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1998 Dry Bean Grower Survey

*of Pest Problems
and Pesticide Use
in Minnesota and
North Dakota*



NDSU EXTENSION SERVICE

North Dakota State University, Fargo, ND 58105

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This is the eleventh annual survey of pest problems, pesticide use and grower practices of the Northharvest Bean Growers Association, an association of dry bean growers in Minnesota and North Dakota. Results of previous surveys dated 1987-1997 have been published (1,2,3,4,5,6,7,8,9,11). There was no survey in 1993.

The survey form (Figure 1, pages 3-4) was developed by research and extension faculty at North Dakota State University and the University of Minnesota and the directors of the Northharvest Bean Growers Association. The survey was completed by attendees at the Northharvest Bean Day in Fargo, ND on January 22, 1999. This was the second time that a survey was conducted at Bean Day. Surveys in previous years were mailed to all Northharvest growers. The surveys were anonymous.

Throughout this report, trade names of chemicals are often presented as an aid to clearer communication. Mention of trade names does not constitute endorsement or recommendation by NDSU nor Northharvest Bean Growers.

Frequent comparisons are made in this report between the 1998 survey and the 1997 survey. Weather conditions varied between the two years; June rainfall was greater throughout most of the growing area in 1998 than in 1997, but July rainfall was greater in 1997. June rainfall affects early season disease and weed problems, but July rainfall is critical for the development of white mold. Results of the two surveys reflect these differences. The 1997 survey is listed in the references (9) and will not be referenced specifically each time it is mentioned in the text.

Figure 1. Survey form.

Please circle or fill in the requested information on pest problems and pesticide use on your 1998 dry bean crop.

Total acres planted in 1998			
Irrigated acres		Dryland acres	
Total acres harvested			
Acres with hail damage			
Acres with water damage			
State	County	Acres	
Minnesota			
North Dakota			
South Dakota			
DRY BEANS GROWN IN 1998			
Class	Variety	Acres	
Pinto			
	1 Arapaho		
	2 Chase		
	3 Hatton		
	4 Maverick		
	5 Othello		
	6 Remington		
	7 RS101		
	8 Topaz		
	9 Winchester		
	10 Other Pinto (specify)		
Navy			
	21 Mayflower		
	22 Navigator		
	23 Norstar		
	24 Schooner		
	25 Other Navy (specify)		
Kidney			
	41 Montcalm (DRK)		
	42 Other Kidney (specify)		
Black			
	61 Raven		
	62 Shadow		
	63 T-39		
	64 UI-911		
	65 Other Black (specify)		
Pink			
	81 (specify)		
Other			
	91 (specify class & variety)		
Seed source		Acres planted	
Western Grown			
Northharvest Grown			
Bin run			
Biggest Production Problem in Dry Beans in 1998 (circle one)			
	Acres Affected	Bean Class	
1 Applied herbicide injury			
2 Herbicide drift injury			
3 Delayed planting			
4 Emergence/stand			

Biggest Production Problem (continued from previous column)			
	Acres Affected	Bean Class	
5 Harvest			
6 Disease			
7 Insects			
8 Micronutrient deficiency			
9 Weeds			
0 None			
11 Other (specify)			
Worst Weed Problems in Dry Beans in 1998 (Rank 1-3; 1=worst)			
	Cocklebur		Ragweed
	Nightshade		Lambsquarters
	Foxtail (pigeon grass)		Redroot pigweed
	Kochia		Wild oat
	Canada thistle		Other (specify)
	Volunteer grain		
Insecticides Used on Dry Beans in 1998			
Insecticide	No. Acres Treated	No. of Sprays	
Lindane Seed Treatment	Yes No	Acres	
Lorsban Seed Treatment	Yes No	Acres	
Worst Insect/Mite Problem in 1998 (Rank 1-3; 1=worst)			
	Grasshoppers		
	Leafhoppers		
	Spider Mites		
	Seed Corn Maggot		
Crop Rotation (fields with dry beans in 1998) (crops in previous years)			
	Field #1	Field #2	Field #3
1997			
1996			
1995			
1994			
Micronutrient Use			
Acres treated with zinc		No. of sprays	
Other micronutrients		No. of sprays	
Non-Chemical Weed Management (double-pass counts as double acres)			
Practice	Acres treated	No. of passes	
Cultivation			
Rotary hoe/harrow			
No herbicide			
Worst Disease Problems in 1998 (Rank 1-3; 1=worst)			
	Alternaria		
	Bacterial Blight		
	Root Rot		
	Rust		
	White Mold		
	None		

Weed Control Chemicals Used On Dry Beans in 1998

Mark weed control used and indicate areas treated for each item. Count double application, double cultivation, etc. as double acres.

Weed control used	Class of bean	Acres treated	Class of bean (if additional)	Acres treated	Class of bean (if additional)	Acres treated
1 Roundup Ultra (preplant)						
2 Eptam (fall)						
3 Eptam (spring)						
4 Trifluralin (fall)						
5 Trifluralin (spring)						
6 Trifluralin + Eptam						
7 Sonalan (fall)						
8 Lasso/generics						
9 Dual						
10 Frontier						
11 Prowl						
12 Pursuit						
13 Basagran/generics						
14 Assure II						
15 Poast/Poast Plus/Ultima 160						
16 Other						
Dessicants						
17 Sodium Chlorate (Leafex, Defol)						
18 Gramoxone Extra						

Fungicides Used On Dry Beans 1998

Fungicide	No. acres treated	No. of sprays	Application method (circle one)	
			air	ground
1 Bravo			air	ground
2 Maneb			air	ground
3 Champion/Champ			air	ground
4 Kocide			air	ground
5 Benlate (broadcast)			air	ground
6 Benlate (banded)			air	ground
7 Tilt			air	ground
8 Topsin (broadcast)			air	ground
9 Topsin (banded)			air	ground
10 Thiolux			air	ground
11 Other			air	ground
12 Any tank mixes? List the combination			air	ground

Responses

Useable responses totaled 176 (Table 1), 15% fewer than in 1997. The survey responses in 1998 represented 96,719 acres, or slightly over 10% of the Northharvest total of 940,000 acres planted in 1998.

Irrigation

Irrigation was used on 13% of Northharvest respondents' acres (Table 2), up from 7% in 1997. Irrigation was used on 33% of Minnesota respondents' acres, nearly double the acreage for 1997. Irrigation was used on only 6% of North Dakota respondents' acres, double the percentage from 1997.

