2000 Nutrient Management Assessment of Producers

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General information:
Farmers in the Cottage Grove Nitrate Study Area (CGNSA).

Elevated nitrate levels are found throughout much of the Prairie du Chien and Jordan aquifers in Cottage Grove, Minnesota. The City of Cottage Grove and homeowners in the surrounding townships rely on groundwater as their only source of drinking water. As the population grows, the city expects to add several wells to the current water supply network. The city is growing towards the east and south into areas that have exhibited elevated nitrate levels. If the trend of nitrate contamination in groundwater continues, there is a threat to the future ability of the Cottage Grove to utilize the Prairie du Chien and Jordan Aquifers.

Washington County Department of Public Health & Environment maintains a database of water testing information analyzed through the County's sampling program. From the period starting in the 1970s to present, over 500 nitrate analyses were conducted on wells in the Cottage Grove area. The average nitrate level in the City of Cottage Grove is 5.3 mg/L as N, and the median is 4.2. Of the samples collected in Cottage Grove, 16% exceeded the Health Risk Limit[1] (HRL) of 10 mg/L as N. A subset of 30 sites sampled over a period of five years or more showed that in 27 of 30 sites, nitrate levels have been increasing in the last five years.

In 2000, the Minnesota Pollution Control Agency Groundwater Monitoring and Assessment Program (MPCA GWMAP) conducted a cursory review of groundwater quality in Cottage Grove. Seventy-four (74) private domestic drinking water wells were analyzed for a range of chemical parameters. Nitrate was identified as "the contaminant of greatest concern." The median nitrate concentration measured in the Prairie du Chien aquifer and the Jordan Aquifer was 6.1 mg/L as N and 5.4 mg/L as N, respectively. More than 16% (12/74) of the wells had nitrate levels greater than the established HRL of 10 mg/L as N. The MPCA GWMAP study concluded the "nitrate concentrations were strongly correlated with herbicide concentrations, indicating that agriculture is the probably source for much of the nitrate."

In the summer of 2000, the Minnesota Department of Agriculture (MDA) conducted a Farm Nutrient Management Assessment Program (FANMAP) study of the commercial enterprises in the Cottage Grove area. Eleven businesses covering 556 acres were interviewed about their nitrogen practices. Businesses included nurseries, golf courses, tree farms, and berry farms. Approximately 30,000 pounds of nitrogen was applied for the 2000 year. Rates of nitrogen ranged from 0 lb/acre to 150 lb/acre. It appears that these enterprises may have a small role in the overall nitrate problems in the CGNSA, although potential problems would probably be very localized to a specific well or small group of wells.

[1] The Health Risk Limit is the level that is considered safe for human consumption by the Environmental Protection Agency.

This study focused on farming activities associated with the CGNSA[2] and reports the results of farm assessments conducted for the 2000 cropping season. A list of farmers/operators in the CGNSA was obtained from the Washington County Farm Service Agency. Minnesota Extension Service Educators, the City of Cottage Grove, the Washington County Public Health and Environment, Natural Resources Conservation Service (NRCS) personnel and Washington Conservation District (WCD) personnel were contacted to inform the farmers of the specifics and objectives of the project.

Introduction letters describing the project were mailed to the farmers in July of 2000. The letter's intent was to identify: 1) the overall project; 2) the purpose of the nutrient assessment; 3) why individual farmers were selected; and 4) what types of information and amount of time would be necessary to successfully complete the project. Letters were sent to 47 farm operations and a total of 39 operators participated in the study.

The Minnesota Department of Agriculture (MDA) used a data-gathering tool and analysis system called the Farm Nutrient Management Assessment Program (FANMAP) to conduct the study. FANMAP was developed seven years ago to provide an understanding of current farm practices regarding agricultural inputs. This information is used to design effective water quality educational programs and provides baseline data to determine program effectiveness over time. In the past seven years, more than 500 farmers throughout Minnesota have volunteered one to three hours of their time to share information about their farming operations. Previous FANMAP studies have been conducted as a result of funding through the Legislative Commission on Minnesota Resources or Clean Water Partnership programs and from the fertilizer tonnage fee account at the MDA. The previous reports can be found on the MDA website at http://www.mda.state.mn.us/appd/ace/fanmap.htm.

Nutrient Information of the Selected Farms in the Cottage Grove Nitrate Study Area

Inventory forms and database design were patterned after a previous successful project[3]. The following types of information were collected on a field-by-field basis for all inventoried acres within the CGNSA through FANMAP interviews:

- Timing, rates and method of applications were collected for all nitrogen (N), phosphate (P_2O_5) and potassium (K_2O) inputs (fertilizers, manures and legumes);
- Pesticide information; and
- Soil and manure testing results were collected if available.

[2] The Acronym CGNSA represents Cottage Grove Nitrate Study Area.

[3] Effective Nitrogen and Water Management for Water Quality Sensitive Regions of Minnesota, LCMR 1991-93

Nutrient inputs and yields were specific for the 2000 cropping season. Crop types and manure applications (starting in the fall of 1999) were also collected for the 1999 season for purposes of nitrogen crediting to crops grown during the 2000 season. Long-term yield data generally reflected the past three to five years. Livestock census and other specifics for the entire farm (i.e. types of manure storage systems, total farm sizes) were also recorded. Information was gathered from the farmer or from the fertilizer dealer if the dealer kept the farmer's records.

Farm Size, Crop and Livestock Characteristics of the Selected Farms in the Cottage Grove Nitrate Study Area

Thirty-nine farmers were interviewed for the study from March through April of 2001. A total of 8,968 acres of farmland was inventoried in the CGNSA study for the 2000 crop season. Aerial photographs provided by the Washington County Farm Service Agency indicate there are approximately 13,700 crop acres in the CGNSA. Farm interviews covered approximately 65% of all agricultural acres in the CGNSA. The CGNSA cropland was dominated by a field corn/soybean rotation accounting for 84% of all acres. Nine percent (9%) of all inventoried crop acres were irrigated. Figure 1 lists each type of crop grown and the corresponding percentage of acres.

