

# 1994 Dry Bean Grower Survey

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

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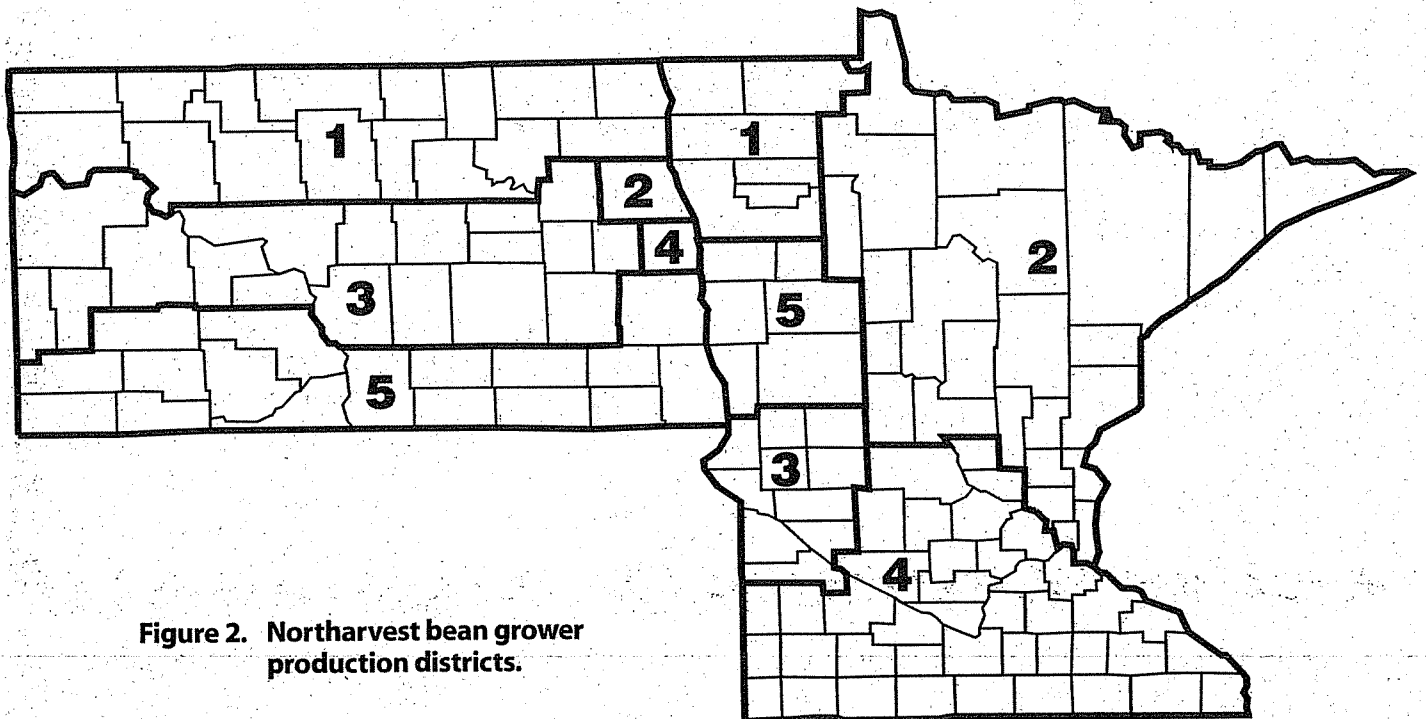


**NDSU EXTENSION SERVICE**

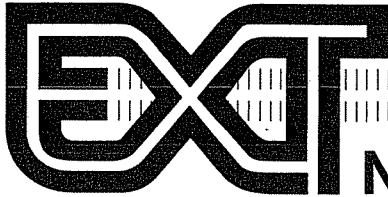
North Dakota State University, Fargo, ND 58105

APRIL 1996

**T**his is the seventh annual survey of pest problems, pesticide use and grower practices of the Northarvest Bean Growers Association, an association of dry bean growers in Minnesota and North Dakota. Results of previous surveys dated 1987-92 have been published ( 2, 3, 4, 5, 6, 8). There was no survey in 1993. The survey form (Figure 1, pages 3-6) was designed with input from research and extension faculty at North Dakota State University, the University of Minnesota, and the directors of Northarvest Bean Growers Association. The survey was mailed on November 15, 1994, to all 3,614 growers in the two-state area. The surveys were sorted by Northarvest production district, with the district number marked in the corner of the form. Except for district designation, the survey was anonymous. For purposes of this discussion, districts are identified as MN1 through MN5 and ND1 through ND5 (Figure 2).



