

2000
**Dry Bean
Grower Survey**

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



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This is the thirteenth 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 1987-1999 have been published (1,2,3,4,5,6,7,8,9,10,11,13). 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 directors of the Northharvest Bean Growers Association. The survey was completed by attendees at the Northharvest Bean Day in Fargo, on January 26, 2001. This was the fourth time that a survey was conducted at Bean Day. Surveys in previous years were mailed to all Northharvest growers. All 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 or Northharvest Bean Growers.

Frequent comparisons are made in this report between the 2000 survey and the 1999 survey. The 1999 survey is listed in the references (11) 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 2000 dry bean crop.

Total acres planted in 2000		
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 2000		
Class	Variety	Acres
Pinto	1 Buster	
	2 Chase	
	3 Elizabeth	
	4 GTS 900	
	5 Maverick	
	6 Remington	
	7 Topaz	
	8 Winchester	
	9 Other Pinto (specify)	
Navy	21 Mayflower	
	22 Navigator	
	23 Norstar	
	24 Schooner	
	25 Vista	
	26 Other Navy (specify)	
Kidney	41 Montcalm (DRK)	
	42 Other Kidney (specify)	
Black	61 Onyx	
	62 Shadow	
	63 T-39	
	64 Other Black (specify)	
Pink	81 (specify)	
Other	91 (specify class & variety)	
Seed source		Acres planted
Western Grown		
Northwest Grown (ND/MN)		
Canadian Grown (MB/ON)/county grown		
Bin run		
Crop Rotation (fields with dry beans in 2000) (crops in previous years)		
	Field #1 dry beans '00	Field #2 dry beans '00
1999		
1998		
1997		
1996		

Biggest Production Problem in Dry Beans in 2000 (circle one)		
	Acres Affected	Bean Class
1 Applied herbicide injury*		
2* List herbicide in #1		
3 Herbicide drift injury		
4 Delayed planting		
5 Emergence/stand		
6 Harvest		
7 Disease		
8 Insects		
9 Micronutrient deficiency		
10 Weeds		
11 Other (specify)		
12 None		
Insecticides Used on Dry Beans in 2000		
Insecticide	No. Acres Treated	No. of Sprays
Lindane Seed Treatment	Yes No	Acres
Lorsban Seed Treatment	Yes No	Acres
Worst Insect/Mite Problem in 2000 (Rank 1-3; 1=worst)		
Grasshoppers		
Leafhoppers		
Spider Mites		
Seed Corn Maggot		
Micronutrient Use		
Acres treated with zinc		No. of sprays
Other micronutrients		No. of sprays
Worst Weed Problems in Dry Beans in 2000 (Rank 1-3; 1=worst)		
Cocklebur		Ragweed
Nightshade		Lambsquarters
Foxtail (pigeon grass)		Redroot
Kochia		Biennial
Canada thistle		Wild oat
Volunteer grain		Other (specify)
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 2000 (Rank 1-3; 1=worst)		
Alternaria		
Bacterial Blight		
Root Rot		
Rust		
White Mold		
None		

Weed Control Chemicals Used On Dry Beans in 2000

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 (spring)						
7 Sonalan (fall)						
8 Sonalan (spring)						
9 Lasso/generics						
10 Dual						
11 Frontier						
12 Prowl						
13 Pursuit						
14 Basagran/generics						
15 Assure II						
16 Poast						
17 Raptor						
18 Reflex						
19 Other						
Desiccants						
20 Sodium Chlorate (Leafex, Defol)						
21 Gramoxone Extra						

Fungicides Used On Dry Beans 2000

Fungicide	No. acres treated	No. of sprays	Application method (circle one)	
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 Thiolut			air	ground
11 Other			air	ground
12 Any tank mixes? List the combination			air	ground

Responses

Useable responses totaled 139 (Table 1) compared to 207 in 1999. The survey responses in 2000 represented 78,136 acres, or slightly over 10% of the Northharvest total of 775,000 acres planted in 2000 (12). This is similar to the response rate in 1998 and less than that in 1999 when there was a response rate of 14% on 830,000 planted acres (12).

Irrigation

Irrigation was used on 10% of Northharvest respondents' acres (Table 2), down from 17% in 1999 and 13% in 1998. Irrigation was used on 24% of Minnesota respondents' acres, slightly less than the 29% in 1999. Irrigation was used on 2% of North Dakota respondents' acres, down greatly from 11% in 1999 and 6% in 1998.

Acres Harvested

Northharvest respondents harvested 82% of planted acres (Table 2), down from 87% in 1999 and 95% in 1998. Minnesota respondents harvested 85% of their planted acres but North Dakota respondents harvested only 81% of their planted acres. Heavy rains late in the season contributed to the reduction in harvested acres and led to quality problems in some fields that were harvested.

Acres Damaged by Hail or Water

Northharvest respondents reported 11% of their acres damaged by hail, 7% in Minnesota and 12% in North Dakota (Table 2). Northharvest respondents reported 26% of their acres were damaged by water, with 23% damaged in Minnesota and 28% damaged in North Dakota (Table 2). Water damage in 2000 was slightly higher than in 1999, when 23% of Northharvest respondents' acres were damaged. Water damage in Minnesota was lower in 2000 at 23% than in 1999 at 34% but was higher in North Dakota in 2000 at 28% than in 1999 at 18%.

Sources of Seed Used

Western-grown seed was the most common seed source, planted on 60% of Northharvest respondents' acres. Northharvest-grown seed was planted on 16% of Northharvest respondents' acres, a lower percentage than in 1999. North Dakota respondents planted Northharvest-grown seed on 23% of their acres, while Minnesota respondents planted Northharvest-grown seed on 3% of their acres. Michigan-grown seed was planted on 5% of Northharvest respondents' acres. Minnesota respondents planted Michigan-grown seed on 14% of their acres, while North

Dakota respondents planted Michigan-grown seed on less than 1% of their acres. Canadian seed was planted on 1% of Northharvest respondents' acres, with 3% of Minnesota respondents' acres planted to Canadian seed and less than 1% of North Dakota respondents' acres planted to Canadian seed. Bin run seed was planted on 13% of Northharvest respondents' acres, up dramatically from 5% in 1999. Minnesota respondents planted bin run seed on 6% of their acres but North Dakota respondents planted bin run seed on 16% of their acres. These figures represent an approximate doubling of bin run seed use in 2000 compared to 1999.