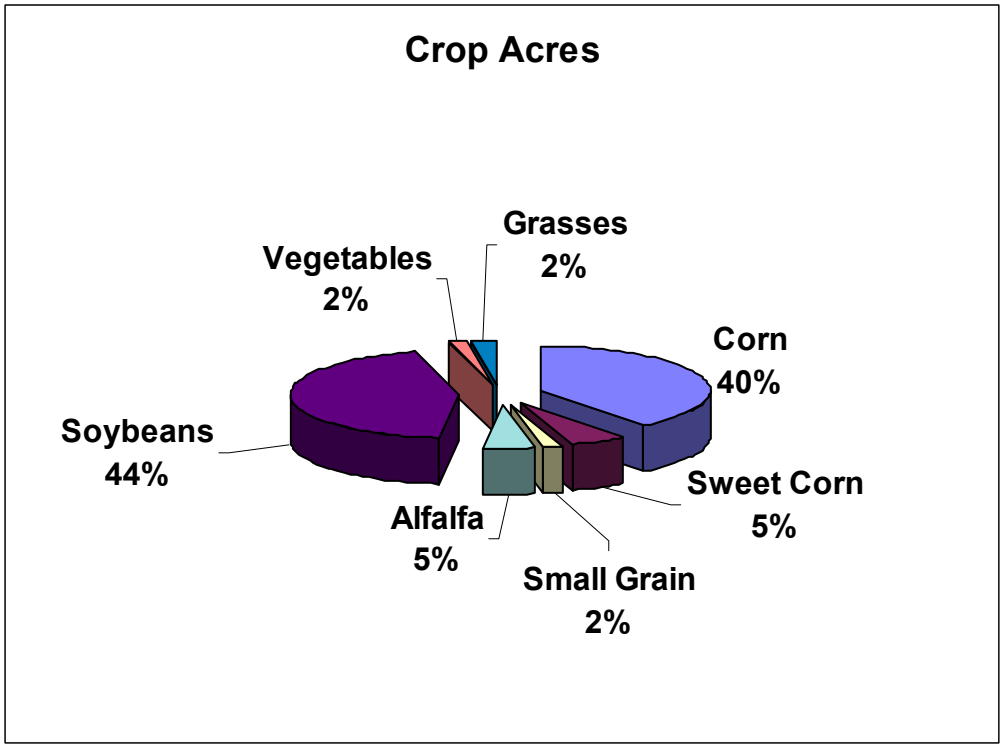


Figure 1. Crop types and percentages found during the 2000 cropping season on 39 farms within the CGNSA. Cropland totaled 8,968 acres.

Commercial Fertilizer Use Characteristics on Selected Farms: Cottage Grove Nitrate Study Area

Field corn accounted for more than 84% (516,897) of the 618,549 pounds of commercial N fertilizer applied on the 39 farms (Figure 2). All field corn acreage received either commercial N fertilizer or manure. Ninety-nine percent (99%) of all field corn acres received commercial N fertilizer. Average fertilizer N rate across all field corn acres was 145 lb/A. Total N inputs will be discussed later in the "Nutrient Balances and Economic Considerations" section of this report.

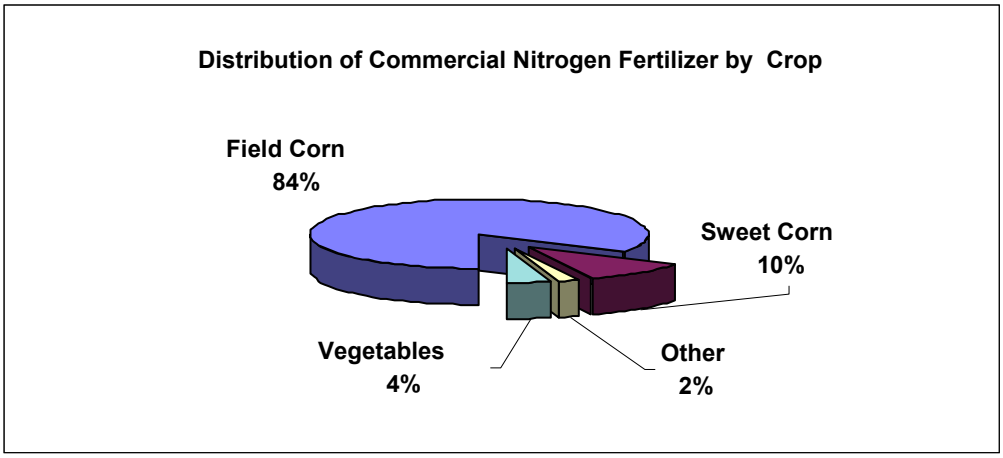


Figure 2. Commercial fertilizer N use on all inventoried acres. Commercial fertilizer N totaled 618,549 pounds.

Timing of N fertilizer applications for all crops is an important consideration on the coarse-textured soils in all of Minnesota. Sixty-two percent (62%) of commercial N applied to all crops was as a preplant application (Figure 3) and there was no fall applied N. This is particularly important in this region because of the coarse textured soils.

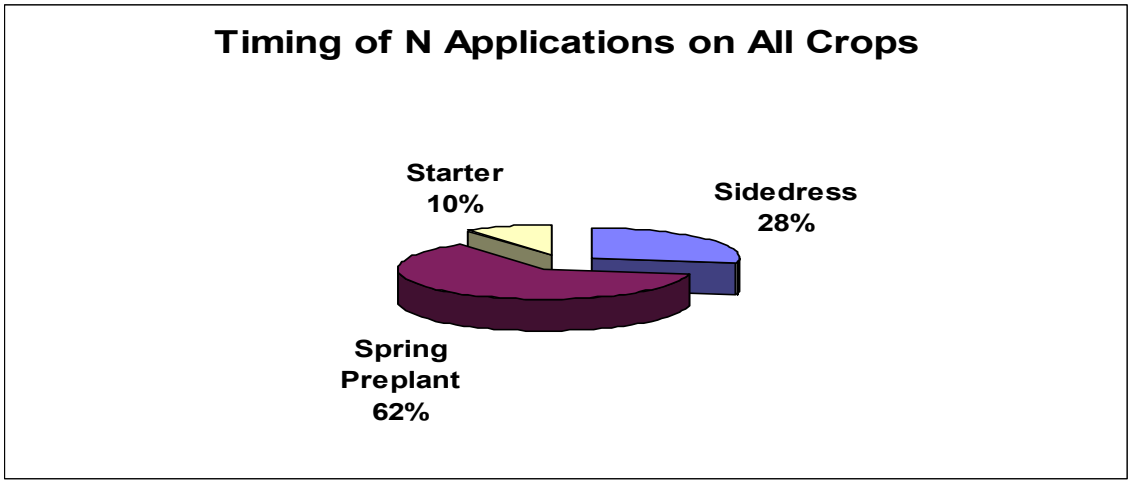


Figure 3.Timing of 2000 commercial N fertilizer applications across **all** inventoried acres.

