2009 Survey of Nitrogen Fertilizer Use on Corn in Minnesota

A Companion Report to the full report prepared by the University of Minnesota Extension

Funding for the Nitrogen Fertilizer Management Survey was provided by the :

CLEAN WATER LAND & LEGACY AMENDMENT

A survey was conducted in the spring of 2010 to characterize the use of nitrogen (N) fertilizer on field corn by Minnesota farmers in the 2009 growing season. Detailed information on N fertilizer management practices was collected from interviews with 1,496 farmers distributed across all of the corn growing regions in the state. Their total corn acreage represented about 7% of the corn acres harvested in Minnesota in 2009. Farmers were asked to give detailed nitrogen information on one of their typical corn fields. Farm interviews were completed by the National Agricultural Statistics Service, Minnesota Field Office and an initial report was written by the University of Minnesota which can be found at:
http://www.mda.state.mn.us/protecting/cleanwaterfund/~/media/C0D97703C7A84E74936431110A5FE897.ashx

This is a companion report that further expands on nitrogen fertilizer rates across different crop rotations and includes ranges of nitrogen fertilizer applied across those crop rotations. Crop rotations will include corn following soybeans, corn following corn, corn following alfalfa and corn following other crops. Fields that were not fertilized with commercial fertilizer are not included in this report.
Minnesota Nitrogen Best Management Practices have been developed on a regional basis as shown in the following chart (figure 1). Crop rotations and nitrogen rate ranges will also be compared on a regional basis.

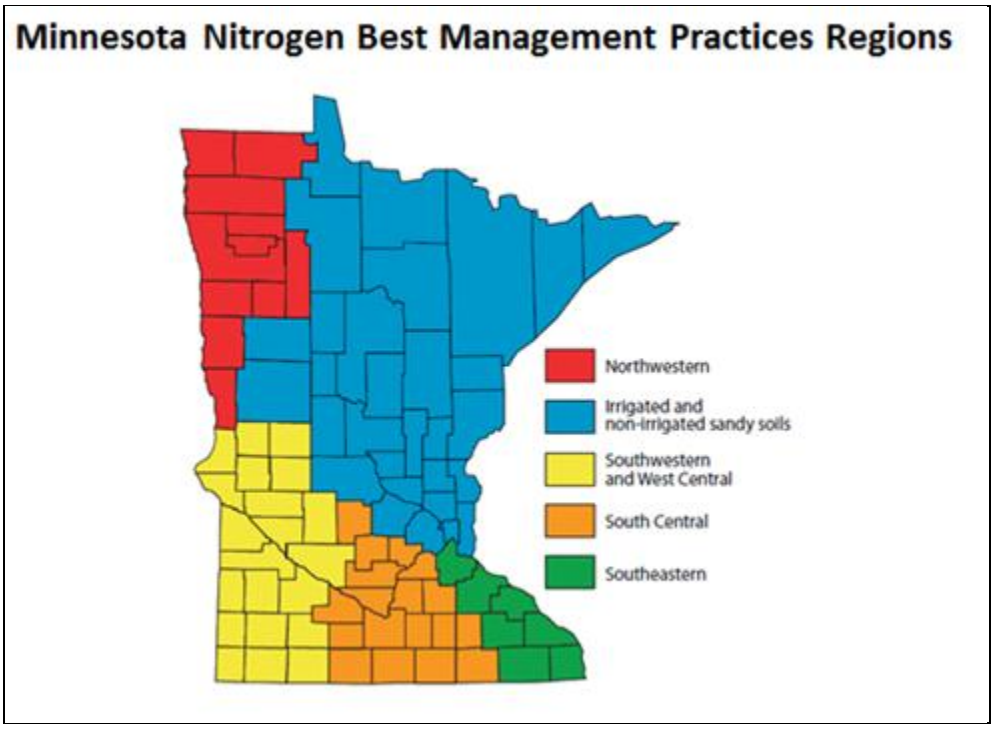

Figure 1. Minnesota Nitrogen Best Management Practices Regions.

Statewide: Corn Following Soybeans

The majority of farmers reported on a typical corn following soybean field. Seventy-five percent of the fields reported were corn following soybean fields. Figure 2 details the counties where farmers reported on fields with corn following soybeans. There were 1,119 corn following soybean fields surveyed across Minnesota.

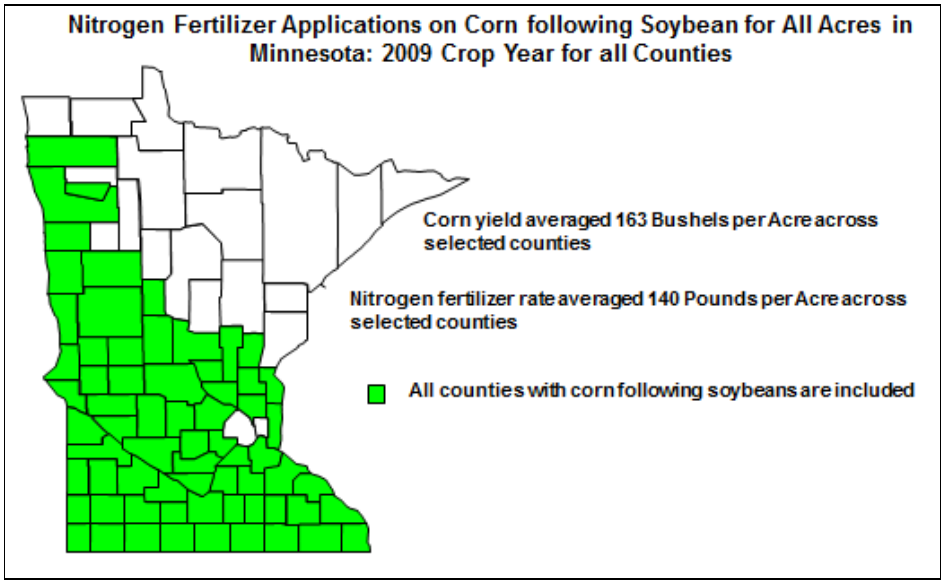

Figure 2. Counties with farmers reporting on corn following soybean fields.

There were 1,119 fields that were included in the corn following soybean statewide analysis. Figure 3 details the distribution of average nitrogen fertilizer rates across Minnesota for those corn following soybean fields.

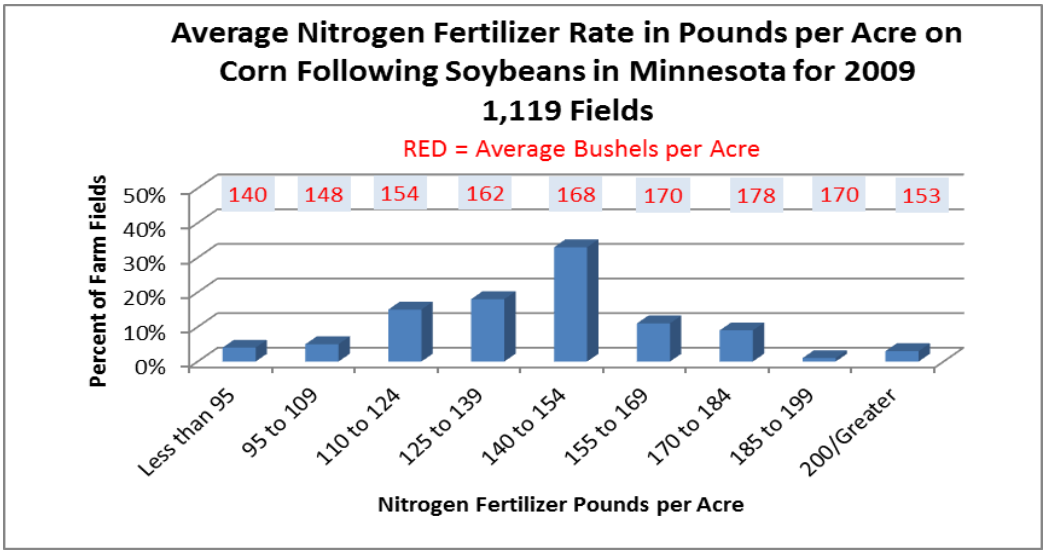

Figure 3. Distribution of the average nitrogen fertilizer rate for 1,119 corn following soybean fields across Minnesota.

Nitrogen fertilizer applications for corn following soybeans differ across the state of Minnesota. Further analysis will be based only counties with 5 or more responses as shown in figure 4.

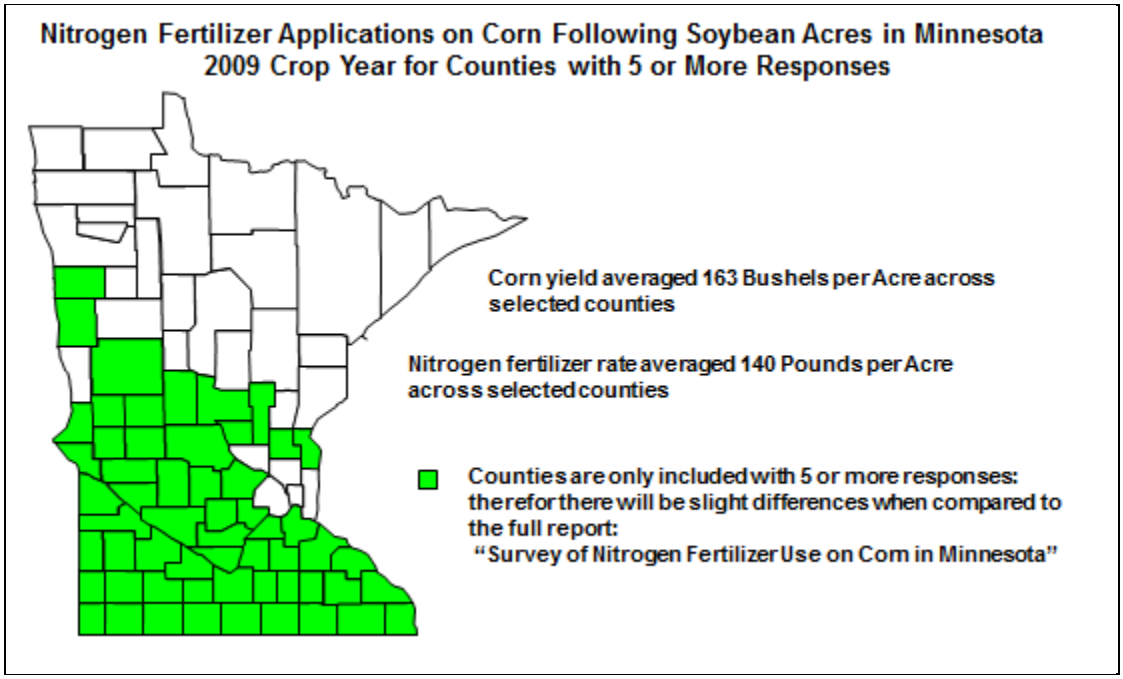

Figure 4. Nitrogen fertilizer applications on corn following soybean acres in Minnesota for the 2009 crop year. Only counties with 5 or more responses are included in the analysis.