'Bean Market Classes Grown

Pinto bean was the most commonly grown dry bean class in 2000, planted on 50% of Northharvest respondents' acres, up slightly from 1999 at 45%. Navy bean was the second most commonly grown dry bean class in 2000, planted on 23% of Northharvest respondents' acres, followed by kidney beans on 15%, black beans on 4%, and

Table 1. Number of Northharvest dry bean growers responding, total acres and acres planted by Minnesota and North Dakota respondents in 2000.

	Growers Responding	Acres Planted		
		Total Acres ^a	Respondents' Acres	Survey Areas (% of Total)
Minnesota	58	165,000	27,017	16.4
North Dakota	81	610,000	51,119	8.4
Northharvest Total	139	775,000	78,136	10.1

^a Total of dry bean acres planted in each state.

Table 2. Acres irrigated, harvested, damaged by hail and by water in Minnesota and North Dakota in 2000.

	% of Respondents' Acres		
	Minnesota	North Dakota	Northharvest
Irrigated	24.4	1.7	9.6
Harvested	85.1	80.7	82.2
Hail damaged	7.3	12.3	10.6
Water damaged	22.5	28.3	26.3

Table 3: Sources of seed used by Minnesota and North Dakota respondents for planting in 2000.

Seed Source	% of Respondents Acres		
	Minnesota	North Dakota	Northharvest
Bin Run	6.3	16.1	12.7
Canada	3.2	0.5	1.4
Michigan	14.3	0.5	5.3
Northharvest Grown	3.4	23.3	16.4
Western	68.3	54.8	59.5

pink beans on 2% of Northarvest respondents' acres (Table 4). Navy bean acres were down to 23% in 2000 compared to 31% in 1999. Black bean acres in 2000 were also down from 1999.

Kidney beans were planted on 42% of Minnesota respondents' acres, navy beans on 25%, pinto beans on 17%, pink beans on 5% and black beans on 2%. Pinto beans were planted on 67% of North Dakota respondents' acres, navy beans on 21%, black beans on 5% and kidney beans on less than 1%. The percentage of Minnesota respondents' acres planted to kidney beans was slightly greater in 2000 than in 1999 and the percentage of navy beans decreased from 31% in 1999 to 25% in 2000. The percentage of North Dakota respondents' acres planted to pinto beans increased from 60% in 1999 to 67% in 2000, the percentage of navy beans decreased from 30% in 1999 to 22% in 2000 and the percentage of black beans decreased from 17% in 1998 and 7% in 1999 to 5% in 2000 (Table 4).

Table 4. Market class of dry beans grown by respondents in Minnesota and North Dakota in 2000.

Bean Class	% of Respondents' Acres		
	Minnesota	North Dakota	Northarvest
Black	1.6	4.7	3.6
Kidney	41.5	0.9	15.0
Navy	24.9	21.2	22.5
Pink	5.1	0	1.8
Pinto	17.4	66.7	49.6
Other	9.4	6.5	7.5

Varieties Grown

Maverick pinto continued as the most commonly grown dry bean variety, planted on 34% of Northarvest respondents' acres (Table 5). Montcalm dark red kidney was the second most commonly grown dry bean variety, planted on 12% of Northarvest respondents' acres, followed by Norstar navy on 7% of their acres, Winchester pinto on 3%, Vista navy on 3%, and Mayflower navy on 3%. These numbers indicate a strong increase in the use of Maverick, from 25% of Northarvest respondents' acres in 1999 to 34% in 2000. The percentage of respondents' acres planted to Norstar was down from 1999 due to a decrease in total navy acres in 2000.

Maverick was the most commonly grown pinto variety, planted on 54% of Minnesota, 71% of North Dakota and 69% of Northarvest respondents' pinto acres. This is a significant increase in pinto acres from 1999. No other pinto variety was planted on more than 10% of respondents' pinto acres (Table 6). This is a dramatic change from 1997, when Othello was the most commonly planted pinto variety in North Dakota. Almost no pinto acres were planted to varieties resistant to the common races of rust in 1996. The varieties Buster, Chase, Frontier, Maverick, Remington and Winchester accounted for 82 % of Northarvest pinto acres in 2000; these varieties are resistant to current rust races. This compares to 81% in 1999, 71% in 1998, less than 20% in 1997 and almost none in 1996.

Table 5. Varieties grown in 2000 by Northarvest respondents in Minnesota and North Dakota.

Variety	Class ^b	Acres Planted ^a					
		MN	%	ND	%	Northarvest	%
Buster	P	150	0.6	1,030	2.0	1,180	1.5
GTS 900	P	150	0.6	1,100	2.2	1,250	1.6
Maverick	P	2,535	9.4	24,105	47.2	26,640	34.1
Remington	P	240	0.9	720	1.4	960	1.2
Topaz	P	25	0.1	1,000	2.0	1,025	1.3
Winchester	P	285	1.1	1,882	3.7	2,167	2.8
Pinto, Other	P	1,320	4.9	4,245	8.3	5,565	7.1
Mayflower	N	177	0.7	1,880	3.7	2,057	2.6
Navigator	N	1,160	4.3	450	0.9	1,610	2.1
Norstar	N	1,925	7.1	3,837	7.5	5,762	7.4
Schooner	N	0	0	840	1.6	840	1.1
Vista	N	922	3.4	1,175	2.3	2,097	2.7
Navy, Other	N	2,538	9.4	2,670	5.2	5,208	6.7
Montcalm	K	8,630	31.9	430	0.9	9,060	11.6
Kidney, Other	K	2,595	9.6	30	0.1	2,625	3.4
Shadow	B	0	0	800	1.6	800	1.0
T-39	B	220	0.8	1,430	2.8	1,650	2.1
Black, Other	B	216	0.8	150	0.3	366	0.5
Pink	PK	1,385	5.1	0	0	1,385	1.8
Other Classes	—	1,544	5.7	1,845	3.6	3,389	4.3

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

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

Table 6. Leading varieties of dry bean, by market class, grown in Minnesota and North Dakota in 2000.

Class/Variety ^a	% of Respondents' Acres ^b		
	Minnesota	North Dakota	Northharvest
Pinto			
Maverick	53.9	70.7	68.7
Navy			
Mayflower	2.6	17.3	11.7
Navigator	17.3	4.1	9.2
Norstar	28.6	35.4	32.8
Vista	13.7	10.8	11.9
Kidney			
Montcalm	76.9	93.5	77.5
Black			
Shadow	0	33.6	28.4
T-39	50.5	60.1	58.6

^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.

