SURVEY OF WEED CONTROL AND PRODUCTION PRACTICES ON SUGARBEET IN EASTERN NORTH DAKOTA AND MINNESOTA - 2000

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Other portions of the survey are published in the
Entomology and Plant Pathology sections.

The thirtysecond annual weed control and production practices questionnaire was mailed in September, 2000 to sugarbeet growers producing sugarbeet for the American Crystal Sugar Company, the Minn-Dak Farmers Cooperative, and the Southern Minnesota Beet Sugar Cooperative. Growers were requested to evaluate weed control and sugarbeet injury from specific herbicides, and to list the most important weed and production problems. In addition, growers were requested to list insecticide use, fungicide use, total acreage, acres of hand-weeded sugarbeet, thinning practices, herbicide application methods, cost of hand thinning and hand weeding, cultivation practices and their experience with micro-rate herbicide use. Insecticide use and fungicide use portions of the survey can be found in the Entomology and Plant Pathology sections.

Approximately 3,600 sugarbeet growers planted 723,000 acres of sugarbeet in the Red River Valley and West Central Minnesota in 2000. Fifteen percent of the growers representing 34 percent of the total acres responded to the survey. Many of the questionnaires represent acres of more than one grower, for example, family operations or partnerships. The responses to the questionnaire are reported in Tables 1 to 32.

Table 1 gives a summary of herbicide use and performance averaged over all counties. The number of growers reporting the use of a herbicide treatment is listed and the acres treated is expressed as a percentage of the total acreage reported on the survey. Multiple herbicide treatments are tabulated for each herbicide treatment, thus the number of growers reporting in Table 1 exceeds the total number of responses. Also, multiple herbicide treatments on the same acreage are listed separately in the tables, thus acres treated exceeds 100%. The ratings of weed control and sugarbeet injury are presented as the percentage of growers who judged weed control as excellent, good, fair or poor; and crop injury as none, slight, moderate or severe.

Total sugarbeet acreage treated with herbicides in 2000 was 348%, which compares to 346% in 1999, 393% in 1998, and 460% in 1997. The acres treated does not included “other weed control methods” which were non-herbicidal methods. Eptam, Ro-Neet and Nortron, used in combination as well as used alone, were the only soil applied herbicides reported in 2000. Soil applied herbicide use was 96% in 1984, 47% in 1989, 32% in 1993, 32% in 1997, 11% in 1998, 4% in 1999 and 3% in 2000. Postemergence herbicide use was 338% in 2000, 337% in 1999, 374% in 1998, 421% in 1997, 389% in 1996 and 359% in 1995. The decline in postemergence herbicide use from 1997 to 2000 is partly due to the increased use of herbicide combinations. In 1997, nearly all of the grass herbicides were applied separately and those acres wee totaled as separate acres. In 2000, most of the grass herbicides were applied in combination with other herbicides so the acres treated are only totaled once for all herbicides in the combination.

The usage of postemergence grass control herbicides was 235% of the acreage in 2000 as compared to 213% in 1999 and 176% in 1998. Assure II was used on 26% of the acreage in 2000, 20% in 1999 and on 26% in 1998. Prism/Select was used on 176% of the acreage in 2000, 161% in 1999 and on 117% in 1998. Poast was used on 33% of the acreage in 2000, 32% in 1999 and on 33% in 1998. The acres treated with grass herbicides increased because many respondents used grass herbicides in combination with the broadleaf herbicides applied more than once in 2000. Nearly all these treatments were at the micro-rate and included an oil adjuvant.

Betanex use was 89% of the acreage in 1995, 176% in 1997, 184% in 1998, 190% in 1999 and 149% in 2000. Betamix use was 52% of the acreage in 1996, 74% in 1997, 67% in 1998, 95% in 1999 and 107% in 2000. Progress

use was 70% of the acreage in 1995, 52% in 1996, 13% in 1997, 20% in 1998, and 21% in 1999 and 54% in 2000. UpBeet use increased from 110% of the acreage in 1996, to 190% in 1997, 249% in 1998, 298% in 1999 and 301% in 2000. Stinger use increased from 55% of the acreage in 1995 to 67% in 1996, 138% in 1997, 226% in 1998, 291% in 1999 and 298% in 2000. A total of 49 different postemergence herbicide combinations were reported on the survey in 2000. The most common herbicide treatment in 2000 was Betanex + UpBeet + Stinger + Select + Oil adjuvant on 76% of the acreage. This combination was used on less than 1% of the acreage in 1997. Combination treatments that included an oil generally would be micro-rate treatments. Treatments including oil were applied to 285% of the acreage in 2000, 273% of the acreage in 1999 and to 162% of the acreage in 1998.