**Figure 2. Northarvest bean grower production districts.**



## NDSU EXTENSION SERVICE

Plant Science – Plant Pathology

North Dakota State University, Box 5012, Fargo, ND 58105-5012  
(701) 231-8866

November 15, 1994

TO: Selected Sunflower Growers in Kansas, Minnesota, North Dakota and South Dakota

FROM: Art Lamey  
Extension Plant Pathologist  
North Dakota State University

SUBJECT: Survey of Pest Problems and Pesticide Use in 1994

Please see the reverse side for the survey of pest problems, pesticide use, and integrated pest management practices (IPM) for the 1994 growing season. This survey has been mailed to a randomly selected list of sunflower growers in Kansas, Minnesota, North Dakota and South Dakota. This is the fourth annual survey, the first having been made of selected North Dakota Growers in 1990. The second and third were mailed in 1991 and 1992 to selected growers in Kansas, Minnesota and North Dakota. A South Dakota survey for 1993 was mailed to S.D. producers in early 1994. This survey was designed by research and extension specialists from all four states with suggestions from the National Sunflower Association board of directors. It is designed to provide specific information on pest problems and pesticide use in sunflower in all four states covered by the survey.

Information from this survey will be invaluable in helping to determine the direction of research and extension programs, and in providing useful information on needs for retaining the use of selected pesticides.

Please take the time to complete the survey inside and return it in the enclosed envelope, which is addressed with postage paid. Your reply is important and will help guide the future of the sunflower industry. Please answer the questions as completely as possible. **Please be sure to provide information on acres treated or planted** whenever this question is asked. Accurate information will help us the most. Please feel free to add explanations or written comments that clarify your practices or express your concerns. Results will be published in future issues of *The Sunflower* and will also be available at the office of the National Sunflower Association.

We have deliberately kept this survey anonymous, so that you may feel free to give completely frank answers.

May we have your reply please by December 15, 1994.

**This questionnaire was derived from *The Sunflower* magazine mailing list. If you no longer wish to receive the magazine or would like to notify them of address changes, please include the mailing label from this packet or include your name and your old and new address including zip code.**

### Helping You Put Knowledge To Work

North Dakota State University – U.S. Department of Agriculture and County Commissioners Cooperating  
NDSU is an equal opportunity institution

**Please circle or fill in the requested information on pest problems and pesticide use on your 1994 dry bean crop.**

Total acres planted in 1994 \_\_\_\_\_  
 Irrigated acres \_\_\_\_\_ Dryland acres \_\_\_\_\_  
 Total acres harvested \_\_\_\_\_  
 Acres with hail damage \_\_\_\_\_  
 Acres with water damage \_\_\_\_\_

**Other Market Class Variety**

(specify \_\_\_\_\_)

**Seed Source in 1994 and Acres**

Bagged and tagged \_\_\_\_\_  
 Tagged tote bag \_\_\_\_\_  
 Bin run \_\_\_\_\_

**State and County Where Grown**

*(If beans are grown in more than one county, list each county and acres)*

State	County	Acres
Minnesota	_____	_____
North Dakota	_____	_____
South Dakota	_____	_____

**Biggest Weather Problem in Dry Beans in 1994**

*(circle one)*

	Acres Lost	Bean Class
Drought	_____	_____
Flooding	_____	_____
Frost	_____	_____
Hail	_____	_____
Wind/sandblasting	_____	_____
Other	_____	_____

**Variety Grown in 1994**

Variety	Acres
<b>Pinto</b>	
Agassiz	_____
Fargo	_____
Fiesta	_____
Nodak	_____
Othello	_____
RS101	_____
Topaz	_____
Other (specify) _____	_____
<b>Navy</b>	
Agri 1	_____
Mayflower	_____
Midland	_____
Norstar	_____
Pearl	_____
Schooner	_____
Upland	_____
Vista	_____
Voyageur	_____
<b>Kidney</b>	
Foxfire	_____
Montcalm	_____
Sacramento	_____
Other (specify) _____	_____