Acres Harvested

Respondents harvested 95% of planted acres (Table 2), up from 92% in 1997 and down from 97% in 1996. Minnesota respondents harvested 97% of their planted acres and North Dakota respondents harvested 94% of their planted acres.

Acres Damaged by Hail or Water

Respondents reported 8% of their acres damaged by hail, 13% in Minnesota and 7% in North Dakota (Table 2). Respondents reported 21% of their acres were damaged by water, with 35% damaged in Minnesota and 16% reported damaged in North Dakota (Table 2).

Table 1. Number of Northharvest dry bean growers responding, total acres and acres planted by Minnesota and North Dakota respondents in 1998.

	Growers Responding	Acres Planted		
		Total Acres ^a	Respondents' Acres	Survey Acres
				(% of Total)
Minnesota	57	190,000	24,903	13.1
North Dakota	119	750,000	71,816	9.6
Northharvest Total	176	940,000	96,719	10.3

^a Total of dry bean acres planted in each state (Reference 10)

Table 2. Acres irrigated, harvested, damaged by hail and by water in Minnesota and North Dakota in 1998.

	% of Respondents' Acres		
	Minnesota	North Dakota	Northharvest
Irrigated	33.3	5.9	12.9
Harvested	96.7	94.4	95.0
Hail damaged	12.7	7.0	8.4
Water damaged	34.8	15.6	20.6

Use of Western-grown and Northharvest-grown Seed

Western-grown seed was the most common seed source, planted on 58% of respondents' acres. Northharvest-grown seed was planted on 25% of respondents' acres, a slightly lower percentage than in 1997. North Dakota respondents planted Northharvest grown seed on 29% of their acres, while Minnesota respondents planted Northharvest-grown seed on 15% of their acres. Use of Northharvest-grown seed was slightly less than in 1997. Use of bin run seed was up from 7% in 1997 to 10% in 1998. Only 6% of Minnesota respondents' acres were planted to bin run seed, but 12% of North Dakota respondents' acres were planted to bin run seed (Table 3), twice the percentage reported in 1997.

Bean Market Classes Grown

Pinto bean was the most commonly grown dry bean class in 1998, planted on 51% of Northharvest respondents' acres. Navy bean was the second most commonly grown dry bean class in 1998, planted on 17% of Northharvest respondents' acres, followed by black bean, planted on 15%, and kidney bean, planted on 12% of Northharvest respondents' acres (Table 4).

Kidney beans were planted on 46% of Minnesota respondents' acres, pinto beans on 22%, navy beans on 16%, and black beans on 7%. Pinto beans were planted on 61% of North Dakota respondents' acres, navy beans on 17%, black beans on 17% and kidney beans on only a few acres.

Table 3. Sources of seed used by Minnesota and North Dakota respondents for planting in 1998.

Seed Source	% of Respondents Acres		
	Minnesota	North Dakota	Northharvest
Western Grown	65.2	54.9	57.6
Northharvest Grown	14.8	28.5	25.0
Bin Run	5.7	11.8	10.2

Table 4. Market class of dry beans grown by respondents in Minnesota and North Dakota in 1998.

Bean Class	% of Respondents' Acres		
	Minnesota	North Dakota	Northharvest
Black	7.4	17.1	14.6
Kidney	45.7	0.4	12.0
Navy	16.3	17.0	16.8
Pink	6.5	1.6	2.8
Pinto	21.6	61.2	51.0
Other	2.5	2.9	2.8

The percentage of Minnesota respondents' acres planted to kidney beans doubled in 1998 when they were the leading class in Minnesota, compared to 1997 when pinto beans were the leading class, followed by navy beans, with kidney beans third. There also was a dramatic increase in black beans grown in 1998 in both states, a reduction in pinto beans grown in Minnesota, and a significant reduction in navy beans grown in both states (Table 4).

Varieties Grown

Maverick pinto was the most commonly grown dry bean variety, planted on 22% of Northharvest respondents' acres (Table 5). Montcalm dark red kidney was the second most commonly grown dry bean variety, planted on 10% of Northharvest respondents' acres, followed by Winchester pinto on 8% of their acres, T-39 black on 7% of their acres; and Norstar navy on 6% of their acres. These numbers are in contrast to 1997, when Norstar navy was the leading variety and Maverick was the seventh most commonly grown variety. A major reduction in navy bean acres in 1998 and inadequate supplies of Maverick seed in 1997 may have affected these changes.

Maverick was the most commonly grown pinto variety, planted on 27% of Minnesota, 45% of North Dakota and

43% of Northharvest respondents' pinto acres. Winchester was the second most commonly grown pinto variety, planted on 25% of Minnesota, 15% of North Dakota and 16% of Northharvest respondents' pinto acres (Table 6). These numbers show a dramatic switch from 1997, when Othello was the most commonly planted pinto in North Dakota and Topaz was the most commonly planted pinto in Minnesota. In 1996, almost no pinto acres were planted to varieties resistant to the common races of rust. In 1998, the rust resistant varieties Maverick, Winchester, Remington and Chase accounted for 71% of Northharvest pinto acres.

Norstar was the leading navy variety, planted on 39% of Minnesota, 35% of North Dakota and 36% of Northharvest respondents' navy acres. Mayflower was the second most commonly planted navy, planted on 5% of Minnesota, 25% of North Dakota and 20% of Northharvest respondents' acres, followed by Vista, planted on 18% of Minnesota, 11% of North Dakota and 13% of Northharvest respondents' acres, and Schooner, planted on 16% of Minnesota, 10% of North Dakota and 11% of Northharvest respondents' navy acres (Table 6). Norstar, the leading navy variety in 1997, continued as the leading navy variety in 1998, but Mayflower acres increased dramatically in North Dakota in 1998.

Table 5. Varieties grown in 1998 by Northharvest respondents in Minnesota and North Dakota.