The rotary hoe or harrow were used on 62% of the acres in 2000 compared to 48% of the acres in 1999 and 58% in 1998. The electrical discharge system, weed pullers, mowing or swathing were used on 7.6% of the acreage in 1995, 4.2% in 1996, 1.6% in 1997, less than 1% in 1998 and 1999 and 1.7% in 2000. This suggests that weed control from herbicides was not as good in 2000 as in 1998 and 1999.

Redroot pigweed is no longer the most important weed problem in sugarbeet (Table 18). The percentage of respondents indicating redroot pigweed as their worst weed declined from 53% in 1997, 51% in 1998, 40% in 1999 and 18% in 2000. The decline in importance of redroot pigweed may be due to the increased use of UpBeet. Kochia was named the most important weed problem by 43% of the survey respondents in 2000 compared to 33% in 1999, 13% in 1998 and 3% in 1997 and 1996. The increasing appearance of kochia that is resistant to UpBeet may explain the increase of kochia being named as worst weed. The question on "worst weed" was first asked in 1977 and 2000 is the first year that redroot pigweed was not named most frequently.

Weeds were named as the most serious production problem by 48% of the survey respondents in 2000 compared to 39% in 1999, 25% in 1998, 34% in 1997 and 53% in 1996 (Table 19). The percentage of respondents who named emergence and stand as their worst problem increased from 2% in 1995, to 12% in 1997, back to 4% in 1998 and up to 12% in 1999 and 10% in 2000. The percentage of respondents who named Cercospora leaf spot (CLS) as their worst problem went from 24% in 1995 to 3% in 1996, 5% in 1997, up to 36% in 1998 and down to 6% in 1999 and 3% in 2000. The new Section 18 label for Eminent in 1999 and 2000 probably explains the reduction in Cercospora being identified as the worst problem. Rhizoctiona/aphanomyces declined from 11% in 1995 to 6% in 1996 but these respondents increased to 14% in 1997 and 17% in 1998 followed by a decline to 9% in 1999 and an increase to 18% in 2000. Soil moisture has a very large influence on sugarbeet injury caused by rhizoctonia and aphanomyces.

Rhizomania was listed as a "worst problem" choice for the first time in 1997 (Table 19). Rhizomania caused identifiable yield loss only in the Southern Minnesota Beet Sugar Cooperative in 1998 but it was identified in the Red River Valley in 1999. Rhizomania was named as worst problem by 3% of the respondents in 1998 and by 2% in 1999 and 2000.

The percentage of acreage hand weeded declined from 72% in 1995 to 62% in 1996, 45% in 1997, 28% in 1998, 26% in 1999 and 25% in 2000 (Table 20). This is the lowest percentage of acreage hand weeded recorded on the annual survey.

Acres of sugarbeet not thinned were 80% in 1996, 75% in 1997, 76% in 1998, 83% in 1999 and 79% in 2000. Acres hand thinned were 9% in 1996, 7% in 1997, 5% in 1998, 2% in 1999 and 1% in 2000. Acres thinned with an electronic thinner were 5% in 1996 and 4% in 1997, 1998 and 1999 and 3% in 2000. The use of various forms of mechanical thinning was 6% of the acreage in 1996, 11% in 1997 and 1998, 8% in 1999 and 13% in 2000.

Averaged over all herbicides, herbicides were band applied to 37%, broadcast applied with a ground sprayer to 54% and broadcast applied by air to 9% of the sugarbeet acreage (Table 21). In 1997, 57% of the acreage was band treated, 40% was band treated in 1998 and 30% was band treated in 1999 so broadcast has become more common. Herbicides were applied by air to 22% of the acreage in 1999, to 17% in 1998 and to 9% in 1997.