There were 1,101 fields that were included in the corn following soybean statewide analysis. Figure 5 details the distribution of average nitrogen fertilizer rates across Minnesota for corn following soybeans.

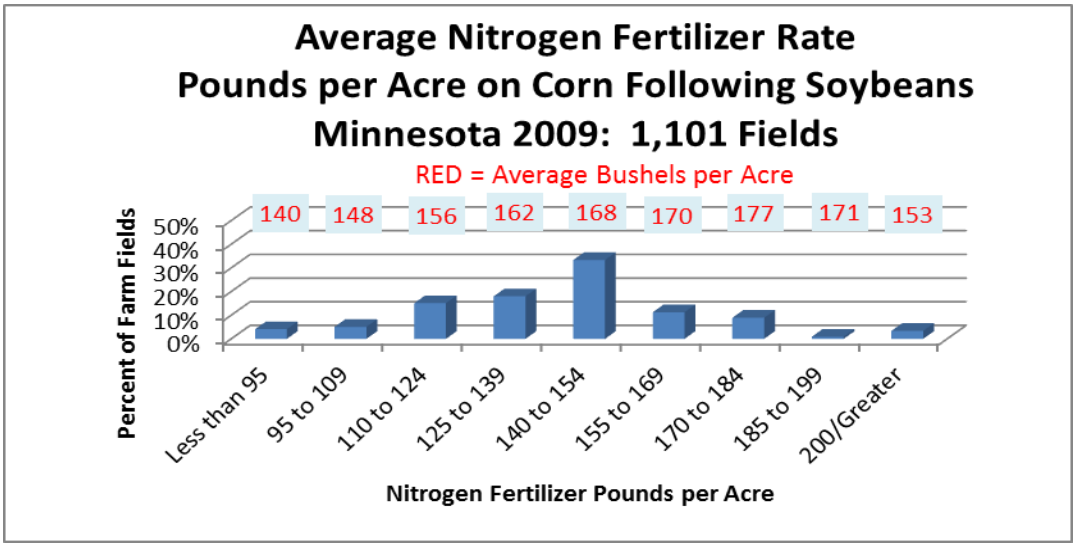

Figure 5. Average nitrogen fertilizer rate distribution across Minnesota for corn following soybeans for the 2009 crop year for counties with more than 5 responses.

Southeastern Region: Corn Following Soybeans

There were 121 fields that were included in the corn following soybean in the Southeastern region analysis. Figure 6 details the location, average rate of fertilizer nitrogen and average yield for corn following soybeans in the Southeastern best management practices region. All counties in the Southeastern region had more than 5 responses.

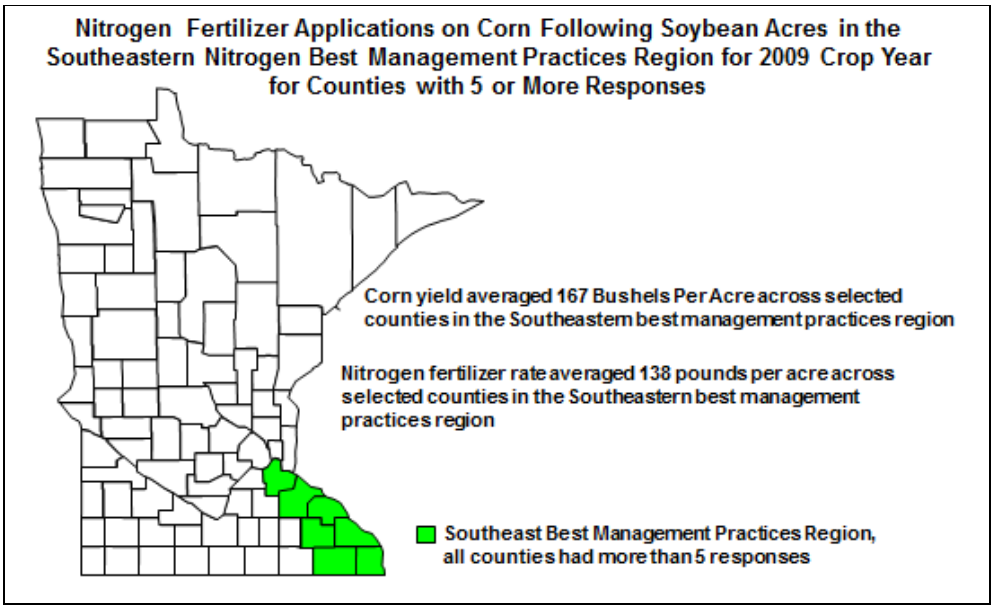

Figure 6. Corn yield averaged 167 bushels per acre and nitrogen fertilizer rate average 138 pounds per acre across the Southeastern best management practices region.

There were 121 fields that were included in the corn following soybean Southeastern best management practices region analysis. Figure 7 details the distribution of nitrogen fertilizer rates across the Southeastern region for corn following soybeans.

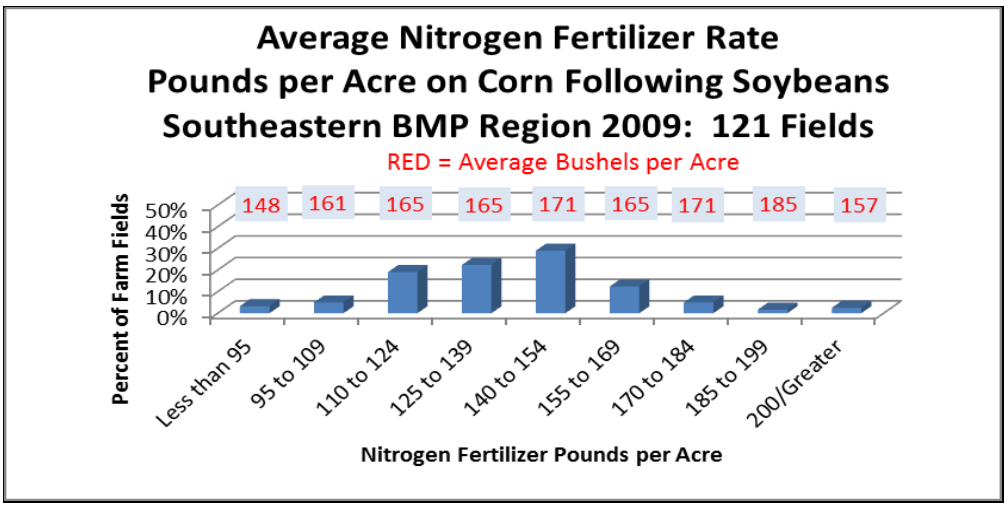

Figure 7. Average nitrogen fertilizer rate distribution across the Southeastern best management practices region for corn following soybeans for the 2009 crop year.

County nitrogen fertilizer rates ranged from an average of 127 pounds per acre in Olmsted to 147 pounds per acre in Wabasha as shown in Table 1.

Table 1.Average County Nitrogen Fertilizer Rates for the Southeastern Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Dakota	16	135	152
Fillmore	27	138	169
Goodhue	26	139	170
Houston	9	139	171
Olmsted	15	127	165
Wabasha	10	147	168
Winona	18	142	169

South Central Region: Corn Following Soybeans

There were 400 fields that were included in the corn following soybean in the South Central region analysis. Figure 8 details the location, average rate of fertilizer nitrogen and average yield for corn following soybeans in the South Central best management practices region. All counties in the South Central region had more than 5 responses.

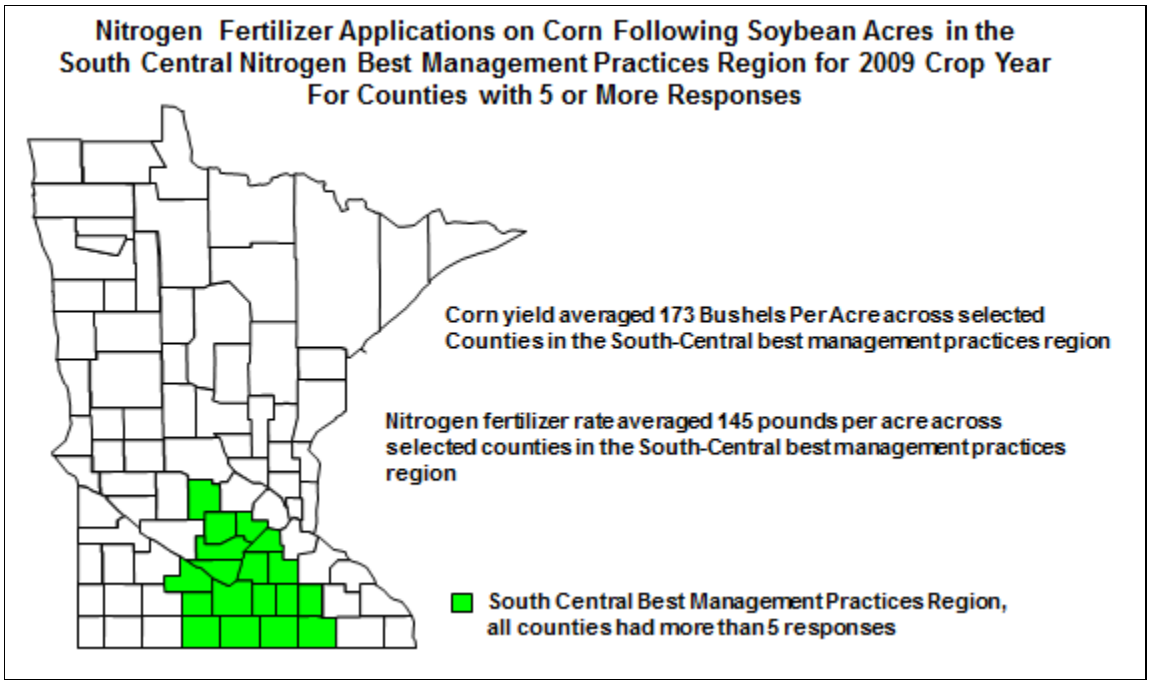

Figure 8. Corn yield averaged 173 bushels per acre and nitrogen fertilizer rate average 145 pounds per acre across the South Central best management practices region.

There were 400 fields that were included in the corn following soybean South Central best management practices region analysis. Figure 9 details the distribution of nitrogen fertilizer rates across the South Central region for corn following soybeans.