Norstar was the leading navy variety, planted to 29% of Minnesota, 35% of North Dakota and 33% of Northharvest respondents' navy acres. Vista was the second most commonly planted navy, planted on 14% of Minnesota, 11% of North Dakota and 12% of Northharvest respondents' navy acres, followed by Mayflower, planted on 3% of Minnesota, 17% of North Dakota and 12% of Northharvest respondents' acres, followed by Navigator, planted on 17% of Minnesota, 4% of North Dakota and 9% of Northharvest respondents' navy acres (Table 6). Norstar was also the leading navy variety in 1997, 1998 and 1999.

Montcalm was the leading kidney variety, planted on 77% of Minnesota, 94% of North Dakota's very few kidney acres and 78% of Northharvest respondents' kidney acres (Table 6).

T-39 was the leading black variety, planted on 51% of Minnesota, 60% of North Dakota and 59% of Northharvest respondents' black acres, followed by Shadow, planted on none of Minnesota, 34% of North Dakota and 28% of Northharvest respondents' black acres (Table 6).

Production Problems

Weeds were reported as the worst production problem for 35% of Minnesota respondents on 30% of their acres, 36% of North Dakota respondents on 42% of their acres and 35% of Northharvest respondents on 38% of their acres. Weather was the worst production problem for 26% of Minnesota respondents on 26% of their acres, 40% of North Dakota respondents on 32% of their acres and 34% of Northharvest respondents on 30% of their acres. Disease

was reported as the worst production problem for 10% of Minnesota respondents on 13% of their acres, 9% of North Dakota respondents on 12% of their acres and 9% of Northharvest respondents on 12% of their acres (Table 7). Weed problems were greatly increased in 2000 and weather problems continued to be serious. All other problems were of minor importance, with less than 10% of respondents' acres affected by any other problem.

Weeds

Nightshade was the worst weed problem for 32% of Northharvest respondents on 35% of the acres reported (Table 8). These percentages are up from 1999. 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.

Ragweed was the worst weed problem for 15% of Northharvest respondents on 15% of the acres reported (Table 8). Kochia was the worst weed for 14% of Northharvest respondents on 14% of the acres reported. Canada thistle was the worst weed for 10% of Northharvest respondents on 11% of the acres reported. Redroot pigweed was the worst weed for 6% of Northharvest respondents on 6% of the acres reported. The ranking of weed problems changed somewhat from 1999 to 2000; in 1999 the worst

Table 7. Worst production problem in 2000 for respondents in Minnesota and North Dakota.

Worst Production Problem Reported	- Respondents -		- Acres Reported* -	
	Number	%	Number	%
Minnesota				
Weeds	18	35.3	8,135	30.1
Weather	13	25.5	7,010	25.9
Disease	5	9.8	3,580	13.3
Insects	2	3.9	1,250	4.6
Emergence/Stand	4	7.8	1,045	3.9
Herbicide Injury	2	3.9	900	3.3
Harvest	3	5.9	733	2.7
North Dakota				
Weeds	27	35.5	21,617	42.3
Weather	30	39.5	16,332	31.9
Disease	7	9.2	6,110	12.0
Harvest	7	9.2	3,050	6.0
Herbicide Injury	1	1.3	800	1.6
Emergence/Stand	1	1.3	130	0.3
Northharvest				
Weeds	45	35.4	29,752	38.1
Weather	43	33.9	23,342	29.9
Disease	12	9.4	9,690	12.4
Harvest	10	7.9	3,783	4.8
Herbicide Injury	3	2.4	1,700	2.2
Insects	2	1.6	1,250	1.6
Emergence/Stand	5	3.9	1,175	1.5

* Respondents' acres only

weeds, in order, were nightshade, cocklebur, ragweed, Canada thistle, biennial wormwood, kochia, foxtail and redroot pigweed.

In Minnesota, ragweed was the worst weed for 28% of survey respondents on 27% of the Minnesota acres reported, whereas in 1999 it was the worst weed for 31% of survey respondents on 22% of the Minnesota acres reported and in 1998 it was the third worst weed, reported by 23% of Minnesota respondents on 20% of their acres. Kochia was the worst weed for 17% of Minnesota respondents on 20% of their acres, nightshade was the worst weed for 22% of respondents on 18% of their acres, and redroot pigweed was the worst weed for 9% of respondents on 8% of their acres (Table 8).

Table 8. Worst weed problem in 2000 in Minnesota and North Dakota.

Worst Weed Problem ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Ragweed	16	27.6	7,379	27.3
Kochia	10	17.2	5,460	20.2
Nightshade	13	22.4	4,950	18.3
Redroot Pigweed	5	8.6	2,218	8.2
Canada Thistle	3	5.2	1,895	7.0
Cocklebur	2	3.4	1,830	6.8
Lambsquarters	5	8.6	1,760	6.5
Foxtail	2	3.4	1,165	4.3
Volunteer Grain	2	3.4	360	1.3
North Dakota				
Nightshade	31	39.7	22,470	44.0
Canada Thistle	10	12.8	6,500	12.7
Kochia	9	11.5	5,287	10.3
Ragweed	5	6.4	4,265	8.3
Biennial Wormwood	4	5.1	2,460	4.8
Cocklebur	6	7.7	2,397	4.7
Redroot Pigweed	3	3.8	2,060	4.0
Foxtail	3	3.8	1,250	2.4
Volunteer Grain	1	1.3	1,220	2.4
Wild Oat	2	2.6	935	1.8
Lambsquarters	3	3.8	790	1.5
Northarvest				
Nightshade	44	32.4	27,420	35.1
Ragweed	21	15.4	11,644	14.9
Kochia	19	14.0	10,747	13.8
Canada Thistle	13	9.6	8,395	10.7
Redroot Pigweed	8	5.9	4,278	5.5
Cocklebur	8	5.9	4,227	5.4
Lambsquarters	8	5.9	2,550	3.3
Biennial Wormwood	4	2.9	2,460	3.1
Foxtail	5	3.7	2,415	3.1
Volunteer Grain	3	2.2	1,580	2.0
Wild Oat	2	1.5	935	1.2

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

^b Respondents' acres only.