The cost of hand weeding and hand thinning varied from zero to over $70/A in 2000 (Table 22). The most common cost was zero dollars at 56% of the respondents. Zero cost responses were 26% in 1996, 41% in 1997, 58% in 1998 and 55% in 1999. The average cost of hand weeding as calculated from Table 22 was $11.90/A in 2000 as compared to $11.20/A in 1999, $12.50/A in 1998, $18.50/A in 1997, $27/A in 1996 and $34/A in 1995. The percentage of respondents who used no hand labor varied by county from 14% in Renville County to 79% in Polk County. Sugarbeet acreage operated by respondents to the survey varied from less than 50 acres to over 2,000 acres (Table 23). The most common acreage was 400 to 599 acres at 25% of the respondents. Other common acreages were 100 to 199

acres at 12%, 200 to 299 acres at 16%, 300 to 399 acres at 14%, and 600 to 799 acres at 14%. Six percent of the respondents reported over 1,000 acres. The percentage of respondents in various categories changed little between 1998 and 2000.

The number of cultivations reported on the survey varied from zero to four (Table 24). The most common number of cultivations was two with 55% of the respondents followed by one or three cultivations with 21% of the respondents. Only four respondents said they did not cultivate. This question was asked previously in 1992 and 1998 and 1999. The average number of cultivations was 3.2 in 1992, 2.3 in 1998, 2.2 in 1999 and 2.0 in 2000.

Lime was applied over the last three years in Chippewa, Polk and Renville counties with the greatest use of lime in Renville county. Liming low pH soils reduces the carryover of certain herbicides such as Pursuit, Raptor and Broadstrike. Also, liming may increase sugarbeet yield on low pH soils.

A total of 34% in 1999 and 50% in 2000 accessed the internet weekly or daily. Internet use as a source of information increased from 59% of the survey respondents in 1999 to 76% in 2000 (Table 26).

The micro-rate (all combination with oil at low rates in Table 1) was used on all or a portion of the acreage by 94% of the survey respondents (Table 27). Averaged over all users, 96.5% indicated that they intend to use the micro-rate again in 2000 (data not shown). The micro-rate was used by 94% of the respondents in 1999, by 64% in 1998 and was not labeled in 1997.

A problem with precipitation in the spray tank and nozzle plugging was reported by 45% of the micro-rate users (Table 28). In 1999, 33% reported a problem with nozzle plugging. The relatively cool weather during early postemergence spraying probably contributed to increased nozzle plugging in 2000. The ranking of severity of the nozzle plugging problem indicated that 10% ranked the problem as a 4 or 5. A listing of the practices that respondents reported to reduce or eliminate nozzle plugging are given in Table 30. The most common were use of a basic blend adjuvant, frequent sprayer cleaning and mixing the herbicides in warm water.

The weeds reported as “not adequately controlled by the micro-rate” are given in Table 31. Averaged over all counties, kochia, common lambsquarters and redroot pigweed were listed more than the other weeds. The same three weeds were listed most often in 1999. Kochia was listed infrequently in response from Chippewa and Renville Counties (the Southern Minnesota Beet Sugar Cooperative area) but common waterhemp was only listed in those two counties. Lanceleaf sage was only listed in the five counties at the southern end of the Red River Valley.

The ratings of satisfaction with the micro-rate were considerably lower from Chippewa and Renville Counties than from the other counties in the survey (Table 32). The reason for the difference between the Southern Minnesota Beet Sugar Cooperative and the Red River Valley is not known. Overall, the satisfaction ratings were good with 69% of the respondents giving a ranking of 4 or 5. The percentage of respondents providing a ranking of 4 or 5 has declined from 82% in 1998 to 77% in 1999 and 69% in 2000. The increased populations of kochia resistant to ALS inhibiting herbicides partly explains the decline in satisfaction with the micro-rate. The micro-rate will not give good control of resistant kochia.

A summary of the most important weed problem responses from 1977 to 2000.

		Weed indicated as most important weed problem in sugarbeet												
Year	RRPW[1]	FXTL	COLQ	WIOA	WIBW	WIMU	KOCZ	COCB	SMWE	EBNS	COMA	LASA	COMW	WAHE
	Percent of respondents													
1977	51	20	3	8	5	1								
1978	55	19	3	8	6	1								
1978	53	22	5	5	7	1								
1980	43	23	10	10	8	1								
1981	46	20	8	6	9	3	5							
1982	44	8	7	9	11	7	14							
1983	50	8	11	6	5	4	12							
1984	54	5	6	6	5	4	10							
1985	43	2	11	9	6	5	12							
1986	71	5	4	3	2	1	5	4						
1987	61	7	6	3	6	2	6	2						
1988	75	2	5	1	2	<1	9	1						
1989	54	5	4	1	5	<1	21	1						
1990	51	2	8	1	5	0	23	1	3					
1991	59	3	4	0	2	0	18	2	3					
1992	47	4	8	3	4	<1	16	3	8					
1993	38	3	6	6	8	1	13	3	9	3	2			
1994	61	2	6	2	8	1	8	2	6	2	1			
1995	71	2	4	1	2	1	4	1	8	4	1			
1996	72	4	4	2	1	1	3	2	6	2	1			
1997	53	7	4	2	6	1	3	2	5	4	1			
1998	51	9	7	2	4	1	13	1	4	1	<1			
1999	40	2	10	2	1	<1	33	1	3	1	<1	2		
2000	18	2	19	<1	2	<1	43	2	3	<1	<1	2	<1	1