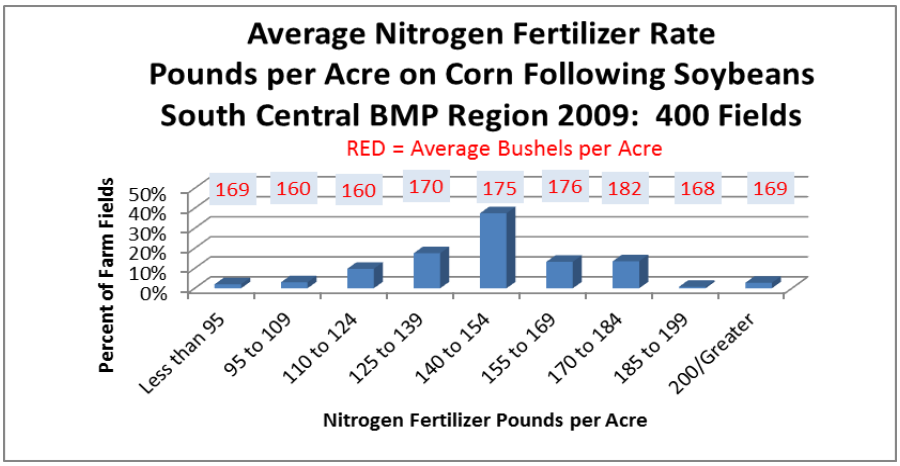

Figure 9. Average nitrogen fertilizer rate distribution across the South Central best management practices region for corn following soybeans for the 2009 crop year.

County nitrogen fertilizer rates ranged from an average of 128 pounds per acre in Rice to 159 pounds per acre in Faribault as shown in Table 2.

Table 2. Average County Nitrogen Fertilizer Rates for the South Central Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Blue Earth	32	147	178
Brown	28	146	178
Carver	15	153	150
Dodge	13	146	180
Faribault	36	159	185
Freeborn	33	150	172
Le Sueur	19	144	170
Martin	23	141	178
McLeod	23	153	166
Meeker	21	138	161
Mower	23	136	168
Nicollet	16	145	174
Rice	24	128	165
Scott	9	141	166
Sibley	27	147	178
Steele	14	139	179
Waseca	20	148	176
Watonwan	24	142	175

Southwestern and West Central Region: Corn Following Soybeans

There were 452 fields that were included in the corn following soybean in the Southwestern and West Central region analysis. Figure 10 details the location, average rate of fertilizer nitrogen and average yield for corn following soybeans in the Southwestern and West Central best management practices region. All counties in the Southwestern and West Central region had more than 5 responses.

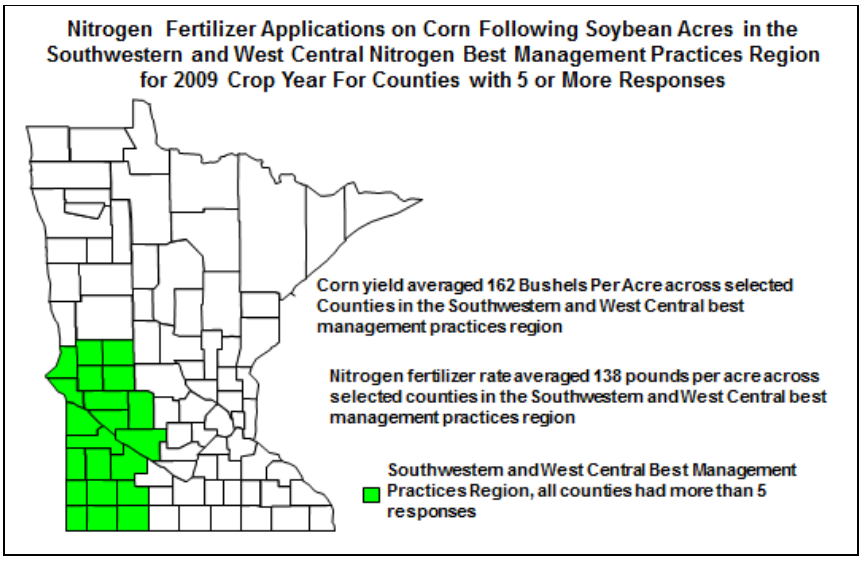

Figure 10. Corn yield averaged 162 bushels per acre and nitrogen fertilizer rate average 138 pounds per acre across the Southwestern and West Central best management practices region.

There were 452 fields that were included in the corn following soybean Southwestern and West Central best management practices region analysis. Figure 11 details the distribution of nitrogen fertilizer rates across the Southwestern and West Central region for corn following soybeans.

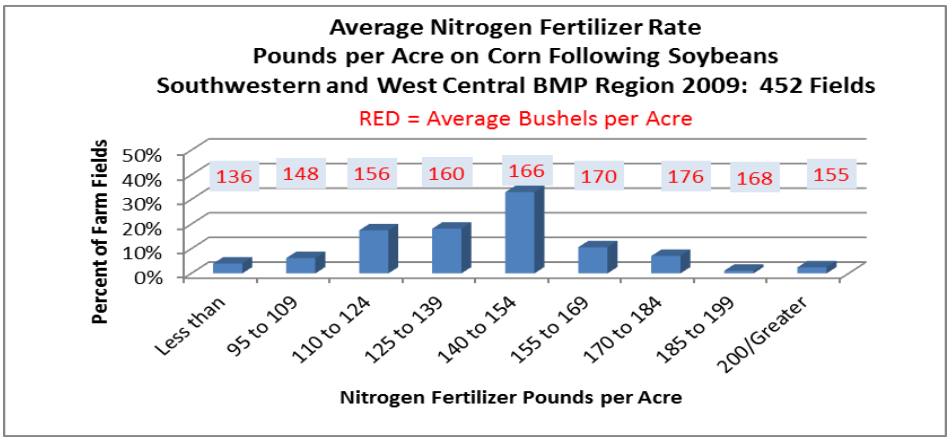

Figure 11. Average nitrogen fertilizer rate distribution across the Southwestern and West Central best management practices region for corn following soybeans for the 2009 crop year.

County nitrogen fertilizer rates ranged from an average of 117 pounds per acre in Douglas to 155 pounds per acre in Redwood as shown in Table 3.

Table 3. Average County Nitrogen Fertilizer Rates for the Southwestern West Central Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Big Stone	11	124	147
Chippewa	20	134	162
Cottonwood	36	132	169
Douglas	10	117	120
Grant	8	134	150
Jackson	33	139	171
Kandiyohi	19	146	163
Lac qui Parle	34	135	154
Lincoln	15	125	151
Lyon	15	123	160
Murray	25	128	171
Nobles	24	128	164
Pipestone	16	126	151
Pope	20	130	140
Redwood	48	155	173
Renville	41	150	168
Rock	15	138	176
Stevens	7	142	150
Swift	21	150	158
Traverse	10	145	156
Yellow Medicine	24	140	162

Northwestern Region: Corn Following Soybeans

There were 19 fields that were included in the corn following soybean in the Northwestern region analysis. Figure 12 details the location, average rate of fertilizer nitrogen and average yield for corn following soybeans in the Northwestern best management practices region. Two counties in the Northwestern region had more than 5 responses.

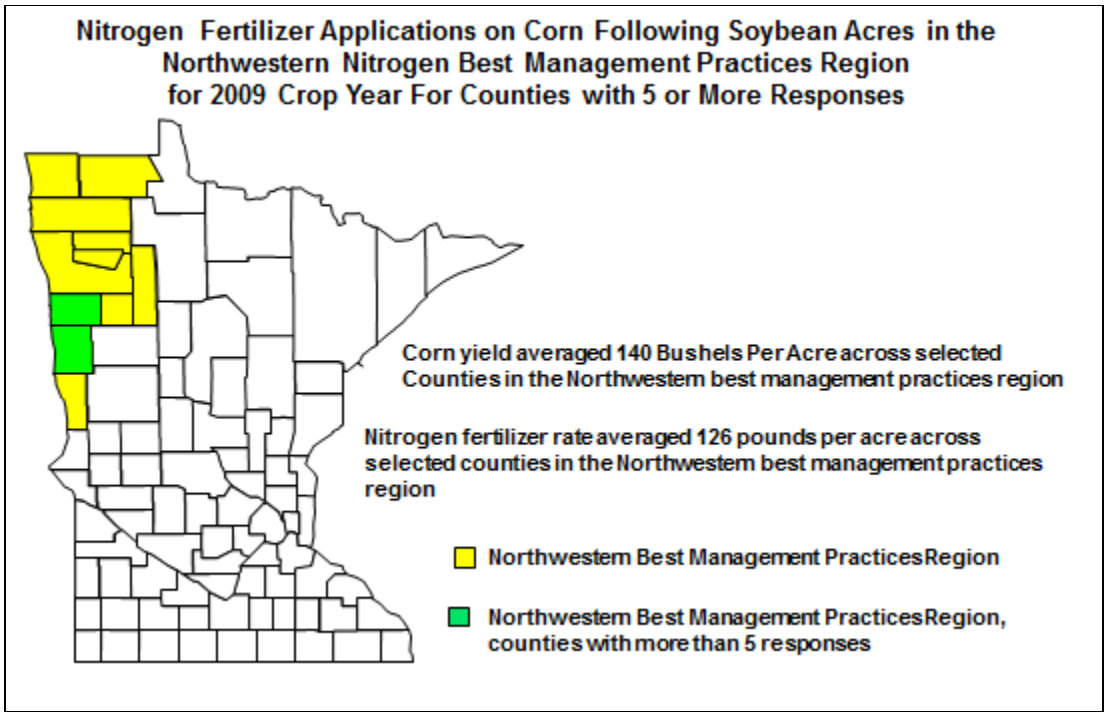

Figure 12. Corn yield averaged 140 bushels per acre and nitrogen fertilizer rate average 126 pounds per acre across the Northwestern best management practices region.

There were 19 fields that were included in the corn following soybean Northwestern best management practices region analysis. Figure 13 details the distribution of nitrogen fertilizer rates across the Northwestern region for corn following soybeans.

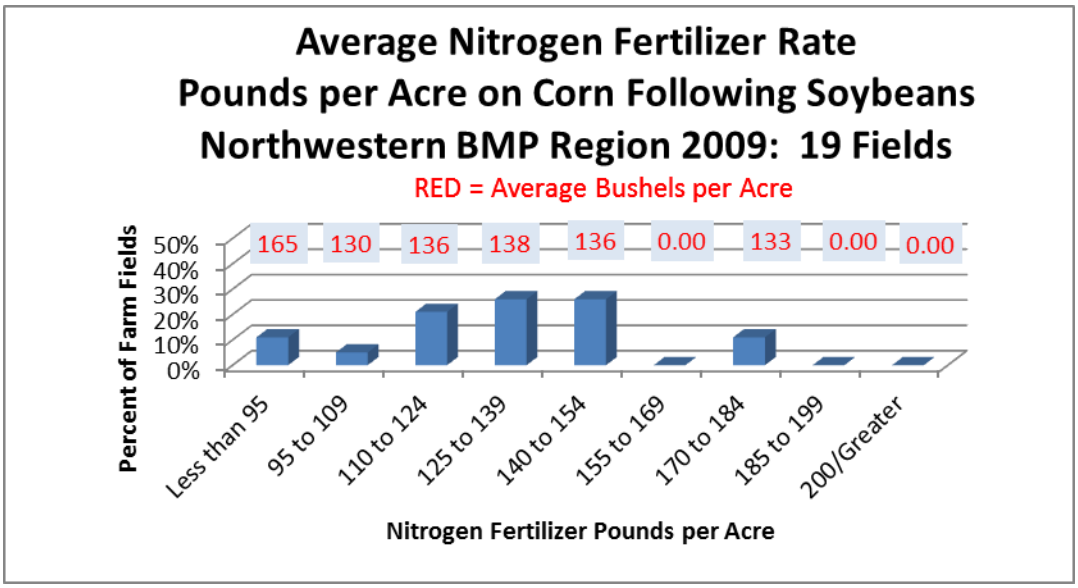

Figure 13. Average nitrogen fertilizer rate distribution across the Northwestern best management practices region for corn following soybeans for the 2009 crop year.