Variety	Class ^b	Acres Planted ^a					
		MN	%	ND	%	Northharvest	%
Arapaho	P	0	0	1,370	1.9	1,370	1.4
Chase	P	300	1.2	2,600	3.6	2,900	3.0
Hatton	P	150	0.6	660	0.9	810	0.8
Maverick	P	1,449	5.8	19,703	27.4	21,152	21.9
Othello	P	0	0	1,153	1.6	1,153	1.2
Remington	P	240	1.0	2,995	4.2	3,235	3.3
RS 101	P	221	0.9	1,015	1.4	1,236	1.3
Topaz	P	810	3.3	3,590	5.0	4,400	4.6
Winchester	P	1,337	5.4	6,350	8.8	7,687	8.0
Bill-Z	P	340	1.4	825	1.2	1,165	1.2
Other Pinto	P	245	1.0	1,290	1.8	1,535	1.6
Mayflower	N	185	0.7	3,071	4.3	3,256	3.4
Navigator	N	240	1.0	768	1.1	1,008	1.0
Norstar	N	1,595	6.4	4,206	5.9	5,801	6.0
Schooner	N	662	2.7	1,170	1.6	1,832	1.9
Vista	N	742	3.0	1,370	1.9	2,112	2.2
Envoy	N	250	1.0	940	1.3	1,190	1.2
Montcalm	K	8,898	35.7	260	0.4	9,158	9.5
Other Kidney	K	2,478	10.0	0	0	2,478	2.6
Shadow	B	0	0	4,385	6.1	4,385	4.5
T-39	B	925	3.7	6,080	8.5	7,005	7.2
UI-911	B	660	2.7	750	1.0	1,410	1.5
Other Black	B	60	0.2	1,035	1.4	1,095	1.1
Pink	PK	1,623	6.5	1,120	1.6	2,743	2.8
Other Class		320	1.3	1,730	2.4	2,050	2.1

^a Includes varieties planted on more than 1% of respondents' total acres.

^b P = pinto; N = navy; K = kidney; B = black; PK = pink

Montcalm dark red kidney continued to be the leading kidney bean variety, planted on 78% of Minnesota, 100% of North Dakota's very few kidney acres and 79% of Northharvest respondents' kidney acres (Table 6).

T-39 was the leading black bean variety, planted on 50% each of Minnesota, North Dakota and Northharvest respondents' black bean acres, followed by Shadow, planted on none of Minnesota, 36% of North Dakota and 31% of Northharvest respondents' acres, and UI-911, planted on 36% of Minnesota, 6% of North Dakota and 10% of Northharvest respondents' black bean acres (Table 6).

Production Problems

Weather was reported as the worst production problem for 23% of Minnesota respondents on 19% of their acres, 24% of North Dakota respondents on 26% of their acres, and by 24% of Northharvest respondents on 24% of their acres. These values represent a major reduction in weather problems from 1997. Disease was the worst production problem for 28% of Minnesota respondents on 39% of their acres, 10% of North Dakota respondents on 18% of their acres and 16% of Northharvest respondents on 23% of their acres. Weeds were the worst production problem for 23% of Minnesota respondents on 26% of their acres, 25% of North Dakota respondents on 22% of their acres and 24% of Northharvest respondents on 23% of their acres. Emergence and stand problems were cited by 9% of Minnesota respondents on 6% of their acres, 9% of North Dakota respondents on 10% of their acres and 9% of Northharvest respondents on 9% of their acres. Harvest was the worst production problem for 7% of North

Table 6. Leading varieties of dry bean, by market class, grown in Minnesota and North Dakota in 1998.

Class/Variety ^a	% of Respondents' Acres ^b		
	Minnesota	North Dakota	Northharvest
Pinto			
Maverick	27.0	44.8	42.9
Winchester	24.9	14.5	15.6
Topaz	15.1	8.2	8.9
Navy			
Norstar	39.2	34.5	35.7
Mayflower	4.6	25.2	20.0
Vista	18.3	11.2	13.0
Schooner	16.3	9.6	11.3
Kidney			
Montcalm	78.2	100.0	78.7
Black			
T-39	50.1	49.6	49.7
Shadow	0	35.8	31.1
UI-911	35.8	6.1	10.0

^a Varieties grown on more than 10% of respondents' acres for that class, in at least one state.

^b % of respondents' acres planted to that class of bean.

Dakota respondents on 7% of their acres (Table 7). Disease was the worst production problem for Minnesota respondents, followed by weeds and weather. In contrast, weather was the worst production problem for North Dakota respondents, followed by weeds and disease.

Disease Problems

White mold was the worst disease problem for 39% of Northharvest respondents on 42% of their acres, followed by root rot for 15% of respondents on 15% of their acres, rust for 6% of respondents on 6% of their acres and bacterial blight for 5% of respondents on 4% of their acres (Table 8). White mold was a less common problem in 1998 than in 1997 and root rot was much more common in 1998 than in 1997. More respondents reported having no serious disease problem ("none") in 1998 than in 1997.

Root rot was the worst disease problem for 33% of Minnesota respondents on 46% of their acres. White mold was the worst disease problem for 33% of Minnesota respondents on 28% of their acres, followed by rust for 5% of Minnesota respondents on 7% of their acres and bacterial blight for 7% of Minnesota respondents on 6% of their acres (Table 8). Root rot was a much greater problem in Minnesota in 1998 than in 1997 and white mold was less of a problem.

Table 7: Worst production problem in 1998 for respondents in Minnesota and North Dakota.

Worst Production Problem Reported	- Respondents -		- Acres Reported -	
	Number	%	Number	%
Minnesota				
Disease	16	28.1	9,723	39.0
Weeds	13	22.8	6,350	25.5
Weather	13	22.8	4,615	18.5
Emergence/Stand	5	8.8	1,485	6.0
Herbicide Injury	3	5.3	745	3.0
Harvest	2	3.5	413	1.7
Micronutrient Deficiency	1	1.8	300	1.2
North Dakota				
Weather	29	24.4	18,451	25.7
Weeds	30	25.2	16,076	22.4
Disease	12	10.1	12,736	17.7
Emergence/Stand	11	9.2	6,823	9.5
Harvest	11	9.2	6,185	8.6
Delayed Planting	4	3.4	1,400	1.9
Herbicide Injury	1	0.8	270	0.4
Northharvest				
Weather	42	23.9	23,066	23.8
Disease	28	15.9	22,459	23.2
Weeds	43	24.4	22,426	23.2
Emergence/Stand	16	9.1	8,308	8.6
Harvest	13	7.4	6,598	6.8
Delayed Planting	4	2.3	1,400	1.4
Herbicide Injury	4	2.3	1,015	1.0
Micronutrient Deficiency	1	0.6	300	0.3

White mold was the worst disease problem for 42% of North Dakota respondents on 48% of their acres, followed by rust for 7% of North Dakota respondents on 6% of their acres, root rot for 6% of respondents on 4% of their acres and bacterial blight for 4% of respondents on 4% of their acres (Table 8). White mold was a less common problem in North Dakota in 1998 than in 1997.