[1]RRPW = Redroot pigweed, FXTL = Green & Yellow foxtail, COLQ = Common lambsquarters, WIOA = Wild oats, WIBW = Wild buckwheat, WIMU = Wild mustard, KOCZ = Kochia, COCB = Common cocklebur, SMWE = Smartweed, EBNS = Eastern black nightshade, COMA = Common mallow, LASA = Lanceleaf sage, COMW = Common milkweed and WAHE = Waterhemp.

A summary of the worst production problem responses from 1977 to 2000.

	Production problem indicated as worst in sugarbeet								
Year	No Problem	Weeds	Weather	Emergence/ stand	Labor mgmt.	Insects	Cercospora leaf spot	Rhizomania	Rhizoctonia/ Aphanomyces
	percent of respondents								
1977	10	13	42	29	4	1	0		
1978	21	47	16	7	6	2	0		
1978	19	41	28	6	4	1	0		
1980	5	23	42	28	2	0	0		
1981	4	35	38	16	1	0	6		
1982	10	39	35	9	3	4	0		
1983	3	37	37	13	2	1	5		
1984	5	26	49	8	2	1	2		
1985	4	20	45	17	1	1	1		
1986	4	39	31	18	1	1	1		
1987	5	42	23	22	2	0	2		
1988	1	37	12	40	1	1	1		
1989	5	38	19	16	3	8	2		
1990	5	42	20	10	2	8	4		
1991	3	26	4	18	1	26	7		8

1992	11	45	9	15	5	9	1		3
1993	3	40	21	16	4	1	2		12
1994	3	56	12	13	4	1	3		8
1995	2	51	6	2	3	<1	24		11
1996	6	53	12	11	6	2	3		6
1997	15	34	13	12	3	1	5	2	14
1998	3	25	9	4	1	1	36	3	17
1999	14	39	14	12	2	1	6	2	9
2000	8	48	9	10	1	<1	3	2	18

TABLE 18. Most important weed problem in sugarbeet, 2000.

County	Respondents	No Problem	RRPW[1]	WIOA	FXTL	WIBW	COLQ	KOCZ
		----------% of respondents----------						
Cass	26	8	19	0	4	4	8	39
Chippewa[2]	38	3	34	0	0	0	34	5
Clay[3]	44	7	14	0	5	2	11	41
Grand Forks	29	0	10	0	3	0	7	72
Kittson	20	5	10	5	0	5	20	55
Marshall	38	5	16	0	0	3	26	42
Norman[4]	29	0	24	0	3	0	14	45
Pembina	39	3	5	3	0	5	3	80
Polk	69	9	12	3	3	0	13	54
Renville[5]	43	2	23	0	0	0	61	0
Richland	22	0	36	0	0	0	23	27
Traill	25	4	4	0	4	0	0	88
Traverse[6]	24	13	38	0	0	0	29	13
Walsh	30	3	23	0	3	3	13	50
Wilkin[7]	34	9	21	0	0	6	9	47
Total	510	5	18	<1	2	2	19	43

Table continued

TABLE 18 (con't). Most important weed problem in sugarbeet, 2000.