Only 2 counties had more than 5 responses in the Northwestern best management practices region. County nitrogen fertilizer rates ranged from an average of 111 pounds per acre in Clay to 134 pounds per acre in Norman as shown in Table 4.

Table 4. Average County Nitrogen Fertilizer Rates for the Northwestern Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Clay	6	111	139
Norman	13	134	139

Irrigated and Non-irrigated Sand Soils Region: Corn Following Soybeans

There were 109 fields that were included in the corn following soybean in the Irrigated and Non-irrigated Sandy Soils region analysis. Figure 14 details the location, average rate of fertilizer nitrogen and average yield for corn following soybeans in the Northwestern best management practices region. Nine counties in the Irrigated and Non-irrigated Sandy Soils region had more than 5 responses.

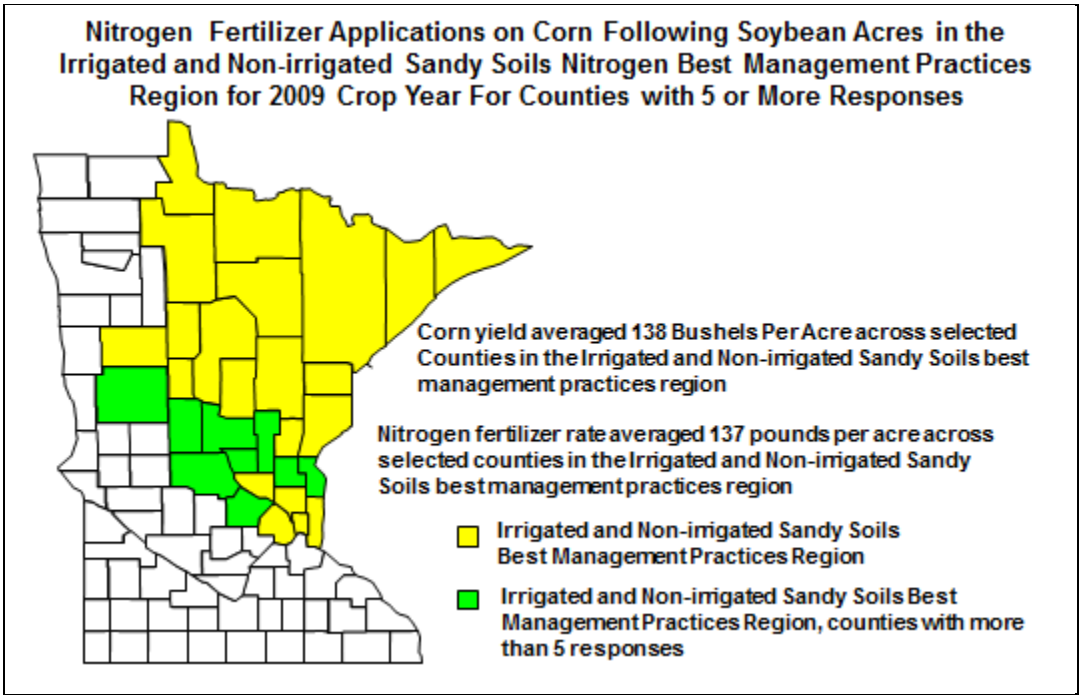

Figure 14. Corn yield averaged 138 bushels per acre and nitrogen fertilizer rate average 137 pounds per acre across the Irrigated and Non-irrigated Sandy soils best management practices region.

There were 109 fields that were included in the corn following soybean Irrigated and Non-irrigated Sandy Soils best management practices region analysis. Figure 15 details the distribution of nitrogen fertilizer rates across the Irrigated and Non-irrigated Sandy Soils region for corn following soybeans.

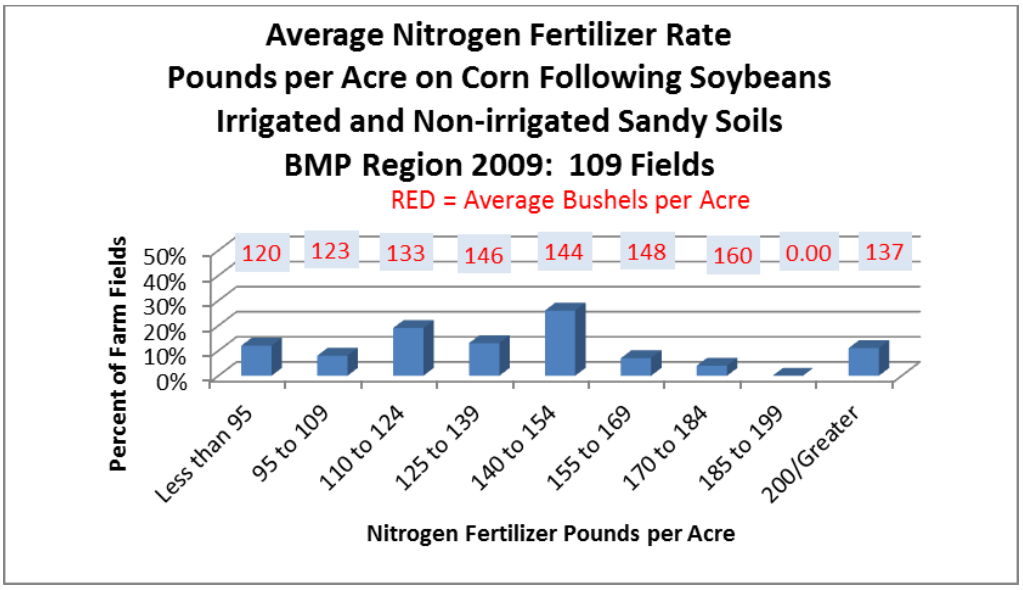

Figure 15. Average nitrogen fertilizer rate distribution across the Irrigated and Non-irrigated Sandy Soils best management practices region for corn following soybeans for the 2009 crop year.

Nine counties had more than 5 responses in the Irrigated and Non-irrigated Sandy Soils best management practices region. County nitrogen fertilizer rates ranged from an average of 112 pounds per acre in Mille Lacs to 162 pounds per acre in Chisago as shown in Table 5.

Table 5. Average County Nitrogen Fertilizer Rates for the Irrigated and Non-irrigated Sandy Soils Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Benton	7	128	121
Chisago	10	162	131
Isanti	8	124	112
Mille Lacs	5	112	104
Morrison	10	144	126
Otter Tail	20	134	143
Stearns	19	128	153
Todd	9	121	123
Wright	21	152	158

Statewide: Corn Following Corn

Nineteen percent of the fields reported were corn following corn fields. Figure 16 details the counties where farmers reported on fields with corn following corn. There were 282 corn following corn fields surveyed across Minnesota.

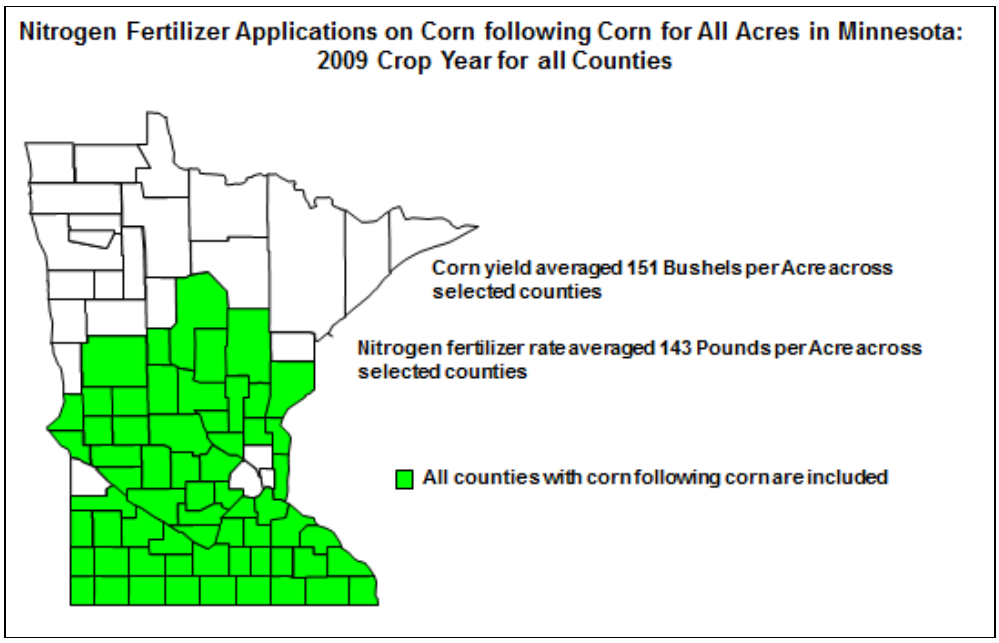

Figure 16. Counties with farmers reporting on corn following corn fields.

There were 282 fields that were included in the corn following corn statewide analysis. Figure 17 details the distribution of average nitrogen fertilizer rates across Minnesota for those corn following corn fields.

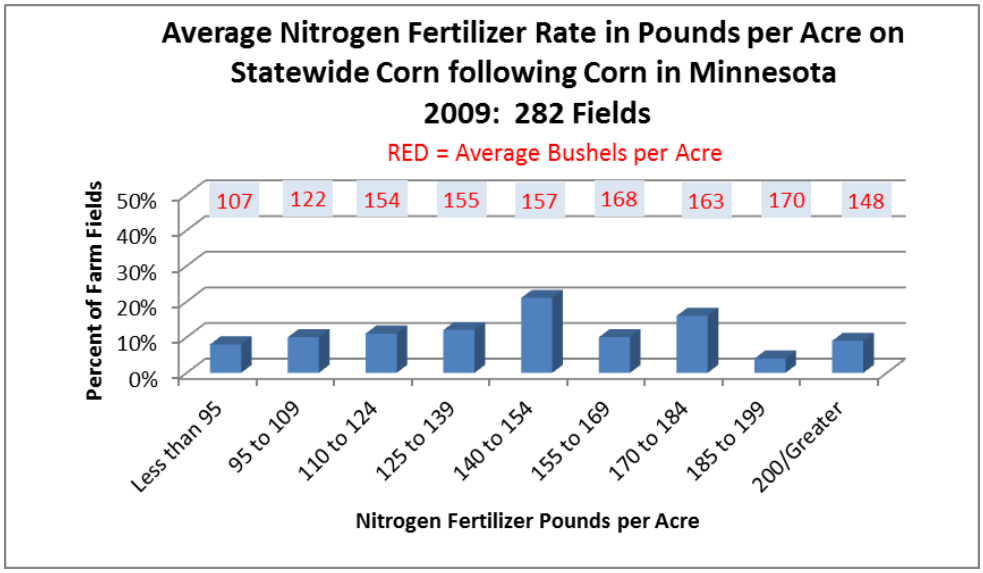

Figure 17. Distribution of the average nitrogen fertilizer rate for 282 corn following corn fields across Minnesota.

