Soils	No	32
South Western and West Central	Yes	45
South Western and West Central	No	55
South Central	Yes	48
South Central	No	52
Southeastern	Yes	67
Southeastern	No	33
Statewide	Yes	54
Statewide	No	46

Table 56 details the main source of manure applied on the corn field for the 2014 corn crop (MQ-5).

Table 56. The main source of manure applied to the corn field by livestock type.

BMP Region	Main Source of Manure	Percent of Respondents
Northwestern	Dairy	20
Northwestern	Beef	63
Northwestern	Hog	4
Northwestern	Poultry	13
Irrigated and Non-irrigated Sandy Soils	Dairy	48
Irrigated and Non-irrigated Sandy Soils	Beef	40
Irrigated and Non-irrigated Sandy Soils	Hog	3
Irrigated and Non-irrigated Sandy Soils	Poultry	7
Irrigated and Non-irrigated Sandy Soils	Other	2
Southwestern and West Central	Dairy	20
Southwestern and West Central	Beef	39
Southwestern and West Central	Hog	30
Southwestern and West Central	Poultry	8
Southwestern and West Central	Other	3
South Central	Dairy	20
South Central	Beef	37
South Central	Hog	33
South Central	Poultry	5
South Central	Other	5
Southeastern	Dairy	41
Southeastern	Beef	46
Southeastern	Hog	4
Southeastern	Poultry	2
Southeastern	Other	7
Statewide	Dairy	32
Statewide	Beef	41
Statewide	Hog	17
Statewide	Poultry	6
Statewide	Other	4

Table 57 details the percent of respondents that applied liquid or solid manure to their corn acres (MQ-6).

Table 57. Percent of respondents that applied liquid or solid manure to the surveyed corn acres.

BMP Region	Solid or Liquid	Percent of Respondents
Northwestern	Solid	79
Northwestern	Liquid	21
Irrigated and Non-irrigated Sandy Soils	Solid	72
Irrigated and Non-irrigated Sandy Soils	Liquid	28
Southwestern and West Central	Solid	63
Southwestern and West Central	Liquid	37
South Central	Solid	57
South Central	Liquid	43
Southeastern	Solid	80
Southeastern	Liquid	20
Statewide	Solid	68
Statewide	Liquid	32

Table 58 details the percent of respondents and the method of application of liquid manure (MQ-6a).

Table 58. Method of application of liquid manure and corresponding Percent of respondents.

BMP Region	Method of Application for Liquid Manure	Percent of Respondents
Northwestern	Knife Injection	20
Northwestern	Disc Injection	20
Northwestern	Broadcast Incorporation within two to four days	40
Northwestern	Broadcast Incorporation over 4 days	20
Irrigated and Non-irrigated Sandy Soils	Sweep Injection	19
Irrigated and Non-irrigated Sandy Soils	Knife Injection	29
Irrigated and Non-irrigated Sandy Soils	Disc Injection	6
Irrigated and Non-irrigated Sandy Soils	Broadcast Incorporation within one day	22
Irrigated and Non-irrigated Sandy Soils	Broadcast Incorporation within two to four days	11
Irrigated and Non-irrigated Sandy Soils	Broadcast Incorporation over 4 days	10
Irrigated and Non-irrigated Sandy Soils	Broadcast No Incorporation	3
Southwestern and West Central	Sweep Injection	17
Southwestern and West Central	Knife Injection	29
Southwestern and West Central	Disc Injection	45
Southwestern and West Central	Broadcast Incorporation within one day	6
Southwestern and West Central	Broadcast Incorporation within two to four days	3
South Central	Sweep Injection	18
South Central	Knife Injection	27
South Central	Disc Injection	43
South Central	Broadcast Incorporation within one day	5
South Central	Broadcast Incorporation within two to four days	4
South Central	Broadcast Incorporation over 4 days	2
South Central	Broadcast No Incorporation	1
Southeastern	Sweep Injection	15
Southeastern	Knife Injection	41
Southeastern	Disc Injection	6
Southeastern	Broadcast Incorporation within one day	12
Southeastern	Broadcast Incorporation within two to four days	3
Southeastern	Broadcast Incorporation over 4 days	12
Southeastern	Broadcast No Incorporation	11
Statewide	Sweep Injection	17
Statewide	Knife Injection	30
Statewide	Disc Injection	30
Statewide	Broadcast Incorporation within one day	10
Statewide	Broadcast Incorporation within two to four days	6
Statewide	Broadcast Incorporation over 4 days	5
Statewide	Broadcast No Incorporation	2

Table 59 details the percent of respondents by method of application for solid manure (MQ-6b).

Table 59. The method of application for solid manure and corresponding Percent of respondents.

BMP Region	Method of Application for Solid Manure	Percent of Respondents
Northwestern	Broadcast Incorporation within one day	28
Northwestern	Broadcast Incorporation within two to four days	22
Northwestern	Broadcast Incorporation over 4 days	28
Northwestern	Broadcast No Incorporation	22
Irrigated and Non-irrigated Sandy Soils	Broadcast Incorporation within one day	20
Irrigated and Non-irrigated Sandy Soils	Broadcast Incorporation within two to four days	29
Irrigated and Non-irrigated Sandy Soils	Broadcast Incorporation over 4 days	36
Irrigated and Non-irrigated Sandy Soils	Broadcast No Incorporation	15
Southwestern and West Central	Broadcast Incorporation within one day	29
Southwestern and West Central	Broadcast Incorporation within two to four days	26
Southwestern and West Central	Broadcast Incorporation over 4 days	31
Southwestern and West Central	Broadcast No Incorporation	14
South Central	Broadcast Incorporation within one day	19
South Central	Broadcast Incorporation within two to four days	19
South Central	Broadcast Incorporation over 4 days	39
South Central	Broadcast No Incorporation	23
Southeastern	Broadcast Incorporation within one day	7
Southeastern	Broadcast Incorporation within two to four days	28
Southeastern	Broadcast Incorporation over 4 days	46
Southeastern	Broadcast No Incorporation	19
Statewide	Broadcast Incorporation within one day	20
Statewide	Broadcast Incorporation within two to four days	26
Statewide	Broadcast Incorporation over 4 days	37
Statewide	Broadcast No Incorporation	17

Table 60 details the percent of responses 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 60. Timing of manure applications by approximate date or over time.

BMP Region	Manure Application Frequency: Approximate Date or Over Time	Percent of Respondents
Northwestern	Approximate date	70
Northwestern	Over a period of time	30
Irrigated and Non-irrigated Sandy Soils	Approximate date	59
Irrigated and Non-irrigated Sandy Soils	Over a period of time	41
Southwestern and West Central	Approximate date	68
Southwestern and West Central	Over a period of time	32
South Central	Approximate date	65
South Central	Over a period of time	35
Southeastern	Approximate date	53
Southeastern	Over a period of time	47
Statewide	Approximate date	63
Statewide	Over a period of time	37

Table 61 details the percent 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 61. Seasonal timing for those farmers who applied manure on a specific date.

BMP Region	Approximate Date of the Manure Application	Percent of Respondents
Northwestern	Fall 2013	81
Northwestern	Spring 2014	19
Irrigated and Non-irrigated Sandy Soils	All Year	2
Irrigated and Non-irrigated Sandy Soils	Don't know	1
Irrigated and Non-irrigated Sandy Soils	Summer 2013	1
Irrigated and Non-irrigated Sandy Soils	Fall 2013	46
Irrigated and Non-irrigated Sandy Soils	Winter 2013	1
Irrigated and Non-irrigated Sandy Soils	Spring 2014	49
Southwestern and West Central	All Year	3
Southwestern and West Central	Don't know	2
Southwestern and West Central	Summer 2013	2
Southwestern and West Central	Fall 2013	75
Southwestern and West Central	Winter 2013	3
Southwestern and West Central	Spring 2014	15
South Central	Don't know	1
South Central	Summer 2013	2
South Central	Fall 2013	75
South Central	Winter 2013	1
South Central	Spring 2014	21
Southeastern	All Year	2
Southeastern	Don't know	2
Southeastern	Fall 2013	61
Southeastern	Winter 2013	5
Southeastern	Spring 2014	30
Statewide	All Year	2
Statewide	Don't know	1
Statewide	Summer 2013	2
Statewide	Fall 2013	64
Statewide	Winter 2013	2
Statewide	Spring 2014	29

Table 62 details the percent of respondents on how often the manure was applied for those farmers who applied manure over a period of time (MQ-7).

Table 62. The frequency of manure applications for farmers who applied manure over a period of time.

BMP Region	Manure Application Frequency	Percent of Respondents
Northwestern	Daily	29
Northwestern	Weekly	43
Northwestern	Monthly	14
Northwestern	Other	14
Irrigated and Non-irrigated Sandy Soils	Daily	42
Irrigated and Non-irrigated Sandy Soils	Weekly	13
Irrigated and Non-irrigated Sandy Soils	Monthly	15
Irrigated and Non-irrigated Sandy Soils	Other	30
Southwestern and West Central	Daily	25
Southwestern and West Central	Weekly	31
Southwestern and West Central	Monthly	22
Southwestern and West Central	Other	22
South Central	Daily	33
South Central	Weekly	30
South Central	Monthly	16
South Central	Other	21
Southeastern	Daily	36
Southeastern	Weekly	26
Southeastern	Monthly	17
Southeastern	Other	21
Statewide	Daily	35
Statewide	Weekly	24
Statewide	Monthly	17
Statewide	Other	24

Table 63 details the percent of respondents to last time manure was applied on the corn field surveyed, before the current manure application for the 2014 corn crop (MQ-8).

Table 63. The date of last manure application before the 2014 manure application for the 2014 corn crop.

BMP Region	Last Application of Manure on this Field	Percent of Respondents
Northwestern	2008 and before	5
Northwestern	2009	5
Northwestern	2010	11
Northwestern	2011	6
Northwestern	2012	47
Northwestern	2013	26
Irrigated and Non-irrigated Sandy Soils	2008 and before	1
Irrigated and Non-irrigated Sandy Soils	2009	6
Irrigated and Non-irrigated Sandy Soils	2010	7
Irrigated and Non-irrigated Sandy Soils	2011	13
Irrigated and Non-irrigated Sandy Soils	2012	37
Irrigated and Non-irrigated Sandy Soils	2013	36
Southwestern and West Central	2008 and before	5
Southwestern and West Central	2009	6
Southwestern and West Central	2010	10
Southwestern and West Central	2011	28
Southwestern and West Central	2012	34
Southwestern and West Central	2013	17
South Central	2008 and before	3
South Central	2009	9
South Central	2010	7
South Central	2011	23
South Central	2012	40
South Central	2013	18
Southeastern	2008 and before	3
Southeastern	2009	5
Southeastern	2010	10
Southeastern	2011	16
Southeastern	2012	31
Southeastern	2013	35
Statewide	2008 and before	4
Statewide	2009	6
Statewide	2010	9
Statewide	2011	19
Statewide	2012	36
Statewide	2013	26

Table 64 details the average miles traveled from the manure source to the corn field applied with manure (MQ-9).

Table 64. Distance to the field for manure applications by composition of manure.

BMP Region	Liquid or Solid Manure	Average Miles to the Field
Northwestern	Solid	1.51
Northwestern	Liquid	0.82
Northwestern	All	1.36
Irrigated and Non-irrigated Sandy Soils	Solid	1.53
Irrigated and Non-irrigated Sandy Soils	Liquid	0.83
Irrigated and Non-irrigated Sandy Soils	All	1.33
Southwestern and West Central	Solid	1.55
Southwestern and West Central	Liquid	1.42
Southwestern and West Central	All	1.50
South Central	Solid	1.68
South Central	Liquid	1.63
South Central	All	1.66
Southeastern	Solid	0.76
Southeastern	Liquid	0.97
Southeastern	All	0.80
Statewide	Solid	1.40
Statewide	Liquid	1.27
Statewide	All	1.36

Table 65 details the average miles travelled to the corn field from the manure source by animal type (MQ-5 and MQ-9).

Table 65. Distance to the field for manure applications by animal type.

BMP Region	Animal Type	Average Miles to the Field
Northwestern	Dairy	1.15
Northwestern	Beef	0.53
Northwestern	Hog	0.50
Northwestern	Poultry	7.07
Irrigated and Non-irrigated Sandy Soils	Dairy	0.95
Irrigated and Non-irrigated Sandy Soils	Beef	0.73
Irrigated and Non-irrigated Sandy Soils	Hog	1.88
Irrigated and Non-irrigated Sandy Soils	Poultry	9.78
Irrigated and Non-irrigated Sandy Soils	Other	0.50
Southwestern and West Central	Dairy	1.15
Southwestern and West Central	Beef	0.95
Southwestern and West Central	Hog	1.45
Southwestern and West Central	Poultry	7.83
Southwestern and West Central	Other	0.70
Southwestern and West Central	Don't Know	7.00
South Central	Dairy	1.60
South Central	Beef	0.62
South Central	Hog	1.80
South Central	Poultry	14.69
South Central	Other	1.27
South Central	Don't Know	1.10
Southeastern	Dairy	0.93
Southeastern	Beef	0.55
Southeastern	Hog	0.53
Southeastern	Poultry	2.05
Southeastern	Other	2.60
Southeastern	Don't Know	1.00
Statewide	Dairy	1.01
Statewide	Beef	0.63
Statewide	Hog	1.47
Statewide	Poultry	7.84
Statewide	Other	1.27
Statewide	Don't Know	2.07

Table 66 details the percent of respondents on if the farmer knew the amount of nitrogen that is in the manure applied for the 2014 corn crop (MQ-10).

Table 66. The farmers’ knowledge of nitrogen content of manure being applied for the 2014 corn crop.

BMP Region	Knowledge of the Actual Amount of Nitrogen Applied	Percent of Respondents
Northwestern	Yes	14
Northwestern	No	86
Irrigated and Non-irrigated Sandy Soils	Yes	16
Irrigated and Non-irrigated Sandy Soils	No	84
Southwestern and West Central	Yes	37
Southwestern and West Central	No	63
South Central	Yes	38
South Central	No	62
Southeastern	Yes	17
Southeastern	No	83
Statewide	Yes	27
Statewide	No	73

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

Table 67 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 67. 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	95
Northwestern	Beef	25
Northwestern	Hog	150
Northwestern	Poultry	103
Irrigated and Non-irrigated Sandy Soils	All	102
Irrigated and Non-irrigated Sandy Soils	Dairy	104
Irrigated and Non-irrigated Sandy Soils	Beef	92
Irrigated and Non-irrigated Sandy Soils	Hog	100
Irrigated and Non-irrigated Sandy Soils	Poultry	108
Irrigated and Non-irrigated Sandy Soils	Other	100
Southwestern and West Central	All	130
Southwestern and West Central	Dairy	135
Southwestern and West Central	Beef	99
Southwestern and West Central	Hog	141
Southwestern and West Central	Poultry	131
Southwestern and West Central	Other	80
South Central	All	130
South Central	Dairy	123
South Central	Beef	86
South Central	Hog	143
South Central	Poultry	146
South Central	Other	130
Southeastern	All	106
Southeastern	Dairy	114
Southeastern	Beef	86
Southeastern	Hog	145
Southeastern	Other	101
Statewide	All	122
Statewide	Dairy	116
Statewide	Beef	90
Statewide	Hog	140
Statewide	Poultry	126
Statewide	Other	108

Average Nitrogen Rate from Manure Applications

Figure 77 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure⁸ and does not include nitrogen from additional commercial nitrogen fertilizer applied to the 2014 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

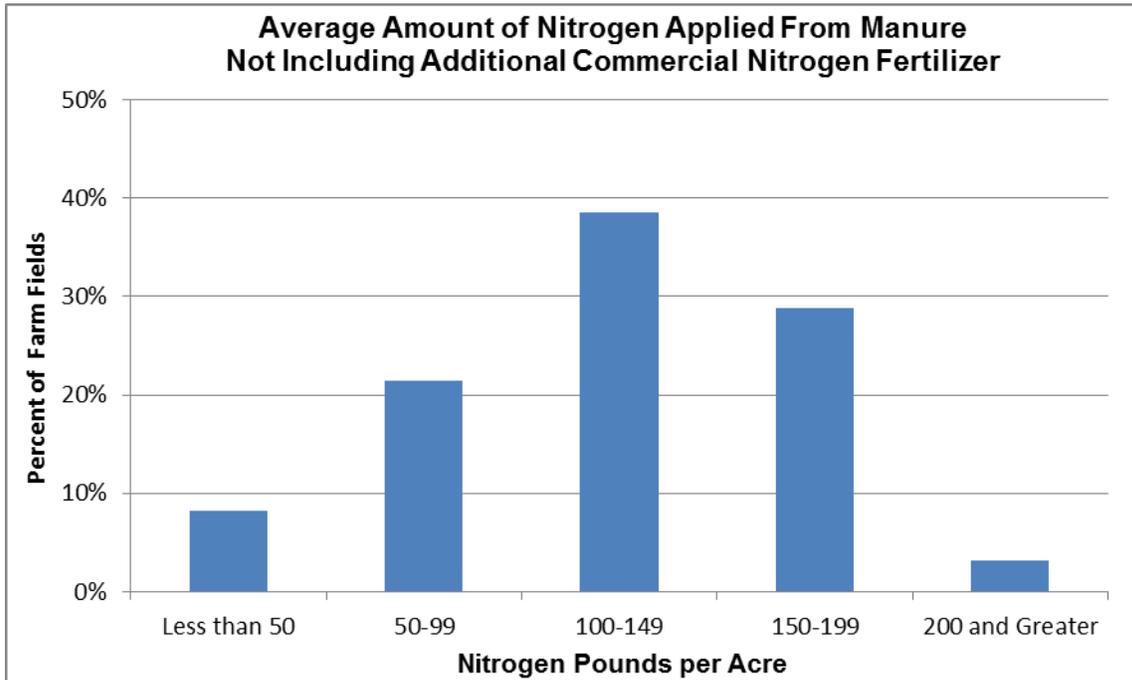


Figure 77. Average nitrogen rates applied to fields from manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2014: 260 fields.

⁸ Manure is from all manure sources

Figure 78 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 2014 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

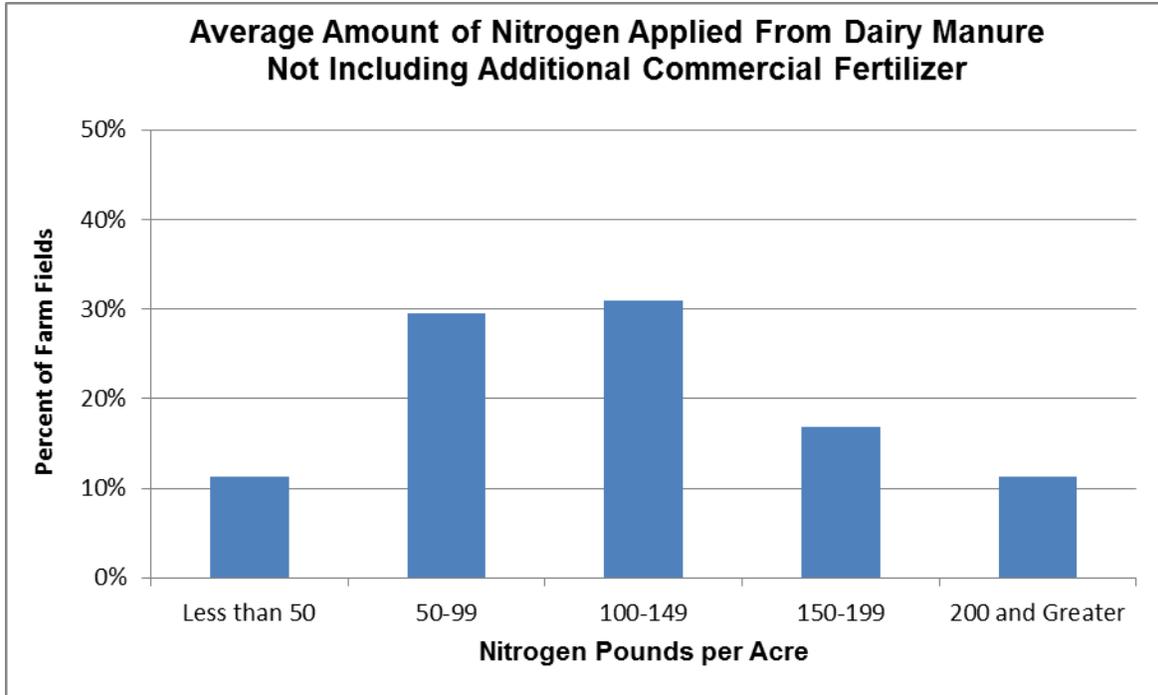


Figure 78. Average nitrogen rates applied to fields from dairy manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2014: 71 fields.

Figure 79 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 2014 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

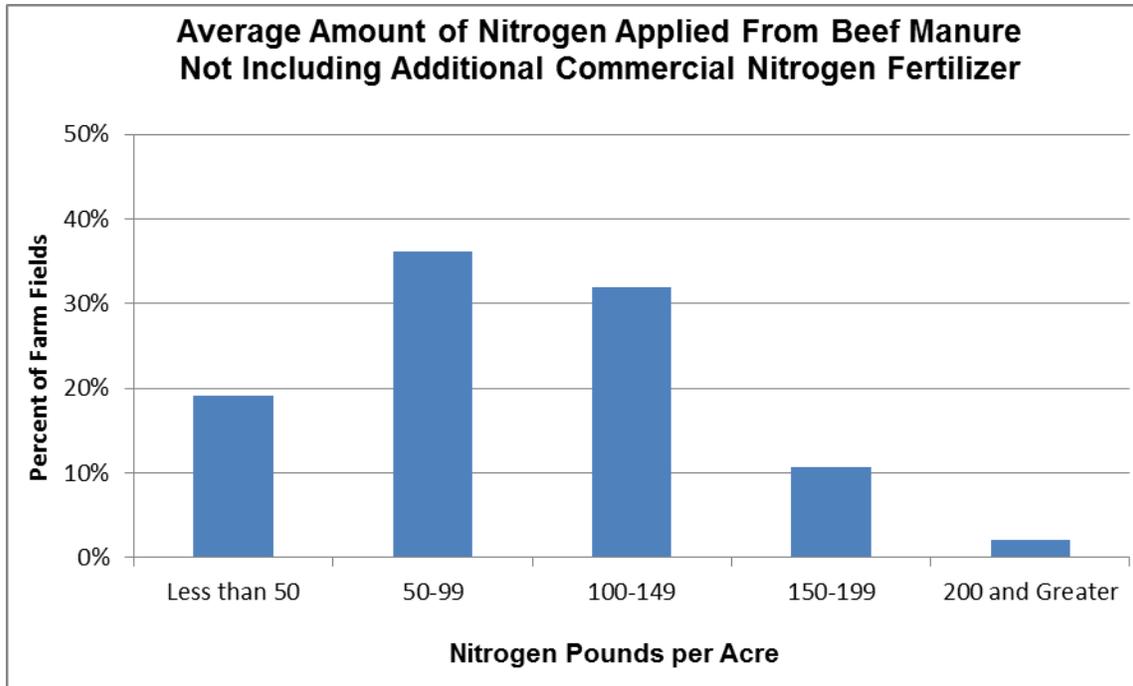


Figure 79. Average nitrogen rates applied to fields from beef manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2014: 47 fields.

Figure 80 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 to the 2014 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

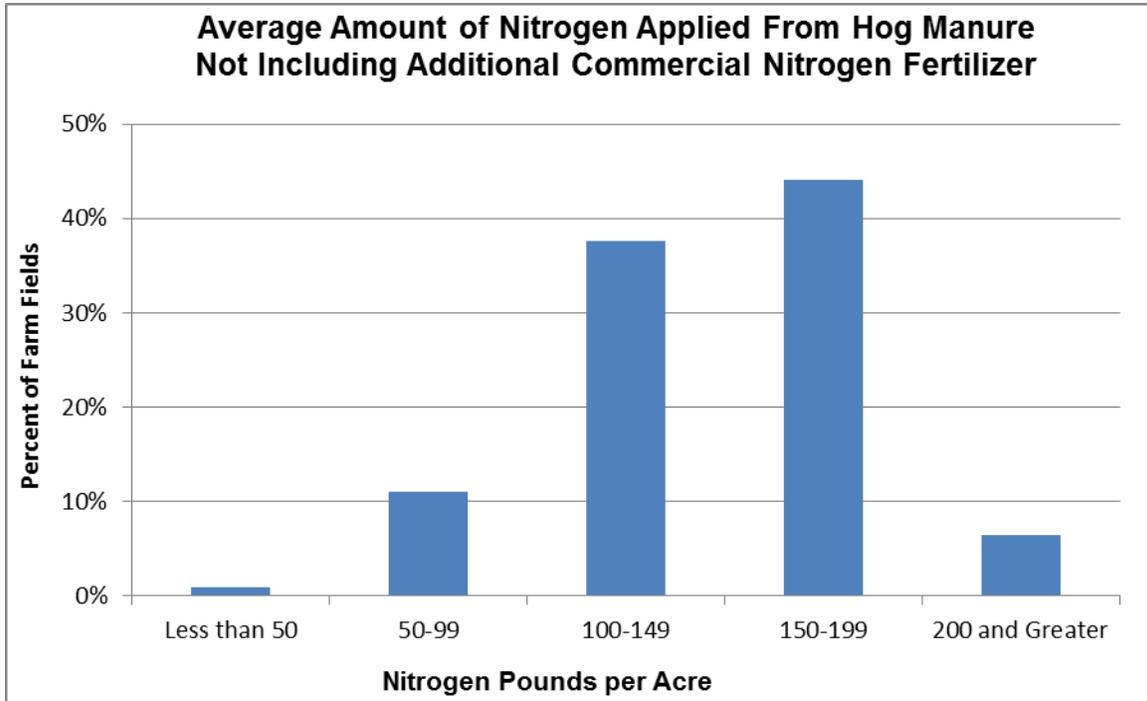


Figure 80. Average nitrogen rates applied to fields from hog manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2014: 109 fields.

Figure 81 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 to the 2014 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

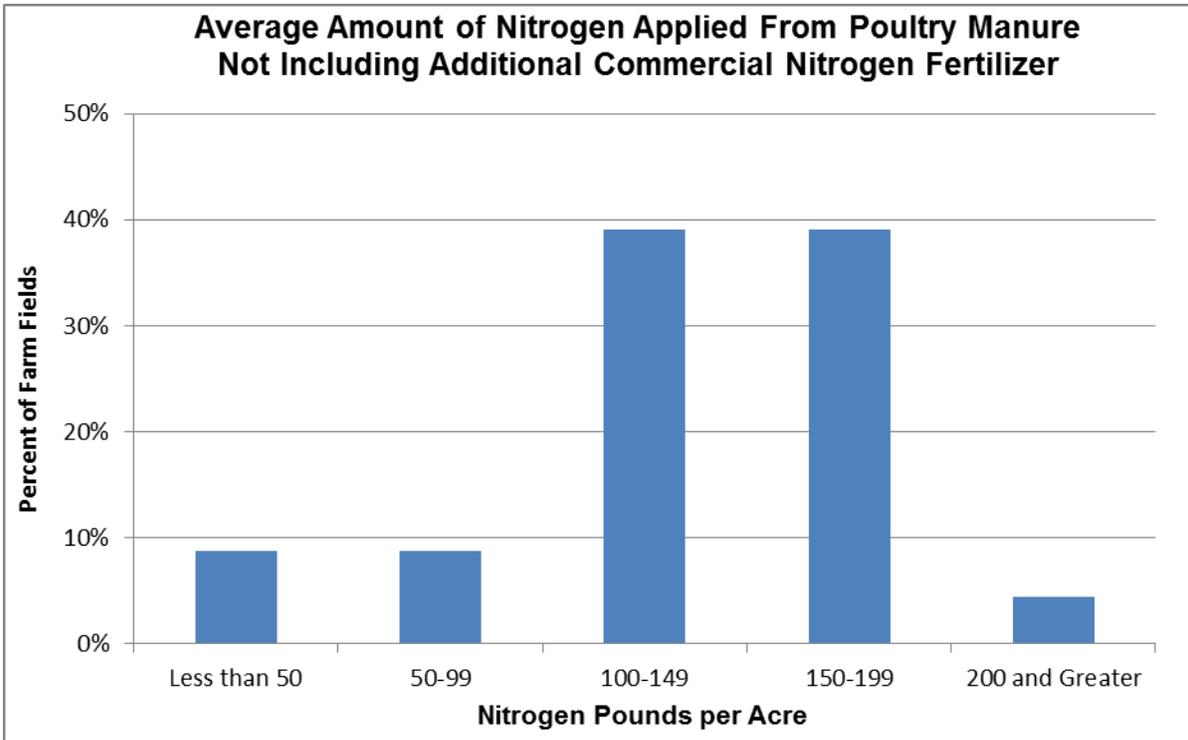


Figure 81. Average nitrogen rates applied to fields from poultry manure and does not include additional commercial nitrogen fertilizer in Minnesota for 2014: 23 fields.

Figure 82 details the distribution of average nitrogen rates in Minnesota from farmers that applied other manure and does not include nitrogen from additional commercial nitrogen fertilizer to the 2014 corn crop (MQ-5, MQ-10, MQ-11, MQ-15, and MQ-16).

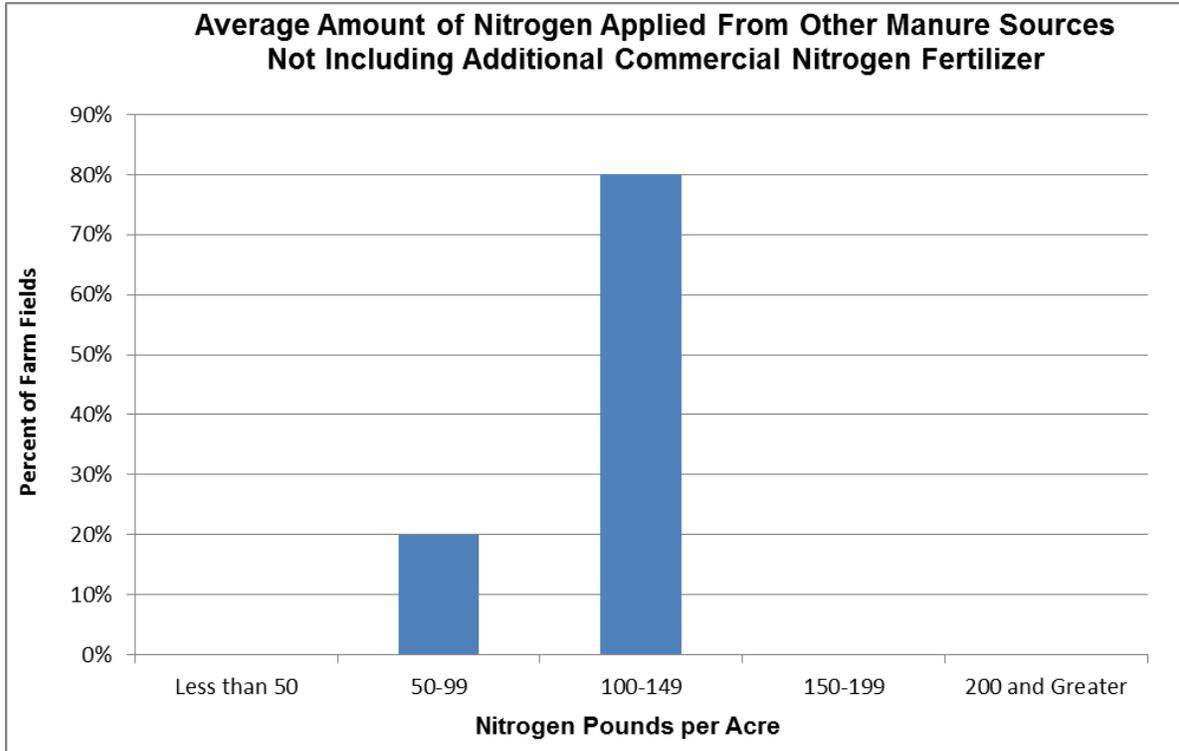


Figure 82. Average nitrogen rates applied to fields from other manure sources and does not include additional commercial nitrogen fertilizer in Minnesota for 2014: 10 fields.

