



# **Herbicide Selection and Management Practices Associated with Minnesota's 2004 Corn Production**

Minnesota Department of Agriculture  
USDA, NASS, Minnesota Field Office

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## **Introduction**

### **Acknowledgements**

This survey was a cooperative effort by the Minnesota Department of Agriculture (MDA), the National Agricultural Statistics Service (NASS), and the NASS Field Offices in Minnesota and North Dakota. This detailed herbicide use information could not have been collected without the cooperation of the hundreds of farmers who voluntarily responded to the survey in the midst of their busy lives, and for this we are extremely grateful. Similarly, the assistance of agricultural chemical dealers and co-operatives is much appreciated. Special thanks go to Doug Hartwig and the late Eddie Oaks, Director and Deputy Director, respectively; of the NASS Minnesota Field Office, Bill Meyer, Deputy Director of the NASS North Dakota Field Office and their respective staff for assistance with survey design, data collection and processing; especially the late Tom DeJong, who provided the computer form for data entry, enabling phone enumerators to better collect information. 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 and agricultural chemical dealerships played a vital part in providing complete and detailed pesticide information.

### **2004 Herbicide Use Practices Summary and Highlights**

This report summarizes a number of important practices associated with herbicide use on Minnesota's 2004 corn acres. Over three thousand (3,040) producers participated in the telephone survey and herbicide information was collected from 657,361 acres representing 9% of Minnesota's seven million corn acres. Most of this report focused on the respondents (98%) that used herbicides for weed control. The survey targeted a variety of practices including herbicide selection and associated management practices (e.g., MDA's best management practices for herbicide use). The report is the second consecutive pesticide survey performed by the MDA and NASS.

### **Objective of the Survey:**

Herbicide Best Management Practices (BMPs) have been developed and are currently being promoted to optimize production and profitability while protecting the state's water resources. This survey was conducted to assess the status of herbicide selection and associated management practices by Minnesota corn farmers and this survey tool will provide baseline data for future assessment of BMP adoption. The survey will also provide valuable insight into targeting and designing future educational activities.

### **Survey Design and Implementation**

Ten Pesticide Monitoring Areas (noted as "PMA" throughout the report), illustrated in Figure 1, were previously developed (cite past report) by MDA staff. Counties were clustered based on similarities in geology, soils, and crops. The areas also define the general boundaries of the monitoring regions used by the MDA water resource monitoring program. Regional pesticide use information will eventually be used to help

design and implement specific water quality monitoring and pesticide educational programs.

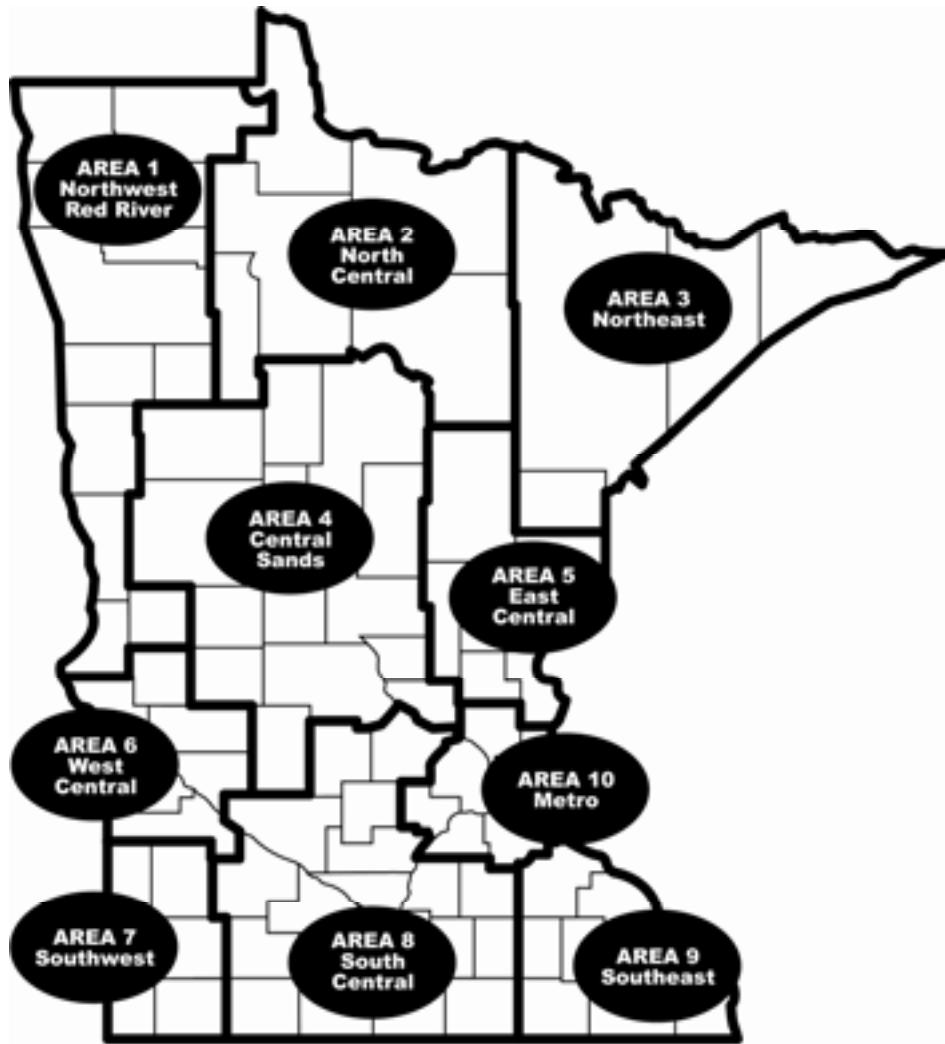
NASS developed a sampling population of 6,500 farms by randomly drawing from its entire database of all corn growers in Minnesota. Approximately 4,700 farmers were contacted by NASS phone enumerators<sup>1</sup>. Of the 4,000 farmers<sup>2</sup> that provided information to the enumerators, 3,040 raised corn in 2004 and completed the survey. No information was collected from the remaining farmers that did not raise corn. The definition of “corn” for purposes of this report includes both grain and silage and excludes sweet corn, seed corn and popcorn.

Due to the low intensity of row crop agriculture in portions of northern Minnesota, Area 2 and Area 3 were not reported individually and are included in the “other regions” category starting with Table 2.

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<sup>1</sup> USDA, NASS, North Dakota Field Office, North Dakota State University Campus, Fargo, ND.

<sup>2</sup> The balance of the seven hundred names either could not be contacted or were no longer farming.



**Figure 1.** Geographical location of MDA's Pesticide Monitoring Areas (PMAs).

## Data Collection Process

Farmers were interviewed over the phone in April and May of 2005. 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 is based upon either the participant’s memory or information readily available during the interview. The interviews would typically last five to ten minutes.

Survey questions can be found in Appendix 1. Corresponding question numbers (noted as “Q” followed by the survey 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.

Questions were grouped into four categories including:

1. **General information.** Questions on who applied the product, label and active ingredient questions, and questions on record keeping.
2. **Scouting for weeds and related practices.** Questions about scouting, mapping, weed type, density, and herbicide resistance corn varieties.
3. **Water resources.** Questions regarding the physical distances from ground water, surface water and buffers, and regarding irrigation management plans.
4. **General practices.** Questions regarding herbicide rotations, dealer involvement in decision making process in regard to herbicide management and internet sales.