Nitrogen fertilizer applications for corn following corn differ across the state of Minnesota. Further analysis will be based only counties with 5 or more responses as shown in figure 18. There were 172 fields in this analysis.

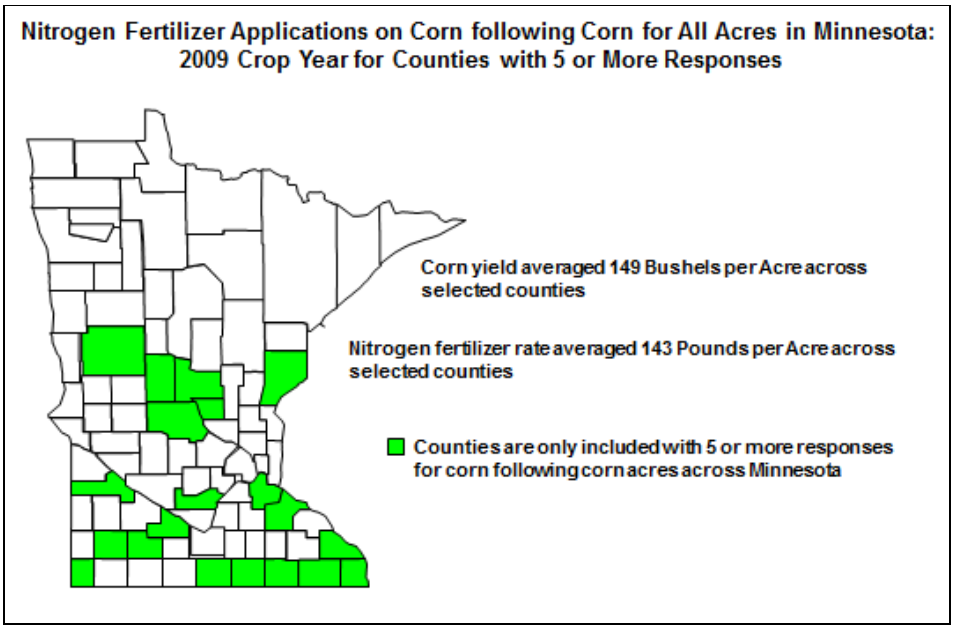

Figure 18. Nitrogen fertilizer applications on corn following corn acres in Minnesota for the 2009 crop year. Only counties with 5 or more responses are included in the analysis.

There were 172 fields that were included in the corn following corn statewide analysis. Figure 19 details the distribution of average nitrogen fertilizer rates across Minnesota for corn following corn for counties with 5 or more responses.

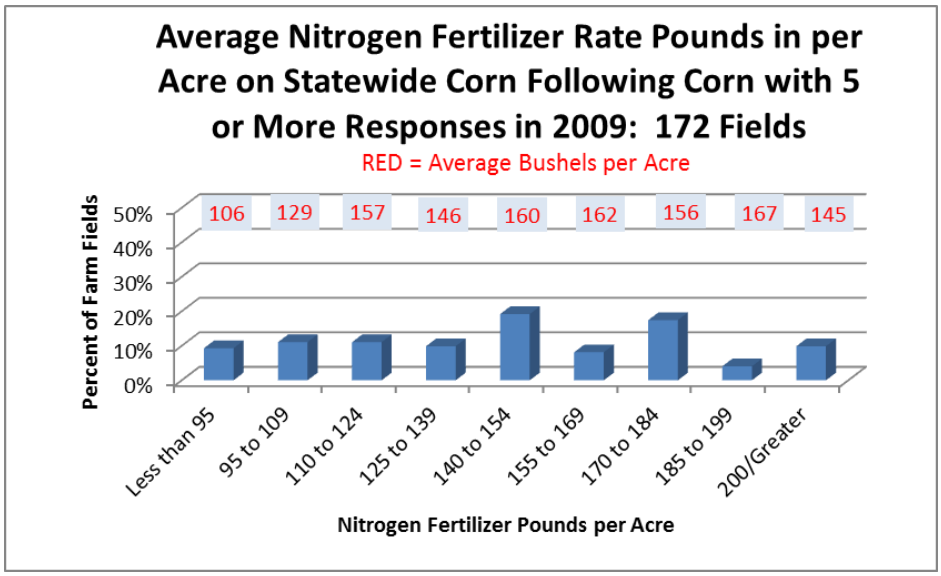

Figure 19. Average nitrogen fertilizer rate distribution across Minnesota for corn following corn for the 2009 crop year for counties with more than 5 responses.

Southeastern Region: Corn Following Corn

There were 49 fields that were included in the corn following soybean in the Southeastern region analysis. Figure 20 details the location, average rate of fertilizer nitrogen and average yield for corn following soybeans in the Southeastern best management practices region. Five counties in the Southwestern and West Central region had more than 5 responses.

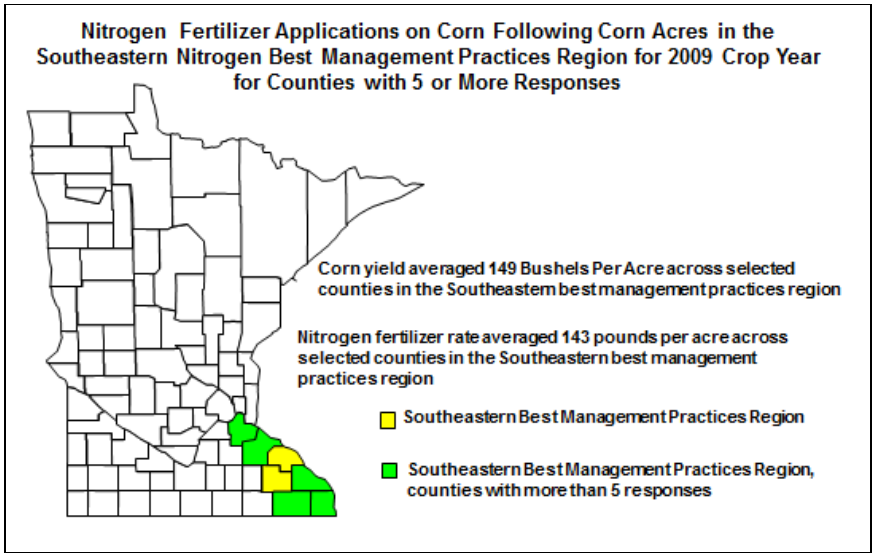

Figure 20. Corn yield averaged 149 bushels per acres and nitrogen fertilizer rate average 143 pounds per acre across the Southeastern best management practices region.

There were 49 fields that were included in the corn following corn Southeastern best management practices region analysis. Figure 21 details the distribution of nitrogen fertilizer rates across the Southeastern region for corn following corn.

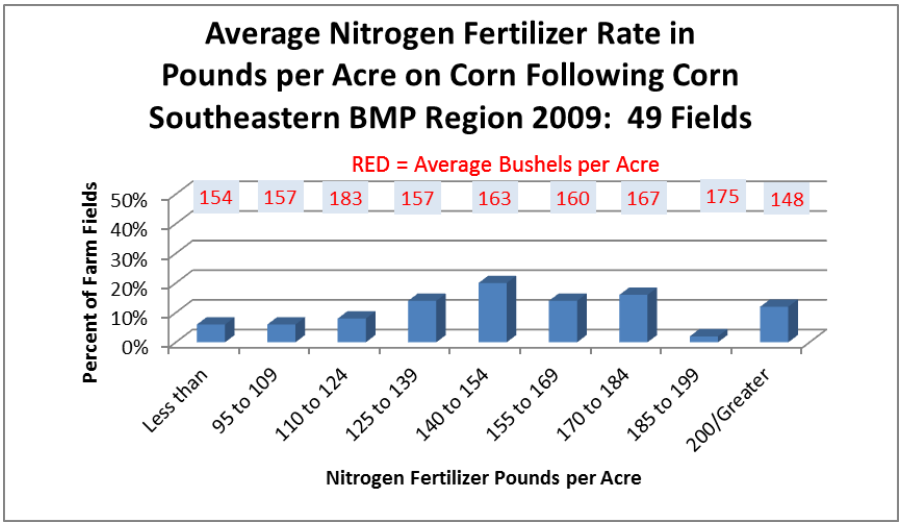

Figure 21. Average nitrogen fertilizer rate distribution across the Southeastern best management practices region for corn following corn for the 2009 crop year.

County nitrogen fertilizer rates ranged from an average of 113 pounds per acre in Houston to 161 pounds per acre in Winona as shown in Table 6.

Table 6. Average County Nitrogen Fertilizer Rates for the Southeastern Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Dakota	7	157	163
Fillmore	13	152	164
Goodhue	16	148	162
Houston	6	113	156
Winona	7	161	159

South Central Region: Corn Following Corn

There were 35 fields that were included in the corn following corn in the South Central region analysis. Figure 22 details the location, average rate of fertilizer nitrogen and average yield for corn following corn in the South Central best management practices region. Five counties in the South Central region had more than 5 responses.

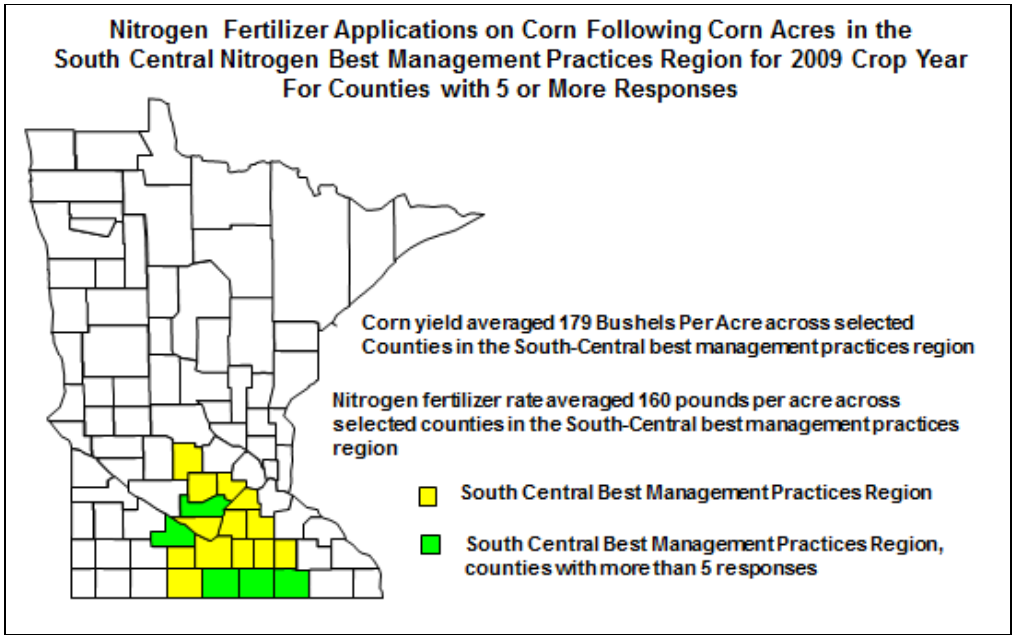

Figure 22. Corn yield averaged 179 bushels per acre and nitrogen fertilizer rate average 160 pounds per acre across the South Central best management practices region.