Average Nitrogen Rate from Manure and Commercial Nitrogen Fertilizer Applications

Figure 83 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure⁹ and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 174 bushels per acre. The average nitrogen rate applied from manure was 108 pounds per acre, and the average commercial nitrogen fertilizer rate was 75 pounds per acre for an average total of 183 pounds of nitrogen per acre.

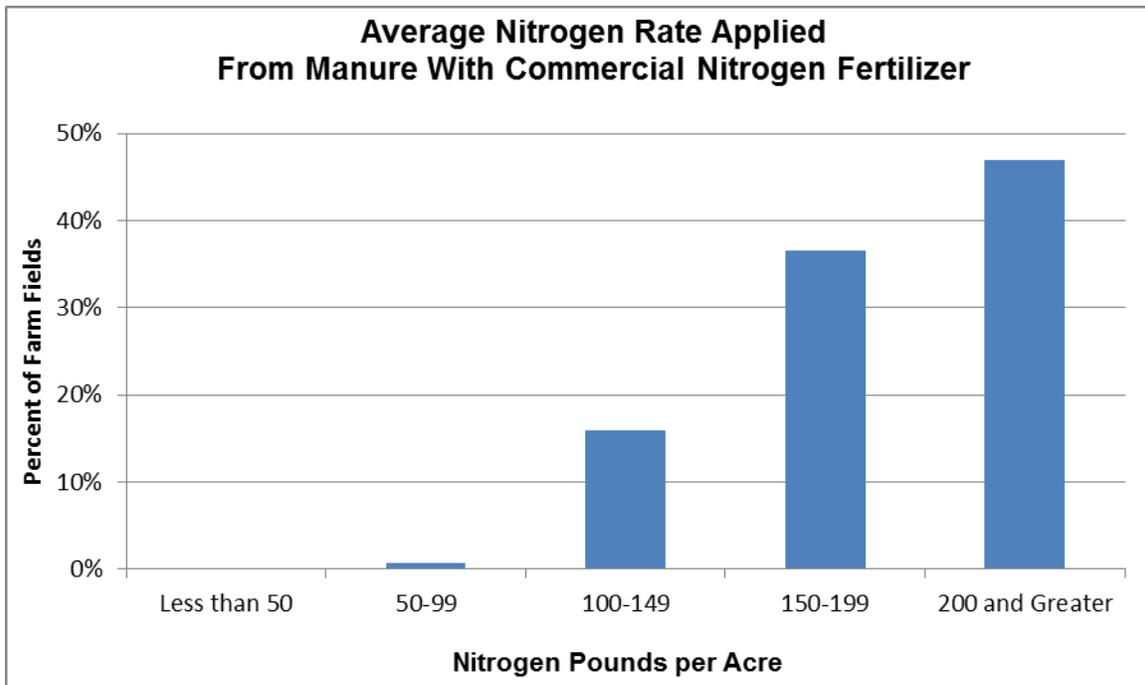


Figure 83. Average nitrogen rates applied to corn from manure and commercial nitrogen fertilizer in Minnesota for 2014: 145 fields.

⁹ Manure is from all manure sources

Figure 84 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 167 bushels per acre. The average nitrogen rate applied from dairy manure was 101 pounds per acre, and the average commercial nitrogen fertilizer rate was 74 pounds per acre for an average total of 175 pounds of nitrogen per acre.

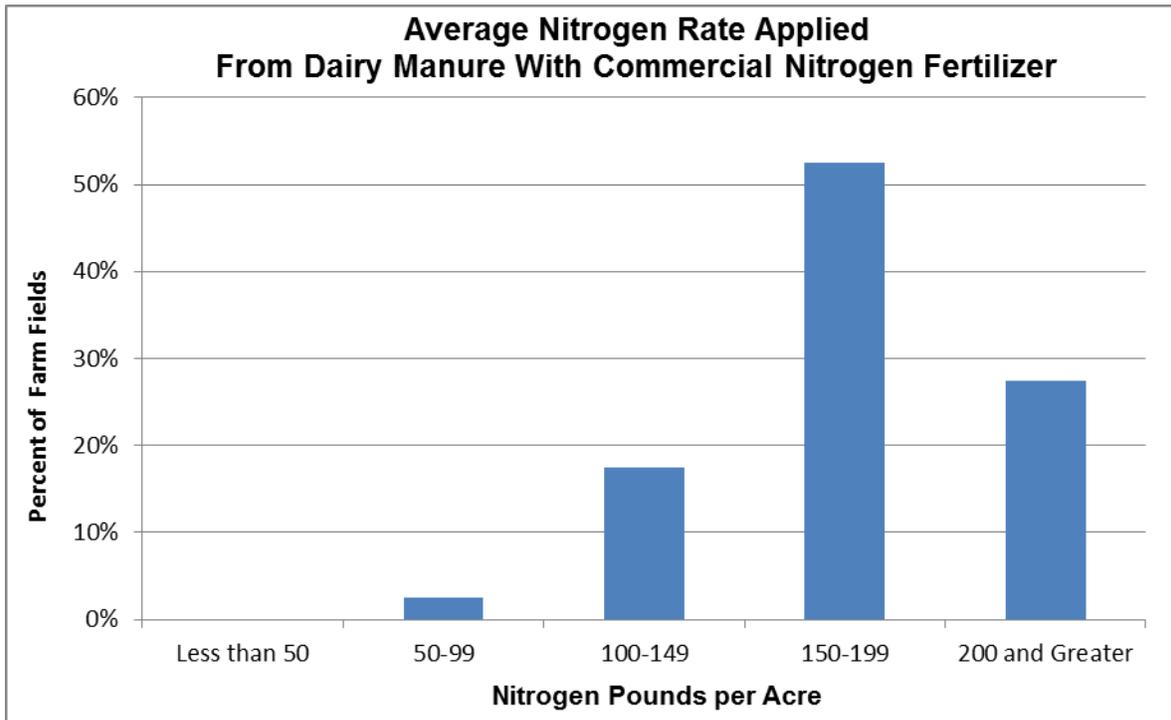


Figure 84. Average nitrogen rates applied to corn from dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 40 fields.

Figure 85 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 177 bushels per acre. The average nitrogen rate applied from beef manure was 84 pounds per acre, and the average commercial nitrogen fertilizer rate was 103 pounds per acre for an average total of 187 pounds of nitrogen per acre.

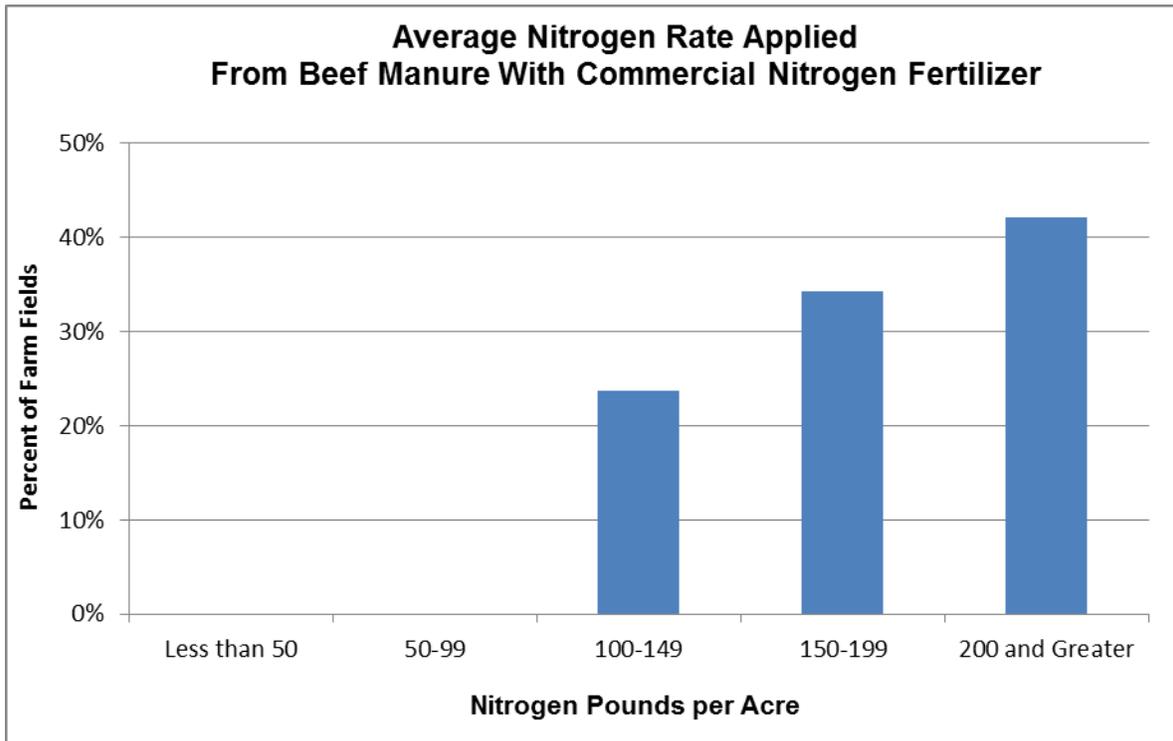


Figure 85. Average nitrogen rates applied to corn from beef manure and commercial nitrogen fertilizer in Minnesota for 2014: 38 fields.

Figure 86 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 128 pounds per acre, and the average commercial nitrogen fertilizer rate was 57 pounds per acre for an average total of 185 pounds of nitrogen per acre.

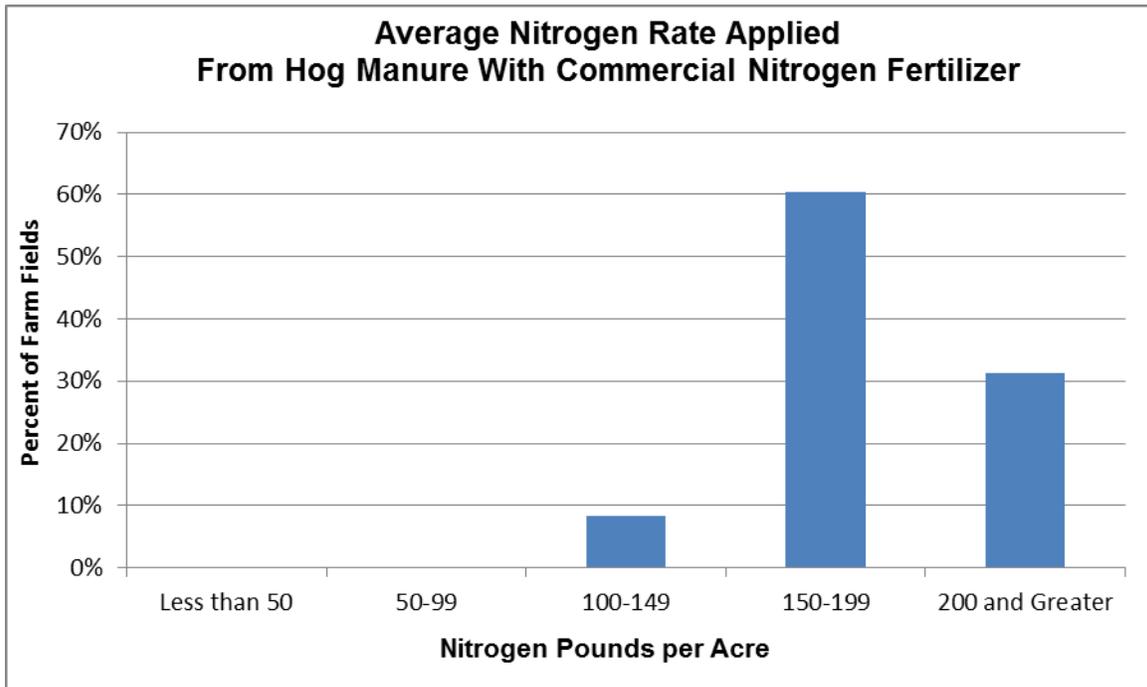


Figure 86. Average nitrogen rates applied to corn from hog manure and commercial nitrogen fertilizer in Minnesota for 2014: 48 fields.

Figure 87 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 168 bushels per acre. The average nitrogen rate applied from poultry manure was 130 pounds per acre, and the average commercial nitrogen fertilizer rate was 53 pounds per acre for an average total of 183 pounds of nitrogen per acre.

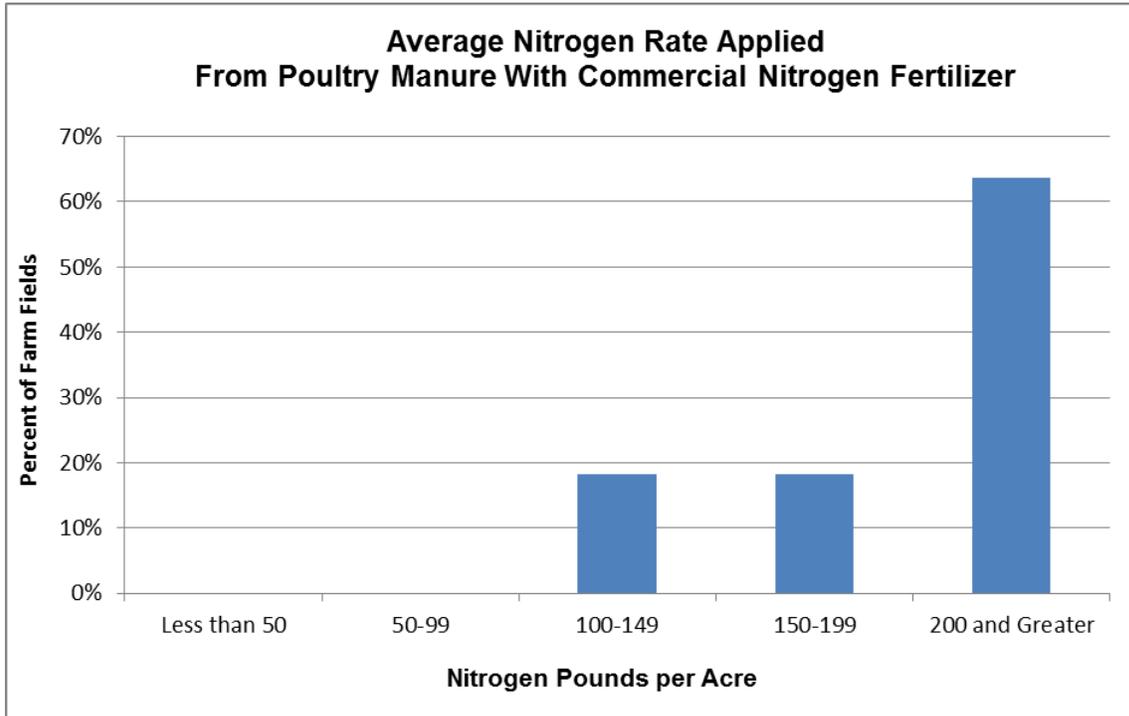


Figure 87. Average nitrogen rates applied to corn from poultry manure sources and commercial nitrogen fertilizer in Minnesota for 2014: 11 fields.

Figure 88 details the distribution of average nitrogen rates in Minnesota from farmers that applied other manure and commercial nitrogen fertilizer (MQ-5, MQ-10, MQ-15 and MQ-16). The average corn yield was 161 bushels per acre. The average nitrogen rate applied from other manure was 102 pounds per acre, and the average commercial nitrogen fertilizer rate was 95 pounds per acre for an average total of 197 pounds of nitrogen per acre.

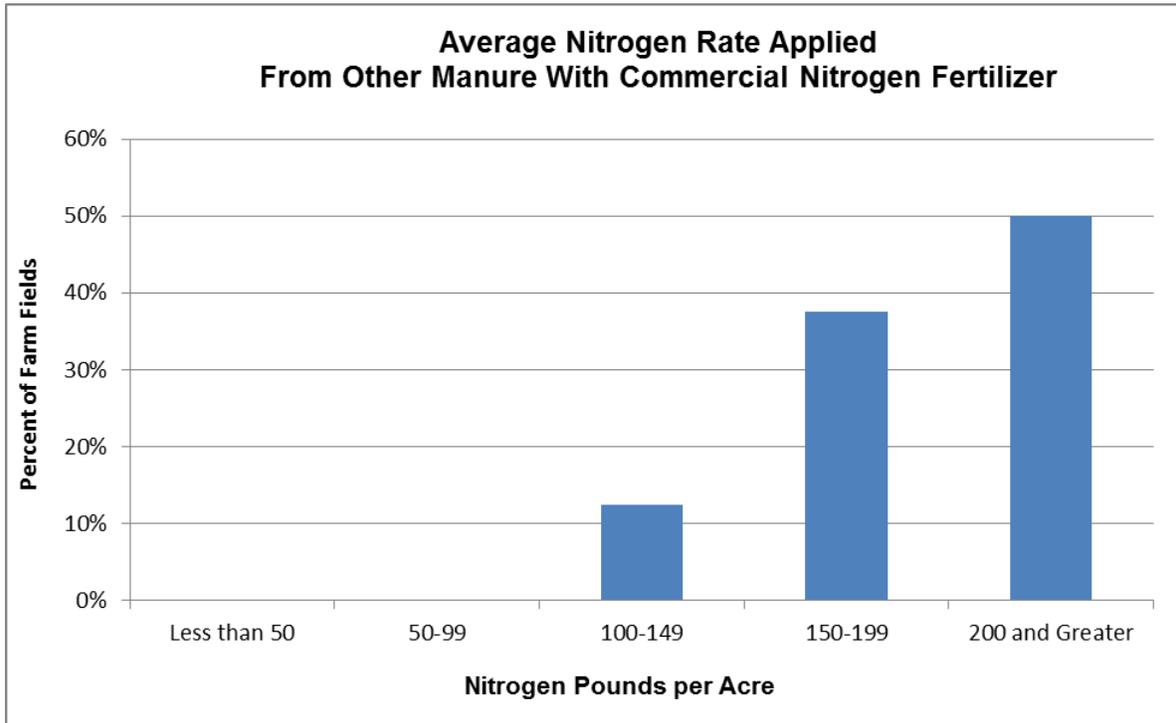


Figure 88. Average nitrogen rates applied to corn from other manure and commercial nitrogen fertilizer in Minnesota for 2014: 8 fields.

Nitrogen Rates and Average Corn Yields on Manured Fields

Table 68 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 manure¹⁰ or manure and commercial nitrogen fertilizer.

Table 68. 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 Only or Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Soybeans	**	**
Northwestern	Corn	**	**
Northwestern	Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	143	149
Irrigated and Non-irrigated Sandy Soils	Corn	167	154
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	156	149
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	166	178
Southwestern and West Central	Corn	170	182
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Small Grains	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	167	178
South Central	Corn	176	179
South Central	Corn/Alfalfa	**	**
South Central	Small Grains	**	**
South Central	Other	**	**
Southeastern	Soybeans	180	191
Southeastern	Corn	179	187
Southeastern	Corn/Alfalfa	171	180
Southeastern	Alfalfa	**	**
Southeastern	Other	**	**

¹⁰ Manure is from all manure sources

Average Nitrogen Rate from Manure and
Commercial Nitrogen Fertilizer Applications

BMP Region	Previous Crop	Average Nitrogen Rate From Manure Only or Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Statewide	Soybeans	164	176
Statewide	Corn	171	175
Statewide	Corn/Alfalfa	161	171
Statewide	Alfalfa	115	154
Statewide	Small Grains	**	**
Statewide	Other	191	170

** 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, and MQ-11). These are corn fields applied with manure and no commercial nitrogen fertilizer.

Table 69. 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
Northwestern	Corn	**	**
Northwestern	Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	104	131
Irrigated and Non-irrigated Sandy Soils	Corn	90	149
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Alfalfa	**	**
Southwestern and West Central	Soybeans	155	176
Southwestern and West Central	Corn	162	182
Southwestern and West Central	Alfalfa	**	**
Southwestern and West Central	Small Grains	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	141	177
South Central	Corn	158	176
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
South Central	Other	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Statewide	Soybeans	147	174
Statewide	Corn	146	173
Statewide	Corn/Alfalfa	136	182
Statewide	Alfalfa	108	149
Statewide	Small Grains	**	**
Statewide	Other	**	**

** Less than five responses.

Table 70 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 70. 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	Soybeans	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	165	158
Irrigated and Non-irrigated Sandy Soils	Corn	184	150
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Small Grains	**	**
Irrigated and Non-irrigated Sandy Soils	Other	**	**
Southwestern and West Central	Soybeans	177	182
Southwestern and West Central	Corn	178	182
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	186	179
South Central	Corn	190	181
South Central	Corn/Alfalfa	**	**
South Central	Small Grains	**	**
South Central	Other	**	**
Southeastern	Soybeans	203	185
Southeastern	Corn	176	186
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Southeastern	Other	**	**
Statewide	Soybeans	180	177
Statewide	Corn	184	173
Statewide	Corn/Alfalfa	183	162
Statewide	Alfalfa	**	**
Statewide	Small Grains	**	**
Statewide	Other	218	166

** Less than five responses.

Table 71 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 71. 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 Only or Dairy Manure and Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Irrigated and Non-irrigated Sandy Soils	Soybeans	163	144
Irrigated and Non-irrigated Sandy Soils	Corn	155	155
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	151	146
Irrigated and Non-irrigated Sandy Soils	Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Small Grains	**	**
Southwestern and West Central	Soybeans	166	177
Southwestern and West Central	Corn	**	**
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Alfalfa	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
South Central	Corn/Alfalfa	**	**
South Central	Alfalfa	**	**
South Central	Small Grains	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	175	181
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Statewide	Soybeans	170	166
Statewide	Corn	165	164
Statewide	Corn/Alfalfa	155	174
Statewide	Alfalfa	111	167
Statewide	Small Grains	**	**

** 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, and MQ-11). These are corn fields applied with dairy manure and no commercial nitrogen fertilizer.

Table 72. 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	Soybeans	**	**
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	**	**
Southwestern and West Central	Corn	**	**
Southwestern and West Central	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	157	165
Statewide	Corn	161	163
Statewide	Corn/Alfalfa	136	182
Statewide	Alfalfa	100	166

** Less than five responses

Table 73 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 2014, corn in 2013 and alfalfa in 2012.

Table 73. 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
Irrigated and Non-irrigated Sandy Soils	Soybeans	165	154
Irrigated and Non-irrigated Sandy Soils	Corn	180	146
Irrigated and Non-irrigated Sandy Soils	Corn/Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Small Grains	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	**	**
Southwestern and West Central	Corn/Alfalfa	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
South Central	Corn/Alfalfa	**	**
South Central	Small Grains	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Statewide	Soybeans	176	167
Statewide	Corn	167	164
Statewide	Corn/Alfalfa	180	164
Statewide	Alfalfa	**	**
Statewide	Small Grains	**	**

** 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, MQ-11, and MQ-16). These are corn fields applied with beef manure or beef manure and commercial nitrogen fertilizer.

Table 74. 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 Only or Beef 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	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	**	**
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	157	186
South Central	Corn	194	186
Southeastern	Soybeans	174	173
Southeastern	Corn	162	193
Southeastern	Corn/Alfalfa	**	**
Southeastern	Other	**	**
Statewide	Soybeans	157	177
Statewide	Corn	185	182
Statewide	Corn/Alfalfa	**	**
Statewide	Other	**	**

** 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, and MQ-11). These are corn fields applied with beef manure and no commercial nitrogen fertilizer.

Table 75. 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	**	**
Irrigated and Non-irrigated Sandy Soils	Corn	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	**	**
South Central	Soybeans	**	**
Statewide	Soybeans	122	173
Statewide	Corn	**	**

** 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 beef manure and commercial nitrogen fertilizer.

Table 76. 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	Soybeans	**	**
Irrigated and Non-irrigated Sandy Soils	Corn	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Corn	**	**
Southwestern and West Central	Corn/Alfalfa	**	**
Southwestern and West Central	Alfalfa	**	**
South Central	Soybeans	172	182
South Central	Corn	194	186
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Southeastern	Corn/Alfalfa	**	**
Statewide	Soybeans	176	180
Statewide	Corn	192	182
Statewide	Corn/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, MQ-11, and MQ-16). These are corn fields applied with hog manure or hog manure and commercial nitrogen fertilizer.

Table 77. 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 Only or Hog Manure and Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	**	**
	Corn	**	**
Southwestern and West Central	Soybeans	168	181
Southwestern and West Central	Corn	155	184
Southwestern and West Central	Small Grains	**	**
South Central	Soybeans	168	183
South Central	Corn	173	177
South Central	Other	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Statewide	Soybeans	165	182
Statewide	Corn	169	178
Statewide	Small Grains	**	**
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, and MQ-11). These are corn fields applied with hog manure and no commercial nitrogen fertilizer.

Table 78. 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
Northwestern	Corn	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	**	**
	Corn	**	**
Southwestern and West Central	Soybeans	155	179
Southwestern and West Central	Corn	133	184
Southwestern and West Central	Small Grains	**	**
South Central	Soybeans	156	183
South Central	Corn	158	179
South Central	Other	**	**
Southeastern	Soybeans	**	**
Southeastern	Corn	**	**
Statewide	Soybeans	151	182
Statewide	Corn	152	180
Statewide	Small Grains	**	**
Statewide	Other	**	**

** Less than five responses.

Table 79 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 79. 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	**	**
Irrigated and Non-irrigated Sandy Soils	Corn	**	**
Southwestern and West Central	Soybeans	180	183
Southwestern and West Central	Corn	177	183
South Central	Soybeans	184	183
South Central	Corn	196	174
South Central	Other	**	**
Statewide	Soybeans	181	183
Statewide	Corn	191	175
Statewide	Other	**	**

** Less than five responses.

Table 80 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 80. Average amount of nitrogen applied from poultry manure or 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 Only or Poultry Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
Northwestern	Corn	**	**
Northwestern	Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	**	**
Irrigated and Non-irrigated Sandy Soils	Corn	**	**
Southwestern and West Central	Soybeans	169	172
Southwestern and West Central	Other	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
Statewide	Soybeans	158	159
Statewide	Corn	**	**
Statewide	Alfalfa	**	**
Statewide	Other	**	**

** Less than five responses.

Table 81 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 81. 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
Northwestern	Corn	**	**
Northwestern	Alfalfa	**	**
Irrigated and Non-irrigated Sandy Soils	Soybeans	**	**
Southwestern and West Central	Soybeans	163	171
South Central	Soybeans	**	**
Statewide	Soybeans	142	152
Statewide	Corn	**	**
Statewide	Alfalfa	**	**

** Less than five responses.

Table 82 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 82. 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	**	**
Southwestern and West Central	Soybeans	**	**
Southwestern and West Central	Other	**	**
South Central	Soybeans	**	**
South Central	Corn	**	**
Statewide	Soybeans	186	172
Statewide	Corn	**	**
Statewide	Other	**	**

** Less than five responses.

Manure Applications from All Manure Sources

Figure 89 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure¹¹ or manure and commercial nitrogen fertilizer to corn following soybeans (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 176 bushels per acre. The average nitrogen rate applied from manure was 128 pounds per acre, and the average commercial nitrogen fertilizer rate was 36 pounds per acre for an average total of 164 pounds of nitrogen per acre.

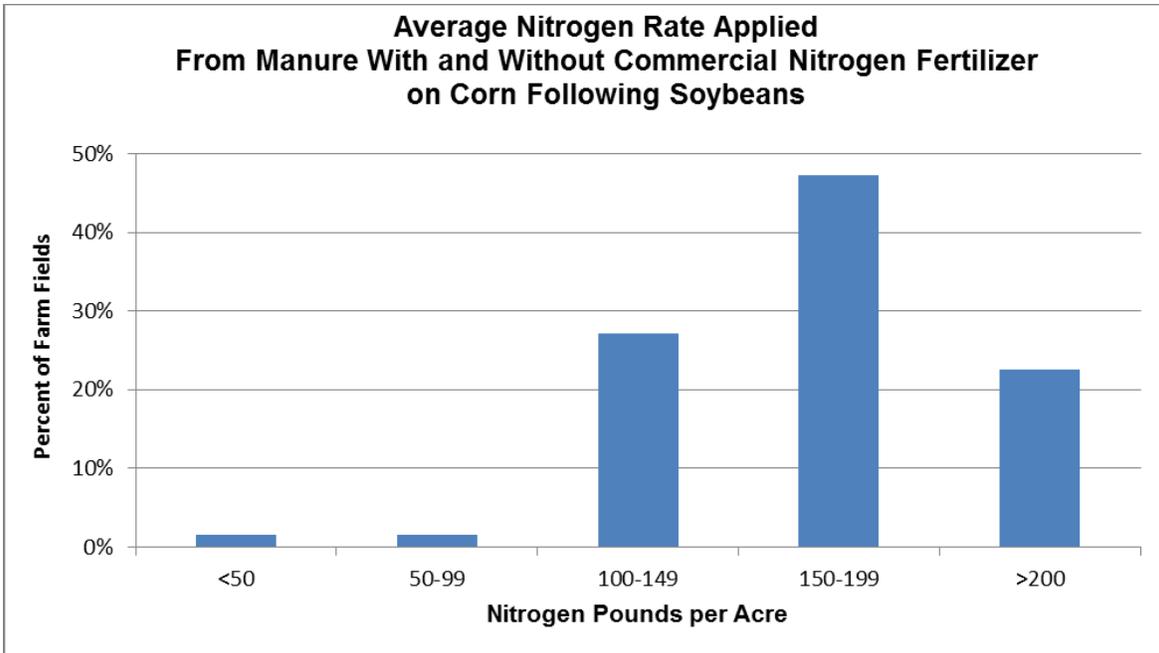


Figure 89. Average nitrogen rates applied to corn following soybeans from manure or manure and commercial nitrogen fertilizer in Minnesota for 2014: 125 fields.

¹¹ Manure is from all manure sources

Figure 90 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 174 bushels per acre. The average nitrogen rate applied from manure was 147 pounds per acre.