**Biggest Production Problem in Dry Beans in 1994**

*(circle one)*

	Acres Lost	Bean Class
Applied herbicide injury	_____	_____
Disease	_____	_____
Emergency/stand	_____	_____
Harvest	_____	_____
Herbicide drift injury	_____	_____
Insects	_____	_____
Micronutrient deficiency	_____	_____
Weeds	_____	_____
None	_____	_____
Other (specify) _____	_____	_____

**Worst Weed Problems in Dry Beans in 1994**

*(Rank 1-3; 1 = worst)*

_____ Cocklebur	_____ Lambsquarters
_____ Eastern black nightshade	_____ Redroot pigweed
_____ Foxtail (pigeon grass)	_____ Wild mustard
_____ Kochia	_____ Wild oat
	_____ Other (specify) _____

**Other Market Class/Variety**

(specify) \_\_\_\_\_

### Non-Chemical Weed Management

Steps used on worst weed

Practice	Acres Treated	# Cultivations
Cultivation	_____	_____
No herbicide	_____	_____
Rotary hoe	_____	_____

### Worst Insect/Mite Problem in 1994

(Rank 1-3; 1 = worst)

_____ Grasshoppers	_____ Seed Corn
_____ Leafhoppers	_____ Maggot
_____ Spider Mites	_____ Other (specify) _____

### Insecticides Used on Dry Beans in 1994

Insecticide	No. Acres Treated	No. of Sprays
_____	_____	_____
_____	_____	_____
_____	_____	_____

### Non-Chemical Insect Management

Steps used on worst weed

Practice	Acres Treated
Crop rotation	_____
Tillage	_____
Other (specify) _____	_____

### Evaluate Weed Control Chemical and Dry Bean Injury

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

Weed Control Used	Acres Treated	Weed Control				Bean Damage			
		Excellent	Good	Fair	Poor	None	Slight	Moderate	Severe
Roundup (preplant)	_____	1	2	3	4	1	2	3	4
Eptam (fall)	_____	1	2	3	4	1	2	3	4
Eptam (spring)	_____	1	2	3	4	1	2	3	4
Trifluralin (fall)	_____	1	2	3	4	1	2	3	4
Trifluralin (spring)	_____	1	2	3	4	1	2	3	4
Trifluralin + Eptam	_____	1	2	3	4	1	2	3	4
Sonalan (fall)	_____	1	2	3	4	1	2	3	4
Sonalan (spring)	_____	1	2	3	4	1	2	3	4
Amiben	_____	1	2	3	4	1	2	3	4
Alachlor	_____	1	2	3	4	1	2	3	4
Dual	_____	1	2	3	4	1	2	3	4
Prowl	_____	1	2	3	4	1	2	3	4
Pursuit	_____	1	2	3	4	1	2	3	4
Bentazon	_____	1	2	3	4	1	2	3	4
Poast	_____	1	2	3	4	1	2	3	4
Other _____	_____	1	2	3	4	1	2	3	4
<b>Desiccants -</b>									
Sodium Chlorate	_____	1	2	3	4	1	2	3	4
Gramoxone Extra	_____	1	2	3	4	1	2	3	4

### Worst Disease Problems in 1994

(Rank 1-3; 1 = worst)

_____ Alternaria	_____ Rust
_____ Bacterial blight	_____ White mold
_____ Root rot	_____ None

### Non-Chemical Disease Management

Steps used on worst disease

Practice	Acres Treated
Crop rotation	_____
Tillage	_____
Resistant variety	_____
Other (specify) _____	_____

### Fungicides Used in Dry Beans in 1994

Fungicide	No. Acres Treated	No. of Sprays
Bravo	_____	_____
Maneb	_____	_____
Champion/Champ	_____	_____
Kocide	_____	_____
Benlate (broadcast)	_____	_____
Benlate (banded)	_____	_____
Topsin (broadcast)	_____	_____
Topsin (broadcast)	_____	_____
Thiolux	_____	_____
Other	_____	_____