Specific Best Management Practices for nitrogen use have been developed for east-central Minnesota[4]. Applications of nitrogen before spring planting of field corn are highly recommended in the CGNSA. Seventy percent (72%) of the N applied to field corn was as a spring preplant application (Figure 4).

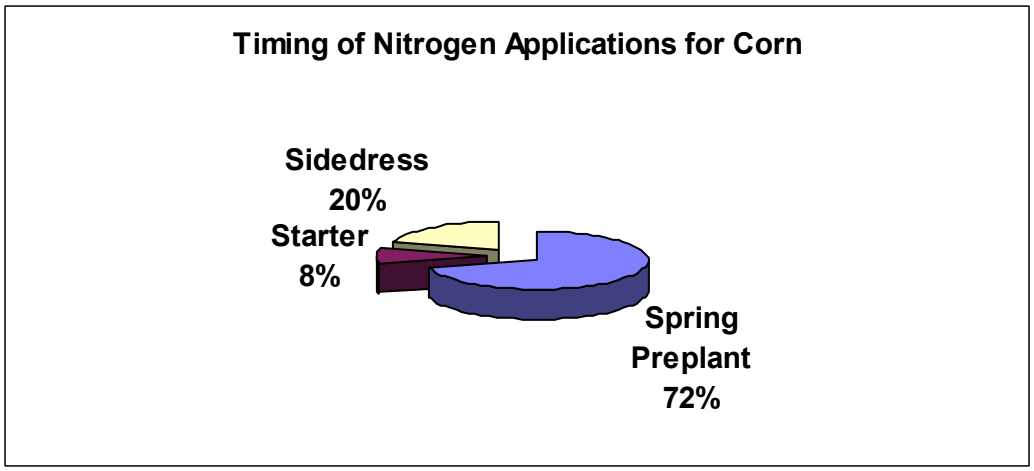


Figure 4. Timing of commercial N applications across all **field corn** acres.

Anhydrous ammonia supplied 59% of the commercial N applied to all inventoried field corn acres (Figure 5).

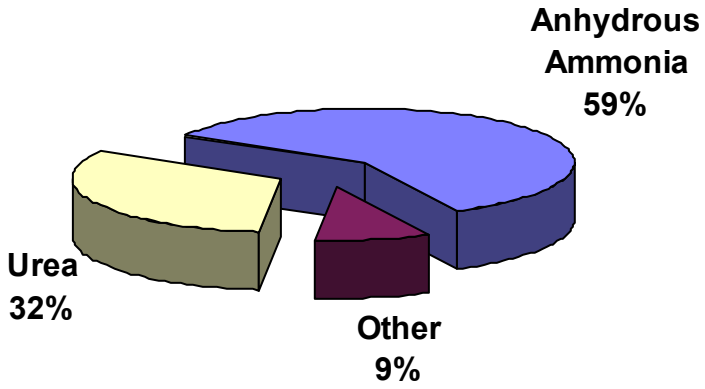


Figure 5. Sources of commercial N used on field corn acres.

[4] Best Management Practices for Nitrogen Use in East-Central and Central Minnesota. M.A. Schmitt, G.W. Randall, University of Minnesota.

Commercial N Applications on Field Corn

The total acres of field corn across the 39 farms was 3,567 acres, of which 110 acres were irrigated. None of these producers were fall applying N on field corn. Spring preplant applications for field corn acres totaled 369,312 pounds of commercial N. Sixty-two percent (62%) of spring preplant N was in the form of anhydrous ammonia with urea accounting for 37% of the balance. Nitrogen inhibitor was used with 147,267 pounds, or 64%, of the anhydrous ammonia during the spring preplant applications. Eight percent (8%) of the N was applied to field corn at planting and was a combination of various forms of N. Sidedress applications of N totaled 103,660 pounds. Farmers were generally applying the majority of sidedress N as anhydrous ammonia (74%), with the balance as urea (26%).

Commercial N Applications on Sweet Corn

Acres planted to sweet corn totaled 470 and all acres were irrigated. Average N rate per acre was 136 pounds across all surveyed acres. All sweet corn was grown for the fresh market. There was no fall application of N on sweet corn acres. Nitrogen applications of commercial N totaled 64,033 pounds with 13,233 pounds of N applied as a starter and the balance as a sidedress. Also 95% of N applied as a sidedress was in the urea ammonium nitrate (UAN) form.

Commercial N Applications on Vegetables

Acres planted to vegetables totaled 159 and all acres were irrigated. There was no fall application of commercial N on vegetable acres. Nitrogen applications of commercial N totaled 25,005 pounds with an average commercial N rate of 157 pounds per acre. Due to the fact that many different varieties of vegetables are grown for the fresh market, additional analysis was not possible.

Commercial N Applications on Other Crops

Nitrogen applications on other crops including small grains, pasture, and grasses consisted of 12,614 pounds of commercial N applied.

Livestock and Manure Characteristics of the Selected Farms:

Factors directly affecting crop nutrient availability from land-applied manure (including manure storage, types, manure amounts being generated, application methods, incorporation factors and rates) were also quantified to complete the "whole farm" nutrient balance. Livestock numbers represent the livestock on hand from the fall of 1999 to the summer of 2000 that contributed manure to the acres within the CGNSA for the 2000 crops. Approximately 10 of the 39 farmers had livestock but only 7 of the farmers had livestock that contributed manure to the CGNSA.