After obtaining some very general NASS information (Q.1), participants were then asked if they grew corn during the 2004 cropping season (Q.2). The interview process ended if there was no field or silage corn grown. Participants were then asked to identify the number of corn acres planted (Q.3). A total of 657,361 corn acres are represented in the survey. Table 1 includes the number of respondents and associated corn acres by county and Pesticide Monitoring Area. Also included is the NASS total corn acres for Minnesota (2003) and the percentage of acres surveyed. The survey covered 9% of the state’s total corn acres.

## Data Reporting and Limitations

The primary purpose of this survey was to develop an understanding of basic herbicide management practices associated with corn production. Participants were asked to identify the herbicides used in very generic terms. Some knowledge of the herbicides used (i.e. soil applied, post-emergent, etc) is essential to understand the current management strategies associated with them. It is important to note that the MDA and its partners provide a highly detailed herbicide use and application rate report on a biennial basis<sup>3</sup>.

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 datasets. Many surveys

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<sup>3</sup> “2003 Pesticide Usage on Four Major Minnesota Crops”  
<http://www.mda.state.mn.us/appd/pesticides/pesticideuse2003.pdf>

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.<sup>4</sup> This survey did not employ such strategies; rather, corn farmers were randomly selected from across Minnesota. Therefore, weighting across areas or counties was not performed. The MDA can be contacted to further discuss interpretation of the survey data.

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<sup>4</sup> For an explanation of survey methods and data quality associated with annual county-level data, visit the NASS “Quik Stats” Frequently Asked Questions website at <http://www.nass.usda.gov:81/ipedbcnty/faqs.htm>



**Table 1. Summary of respondents and corresponding corn acres by county and PMAs.**

<b>County</b>	<b>Pesticide Monitoring Area (PMA)</b>	<b>Number of Respondents</b>	<b>2003 Planted Corn Acres</b>	<b>Surveyed Corn Acres</b>	<b>Percentage of Acres Surveyed</b>
Clay	1	14	41,700	4,208	10%
Grant	1	30	88,000	8,399	10%
Kittson	1	5	5,400	425	8%
Mahnomen	1	8	16,300	2,445	15%
Marshall	1	5	7,600	1,033	14%
Norman	1	6	30,000	746	2%
Pennington	1	Not Included			
Polk	1	19	24,000	2,601	11%
Red Lake	1	4	5,500	246	4%
Roseau	1	3	6,400	230	4%
Traverse	1	20	111,100	9,655	9%
Wilkin	1	14	47,200	4,141	9%
<b>Totals/Averages</b>	<b>1</b>	<b>128</b>	<b>383,200</b>	<b>34,129</b>	<b>9%</b>
Beltrami	2	7	4,400	286	7%
Clearwater	2	6	3,600	374	10%
Itasca	2	1	**	20	**
Koochiching	2	2	**	300	**
Lake of the Woods	2	Not Included			
<b>Totals/Averages</b>	<b>2</b>	<b>16</b>	<b>**</b>	<b>910</b>	<b>**</b>
Carlton	3	6	1,600	316	20%
St. Louis	3	1	**	40	**
Lake	3	Not Included			
Cook	3	0			
<b>Totals/Averages</b>	<b>3</b>	<b>7</b>	<b>**</b>	<b>256</b>	<b>**</b>
Becker	4	20	20,200	2,606	13%
Benton	4	38	59,700	5,512	9%
Cass	4	10	7,800	1,007	13%
Crow Wing	4	13	7,700	971	13%
Douglas	4	31	56,600	5,443	10%
Hubbard	4	3	11,800	443	4%
Kandiyohi	4	38	140,900	11,736	8%
Morrison	4	83	97,300	10,418	11%
Otter Tail	4	112	151,700	14,228	9%
Pope	4	46	97,200	16,011	16%
Sherburne	4	9	27,800	704	3%
Stearns	4	159	208,300	19,156	9%
Todd	4	88	73,600	7,699	10%
Wadena	4	20	22,600	3,365	15%
<b>Totals/Averages</b>	<b>4</b>	<b>670</b>	<b>983,200</b>	<b>99,299</b>	<b>10%</b>
Aitkin	5	8	1,400	187	13%
Chisago	5	27	24,200	3,922	16%
Isanti	5	14	32,500	3,654	11%
Kanabec	5	23	16,500	2,775	17%

\*\* Not reported by NASS

County	Pesticide Monitoring Area (PMA)	Number of Respondents	2003 Planted Corn Acres	Surveyed Corn Acres	Percentage of Acres Surveyed
Mille Lacs	5	30	23,000	3,432	15%
Pine	5	26	19,700	2,169	11%
<b>Totals/Averages</b>	<b>5</b>	<b>128</b>	<b>117,300</b>	<b>16,139</b>	<b>14%</b>
Big Stone	6	17	77,200	4,527	6%
Chippewa	6	44	139,400	18,417	13%
Lac Qui Parle	6	46	157,900	15,488	10%
Stevens	6	27	143,100	6,764	5%
Swift	6	38	160,500	14,862	9%
Yellow Medicine	6	39	182,800	15,639	9%
<b>Totals/Averages</b>	<b>6</b>	<b>211</b>	<b>860,900</b>	<b>75,697</b>	<b>9%</b>
Lincoln	7	47	93,100	10,258	11%
Lyon	7	48	176,500	13,375	8%
Murray	7	49	174,000	17,053	10%
Nobles	7	57	192,600	17,930	9%
Pipestone	7	41	95,900	8,005	8%
Rock	7	44	128,100	12,765	10%
<b>Totals/Averages</b>	<b>7</b>	<b>286</b>	<b>860,200</b>	<b>79,386</b>	<b>9%</b>
Blue Earth	8	63	178,700	14,603	8%
Brown	8	69	165,300	13,049	8%
Cottonwood	8	50	175,700	13,737	8%
Faribault	8	54	197,300	21,315	11%
Freeborn	8	46	173,100	11,665	7%
Jackson	8	64	178,700	19,401	11%
Le Sueur	8	35	92,400	7,395	8%
Martin	8	55	216,200	18,545	9%
McLeod	8	59	105,300	8,792	8%
Meeker	8	50	111,300	9,519	9%
Nicollet	8	55	117,000	12,248	10%
Redwood	8	71	233,300	19,865	9%
Renville	8	68	246,600	23,183	9%
Rice	8	41	80,500	7,613	9%
Sibley	8	51	135,900	11,053	8%
Steele	8	31	102,600	7,976	8%
Waseca	8	48	117,100	9,823	8%
Watonwan	8	34	120,300	8,585	7%
Wright	8	63	77,900	7,186	9%
<b>Totals/Averages</b>	<b>8</b>	<b>1,007</b>	<b>2,825,200</b>	<b>245,553</b>	<b>9%</b>
Dodge	9	30	109,100	8,155	7%
Fillmore	9	74	160,800	13,017	8%
Goodhue	9	81	138,200	12,036	9%
Houston	9	55	56,700	6,337	11%
Mower	9	41	171,300	12,923	8%
Olmsted	9	52	110,100	8,318	8%
Wabasha	9	48	87,700	8,105	9%
Winona	9	58	84,300	7,145	8%
<b>Totals/Averages</b>	<b>9</b>	<b>439</b>	<b>918,200</b>	<b>76,036</b>	<b>8%</b>
Anoka	10	7	8,300	1,231	15%
Carver	10	38	61,900	5,740	9%
Dakota	10	40	91,100	10,447	11%
Hennepin	10	16	15,900	1,880	12%
Ramsey	10	<b>Not</b>			