County	COCB	SMWE	WIMU	CATH	COMA	LASA	COMW	WAHE	Other
	----------% of respondents----------								
Cass	0	0	0	0	4	15	0	0	0
Chippewa[2]	3	11	0	0	0	0	0	11	0
Clay[3]	7	2	5	0	2	5	0	0	0
Grand Forks	0	3	0	0	0	0	3	0	0
Kittson	0	0	0	0	0	0	0	0	0
Marshall	0	5	0	0	0	0	0	0	3
Norman[4]	3	0	0	0	3	0	7	0	0
Pembina	0	0	3	0	0	0	0	0	0
Polk	0	6	1	0	0	0	0	0	0
Renville[5]	0	5	0	0	2	0	0	7	0
Richland	0	0	0	0	0	0	0	0	0
Traill	0	0	0	0	0	14	0	0	0
Traverse[6]	4	0	0	4	0	0	0	0	0

Walsh	0	3	0	0	0	0	0	0	0
Wilkin[7]	6	0	0	0	0	3	0	0	0
Total	2	3	<1	<1	<1	2	<1	1	<1

[1]RRPW = Redroot pigweed; WIOA = Wild oats; FXTL = Green & yellow foxtail; WIBW = Wild buckwheat; COLQ = Common lambsquarters; KOCZ = Kochia; COCB = Common cocklebur; SMWE = Smartweed' WIMU = Wild mustard; CATH = Canada thistle; COMA = Common mallow; LASA = Lanceleaf sage; COMW = Common milkweed; WAHE = Waterhemp.
[2]Includes Swift and Kandiyohi Counties.
[3]Includes Becker County.
[4]Includes Mahnomen County.
[5]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[6]Includes Grant, Stevens and Big Stone Counties.
[7]Includes Becker County.

TABLE 19. Most serious production problem in sugarbeet, 2000.

County	Respon-dents	No Prob	Weeds	Emerg/ Stand	Labor Mangmt	Root Maggot	CLS[1]	Rhizo-mania	Rhizoctonia/ Aphanomyces	Weather	Other
		% of respondents									
Cass	23	9	39	4	0	0	4	4	22	9	9
Chippewa[2]	33	0	76	3	0	0	0	12	9	0	0
Clay[3]	36	11	25	3	3	0	0	0	50	6	3
Grand Forks	22	9	36	18	0	5	0	9	0	23	0
Kittson	19	11	42	32	0	0	0	0	0	16	0
Marshall	35	14	51	6	6	0	6	0	6	9	3
Norman[4]	25	12	56	0	0	0	0	0	16	16	0
Pembina	36	3	44	33	3	3	3	0	6	6	0
Polk	59	9	48	3	0	0	5	0	22	12	2
Renville[5]	33	3	21	9	3	0	3	3	21	0	3
Richland	19	11	42	5	0	0	0	0	37	5	0
Traill	20	0	50	10	0	0	0	0	30	10	0
Traverse[6]	19	11	68	0	0	0	0	0	5	16	0
Walsh	25	0	36	36	0	0	12	4	4	8	0
Wilkin[7]	32	16	50	3	3	0	0	0	25	3	0
Total	436	8	48	10	1	<1	3	2	18	9	1

[1]CLS = Cercospora leaf spot.
[2]Includes Swift and Kandiyohi Counties.
[3]Includes Becker County.
[4]Includes Mahnomen County.
[5]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[6]Includes Grant, Stevens and Big Stone Counties.
[7]Includes Ottertail County.

TABLE 20. Sugarbeet acreage that was hand weeded and thinned by various methods, 2000.

County	Acres planted by respondents	Hand weeded	Mech[1] thinner	Elec[1] thinner	Hand thinned	Not thinned
		% of acres planted				
Cass	11703	29	25	9	<1	57
Chippewa[2]	21376	60	11	0	<1	83
Clay[3]	26407	5	12	<1	0	79
Grand Forks	13911	14	10	0	<1	89
Kittson	9192	5	<1	<1	<1	95
Marshall	17209	4	16	0	<1	83
Norman[4]	11599	7	21	7	<1	70
Pembina	21019	33	4	5	6	80
Polk	37495	10	8	1	0	91
Renville[5]	15663	81	24	1	2	66
Richland	13000	49	3	4	2	91

Traill	10159	29	24	<1	4	71
Traverse[6]	11795	15	23	2	2	73
Walsh	12603	26	12	1	<1	72
Wilkin[7]	15674	26	22	17	<1	59
Other	110	0	0	0	0	0
Total	248,915	25	13	3	1	79

[1]Mech = Mechanical, harrow, rotary hoe; Elec = Electronic.
[2]Includes Swift and Kandiyohi Counties.
[3]Includes Becker County.
[4]Includes Mahnomen County.
[5]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[6]Includes Grant, Stevens and Big Stone Counties.
[7]Includes Ottertail County.

TABLE 21. Method of herbicide application, 2000.