Animal production in the CGNSA consists of dairy and beef operations. Table 1 details the variety of animals produced in the CGNSA.

Table 1. 2000 Distribution of Livestock Across Inventoried Farms	
Livestock Type	**Livestock Number**
Dairy Cattle	305
Beef Cattle	201
Horses	30
TOTALS	**536**

Information on manure production was limited for those surveyed farmers. All 7 of the livestock farmers surveyed had a daily hauling system or a barn/lot manure system. No manure was collected in the liquid form. Most livestock was pastured during spring/summer/fall, and manure was generally not incorporated into the soil when broadcast onto the field.

Available manure N totaled only 9,487 pounds and was spread over 144 acres of cropland, of which 110 acres were corn acres.

Relative Importance of Nutrient Sources on the Selected Farms: Cottage Grove Nitrate Study Area

The University of Minnesota recommends legume crops be credited for their N contributions to subsequent crops. Alfalfa credits were available on only 25 acres of field corn. Field corn acres following alfalfa were given a 75 lb N/A credit. Soybean acres were given a 40 lb N/A credit for the following corn crop. Soybeans were the most important source of legume N, supplying approximately 99% of all legume N.

Commercial fertilizers (82%), manures (1%), and legumes (17%) contributed a total of 628,036 lb of "first year available N" to all inventoried acres in 2000 (Figure 6).

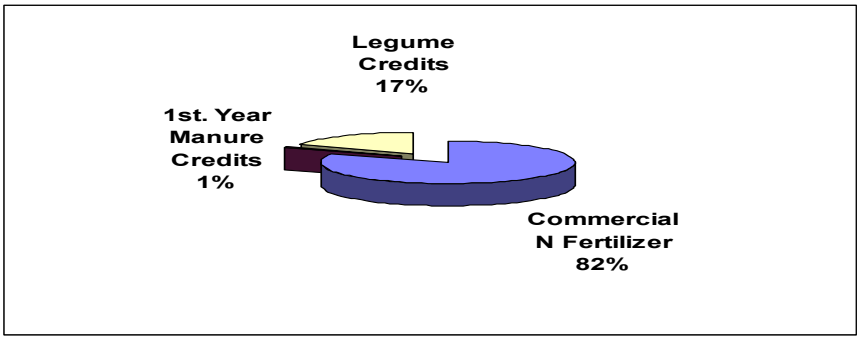


Figure 6. Relative N contributions from fertilizers, manures and legumes across all crop acres inventoried in 2000. Nitrogen inputs totaled 628,036 lb for all sources across all inventoried acres. Legume credits are reflected in UM recommendations and are not considered an input.

Nutrient Balances and Economic Considerations:
Cottage Grove Nitrate Study Area

Contributions of N from commercial fertilizer and manure to inventoried acres totaled 628,036 pounds. Field corn received most of the N with 84% (525,613 pounds of N) total application. Field corn yield goal across these farms averaged 160 Bu/A while historic yields averaged 162 Bu/A. Yield goals for corn were approximately 2 Bu/A greater than average yields for the past five years. It appears farmers are using realistic yield goals for field corn acres.

University of Minnesota recommendations are based on economic and environmental factors. Research at the Southern Minnesota Research & Outreach Center (Waseca) has shown that the recommendations are based on sound economic decisions and, in the long term, generally result in the most economic profit.

University of Minnesota (UM) N recommendations (based on yield goal, crop history, and soil organic matter level) were compared to actual amounts of fertilizer and manure applied to each field. In the fall of 2000 the UM released new fertilizer recommendations for field corn. This analysis will compare actual amounts of N with the new UM recommendations. Based on soil surveys and actual soil tests in this survey, all soils in the CGNSA are considered low in organic matter. Organic matter levels for irrigated soils are classified as low in the UM fertilizer recommendation tables. Irrigation was limited on surveyed field corn acres with 110 acres irrigated.

New 2000 UM N recommendations for corn averaged 155 lb N/A. Actual amounts of N applied from fertilizer and manure averaged 147 lb N/A across all corn acres (figure 7). Factoring in all appropriate credits from fertilizer, legumes and manures, there was an **under**-application rate of 8 lb/N/A according to the new UM recommendations.

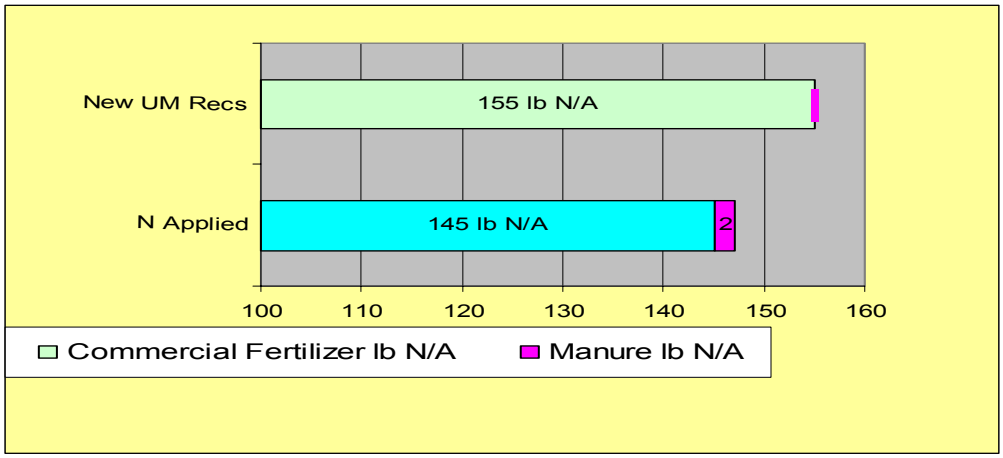


Figure 7. 2000 crop N requirements based on 2000 University of Minnesota nitrogen recommendations in comparison to actual N inputs (fertilizer and manure) for field corn acres in the inventoried area. Average N application was 147 lb N/A.