<b>County</b>	<b>Pesticide Monitoring Area (PMA)</b>	<b>Number of Respondents</b>	<b>2003 Planted Corn Acres</b>	<b>Surveyed Corn Acres</b>	<b>Percentage of Acres Surveyed</b>
		<b>Included</b>			
Scott	10	29	41,100	5,602	14%
Washington	10	18	21,100	4,886	23%
<b>Totals/Averages</b>	<b>10</b>	<b>148</b>	<b>239,400</b>	<b>29,786</b>	<b>12%</b>
<b>State</b>	<b>ALL</b>	<b>3,040</b>	<b>7,200,000</b>	<b>657,361</b>	<b>9%</b>

**Note: USDA/NASS Minnesota Corn Acreage Planted**

### **Statewide Herbicide Applications on Corn**

Ninety-four percent (94%) of the respondents reported using herbicides and these respondents managed 98% of the corn acres (644,579 Acres.) reported in this survey (Table 2). The remaining two percent that did not receive a herbicide application was managed by six percent of respondents. This portion of the respondents tended to grow less corn acres than the majority that used herbicides (75 and 225 acres, respectively). If herbicides were not used, the survey was then concluded.

Tables 3 through 30 contain information from all corn producers that used herbicides. Not all farmers answered every question resulting in some acres or farmer numbers totaling less than the statewide numbers.

Participants were then asked who made the application (Q. 4). Acres were evenly split between self-applied (45%) and those using a custom applicator (46%). Table 2 summarizes who applied the application and the responses are grouped by PMAs.

Farmers that applied their own herbicides tended to be on the larger operations (corn grown averaged 283 acres) compared to farmers that relied on custom applicators (corn grown averaged 152 acres). Eight percent of the respondents that used both methods and those operations raised an average of 313 acres of corn.

**Table 2. Percentage of respondents that used corn herbicides.**

<b>Pesticide Monitoring Area</b>	<b>Do You Use Herbicides?</b>	<b>Percent of All Respondents</b>
1 – Red River	Yes	94%
1 – Red River	No	6%
4 – Central Sands	Yes	93%
4 – Central Sands	No	7%
5 – East Central	Yes	86%
5 – East Central	No	14%
6 – Upper MN	Yes	97%
6 – Upper MN	No	3%
7 – Southwest	Yes	97%
7 – Southwest	No	3%
8 – South Central	Yes	96%
8 – South Central	No	4%
9 – South East	Yes	95%
9 – South East	No	5%
10 – Metro	Yes	92%
10 - Metro	No	8%
Other	Yes	83%
Other	No	7%
<b>Statewide</b>	<b>Yes</b>	<b>94%</b>
<b>Statewide</b>	<b>No</b>	<b>6%</b>

**Table 3. Did you: “Apply herbicides yourself?, Have herbicides custom applied?, Both?” (Q.4).**

<b>Pesticide Monitoring Area</b>	<b>Application Type</b>	<b>Percent of Respondents</b>	<b>Average Corn Acres per Respondent</b>
		<i>%</i>	<i>Acres</i>
1 – Red River	Self Applied	55%	333
1 – Red River	Custom Applied	40%	159
1 – Red River	Both	5%	400
4 – Central Sands	Self Applied	40%	198
4 – Central Sands	Custom Applied	56%	115
4 – Central Sands	Both	4%	276
5 – East Central	Self Applied	44%	119
5 – East Central	Custom Applied	53%	135
5 – East Central	Both	3%	460
6 – Upper MN	Self Applied	53%	413
6 – Upper MN	Custom Applied	33%	252
6 – Upper MN	Both	14%	441
7 – Southwest	Self Applied	57%	333
7 – Southwest	Custom Applied	30%	208
7 – Southwest	Both	13%	235
8 – South Central	Self Applied	46%	328
8 – South Central	Custom Applied	44%	158
8 – South Central	Both	10%	301
9 – South East	Self Applied	40%	215
9 – South East	Custom Applied	54%	140
9 – South East	Both	6%	331
10 – Metro	Self Applied	39%	231
10 – Metro	Custom Applied	54%	190
10 – Metro	Both	7%	307
Other	Self Applied	63%	75
Other	Custom Applied	37%	54
<b>Statewide</b>	<b>Self Applied</b>	<b>45%</b>	<b>283</b>
<b>Statewide</b>	<b>Custom Applied</b>	<b>47%</b>	<b>152</b>
<b>Statewide</b>	<b>Both</b>	<b>8%</b>	<b>313</b>

Farmers were asked to identify the most common brand name of herbicide used on their corn acres (Q.5). Glyphosate was listed as the most used product followed by atrazine, acetochlor, metolachlor and alachlor (Table 4). Self-applicators used glyphosate for frequently. For highly detailed information on specific products, rates, and active ingredients, the reader is once again referred to the previously mentioned biennial report.

**Table 4. “What is the product name of the herbicide that was applied to the majority of your corn acres in 2004” (Q.5).**

<b>Product</b>	<b>Percent of All Respondents (Self and Custom Applications)</b>	<b>Percent of Respondents (Self-Application Only)</b>
Glyphosate	24%	34%
Atrazine	16%	14%
Acetochlor	14%	16%
Metolachlor	4%	4%
Alachlor	<1%	0%
Other	41%	32%
Total	100%	100%

Farmers were asked if they knew the active ingredients in the herbicides they applied (Q.7). Based upon previous surveys, most farmers can identify the product name (i.e. “Roundup”, etc) but identifying the active ingredient is considerably more challenging. Statewide for all respondents (self-applicators and those that hired a custom applicator), 21% knew the active ingredients (A.I.) in their herbicide applications and another 5% knew some of the active ingredients (Table 5). Thirty percent of the farmers that applied the products themselves were able to identify the AI. It must be emphasized that farmers were asked these questions “on the spot” and were not given the opportunity to check their records during the telephone interview.

**Table 5. “Do you know the active ingredients of the herbicides you used in 2004?”(Q.7).**

<b>Pesticide Monitoring Area</b>	<b>Knew the Active Ingredients</b>	<b>Percent of All Respondents</b>	<b>Percent of “Self-Applicators”</b>
1 – Red River	Yes	21%	24%
1 – Red River	Some	3%	3%
1 – Red River	No	76%	73%
4 – Central Sands	Yes	21%	33%
4 – Central Sands	Some	5%	6%
4 – Central Sands	No	74%	61%
5 – East Central	Yes	25%	38%
5 – East Central	Some	4%	4%
5 – East Central	No	71%	58%
6 – Upper MN	Yes	27%	39%
6 – Upper MN	Some	4%	4%
6 – Upper MN	No	69%	57%
7 – Southwest	Yes	29%	36%
7 – Southwest	Some	5%	5%
7 – Southwest	No	66%	59%
8 – South Central	Yes	20%	27%
8 – South Central	Some	4%	5%
8 – South Central	No	76%	68%
9 – South East	Yes	17%	24%
9 – South East	Some	8%	11%
9 – South East	No	75%	65%
10 – Metro	Yes	13%	23%
10 – Metro	Some	2%	2%
10 - Metro	No	85%	75%
Other	Yes	16%	25%
Other	No	84%	75%
<b>Statewide</b>	<b>Yes</b>	<b>21%</b>	<b>30%</b>
<b>Statewide</b>	<b>Some</b>	<b>5%</b>	<b>6%</b>
<b>Statewide</b>	<b>No</b>	<b>74%</b>	<b>65%</b>

\*Totals may not add due to rounding

Producers were asked if they kept pesticide application records on the farm (Q.8). Statewide, 66% of all respondents kept all their herbicide records on the farm and another 3% kept some records on the farm (Table 6). Eighty-two percent of the farmers that applied their own herbicides kept the records on the farm.