### Integrated Pest Management (IPM)

Compared to 1993, pesticide use in 1994 was

- less     more     same

If less or more, \_\_\_\_\_% increase or decrease

#### If less pesticides used in 1994, was due to:

(Please circle one or more)

- a) fewer pests
- b) better application techniques
- c) better scouting for timely application
- d) use of different chemical with lower use rates
- e) not economically feasible
- f) used alternative pest management practices

#### Please specify practices below

1. Crop rotation \_\_\_\_\_ # acres.
2. Preceding crop \_\_\_\_\_  
How long since previous dry beans? \_\_\_\_\_
3. Cultivation \_\_\_\_\_ # \_\_\_\_\_ # acres.
4. Water management (irrigators) \_\_\_\_\_ # acres.
5. Other (specify) \_\_\_\_\_ # acres.

### Micronutrient Use

Acres treated with zinc \_\_\_\_\_ No. of sprays \_\_\_\_\_

### For Irrigators Only

Was chemigation (application of chemical through the irrigation system) used in 1994?

\_\_\_\_\_ Fungicide    \_\_\_\_\_ Insecticide    \_\_\_\_\_ Fertilizer

Chemical Applied

Acres

_____	_____
_____	_____
_____	_____
_____	_____

### Do you wish to expand the use of IPM in the next five years?

- Yes     No

#### If yes, circle all the techniques you plan to use for dry bean IPM

1. Increased pest monitoring.
2. Use of pest forecasting (if available).
3. Pesticide application timed by pest forecasting.
4. Use of resistant hybrids.
5. Crop rotation.
6. Tillage to bury crop refuse.
7. Other (specify) \_\_\_\_\_

#### In which of the above areas do you need help?

(List number from above)

Research \_\_\_\_\_

Extension (training) \_\_\_\_\_

### Other Comments

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Results of the survey will be published in *Bean Talk*

Please return by December 15, 1994 • Thank you • Art Lamey, Extension Plant Pathologist, NDSU

## Responses

We received 661 useable responses, or a return rate of 18% (Table 1). This useable response rate is higher than the 15% in 1992 and 1991, but lower than the 19-23% useable response rates of 1987-1990. The surveys returned in 1994 represented 188,479 acres (A) or 27% of the Northharvest total of 705,000 A planted in 1994 (7). This is a similar response rate to previous surveys.

The responses by district are shown in Table 2. MN1, which comprises primarily the Red River Valley, represents 45% of Minnesota respondents' acres. ND1, which is the northernmost part of North Dakota, represents 32% of North Dakota respondents' acres.

**Table 1. Number of Northharvest dry bean growers contacted, respondents, total acres and acres planted by Minnesota and North Dakota respondents in 1994.**

	Growers			Acres Planted		
	Contacted Number	Responded Number	Responded %	Total <sup>a</sup> Number	Respondents Number	Respondents' Acres % of Total
Minnesota	985	186	18.9	135,000	39,769	29.5
North Dakota	2,629	475	18.0	570,000	148,710	26.1
Northharvest Total	3,614	661	18.3	705,000	188,479	26.7

<sup>a</sup> Total acres planted in state according to USDA data.

**Table 2. Number of respondents and acres planted in 1994 by respondents in each Northharvest district of Minnesota and North Dakota.**

Northharvest District	Respondents		Acres Planted	
	Number	% of State Total	Number <sup>a</sup>	% of State Total <sup>a</sup>
<b>Minnesota</b>				
MN1	49	26.3	17,894	45.0
MN2	16	8.6	6,570	16.5
MN3	44	23.7	5,629	14.2
MN4	47	25.3	4,716	11.9
MN5	30	16.1	4,960	12.5
MN Total	186	100.0	39,769	100.0
<b>North Dakota</b>				
ND1	152	32.0	41,795	28.1
ND2	87	18.3	27,032	18.2
ND3	77	16.2	22,996	15.5
ND4	74	15.6	26,526	17.8
ND5	85	17.9	30,361	20.4
ND Total	475 <sup>b</sup>	100.0	148,710 <sup>c</sup>	100.0
<b>Northharvest Total</b>				
Total	661		188,479	

<sup>a</sup> Respondents' acres only

<sup>b</sup> 71.9% of all respondents

<sup>c</sup> 78.9% of all respondents' acres

## Irrigation and Chemigation

Irrigation was used on 9% of Northharvest respondents' acres (Table 3). In Minnesota, irrigation was used on 24% of respondents' acres, down from the 40% total in 1992 (3), but still as high as 85% in MN2 in 1994. Irrigation was used on only 5% of North Dakota respondents' acres, but with the percentage as high as 20% in ND5, a dramatic increase in irrigated acres from 3% in that district in 1992 (4).