One major advantage of the technique developed through the nutrient assessment process is the ability to examine in great detail the nutrient balances and make some inferences on where the biggest gains in water quality can be obtained through focused educational programs. Factoring in legume N credits and manure N credits into the process on a field-by-field basis, the amounts in excess of UM recommendations are illustrated in Figure 8.

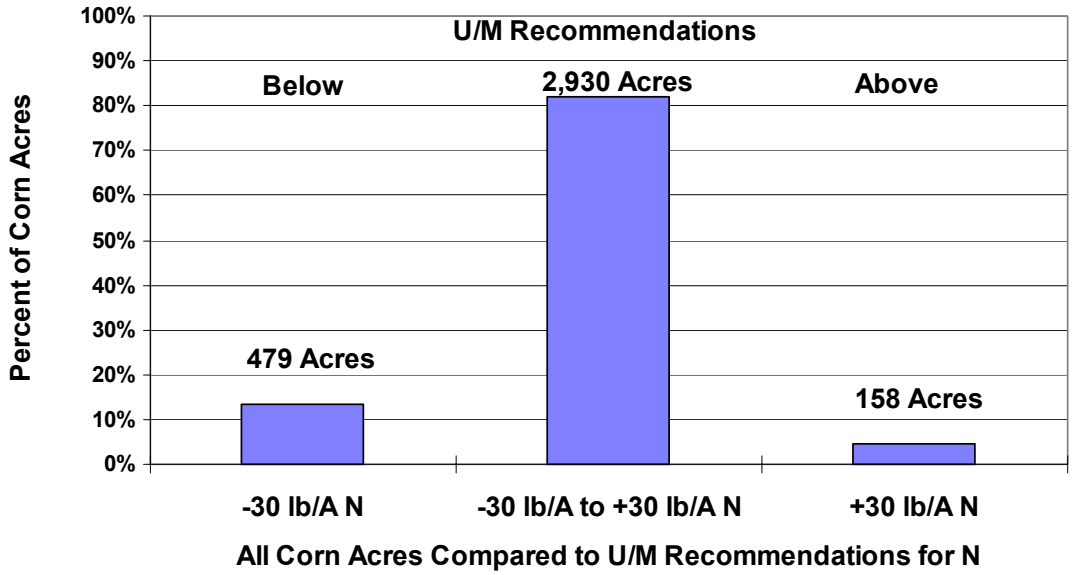


Figure 8. Field corn acres that fall within plus and minus 30 pounds of the 2000 UM recommendations for N.

Four percent (4%) of the field corn acres were classified in the excess category according to the UM recommendations. By applying the N according to the UM recommendations, N applied to corn acres would actually increase inputs by 28,817 lbs.

Contributions of N from commercial fertilizer and manure applied to sweet corn and vegetable acres accounted for 16% of all N applied in the CCNSA. Most, if not all vegetable and sweet corn acres were grown for the fresh market and were hand harvested throughout the season. Because of the frequent harvesting, yield goals were not established by the farmers. At this time there are no recommendations for these crops based on hand harvesting.

Pesticide Applications:
Cottage Grove Nitrate Study Area:

Pesticide use data was gathered on all crop acres. Pesticides were used on 90% of all crop acres (Table 2). Pesticide use on the CGNSA included herbicides, insecticides and fungicides.

Table 2. Crop Acreage and Percentage Treated With Pesticides.

Crop Grown	Total Acres	Pesticides	
		Acres Applied With Pesticides	Percent of Total Acres
Corn	3,567	3,547	99%
Sweet Corn	470	400	85%
Soybeans	3,934	3,805	97%
Other	997	281	28%
Total Acres	**8,968**	**8,033**	**90%**

Pesticide use on all acres consisted of 48 different formulas (different EPA numbers). Table 3 describes the pesticide and the corresponding Active Ingredients (AI) of each pesticide product used.