**Table 6. “Do you keep herbicide application records on your farm?” (Q.8)**

<b>Pesticide Monitoring Area</b>	<b>Kept “On Farm” Pesticide Records</b>	<b>Percent of All Respondents</b>	<b>Percent of Self-Applicators</b>
1 – Red River	Yes	67%	82%
1 – Red River	Some	2%	0%
1 – Red River	No	31%	18%
4 – Central Sands	Yes	57%	75%
4 – Central Sands	Some	3%	2%
4 – Central Sands	No	40%	23%
5 – East Central	Yes	67%	83%
5 – East Central	Some	3%	0%
5 – East Central	No	30%	17%
6 – Upper MN	Yes	72%	85%
6 – Upper MN	Some	2%	0%
6 – Upper MN	No	26%	15%
7 – Southwest	Yes	72%	82%
7 – Southwest	Some	3%	2%
7 – Southwest	No	25%	17
8 – South Central	Yes	68%	83%
8 – South Central	Some	2%	2%
8 – South Central	No	30%	15%
9 – South East	Yes	64%	85%
9 – South East	Some	4%	2%
9 – South East	No	32%	13%
10 – Metro	Yes	66%	85%
10 – Metro	Some	1%	2%
10 - Metro	No	33%	13%
Other	Yes	58%	67%
Other	Some	5%	8%
Other	No	37%	25%
<b>Statewide</b>	<b>Yes</b>	<b>65%</b>	<b>82%</b>
<b>Statewide</b>	<b>Some</b>	<b>3%</b>	<b>2%</b>
<b>Statewide</b>	<b>No</b>	<b>32%</b>	<b>17%</b>

\*Totals may not add due to rounding



Participants were asked about the practice of reading the label (Q.9) and the results are provided in Table 7. Statewide, 92% of the respondents who applied herbicide themselves usually read the label. These percentages drop to 69% when including the farmers which hired custom applicators.

**Table 7. “Do you usually read the label for pesticide products applied on your farm?” (Q.9).**

<b>Pesticide Management Area</b>	<b>Response to “Reading the Label”</b>	<b>Percent of All Respondents</b>	<b>Percent of Self-Applicators</b>
1 – Red River	Yes	72%	86%
1 – Red River	No	28%	14%
4 – Central Sands	Yes	61%	91%
4 – Central Sands	No	39%	9%
5 – East Central	Yes	61%	92%
5 – East Central	No	39%	8%
6 – Upper MN	Yes	76%	93%
6 – Upper MN	No	24%	7%
7 – Southwest	Yes	79%	92%
7 – Southwest	No	21%	8%
8 – South Central	Yes	74%	92%
8 – South Central	No	26%	8%
9 – South East	Yes	62%	92%
9 – South East	No	38%	8%
10 – Metro	Yes	64%	100%
10 – Metro	No	36%	0%
Other	Yes	68%	92%
Other	No	32%	8%
<b>Statewide</b>	<b>Yes</b>	<b>69%</b>	<b>92%</b>
<b>Statewide</b>	<b>No</b>	<b>31%</b>	<b>8%</b>

\*Totals may not add due to rounding

Participants were asked if they grew any “herbicide-tolerant” corn varieties (Q.10). If they responded “Yes”, they were then asked whether any weed scouting was conducted. Fifty-four percent of the respondents grew herbicide tolerant corn in 2004 (Table 8) and 86% (ranged 67 to 92% by PMA) conducted some level of scouting.

**Table 8. “In the 2004 growing season did you grow Roundup Ready, Liberty Link, or other herbicide tolerant corn?”(Q.10) “IF YES, was in-field scouting for weeds conducted on a majority of these herbicide tolerant corn acres?”(Q.10i).**

<b>Pesticide Monitoring Area</b>	<b>Percent of Respondents who grew Herbicide-Tolerant Corn</b>	<b>In-field Scouting For Respondents Who Grew Herbicide-Tolerant Corn</b>	<b>Percent of Respondents</b>
1 – Red River	54%	Yes	86%
1 – Red River		No	14%
4 – Central Sands	58%	Yes	84%
4 – Central Sands		No	16%
5 – East Central	54%	Yes	76%
5 – East Central		No	24%
6 – Upper MN	66%	Yes	92%
6 – Upper MN		No	8%
7 – Southwest	67%	Yes	90%
7 – Southwest		No	10%
8 – South Central	50%	Yes	89%
8 – South Central		No	11%
9 – South East	47%	Yes	86%
9 – South East		No	14%
10 – Metro	46%	Yes	79%
10 - Metro		No	21%
Other	79%	Yes	67%
Other		No	33%
<b>Statewide</b>	<b>54%</b>	<b>Yes</b>	<b>86%</b>
<b>Statewide</b>		<b>No</b>	<b>14%</b>

\*Totals may not add due to rounding

In a similar fashion, participants were also asked if they raised any non-herbicide-tolerant varieties (Q.11) and the associated weed scouting. An average of 61% responded “yes” and 86% of those respondents reported doing some level of field scouting (Table 9).

**Table 9. “In the 2004 growing season did you grow non-herbicide tolerant corn?”(Q.11) “IF YES, was in-field scouting for weeds conducted on a majority of these herbicide tolerant corn acres?”(Q.11i)**

<b>Pesticide Monitoring Area</b>	<b>Percent of Respondents who Grew Herbicide Non-Tolerant Corn</b>	<b>In-field Scouting For Respondents Who Grew Herbicide-Tolerant Corn</b>	<b>Percent of Respondents</b>
1 – Red River	60%	Yes	81%
1 – Red River		No	19%
4 – Central Sands	55%	Yes	84%
4 – Central Sands		No	16%
5 – East Central	55%	Yes	79%
5 – East Central		No	21%
6 – Upper MN	58%	Yes	92%
6 – Upper MN		No	8%
7 – Southwest	57%	Yes	90%
7 – Southwest		No	10%
8 – South Central	65%	Yes	87%
8 – South Central		No	13%
9 – South East	65%	Yes	86%
9 – South East		No	14%
10 – Metro	61%	Yes	80%
10 - Metro		No	20%
Other	11%	Yes	50%
Other		No	50%
<b>Statewide</b>	<b>61%</b>	<b>Yes</b>	<b>86%</b>
<b>Statewide</b>		<b>No</b>	<b>14%</b>

\*Totals may not add due to rounding

Due to the straight forward interpretation of the remaining tables, only a minimal amount of supporting information is provided under the “Editors Notes”.