White mold was ranked as one of the three worst diseases by Northarvest respondents on 53% of dry bean acres reported, considerably less than in 1995-1997. Root rot was ranked as one of the three worst diseases by Northarvest respondents on 36% of respondents' acres, up considerably from 1997. Bacterial blight was ranked as one of the three worst diseases by Northarvest respondents on 32% of their acres, up from 1998. Rust was ranked as one of the three worst diseases by Northarvest respondents on 27% of their acres, slightly lower than in 1997 (Table 9).

Root rot was one of the three worst diseases on 66% of Minnesota respondents' acres and on 26% of North Dakota respondents' acres (Table 9), substantial increases from 1997 in root rot ranking in both states. The data for all other diseases are fairly similar for both states and do not vary greatly from that of the combined data for both states (Northarvest total).

Table 8. Worst disease problem^a in 1998 in Minnesota and North Dakota.

Worst Disease Problem	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Root Rot	19	33.3	11,461	46.0
White Mold	19	33.3	6,863	27.6
Rust	3	5.3	1,649	6.6
Bacterial Blight	4	7.0	1,374	5.5
Alternaria	1	1.8	700	2.8
None	6	10.5	1,163	4.7
North Dakota				
White Mold	50	42.0	34,163	47.6
Rust	8	6.7	3,920	5.5
Root Rot	7	5.9	3,040	4.2
Bacterial Blight	5	4.2	2,536	3.5
Alternaria	1	0.8	600	0.8
None	34	28.6	18,266	25.4
Northarvest				
White Mold	69	39.2	41,026	42.4
Root Rot	26	14.8	14,501	15.0
Rust	11	6.3	5,569	5.8
Bacterial Blight	9	5.1	3,910	4.0
Alternaria	2	1.1	1,300	1.3
None	40	22.7	19,429	20.1

^a Ranked as No. 1 disease problem by respondents.
^b Respondents' acres only.

Disease Control Practices

Fungicides were used on 28% of Northarvest survey respondents' acres, down from 43% in 1997 and 61% in 1996. Fungicides were used on 28% of Minnesota and 27% of North Dakota respondents' acres, down from 59% and 37%, respectively, in 1997 and from 68% and 59% in 1996. Benlate was the most widely used fungicide in Minnesota, applied to 19% of respondents acres, followed by Topsin M, applied to 8% of their acres, and Tilt, applied to 0.4% of their acres. Benlate was the most widely used fungicide in North Dakota, applied to 13% of respondents' acres, followed by Topsin M applied to 9% of their acres, Tilt applied to 2%, Bravo applied to 2%, and maneb applied to less than 1% (Tables 10 and 11).

The percentage of acres treated by ground was nearly 9 times that treated by air for all Northarvest respondents. It was 9 times as great for Minnesota respondents and 8 times as great for North Dakota respondents (Table 10).

Minnesota respondents sprayed 27% of their acres with the benzimidazole fungicides Benlate and Topsin M for white mold control, compared with 52% in 1997, 44% in 1996 and 21% in 1995. North Dakota respondents sprayed 22% of their acres with the benzimidazole fungicides, compared to 28% in 1997, 22% in 1996 and 18% in 1995. In Minnesota 9% of respondents' acres were band sprayed

Table 9. Diseases ranked as one of the three worst^a in 1998 in Minnesota and North Dakota.

No. 1, 2 or 3 Disease Problem	- Respondents -		- Acres Reported ^b -	
	Number	%	Number	%
Minnesota				
Root Rot	33	57.9	16,361	65.7
White Mold	30	52.6	12,718	51.1
Bacterial Blight	18	31.6	9,279	37.3
Rust	12	21.1	6,306	25.3
Alternaria	3	5.3	1,815	7.3
None	6	10.5	1,163	4.7
North Dakota				
White Mold	60	50.4	38,383	53.4
Bacterial Blight	30	25.2	21,671	30.2
Rust	34	28.6	20,230	28.2
Root Rot	27	22.7	18,864	26.3
Alternaria	5	4.2	4,015	5.6
None	34	28.6	18,266	25.4
Northarvest				
White Mold	90	51.1	51,101	52.8
Root Rot	60	34.1	35,225	36.4
Bacterial Blight	48	27.3	30,950	
Rust	46	26.1	26,536	27.4
Alternaria	8	4.5	5,830	6.0
None	40	22.7	19,429	20.1

^a Ranked as No. 1, 2 or 3 disease problem by respondents.
^b Respondents' acres only.

Table 10. Fungicides applied to dry beans in 1998 by respondents in Minnesota and North Dakota.

Fungicide ^a	Method of Appl. ^b	Total Acres Treated ^c		Acres Treated by Air ^c		Acres Treated by Ground	
		Number	%	Number	%	Number	%
Minnesota							
Benlate	Banded	1,880	7.5	0	0	1,880	7.5
Benlate	Broadcast	2,904	11.7	378	1.5	2,526	10.1
Tilt	—	208	0.8	108	0.4	100	0.4
Topsin M	Banded	230	0.9	0	0	230	0.9
Topsin M	Broadcast	1,812	7.3	190	0.8	1,622	6.5
Total Fungicide		7,034	28.2	676	2.7	6,358	25.5
North Dakota							
Benlate	Banded	7,117	9.9	0	0	7,117	
Benlate	Broadcast	2,040	2.8	570	0.8	1,470	2.0
Bravo	—	1,600	2.2	0	0	1,600	2.2
Maneb	—	850	1.2	200	0.3	650	0.9
Tilt	—	1,645	2.3	135	0.2	1,510	2.1
Topsin M	Banded	1,395	1.9	0	0	1,395	1.9
Topsin M	Broadcast	4,915	6.8	1,205	1.7	3,710	5.2
Total Fungicide		19,562	27.2	2,110	2.9	17,452	24.3
Northarvest							
Benlate	Banded	8,997	9.3	0	0	8,997	9.3
Benlate	Broadcast	4,944	5.1	948	1.0	3,996	4.1
Bravo	—	1,600	1.7	0	0	1,600	1.7
Maneb	—	850	0.9	200	0.2	650	0.7
Tilt	—	1,853	1.9	243	0.3	1,610	1.7
Topsin M	Banded	1,625	1.7	0	0	1,625	1.7
Topsin M	Broadcast	6,727	7.0	1,395	1.4	5,332	5.5
Total Fungicide		26,596	27.5	2,786	2.9	23,810	24.6

^a Mention of a trade name does not constitute an endorsement, recommendation nor preference over other similar fungicides.

^b Respondents were not asked method of application for Bravo, Maneb or Tilt.