In North Dakota, nightshade was the worst weed for 40% of survey respondents on 44% of the acres reported, higher than in 1999. Canada thistle was the worst weed for 13% of respondents on 13% of their acres, kochia was the worst weed for 12% of respondents on 10% of their acres and ragweed was the worst weed for 6% of respondents on 8% of their acres (Table 8).

Nightshade was ranked most frequently as one of the three worst weed problems for Northarvest respondents, with 54% of respondents' acres affected, followed by Canada thistle on 44%, ragweed on 39%, kochia on 28%, redroot pigweed on 26%, lambsquarters on 21%, cocklebur on 20%, foxtail on 17% and biennial wormwood on 10% (Table 9). Nightshade was a more frequent problem in 2000 than in 1999.

Table 9. Weeds ranked as one of the three worst in 2000 in Minnesota and North Dakota.

No. 1, 2 or 3 Weed Problem ^a	- Respondents -		- Acres Reported ^b -	
	Number	%	Number	%
Minnesota				
Ragweed	32	55.2	13,032	48.2
Nightshade	23	39.7	11,335	42.0
Lambsquarters	25	43.1	10,549	39.0
Canada Thistle	15	25.9	10,000	37.0
Redroot Pigweed	18	31.0	9,228	34.2
Kochia	14	24.1	7,790	28.8
Cocklebur	10	17.2	4,310	16.0
Foxtail	8	13.8	4,174	15.4
North Dakota				
Nightshade	43	53.1	30,782	60.2
Canada Thistle	38	46.9	24,205	47.4
Ragweed	26	32.1	17,544	34.3
Kochia	27	33.3	14,282	27.9
Redroot Pigweed	16	19.8	11,220	21.9
Cocklebur	22	27.2	11,002	21.5
Foxtail	13	16.0	9,405	18.4
Biennial Wormwood	13	16.0	7,805	15.3
Lambsquarters	10	12.3	5,680	11.1
Northarvest				
Nightshade	66	47.5	42,117	53.9
Canada Thistle	53	38.1	34,205	43.8
Ragweed	58	41.7	30,576	39.1
Kochia	41	29.5	22,072	28.2
Redroot Pigweed	34	24.5	20,448	26.2
Lambsquarters	35	25.2	16,229	20.8
Cocklebur	32	23.0	15,312	19.6
Foxtail	21	15.1	13,579	17.4
Biennial Wormwood	13	9.4	7,805	10.0

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

^b Respondents' acres only.

In Minnesota, ragweed was ranked most frequently as one of the three worst weed problems on 48% of respondents' acres, followed by nightshade on 42%, lambsquarters on 39%, Canada thistle on 37%, redroot pigweed on 34%, kochia on 29%, cocklebur on 16% and foxtail on 15% (Table 9). There was a large increase in the percent of respondents' acres affected by Canada thistle, reported to be one of the three worst weed problems on 37% of Minnesota respondents' acres in 2000 compared to 19% in 1999. In North Dakota, nightshade was ranked most frequently as one of the three worst weed problems on 60% of respondents' acres, up from 49% in 1999 and 53% in 1998. Canada thistle was ranked as one of the three worst weed problems on 47% of North Dakota respondents' acres, up from 37% in both 1999 and 1998. Ragweed was ranked as one of the three worst weed problems on 34% of North Dakota respondents' acres, followed by kochia on 28% of respondents' acres, redroot pigweed on 22%, cocklebur on 22%, foxtail on 18%, biennial wormwood on 15% and lambsquarters on 11% (Table 9).

Table 10. Weed control practices in 2000 by all Northharvest respondents in Minnesota and North Dakota.

Weed Control Practice ^a	- Respondents -		- Acres Reported ^b -	
	Number	%	Number	%
Cultivation	112	80.6	58,648	75.1
Bentazon (Basagran, others)	87	62.6	31,179	39.9
Sonalan, spring applied	63	45.3	23,801	30.5
Trifluralin, spring applied	69	49.6	23,177	29.7
Raptor	69	49.6	18,565	23.8
Pursuit	45	32.4	15,060	19.3
Poast	40	28.8	14,750	18.9
Rotary hoe	19	13.7	6,663	8.5
Assure II	22	15.8	4,855	6.2
Eptam, spring applied	10	7.2	4,750	6.1
Prowl	19	13.7	4,658	6.0
Sonalan, fall applied	8	5.8	4,395	5.6
Reflex	15	10.8	3,860	4.9
Trifluralin, fall applied	6	4.3	2,955	3.8
Frontier	10	7.2	2,882	3.7
Roundup, preplant	8	5.8	2,472	3.2
Trifluralin + Eptam	6	4.3	2,200	2.8
Lasso	7	5.0	2,040	2.6
Dual	5	3.6	1,702	2.2

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

^b Respondents' acres only.

Weed Control Practices

The most common chemical weed control practices were post-applied bentazon (Basagran, others), used by 63% of respondents on 40% of Northharvest respondents' acres, followed by spring applied Sonalan, used on 31% of respondents' acres, spring applied trifluralin on 30% of their acres, Raptor on 24% of their acres, Pursuit on 19% of their acres, and Poast on 19% of their acres. Other common weed control practices included use of Assure II on 6% of respondents' acres, spring applied Eptam on 6%, Prowl on 6%, fall applied Sonalan on 6%, and Reflex on 5% (Table 10).

The most common cultural weed control practice was inter-row cultivation, used by 81% of respondents on 75% of their acres. Rotary hoe was used by 14% of respondents on 9% of their acres. These data indicate a reduction in inter-row cultivation from 85% of respondents' acres in 1999 to 75% in 2000 and a reduction in rotary hoe use from 19% of respondents' acres in 1999 to 9% in 2000.

In Minnesota, post-applied bentazon was applied by 57% of respondents on 30% of their acres, down from 37% of their acres in 1999 and 55% in 1998. Raptor was applied on 28% of respondents' acres, followed by Poast on 24%, spring applied trifluralin on 21%, spring applied Sonalan on 20%, Pursuit on 17%, Prowl on 14% and spring applied Eptam on 14%. Use of Raptor is due to a greater nightshade infestation in dry bean acres. Inter-row cultivation was used by 86% of respondents on 86% of their acres,

which is similar to previous years. Rotary hoe was used by 22% of respondents on 18% of their acres, down from 42% in 1999 (Table 11). Wet weather early in the season may have reduced the use of rotary hoe.