There were 35 fields that were included in the corn following corn South Central best management practices region analysis. Figure 23 details the distribution of nitrogen fertilizer rates across the South Central region for corn following corn.

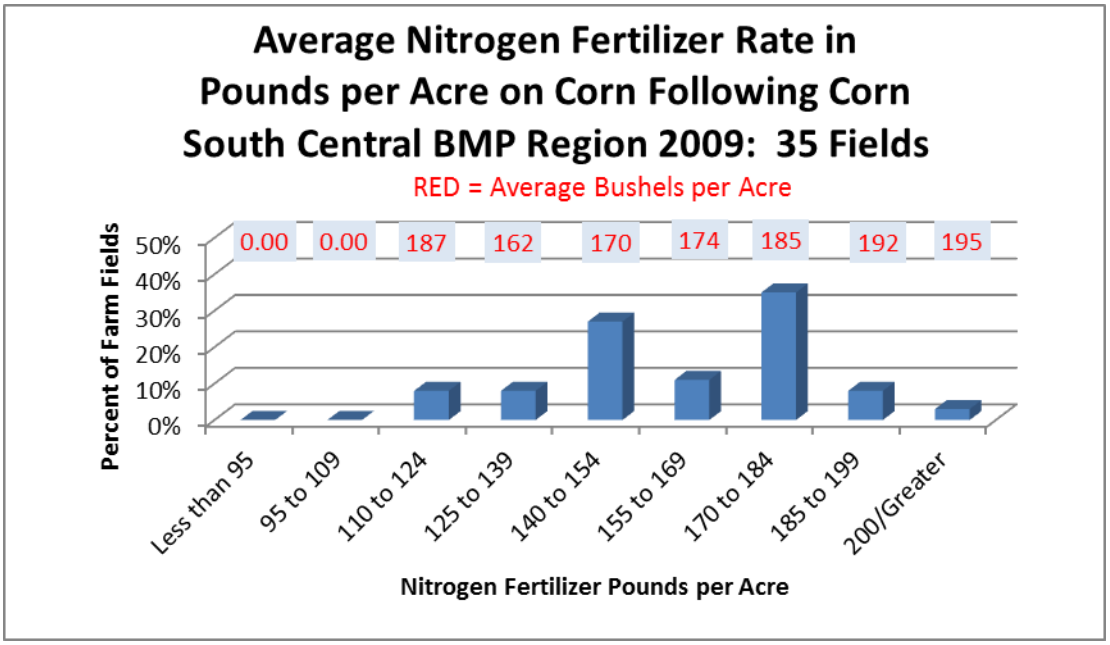

Figure 23. Average nitrogen fertilizer rate distribution across the South Central best management practices region for corn following corn for the 2009 crop year.

County nitrogen fertilizer rates ranged from an average of 152 pounds per acre in Mower to 168 pounds per acre in Freeborn as shown in Table 7.

Table 7. Average County Nitrogen Fertilizer Rates for the South Central Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Brown	10	158	178
Faribault	7	161	190
Freeborn	5	168	176
Mower	6	152	176
Sibley	7	161	176

Southwestern and West Central Region: Corn Following Corn

There were 27 fields that were included in the corn following corn in the Southwestern and West Central region analysis. Figure 24 details the location, average rate of fertilizer nitrogen and average yield for corn following corn in the Southwestern and West Central best management practices region. Four counties in the Southwestern and West Central region had more than 5 responses.

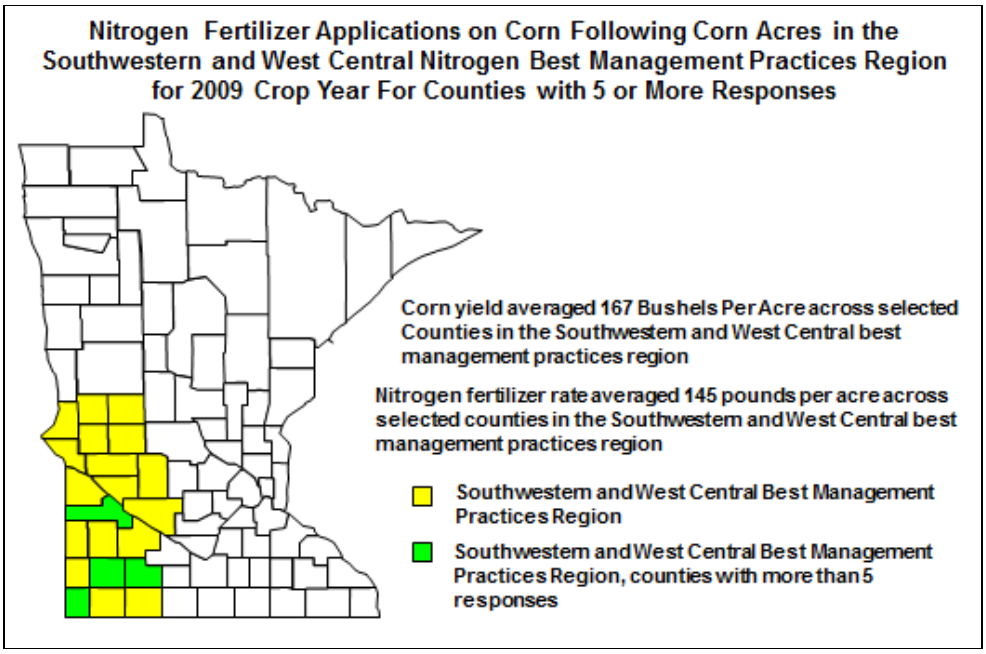

Figure 24. Corn yield averaged 167 bushels per acre and nitrogen fertilizer rate average 145 pounds per acre across the Southwestern and West Central best management practices region.

There were 27 fields that were included in the corn following corn Southwestern and West Central best management practices region analysis. Figure 25 details the distribution of nitrogen fertilizer rates across the Southwestern and West Central region for corn following corn.

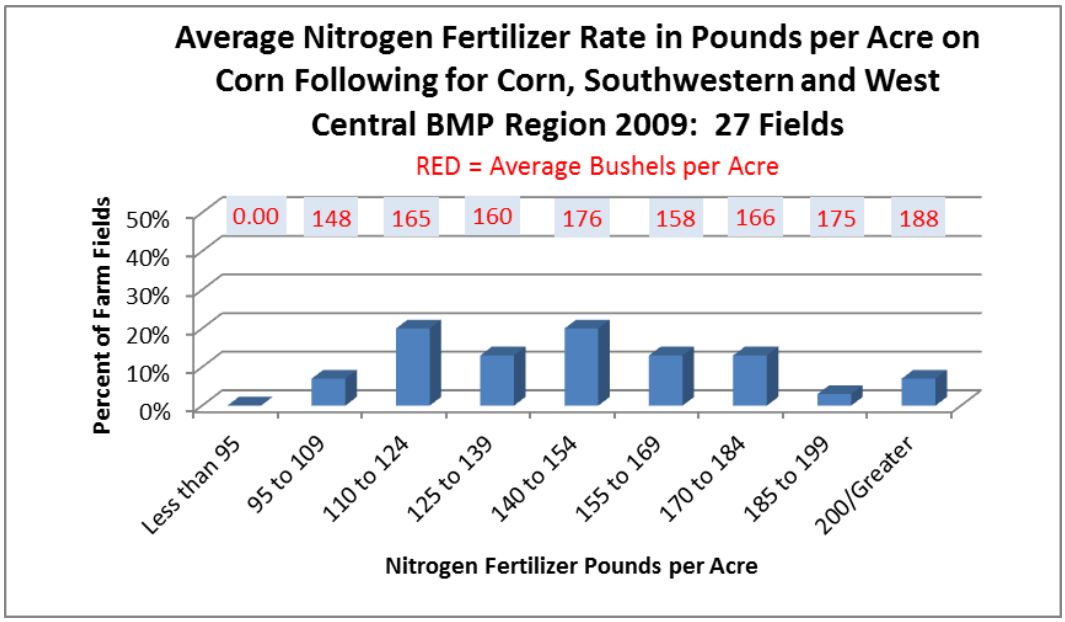

Figure 25. Average nitrogen fertilizer rate distribution across the Southwestern and West Central best management practices region for corn following corn for the 2009 crop year.

County nitrogen fertilizer rates ranged from an average of 134 pounds per acre in Rock to 153 pounds per acre in Cottonwood as shown in Table 8.

Table 8. Average County Nitrogen Fertilizer Rates for the Southwestern West Central Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Cottonwood	8	153	171
Murray	7	144	169
Rock	6	134	168
Yellow Medicine	6	147	156

Northwestern Region: Corn Following Corn

There were no counties with more than 5 fields of corn following corn in the Northwestern region analysis.

Irrigated and Non-irrigated Sand Soils Region: Corn Following Corn

There were 61 fields that were included in the corn following corn in the Irrigated and Non-irrigated Sandy Soils region analysis. Figure 26 details the location, average rate of fertilizer nitrogen and average yield for corn following corn in the Irrigated and Non-irrigated Sandy Soils region. Six counties in the Irrigated and Non-irrigated Sandy Soils region had more than 5 responses.

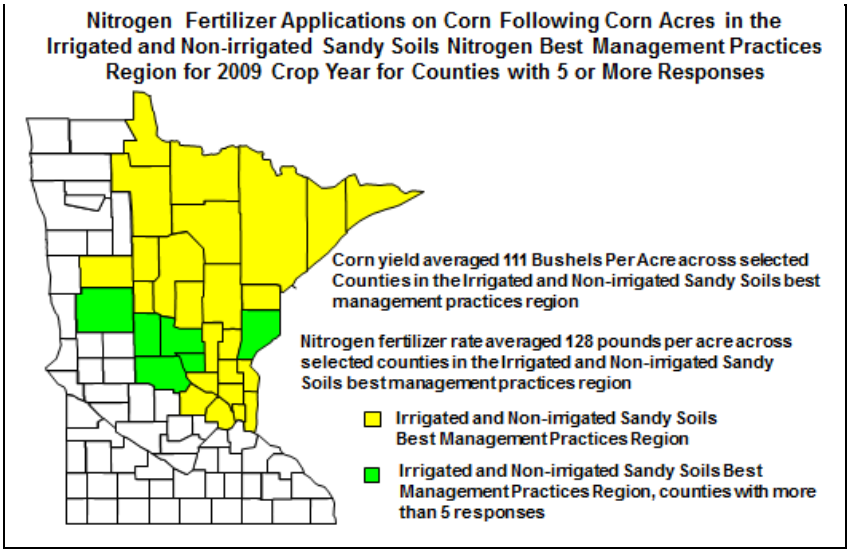

Figure 26. Corn yield averaged 111 bushels per acre and nitrogen fertilizer rate average 128 pounds per acre across the Irrigated and Non-irrigated Sandy soils best management practices region.