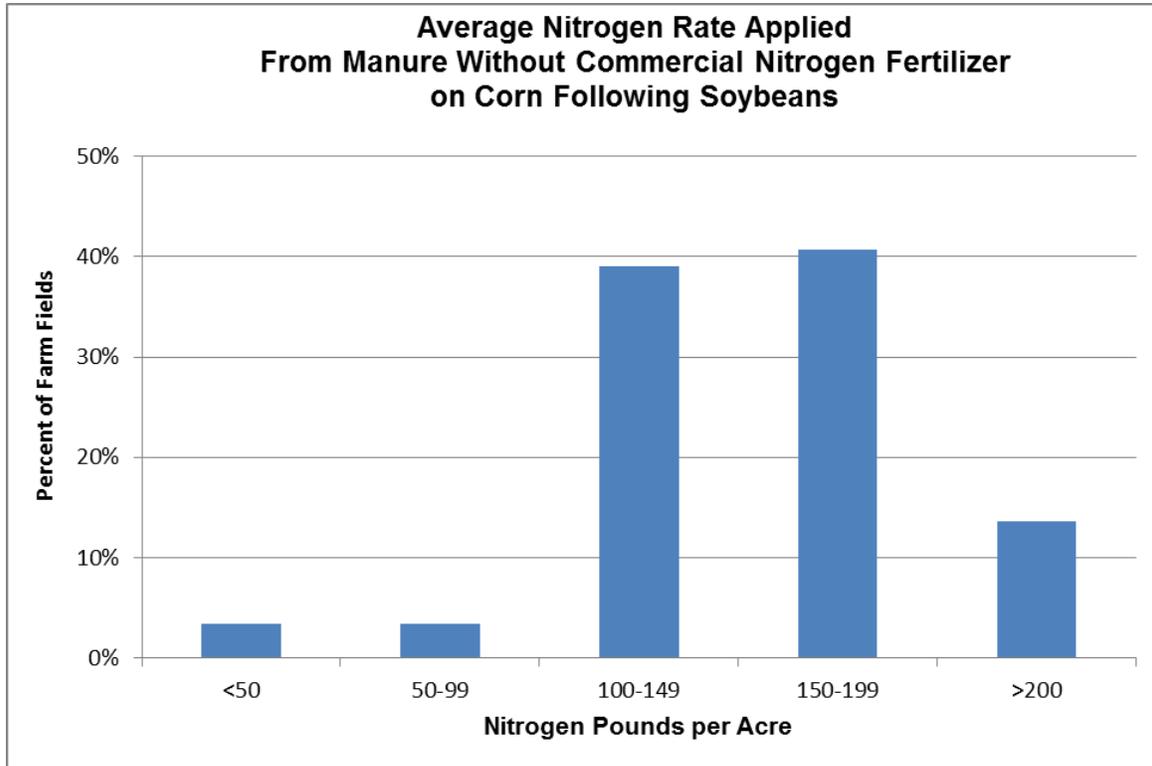


Figure 90. Average nitrogen rates applied to corn following soybeans from manure and no commercial nitrogen fertilizer in Minnesota for 2014: 60 fields.

Figure 91 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 177 bushels per acre. The average nitrogen rate applied from manure was 114 pounds per acre, and the average commercial nitrogen fertilizer rate was 67 pounds per acre for an average total of 181 pounds of nitrogen per acre.

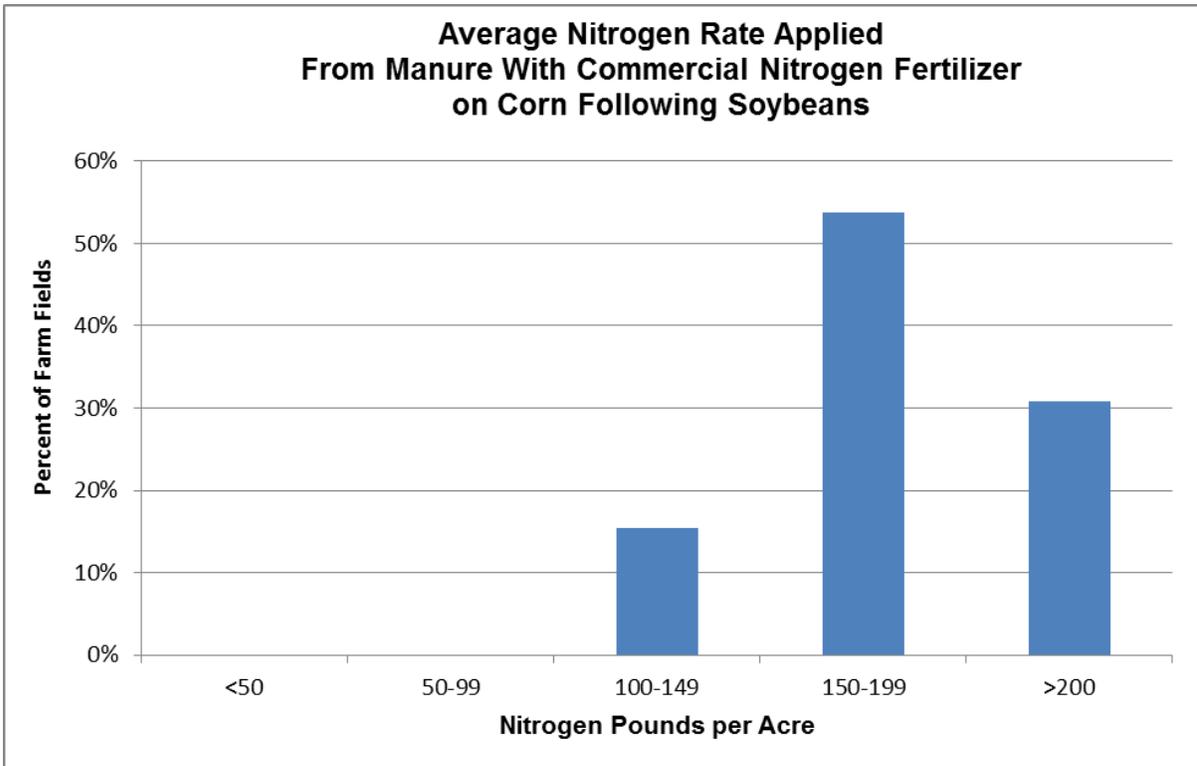


Figure 91. Average nitrogen rates applied to corn following soybeans from manure and commercial nitrogen fertilizer in Minnesota for 2014: 65 fields.

Figure 92 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 nitrogen from manure applied to the field is not known. The average corn yield was 164 bushels per acre. The average commercial nitrogen fertilizer rate was 123 pounds per acre.

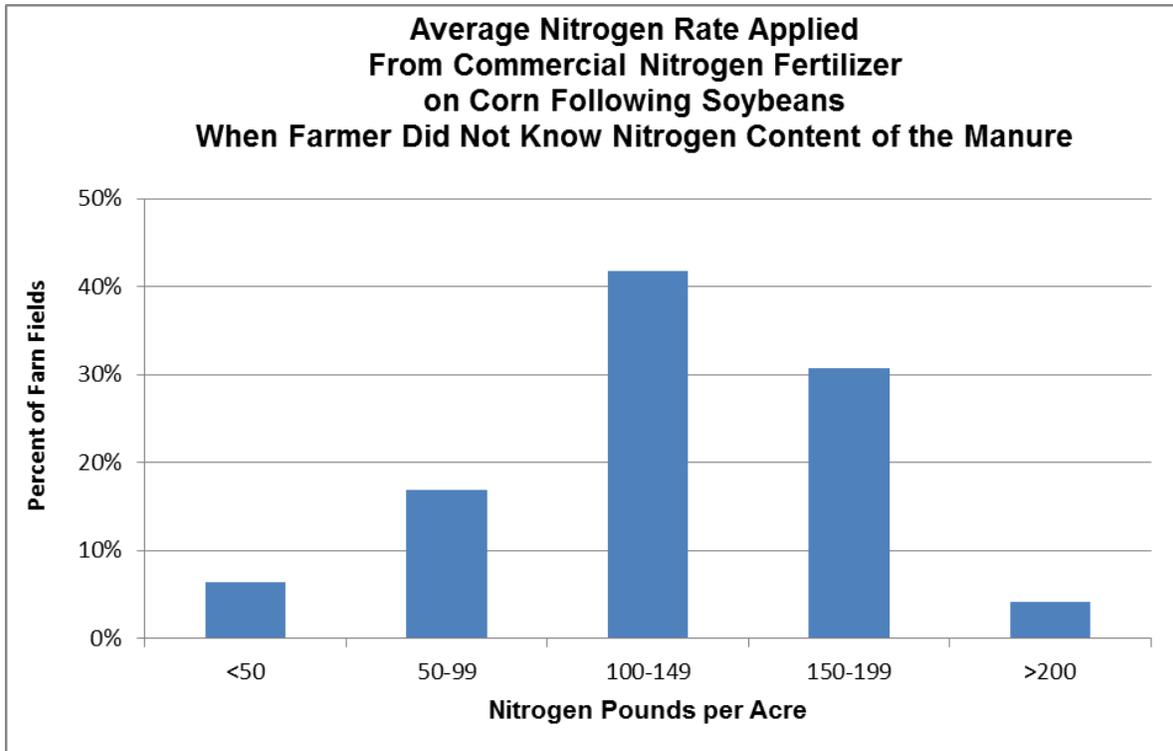


Figure 92. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2014 when the manure nitrogen content is unknown: 189 fields.

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 (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 175 bushels per acre. The average nitrogen rate applied from manure was 121 pounds per acre, and the average commercial nitrogen fertilizer rate was 50 pounds per acre for an average total of 171 pounds of nitrogen per acre.

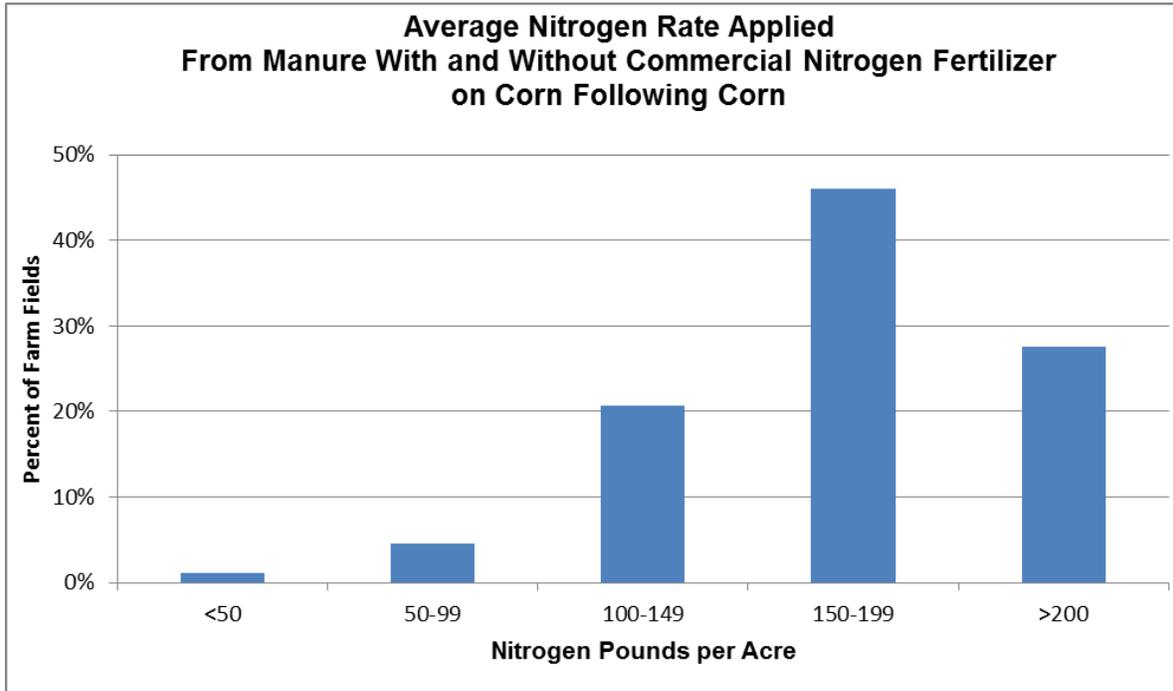


Figure 93. Average nitrogen rates applied to corn following corn from manure or manure and commercial nitrogen fertilizer in Minnesota for 2014: 84 fields.

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 (MQ-1a, MQ-5, and MQ-11). The average corn yield was 176 bushels per acre. The average nitrogen rate applied from manure was 150 pounds per acre.

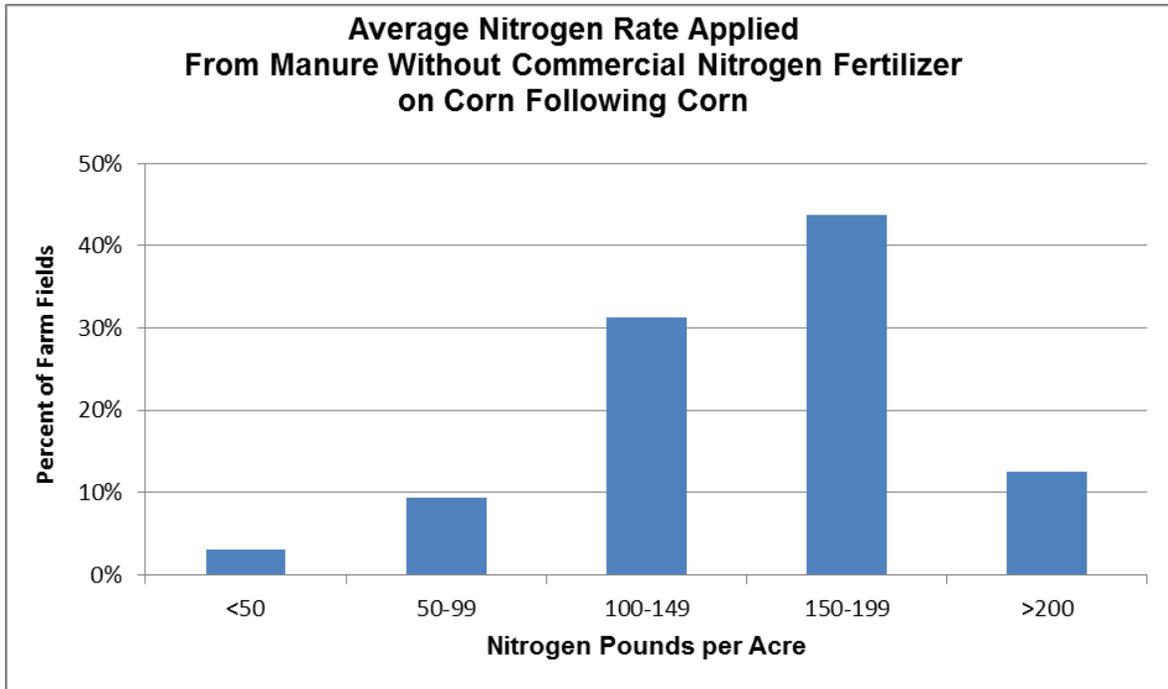


Figure 94. Average nitrogen rates applied to corn following corn from manure and no commercial nitrogen fertilizer in Minnesota for 2014: 32 fields.

Figure 95 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following corn (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 173 bushels per acre. The average nitrogen rate applied from manure was 102 pounds per acre, and the average commercial nitrogen fertilizer rate was 82 pounds per acre for an average total of 184 pounds of nitrogen per acre.

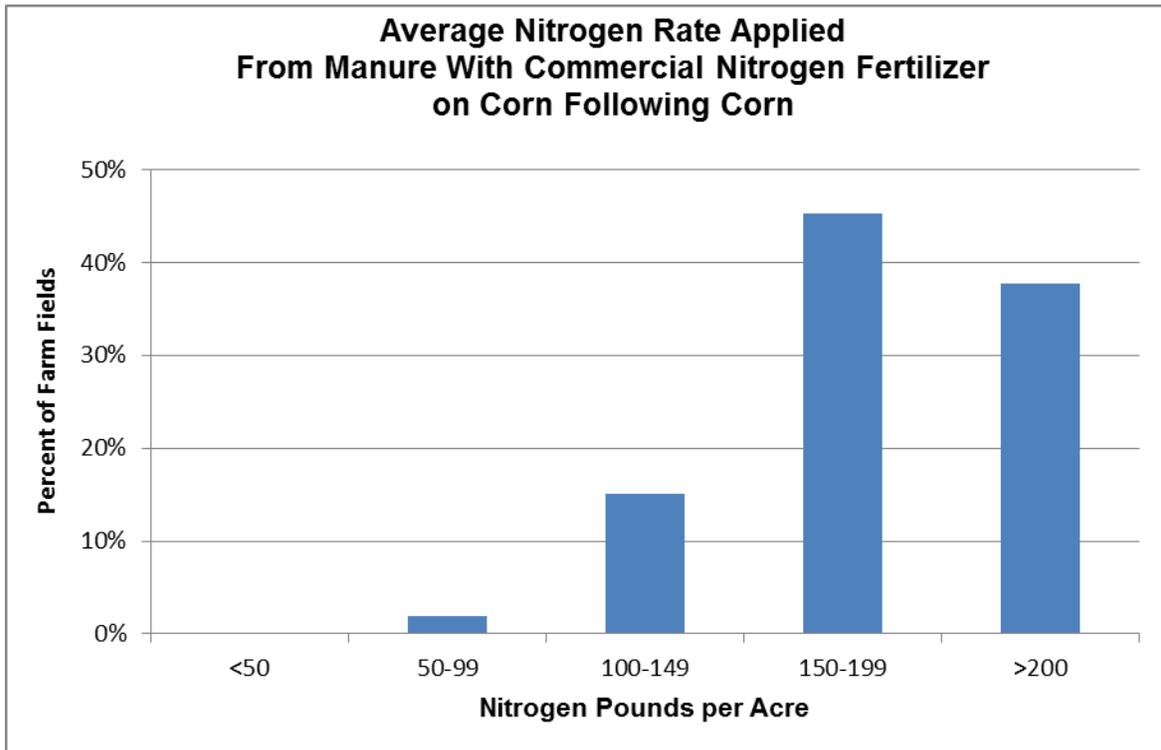


Figure 95. Average nitrogen rates applied to corn following corn from manure and commercial nitrogen fertilizer in Minnesota for 2014: 52 fields.

Figure 96 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and commercial nitrogen fertilizer to corn following corn 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 nitrogen from manure applied to the field is not known. The average corn yield was 154 bushels per acre. The average commercial nitrogen fertilizer rate was 123 pounds per acre.

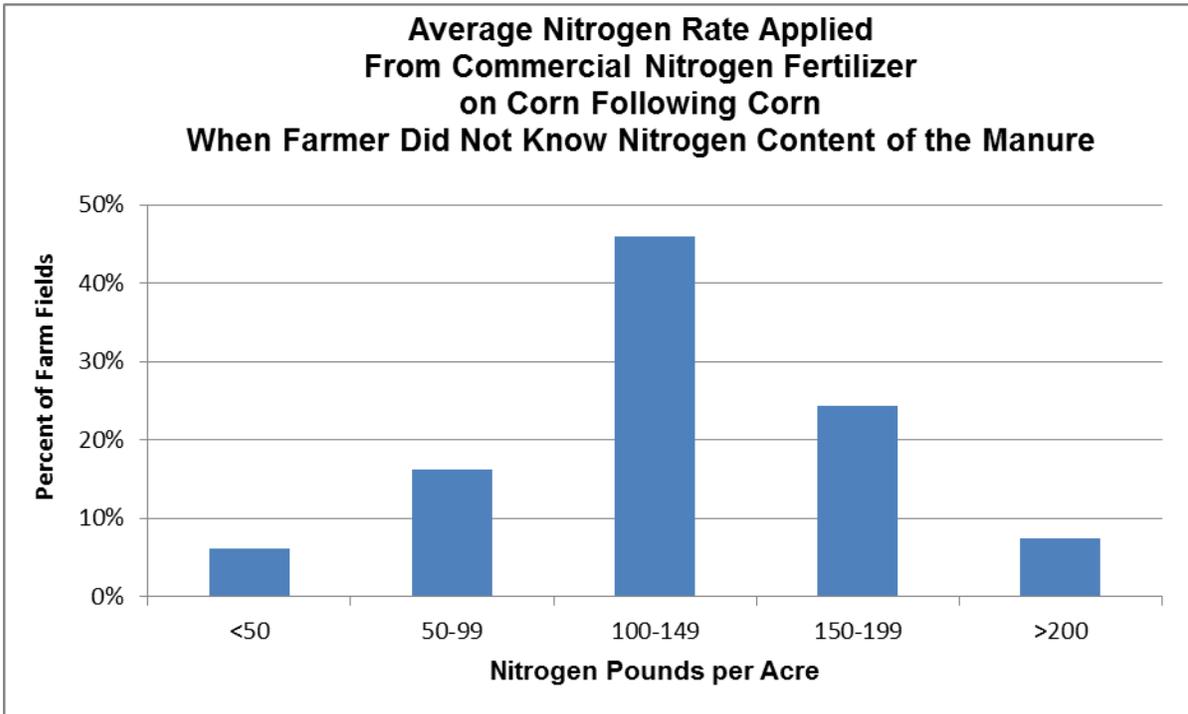


Figure 96. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2014 when the manure nitrogen content is unknown: 148 fields.

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 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 123 pounds per acre, and the average commercial nitrogen fertilizer rate was 38 pounds per acre for an average total of 161 pounds of nitrogen per acre.

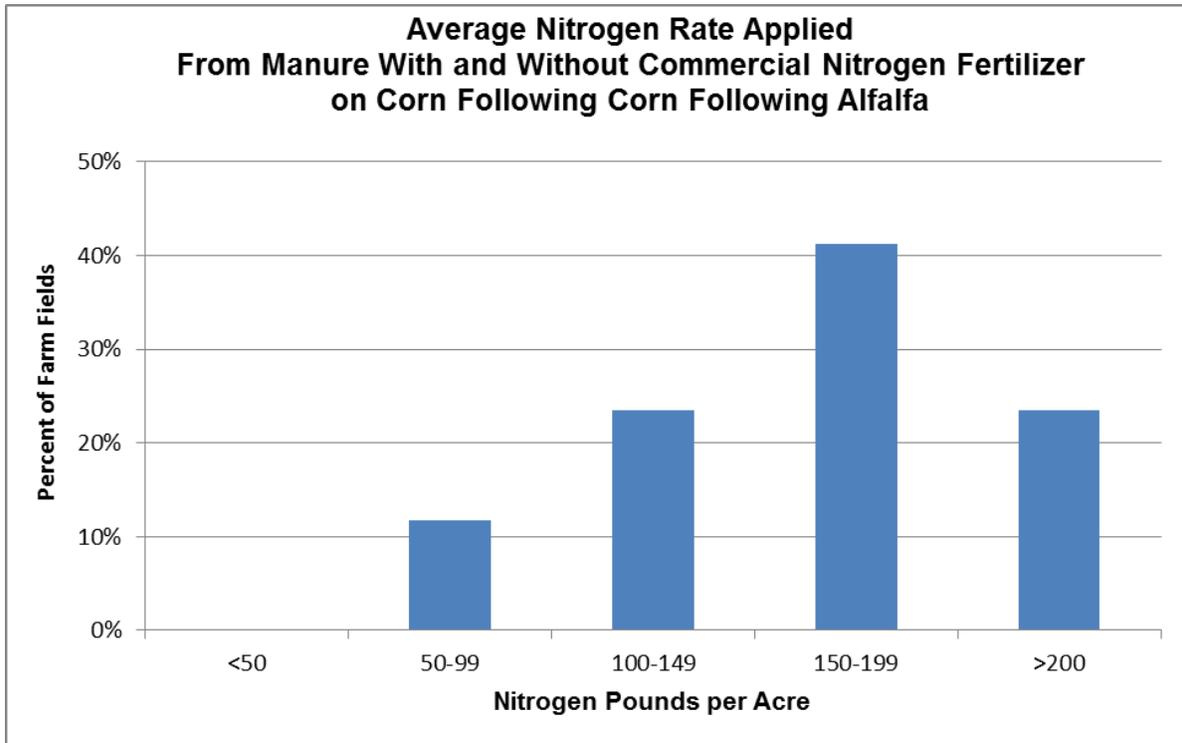


Figure 97. Average nitrogen rates applied to corn following corn following alfalfa from manure or manure and commercial nitrogen fertilizer in Minnesota for 2014: 17 fields.

Figure 98 details the distribution of average nitrogen rates in Minnesota from farmers that applied manure and no commercial nitrogen fertilizer to corn following corn following alfalfa (MQ-1a, MQ-5, and MQ-11). The average corn yield was 182 bushels per acre. The average nitrogen rate applied from manure was 136 pounds per acre.

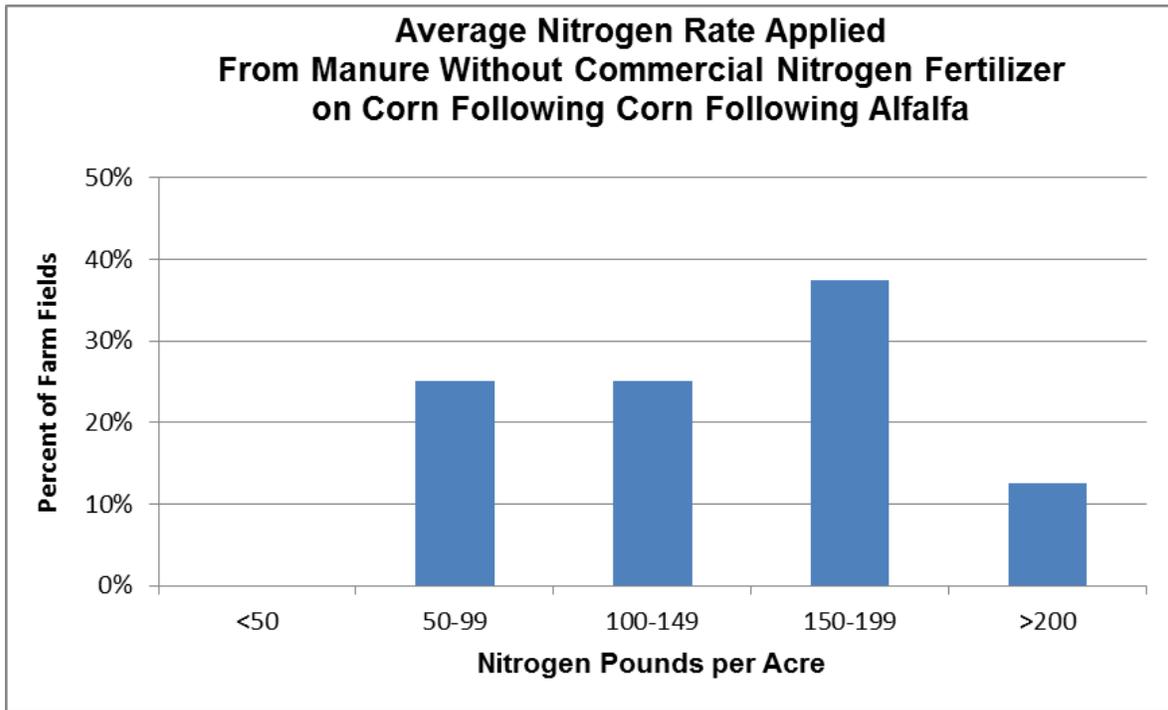


Figure 98. Average nitrogen rates applied to corn following corn following alfalfa from manure and no commercial nitrogen fertilizer in Minnesota for 2014: 8 fields.

Figure 99 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 162 bushels per acre. The average nitrogen rate applied from manure was 112 pounds per acre, and the average commercial nitrogen fertilizer rate was 71 pounds per acre for an average total of 183 pounds of nitrogen per acre.

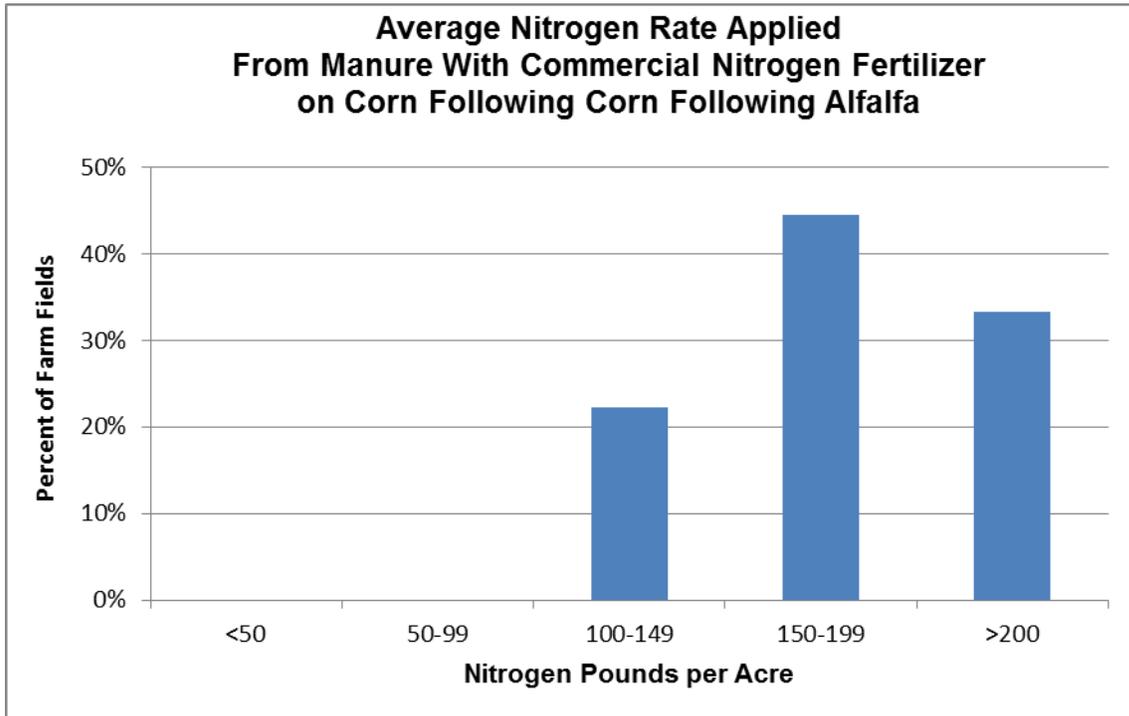


Figure 99. Average nitrogen rates applied to corn following corn following alfalfa from manure and commercial nitrogen fertilizer in Minnesota for 2014: 9 fields.

Figure 100 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 nitrogen from manure applied to the field is not known. The average corn yield was 155 bushels per acre. The average commercial nitrogen fertilizer rate was 111 pounds per acre.

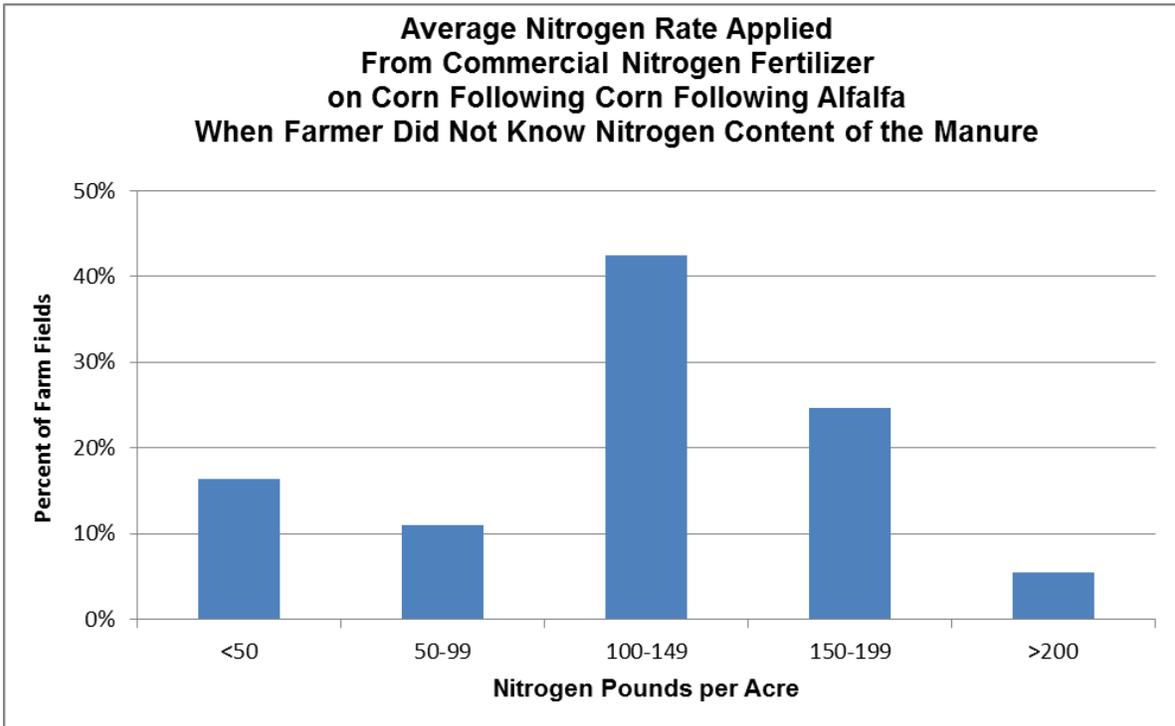


Figure 100. Average nitrogen rates applied to corn following corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2014 when the manure nitrogen content is unknown: 73 fields.