**Table 10. “Has someone mapped weed infestations in any of your corn fields in the last two to three years?” (Q.12).**

<b>Pesticide Monitoring Area</b>	<b>Response to Weed Mapping</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	25%
1 – Red River	No	75%
4 – Central Sands	Yes	15%
4 – Central Sands	No	85%
5 – East Central	Yes	8%
5 – East Central	No	92%
6 – Upper MN	Yes	14%
6 – Upper MN	No	86%
7 – Southwest	Yes	12%
7 – Southwest	No	88%
8 – South Central	Yes	14%
8 – South Central	No	86%
9 – South East	Yes	13%
9 – South East	No	87%
10 – Metro	Yes	13%
10 - Metro	No	87%
Other	Yes	5%
Other	No	95%
<b>Statewide</b>	<b>Yes</b>	<b>14%</b>
<b>Statewide</b>	<b>No</b>	<b>86%</b>

\*Totals may not add due to rounding

**Table 11. “Do you choose herbicides based on type of weeds and/or density of weeds?” (Q.13).**

<b>Pesticide Monitoring Area</b>	<b>Herbicide Choice Based on Type and/or Density</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	82%
1 – Red River	No	18%
4 – Central Sands	Yes	80%
4 – Central Sands	No	20%
5 – East Central	Yes	82%
5 – East Central	No	18%
6 – Upper MN	Yes	81%
6 – Upper MN	No	19%
7 – Southwest	Yes	83%
7 – Southwest	No	17%
8 – South Central	Yes	83%
8 – South Central	No	17%
9 – South East	Yes	81%
9 – South East	No	19%
10 – Metro	Yes	82%
10 - Metro	No	18%
Other	Yes	68%
Other	No	32%
<b>Statewide</b>	<b>Yes</b>	<b>82%</b>
<b>Statewide</b>	<b>No</b>	<b>18%</b>

\*Totals may not add due to rounding

**Table 12. “Do you know the depth to the water table in your fields”?  
(Q.14).**

<b>Pesticide Monitoring Area</b>	<b>Knowledgeable about water table depth</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	33%
1 – Red River	No	67%
4 – Central Sands	Yes	29%
4 – Central Sands	No	71%
5 – East Central	Yes	17%
5 – East Central	No	83%
6 – Upper MN	Yes	17%
6 – Upper MN	No	83%
7 – Southwest	Yes	21%
7 – Southwest	No	79%
8 – South Central	Yes	17%
8 – South Central	No	83%
9 – South East	Yes	20%
9 – South East	No	80%
10 – Metro	Yes	33%
10 – Metro	No	67%
Other	Yes	22%
Other	No	78%
<b>Statewide</b>	<b>Yes</b>	<b>22%</b>
<b>Statewide</b>	<b>No</b>	<b>78%</b>

\*Totals may not add due to rounding

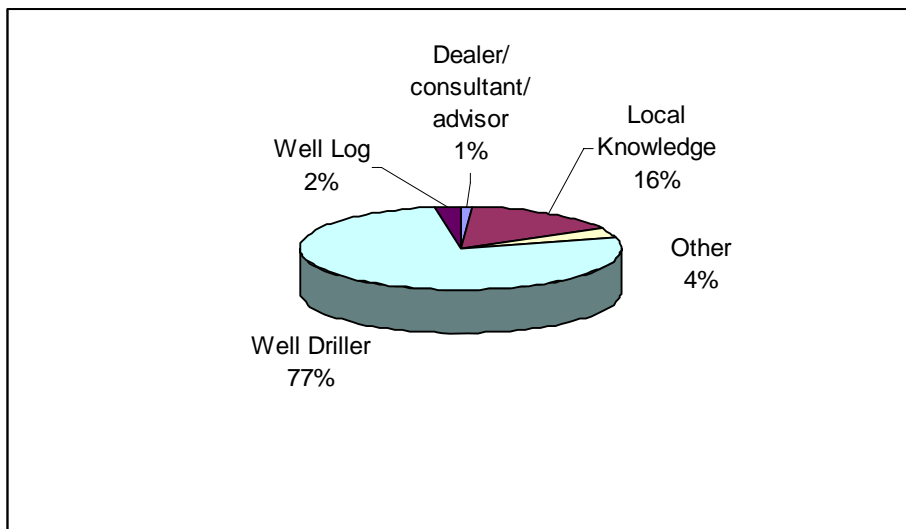
Editors Note: Respondents might not have known the exact depth to the ground water but still may have known that depth to groundwater exceeded 30 feet. Table 13 details those respondents.

**Table 13. “Is the water table at a depth greater than 30 feet?” (Q.15).**

<b>Pesticide Monitoring Area</b>	<b>“Yes” Response (%)</b>	<b>“No” Response(%)</b>	<b>Don’t Know Response (%)</b>
1 – Red River	37%	34%	29%
4 – Central Sands	42%	21%	37%
5 – East Central	35%	30%	35%
6 – Upper MN	40%	17%	43%
7 – Southwest	42%	17%	41%
8 – South Central	36%	19%	46%
9 – South East	49%	15%	35%
10 – Metro	53%	10%	36%
Other	56%	22%	22%
<b>Statewide</b>	<b>41%</b>	<b>19%</b>	<b>40%</b>

\*Totals may not add due to rounding

Editors Note: Respondents who answered yes to question 15 were then asked “how was the depth primarily determined”. Figure 2 details the responses to how the depth was determined.



**Figure 2. “Information sources used to determine water table depth (Q.15i).**

**Table 14. “Are there any streams, lakes or other surface waters adjacent to or in your corn fields?” (Q.16).**

<b>Pesticide Monitoring Area</b>	<b>Surface Water Adjacent to or in Field</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	26%
1 – Red River	No	74%
4 – Central Sands	Yes	26%
4 – Central Sands	No	74%
5 – East Central	Yes	24%
5 – East Central	No	76%
6 – Upper MN	Yes	33%
6 – Upper MN	No	67%
7 – Southwest	Yes	29%
7 – Southwest	No	71%
8 – South Central	Yes	36%
8 – South Central	No	64%
9 – South East	Yes	26%
9 – South East	No	74%
10 – Metro	Yes	31%
10 - Metro	No	69%
Other	Yes	6%
Other	No	94%
<b>Statewide</b>	<b>Yes</b>	<b>22%</b>
<b>Statewide</b>	<b>No</b>	<b>78%</b>

\*Totals may not add due to rounding

Editors Note: Respondents who answered YES to question 16 were then asked if there were filter strips or vegetative buffers on or next to any of those acres. Table 15 details the responses.



**Table 15. “Are there filter strips or vegetative buffers on any of these acres?” (Q.16A).**

<b>Pesticide Monitoring Area</b>	<b>Filter Strips or Buffers</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	74%
1 – Red River	No	26%
4 – Central Sands	Yes	83%
4 – Central Sands	No	17%
5 – East Central	Yes	73%
5 – East Central	No	27%
6 – Upper MN	Yes	85%
6 – Upper MN	No	15%
7 – Southwest	Yes	84%
7 – Southwest	No	16%
8 – South Central	Yes	83%
8 – South Central	No	17%
9 – South East	Yes	84%
9 – South East	No	16%
10 – Metro	Yes	88%
10 - Metro	No	12%
Other	**	**
Other	**	**
<b>Statewide</b>	<b>Yes</b>	<b>83%</b>
<b>Statewide</b>	<b>No</b>	<b>17%</b>

\*Totals may not add due to rounding

Editors Note: Respondents who answered YES to question 16a in regards to having filter strips or vegetative buffers were then asked if filter strips or vegetative buffers were part of a conservation program. Table 16 details the responses.