In North Dakota, post-applied bentazon was applied by 67% of respondents on 45% of their acres, which is similar to 1999. Spring-applied Sonalan was applied on 36% of respondents' acres, followed by spring applied trifluralin on 34%, Raptor on 22%, Pursuit on 21% and Poast on 16%. Inter-row cultivation was used by 77% of respondents on 69% of their acres, which is slightly lower than in 1999 and 1998. Rotary hoe was used by only 7% of respondents on 4% of their acres (Table 11). There was a dramatic difference in the use of rotary hoe in Minnesota, where it was used on 18% of respondents' acres and North Dakota, where it was used on only 4% of respondents' acres.

Gramoxone Extra desiccant was used by 7% of Minnesota, 9% of North Dakota and 8% of Northharvest respondents on 3%, 5% and 4% of their acres, respectively. Sodium chlorate desiccant was used by 7%, 4% and 5% of Northharvest respondents on 3%, 1% and 2% of their acres, respectively (Table 12). These figures represent a modest increase in use of desiccants from 1999 and 1998 but are much lower than 1997, when 33% of Minnesota, 25% of North Dakota and 27% of Northharvest respondents' acres were treated.

Post-applied bentazon was used on 9% of Minnesota respondents' black bean acres, 9% of their kidney, 67% of their navy, and 34% of their pinto bean acres. Raptor was used on 21% of Minnesota respondents' black, 41% of their kidney, 31% of their navy and 12% of their pinto acres. Poast was used on 143% of respondents' black, 8% of their kidney, 47% of their navy and 25% of their pinto acres.

Spring applied trifluralin was used on 41% of respondents' black, 8% of their kidney, 33% of their navy and 27%

of their pinto acres. Spring applied Sonalan was used on none of respondents' black, 21% of their kidney, 37% of their navy and 9% of their pinto acres. Pursuit was used on 32% of respondents' black, 5% of their kidney, 11% of their navy and 53% of their pinto acres. Prowl was used on none of respondents' black, 16% of their kidney, 16% of their navy and 5% of their pinto acres. Spring applied Eptam was used on 73% of respondents' black, 14% of their kidney, 16% of their navy and 7% of their pinto acres.

Fall applied trifluralin was applied on none of respondents' black, 5% of their kidney, none of their navy and 34% of their pinto acres. Reflex was used on none of respondents' black, 3% of their kidney, 17% of their navy and 1% of their pinto acres. Dual was applied was applied to 14% kidney, 3% navy, but was not applied to black or pinto acres as reported by respondents. Lasso was used on none of respondents' black, 12% of their kidney, 2% of their navy and none of their pinto acres. Fall applied Sonalan was used on 73% of respondents' black, none of their kidney, none of their navy and 17% of their pinto acres (Table 13).

Post-applied bentazon was used on 46% of North Dakota respondents black bean acres, 31% of their navy and 52% of their pinto bean acres. Spring applied Sonalan was used on 20% of North Dakota respondents' black, 26% of their navy and 44% of their pinto acres. Spring applied trifluralin was used on 62% of respondents' black, 47% of their navy and 32% of their pinto acres. Raptor was used on 45% of respondents' black, 28% of their navy and 21% of their pinto acres. Pursuit was used on 18% of respondents' black, 13% of their navy and 25% of their pinto acres. Poast was used on none of respondents' black, 12% of their navy and 18% of their pinto acres. Fall applied Sonalan was used on 21% of respondents' black, none of their navy and 8% of their pinto acres. Frontier was used on 13% of respondents' black, 1% of their navy and 4% of their pinto acres (Table 13). There were not enough kidney acres in North Dakota to provide an assessment of herbicide use on that class of dry bean.

Inter-row cultivation was used once by 44% of Minnesota respondents who answered the question, twice by 52% and three times by 4%. Inter-row cultivation was used once by 47% of North Dakota respondents who answered the question, twice by 48% and three times by 5% (Table 14). These data are similar to data for 1999 except that there were fewer respondents who used three or more cultivations in 2000.

Rotary hoe was used once by 69% of Minnesota respondents who answered the question and twice by 31%; fewer respondents answered this and the previous question than

Table 11. Common weed control practices in 2000 in Minnesota and North Dakota.

Weed Control Practices ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Cultivation	50	86.2	23,204	85.9
Bentazon (Basagran, others)	33	56.9	8,049	29.8
Raptor	32	55.2	7,458	27.6
Poast	21	36.2	6,480	24.0
Trifluralin, spring applied	22	37.9	5,577	20.6
Sonalan, spring applied	20	34.5	5,464	20.2
Rotary hoe	13	22.4	4,823	17.9
Pursuit	17	29.3	4,560	16.9
Prowl	17	29.3	3,758	13.9
Eptam, spring applied	8	13.8	3,700	13.7
North Dakota				
Cultivation	62	76.5	35,444	69.3
Bentazon (Basagran, others)	54	66.7	23,130	45.2
Sonalan, spring applied	43	53.1	18,337	35.9
Trifluralin, spring applied	47	58.0	17,600	34.4
Raptor	37	45.7	11,107	21.7
Pursuit	28	34.6	10,500	20.5
Poast	19	23.5	8,270	16.2

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

^b Respondents' acres only.

Table 12. Desiccants used in 2000 in Minnesota and North Dakota.

Desiccant	Respondents		Acres Reported ^a	
	Number	%	Number	%
Minnesota				
Gramoxone Extra	4	6.9	790	2.9
Sodium Chlorate	4	6.9	749	2.8
North Dakota				
Gramoxone Extra	7	8.6	2,370	4.6
Sodium Chlorate	3	3.7	650	1.3
Northarvest				
Gramoxone Extra	11	7.9	3,160	4.0
Sodium Chlorate	7	5.0	1,399	1.8

^a Respondents' acres only

Table 13. Herbicide use by bean class in 2000 in Minnesota and North Dakota.