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 alfalfa (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 154 bushels per acre. The average nitrogen rate applied from manure was 100 pounds per acre, and the average commercial nitrogen fertilizer rate was 15 pounds per acre for an average total of 115 pounds of nitrogen per acre.

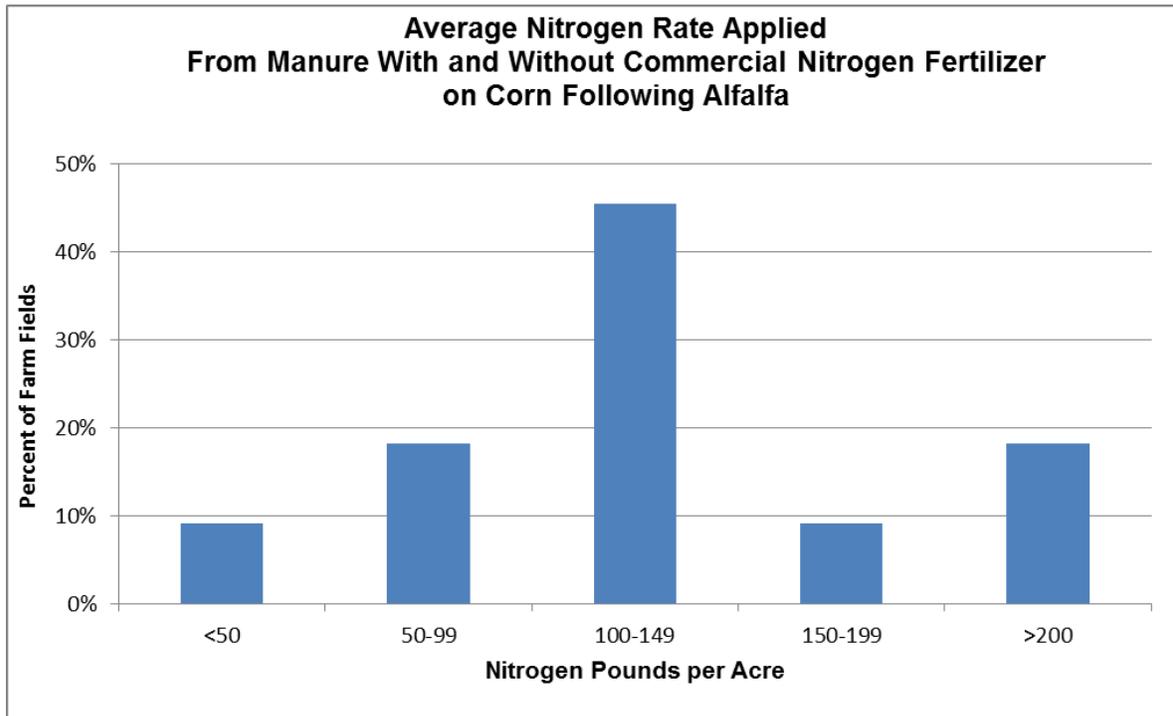


Figure 101. Average nitrogen rates applied to corn following alfalfa from manure or manure and commercial nitrogen fertilizer in Minnesota for 2014: 11 fields.

Figure 102 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 149 bushels per acre. The average nitrogen rate applied from manure was 108 pounds per acre.

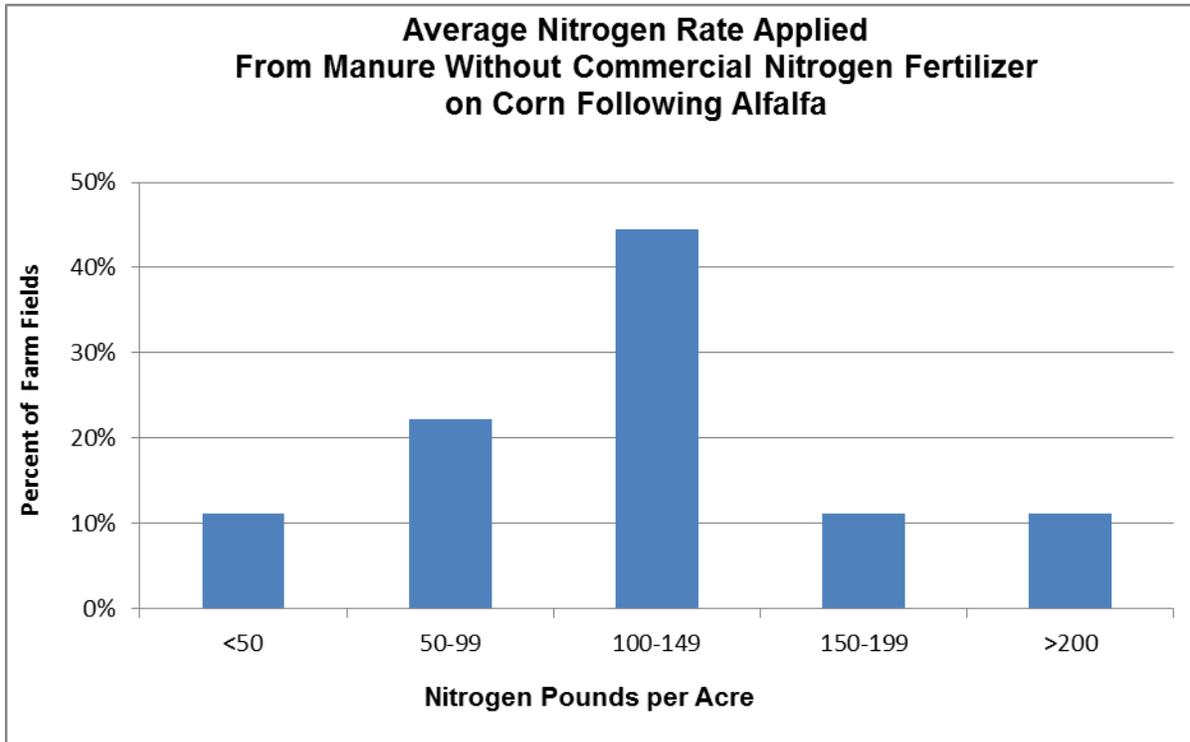


Figure 102. Average nitrogen rates applied to corn following alfalfa from manure and no commercial nitrogen fertilizer in Minnesota for 2014: 9 fields.

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

Figure 103 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 nitrogen from manure applied to the field is not known. The average corn yield was 157 bushels per acre. The average commercial nitrogen fertilizer rate was 100 pounds per acre.

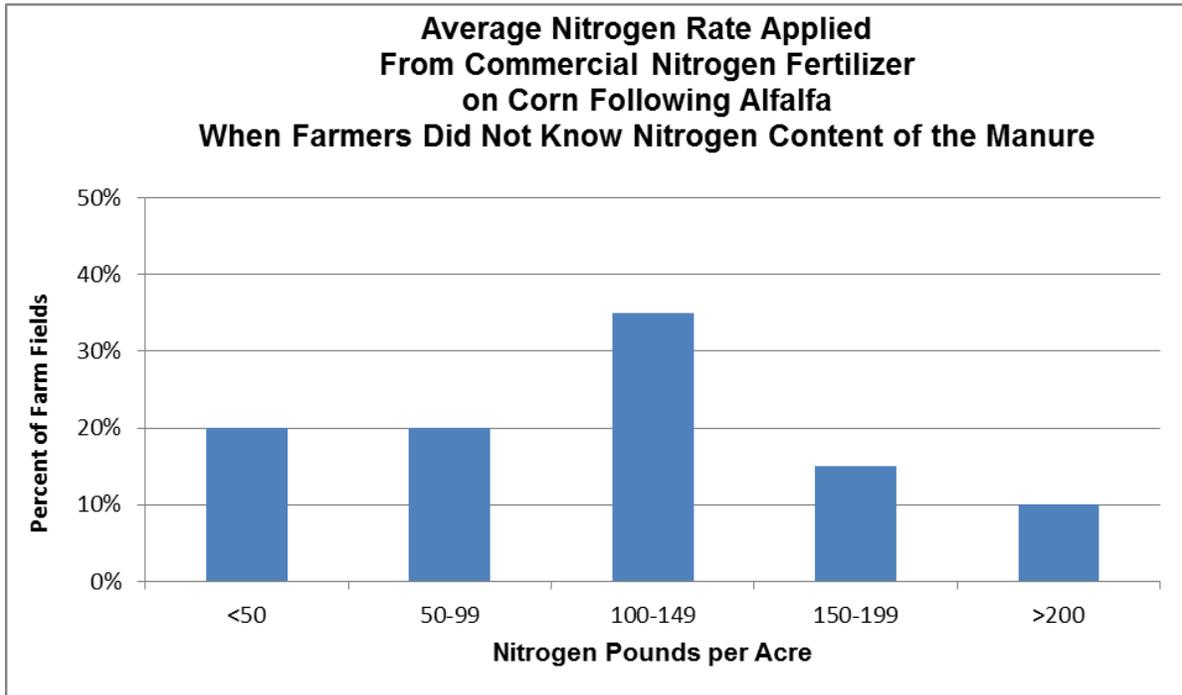


Figure 103. Average nitrogen rates applied to corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2014 when the manure nitrogen content is unknown: 20 fields.

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

- With manure or with manure and commercial nitrogen fertilizer.
- With manure and no commercial nitrogen fertilizer.
- With manure and 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 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 nitrogen from manure applied to the field is not known. The average corn yield was 170 bushels per acre. The average commercial nitrogen fertilizer rate was 112 pounds per acre.

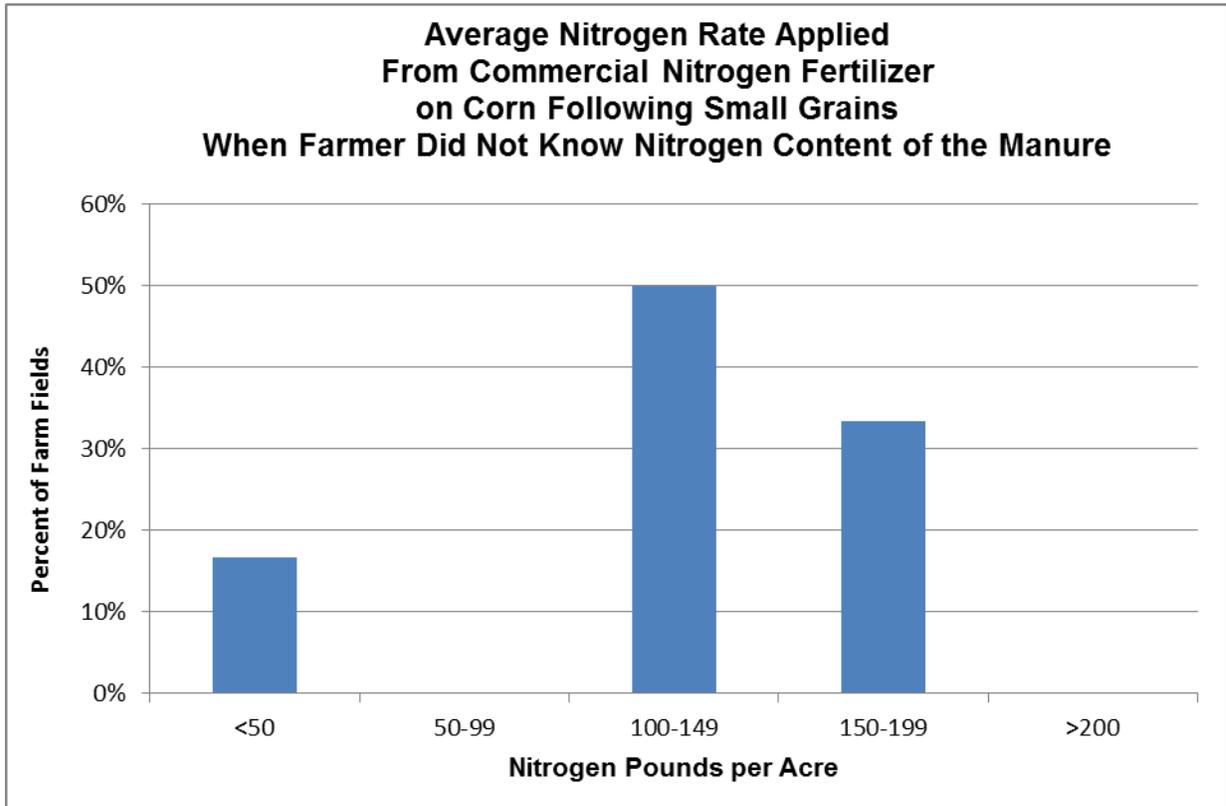


Figure 104. Average nitrogen rates applied to corn following small grains from commercial nitrogen fertilizer in Minnesota for 2014 when the manure nitrogen content is unknown: 12 fields.

Figure 105 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 170 bushels per acre. The average nitrogen rate applied from manure was 110 pounds per acre, and the average commercial nitrogen fertilizer rate was 81 pounds per acre for an average total of 191 pounds of nitrogen per acre.

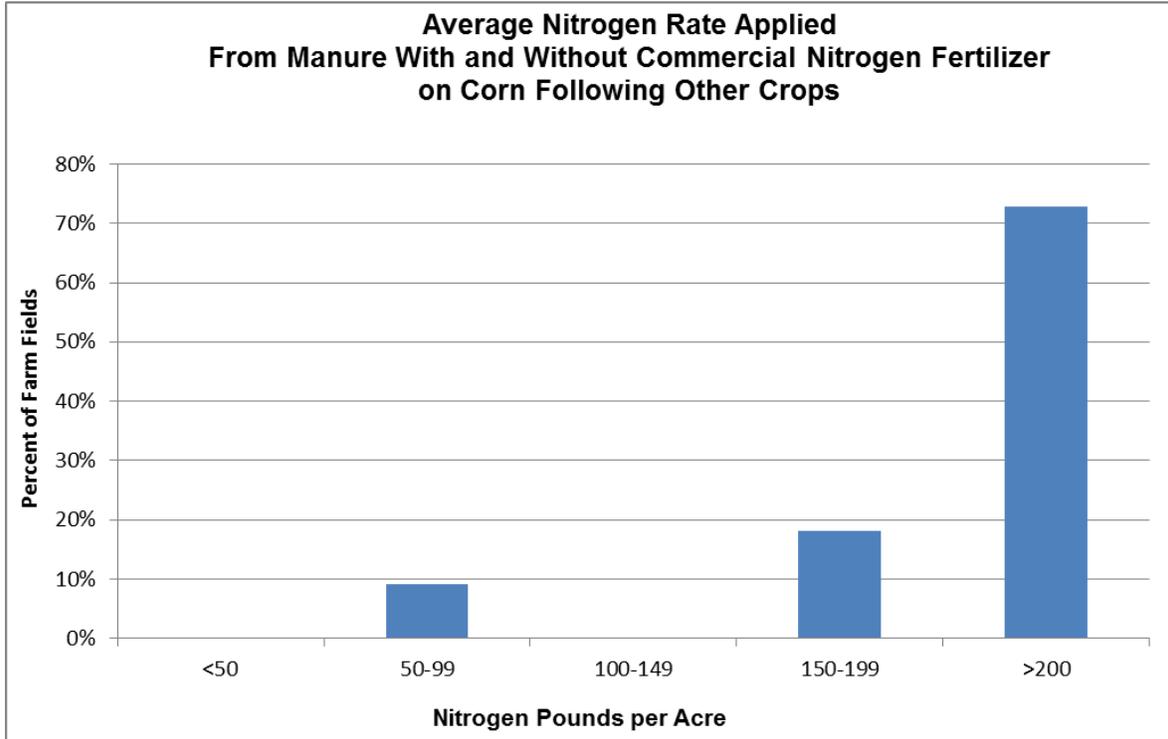


Figure 105. Average nitrogen rates applied to corn following other crops from manure or manure and commercial nitrogen fertilizer in Minnesota for 2014: 11 fields.

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

Figure 106 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 166 bushels per acre. The average nitrogen rate applied from manure was 106 pounds per acre, and the average commercial nitrogen fertilizer rate was 112 pounds per acre for an average total of 218 pounds of nitrogen per acre.

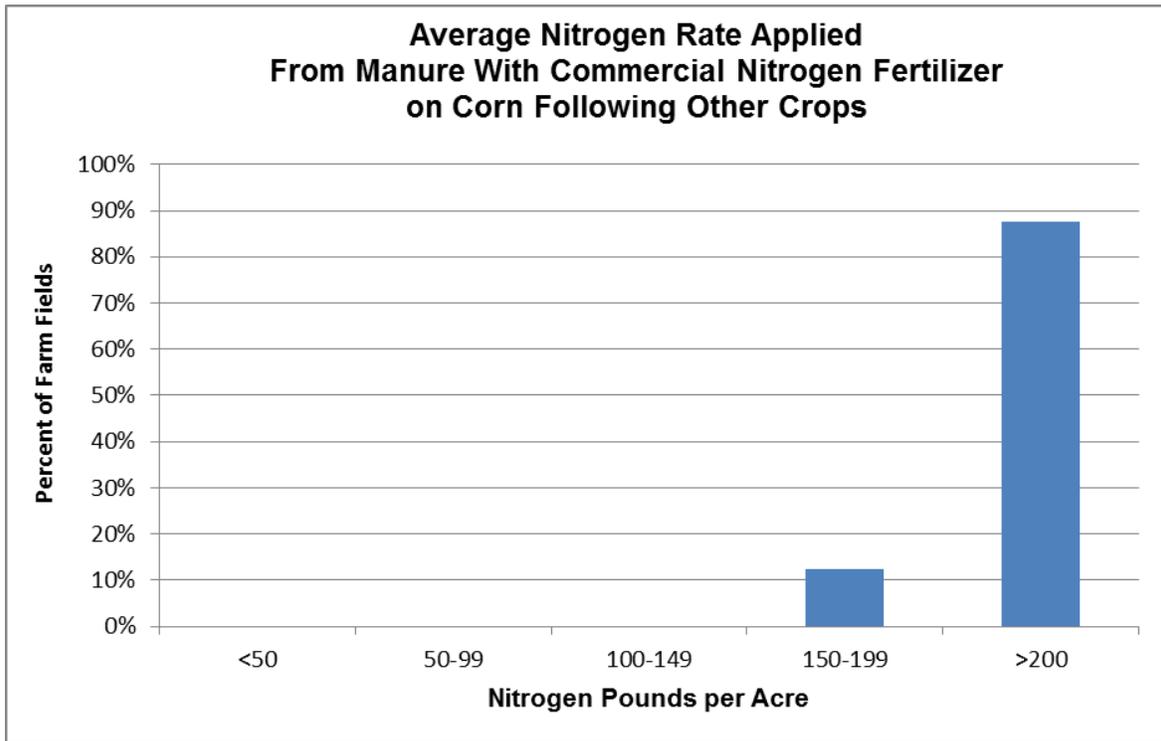


Figure 106. Average nitrogen rates applied to corn following other crops from manure and commercial nitrogen fertilizer in Minnesota for 2014: 8 fields.

Figure 107 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 nitrogen from manure applied to the field is not known. The average corn yield was 159 bushels per acre. The average commercial nitrogen fertilizer rate was 95 pounds per acre.

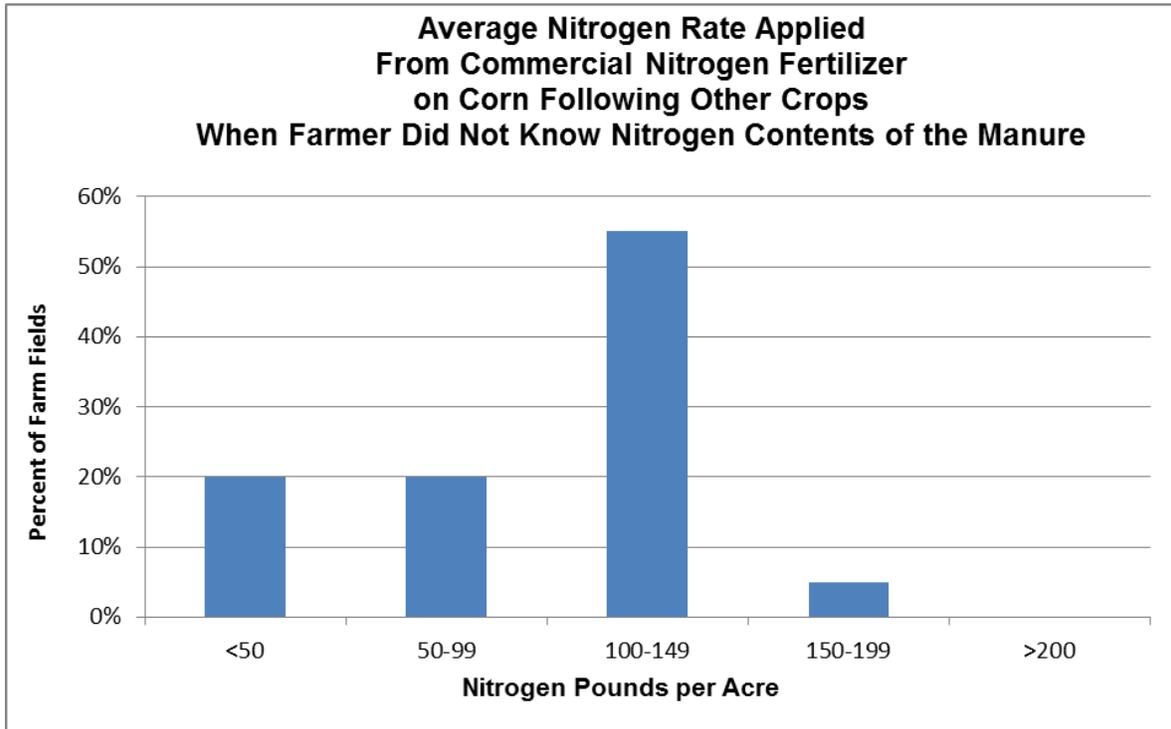


Figure 107. Average nitrogen rates applied to corn following other crops from commercial nitrogen fertilizer in Minnesota for 2014 when the manure nitrogen content is unknown: 20 fields.

Manure Applications from Dairy Manure

Figure 108 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 166 bushels per acre. The average nitrogen rate applied from dairy manure was 117 pounds per acre, and the average commercial nitrogen fertilizer rate was 53 pounds per acre for an average total of 170 pounds of nitrogen per acre.

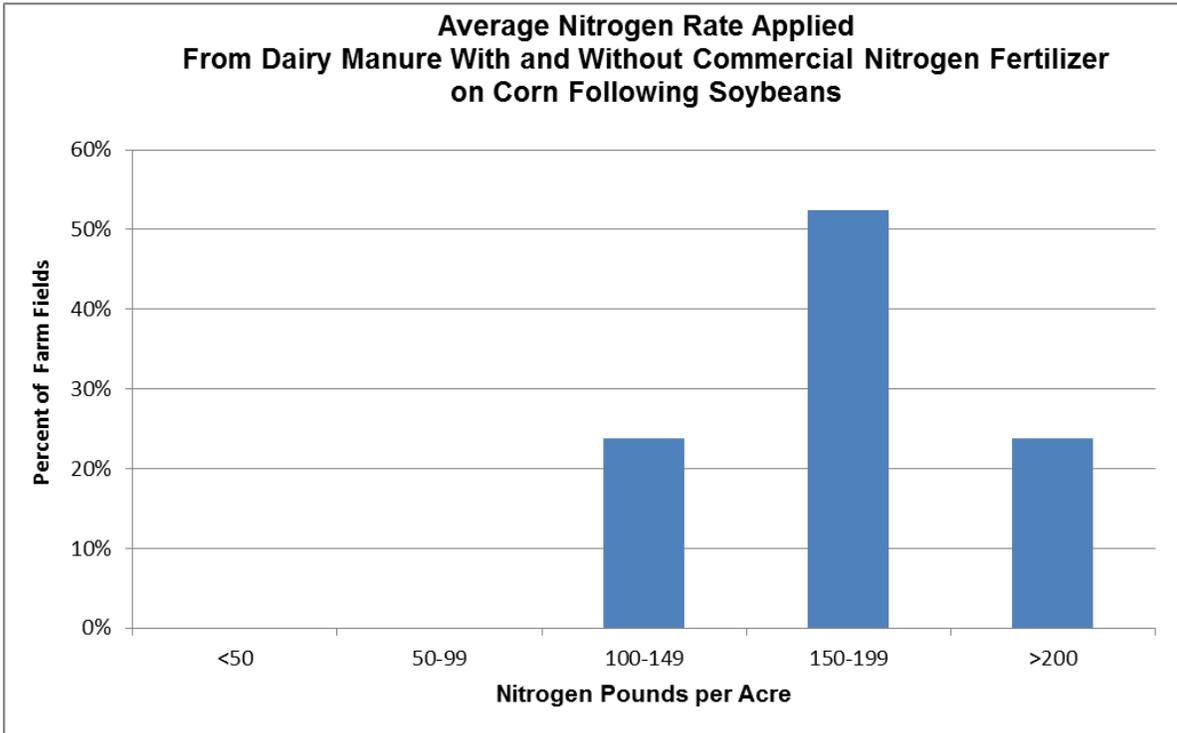


Figure 108. Average nitrogen rates applied to corn following soybeans from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 21 fields.

Figure 109 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 165 bushels per acre. The average nitrogen rate applied from dairy manure was 157 pounds per acre.

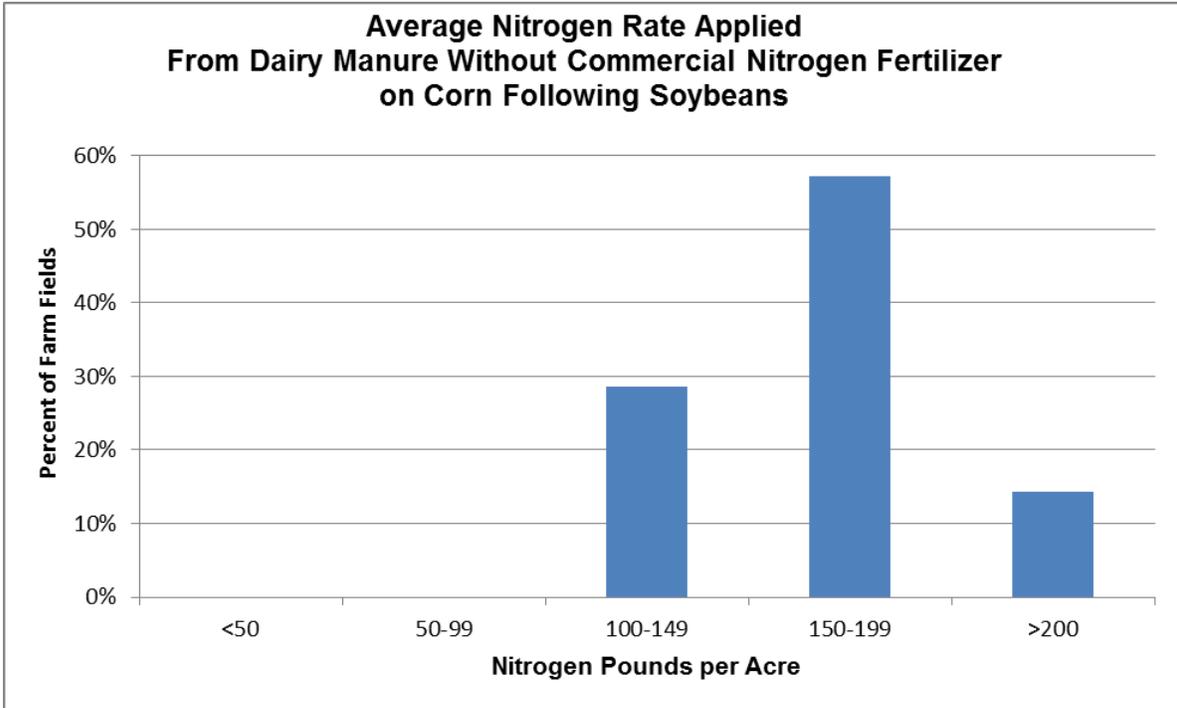


Figure 109. Average nitrogen rates applied to corn following soybeans from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2014: 7 fields.

Figure 110 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 167 bushels per acre. The average nitrogen rate applied from dairy manure was 97 pounds per acre, and the average commercial nitrogen fertilizer rate was 80 pounds per acre for an average total of 176 pounds of nitrogen per acre.

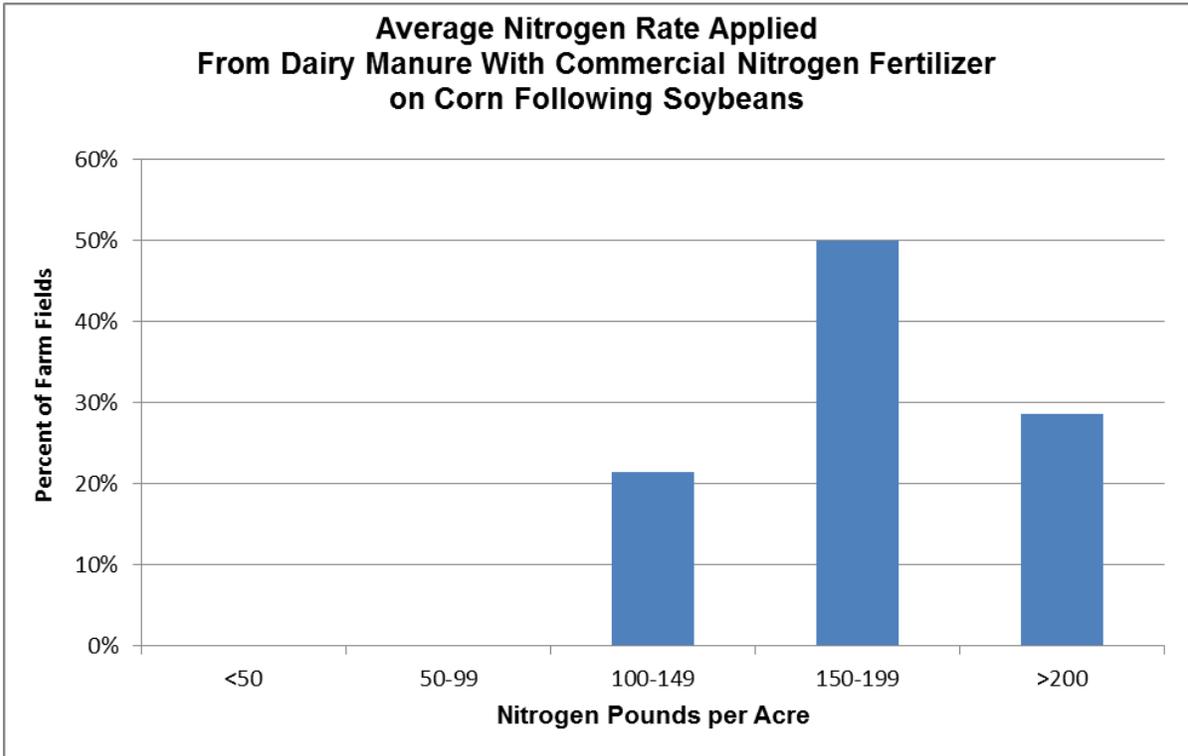


Figure 110. Average nitrogen rates applied to corn following soybeans from dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 14 fields.