^c Respondents' acres only.

(directed spray with drop nozzles between the rows) with benzimidazole fungicides and 19% were broadcast sprayed, a slightly higher percentage of band spraying than in previous years. In North Dakota, 12% of respondents' acres were band sprayed with benzimidazole fungicides and 10% were broadcast sprayed, an increase in band spraying from 1996 and 1997. Wet conditions in 1996 and 1997 may have reduced the ability of respondents to band spray in a timely manner. Use of Benlate in Minnesota was about twice that of Topsin M and in North Dakota it was about 50% higher (Table 11).

Rust fungicides were used on 4% of Northarvest respondents' acres, compared to 9% in 1997 and 34% in 1996. Tilt, available in both states under a specific exemption (section 18), was used on 2% of Northarvest respondents' acres, followed by Bravo on less than 2% and maneb on less than 1%. In Minnesota, Tilt was used on less than 1% of respondents' acres. In North Dakota, Tilt was used on 2% of respondents' acres, followed by Bravo on 2% and maneb on 1% (Table 12). This dramatic reduction in use of rust fungicides since 1996 is at least partly due to increased use of pinto varieties that have resistance to the current rust races, as indicated in the section on varieties grown.

Table 11. Fungicides and application methods for white mold control in 1998 in Minnesota and North Dakota.

Fungicide	Band Applied		Broadcast		Total	
	Acres	% ^a	Acres	% ^a	Acres	% ^a
Minnesota						
Benlate	1,880	7.5	2,904	11.7	4,784	19.2
Topin M	230	0.9	1,812	7.3	2,042	8.2
Total ^b	2,110	8.5	4,716	18.9	6,826	27.4
North Dakota						
Benlate	7,117	9.9	2,040	2.8	9,157	12.8
Topin M	1,395	1.9	4,915	6.8	6,310	8.8
Total ^b	8,512	11.9	6,955	9.7	15,467	21.5
Northarvest						
Benlate	8,997	9.3	4,994	5.1	13,991	14.5
Topin M	1,625	1.7	6,727	7.0	8,352	8.6
Total ^b	10,622	11.0	11,721	12.1	22,343	23.1

^a Percent of respondents' acres

^b Total of Benlate and Topin M

Table 12. Fungicides used for rust control in 1998 in Minnesota and North Dakota.

State	Bravo		Maneb		Tilt		Total	
	Acres	% ^a	Acres	% ^a	Acres	% ^a	Acres	%
Minnesota	0	0	0	0	208	0.8	208	0.8
North Dakota	1,600	2.2	850	1.2	1,645	2.3	4,095	5.7
Northharvest Total	1,600	1.7	850	0.9	1,853	1.9	4,303	4.4

^a Percent of respondents' acres

^b Total of Bravo, Maneb and Tilt

Weed Problems

Nightshade was the worst weed problem for 29% of Northharvest respondents on 36% of the acres reported. This percentage is up from 14% of respondents and 18% of acres in 1997 when nightshade also was the worst weed problem. In 1996 nightshade was the worst weed for 12% of respondents on 12% of their acres; it was the second worst weed behind wild mustard (Table 13). The nightshade problem has increased dramatically in recent years due to wetter weather, high seed production and dissemination, multiple flushes, and lack of control in row crops.

Redroot pigweed was the worst weed for 10% of Northharvest respondents, representing 10% of the acres reported. Canada thistle was the worst weed for 10% of respondents on 9% of the acres reported, and foxtail was the worst weed for 8% of respondents on 8% of their acres. Ragweed was the worst weed for 9% of respondents on 6% of the acres reported, followed by kochia for 5% of respondents on 6% of their acres, cocklebur for 6% of respondents on 6% of their acres, wild mustard for 5% of respondents on 5% of their acres and lambsquarters for 8% of respondents on 5% of their acres (Table 13). Wild mustard was the worst weed in 1996, the fifth worst weed in 1997 and the eighth worst weed in 1998, indicating a shift in weed problems since 1996.

In Minnesota, nightshade was the worst weed for 30% of survey respondents on 37% of the Minnesota acres reported. This contrasts to 1997 when it was the third worst weed in Minnesota, reported as the worst on 14% of respondents' acres. Nightshade was the worst weed on nearly three times as many acres in 1998 as in 1997. Redroot pigweed was the worst weed for 14% of respondents on 18% of the acres reported. This is a decrease from 1997 when redroot pigweed was the worst weed for 26% of respondents on 28% of their acres. Ragweed was the worst weed for 18% of respondents on 17% of their acres, followed by lambsquarters which was the worst weed for 19% of respondents on 16% of their acres and foxtail which was the worst weed for 7% of respondents on 6% of their acres (Table 13).

In North Dakota, nightshade was the worst weed for 29% of respondents on 35% of the North Dakota acres reported, nearly double 1997 when it was the worst weed for 14% of respondents' on 19% of their acres. Canada thistle was the worst weed for 14% of respondents on 13% of acres reported, which is similar to 1997 and 1996. Foxtail, cocklebur and redroot pigweed were each the worst weed for 8% of respondents on 8%, 8% and 7% of respondents' acres, respectively. Kochia and wild mustard each

Table 13. Worst weed problem in 1998 in Minnesota and North Dakota.

Worst Weed Problem ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Nightshade	17	29.8	9,114	36.6
Redroot Pigweed	8	14.0	4,429	17.8
Ragweed	10	17.5	4,230	17.0
Lambsquarters	11	19.3	3,995	16.0
Foxtail	4	7.0	1,515	6.1
Kochia	1	1.8	600	2.4
Wild Mustard	2	3.5	461	1.9
North Dakota				
Nightshade	34	28.6	25,430	35.4
Canada Thistle	17	14.3	9,108	12.7
Foxtail	10	8.4	5,740	8.0
Cocklebur	10	8.4	5,420	7.5
Redroot Pigweed	10	8.4	4,991	6.9
Kochia	7	5.9	4,990	6.9
Wild Mustard	7	5.9	4,810	6.7
Ragweed	6	5.0	1,656	2.3
Lambsquarters	3	2.5	875	1.2
Wild Oat	3	2.5	780	1.1
Volunteer Grain	1	0.8	450	0.6
Northharvest				
Nightshade	51	29.0	34,554	35.7
Redroot Pigweed	18	10.2	9,420	9.7
Canada Thistle	17	9.7	9,108	9.4
Foxtail	14	8.0	7,255	7.5
Ragweed	16	9.1	5,886	6.1
Kochia	8	4.5	5,590	5.8
Cocklebur	10	5.7	5,420	5.6
Wild Mustard	9	5.1	5,271	5.4
Lambsquarters	14	8.0	4,870	5.0
Wild Oat	3	1.7	780	0.8
Volunteer Grain	1	0.6	450	0.5

^a Ranked as No. 1 weed problem on more than 0.5% of respondents' acres.