Table 3. Product Name and Description of Herbicide Use in CGNSA.					
Name Of Product	**EPA Number**	**Herbicide Insecticide Fungicide**	**Active Ingredients (AI)**	**AI in Product**	**AI Expressed as**
2,4-D Amine	5905-72	Herbicide	2,4-D	5.700	Pounds Per Gallon
Accent	352-560	Herbicide	Nicosulfuron	0.750	Percent By Weight
Accent Gold	352-593	Herbicide	Clopyralid Flumetsulam Nicosulfuron Rimsulfuron	0.517 0.190 0.070 0.070	Percent By Weight
Admire 2	3125-422	Insecticide	Imidacloprid	2.000	Pounds Per Gallon
Asana XL	352-515	Insecticide	Esfenvalerate	0.660	Pounds Per Gallon
Assure II	352-541	Herbicide	Quizalofop P Ethyl	0.880	Pounds Per Gallon
Atrazine 90 WDG	34704-622	Herbicide	Atrazine	0.900	Percent By Weight
Aatrex 90	100-585	Herbicide	Atrazine	0.855	Percent By Weight
Axiom	3125-488	Herbicide	Flufenacet Metrabuzin	0.540 0.136	Percent By Weight
Aztec	3125-412	Insecticide	Tebupirimphos Cyfluthrin	0.020 0.001	Percent By Weight
Banvel SGF	7969-135	Herbicide	Sodium Salt of Dicamba	2.000	Pounds Per Gallon
Basagran	7969-45	Herbicide	Sodium Salt of Bentazon	4.000	Pounds Per Gallon
Basis	352-571	Herbicide	Rimsulfuron Thifensulfuron	0.500 0.250	Percent By Weight
Baythroid	3125-351	Insecticide	Cyfluthrin	2.000	Pounds Per Gallon
Bladex 90DF	352-495	Herbicide	Cyanazine	0.900	Percent By Weight
Buctril	264-437	Herbicide	Bromoxynil	2.000	Pounds Per Gallon
Clarity	7969-137	Herbicide	Dicamba Diglycolamine Salt	4.000	Pounds Per Gallon
Copper	5905-491	Fungicide	Copper Hydroxide	3.000	Pounds Per Gallon
Counter CR	241-314	Insecticide	Terbufos	0.200	Percent By Weight
Degree	524-496	Herbicide	Acetochlor	3.800	Pounds Per Gallon
Doubleplay	10182-388	Herbicide	EPTC Acetochlor	5.600 1.400	Pounds Per Gallon
Dual II Magnum	100-818	Herbicide	Metolachlor	7.640	Pounds Per Gallon
Dual II Magnum SI	100-829	Herbicide	Metolachlor	7.640	Pounds Per Gallon
Eradicane 6.7E	10182-223	Herbicide	EPTC	6.700	Pounds Per Gallon
Extreme	241-405	Herbicide	Imazethapyr Glyphosate	0.170 2.000	Pounds Per Gallon
First Rate	62719-275	Herbicide	Cloransulam-Methyl	0.840	Percent By Weight
Flexstar	10182-418	Herbicide	Sodium Salt Of Fomesafen	0.221	Pounds Per Gallon
Fusion	10182-343	Herbicide	Fluazifop-P-Butyl Fenoxaprop-p-ethyl	2.000 0.560	Pounds Per Gallon
Harness	524-473	Herbicide	Acetochlor	7.000	Pounds Per Gallon
Hornet	62719-253	Herbicide	Flumetsulam Clopyralid	0.231 0.630	Percent By Weight
Kocide DF	1812-334	Fungicide	Copper Hydroxide	0.614	Percent By Weight
Liberty	45639-199	Herbicide	Glufosinate-Ammonium	1.670	Pounds Per Gallon
Lightning	241-377	Herbicide	Imazethapyr Imazapyr	0.525 0.175	Percent By Weight
Lorsban 15G	62719-34	Insecticide	Chlorpyrifos	0.150	Percent By Weight
Marksman	7969-136	Herbicide	Dicamba Potassium Salt Atrazine	0.134 0.222	Pounds Per Gallon
Northstar	100-923	Herbicide	Primisulfuron Sodium Salt of Dicamba	 0.075	Percent By Weight
Orthene 75S	59639-26	Insecticide	Acephate	0.750	Percent By Weight
Pinnicle	352-525	Herbicide	Thifensulfuron Methyl	0.250	Percent By Weight
Prestige	7969-88-241	Herbicide	Sethoxydim	1.000	Pounds Per Gallon
Prowl 3.3 EC	241-337	Herbicide	Pendimethalin	3.300	Pounds Per Gallon
Pursuit DG	241-350	Herbicide	Imazethapyr	0.700	Percent By Weight
Raptor	241-379	Herbicide	Ammonium Salt Of Imazamox	1.000	Pounds Per Gallon
Reflex	10182-83	Herbicide	Fomesafen	2.000	Pounds Per Gallon
Ridomil Gold EC	100-801	Fungicid	Metalaxyl	4.000	Pounds Per Gallon
Roundup Ultra	524-475	Herbicide	Glyphosate	3.000	Pounds Per Gallon
Surpass 100	10182-363	Herbicide	Acetochlor Atrazine	3.000 2.000	Pounds Per Gallon
Treflan	62719-250	Herbicide	Trifluralin	4.000	Pounds Per Gallon
Warrior	10182-96	Insecticide	Lambda-Cyhalothrin	1.000	Pounds Per Gallon

There were a total of 12,400 pounds of active ingredients (AI) from all pesticides used on all crops. Herbicide AI totaled 11,673 pounds and fungicide and insecticide AI totaled 351 and 376 pounds respectively (Figure 9).

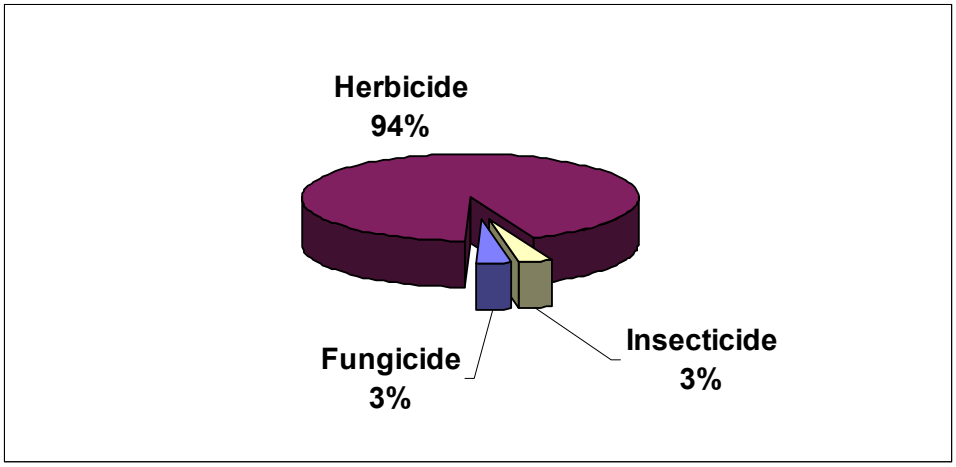


Figure 9. Contributions of active ingredients (AI) of pesticides. A total of 10,804 pounds of AI were applied to all surveyed acres.

Field corn acres accounted for 55% of all pesticide AI (Figure 10).

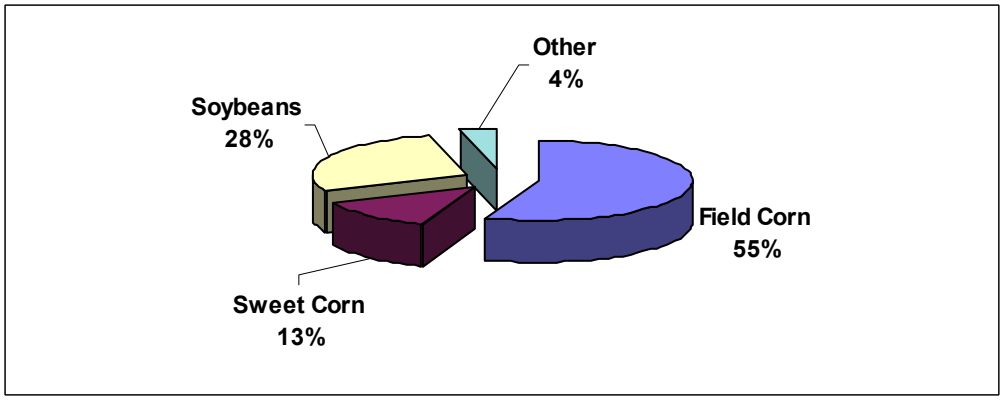


Figure 10. Application of pesticides applied to inventoried acres by crop type.