Figure 111 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 nitrogen from 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 112 pounds per acre.

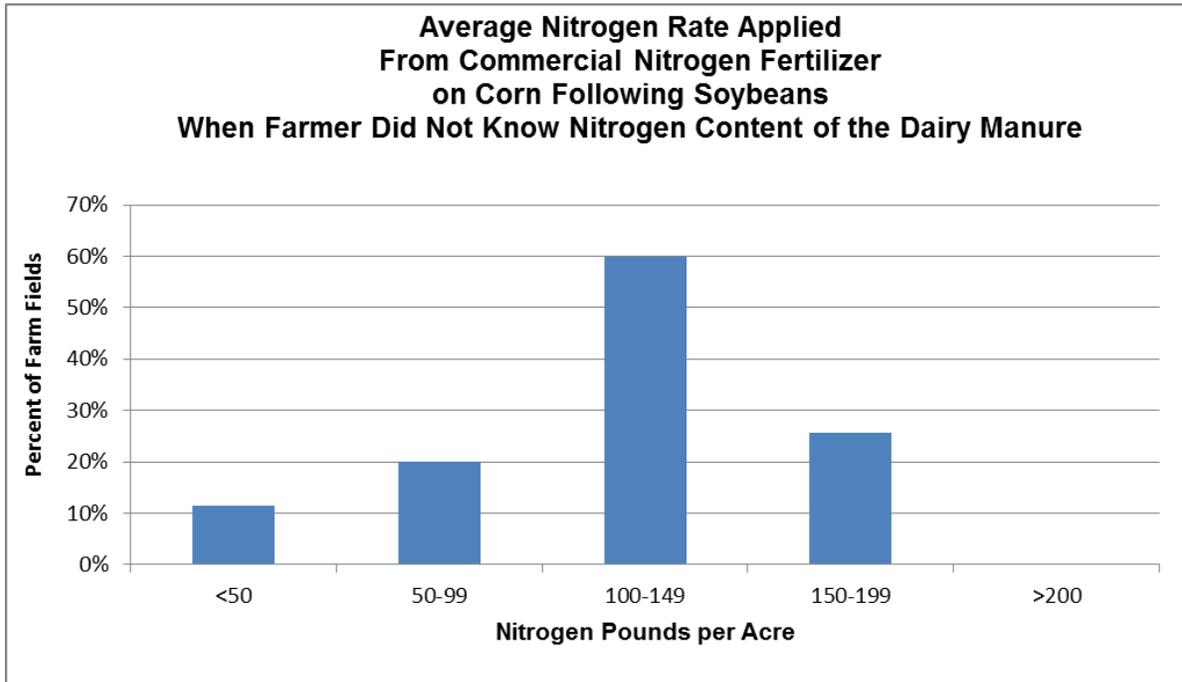


Figure 111. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2014 when the dairy manure nitrogen content is unknown: 41 fields.

Figure 112 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 164 bushels per acre. The average nitrogen rate applied from dairy manure was 127 pounds per acre, and the average commercial nitrogen fertilizer rate was 38 pounds per acre for an average total of 165 pounds of nitrogen per acre.

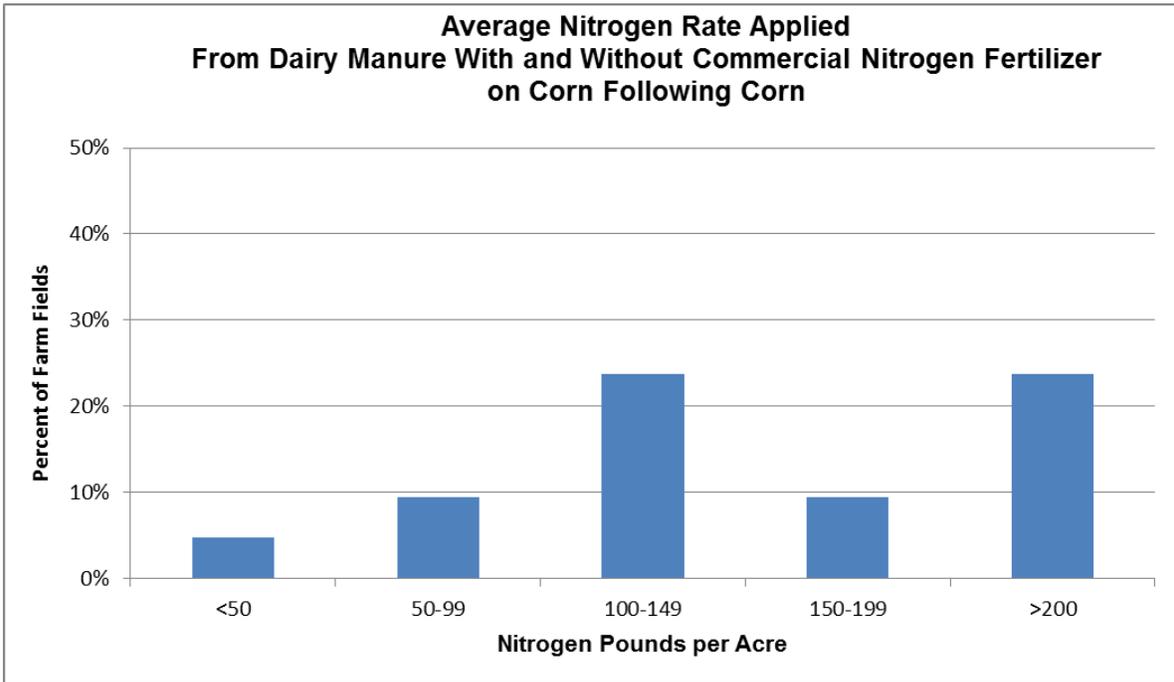


Figure 112. Average nitrogen rates applied to corn following corn from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 21 fields.

Figure 113 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 162 bushels per acre. The average nitrogen rate applied from dairy manure was 161 pounds per acre.

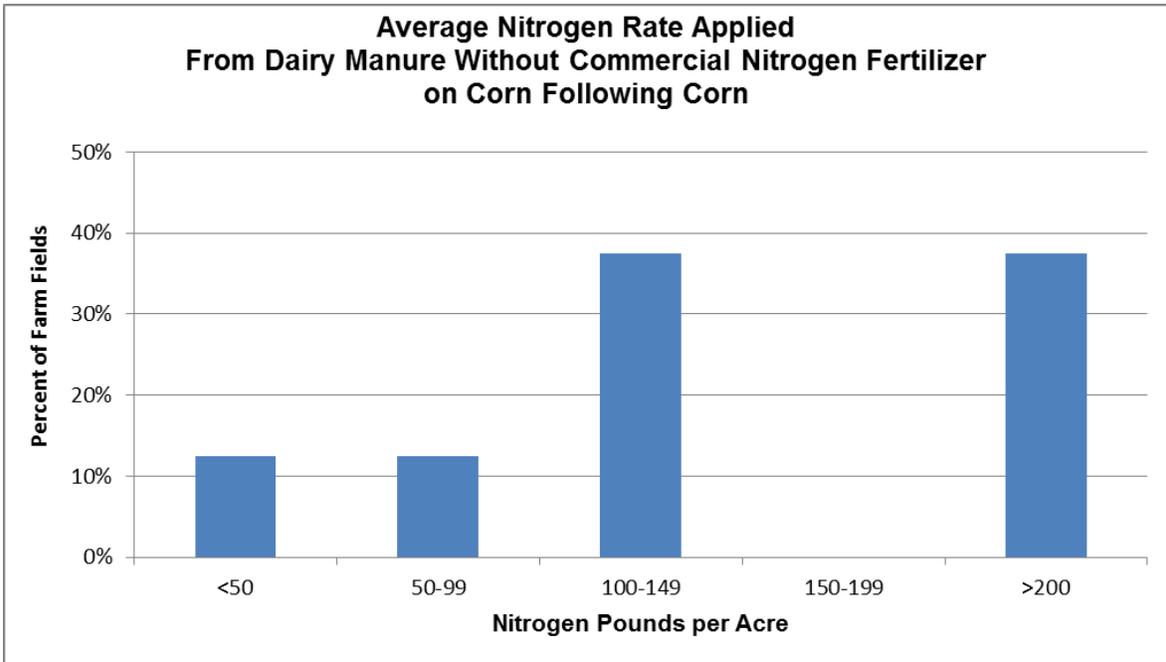


Figure 113. Average nitrogen rates applied to corn following corn from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2014: 8 fields.

Figure 114 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 164 bushels per acre. The average nitrogen rate applied from dairy manure was 105 pounds per acre, and the average commercial nitrogen fertilizer rate was 62 pounds per acre for an average total of 167 pounds of nitrogen per acre.

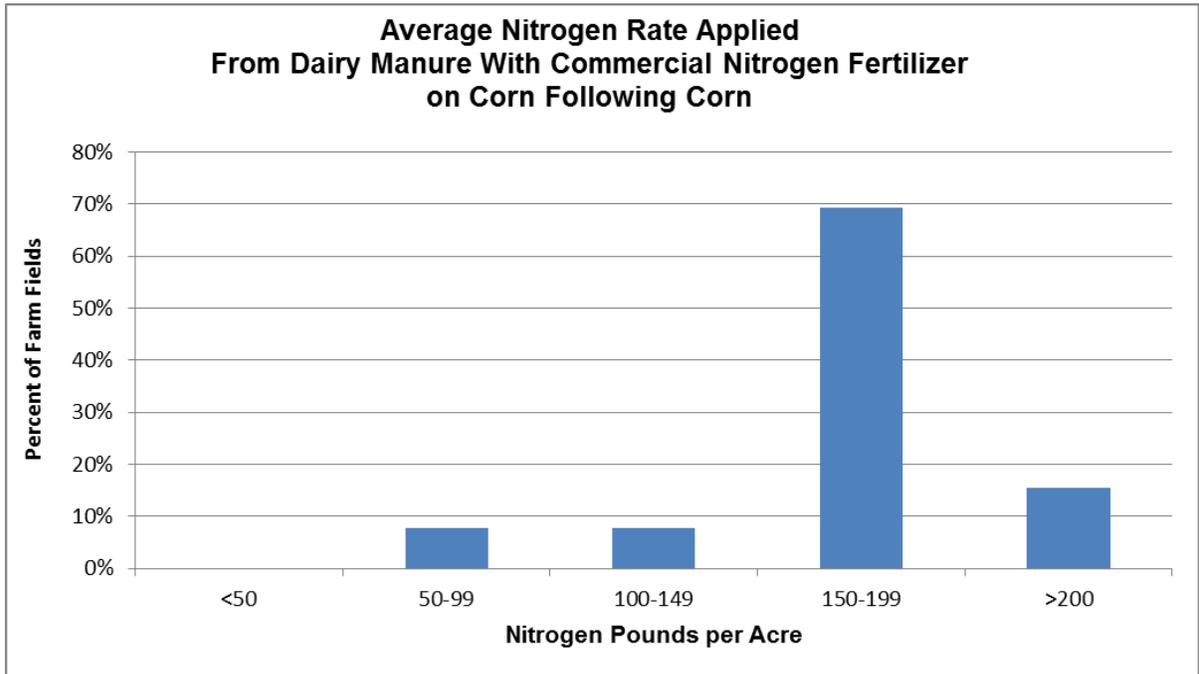


Figure 114. Average nitrogen rates applied to corn following corn from dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 13 fields.

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 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 nitrogen from dairy manure applied to the field is not known. The average corn yield was 152 bushels per acre. The average commercial nitrogen fertilizer rate was 111 pounds per acre.

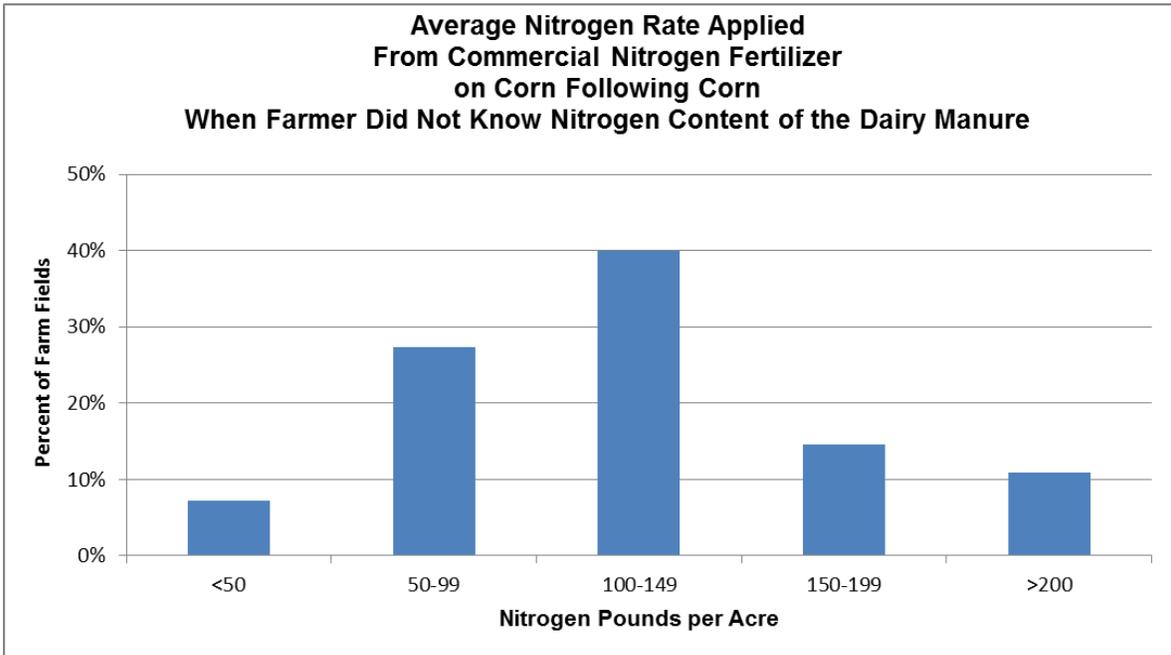


Figure 115. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2014 when the dairy manure nitrogen content is unknown: 55 fields.

Figure 116 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 174 bushels per acre. The average nitrogen rate applied from dairy manure was 124 pounds per acre, and the average commercial nitrogen fertilizer rate was 31 pounds per acre for an average total of 155 pounds of nitrogen per acre.

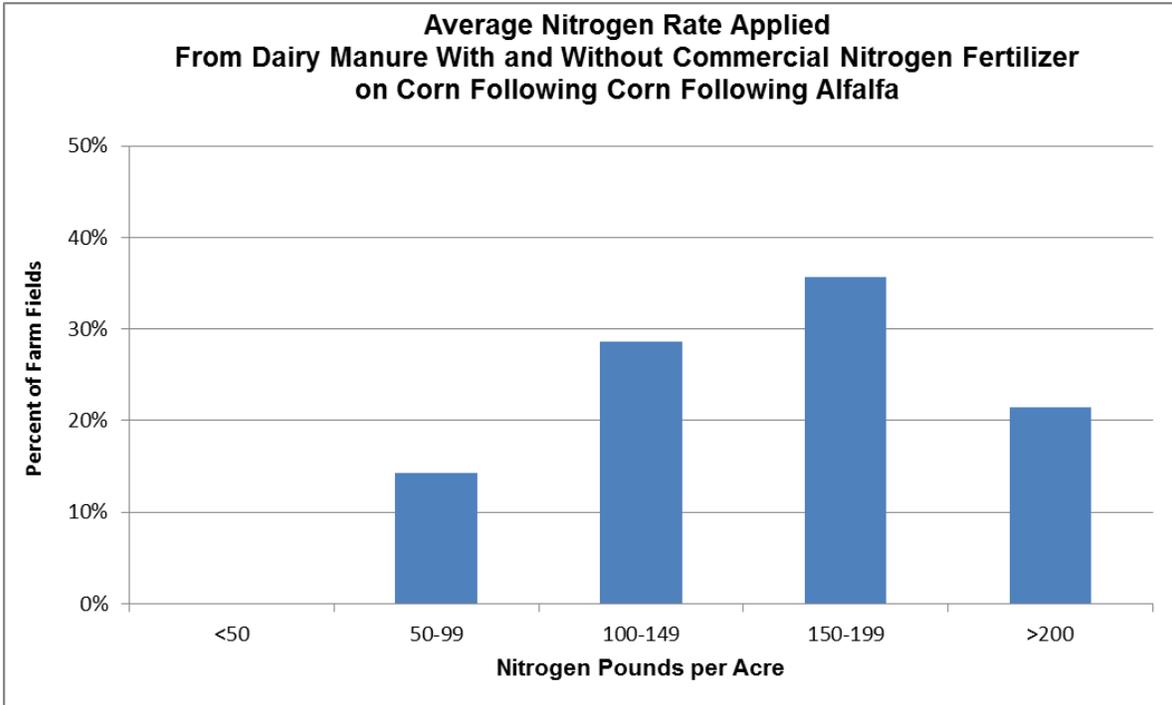


Figure 116. Average nitrogen rates applied to corn following corn following alfalfa from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 14 fields.

Figure 117 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 182 bushels per acre. The average nitrogen rate applied from dairy manure was 136 pounds per acre.

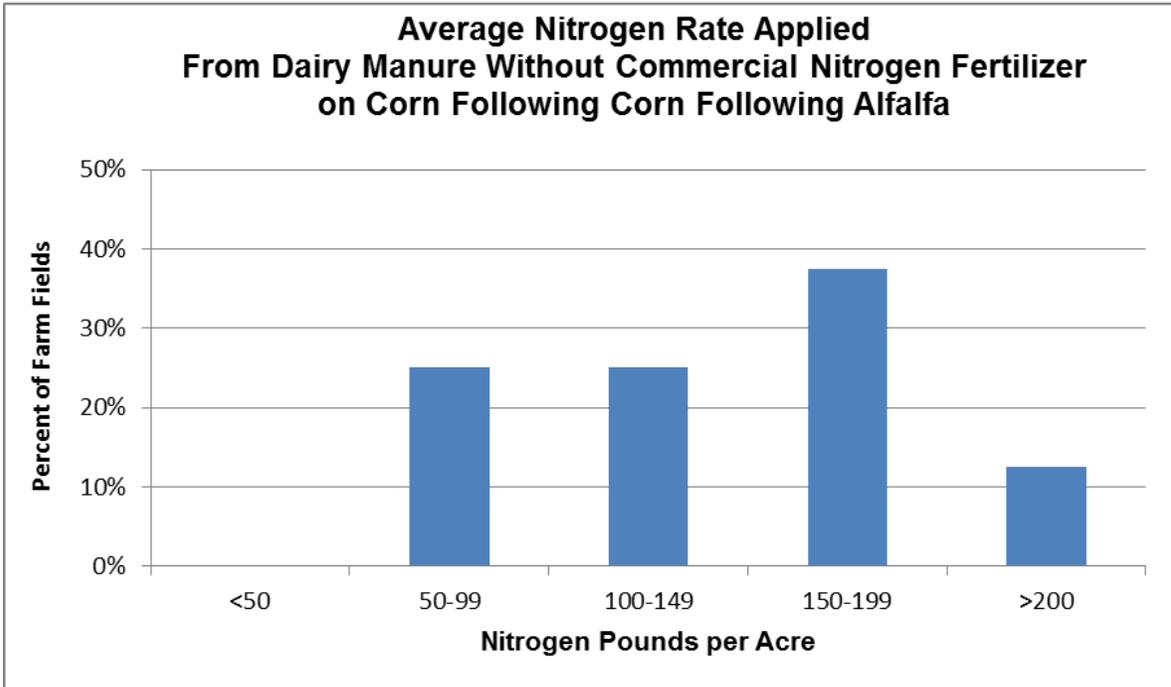


Figure 117. Average nitrogen rates applied to corn following corn following alfalfa from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2014: 8 fields.

Figure 118 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 109 pounds per acre, and the average commercial nitrogen fertilizer rate was 71 pounds per acre for an average total of 180 pounds of nitrogen per acre.

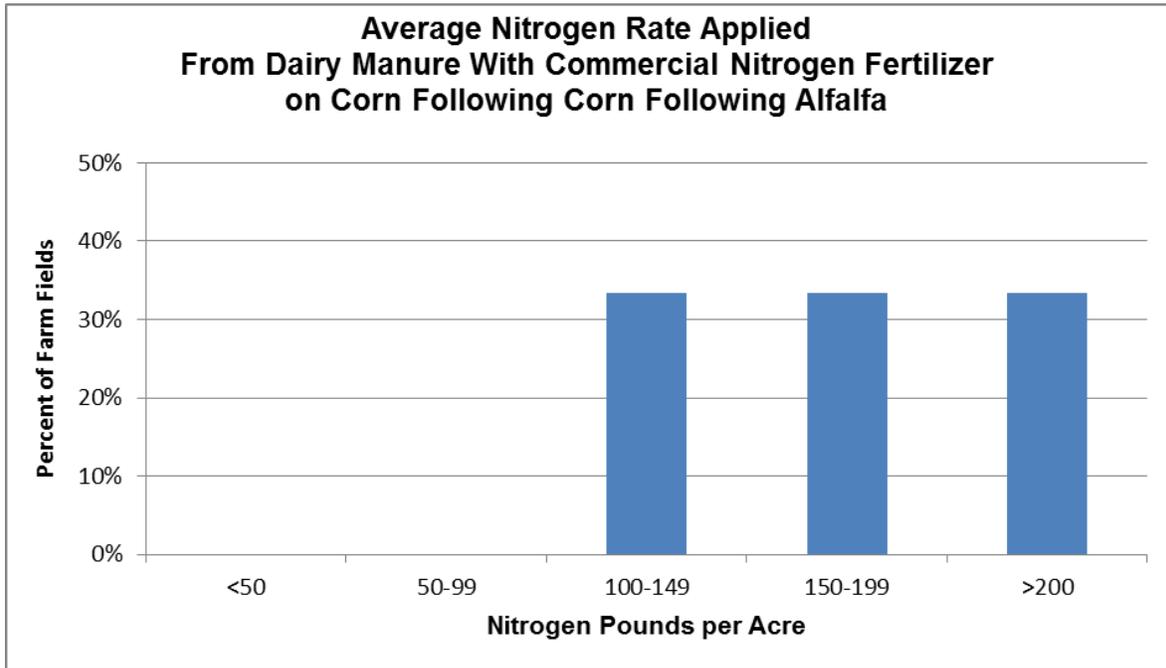


Figure 118. Average nitrogen rates applied to corn following corn following alfalfa from dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 6 fields.

Figure 119 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 nitrogen from dairy manure applied to the field is not known. The average corn yield was 152 bushels per acre. The average commercial nitrogen fertilizer rate was 110 pounds per acre.

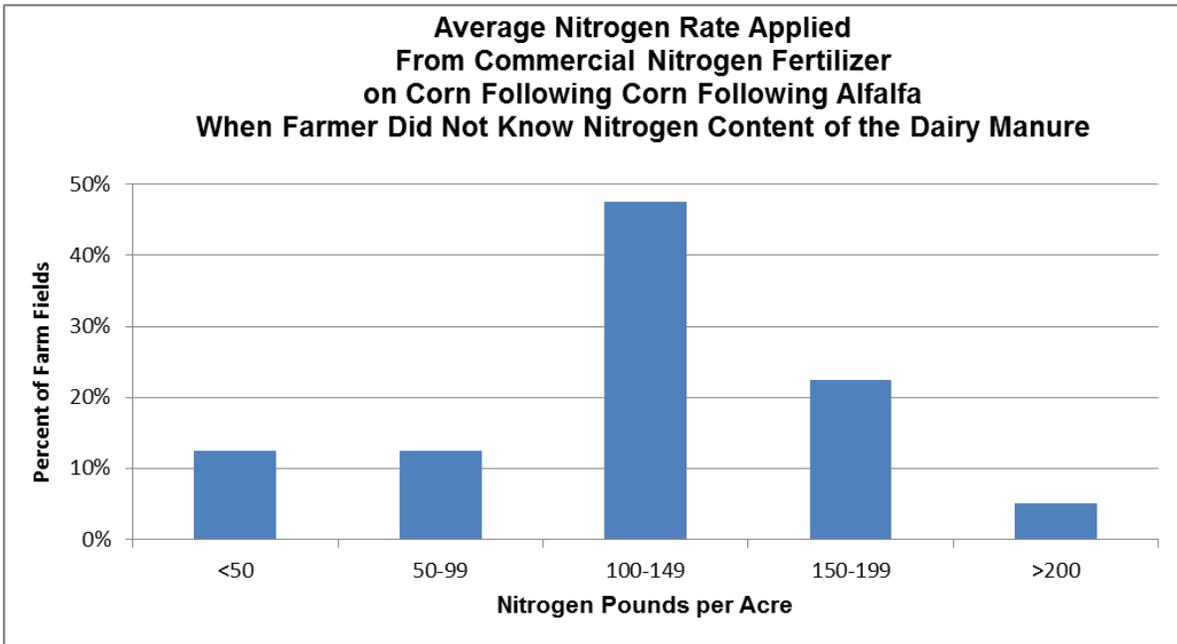


Figure 119. Average nitrogen rates applied to corn following corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2014 when the dairy manure nitrogen content is unknown: 40 fields.

Figure 120 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 167 bushels per acre. The average nitrogen rate applied from dairy manure was 92 pounds per acre, and the average commercial nitrogen fertilizer rate was 19 pounds per acre for an average total of 111 pounds of nitrogen per acre.

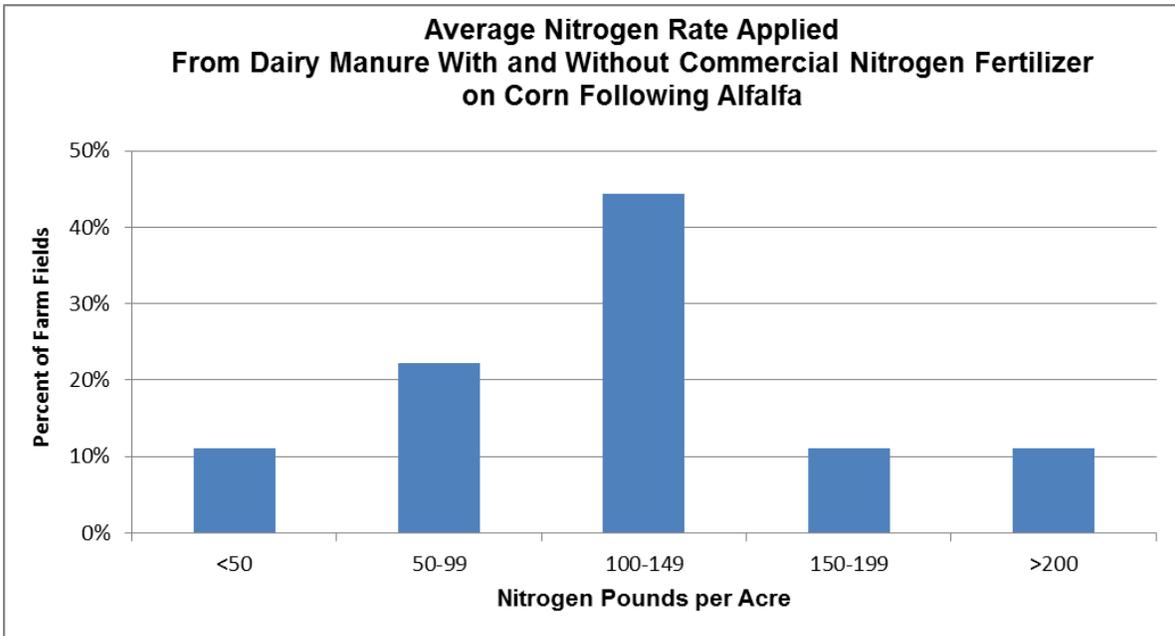


Figure 120. Average nitrogen rates applied to corn following alfalfa from dairy manure or dairy manure and commercial nitrogen fertilizer in Minnesota for 2014: 9 fields.

Figure 121 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 166 bushels per acre. The average nitrogen applied from dairy manure was 100 pounds per acre.

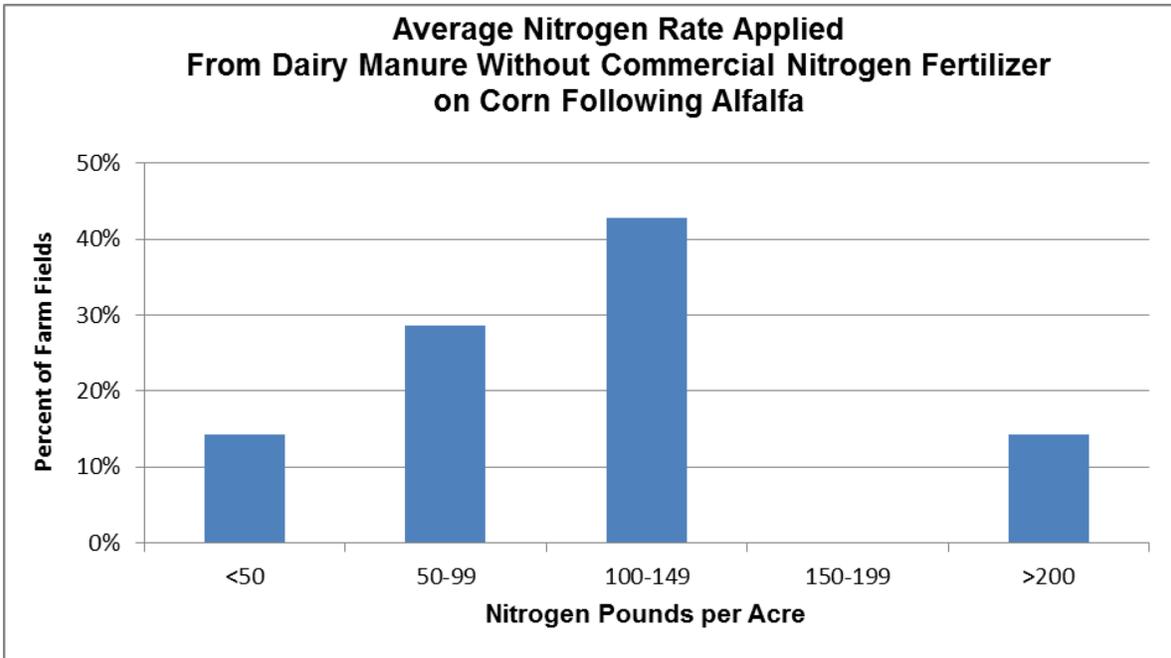


Figure 121. Average nitrogen rates applied to corn following alfalfa from dairy manure and no commercial nitrogen fertilizer in Minnesota for 2014: 7 fields.

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

Figure 122 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 nitrogen from dairy manure applied to the field is not known. The average corn yield was 174 bushels per acre. The average commercial nitrogen fertilizer rate was 119 pounds per acre.