**Table 16. “Were they required as part of a conservation program?”(Q.16Ai).**

<b>Pesticide Monitoring Area</b>	<b>Response</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	26%
1 – Red River	No	74%
4 – Central Sands	Yes	11%
4 – Central Sands	No	89%
5 – East Central	Yes	26%
5 – East Central	No	74%
6 – Upper MN	Yes	25%
6 – Upper MN	No	75%
7 – Southwest	Yes	15%
7 – Southwest	No	85%
8 – South Central	Yes	24%
8 – South Central	No	76%
9 – South East	Yes	19%
9 – South East	No	81%
10 – Metro	Yes	30%
10 - Metro	No	70%
Other	**	**
Other	**	**
<b>Statewide</b>	<b>Yes</b>	<b>20%</b>
<b>Statewide</b>	<b>No</b>	<b>80%</b>

\*Totals may not add due to rounding

**Table 17. “In general, do you alternate use of herbicide products to keep weeds from becoming resistant to herbicides?” (Q.18).**

<b>Pesticide Monitoring Area</b>	<b>Response to Using Alternative Herbicide</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	85%
1 – Red River	No	15%
4 – Central Sands	Yes	79%
4 – Central Sands	No	21%
5 – East Central	Yes	74%
5 – East Central	No	26%
6 – Upper MN	Yes	87%
6 – Upper MN	No	13%
7 – Southwest	Yes	79%
7 – Southwest	No	21%
8 – South Central	Yes	84%
8 – South Central	No	16%
9 – South East	Yes	80%
9 – South East	No	20%
10 – Metro	Yes	86%
10 - Metro	No	14%
Other	Yes	65%
Other	No	35%
<b>Statewide</b>	<b>Yes</b>	<b>82%</b>
<b>Statewide</b>	<b>No</b>	<b>18%</b>

\*Totals may not add due to rounding

Editors Note: Question 19 is a multiple answer question repeated for a variety of answers. Tables 18 through 24 are the responses for the various answers to question 19.

**Table 18. “During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor - Herbicide price?” (Q.19).**

<b>Pesticide Monitoring Area</b>	<b>Discussed Price with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	71%
1 – Red River	No	29%
4 – Central Sands	Yes	59%
4 – Central Sands	No	41%
5 – East Central	Yes	55%
5 – East Central	No	45%
6 – Upper MN	Yes	76%
6 – Upper MN	No	24%
7 – Southwest	Yes	81%
7 – Southwest	No	19%
8 – South Central	Yes	78%
8 – South Central	No	22%
9 – South East	Yes	66%
9 – South East	No	34%
10 – Metro	Yes	68%
10 - Metro	No	32%
Other	Yes	44%
Other	No	56%
<b>Statewide</b>	<b>Yes</b>	<b>70%</b>
<b>Statewide</b>	<b>No</b>	<b>30%</b>

\*Totals may not add due to rounding

**Table 19. "During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor - Herbicide rate?" (Q.19).**

<b>Pesticide Monitoring Area</b>	<b>Discussed Rate with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	69%
1 – Red River	No	31%
4 – Central Sands	Yes	61%
4 – Central Sands	No	39%
5 – East Central	Yes	61%
5 – East Central	No	39%
6 – Upper MN	Yes	78%
6 – Upper MN	No	22%
7 – Southwest	Yes	81%
7 – Southwest	No	19%
8 – South Central	Yes	76%
8 – South Central	No	24%
9 – South East	Yes	68%
9 – South East	No	32%
10 – Metro	Yes	63%
10 - Metro	No	37%
Other	Yes	44%
Other	No	56%
<b>Statewide</b>	<b>Yes</b>	<b>71%</b>
<b>Statewide</b>	<b>No</b>	<b>29%</b>

\*Totals may not add due to rounding

**Table 20. “During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor- Alternative or new herbicides?” (Q.19).**

<b>Pesticide Monitoring Area</b>	<b>Discussed Alternative or New Herbicides with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	63%
1 – Red River	No	37%
4 – Central Sands	Yes	52%
4 – Central Sands	No	48%
5 – East Central	Yes	46%
5 – East Central	No	54%
6 – Upper MN	Yes	66%
6 – Upper MN	No	34%
7 – Southwest	Yes	68%
7 – Southwest	No	32%
8 – South Central	Yes	63%
8 – South Central	No	37%
9 – South East	Yes	53%
9 – South East	No	47%
10 – Metro	Yes	60%
10 - Metro	No	40%
Other	Yes	28%
Other	No	72%
<b>Statewide</b>	<b>Yes</b>	<b>59%</b>
<b>Statewide</b>	<b>No</b>	<b>41%</b>

\*Totals may not add due to rounding

**Table 21. “During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor- Mode of action of a particular herbicide?” (Q 19).**

<b>Pesticide Monitoring Area</b>	<b>Discussed Mode of Action with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	55%
1 – Red River	No	45%
4 – Central Sands	Yes	39%
4 – Central Sands	No	61%
5 – East Central	Yes	37%
5 – East Central	No	63%
6 – Upper MN	Yes	60%
6 – Upper MN	No	40%
7 – Southwest	Yes	57%
7 – Southwest	No	43%
8 – South Central	Yes	58%
8 – South Central	No	42%
9 – South East	Yes	48%
9 – South East	No	52%
10 – Metro	Yes	47%
10 - Metro	No	53%
Other	Yes	22%
Other	No	78%
<b>Statewide</b>	<b>Yes</b>	<b>51%</b>
<b>Statewide</b>	<b>No</b>	<b>49%</b>

\*Totals may not add due to rounding

**Table 22. “During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor –Incorporation of soil applied herbicides?” (Q.19).**

<b>Pesticide Monitoring Area</b>	<b>Discussed Incorporating Soil Applied Herbicides with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	42%
1 – Red River	No	58%
4 – Central Sands	Yes	34%
4 – Central Sands	No	66%
5 – East Central	Yes	20%
5 – East Central	No	80%
6 – Upper MN	Yes	49%
6 – Upper MN	No	51%
7 – Southwest	Yes	54%
7 – Southwest	No	46%
8 – South Central	Yes	53%
8 – South Central	No	47%
9 – South East	Yes	40%
9 – South East	No	60%
10 – Metro	Yes	43%
10 - Metro	No	57%
Other	Yes	17%
Other	No	83%
<b>Statewide</b>	<b>Yes</b>	<b>44%</b>
<b>Statewide</b>	<b>No</b>	<b>56%</b>

\*Totals may not add due to rounding



**Table 23. “During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor –Impact to surface or groundwater from various herbicides?” (Q.19).**

<b>Pesticide Monitoring Area</b>	<b>Discussed Impact to Surface or Groundwater with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	39%
1 – Red River	No	61%
4 – Central Sands	Yes	36%
4 – Central Sands	No	64%
5 – East Central	Yes	30%
5 – East Central	No	70%
6 – Upper MN	Yes	42%
6 – Upper MN	No	58%
7 – Southwest	Yes	47%
7 – Southwest	No	53%
8 – South Central	Yes	42%
8 – South Central	No	58%
9 – South East	Yes	39%
9 – South East	No	61%
10 – Metro	Yes	34%
10 - Metro	No	66%
Other	Yes	28%
Other	No	72%
<b>Statewide</b>	<b>Yes</b>	<b>39%</b>
<b>Statewide</b>	<b>No</b>	<b>61%</b>

\*Totals may not add due to rounding

**Table 24. “During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor –Banding herbicide applications to reduce use or increase effectiveness?” (Q.19)**

<b>Pesticide Monitoring Area</b>	<b>Discussed Banding Herbicides with Pesticide Dealer...?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	33%
1 – Red River	No	67%
4 – Central Sands	Yes	17%
4 – Central Sands	No	83%
5 – East Central	Yes	15%
5 – East Central	No	85%
6 – Upper MN	Yes	24%
6 – Upper MN	No	76%
7 – Southwest	Yes	27%
7 – Southwest	No	73%
8 – South Central	Yes	27%
8 – South Central	No	73%
9 – South East	Yes	16%
9 – South East	No	84%
10 – Metro	Yes	20%
10 – Metro	No	80%
Other	Yes	11%
Other	No	89%
<b>Statewide</b>	<b>Yes</b>	<b>22%</b>
<b>Statewide</b>	<b>No</b>	<b>78%</b>

\*Totals may not add due to rounding

Editors Note: Question 20 is a multiple answer question repeated for a variety of answers. Whereas question 19 focused on whether there was discussion about specific subjects, question 20 focuses on whether there was any implementation. Tables 25 through 29 are the responses for the various answers to question 20.