^b Respondents' acres only.

was the worst weed for 6% of respondents on 7% of their acres (Table 13). Foxtail and wild mustard each was a less common problem in 1998 than in 1997. Cocklebur was about the same both years.

Nightshade was ranked most frequently as one of the three worst weed problems for Northarvest respondents, with 53% of respondents' acres affected, followed by cocklebur on 31%, Canada thistle on 30%, redroot pigweed on 22%, ragweed on 22%, lambsquarters on 16% and kochia on 16% (Table 14). Nightshade was about twice as common a weed problem in 1998 as in 1997, as was cocklebur.

In Minnesota, ragweed was ranked most frequently as one of the three worst weed problems on 59% of respondents' acres, followed by nightshade on 55%, redroot pigweed on 40%, lambsquarters on 32%, foxtail on 20%, Canada thistle on 13% and cocklebur on 11% (Table 14). Ragweed and nightshade were almost twice as commonly ranked among the three worst weeds in 1998 as in 1997. Redroot pigweed was a less commonly ranked weed problem in 1998 than in 1997.

In North Dakota, nightshade was ranked most frequently as one of the three worst weeds on 53% of respondents' acres, followed by cocklebur on 38%, Canada thistle on 37%, foxtail on 23%, kochia on 19% and redroot pigweed on 16% (Table 14). Nightshade and cocklebur were each one of the three worst weed problems on about 50% more respondents' acres in 1998 than in 1997.

Weed Control Practices

The most common chemical weed control practices were post-applied bentazon (Basagran, others), used by 80% of respondents on 57% of Northarvest respondents' acres, followed by spring applied trifluralin, used on 31% of respondents' acres, and Assure II and Pursuit, each used on 26% of respondents' acres, and fall applied Sonalan, used on 23% of respondents' acres. Other common weed control practices included use of spring applied Sonalan, used on 18% of respondents' acres, and Poast, used on 11% of respondents acres (Table 15). The use of Assure II was up from 19% of respondents' acres in 1997.

The most common cultural weed control practice was inter-row cultivation, used by 85% of Northarvest respondents on 85% of their acres. Rotary hoe was used by 26% of respondents on 18% of their acres (Table 15).

Table 14. Weeds ranked one of the three worst in 1998 in Minnesota and North Dakota.

No. 1,2 or 3 Weed Problem ^a	-- Respondents --		-- Acres Reported ^b --	
	Number	%	Number	%
Minnesota				
Ragweed	30	52.6	14,641	58.8
Nightshade	28	49.1	13,743	55.1
Redroot Pigweed	19	33.3	9,834	39.5
Lambsquarters	22	38.6	7,872	31.6
Foxtail	11	19.3	4,922	19.8
Canada Thistle	5	8.8	3,161	12.7
Cocklebur	10	17.5	2,704	10.9
North Dakota				
Nightshade	51	42.9	37,701	52.5
Cocklebur	39	32.8	27,130	37.8
Canada Thistle	50	42.0	26,238	36.5
Foxtail	35	29.4	16,545	23.0
Kochia	23	19.3	13,550	18.9
Redroot Pigweed	23	19.3	11,796	16.4
Volunteer Grain	5	4.2	8,390	11.7
Wild Oat	15	12.6	8,233	11.5
Lambsquarters	20	16.8	7,973	11.1
Northarvest				
Nightshade	79	44.9	51,544	53.2
Cocklebur	49	27.8	29,834	30.8
Canada Thistle	55	31.3	29,399	30.4
Redroot Pigweed	42	23.3	21,630	22.4
Ragweed	47	26.7	21,149	21.9
Lambsquarters	42	23.3	15,845	16.4
Kochia	27	15.3	15,380	15.9

^a Ranked as No. 1,2 or 3 weed problem on more than 10% of respondents' acres.

^b Respondents' acres only.

Table 15. Weed control practices in 1998 by all Northarvest respondents in Minnesota and North Dakota.

Weed Control Practice ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Cultivation	149	84.7	81,929	84.7
Bentazon (Basagran, others)	141	80.1	55,335	57.2
Trifluralin, spring applied	95	54.0	30,366	31.4
Assure II	60	34.1	25,210	26.1
Pursuit	82	46.6	24,634	25.5
Sonalan, fall applied	48	27.3	21,837	22.6
Rotary hoe	46	26.1	17,777	18.4
Sonalan, spring applied	47	26.7	17,661	18.3
Poast	27	15.3	10,273	10.6
Prowl	29	16.5	7,600	7.9
Eptam, spring applied	16	9.1	5,755	6.0
Roundup, preplant	13	7.4	5,625	5.8
Lasso	12	6.8	4,372	4.5
Trifluralin + Eptam	3	1.7	2,550	2.6
Dual	4	2.3	2,000	2.1
Trifluralin, fall applied	6	3.4	1,525	1.6
Frontier	4	2.3	1,190	1.2

^a Includes all practices or herbicides used on more than 1,000 acres.

^b Respondents' acres only.

In Minnesota, post-applied bentazon was applied by 75% of respondents on 55% of their acres, up slightly from 52% in 1997. Fall-applied Sonalan was applied to 26% of respondents' acres, followed by Pursuit, applied to 25% of respondents' acres. The use of Pursuit was a significant increase from 1997, when it was used on less than 10% of Minnesota respondents' acres. Increased Pursuit use is due to a greater nightshade infestation in dry bean acres. No other registered dry bean herbicide controls nightshade as well as Pursuit. Assure II was used on 21% of respondents' acres, followed by Prowl on 19%, Lasso on 15%, spring applied Sonalan, spring applied trifluralin, spring applied Eptam and Poast, each on 14%. Most herbicide usage was similar to that in 1997, except that the use of Prowl increased from 13% of respondents' acres in 1997 to 19% in 1998. Inter-row cultivation was used by 84% of respondents on 79% of their acres, down from 81% in 1997 and 85% in 1996. Rotary hoe was used by 28% of respondents on 24% of their acres, down from 33% in 1997 and 30% in 1996 (Table 16). Wet weather early in the season may have influenced the reduced use of rotary hoe in 1998.