		Method of application	
Herbicide	Band	Broadcast ground	Broadcast air
	----------% of acres----------		
Eptam + Ro-Neet, Eptam, Ro-Neet	0	100	0
Nortron (PRE/PPI)	38	62	0
Betamix/Betanex/Progress	24	56	20
Poast, Select, Assure II	20	64	16
Bnex/Bmix/Progress+UpBeet	30	39	31
Bnex/Bmix/Progress+Stinger	23	63	14
Bnex/Bmix/Progress+UpB+Stinger	33	49	18
Bnex/Bmix/Prog+UpB+Sting+Grass	40	54	6
All herbicides	37	54	9

TABLE 22. Cost of hand weeding and hand thinning sugarbeet, 2000.

County	Respondents	Dollars per acre					
		0	1-10	11-15	16-20	21-25	26-30
		% of respondents					
Cass	27	59	0	7	4	22	4
Chippewa[2]	39	21	8	5	5	13	15
Clay[3]	44	73	5	7	0	5	7
Grand Forks	29	66	0	3	3	10	7
Kittson	21	76	0	0	0	10	5
Marshall	39	74	3	3	8	3	8
Norman[4]	29	69	3	0	7	10	3
Pembina	40	35	3	0	3	28	10
Polk	70	79	0	3	4	10	0
Renville[5]	44	14	9	7	9	18	7
Richland	23	39	0	13	13	26	0
Traill	25	44	0	4	0	24	8
Traverse[6]	25	68	8	4	0	12	0
Walsh	31	58	3	10	13	10	0
Wilkin[7]	36	61	0	3	3	25	3
Other	1	100	0	0	0	0	0
Total	523	56	3	4	5	14	5

Table continued.

TABLE 22 (con't) Cost of hand weeding and hand thinning sugarbeet, 2000.

County	Dollars per acre							
	31-35	36-40	41-45	46-50	51-55	56-60	61-70	>70
	% of respondents							
Cass	4	0	0	0	0	0	0	0
Chippewa[2]	5	10	8	8	3	0	0	0
Clay[3]	0	2	0	2	0	0	0	0
Grand Forks	0	0	3	7	0	0	0	0
Kittson	0	0	0	5	5	0	0	0
Marshall	3	0	0	0	0	0	0	0
Norman[4]	0	3	0	0	3	0	0	0
Pembina	3	3	0	0	13	0	0	3
Polk	1	1	0	1	0	0	0	0
Renville[5]	5	11	5	9	2	5	0	0
Richland	4	4	0	0	0	0	0	0
Traill	8	0	0	4	0	0	8	0

Traverse[6]	0	0	4	0	0	0	4	0
Walsh	0	3	0	0	0	0	3	0
Wilkin[7]	0	0	0	6	0	0	0	0
Other	0	0	0	0	0	0	0	0
Total	2	3	1	3	2	<1	1	<1

[1]Includes Swift and Kandiyohi Counties.
[2]Includes Becker County.
[3]Includes Mahnomen County.
[4]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[5]Includes Grant, Stevens and Big Stone Counties.
[6]Inculdes Ottertail County.

TABLE 23. Total sugarbeet acreage operated by respondents to the survey, 2000.

		Acres of sugarbeet					
County	Respondents	<50	50-99	100-199	200-299	300-399	400-599
		% of respondents					
Cass	27	0	7	15	4	11	41
Chippewa[1]	39	5	3	21	5	15	23
Clay[2]	44	2	2	11	18	9	25
Grand Forks	29	0	0	17	14	7	28
Kittson	21	0	0	14	19	24	14
Marshall	39	3	5	3	5	39	28
Norman[3]	29	3	10	14	17	10	24
Pembina	40	0	3	8	15	8	38
Polk	70	1	1	9	17	11	16
Renville[4]	44	2	9	23	30	11	9
Richland	23	0	0	4	0	22	35
Traill	25	0	0	4	24	20	36
Traverse[5]	25	4	4	0	32	0	40
Walsh	31	7	7	7	19	13	29
Wilkin[6]	36	0	6	17	19	17	14
Other	1	0	0	100	0	0	0
Total	523	2	4	12	16	14	25

Table continued.

TABLE 23 (cont.). Total sugarbeet acreage operated by respondents to the survey, 2000.