Table 4 summarizes each compound, coverage and total pounds of AI.

Table 4. Pesticide Use And Acres Covered by Compound.		
Name Of Compound	**Acres Covered**	**Total Pounds**
2,4-D	10	7
Acephate	55	21
Acetochlor	859	908
Atrazine	2,426	2,409
Bentazon	710	361
Bromoxynil	200	68
Chlorpyrifos	75	90
Clopyralid	1,247	94
Cloransulam-methyl	112	<1
Copper	85	303
Cyanazine	297	218
Cyfluthrin	220	6
Dicamba	886	144
Eptc	389	1,463
Esfenvalerate	125	4
Fenoxaprop-p-ethyl	113	4
Fluazifop-p-butyl	113	3.6
Flufenacet	65	39
Flumetsulam	1,247	59
Fomesafen	115	24
Glufosinate-ammonium	450	153
Glyphosate	2,430	1,874
Imazamox	100	3
Imazapyr	90	<1
Imazethapyr	1,519	311
Imidacloprid	4	1
Lambda-cyhalothrin	565	14
Metalazyl	95	48
Metolachlor	1,233	2,365
Metribuzin	65	10
Nicosulfuron	1,152	13
Pendimethalin	1,262	1,021
Primisulfuron	540	11
Quizalofop p ethyl	220	12
Rimsulfuron	883	7
Sethoxydim	660	62
Tebupirimphos	120	1
Terbufos	200	240
Thifensulfuron Methyl	101	1
Trifluralin	55	27

Pesticide use on corn acres consisted of 18 separate compounds. Table 5 details each compound used and the number of acres covered by each compound.

Table 5. Pesticide Use on Corn Acres.

Name Of Compound	Acres Covered	Pounds of Compound Applied
Acetochlor	859	908
Atrazine	2,226	2,153
Bromoxynil	200	68
Chlorpyrifos	75	90
Clopyralid	1,247	94
Cyanazine	297	218
Cyfluthrin	120	1
Dicamba	874	143
Flufenacet	65	39
Glufosinate-ammonium	450	153
Imazapyr	90	<1
Imazethapyr	90	<1
Lambda-cyhalothrin	110	2
Metolachlor	1,033	2,174
Metribuzin	65	10
Nicosulfuron	1,152	13
Pendimethalin	486	413
Primisulfuron	540	11
Rimsulfuron	883	7
Tebupirimphos	120	1
Thifensulfuron Methyl	21	<1

Figure 11 compares the top 7 pesticides used on field corn, based on acres.

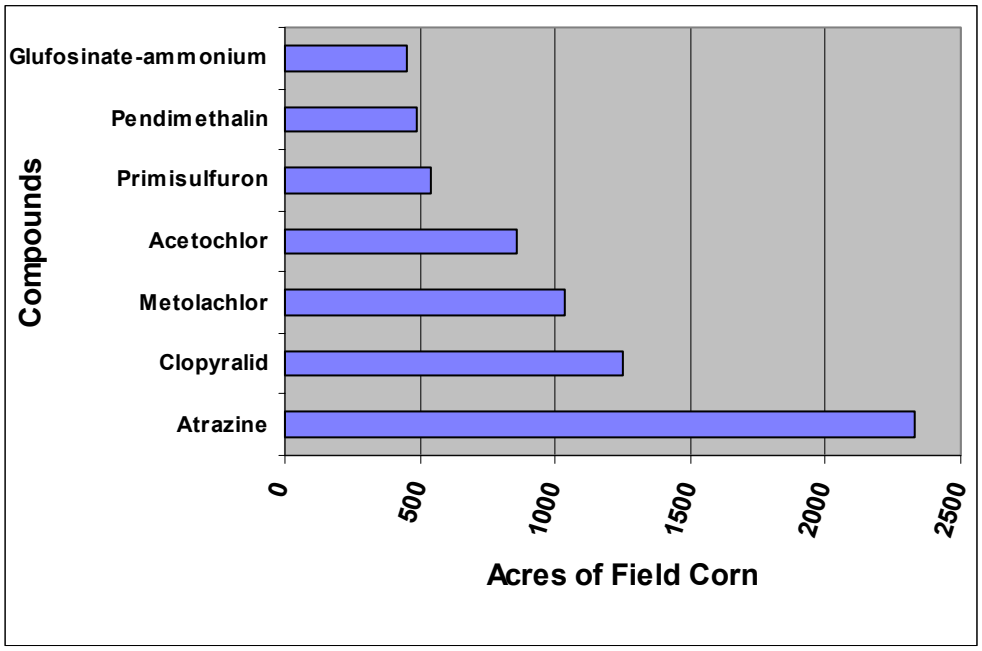


Figure 11. The top 7 active ingredients from herbicides applied to field corn acres, based on acres covered.

Figure 12 compares active ingredients from pesticides applied to field corn, based on pounds of active ingredients.