**Table 25. “Based on any discussions you had with your dealer, consultant or crop advisor, or based on your own decision making – Did you reduce from previous applications, the rate per acre of any corn herbicide?” (Q.20).**

<b>Pesticide Monitoring Area</b>	<b>Reduced Rate from Previous Applications</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	33%
1 – Red River	No	67%
4 – Central Sands	Yes	45%
4 – Central Sands	No	55%
5 – East Central	Yes	48%
5 – East Central	No	52%
6 – Upper MN	Yes	42%
6 – Upper MN	No	58%
7 – Southwest	Yes	45%
7 – Southwest	No	55%
8 – South Central	Yes	45%
8 – South Central	No	55%
9 – South East	Yes	43%
9 – South East	No	57%
10 – Metro	Yes	47%
10 - Metro	No	53%
Other	Yes	39%
Other	No	61%
<b>Statewide</b>	<b>Yes</b>	<b>44%</b>
<b>Statewide</b>	<b>No</b>	<b>56%</b>

\*Totals may not add due to rounding

**Table 26. “Based on any discussions you had with your dealer, consultant or crop advisor, or based on your own decision making – Did you select an herbicide with a different mode of action to reduce weed resistance to herbicides?” (Q.20).**

<b>Pesticide Monitoring Area</b>	<b>Selected Herbicide with Different Mode of Action to Reduce Weed Resistance</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	42%
1 – Red River	No	58%
4 – Central Sands	Yes	40%
4 – Central Sands	No	60%
5 – East Central	Yes	29%
5 – East Central	No	71%
6 – Upper MN	Yes	52%
6 – Upper MN	No	48%
7 – Southwest	Yes	48%
7 – Southwest	No	52%
8 – South Central	Yes	47%
8 – South Central	No	53%
9 – South East	Yes	45%
9 – South East	No	55%
10 – Metro	Yes	40%
10 – Metro	No	60%
Other	Yes	17%
Other	No	83%
<b>Statewide</b>	<b>Yes</b>	<b>44%</b>
<b>Statewide</b>	<b>No</b>	<b>56%</b>

\*Totals may not add due to rounding

**Table 27. “Based on any discussions you had with your dealer, consultant or crop advisor, or based on your own decision making – Did you incorporate soil applied herbicides?” (Q.20).**

<b>Pesticide Monitoring Area</b>	<b>Incorporated Soil Applied Herbicides</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	24%
1 – Red River	No	76%
4 – Central Sands	Yes	17%
4 – Central Sands	No	83%
5 – East Central	Yes	8%
5 – East Central	No	92%
6 – Upper MN	Yes	30%
6 – Upper MN	No	70%
7 – Southwest	Yes	36%
7 – Southwest	No	64%
8 – South Central	Yes	38%
8 – South Central	No	62%
9 – South East	Yes	25%
9 – South East	No	75%
10 – Metro	Yes	25%
10 - Metro	No	75%
Other	Yes	28%
Other	No	72%
<b>Statewide</b>	<b>Yes</b>	<b>29%</b>
<b>Statewide</b>	<b>No</b>	<b>71%</b>

\*Totals may not add due to rounding

**Table 28. “Based on any discussions you had with your dealer, consultant or crop advisor, or based on your own decision making – Did you choose a particular herbicide to reduce impacts to surface water or groundwater?” (Q.20).**

<b>Pesticide Monitoring Area</b>	<b>Chose Herbicide to Reduce Impact to Surface or Ground Water</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	23%
1 – Red River	No	77%
4 – Central Sands	Yes	32%
4 – Central Sands	No	68%
5 – East Central	Yes	24%
5 – East Central	No	76%
6 – Upper MN	Yes	37%
6 – Upper MN	No	63%
7 – Southwest	Yes	35%
7 – Southwest	No	65%
8 – South Central	Yes	32%
8 – South Central	No	68%
9 – South East	Yes	31%
9 – South East	No	69%
10 – Metro	Yes	33%
10 - Metro	No	67%
Other	Yes	35%
Other	No	65%
<b>Statewide</b>	<b>Yes</b>	<b>32%</b>
<b>Statewide</b>	<b>No</b>	<b>68%</b>

\*Totals may not add due to rounding

**Table 29. “Based on any discussions you had with your dealer, consultant or crop advisor, or based on your own decision making – Did you band herbicide applications to reduce use?” (Q.20).**

<b>Pesticide Monitoring Area</b>	<b>Banded Herbicide Applications to Reduce Use</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	14%
1 – Red River	No	86%
4 – Central Sands	Yes	7%
4 – Central Sands	No	93%
5 – East Central	Yes	9%
5 – East Central	No	91%
6 – Upper MN	Yes	7%
6 – Upper MN	No	93%
7 – Southwest	Yes	11%
7 – Southwest	No	89%
8 – South Central	Yes	12%
8 – South Central	No	88%
9 – South East	Yes	5%
9 – South East	No	95%
10 – Metro	Yes	6%
10 - Metro	No	94%
Other	Yes	11%
Other	No	89%
<b>Statewide</b>	<b>Yes</b>	<b>9%</b>
<b>Statewide</b>	<b>No</b>	<b>91%</b>

\*Totals may not add due to rounding

**Table 30. “Have you purchased pesticides over the internet?” (Q.21).**

<b>Pesticide Monitoring Area</b>	<b>Has Respondent Purchased Pesticides Over the Internet?</b>	<b>Percent of Respondents</b>
1 – Red River	Yes	0%
1 – Red River	No	100%
4 – Central Sands	Yes	1%
4 – Central Sands	No	99%
5 – East Central	Yes	2%
5 – East Central	No	98%
6 – Upper MN	Yes	3%
6 – Upper MN	No	97%
7 – Southwest	Yes	2%
7 – Southwest	No	98%
8 – South Central	Yes	2%
8 – South Central	No	98%
9 – South East	Yes	1%
9 – South East	No	99%
10 – Metro	Yes	1%
10 - Metro	No	99%
Other	Yes	0%
Other	No	100%
<b>Statewide</b>	<b>Yes</b>	<b>2%</b>
<b>Statewide</b>	<b>No</b>	<b>98%</b>

\*Totals may not add due to rounding





# Appendices

## Appendix 1. Survey Instrument

### Annual Pesticide Survey: Herbicide Applications and Practices on Corn In Planning for or During the 2004 Growing Season

Dear Producer:  
Information collected on this survey is used to prepare estimates of chemical use practices of Minnesota corn growers. This survey conducted for the Minnesota Department of Agriculture in cooperation with the Minnesota Agricultural Statistics Service.

Please make necessary corrections in name and address on the label.