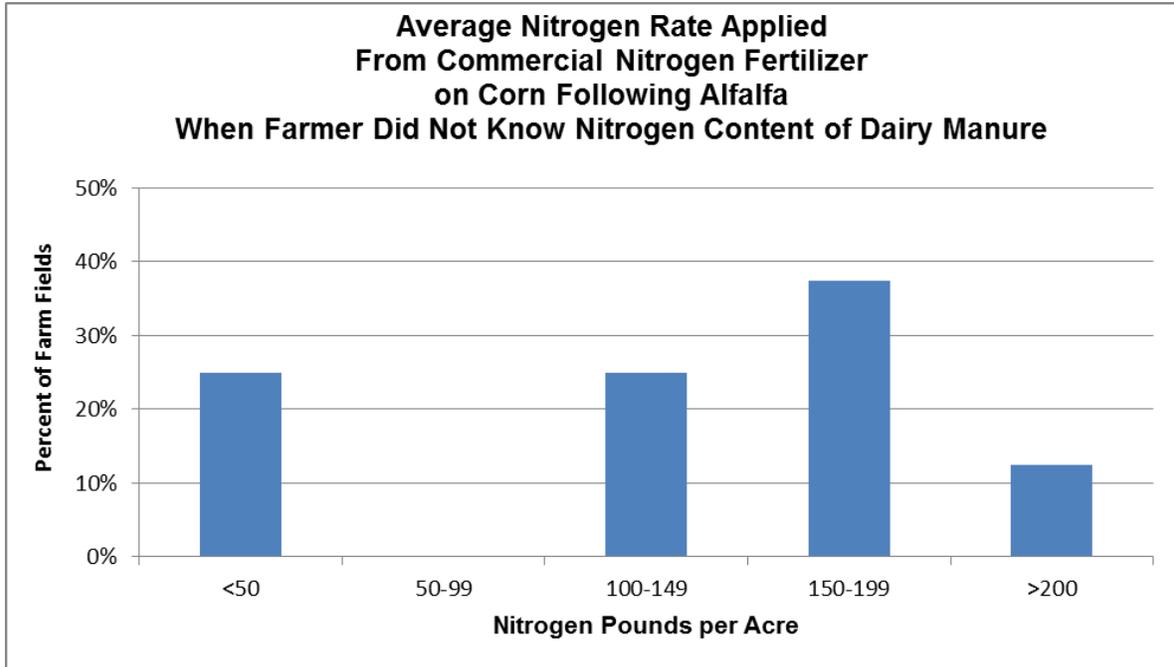


Figure 122. Average nitrogen rates applied to corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2014 when the dairy manure nitrogen content is unknown: 8 fields.

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 123 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 177 bushels per acre. The average nitrogen rate applied from beef manure was 105 pounds per acre, and the average commercial nitrogen fertilizer rate was 52 pounds per acre for an average total of 157 pounds of nitrogen per acre.

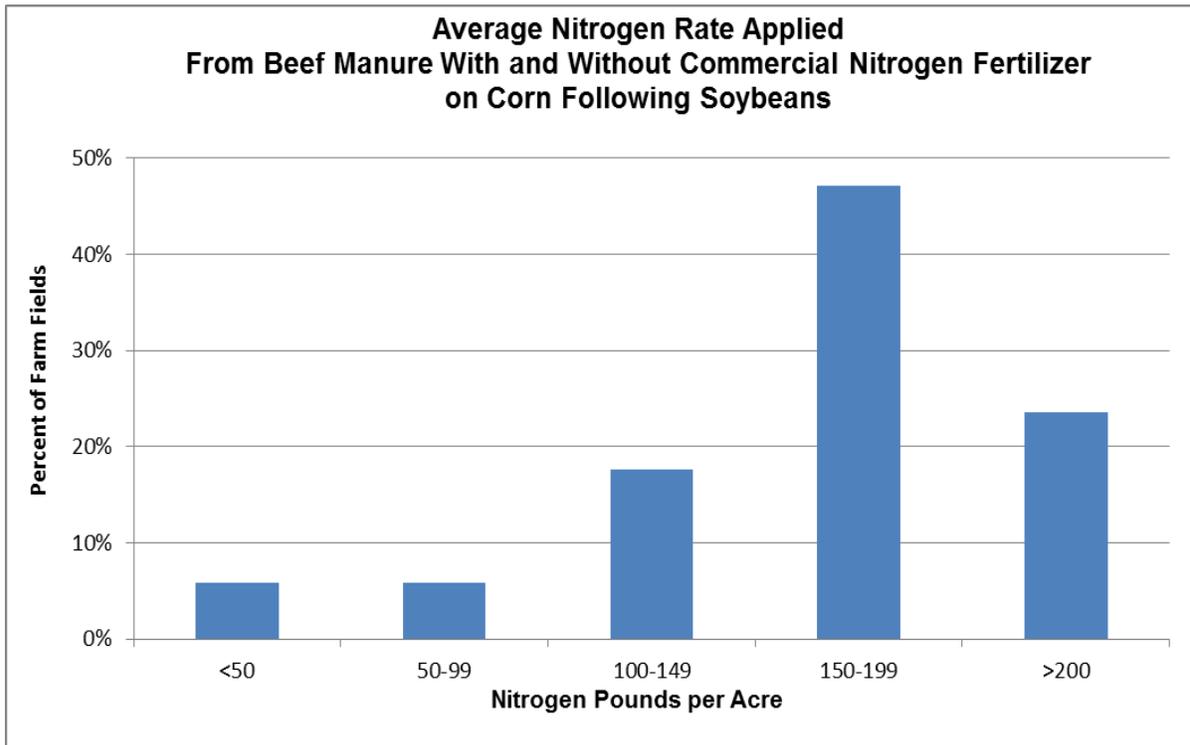


Figure 123. Average nitrogen rates applied to corn following soybeans from beef manure or beef manure and commercial nitrogen fertilizer in Minnesota for 2014: 17 fields.

Figure 124 details the distribution of average nitrogen rates in Minnesota from farmers that applied beef 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 applied from beef manure was 122 pounds per acre.

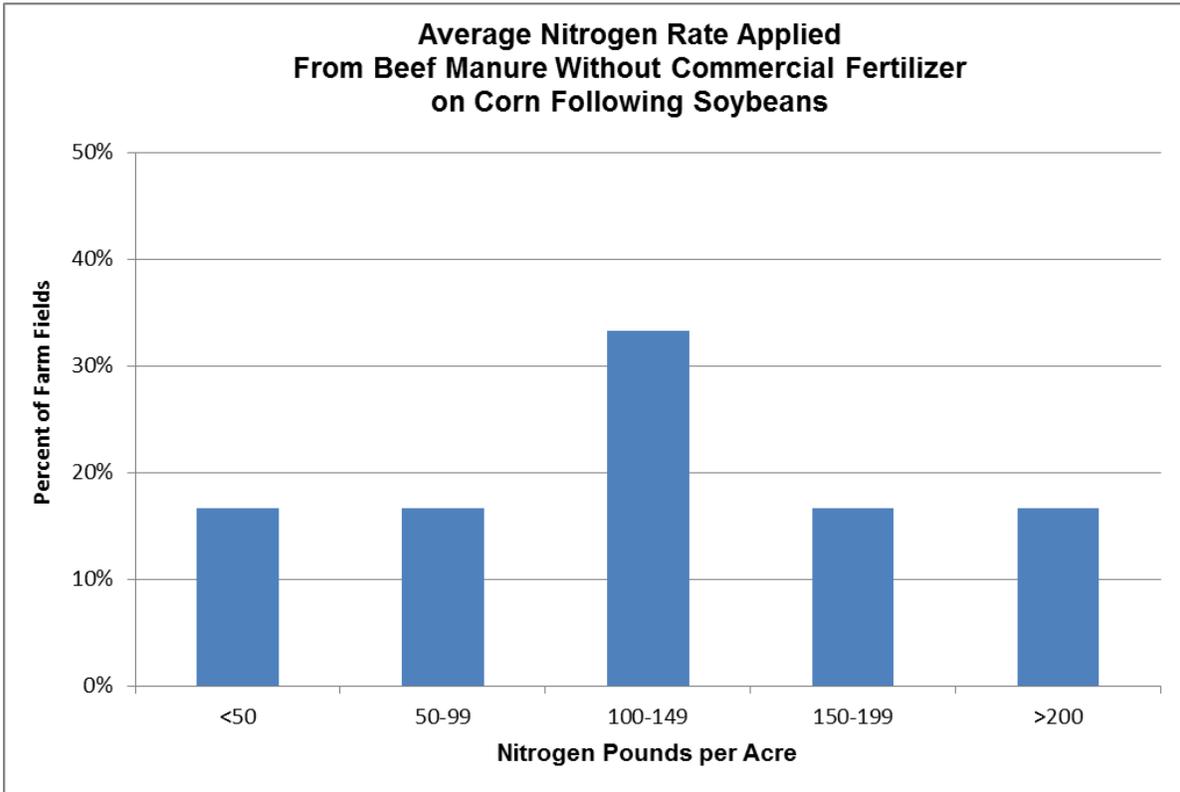


Figure 124. Average nitrogen rates applied to corn following soybeans from beef manure and no commercial nitrogen fertilizer in Minnesota for 2014: 6 fields.

Figure 125 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 180 bushels per acre. The average nitrogen rate applied from beef manure was 100 pounds per acre, and the average commercial nitrogen fertilizer rate was 76 pounds per acre for an average total of 176 pounds of nitrogen per acre.

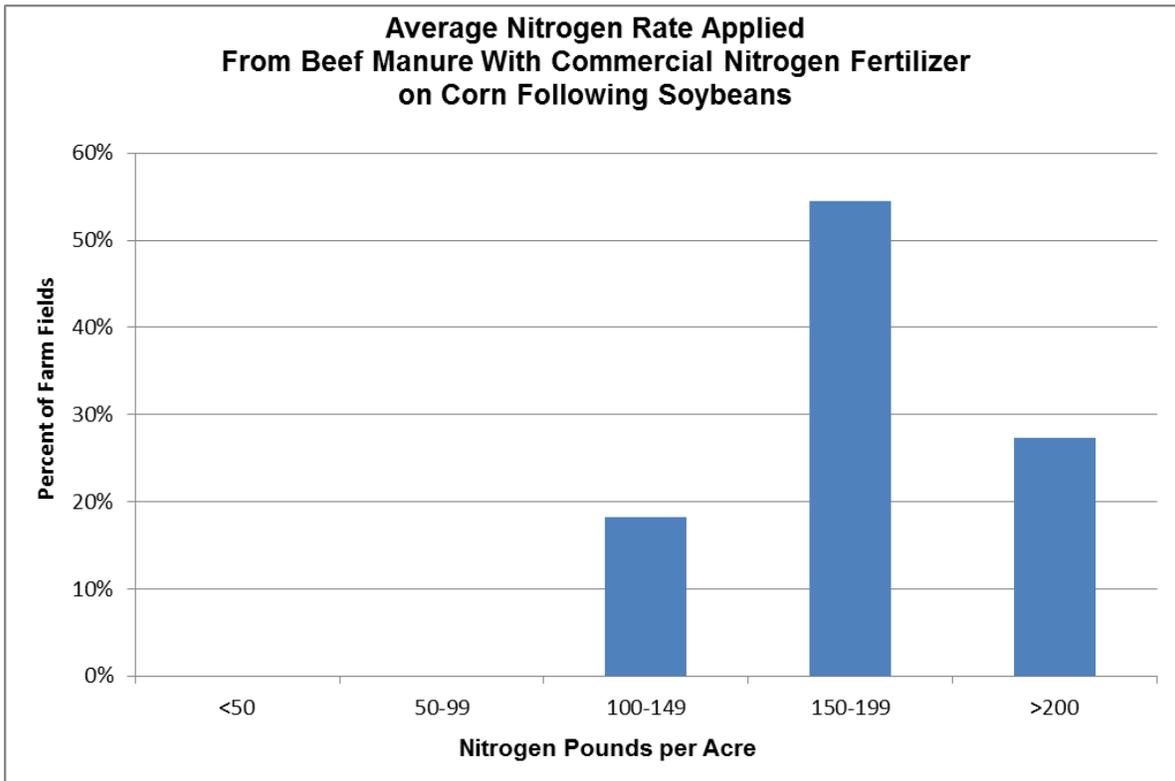


Figure 125. Average nitrogen rates applied to corn following soybeans from beef manure and commercial nitrogen fertilizer in Minnesota for 2014: 11 fields.

Figure 126 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 nitrogen from 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 132 pounds per acre.

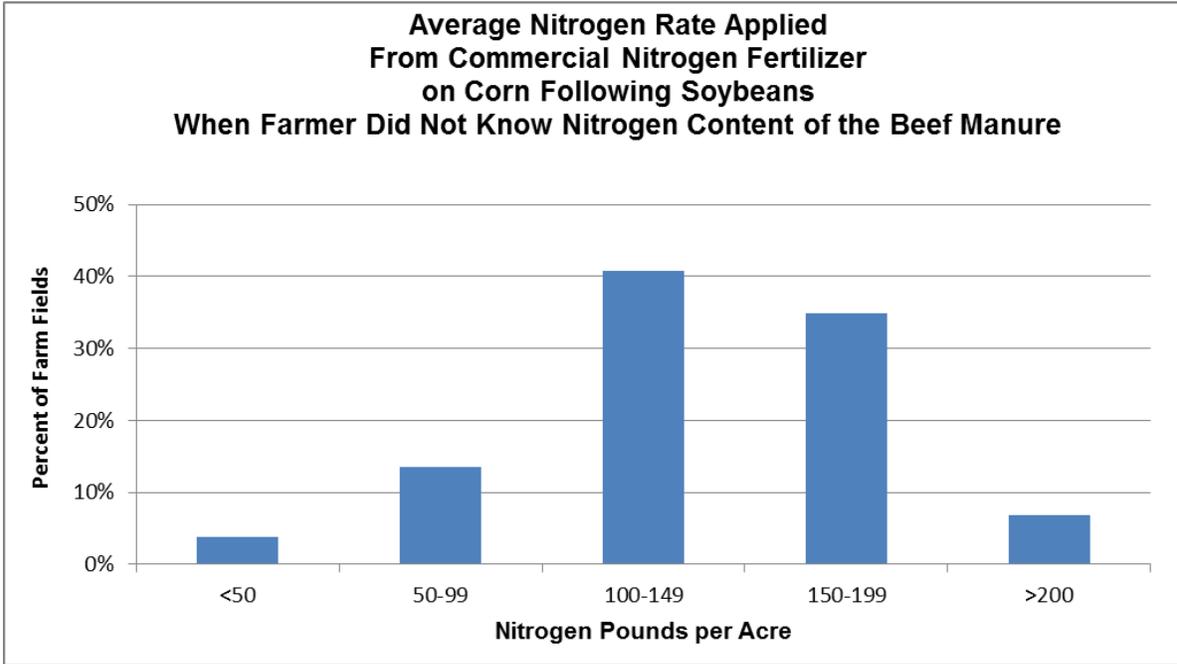


Figure 126. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2014 when the beef manure nitrogen content is unknown: 103 fields.

Figure 127 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 182 bushels per acre. The average nitrogen rate applied from beef manure was 80 pounds per acre, and the average commercial nitrogen fertilizer rate was 105 pounds per acre for an average total of 185 pounds of nitrogen per acre.

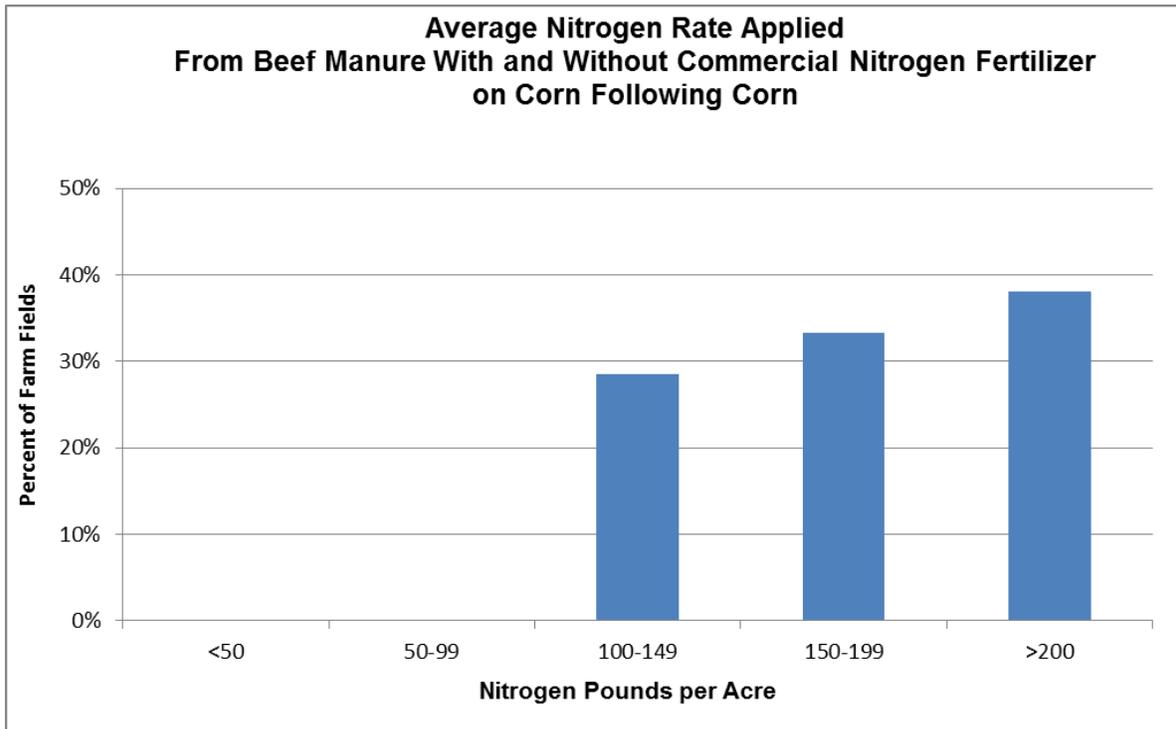


Figure 127. Average nitrogen rates applied to corn following corn from beef manure or beef manure and commercial nitrogen fertilizer in Minnesota for 2014: 21 fields.

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

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 (MQ-1a, MQ-5, MQ-11, and MQ-16). The average corn yield was 182 bushels per acre. The average nitrogen rate applied from beef manure was 70 pounds per acre, and the average commercial nitrogen fertilizer rate was 122 pounds per acre for an average total of 192 pounds of nitrogen per acre.

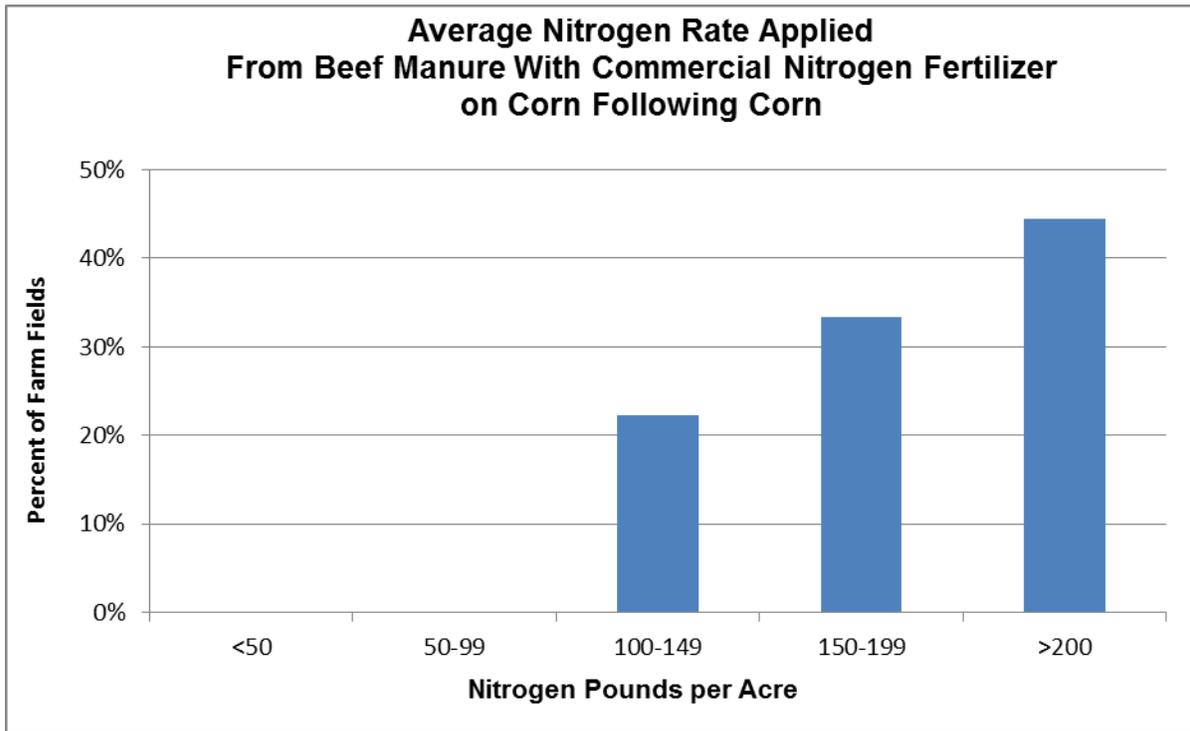


Figure 128. Average nitrogen rates applied to corn following corn from beef manure and commercial nitrogen fertilizer in Minnesota for 2014: 18 fields.

Figure 129 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 nitrogen from beef manure applied to the field is not known. The average corn yield was 155 bushels per acre. The average commercial nitrogen fertilizer rate was 134 pounds per acre.

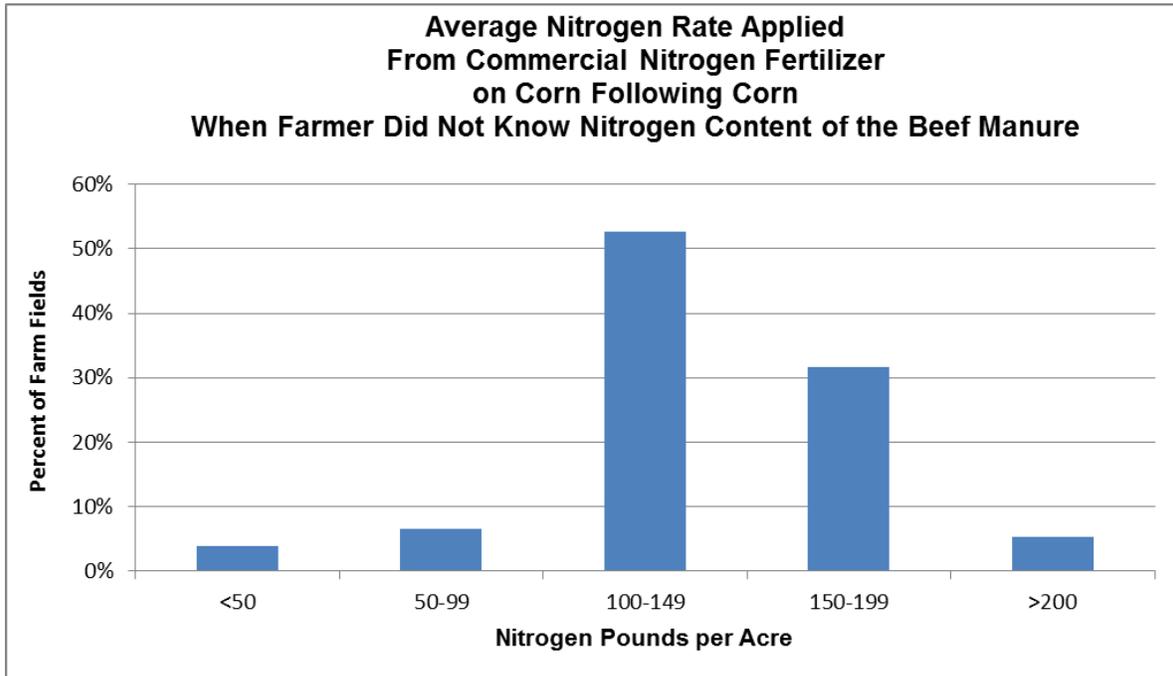


Figure 129. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2014 when the beef manure nitrogen content is unknown: 76 fields.

Less than five farmers reported planting corn following 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 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 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 nitrogen from beef manure applied to the field is not known. The average corn yield was 158 bushels per acre. The average commercial nitrogen fertilizer rate was 112 pounds per acre.

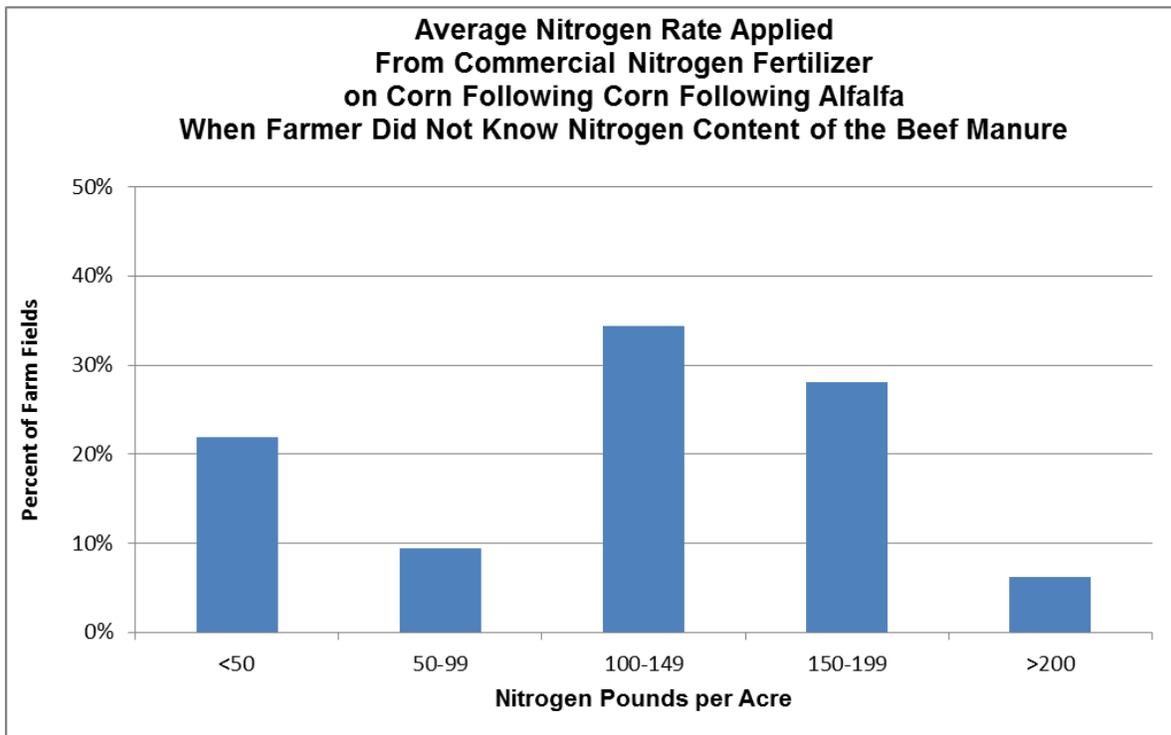


Figure 130. Average nitrogen rates applied to corn following corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2014 when the beef manure nitrogen content is unknown: 32 fields.

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 131 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 nitrogen from beef manure applied to the field is not known. The average corn yield was 146 bushels per acre. The average commercial nitrogen fertilizer rate was 87 pounds per acre.

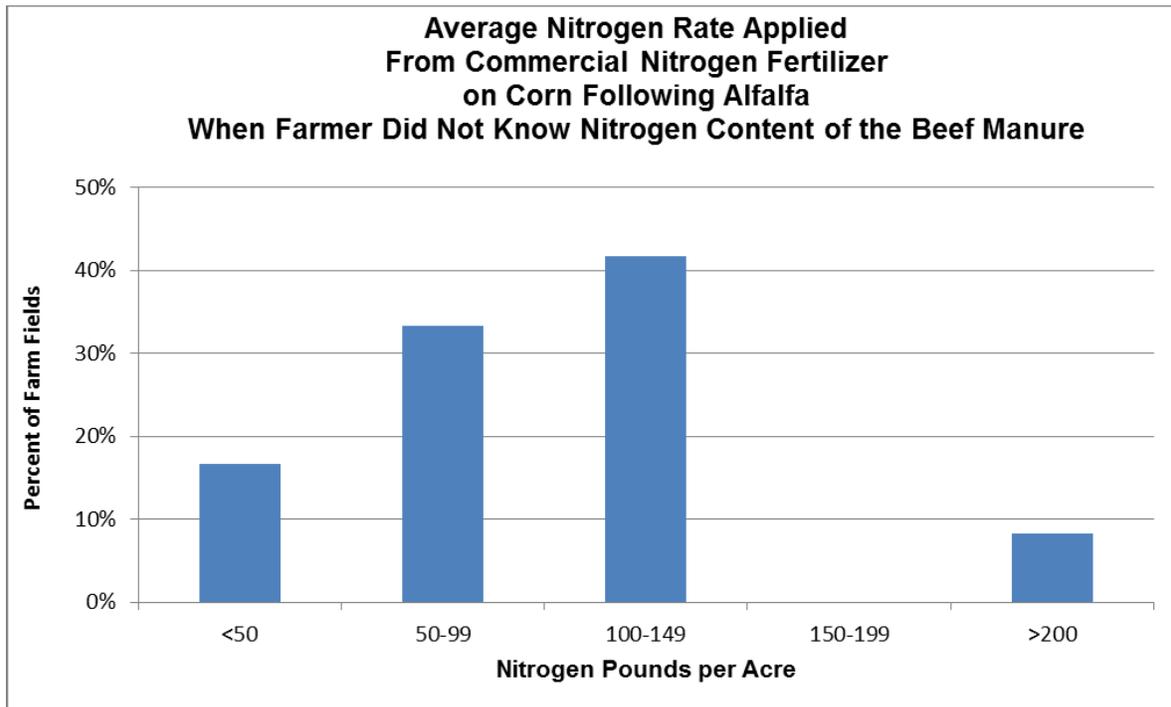


Figure 131. Average nitrogen rates applied to corn following alfalfa from commercial nitrogen fertilizer in Minnesota for 2014 when the beef manure nitrogen content is unknown: 12 fields.

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 132 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 nitrogen from beef manure applied to the field is not known. The average corn yield was 172 bushels per acre. The average commercial nitrogen fertilizer rate was 126 pounds per acre.