Herbicide	Black	Kidney	Navy	Pinto	State Total
Minnesota					
Bentazon (Basagran, others)	9.2	9.2	66.5	34.4	29.8
Raptor	20.6	41.2	31.0	12.2	27.6
Poast	143.3 ^b	7.9	46.5	25.2	24.0
Trifluralin, spring applied	41.3	8.2	33.1	27.2	20.6
Sonalan, spring applied	0	20.5	36.5	8.5	20.2
Pursuit	32.1	5.1	10.8	52.7	16.9
Prowl	0	15.5	16.2	5.3	13.9
Eptam, spring applied	73.4	13.6	16.4	7.4	13.7
Trifluralin, fall applied	0	5.3	0	33.6	8.1
Reflex	0	2.7	16.7	1.1	6.9
Dual	0	13.6	2.5	0	6.3
Lasso	0	12.3	2.4	0	5.7
Sonalan, fall applied	73.4	0	0	16.5	4.1
North Dakota					
Bentazon (Basagran, others)	46.2	—	30.5	52.1	45.2
Sonalan, spring applied	19.7	—	25.9	44.2	35.9
Trifluralin, spring applied	62.2	—	46.9	32.0	34.4
Raptor	44.5	—	28.2	20.5	21.7
Pursuit	17.6	—	13.2	25.0	20.5
Poast	0	—	11.5	17.8	16.2
Sonalan, fall applied	21.0	—	0	8.2	6.5
Frontier	12.6	—	0.9	3.5	3.6

^a % of respondents' acres for that class; includes herbicides used on over 10% of respondents' acres for one or more classes.

^b Number is an average of values from two respondents totaling 436 acres.

some of the other questions. Rotary hoe was used once by 83% of North Dakota respondents who answered the question and twice by 17% (Table 15). These data are similar to previous years. Rotary hoe was used very little in North Dakota compared to Minnesota.

Table 14. Number of cultivations of dry beans in 2000 in Minnesota and North Dakota

	Number of Cultivations ^a		
	1	2	3
	% of Respondents ^a		
Minnesota	44.0	52.0	4.0
North Dakota	46.8	48.4	4.8

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

Table 15. Number of times rotary hoe was used on dry beans in 2000 in Minnesota and North Dakota.

	Number of Times Rotary Hoe Used ^a	
	1	2
	% of Respondents	
Minnesota	69.2	30.8
North Dakota	83.3	16.7

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

Disease Problems

White mold was the worst disease problem for 36% of Northharvest respondents on 35% of their acres, followed by bacterial blight for 9% of respondents on 12% of their acres, root rot for 14% of respondents on 12% of their acres, Alternaria for 4% of respondents on 5% of their acres and rust for 1% of respondents on 2% of their acres (Table 16). These figures are similar to those for 1999.

White mold was the worst disease problem for 41% of Minnesota respondents on 33% of their acres. Root rot was the worst disease problem for 19% of Minnesota respondents on 20% of their acres, followed by bacterial blight for 7% of Minnesota respondents on 8% of their acres, rust for 3% of Minnesota respondents on 5% of their acres and Alternaria for 3% of Minnesota respondents on 4% of their acres (Table 16). White mold was a much more common problem for Minnesota respondents in 2000 than in 1999 and root rot was about half as great a problem in 2000 as in 1999.

White mold was the worst disease problem for 32% of North Dakota respondents on 36% of their acres. This is about half the percentage of respondents affected and acres reported in 1999. Bacterial blight was the second worst disease problem for 11% of North Dakota respondents on

15% of their acres, followed by root rot for 10% of North Dakota respondents on 7% of their acres and *Alternaria* for 4% of respondents on 5% of their acres (Table 16). Rust was not mentioned as a worst disease problem by North Dakota respondents. The increased use of pinto varieties that are resistant to the current races of rust may be responsible for the decreased concern over rust among respondents.

White mold was ranked as one of the three worst diseases by Northharvest respondents on 48% of their dry bean acres, considerably less than the 69% reported by respondents in 1999. Bacterial blight was ranked as one of the three worst diseases by Northharvest respondents on 35% of their acres. Root rot was ranked as one of the three worst diseases by Northharvest respondents on 29% of their acres, much less than the 47% reported in 1999. Rust was ranked as one of the three worst diseases by Northharvest respondents on 16% of their acres and *Alternaria* was reported as one of the three worst diseases by respondents on 5% of their acres (Table 17).

White mold was one of the three worst diseases on 54% of Minnesota respondents' acres and on 45% of North Dakota respondents' acres (Table 17); these figures represent substantial decreases from 1999. Root rot was one of the three worst diseases on 40% of Minnesota respondents' acres and 23% of North Dakota respondents' acres; both figures represent major decreases from 1999.

Table 16. Worst disease problem in 2000 in Minnesota and North Dakota.

Worst Disease Problem ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
White Mold	24	41.4	8,914	33.0
Root Rot	11	19.0	5,285	19.6
Bacterial Blight	4	6.9	2,140	7.9
Rust	2	3.4	1,395	5.2
<i>Alternaria</i>	2	3.4	1,185	4.4
North Dakota				
White Mold	26	32.1	18,420	36.0
Bacterial Blight	9	11.1	7,530	14.7
Root Rot	8	9.9	3,720	7.3
<i>Alternaria</i>	3	3.7	2,685	5.3
Northharvest				
White Mold	50	36.0	27,334	35.0
Bacterial Blight	13	9.4	9,670	12.4
Root Rot	19	13.7	9,005	11.5
<i>Alternaria</i>	5	3.6	3,870	5.0
Rust	2	1.4	1,395	1.8

^a Ranked as No. 1 disease problem by respondents.

^b Respondents' acres only.

Disease Control Practices

Fungicides were used on 17% of Northharvest survey respondents' acres, down from 30% in 1999, 28% in 1998, 43% in 1997 and 61% in 1996. Fungicides were used on 32% of Minnesota but only 9% of North Dakota respondents' acres, compared to 53% and 20% in 1999. Topsin M was the most widely used fungicide in Minnesota, applied on 17% of respondents' acres, followed by Benlate, applied on 13% of their acres. Topsin M was the most widely used fungicide in North Dakota, applied on 3% of respondents' acres, followed by Benlate, applied on 3% of their acres and maneb, applied on 2% (Tables 18 and 19).

The percentage of acres treated by ground was 11 times the acres treated by air for all Northharvest respondents. No North Dakota respondents reported using aerial application, and Minnesota respondents reported using ground application on seven times as many acres as aerial application (Table 18).

Broadcast application was used by Northharvest respondents on nearly six times as many acres as band application. Broadcast application was used by Minnesota respondents on more than seven times as many acres as band application. In contrast, broadcast application was used by North Dakota respondents on less than four times as many acres as band application.

Table 17. Diseases ranked as one of the three worst in 2000 in Minnesota and North Dakota.