In North Dakota, post-applied bentazon was applied by 82% of respondents on 58% of their acres, up from 48% in 1997, but down from 64% in 1996. Spring applied trifluralin was applied to 38% of respondents' acres, up from 28% in 1997 and 16% in 1996. Assure II was applied on 28% of respondents' acres, up from 18% in 1997. Pursuit was applied to 26% of respondents' acres, fall applied Sonalan was applied to 22% of their acres and spring applied Sonalan was applied to 20% of their acres. Inter-row cultivation was used by 85% of respondents on 87% of their acres, up slightly from 85% in 1997. Rotary hoe was used by 25% of respondents on 17% of their acres, down slightly from 20% in 1997 (Table 16).

Gramoxone Extra desiccant was used by 9% of Minnesota, 13% of North Dakota and 12% of Northarvest respondents on 4%, 3% and 3% of their acres, respectively. Sodium chlorate desiccant was used by 12% of Minnesota, 3% of North Dakota and 6% of Northarvest respondents on 7%, >1% and 2% of their acres, respectively (Table 17). The low use of desiccants in 1998 contrasts sharply with the high use in 1997, when 33% of Minnesota, 25% of North Dakota and 27% of Northarvest respondents' acres were treated.

Post-applied bentazon was the most commonly used herbicide on 50% of Minnesota respondents' black bean acres, 51% of their kidney, 57% of their navy, and 46% of their pinto bean acres. Fall-applied Sonalan was used on none of Minnesota respondents' black, 31% of their kidney, 27% of their navy, and 33% of their pinto acres.

Pursuit was used on 21% of respondents' black, 29% of their kidney, 18% of their navy, and 28% of their kidney acres. Assure II was used on none of respondents' black, 23% of their kidney, 35% of their navy, and 14% of their pinto acres. Prowl was used on 29% of respondents' black, 16% of their kidney, 30% of their navy, and 14% of their pinto acres. Lasso was used on none of respondents' black, 29% of their kidney, none of their navy and 3% of their pinto acres. Spring applied Sonalan was used on 8% of respondents' black, 16% of their kidney, 22% of their navy

Table 16. Common weed control practices in 1998 in Minnesota and North Dakota.

Weed Control Practice ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Cultivation	48	84.2	19,582	78.6
Bentazon				
(Basagran, others)	43	75.4	13,753	55.2
Sonalan, fall applied	14	24.6	6,386	25.6
Pursuit	24	42.1	6,103	24.5
Rotary hoe	16	28.1	5,956	23.9
Assure II	18	31.6	5,095	20.5
Prowl	20	35.1	4,660	18.7
Lasso	7	12.3	3,682	14.8
Sonalan, spring applied	14	24.6	3,575	14.4
Trifluralin, spring applied	15	26.3	3,438	13.8
Eptam, spring applied	10	17.5	3,430	13.8
Poast	13	22.8	3,423	13.7
North Dakota				
Cultivation	101	84.9	62,347	86.8
Bentazon				
(Basagran, others)	98	82.4	41,582	57.9
Trifluralin, spring applied	80	67.2	26,928	37.5
Assure II	42	35.3	20,115	28.0
Pursuit	58	48.7	18,531	25.8
Sonalan, fall applied	34	28.6	15,451	21.5
Sonalan, spring applied	33	27.7	14,086	19.6
Rotary hoe	30	25.2	11,821	16.5

^a Practice or herbicide used on more than 10% of respondents' acres.

^b Respondents' acres only.

Table 17. Desiccants used in 1998 in Minnesota and North Dakota.

Desiccant	Respondents		Acres Reported ^a	
	Number	%	Number	%
Minnesota				
Sodium Chlorate	7	12.3	1,712	6.9
Gramoxone Extra	5	8.9	935	3.8
North Dakota				
Sodium Chlorate	3	2.5	440	0.6
Gramoxone Extra	16	13.4	1,975	2.8
Northarvest Total				
Sodium Chlorate	10	5.7	2,152	2.2
Gramoxone Extra	21	11.9	2,910	3.0

^a Respondents' acres only.

and 11% of their pinto acres. Spring applied trifluralin was used on none of respondents' black, 5% of their kidney, 15% of their navy and 21% of their pinto acres. Spring applied Eptam was used on none of respondents' black, 10% of their kidney, 27% of their navy and 21% of their pinto acres. Poast was used on none of respondents' black, 14% of their kidney, 18% of their navy and 18% of their pinto acres (Table 18).

Post-applied bentazon was the most commonly used herbicide on 38% of North Dakota respondents' black bean acres, 53% of their navy, and 63% of their pinto bean acres. Spring applied trifluralin was used on 30% of North Dakota respondents' black, 61% of their navy and 32% of their pinto acres. Assure II was used on 26% of respondents' black, 15% of their navy and 27% of their pinto acres. Pursuit was used on 30% of respondents' black, 22% of their navy and 20% of their pinto acres. Fall applied Sonalan was used on 13% of respondents' black, 10% of their navy and 25% of their pinto acres. Spring applied Sonalan was used on 19% of respondents' black, 8% of their

navy and 21% of their pinto acres. Poast was used on 2% of respondents' black, 3% of their navy and 10% of their pinto acres (Table 18).

Inter-row cultivation was used once by 31% of Minnesota respondents who answered the question, twice by 58%, and three times by 10%. Inter-row cultivation was used once by 31% of North Dakota respondents who answered the question, twice by 57%, three times by 11% and four times by 1% (Table 19). These data are similar to those for 1997.

Rotary hoe was used once by 69% of Minnesota respondents who answered the question, twice by 25% and three times by 6%; fewer respondents answered this and the previous question than some of the other questions. Rotary hoe was used once by 83% of North Dakota respondents who answered the question, twice by 13% and three times by 3% (Table 20). These data are similar to those for 1997.

Insect Problems

Grasshoppers were the worst insect problem for 22% of Northharvest survey respondents representing 24% of the dry bean acres reported, up from 15% in 1997 and 6% in 1996. Grasshoppers were a problem on 29% of North Dakota respondents' acres but only 10% of Minnesota respondents' acres. The potato leafhopper was a more common problem for Minnesota respondents, reported as a problem on 11% of Minnesota respondents' acres but only 1% of North Dakota respondents' acres (Table 21).

Table 19. Number of cultivations of dry beans in 1998 in Minnesota and North Dakota.

	Number of Cultivations ^a			
	1	2	3	4
Minnesota	31.3	58.3	10.4	0
North Dakota	30.7	57.4	10.9	1.0

^a % of respondents' answering question; excludes respondents who did not answer question.