There were 61 fields that were included in the corn following corn Irrigated and Non-irrigated Sandy Soils best management practices region analysis. Figure 27 details the distribution of nitrogen fertilizer rates across the Irrigated and Non-irrigated Sandy Soils region for corn following corn.

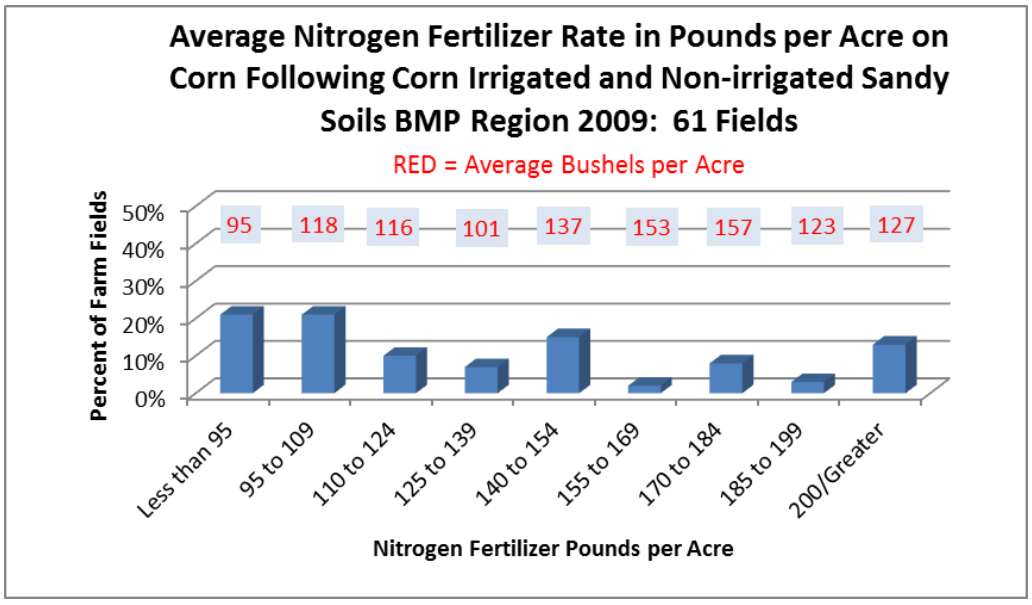

Figure 27. Average nitrogen fertilizer rate distribution across the Irrigated and Non-irrigated Sandy Soils best management practices region for corn following corn for the 2009 crop year.

Six counties had more than 5 responses in the Irrigated and Non-irrigated Sandy Soils best management practices region. County nitrogen fertilizer rates ranged from an average of 93 pounds per acre in Benton to 143 pounds per acre in Stearns as shown in Table 9.

Table 9. Average County Nitrogen Fertilizer Rates for the Irrigated and Non-irrigated Sandy Soils Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Benton	8	93	108
Morrison	15	138	98
Otter Tail	9	124	97
Pine	7	137	117
Stearns	15	143	138
Todd	7	119	102

Statewide: Corn Following Alfalfa

Two percent of the fields reported were corn following alfalfa fields. Figure 28 details the counties where farmers reported on fields with corn following alfalfa. There were 30 corn following alfalfa fields surveyed across Minnesota.

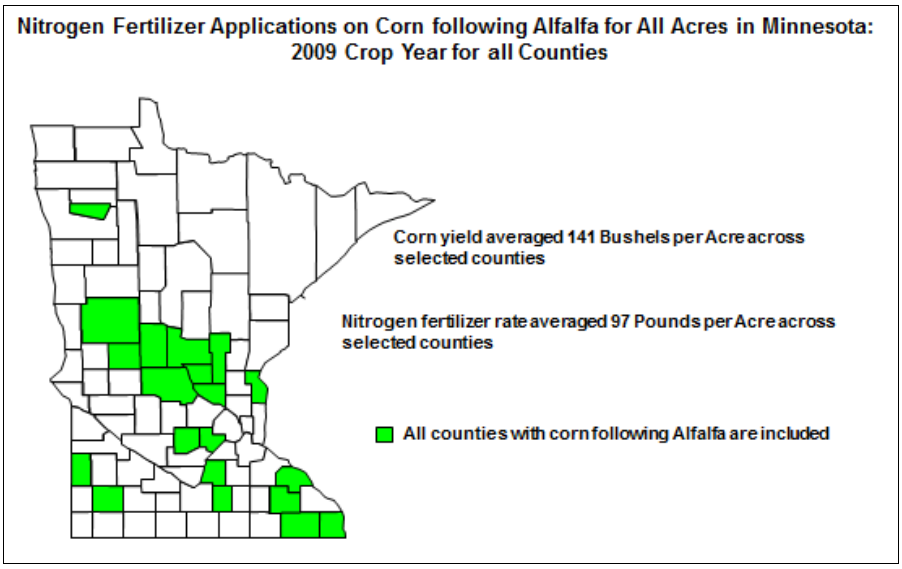

Figure 28. Counties with farmers reporting on corn following alfalfa fields.

There were 30 fields that were included in the corn following alfalfa statewide analysis. Figure 29 details the distribution of average nitrogen fertilizer rates across Minnesota for those corn following alfalfa fields.

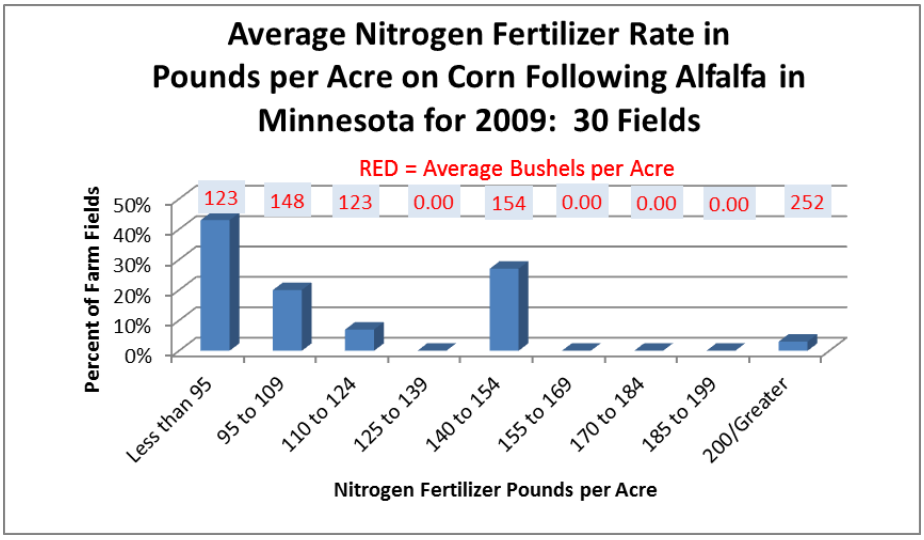

Figure 29. Distribution of the average nitrogen fertilizer rate for 30 corn following alfalfa fields across Minnesota.

No counties were represented with more than 5 responses so analysis by best management practices regions for nitrogen was not performed.

Statewide: Corn Following Other Crops

Four percent of the fields reported were corn following other crop fields. Figure 30 details the counties where farmers reported on fields with corn following other crops. There were 65 corn following other crop fields surveyed across Minnesota.

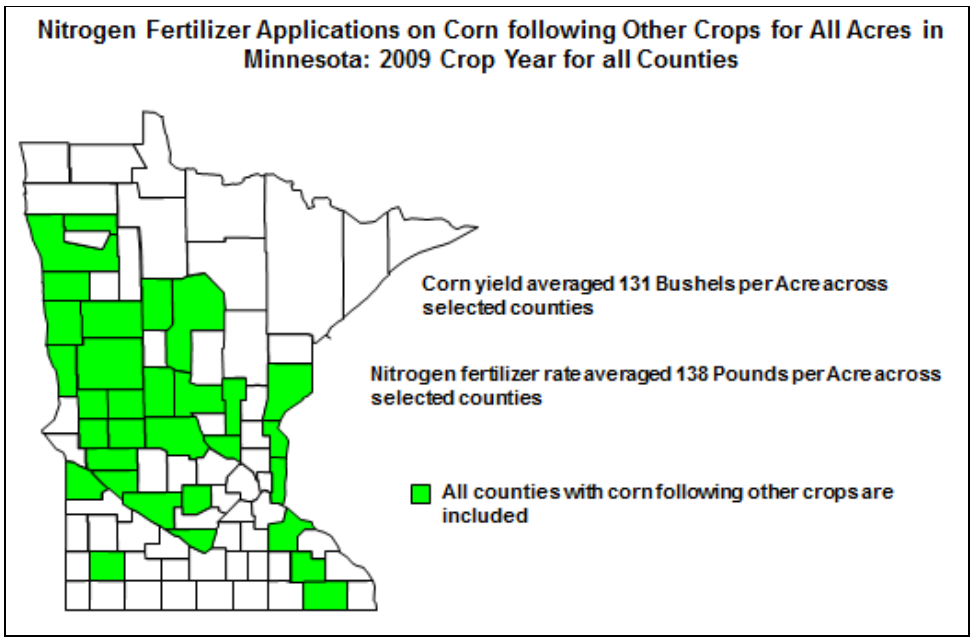

Figure 30. Counties with farmers reporting on corn following other crop fields.

There were 65 fields that were included in the corn following other crops statewide analysis. Figure 31 details the distribution of average nitrogen fertilizer rates across Minnesota for those corn following other crop fields.

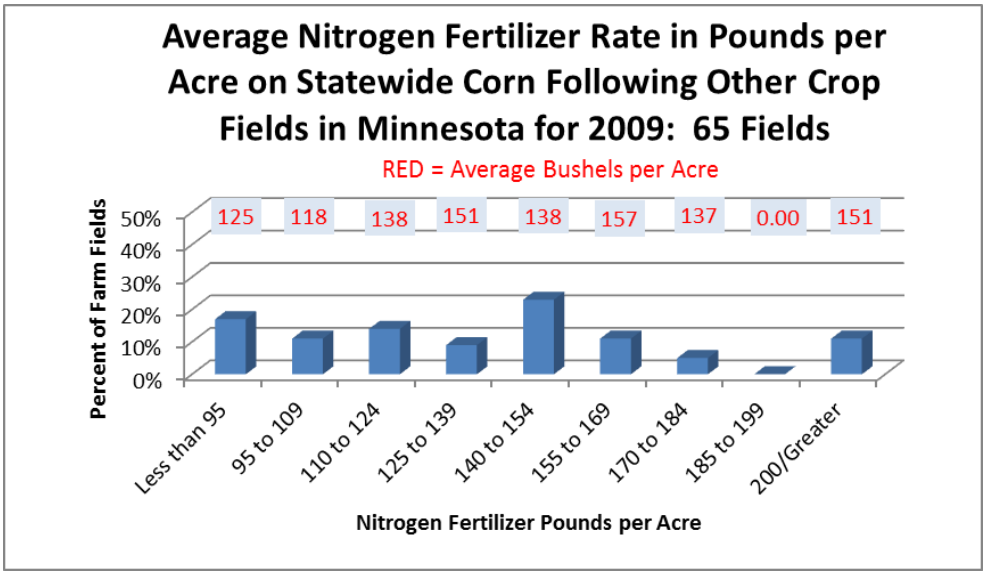

Figure 31. Distribution of the average nitrogen fertilizer rate for 30 corn following other crop fields across Minnesota.