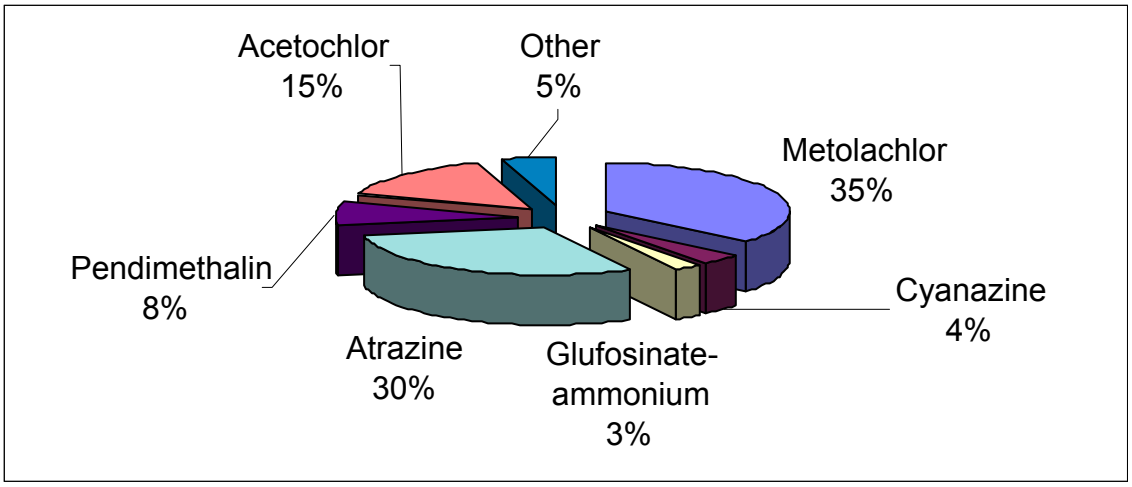


Figure 12. Active ingredients applied to field corn acres, based on pounds of AI applied.

Sweet corn received pesticide applications from 5 different compounds (Table 6).

Table 6. Pesticide Use on Sweet Corn Acres.

Name Of Compound	Acres Covered	Pounds of Compound Applied
Atrazine	200	256
Eptc	200	670
Lambda-cyhalothrin	400	10
Metolachlor	200	191
Terbufos	200	240

Soybean acres received pesticide applications from 13 different compounds (Table 7).

Table 7. Pesticide Use on Soybean Acres.

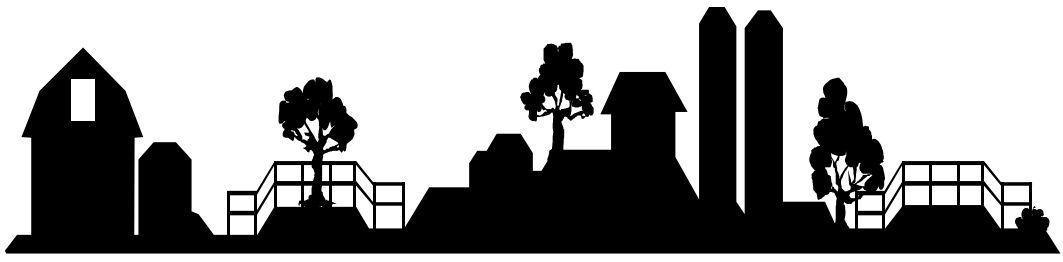
Name Of Compound	Acres of Soybeans Covered	Pounds of Compound Applied
Bentazon	710	361
Cloransulam-methyl	112	1
Fenoxaprop-p-ethyl	113	4
Fomesafen	115	24
Glyphosate	2,430	1,874
Imazamox	100	3
Imazethapyr	1,429	312
Pendimethalin	776	608
Quizalofop p ethyl	220	12
Sethoxydim	660	62
Thifensulfuron methyl	80	1

Vegetables, small grains, and other crops grown by the 39 inventoried farmers also received pesticides. Pesticide use, acres covered and pounds of AI for these crops are listed in table 8.

Table 8. Pesticide Use on Other Crops.

Pesticide	Acres Covered	Pounds of Compound Applied
2,4-D	10	7
Acephate	55	21
Copper	85	303
Cyfluthrin	100	5
Dicamba	12	1
Esfenvalerate	125	4
Imidacloprid	4	1
Lambda-cyhalothrin	55	1
Metalazyl	95	48
Trifluralin	55	27

It appears all applications of pesticides are at or below recommended rates for both application rates per application and total AI allowed per year.



Conclusions and Summary of the Current Nutrient Management Practices for the Cottage Grove Nitrate Study Area.

The Cottage Grove Nitrate Study Area consists of coarse-textured soils which are common in the east-central Minnesota region. Thirty-nine farmers, farming 9,000 acres in the CGNSA, were interviewed by the Minnesota Department of Agriculture using the Farm Nutrient Management Assessment Program (FANMAP) tool. Producers volunteered one to two hours of their time to share information about their farming operations. The overall purpose of the program was to develop a clear understanding of current farm practices regarding agricultural nutrients and pesticides and use this knowledge for future water quality educational programs.

Approximately 65% of the crop acres within the CGNSA were inventoried. Field corn and soybeans were the dominant crops with 88% of all acres planted to these crops. Forty percent (40%) of the crop acres were planted with field corn and 84% of the 600,000 pounds commercial N was applied to those field corn acres. Sixty-two percent (62%) of all N applied was during spring preplant applications. No N was fall applied. Anhydrous ammonia and urea accounted for 59% and 32% of the N, respectively. Nitrogen inhibitors were applied with spring preplant applications of N, and 64% of field corn acres applied with anhydrous ammonia used nitrogen inhibitors.

Manure N (first year available) accounted for 1% of all relative N contributions with legumes and commercial N accounting for 17% and 82%, respectively. Soybeans were the dominant source of legume N credits accounting for more than 99% of all legume N credits.

In the fall of 2000, the University of Minnesota came out with new recommendations for field corn. According to the new recommendations only 4% of the field corn acres were over-applied with N by more than 30 pounds/A or more.

Pesticide use was prevalent in the CGNSA, as 90% of all crop acres were applied with herbicides, pesticides or fungicides. Pesticide use consisted of 48 different formulas. There were 38 separate compounds of active ingredient used in these pesticide applications, totaling 11,000 pounds of active ingredients.

Herbicide use was dominated by field corn with 55% of all AI applied to field corn. Atrazine and Metolachlor were the most used compounds accounting for 30% and 35% of all AI, respectively. It also appears all applications of pesticides are at or below recommended rates for both rates per application and total AI allowed per year.

Some very positive results were discovered through this study. There is strong evidence that producers are voluntarily adopting the educational materials and recommended N management strategies developed by the UM for the CGNSA. It is also evident that promotional activities need to continue and be specifically targeted to deliver the most recent advances in technology and revised N management and new UM recommendations for the area.