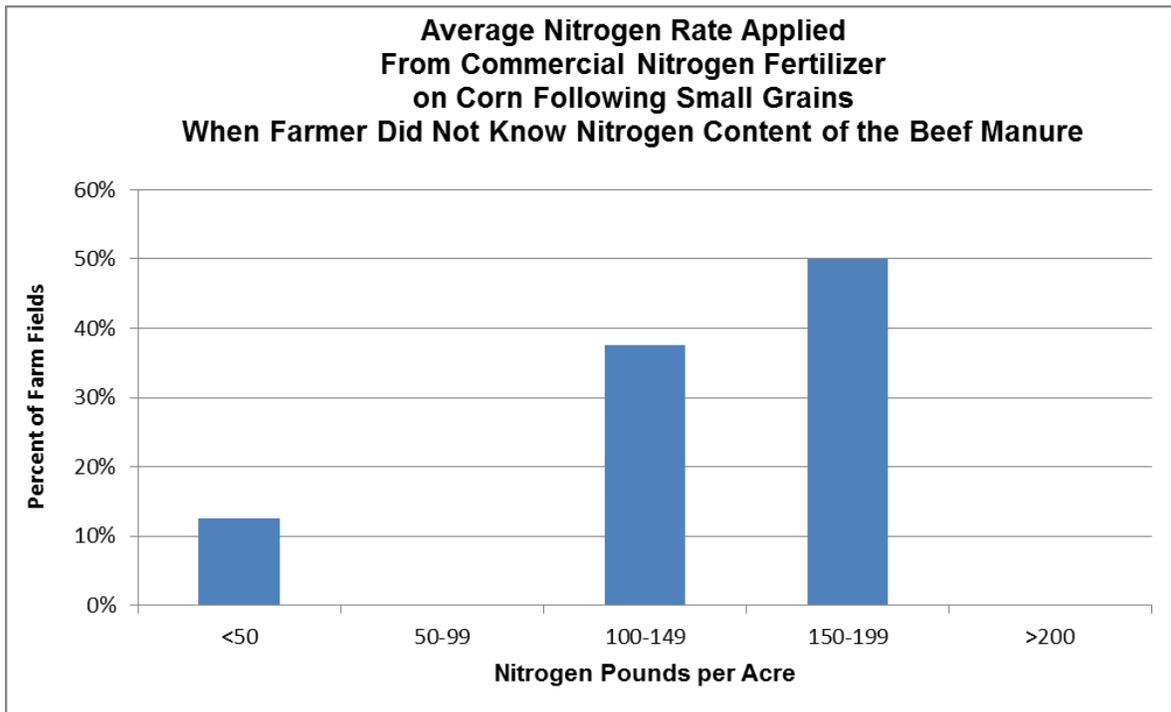


Figure 132. Average nitrogen rates applied to corn following small grains from commercial nitrogen fertilizer in Minnesota for 2014 when the beef manure nitrogen content is unknown: 8 fields.

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 133 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 nitrogen from 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 102 pounds per acre.

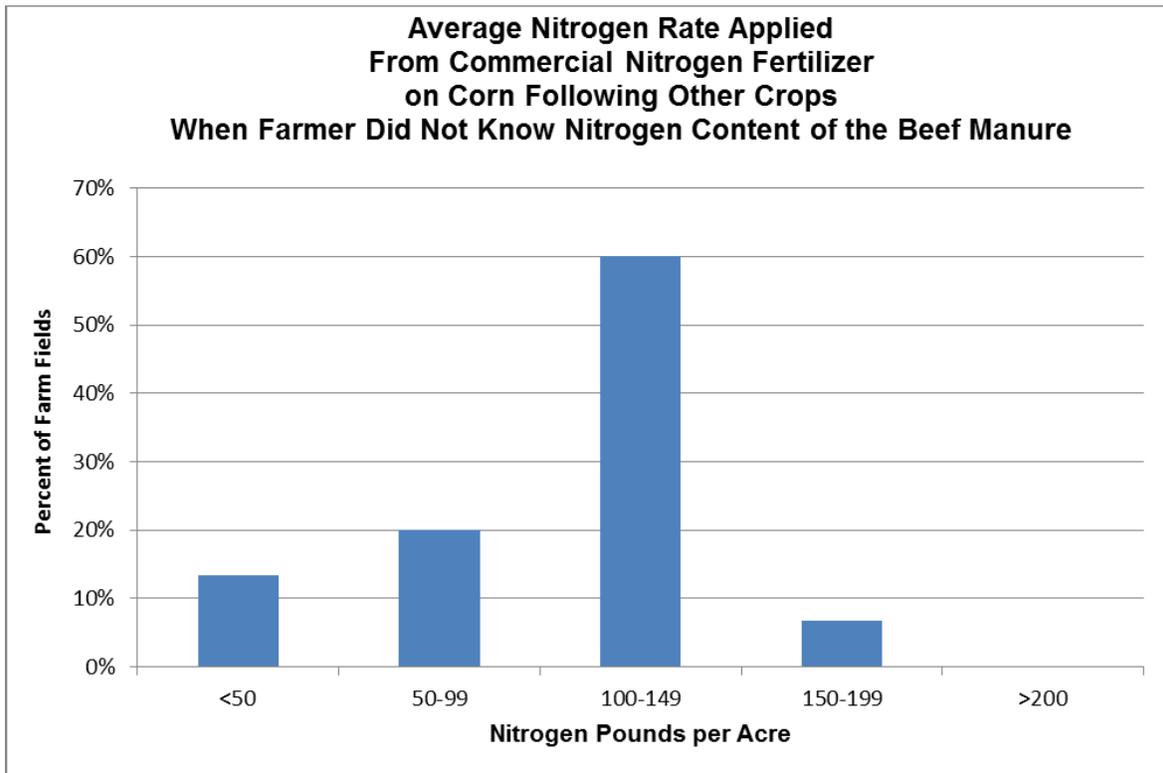


Figure 133. Average nitrogen rates applied to corn following other crops from commercial nitrogen fertilizer in Minnesota for 2014 when the beef manure nitrogen content is unknown: 15 fields.

Manure Applications from Hog Manure

Figure 134 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 182 bushels per acre. The average nitrogen rate applied from hog manure was 139 pounds per acre, and the average commercial nitrogen fertilizer rate was 26 pounds per acre for an average total of 165 pounds of nitrogen per acre.

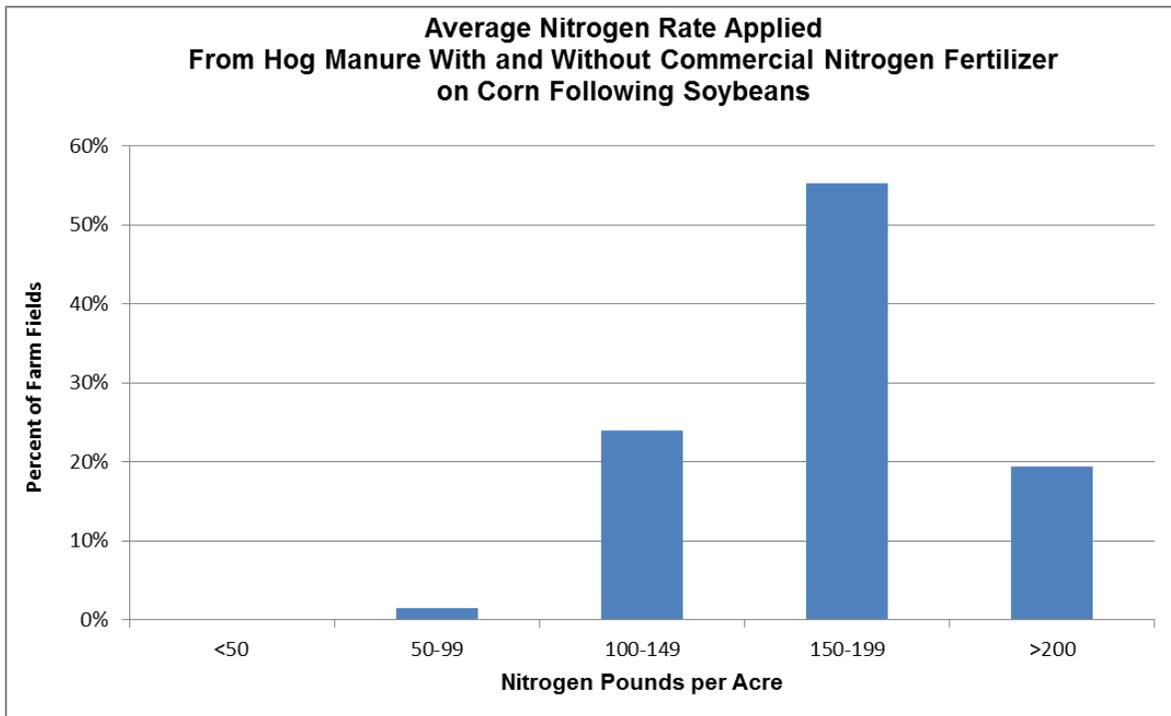


Figure 134. Average nitrogen rates applied to corn following soybeans from hog manure or hog manure and commercial nitrogen fertilizer in Minnesota for 2014: 66 fields.

Figure 135 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 182 bushels per acre. The average nitrogen rate applied from hog manure was 151 pounds per acre.

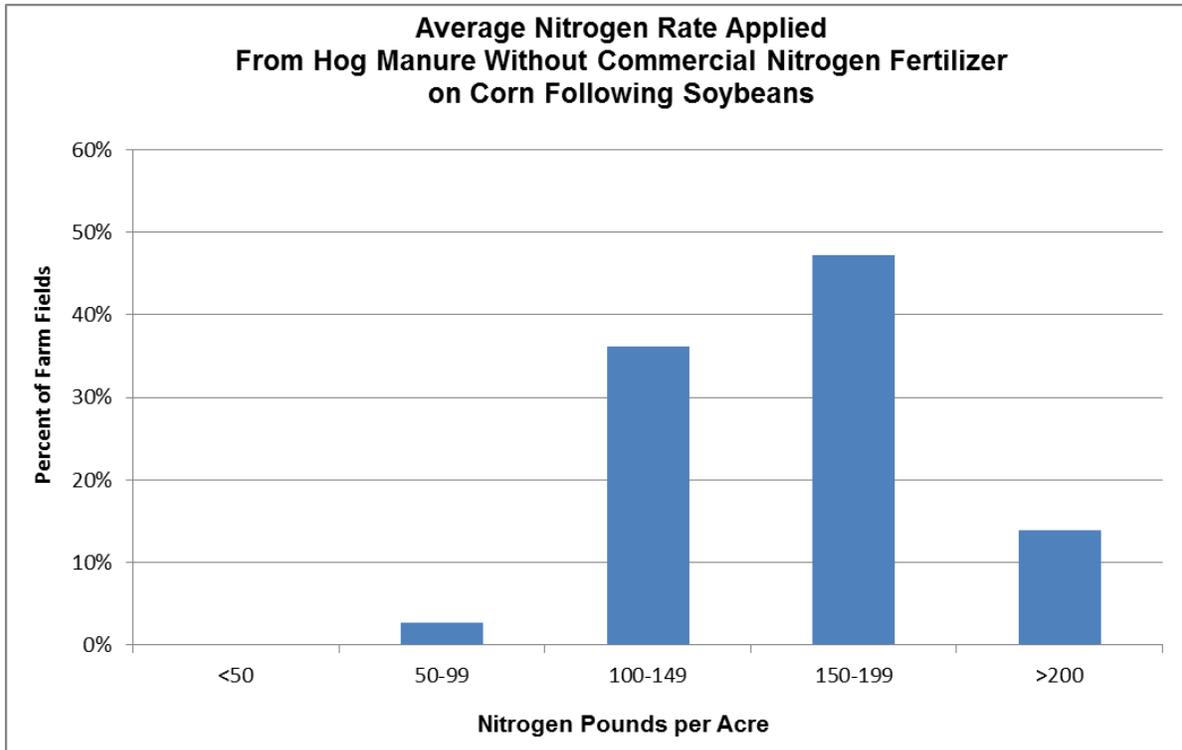


Figure 135. Average nitrogen rates applied to corn following soybeans from hog manure and no commercial nitrogen fertilizer in Minnesota for 2014: 35 fields.

Figure 136 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 183 bushels per acre. The average nitrogen rate applied from hog manure was 125 pounds per acre, and the average commercial nitrogen fertilizer rate was 56 pounds per acre for an average total of 181 pounds of nitrogen per acre.

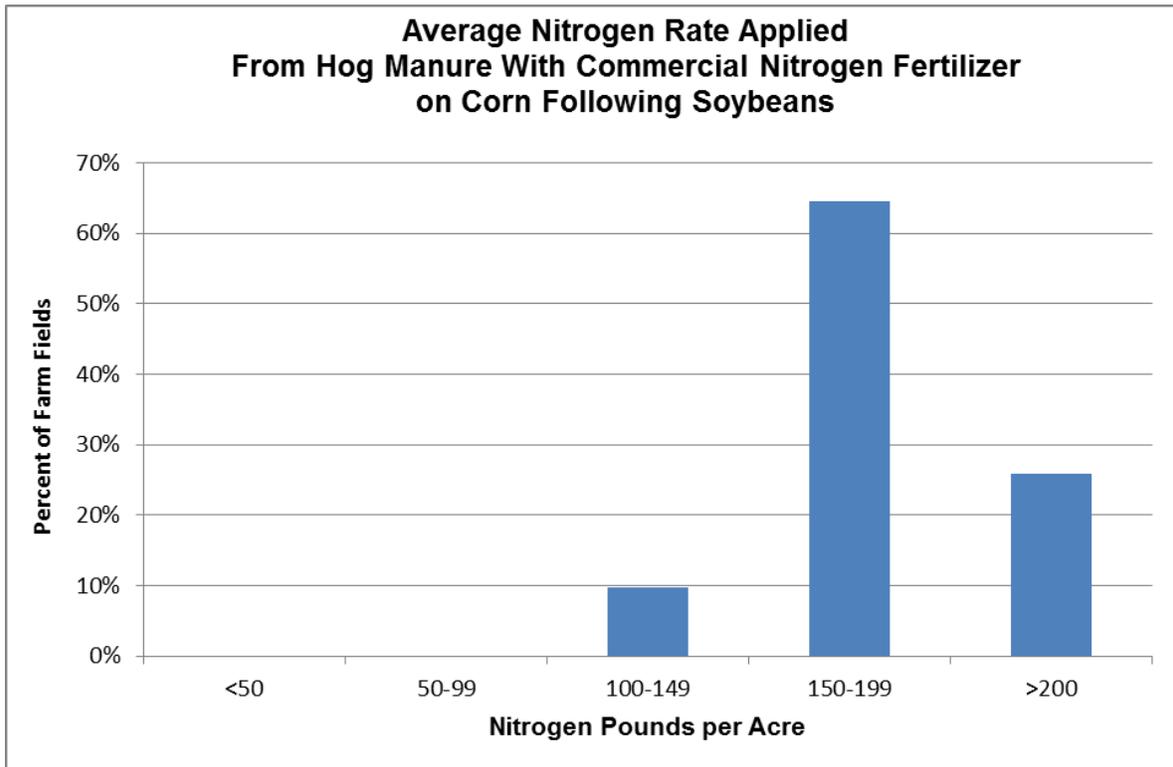


Figure 136. Average nitrogen rates applied to corn following soybeans from hog manure and commercial nitrogen fertilizer in Minnesota for 2014: 31 fields.

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 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 nitrogen from hog manure applied to the field is not known. The average corn yield was 178 bushels per acre. The average commercial nitrogen fertilizer rate was 113 pounds per acre.

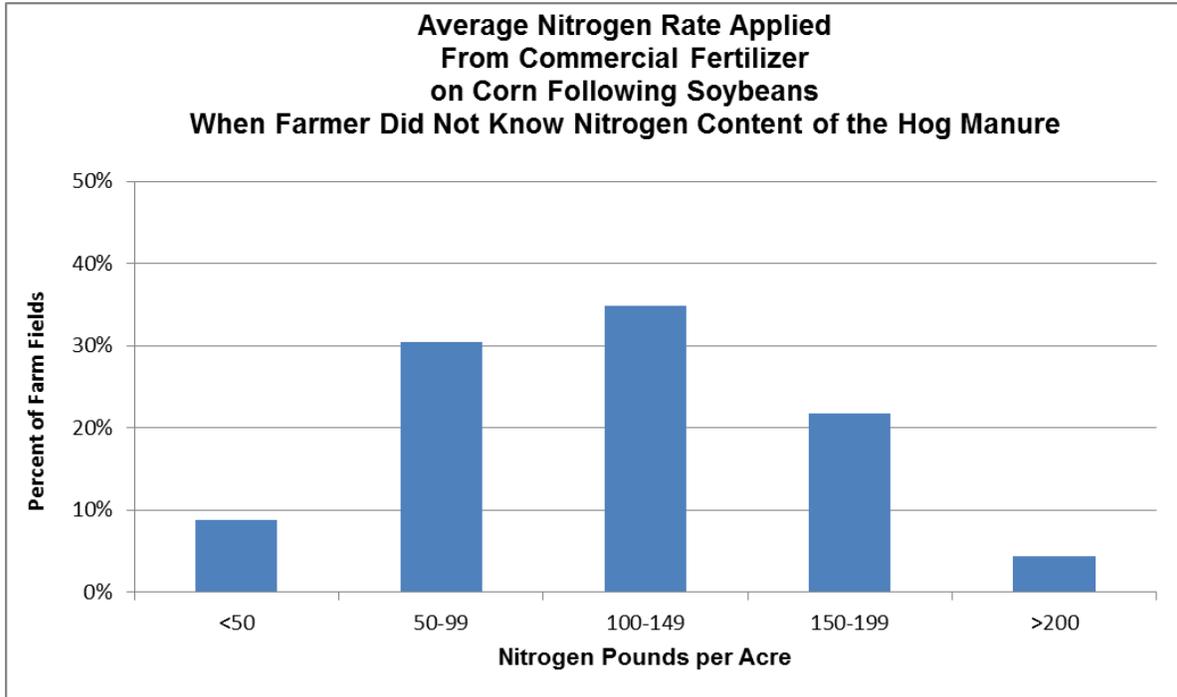


Figure 137. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2014 when the hog manure nitrogen content is unknown: 23 fields.

Figure 138 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 178 bushels per acre. The average nitrogen rate applied from hog manure was 145 pounds per acre, and the average commercial nitrogen fertilizer rate was 24 pounds per acre for an average total of 169 pounds of nitrogen per acre.

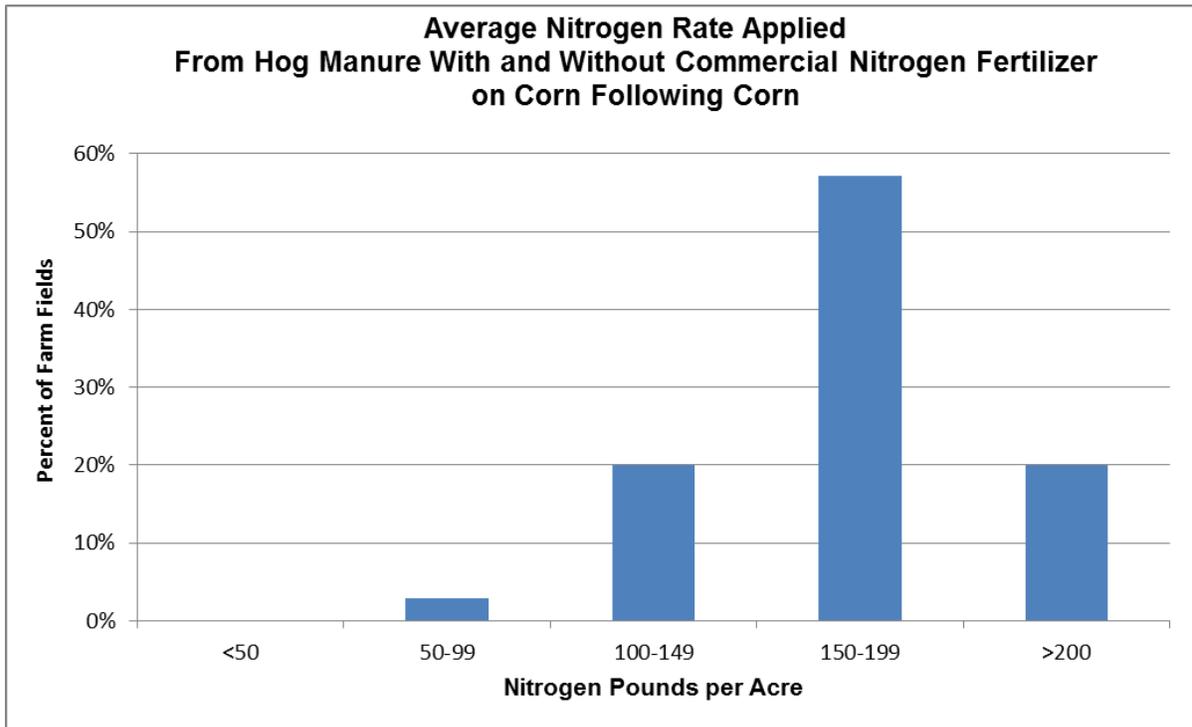


Figure 138. Average nitrogen rates applied to corn following corn from hog manure or hog manure and commercial nitrogen fertilizer in Minnesota for 2014: 35 fields.

Figure 139 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 180 bushels per acre. The average nitrogen rate applied from hog manure was 152 pounds per acre.

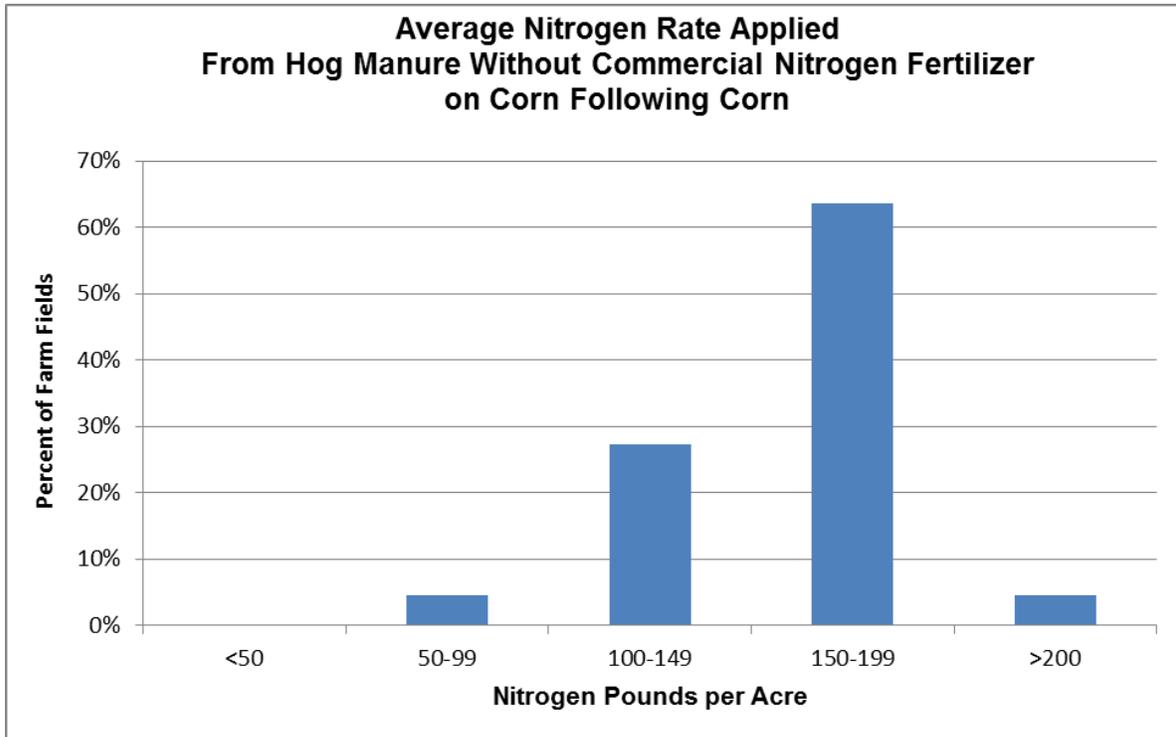


Figure 139. Average nitrogen rates applied to corn following corn from hog manure and no commercial nitrogen fertilizer in Minnesota for 2014: 20 fields.

Figure 140 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 175 bushels per acre. The average nitrogen rate applied from hog manure was 134 pounds per acre, and the average commercial nitrogen fertilizer rate was 57 pounds per acre for an average total of 191 pounds of nitrogen per acre.

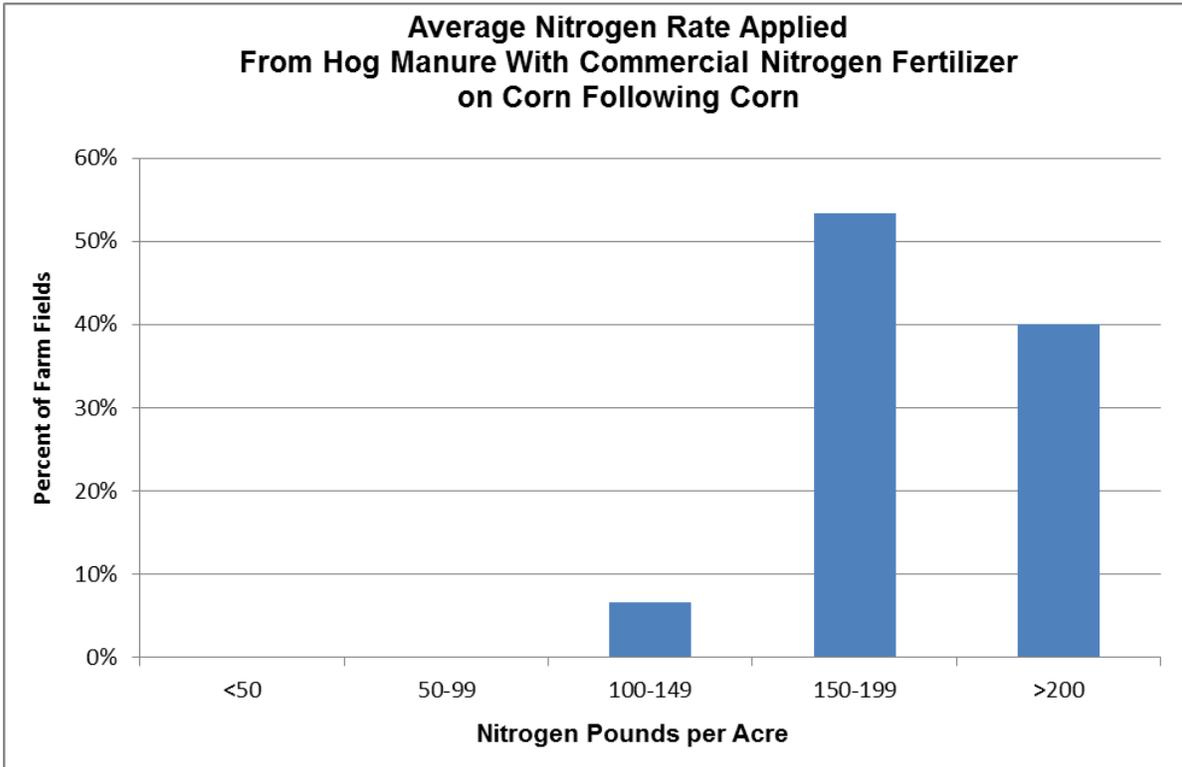


Figure 140. Average nitrogen rates applied to corn following corn from hog manure and commercial nitrogen fertilizer in Minnesota for 2014: 15 fields.

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 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 nitrogen from 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.

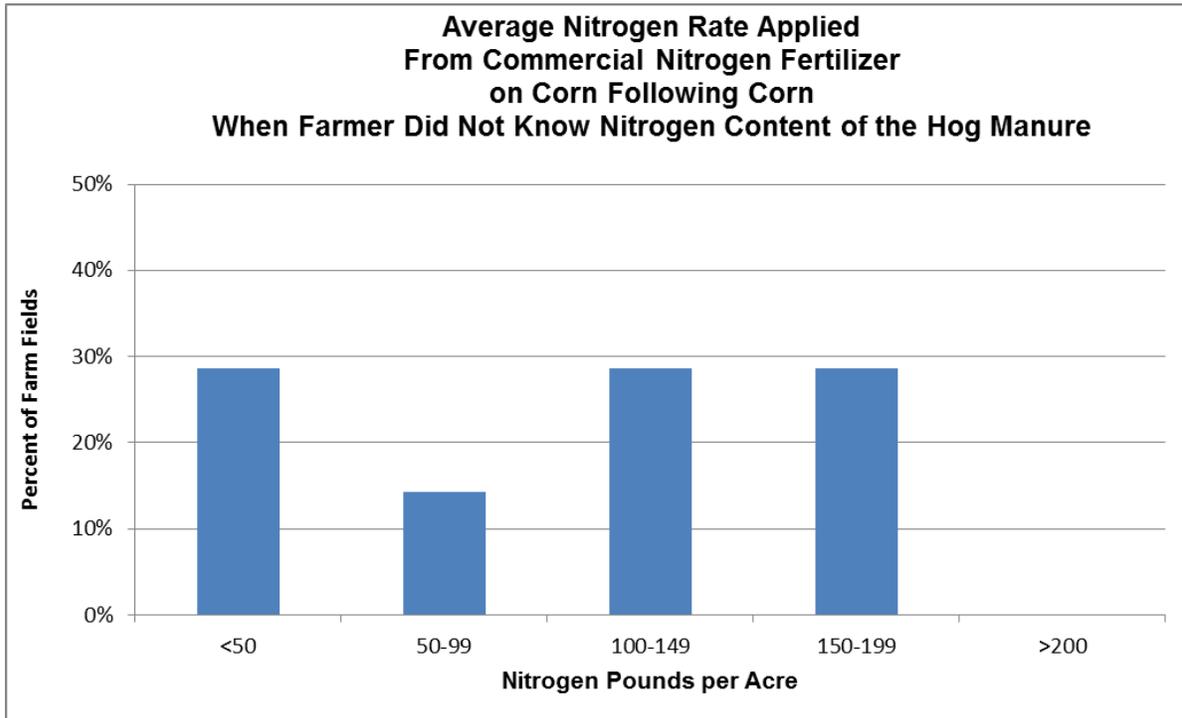


Figure 141. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2014 when the hog manure nitrogen content is unknown: 7 fields.

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 142 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 159 bushels per acre. The average nitrogen rate applied from poultry manure was 134 pounds per acre, and the average commercial nitrogen fertilizer rate was 24 pounds per acre for an average total of 158 pounds of nitrogen per acre.

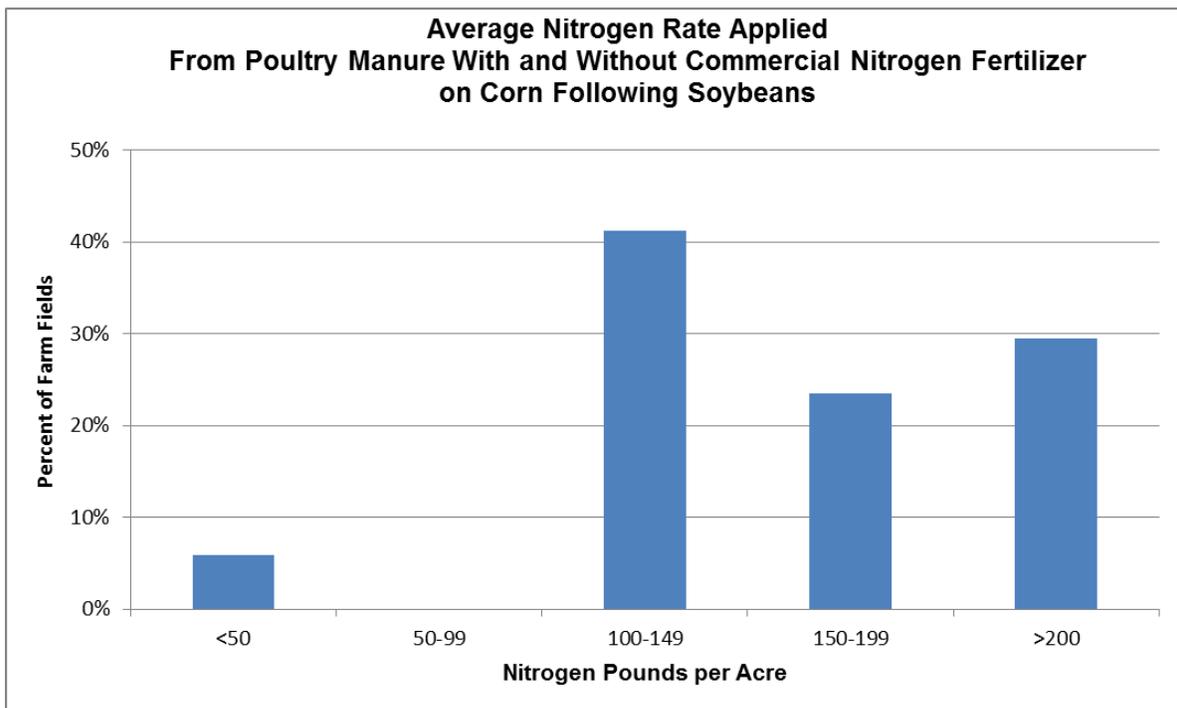


Figure 142. Average nitrogen rates applied to corn following soybeans from poultry manure or poultry manure and commercial nitrogen fertilizer in Minnesota for 2014: 17 fields.