	Acres of sugarbeet				
County	600-799	800-999	1000-1499	1500-1999	>2000
	% of respondents				
Cass	19	0	4	0	0
Chippewa[1]	10	8	8	0	3
Clay[2]	9	7	7	5	5
Grand Forks	21	10	3	0	0
Kittson	19	5	5	0	0
Marshall	10	5	3	0	0
Norman[3]	10	7	0	3	0
Pembina	15	10	3	3	0
Polk	26	9	9	1	0
Renville[4]	5	5	7	0	0
Richland	17	13	9	0	0
Traill	16	0	0	0	0

Traverse[5]	8	8	0	4	0
Walsh	13	0	7	0	0
Wilkin[6]	14	11	0	3	0
Other	0	0	0	0	0
Total	14	7	5	1	<1

[1]Includes Swift and Kandiyohi Counties.
[2]Includes Becker County.
[3]Includes Mahnomen County.
[4]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[5]Includes Grant, Stevens and Big Stone Counties.
[6]Includes Ottertail County.

TABLE 24. Number of postemergence row crop cultivations, 2000.

	Number of cultivations					
County	0	1	2	3	4	5
	----------% of respondents----------					
Cass	0	22	70	7	0	0
Chippewa[1]	0	26	69	5	0	0
Clay[2]	5	17	55	19	5	0
Grand Forks	0	37	52	11	0	0
Kittson	5	57	38	0	0	0
Marshall	0	23	64	13	0	0
Norman[3]	0	29	57	14	0	0
Pembina	0	8	58	34	0	0
Polk	0	19	55	25	1	0
Renville[4]	0	15	63	20	2	0
Richland	0	4	48	35	13	0
Traill	0	29	71	0	0	0
Traverse[5]	0	17	50	29	4	0
Walsh	3	23	30	43	0	0
Wilkin[6]	0	6	36	42	17	0
Total	<1	21	55	21	3	0

TABLE 25. Acres where lime was applied in the past three years.

County	Lime treated acres in last three years	
	Acres reported on survey	% of 2000 sugarbeet acres
Cass	0	0
Chippewa[1]	470	2
Clay[2]	0	0
Grand Forks	0	0
Kittson	0	0
Marshall	0	0
Norman[3]	0	0
Pembina	0	0
Polk	200	<1
Renville[4]	2538	16

Richland	0	0
Traill	0	0
Traverse[5]	0	0
Walsh	0	0
Wilkin[6]	0	0
Other	0	0
Total	3208	1

[1]Includes Swift and Kandiyohi Counties.
[2]Includes Becker County.
[3]Includes Mahnomen County.
[4]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley County.
[5]Includes Grant, Stevens and Big Stone Counties.
[6]Includes Ottertail County.

TABLE 26. Frequency of Internet Access, 2000.

County	Never	Yearly	Monthly	Weekly	Daily
	% of respondents				
Cass	11	4	11	56	19
Chippewa[1]	26	8	16	29	21
Clay[2]	19	2	28	37	14
Grand Forks	17	3	35	41	3
Kittson	29	0	24	29	19
Marshall	13	5	33	36	13
Norman[3]	14	3	21	45	17
Pembina	21	5	21	33	21
Polk	19	4	25	34	18
Renville[4]	37	7	9	26	21
Richland	39	4	26	17	13
Traill	38	0	13	25	25
Traverse[5]	35	17	17	22	9
Walsh	26	7	10	36	23
Wilkin[6]	31	3	26	23	17
Other	0	0	0	100	0
Total	24	5	21	33	17

TABLE 27. Micro-rate use in 2000.

County	Used micro-rate
	% of respondents
Cass	96
Chippewa[1]	92
Clay[2]	96
Grand Forks	100
Kittson	86
Marshall	97
Norman[3]	100
Pembina	88
Polk	93

Renville[4]		98
Richland		100
Traill		100
Traverse[5]		96
Walsh		100
Wilkin[6]		92
Other		100
	Total	95

[1]Includes Swift and Kandiyohi Counties.
[2]Includes Becker County.
[3]Includes Mahnomen County.
[4]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[5]Includes Grant, Stevens and Big Stone Counties.
[6]Includes Ottertail County.

TABLE 28. Problems with nozzle plugging in sprayers, 2000.

Response	Micro-rate user respondents
	----------%----------
Yes, had a problem	45
No, did not have a problem	53
All sprayed by air	2

TABLE 29. Ranking of the relative severity of nozzle plugging over ground spraying respondents, 2000.