### IDENTIFICATION

1. On land operated by the farm, ranch, or individual(s) listed on the label:
  - a. Were crops grown or hay cut at anytime during 2004?.....  YES  NO
  - b. Is any land in this operation in government programs such as CRP, WRP, etc?  YES  NO
  - c. Have or will grains or oilseeds be stored on this operation at anytime during 2004, or do you have storage facilities used for storing grain? .....  YES  NO
  - d. Have or will there be any hogs, cattle, sheep, horses, or other livestock, or poultry on this operation at anytime during 2004? .....  YES  NO

If NO for all items, go to back page, Change in Operation

2. Did you grow corn on your operation in 2004?  
(Exclude sweet corn and popcorn)  
 YES  NO - conclude interview

3. How many corn acres were planted for all purposes in 2004?

### GENERAL INFORMATION

4. On your 2004 corn acres, did you:
 

Apply herbicides yourself?	1	<input type="checkbox"/>	}	<u>Enter Code</u>
Have herbicides custom applied?	2	<input type="checkbox"/>		
Both?	3	<input type="checkbox"/>		
Don't use herbicides [conclude interview]	4	<input type="checkbox"/>		

5. What is the product name of the herbicide that was applied to the majority of your corn acres in 2004? \_\_\_\_\_

6. Which, if any, other herbicides were applied to your corn acres in 2004?

a. \_\_\_\_\_ (product name)

b. \_\_\_\_\_ (product name)

7. Do you know the active ingredients of the herbicides you used in 2004?

Yes = 1       No = 2       Some = 3

8. Do you keep herbicide application records on your farm?

Yes = 1       No = 2       Some = 3

9. Do you usually read the label for pesticide products applied on your farm?

Yes = 1       No = 2

**SCOUTING FOR WEEDS and RELATED PRACTICES**

10. In the 2004 growing season, did you grow Roundup Ready, Liberty Link, or other herbicide tolerant corn?  
(exclude Bt only corn)

Yes       No (go to 11)

i. If YES, was in-field scouting for weeds conducted on a majority of these herbicide tolerant corn acres?

Yes = 1       No = 2

11. In the 2004 growing season, did you grow non-herbicide tolerant corn?  
(include Bt only corn)

Yes       No (go to 12)

i. If YES, was in-field scouting for weeds conducted on a majority of these non-herbicide tolerant corn acres?

Yes = 1       No = 2

12. Has someone mapped weed infestations in any of your corn fields in the last two to three years?

Yes = 1       No = 2

13. Do you choose herbicides based on type of weeds and/or density of weeds?

Yes = 1       No = 2

**WATER RESOURCES**

14. Do you know the depth to the water table in your fields?

Yes = 1       No = 2

15. Is the water table at a depth greater than 30 feet?

Yes = 1       No = 2 (go to 16)       Don't know = 3 (go to 16)

If yes, how was the depth primarily determined? (check one)

Well driller for drinking water	1	<input type="checkbox"/>	} <u>Enter Code</u>
Local knowledge	2	<input type="checkbox"/>	
A dealer, consultant or crop advisor	3	<input type="checkbox"/>	
Well log	4	<input type="checkbox"/>	
None of the above	5	<input type="checkbox"/>	

16. Are any streams, lakes or other surface waters adjacent to or in your corn fields?

Yes = 1       No = 2      (if no go to 17)

16a. Are there filter strips or vegetative buffers on any of these acres?

Yes = 1       No = 2      (if no go to 17)

i. If YES, were they required as part of a conservation program?

Yes = 1       No = 2

17. If you irrigate, do you have an irrigation water management plan?

Yes = 1       No = 2       I don't irrigate = 3

**GENERAL PRACTICES**

18. In general, do you alternate use of herbicide products to keep weeds from becoming resistant to herbicides?

Yes = 1       No = 2

19. During the past year, have you discussed any of the following with your pesticide dealer, consultant or crop advisor?

Herbicide price

Yes = 1       No = 2

Herbicide rate

Yes = 1       No = 2

Alternative or new herbicides

Yes = 1       No = 2

The mode of action of a particular herbicide

Yes = 1       No = 2

Incorporation of soil applied herbicides

Yes = 1       No = 2

Impact to surface water or groundwater from various herbicides

Yes = 1       No = 2

Banding herbicide applications to reduce use or increase effectiveness

Yes = 1       No = 2

20. Based on any discussions you had with your dealer, consultant or crop advisor, or based on your own decision making (research):

Did you reduce from previous applications, the rate per acre of any corn herbicide?

Yes = 1       No = 2

Did you select an herbicide with a different mode of action to reduce weed resistance to herbicides?

Yes = 1       No = 2

Did you incorporate soil applied herbicides?

Yes = 1       No = 2

Did you choose a particular herbicide to reduce impacts to surface water or groundwater?

Yes = 1       No = 2

Did you band herbicide applications to reduce use?

Yes = 1       No = 2

21. Have you purchased pesticides over the internet?

Yes = 1       No = 2

**CHANGE IN OPERATION**

<b>If no longer farming or ranching, did you:</b>	<input type="checkbox"/> Sell out?	<input type="checkbox"/> Retire?	<input type="checkbox"/> Lease/Rent out your land ( <i>Landlord only</i> )
<input type="checkbox"/> CRP land? _____ Acres	<input type="checkbox"/> Idle land? _____ Acres	<input type="checkbox"/> Other? Specify: _____	
Who is the current operator or renter of the land you previously farmed or ranched?			
Operation Name:			
Current Operator:			
Address:			
City:		Zip:	Phone:

Would you like a copy of the results of this survey?

## Appendix 2. Additional Project Background Information

The Minnesota Department of Agriculture (MDA) is required by state law to monitor pesticide use. In pursuit of fulfilling that responsibility, the MDA began exploring the possibility of using the existing framework of the National Agricultural Statistics Service (NASS) to enhance and broaden pesticide use monitoring efforts. NASS has a long history of providing statewide crop and production statistics. Over the last decade NASS has also become an important information source for pesticide and fertilizer use. Several joint pilot projects evolved with the financial assistance from Environmental Protection Agency (EPA) and were conducted from 2001-2003. These pilots were essential to the final methodology used in this report.

The first pilot<sup>5</sup> was conducted in 2001 by expanding the existing ARMS (Agricultural Resource Management Study) developed by USDA's National Agricultural Statistics Service (NASS). The normal number of participating 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, useful information on primary sources of pesticide management information, 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. *“Pesticide Use and Pest Management Practices for Major Crops in North Dakota”* is published on a four-year cycle. With the goal of expanding to a statewide scale while reducing costs, a second pilot<sup>6</sup> 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 out 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.

A second pilot testing two methods for collecting pesticide rate information was conducted in 2003. “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 any information that was provided. In neighboring Grant County, another 150 farm operators were contacted. In this county using “Method Two”, if the farm records were incomplete, follow-up calls were made the pesticide dealer to complete the survey. The number of surveys with complete data sets was significantly increased with the additional assistance from the dealerships. Eighty-three (83) percent of the surveys were complete in Grant County compared to forty-six (46%) in Douglas County. Equally impressive was the overall support by the local dealerships.

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<sup>5</sup> *“Expanded Minnesota Agricultural Statistics Pesticide Use Data”*, 2003, by NASS and MDA.

<sup>6</sup> Unpublished data. From the September 20, 2003 EPA Report.

A statewide survey was conducted using the successful “Method Two” from the pilot project in Douglas and Grant Counties. “*2003 Pesticide Usage on Four Major Minnesota Crops*” was published in January of 2005. Corn, wheat, hay and soybeans were the crops surveyed and included data from 2,400 farmers and 1,000,000 acres of cropland across Minnesota.