Figure 143 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 152 bushels per acre. The average nitrogen rate applied from poultry manure was 142 pounds per acre.

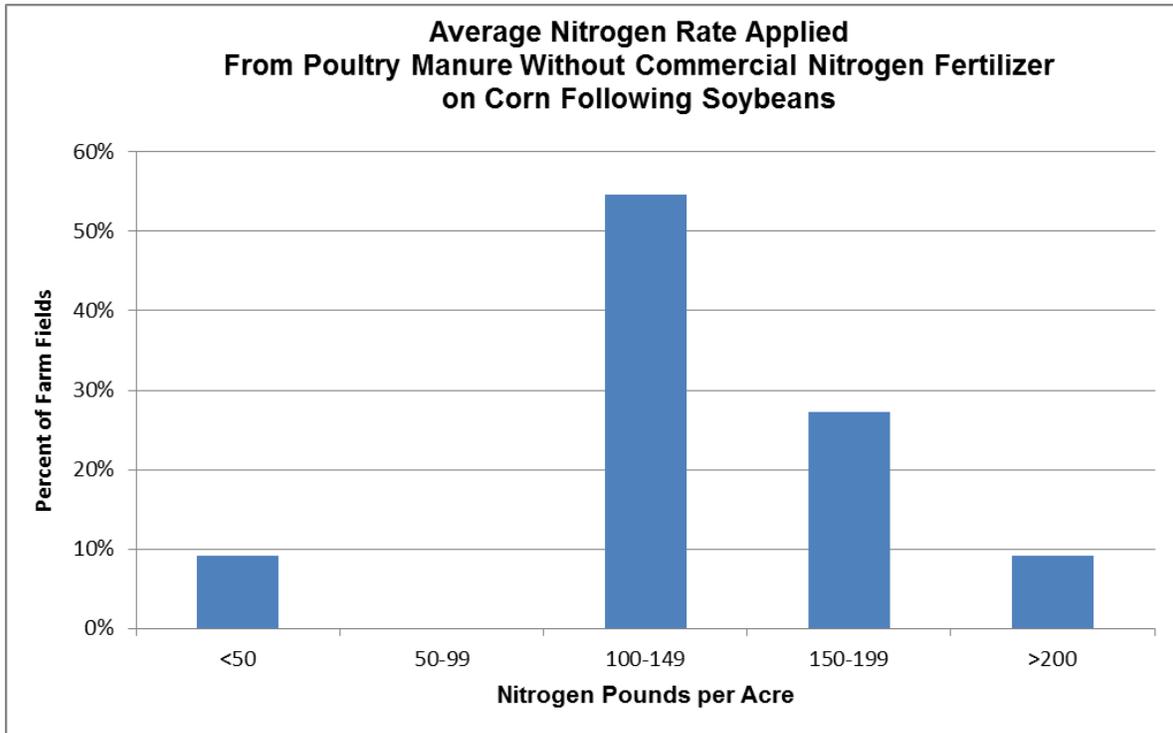


Figure 143. Average nitrogen rates applied to corn following soybeans from poultry manure and no commercial nitrogen fertilizer in Minnesota for 2014: 11 fields.

Figure 144 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry 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 poultry manure was 128 pounds per acre, and the average commercial nitrogen fertilizer rate was 57 pounds per acre for an average total of 185 pounds of nitrogen per acre.

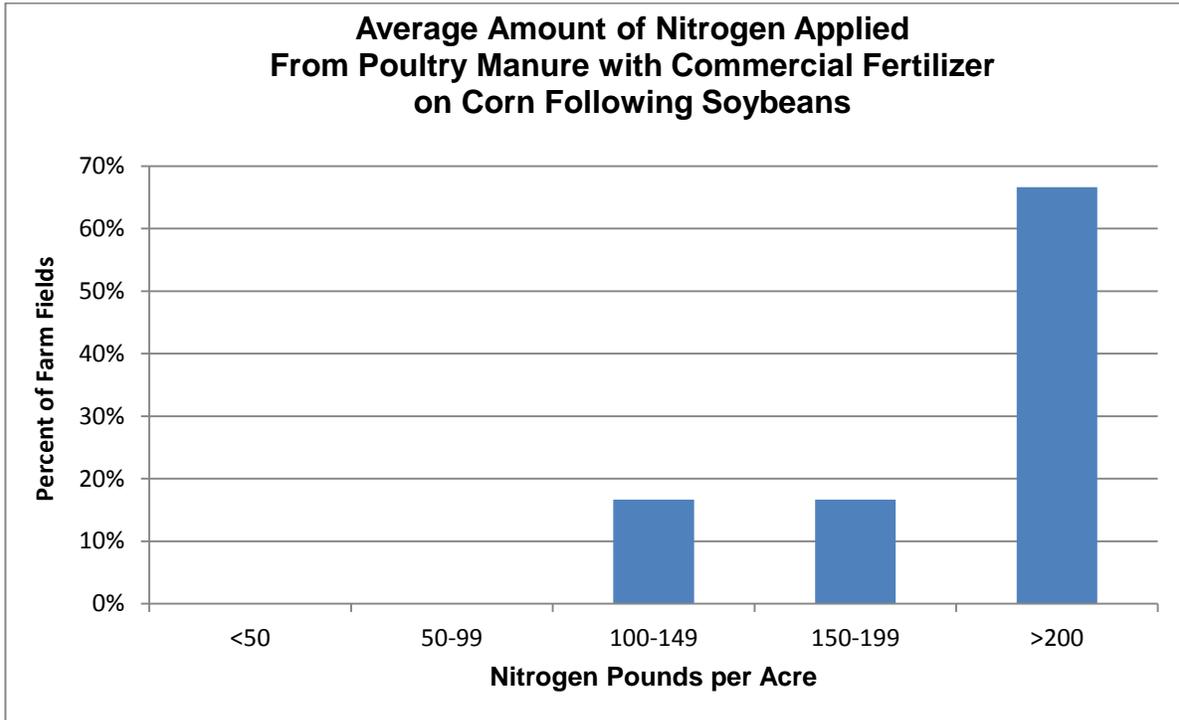


Figure 144. Average nitrogen rates applied to corn following soybeans from poultry manure and commercial nitrogen fertilizer in Minnesota for 2014: 6 fields.

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 nitrogen from poultry manure applied to the field is not known. The average corn yield was 167 bushels per acre. The average commercial nitrogen fertilizer rate was 103 pounds per acre.

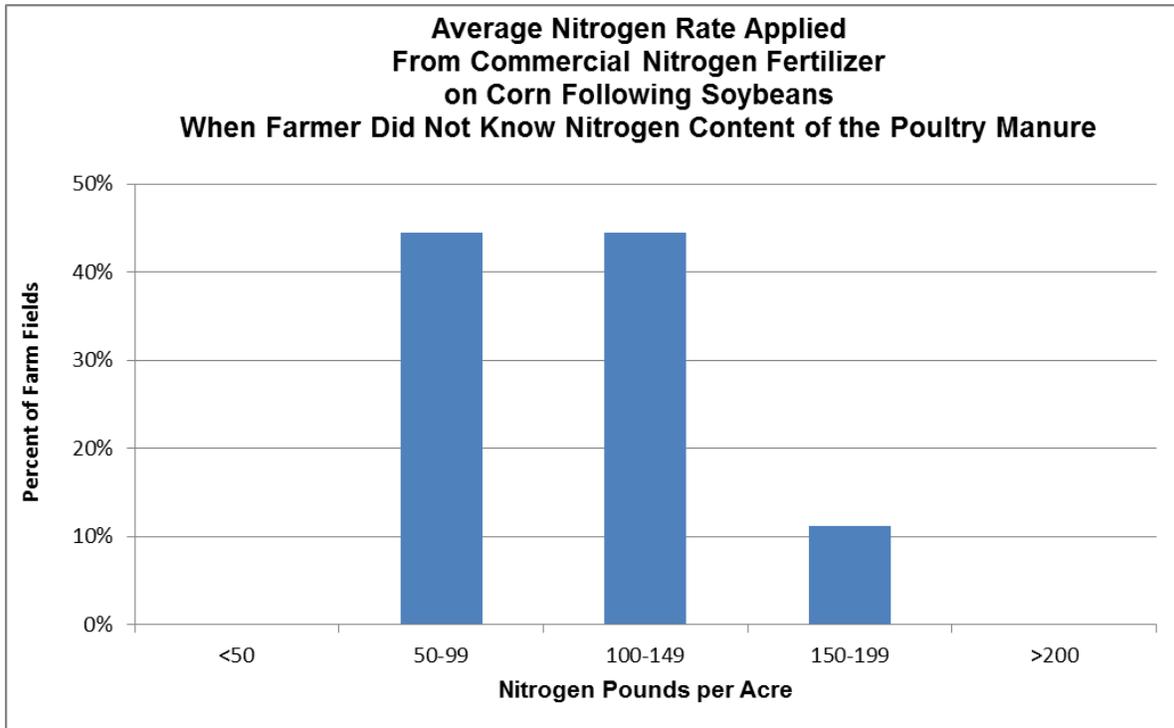


Figure 145. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2014 when the poultry manure nitrogen content is unknown: 9 fields.

Other survey results:

Less than five farmers reported planting corn following corn 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.

Figure 146 details the distribution of average nitrogen rates in Minnesota from farmers that applied poultry manure and commercial nitrogen fertilizer to corn following corn 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 123 bushels per acre. The average commercial nitrogen fertilizer rate was 103 pounds per acre.

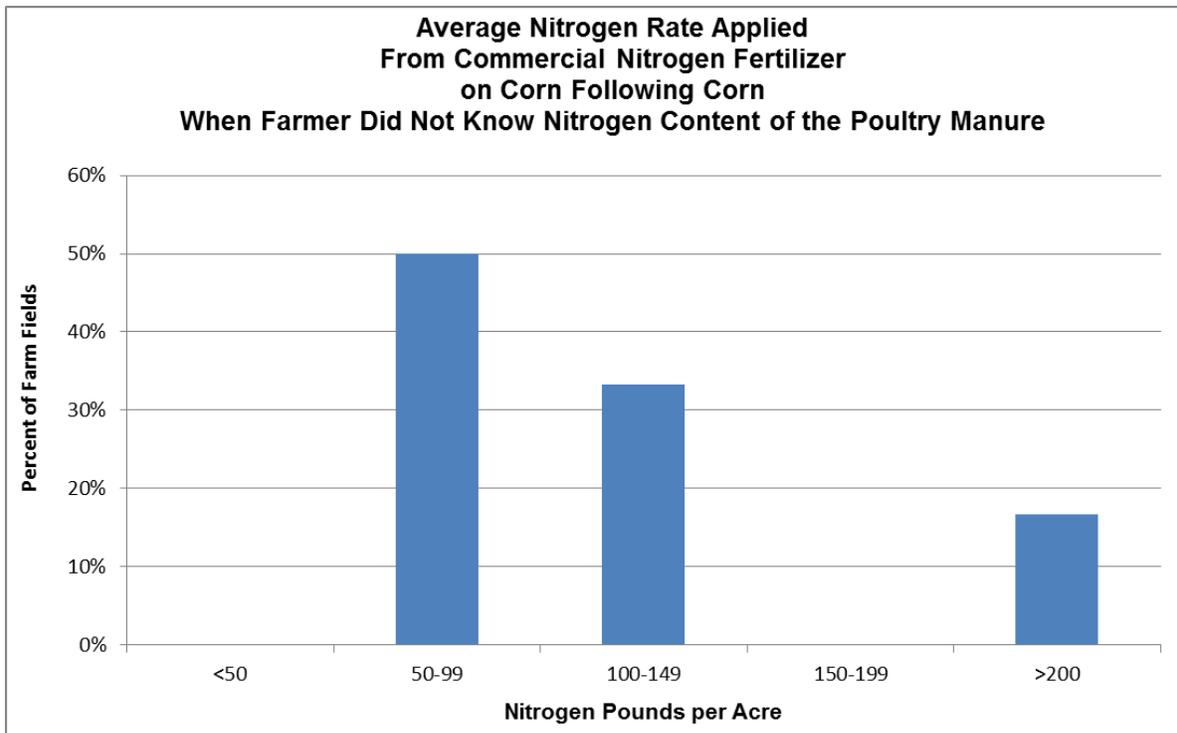


Figure 146. Average nitrogen rates applied to corn following corn from commercial nitrogen fertilizer in Minnesota for 2014 when the poultry manure nitrogen content is unknown: 6 fields.

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.

Manure Applications from Other Manure

Other survey results:

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

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

Figure 147 details the distribution of average nitrogen rates in Minnesota from farmers that applied other manure sources and commercial nitrogen fertilizer to corn following soybeans when the farmer did not know the nitrogen content of the other manure application (MQ-1a, MQ-5, MQ-11, and MQ-16). Therefore, manure nitrogen was not included in the analysis when the quantity of nitrogen from other manure sources applied to the field is not known. The average corn yield was 153 bushels per acre. The average commercial nitrogen fertilizer rate was 135 pounds per acre.

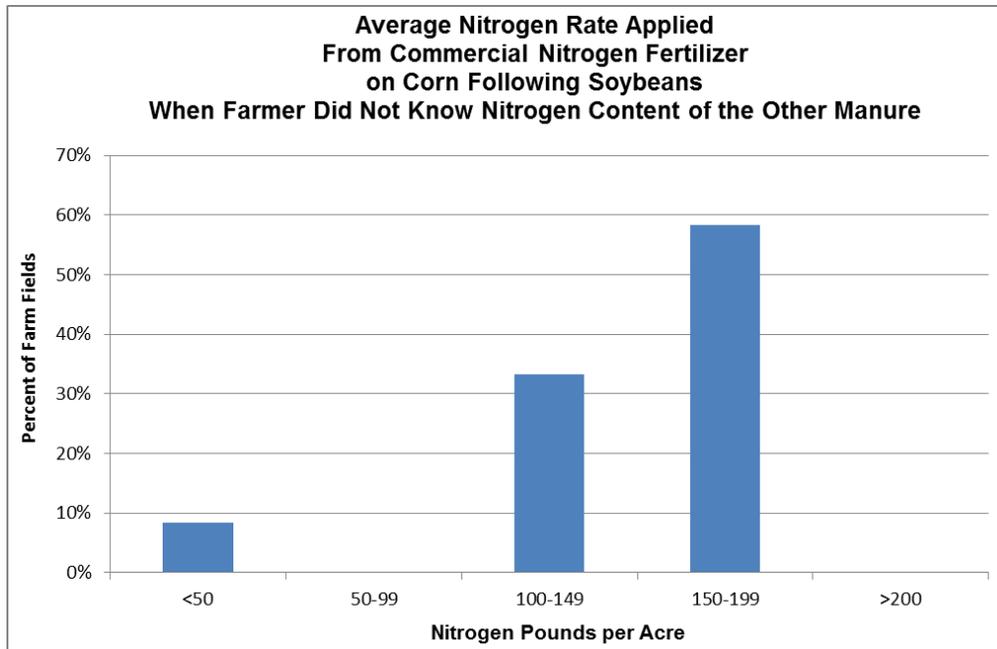


Figure 147. Average nitrogen rates applied to corn following soybeans from commercial nitrogen fertilizer in Minnesota for 2014 when the other manure nitrogen content is unknown: 12 fields.

Other survey results:

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

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

Other survey results:

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

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

Other survey results:

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

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

Other survey results:

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

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

Other survey results:

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

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

Statewide Manure Use and Practices

Table 83 details the percent of respondents on manure applications using variable rate technology (MQ-12).

Table 83. Manure applications using variable rate technology.

BMP Region	Manure Applications Using Variable Rate	Percent of Respondents
Northwestern	Yes	13
Northwestern	No	87
Irrigated and Non-irrigated Sandy Soils	Yes	23
Irrigated and Non-irrigated Sandy Soils	No	77
Southwestern and West Central	Yes	16
Southwestern and West Central	No	84
South Central	Yes	19
South Central	No	81
Southeastern	Yes	15
Southeastern	No	85
Statewide	Yes	19
Statewide	No	81

Table 84 details the percent of respondents who knew the manure application rate (MQ-13).

Table 84. Farmer’s knowledge of manure application rates.

BMP Region	Knowledge of Manure Application Rates	Percent of Respondents
Northwestern	Yes	48
Northwestern	No	52
Irrigated and Non-irrigated Sandy Soils	Yes	43
Irrigated and Non-irrigated Sandy Soils	No	57
Southwestern and West Central	Yes	56
Southwestern and West Central	No	44
South Central	Yes	54
South Central	No	46
Southeastern	Yes	37
Southeastern	No	63
Statewide	Yes	48
Statewide	No	52

Table 85 details the application rate for liquid manure, if known by the farmer (MQ-14).

Table 85. Rates for liquid manure applications by region.

BMP Region	Average Gallons per Acre
Northwestern	8,500
Irrigated and Non-irrigated Sandy Soils	7,493
Southwestern and West Central	4,630
South Central	4,623
Southeastern	5,823
Statewide	5,498

Table 86 details the application rate for solid manure, if known by the farmer (MQ-14).

Table 86. Rates for solid manure applications by region.

BMP Region	Average Tons per Acre
Northwestern	8.29
Irrigated and Non-irrigated Sandy Soils	6.89
Southwestern and West Central	7.21
South Central	7.21
Southeastern	8.32
Statewide	7.36

Table 87 details the percent of farmers who applied commercial fertilizer on the manured field (MQ-15).

Table 87. Commercial fertilizer applications on manured fields by region.

BMP Region	Application of Commercial Fertilizer to Manured Field	Percent of Respondents
Northwestern	Yes	63
Northwestern	No	37
Irrigated and Non-irrigated Sandy Soils	Yes	61
Irrigated and Non-irrigated Sandy Soils	No	39
Southwestern and West Central	Yes	58
Southwestern and West Central	No	42
South Central	Yes	62
South Central	No	38
Southeastern	Yes	74
Southeastern	No	26
Statewide	Yes	63
Statewide	No	37

Table 88 details the amount of nitrogen applied to the manured field from commercial nitrogen by livestock type (MQ-16).

Table 88. 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	**
Northwestern	Hog	**
Northwestern	Poultry	**
Irrigated and Non-irrigated Sandy Soils	All	48
Irrigated and Non-irrigated Sandy Soils	Dairy	41
Irrigated and Non-irrigated Sandy Soils	Beef	86
Irrigated and Non-irrigated Sandy Soils	Hog	60
Irrigated and Non-irrigated Sandy Soils	Poultry	27
Irrigated and Non-irrigated Sandy Soils	Other	**
Southwestern and West Central	All	36
Southwestern and West Central	Dairy	42
Southwestern and West Central	Beef	71
Southwestern and West Central	Hog	25
Southwestern and West Central	Poultry	28
Southwestern and West Central	Other	**
South Central	All	35
South Central	Dairy	21
South Central	Beef	91
South Central	Hog	25
South Central	Poultry	29
South Central	Other	**
Southeastern	All	72
Southeastern	Dairy	49
Southeastern	Beef	102
Southeastern	Hog	**
Southeastern	Other	**
Statewide	All	42
Statewide	Dairy	39
Statewide	Beef	86
Statewide	Hog	26
Statewide	Poultry	25
Statewide	Other	76

** Less than five responses.

Table 89 details the total amount of nitrogen applied to fields from both manure and commercial nitrogen (MQ-10 and MQ-16).

Table 89. 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
Irrigated and Non-irrigated Sandy Soils	All	180
Irrigated and Non-irrigated Sandy Soils	Dairy	175
Irrigated and Non-irrigated Sandy Soils	Beef	**
Irrigated and Non-irrigated Sandy Soils	Hog	**
Irrigated and Non-irrigated Sandy Soils	Poultry	**
Irrigated and Non-irrigated Sandy Soils	Other	**
South Western and West Central	All	180
South Western and West Central	Dairy	159
South Western and West Central	Beef	198
South Western and West Central	Hog	179
South Western and West Central	Poultry	**
South Western and West Central	Other	**
South Central	All	188
South Central	Dairy	178
South Central	Beef	185
South Central	Hog	**
South Central	Poultry	208
South Central	Other	180
Southeastern	All	191
Southeastern	Dairy	178
Southeastern	Beef	**
Southeastern	Other	**
Statewide	All	184
Statewide	Dairy	173
Statewide	Beef	193
Statewide	Hog	185
Statewide	Poultry	184
Statewide	Other	197

** Less than five responses.

Table 90 details if the manure applied was from the farmer’s livestock (MQ-17).

Table 90. Origin of the manure in regards to livestock ownership source.

BMP Region	Manure From the Farmer’s Livestock	Percent of Respondents
Northwestern	Yes	83
Northwestern	No	17
Irrigated and Non-irrigated Sandy Soils	Yes	88
Irrigated and Non-irrigated Sandy Soils	No	12
Southwestern and West Central	Yes	77
Southwestern and West Central	No	23
South Central	Yes	75
South Central	No	25
Southeastern	Yes	87
Southeastern	No	13
Statewide	Yes	82
Statewide	No	18

Table 91 details when the manure was last tested for nutrients (MQ-18).

Table 91. Date of last test for manure nutrient content.

BMP Region	Last Manure Test	Percent of Respondents
Northwestern	This Year	10
Northwestern	Last 3 Years	5
Northwestern	Over 3 Years ago	33
Northwestern	Don't Test	52
Irrigated and Non-irrigated Sandy Soils	This year	19
Irrigated and Non-irrigated Sandy Soils	Last 3 years	14
Irrigated and Non-irrigated Sandy Soils	Over 3 years ago	12
Irrigated and Non-irrigated Sandy Soils	Don't test	55
Southwestern and West Central	This year	43
Southwestern and West Central	Last 3 years	10
Southwestern and West Central	Over 3 years ago	7
Southwestern and West Central	Don't test	40
South Central	This year	32
South Central	Last 3 years	13
South Central	Over 3 Years ago	13
South Central	Don't test	42
Southeastern	This year	17
Southeastern	Last 3 ears	15
Southeastern	Over 3 years ago	14
Southeastern	Don't Test	54
Statewide	This year	27
Statewide	Last 3 years	12
Statewide	Over 3 years ago	12
Statewide	Don't test	49

Table 92 details the applications of nitrogen enhancing products or inhibitors on the corn field applied with manure (MQ-19).

Table 92. Use of nitrogen enhancing products or inhibitors on the corn field applied with manure.

BMP Region	Application of nitrogen enhancing or inhibitors in 2014	Percent of Respondents
Northwestern	Yes	22
Northwestern	No	78
Irrigated and Non-irrigated Sandy Soils	Yes	14
Irrigated and Non-irrigated Sandy Soils	No	86
Southwestern and West Central	Yes	12
Southwestern and West Central	No	88
South Central	Yes	21
South Central	No	79
Southeastern	Yes	11
Southeastern	No	89
Statewide	Yes	15
Statewide	No	85

Soil Testing in Last Five Years

Table 93 details the type of soil test the farmer used in the last five years (MQ-20). The percentage can equal greater than 100 percent due to some farmers conducting multiple soils tests within the five year time frame.

Table 93. Types of soil tests used in the last five years.

BMP Region	Type of Soil Testing	Percent of Respondents
Northwestern	Traditional	56
Northwestern	Grid	12
Northwestern	Zone	14
Northwestern	Other	8
Northwestern	None	18
Irrigated and Non-irrigated Sandy Soils	Traditional	52
Irrigated and Non-irrigated Sandy Soils	Grid	16
Irrigated and Non-irrigated Sandy Soils	Zone	4
Irrigated and Non-irrigated Sandy Soils	Other	7
Irrigated and Non-irrigated Sandy Soils	None	27
Southwestern and West Central	Traditional	50
Southwestern and West Central	Grid	33
Southwestern and West Central	Zone	10
Southwestern and West Central	Other	5
Southwestern and West Central	None	12
South Central	Traditional	40
South Central	Grid	40
South Central	Zone	8
South Central	Other	5
South Central	None	15
Southeastern	Traditional	47
Southeastern	Grid	34
Southeastern	Zone	7
Southeastern	Other	4
Southeastern	None	14
Statewide	Traditional	47
Statewide	Grid	30
Statewide	Zone	8
Statewide	Other	5
Statewide	None	17

[§] 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 2014 Crop Season

FIELDS MP102 Part 2 (Corn Field 1)

Setup Question Verify Acres Earlier you reported you planted XXXX acres of

Setup Question Ask Acres Earlier you reported that you did not plant any corn in 2014. Is that correct? Yes No

Setup Question Corn Did you grow CORN on your operation in 2014? Yes no

N Question 1 Corn Acre How many corn acres were planted for FIELD CORN in 2014?

N Question 2 Corn Acre How many of your corn acres had been planted to soybeans in 2013?

N Question 3 Corn Acre How many of your corn acres had manure applied in 2014, please include 2013 fall applications of manure?

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 2014 growing season.

N Question 4 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 2014 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 5 Prev Crop What was the crop planted on this field 2014?

Prev Crop =

Soybeans (1) "Soybeans",

Corn (2) "Corn",

Alfalfa (3) "Alfalfa",

Small Grains (4) "Small Grains",

Other (99) "Other"

N Question 5b If Corn was planted, was alfalfa planted in 2012? Yes, no, DK, RF

N Question 6 If Corn Acres How many acres are in this field?

N Question 7 Ave Yield What was the average yield of this field over the last 3 corn crops? Bushels per Acre, DK, RF

N Question 8 Fert Applied Was any commercial nitrogen fertilizer applied to this corn field in 2014? Please include fall applications in 2013 for the 2014 crop year.
Yes No

N Question 9 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 2014 crop year. These will include fall applications in 2013 for the 2014 crop year, pre-plant and post plant applications including any nitrogen in starters, phosphorus or sulfur sources made for the 2014 crop.

N Question 10 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 11 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 12 FallFert Did you apply any commercial fertilizer in the fall of 2013 for the 2014 crop season? Yes No

N Question 13 FallAnhydrous Did you apply Anhydrous Ammonia in the fall of 2013? Yes No

N Question 14 FallAnhydrous How many pounds per acre of nitrogen were applied as Anhydrous Ammonia? Pounds per Acre, DK, RF

N Question 15 FallUrea Did you apply Urea in the fall of 2013? Yes No

N Question 16 FallUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 17 FallLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions in the fall of 2013? Yes No

N Question 18 FallLiq_Lb How many pound per acre of nitrogen was applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 19 FallMAP Did you apply any phosphorus sources such as MAP or DAP in the fall of 2013? Yes No

N Question 20 FallMAP_Lb How many pounds of nitrogen were applied as MAP or DAP? Pounds per Acre, DK, RF

N Question 21 FallOtherN Did you apply other sources of fertilizer in the fall of 2015 that included nitrogen? (Not Potash) Yes No

N Question 22 FallOtherN_Lb How many pounds per acre of nitrogen were applied from other sources of fertilizer? Pounds per Acre, DK, RF

N Question 23 FallVerify_Lb Were all fall sources included in the total nitrogen that you stated earlier? Yes No

N Question 24 FixFall_Lb Originally reported: XXXXXX What is the correct total amount of Nitrogen applied? Yes, No, DK, RF

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

N Question 25 SprFert Did you apply any commercial fertilizer in the spring as a preplant for the crop season? Yes No

N Question 26 SprAnhydrous Did you apply Anhydrous Ammonia in the spring of 2014? Yes No

N Question 27 SprAnhydrous_Lb How many pounds per acre of nitrogen were applied as Anhydrous Ammonia? Pounds per Acre, DK, RF

N Question 28 SprUrea Did you apply Urea in the spring as a preplant? Yes No

N Question 29 SprUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 30 SprLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions in the spring as a preplant?" Yes No

N Question 31 SprLiq_Lb How many pounds per acre of nitrogen were applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 32 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 33 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 34 SprOtherN Did you apply other sources of fertilizer in the spring as a preplant that included nitrogen? (Not Potash) Yes No

N Question 35 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 36 PitFert Did you apply any commercial fertilizer in the spring as a starter or at planting for the crop season? Yes No

N Question 37 PitUrea Did you apply Urea in the spring as a starter or at planting? Yes No

N Question 38 PitUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 39 PitLiq 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 40 PltLiq_Lb How many pounds per acre of nitrogen were applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 41 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 42 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 43 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 44 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 45 PostFert Did you apply any commercial fertilizer after planting such as a sidedress for the crop season? Yes No

N Question 46 PostAnhydrous Did you apply Anhydrous Ammonia post planting such as a sidedress? Yes No

N Question 47 PostAnhydrous_Lb How many pounds per acre of nitrogen were applied as Anhydrous Ammonia? Pounds per Acre, DK, RF

N Question 48 PostUrea Did you apply Urea in the spring as a sidedress? Yes No

N Question 49 PostUrea_Lb How many pounds per acre of nitrogen were applied as Urea? Pounds per Acre, DK, RF

N Question 50 PostLiq Did you apply Liquid Nitrogen such as 28%, 32% or other UAN solutions after planting such as a sidedress? Yes No

N Question 51 PostLiq_Lb How many pounds per acre of nitrogen were applied as Liquid Nitrogen? Pounds per Acre, DK, RF

N Question 52 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 53 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 54 PostOtherN Did you apply Other sources of fertilizer after planting such as a sidedress that included nitrogen? (Not Potash) Yes No

N Question 55 PostOtherN_Lb How many pounds per acre of @Bnitrogen@B were applied from Other sources of fertilizer? Pounds per Acre, DK, RF

N Question 56 NEnhancing Did you use any nitrogen enhancing products or inhibitors on your corn field? Yes No

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 2013 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.

2014 Manure use report

Manure Use Questions 2014 Crop Season

M Question 1. Do you have a corn field that was applied with manure for the 2014 crop year, including manure applied in the fall of 2013? Yes No

M Question 1a. What was the previous crop planted on this field in 2013?

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 2012? Yes No

LeadIn2, Think about an average corn field you planted in 2014 with manure applied for the 2014 growing season. (Includes manure applications in the fall of 2013 for the 2014 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 2014 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 2014crop 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 2014 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 2013 applications for the 2014 crop year)",
Last3 (2) "Last 3 years",
Over3 (3) "Over 3 years ago"
Don't Test (4) "Don't Test"

M Question 19. NEnhancing Did you use any nitrogen enhancing products or inhibitors on your corn field? Yes No

M Question 20. 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"