Ranking		Micro-rate user rank of problem
		%
No problem	0	38
	1	26
	2	17
	3	10
	4	6
Terrible problem	5	4

TABLE 30. Responses to question: What reduced or eliminated nozzle plugging?

Practice	Number of responses	% of responses
Use a basic blend adjuvant	90	21
Clean sprayer frequently	76	18
Mix in warm water	61	15
Proper mixing order	26	6
Include a grass herbicide	10	2
Add ammonia to raise water pH	16	4
Change screens	19	5
Change oil adjuvant	26	6
Reduce agitation	3	1

Preslurry UpBeet	5	1
Use injection system	11	3
Use a different source of water	4	1
Reduce water volume	8	2
Custom application	3	1
Change herbicide	37	9
Spray immediately after mixing	17	4
Change nozzles	4	1

TABLE 31. Response to the question "What weeds were not adequately controlled by the micro-rate".

County	Kochia	Colq[1]	Rrpw	Smwe	Wahe	Cath	Lasa	Comw	Fxtl	Wibw	Wioa	Cocb	Ebns	Coma
	----------% of respondents----------													
Cass	40	9	6	3	0	0	14	6	6	0	0	0	0	0
Chippewa[2]	2	37	30	12	13	0	0	0	0	0	0	0	2	0
Clay[3]	47	8	6	4	0	0	4	2	4	2	0	4	0	4
Grand Forks	54	12	2	2	0	7	0	7	2	2	2	0	2	0
Kittson	58	10	5	0	0	5	0	0	0	5	5	0	0	10
Marshall	50	26	0	5	0	2	0	2	0	2	0	0	0	0
Norman[4]	54	12	9	3	0	6	0	6	0	0	0	3	0	3
Pembina	62	23	2	0	0	0	0	0	2	2	5	0	0	0
Polk	49	22	7	7	0	3	0	1	3	1	1	0	0	0
Renville[5]	1	44	26	6	10	0	0	0	0	0	0	0	7	1
Richland	21	21	24	7	0	0	14	0	0	0	0	3	3	0
Traill	70	12	6	0	0	0	0	3	0	0	3	0	0	0
Traverse[6]	18	33	37	0	0	0	4	0	0	0	0	0	0	0
Walsh	53	24	5	0	0	3	0	0	3	3	8	0	0	0
Wilkin[7]	50	16	16	0	0	0	3	0	0	3	0	8	0	0
Other	100	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	39	22	13	4	2	2	2	2	1	1	1	1	1	1

[1]Colq = common lambsquarters, Rrpw = redroot pigweed, Smwe = smartweed spp., Wahe = common waterhemp, Cath = Canada thistle, Lasa = lanceleaf sage , Comw = common milkweed, Fxtl = green and yellow foxtail, Wibw = wild buckwheat, Wioa = wild oats, Cocb = common cocklebur, Ebns = eastern black nightshade, Coma = common mallow.
[2]Includes Swift and Kandiyohi Counties.
[3]Includes Becker County.
[4]Includes Mahnomen County.
[5]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[6]Includes Grant, Stevens and Big Stone Counties.
[7]Includes Ottertail County.

TABLE 32. Ranking of satisfaction with the micro-rate, 2000.

	Rank of satisfaction					
	Not satisfied					Completely satisfied
County	0	1	2	3	4	5
	% of respondent					
Cass	0	0	4	8	73	15
Chippewa[1]	6	14	14	31	34	0
Clay[2]	0	2	2	5	69	21
Grand Forks	0	4	0	25	57	14
Kittson	0	0	0	22	56	22
Marshall	0	0	3	18	58	21
Norman[3]	0	7	3	17	59	14
Pembina	0	3	6	26	57	9
Polk	0	2	5	11	69	14
Renville[4]	9	14	28	33	16	0
Richland	0	0	9	13	52	26
Traill	0	4	0	32	52	12
Traverse[5]	0	8	8	12	58	12
Walsh	0	6	3	16	65	10
Wilkin[6]	0	6	3	12	58	21
Other	0	0	0	100	0	0
Total	1	5	6	19	55	14

[1]Includes Swift and Kandiyohi Counties.
[2]Includes Becker County.
[3]Includes Mahnomen County.
[4]Includes Redwood, Faribault, Yellow Medicine, Lac Qui Parle and Sibley Counties.
[5]Includes Grant, Stevens and Big Stone Counties.
[6]Includes Ottertail County.