No. 1, 2 or 3 Disease Problem ^a	- Respondents -		- Acres Reported ^b -	
	Number	%	Number	%
Minnesota				
White Mold	35	60.3	14,509	53.7
Root Rot	26	44.8	10,830	40.1
Bacterial Blight	17	29.3	7,190	26.6
Rust	7	12.1	2,860	10.6
<i>Alternaria</i>	2	3.4	1,185	4.4
North Dakota				
White Mold	34	42.0	23,065	45.1
Bacterial Blight	28	34.6	19,950	39.0
Root Rot	20	24.7	11,640	22.8
Rust	15	18.5	9,345	18.3
<i>Alternaria</i>	4	4.9	2,985	5.8
Northharvest				
White Mold	69	49.6	37,574	48.1
Bacterial Blight	45	32.4	27,140	34.7
Root Rot	46	33.1	22,470	28.8
Rust	22	15.8	12,205	15.6
<i>Alternaria</i>	6	4.3	4,170	5.3

^a Ranked as No. 1, 2 or 3 disease problem by respondents.

^b Respondents' acres only.

Table 18. Fungicides applied to dry beans in 2000 by respondents in Minnesota and North Dakota.

Fungicide	Method of Appl. ^a	Total Acres Treated ^b		Acres Treated by Air ^b		Acres Treated by Ground ^b	
		Number	%	Number	%	Number	%
Minnesota							
Benlate	Banded	600	2.2	0	0	600	2.2
Benlate	Broadcast	2,869	10.6	100	0.4	2,604	9.6
Topsin M	Banded	380	1.4	0	0	380	1.4
Topsin M	Broadcast	4,275	15.8	750	2.8	2,575	9.5
Tank Mix	—	600	2.2	0	0	0	0
Total Fungicide	—	8,724	32.3	850	3.1	6,159	22.8
North Dakota							
Benlate	Banded	700	1.4	0	0	700	1.4
Benlate	Broadcast	1,000	2.0	0	0	500	1.0
Maneb	—	800	1.6	0	0	800	1.6
Topsin M	Banded	0	0	0	0	0	0
Topsin M	Broadcast	1,774	3.5	0	0	1,524	3.0
Other	—	250	0.5	0	0	0	0
Total Fungicide	—	4,524	8.8	0	0	3,524	6.9
Northarvest							
Benlate	Banded	1,300	1.7	0	0	1,300	1.7
Benlate	Broadcast	3,869	5.0	100	0.1	3,104	4.0
Maneb	—	800	1.0	0	0	800	1.0
Topsin M	Banded	380	0.5	0	0	380	0.5
Topsin M	Broadcast	6,049	7.7	750	1.0	4,099	5.2
Touk Mix	—	600	0.8	0	0	0	0
Other	—	250	0.3	0	0	0	0
Total Fungicide	—	13,248	17.0	850	1.1	9,683	12.4

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

^b Respondents' acres only.

Minnesota respondents sprayed 30% of their acres with the benzimidazole fungicides Benlate and Topsin M for white mold control, compared to 44% in 1999, 27% in 1998, 52% in 1997, 44% in 1996 and 22% in 1995. North Dakota

respondents sprayed 7% of their acres with the benzimidazole fungicides, compared to 17% in 1999, 22% in 1998, 28% in 1997, 22% in 1996 and 18% in 1995. In Minnesota, 4% of respondents' acres were band sprayed (directed spray with drop nozzles between the rows) with benzimidazole fungicides and 26% were broadcast sprayed. In North Dakota, 1% of respondents' acres were band sprayed with benzimidazole fungicides and 5% were broadcast sprayed. Use of Topsin M was slightly higher than that of Benlate in both states (Table 19).

Table 19. Fungicides and application methods for white mold control in 2000 in Minnesota and North Dakota.

Fungicide ^a	Acres Treated					
	Band Applied		Broadcast		Total	
	Number	%	Number	%	Number	%
Minnesota						
Benlate	600	2.2	2,869	10.6	3,469	12.8
Topin M	380	1.4	4,275	15.8	4,655	17.2
Total ^b	980	3.6	7,144	26.4	8,124	30.1
North Dakota						
Benlate	700	1.4	1,000	2.0	1,700	3.3
Topin M	0	0	1,774	3.4	1,744	3.4
Total ^b	700	1.4	2,774	5.4	3,474	6.8
Northarvest						
Benlate	1,300	1.7	3,869	5.0	5,169	6.6
Topin M	380	0.5	6,049	7.7	6,429	8.2
Total ^b	1,680	2.2	9,918	12.7	11,598	14.8

^a Percent of respondents' acres.

^b Total of Benlate and Topin M.

Use of rust fungicides was minimal in 2000, suggesting that the widespread adoption of rust resistant pinto varieties may have reduced the need for a rust fungicide (Table 18).

Insect Problems

Potato leafhopper was the worst insect problem on dry beans in the region. It was reported as the worst by 19% of Northarvest survey respondents representing 20% of the dry bean acres, down from 40% of acres in 1999, and compared to 24% reported in 1998, 9% in 1997 and 2% in 1996. Leafhoppers were a problem on 17% of Minnesota respondents' acres and 12% of North Dakota respondents'

acres. The seed corn maggot was a problem on 13% of Minnesota respondents' acres but only 2% of North Dakota respondents' acres. Grasshoppers were a problem on 2% of Minnesota respondents' acres and 5% of North Dakota respondents' acres. Spider mites were a problem on only 3% of Minnesota respondents' acres (Table 20).

The potato leafhopper was one of the three worst insects for 25% of Northharvest respondents on 26% of their acres. The potato leafhopper was one of the three worst insects on 30% of Minnesota respondents' acres and 23% of North Dakota respondents' acres. Grasshoppers were one of the three worst insects on 14% of Northharvest respondents' acres, followed by the seed corn maggot on 13% and spider mites on 6% (Table 21).

Table 20. Worst insect problem in 2000 in Minnesota and North Dakota.

Worst Insect Problem ^a	Respondents		Acres Reported ^b	
	Number	%	Number	%
Minnesota				
Leaf Hopper	13	22.4	4,620	17.1
Seed Corn Maggot	6	10.3	3,410	12.6
Spider mite	1	1.7	900	3.3
Grasshopper	1	1.7	600	2.2
North Dakota				
Leafhopper	13	16.0	10,825	12.2
Grasshopper	5	6.2	2,615	5.1
Seed Corn Maggot	1	1.2	800	1.6
Northharvest Total				
Leafhopper	26	18.7	15,445	19.8
Seed Corn Maggot	7	5.0	4,210	5.4
Grasshopper	6	4.3	3,215	4.1
Spider Mite	1	0.7	900	1.2

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

^b Respondents' acres only.