Table 20. Number of times rotary hoe was used on dry beans in 1998 in Minnesota and North Dakota.

	Number of Times Rotary Hoe Used ^a		
	1	2	3
Minnesota	68.8	25.0	6.3
North Dakota	83.3	13.3	3.3

^a % of respondents' answering question; excludes respondents who did not answer question.

Table 18. Herbicide use by bean class in 1998 in Minnesota and North Dakota.

Herbicide	Black	Kidney	Navy	Pinto	State Total
	----- % of Acres Treated ^a -----				
Minnesota					
Bentazon (Basagran, others)	49.9	50.6	56.6	46.1	55.2
Sonalan, fall applied	0	30.7	27.1	32.6	25.6
Pursuit	20.8	29.1	18.1	28.7	24.5
Assure II	0	22.8	34.7	14.0	20.5
Prowl	28.9	16.4	30.3	13.9	18.7
Lasso	0	29.3	0	2.8	14.8
Sonalan, spring applied	7.9	16.4	22.1	10.5	14.4
Trifluralin, spring applied	0	5.0	14.9	20.6	13.8
Eptam, spring applied	0	10.4	27.1	21.4	13.8
Poast	0	14.4	17.7	17.7	13.7
North Dakota					
Bentazon (Basagran, others)	37.6	^b	53.2	63.4	57.9
Trifluralin, spring applied	29.5	^b	60.8	32.0	37.5
Assure II	25.6	^b	15.0	26.8	28.0
Pursuit	29.7	^b	21.6	20.1	25.8
Sonalan, fall applied	12.7	^b	10.3	24.7	21.5
Sonalan, spring applied	19.1	^b	7.9	21.2	19.6
Poast	2.1	^b	3.3	10.4	9.5

^a % of respondents' acres for that class.

^b Insufficient data.

Insecticidal Seed Treatments

No seed treatment was used on 14% of acres of Minnesota respondents answering the question. Lindane seed treatment was used on 13% of respondents' acres, Lorsban on 17% and "unknown" was used on 20% (Table 22). The "unknown" is significant because growers might know that the seed was treated but not remember what was stated on the seed tag.

Micronutrient Usage

Zinc, a common micronutrient for dry beans, was applied to 53% of Northarvest respondents' acres, nearly the same as in 1997. Zinc was applied to 39% of Minnesota and 59% of North Dakota respondents' acres, which is down from 1997 for Minnesota but about the same for North Dakota. Other micronutrients were used on 11% of Northarvest, 13% of Minnesota and 11% of North Dakota respondents' acres, nearly double the usage in 1997 (Table 23).

A single application of zinc was made by 97% of Minnesota and 95% of North Dakota respondents who answered the question. Two applications were made by 3% of respondents in each state and three applications

Table 21. Worst Insect problem in 1998 in Minnesota and North Dakota.

Worst Insect Problem ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Leaf Hopper	9	15.8	2,687	10.8
Grasshopper	8	14.0	2,477	9.9
North Dakota				
Grasshopper	30	25.2	20,548	28.6
Leafhopper	1	0.8	800	1.1
Northarvest Total				
Grasshopper	38	21.6	23,025	23.8
Leafhopper	10	5.7	3,487	3.6

^a Insect problems reported on more than 1% of respondents' acres only.

^b Respondents' acres only.

Table 22. Use of insecticidal seed treatment in 1998 in Minnesota.

Treatment	Respondents		Acres Reported	
	Number	% ^a	Number	%
No Seed Treatment	8	12.3	3,460	13.9
Lindane	8	12.3	3,151	12.7
Lorsban	6	9.2	4,100	16.5
Unknown	13	20.0	4,987	20.0

^a Percent responding to question.

were made by 2% of North Dakota respondents. Most respondents in both states made but a single application of other micronutrients (Table 24).

Crop Rotations

Crop rotations used by Northarvest respondents involved several years between dry bean crops. Nearly 33% of the dry beans planted in Minnesota followed corn, 31% followed wheat, 16% followed soybeans, 8% followed barley, 6% followed sugarbeets and 4% followed potatoes. Nearly 70% of dry beans planted in North Dakota followed wheat, 13% followed barley, 10% followed corn and 6% followed sugarbeet (Table 25). The percentage of various crops that preceded dry beans in each state was similar to 1997.

Three, four and five year rotations were common in Minnesota, with 30%, 38% and 25% of respondents who answered the question citing these respective rotations. Only 5% of Minnesota respondents cited a two year rotation. In North Dakota, two, three and four year rotations were common, with 34%, 32% and 20% of respondents' citing these respective rotations. Only 14% of North Dakota respondents reported using a five year rotation (Table 26).

Table 23. Use of zinc and other micronutrients in 1998 in Minnesota and North Dakota.

Treatment	Acres Treated ^a	
	Number	%
Minnesota		
Zinc	9,582	38.6
Other Micronutrients	3,229	13.0
North Dakota		
Zinc	41,974	58.5
Other Micronutrients	7,633	10.6
Northarvest Total		
Zinc	51,556	53.3
Other Micronutrients	10,862	11.2

^a Respondents' acres only.

Table 24. Number of applications of zinc and other micronutrients in 1998 by respondents in Minnesota and North Dakota.

Treatment	Number of Applications				
	Zinc			Other Micronutrients	
	1	2	3	1	2
----- % of Respondents ^a -----					
Minnesota	96.7	3.3	0	100	0
North Dakota	95.3	3.1	1.6	95	0

^a Percent of those responding to question; includes only respondents who applied micronutrients.

Table 25. Crop grown the year prior to dry beans in 1998 by respondents in Minnesota and North Dakota.

Previous Crop	% of Respondents ^a	
	Minnesota	North Dakota
Wheat	31.2	69.5
Barley	7.6	13.2
Dry Bean	0.4	0.4
Corn	32.8	9.5
Flax	0	0.4
Sorghum/millet	0	0.4
Sunflower	1.2	0
Alfalfa	0.8	0
Soybean	15.6	0
Sugarbeet	6.4	6.2
Potato	3.6	0.4

^a Percent of those responding to question.

Table 26. Number of years in dry bean rotation in 1998 in Minnesota and North Dakota.

Number of Years in Rotation	% of Respondents ^a	
	Minnesota	North Dakota
1	1.0	0.4
2	5.2	33.5
3	30.2	32.2
4	37.5	20.1
5	25.0	13.8
9	1.0	0

^a Percent of those responding to question.

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ER-58

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