Nitrogen fertilizer applications for corn following other crops differ across the state of Minnesota. Further analysis will be based only counties with 5 or more responses as shown in figure 32. There were 14 fields in this analysis.

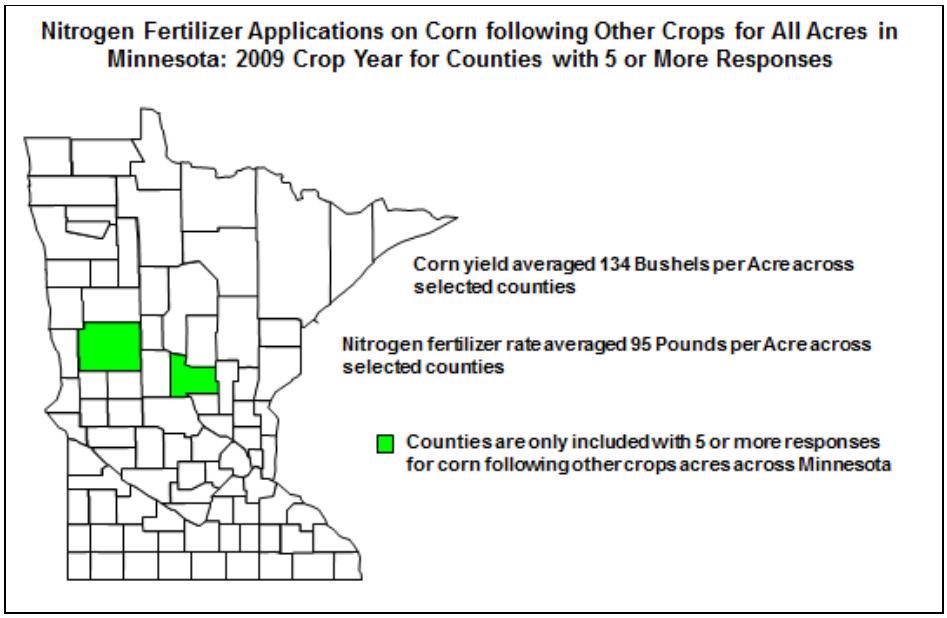

Figure 32. Nitrogen fertilizer applications on corn following other crop acres in Minnesota for the 2009 crop year. Only counties with 5 or more responses are included in the analysis.

There were 14 fields that were included in the corn following other crops statewide analysis. Figure 33 details the distribution of average nitrogen fertilizer rates across Minnesota for corn following other crops for counties with 5 or more responses.

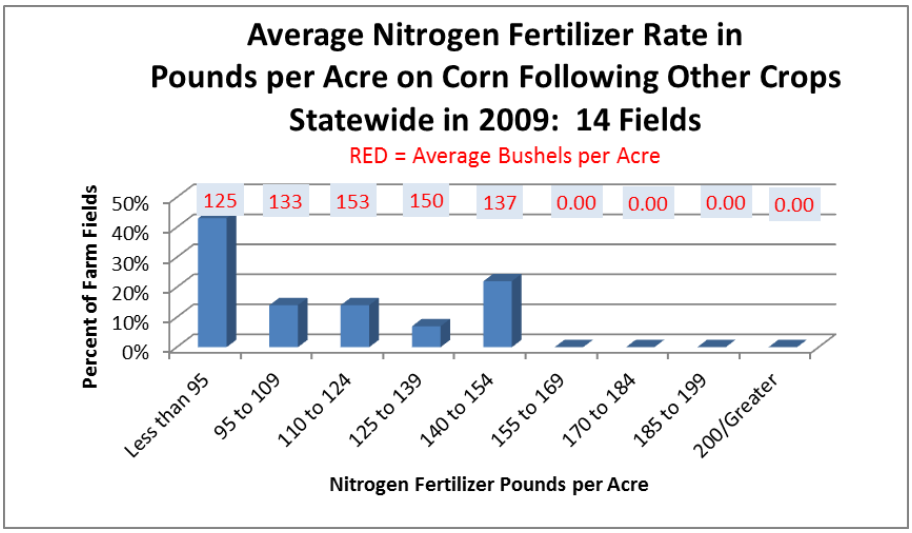

Figure 33. Average nitrogen fertilizer rate distribution across Minnesota for corn following other crops for the 2009 crop year for counties with more than 5 responses.

Only two counties had more than 5 responses for corn following other crops and both counties were in the Irrigated and Non-irrigated Sandy Soils region. Only the Irrigated and Non-irrigated Sandy Soils region will have analysis.

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

There were 14 fields that were included in the corn following other crops in the Irrigated and Non-irrigated Sandy Soils region analysis. Figure 34 details the location, average rate of fertilizer nitrogen and average yield for corn following corn in the Northwestern best management practices region. Two counties in the Irrigated and Non-irrigated Sandy Soils region had more than 5 responses.

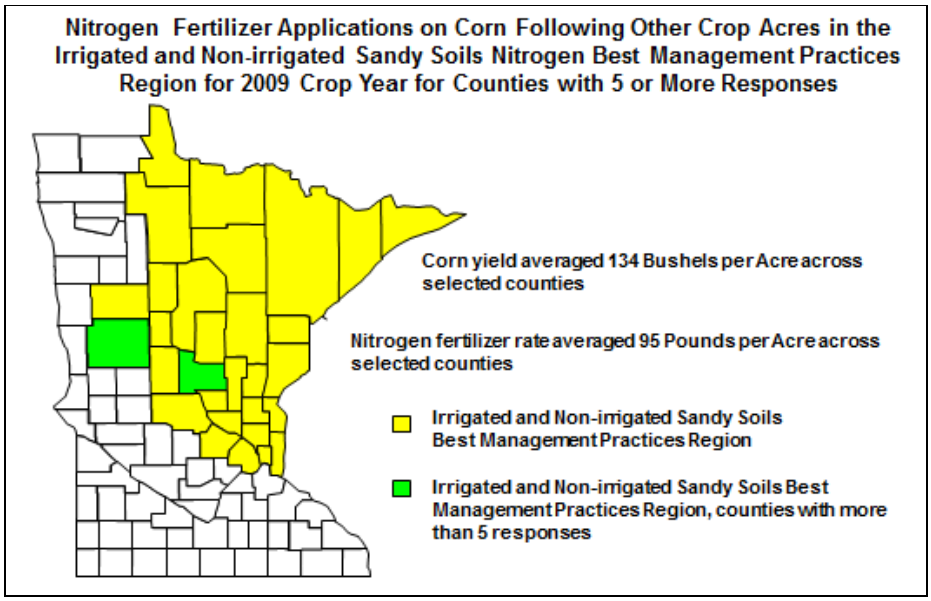

Figure 34. Corn yield averaged 134 bushels per acre and nitrogen fertilizer rate average 95 pounds per acre across the Irrigated and Non-irrigated Sandy soils best management practices region.

There were 14 fields that were included in the corn following other crops. Irrigated and Non-irrigated Sandy Soils best management practices region analysis. Figure 35 details the distribution of nitrogen fertilizer rates across the Irrigated and Non-irrigated Sandy Soils region for corn following other crops.

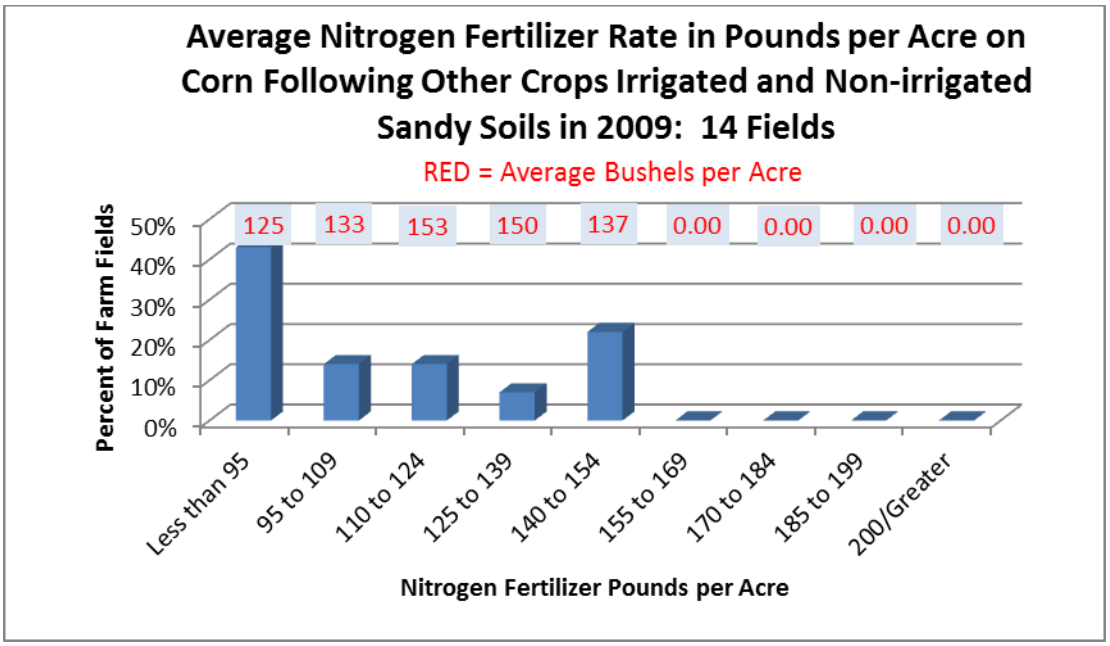

Figure 35. Average nitrogen fertilizer rate distribution across the Irrigated and Non-irrigated Sandy Soils best management practices region for corn following other crops for the 2009 crop year.

Two counties had more than 5 responses in the Irrigated and Non-irrigated Sandy Soils best management practices region. County nitrogen fertilizer rates ranged from an average of 67 pounds per acre in Morrison to 116 pounds per acre in Otter Tail as shown in Table 10.

Table 10. Average County Nitrogen Fertilizer Rates for the Irrigated and Non-irrigated Sandy Soils Best Management Practices Region

County	Number of Farm Fields	Nitrogen Fertilizer Rate	Yield Bushels per Acre
Morrison	6	67	125
Otter Tail	8	116	141