Table 21. Insects ranked as one of the three worst in 2000 in Minnesota and North Dakota.

No. 1, 2 or 3 Insect Problem ^a	- Respondents -		- Acres Reported ^b -	
	Number	%	Number	%
Minnesota				
Leafhopper	19	32.8	8,205	30.4
Seed Corn Maggot	7	12.1	3,510	13.0
Grasshopper	6	10.3	2,840	10.5
Spider Mite	3	5.2	2,475	9.2
North Dakota				
Leafhopper	16	19.8	11,865	23.2
Grasshopper	13	16.0	8,340	16.3
Seed Corn Maggot	5	6.2	6,850	13.4
Spider Mite	5	6.2	2,240	4.4
Northharvest				
Leafhopper	35	25.2	20,070	25.7
Grasshopper	19	13.7	11,180	14.3
Seed Corn Maggot	12	8.6	10,360	13.3
Spider Mite	8	5.8	4,715	6.0

^a Ranked as No. 1, 2 or 3 insect problem by respondents.

^b Respondents' acres only.

Insect Control Practices

Asana was used on 1% of Northharvest respondents' acres, followed by dimethoate on less than 1%. These insecticides were used to control potato leafhopper and grasshopper. Minnesota respondents treated 4% of their acres with Asana and 2% with dimethoate. No acres were reported treated with an insecticide in North Dakota (Table 22). The percentage of treated acres was down from 1999 when Asana was used on 7% of Northharvest respondents' acres and dimethoate was used on 2%.

Lindane seed treatment to control seed corn maggot was used on 10% of Northharvest respondents' acres and Lorsban was used on 8%. In Minnesota, lindane seed treatment was used on 11% of respondents' acres and Lorsban was used on 10%. In North Dakota, lindane seed treatment was used on 10% of respondents' acres and Lorsban was used on 8% (Table 23). These data differ from those in 1999, when lindane seed treatment was used on 19% of North Dakota respondents' acres but only 2% of Minnesota respondents' acres. Lindane usage increases when growers planting into cool, wet soils.

Table 22. Use of insecticides in Minnesota and North Dakota in 2000.

Treatment	Respondents		Acres Reported ^a	
	Number	%	Number	%
Minnesota				
Asana	3	5.2	1,020	3.8
Dimethoate	1	1.7	450	1.7
Northharvest				
Asana	3	2.2	1,020	1.3
Dimathoate	1	0.7	450	0.6

^a Percent of respondents' acres; over 1% of respondents' acres treated.

Table 23. Use of insecticidal seed treatment in Minnesota and North Dakota in 2000.

Treatment	Respondents		Acres Reported	
	Number	% ^a	Number	% ^b
Minnesota				
Lindane	18	31.0	2,890	10.7
Lorsban	21	36.2	2,580	9.5
North Dakota				
Lindane	27	33.3	5,145	10.1
Lorsban	23	28.4	3,957	7.7
Northharvest				
Lindane	45	32.4	8,035	10.3
Lorban	44	31.7	6,537	8.4

^a Percent responding to question.

^b Percent of respondents' acres.

Micronutrient Usage

Zinc, a common micronutrient for dry beans, was applied to 54% of Northharvest respondents' acres, similar to 1999-1997. Zinc was applied to 57% of Minnesota and 52% of North Dakota respondents' acres. Other micronutrients were used on 9% of Northharvest, 11% of Minnesota and 7% of North Dakota respondents' acres (Table 24).

A single application of zinc was made by 97% of Minnesota and 96% of North Dakota respondents who answered the question. Two applications were made by 3% of Minnesota and 4% of North Dakota respondents. All Minnesota and 75% of North Dakota respondents made a single application of micronutrients; two applications were made by 25% of North Dakota respondents (Table 25).

Crop Rotations

Crop rotations used by Northharvest respondents involved several years between dry bean crops. Over 46% of dry beans in Minnesota followed corn, 38% followed wheat and 11% followed sugarbeets. In North Dakota, 74% of dry beans followed wheat, 9% followed corn, 8% followed sugarbeets, and 7% followed barley (Table 26). Corn was more commonly the preceding crop in Minnesota in 2000 than it was in 1999 and wheat was less commonly the preceding crop. However, in North Dakota wheat was more commonly the preceding crop in 2000 than it was in 1999.

Three-, four- and five-year rotations were common in Minnesota, with 19%, 31% and 41% of respondents who answered the question citing these respective rotations. In North Dakota, two-, three-, four- and five-year rotations were common, with 24%, 37%, 19% and 16% of respondents citing these respective rotations (Table 27). More Minnesota respondents used a five-year rotation in 2000 than in 1999 and more North Dakota respondents used a three-year rotation in 2000 than in 1999.

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Table 24. Use of zinc and other micronutrients in 2000 in Minnesota and North Dakota.

Treatment	Acres Treated ^a	
	Number	%
Minnesota		
Zinc	15,455	57.2
Other Micronutrients	2,925	10.8
North Dakota		
Zinc	26,784	52.4
Other Micronutrients	3,780	7.4
Northharvest Total		
Zinc	42,239	54.1
Other Micronutrients	6,705	8.6

^a Respondents' acres only.

Table 25. Number of applications of zinc and other micronutrients in 2000 by respondents in Minnesota and North Dakota.

	Number of Applications			
	Zinc		Other Micronutrients	
	% of Respondents ^a			
	1	2	1	2
Minnesota	97.1	2.9	100.0	0
North Dakota	95.7	4.3	75.0	25.0

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

Table 26. Crop grown the year prior to dry beans in 2000 by respondents in Minnesota and North Dakota.

Previous Crop	Minnesota	North Dakota
	% of Respondents ^a	
Barley	1.3	6.7
Corn	46.3	8.7
Potato	1.3	1.9
Oat	1.3	1.0
Sugarbeet	11.3	7.7
Wheat	37.5	74.0

^a Percent of those responding to question.

Table 27. Number of years in dry bean rotation in 2000 in Minnesota and North Dakota.

Number of Years in Rotation	Minnesota	North Dakota
	% of Respondents ^a	
1	0	2.8
2	9.9	23.9
3	18.5	36.7
4	30.9	19.3
5	40.7	15.6
9	0	1.8

^a Percent of those responding to question.

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