Fertilizers were about the only chemical bean growers applied through the irrigation system (chemigation). Fertilizers were applied through the irrigation system to less than 7% of respondents' acres in Minnesota and only 0.2% of respondents' acres in North Dakota (no table shown).

**Table 3. Acres irrigated in 1994 by respondents in each Northharvest district of Minnesota and North Dakota.**

Northharvest District	Acres Irrigated <sup>a</sup>	
	Acres	% of District Acres
<b>Minnesota</b>		
MN1	188	1.1
MN2	5,568	84.7
MN3	1,183	21.0
MN4	825	17.5
MN5	1,903	38.4
MN Total	9,667	24.3
<b>North Dakota</b>		
ND1	134	0.3
ND2	0 <sup>b</sup>	0
ND3	927	4.0
ND4	160	0.6
ND5	6,048	19.9
ND Total	7,269	4.9
<b>Northharvest Total</b>	<b>16,936</b>	<b>9.0</b>

<sup>a</sup> Respondents' acres only.

<sup>b</sup> No irrigated acres reported for this district.

## Weather Problems

The worst weather problem in 1994 was flooding and wet weather, as reported for 58% of Minnesota respondents' acres, 62% of North Dakota respondents' acres and 61% of all Northharvest respondents' acres (Table 9). Acres lost to flooding were 13% in Minnesota, 11% in North Dakota and 11% for all Northharvest acres. Hail was the worst weather problem reported for 14% of Minnesota, 25% of North

Dakota and 23% of Northharvest respondents' acres. This contrasts to 1992 when cold weather was the worst weather problem in both states (4).

Flooding damaged 94% of MN1 respondents' acres, 83% of ND2 respondents' acres, 81% of ND4 respondents' acres, 65% of ND5 respondents' acres and 59% of ND3 respondents' acres. In (Table 10) MN1 27% of respondents' acres

**Table 9. Worst weather problem in 1994 for respondents in Minnesota and North Dakota.**

Worst Weather Problem Reported	--- Respondents ---		----- Acres Reported <sup>a</sup> -----			
	Number	%	Number	%	Acres Lost	%
<b>Minnesota</b>						
Drought/Dry	5	3.3	776	2.0	0	0
Flooding/Wet	89	58.6	22,899	57.6	5,107	12.8
Hail	24	15.8	5,573	14.0	198	0.5
None	27	17.8	3,710	9.3	—	—
<b>North Dakota</b>						
Drought/Dry	7	1.6	1,429	1.0	122	0.1
Flooding/Wet	299	69.9	92,620	62.3	16,250	10.9
Hail	99	23.1	37,060	24.9	5,315	3.6
None	9	2.1	1,814	1.2	—	—
<b>Northharvest</b>						
Drought/Dry	12	2.1	2,205	1.2	122	0.1
Flooding/Wet	388	66.9	115,519	61.3	21,357	11.3
Hail	123	21.2	42,633	22.6	5,513	2.9
None	36	6.2	5,524	2.9	—	—

<sup>a</sup> Respondents' acres only.

**Table 10. Weather damage reported by respondents in 1994 in each Northharvest district of Minnesota and North Dakota.**

Northharvest District	----- Area Damaged <sup>a</sup> -----				----- Area Lost <sup>a</sup> -----			
	Hail		Flooding/Wet		Hail		Flooding/Wet	
	Acres	%	Acres	%	Acres	%	Acres	%
<b>Minnesota</b>								
MN1	552	3.1	16,738	93.5	40	0.2	4,850	27.1
MN2	0	0	955	14.5	0	0	3	0.0
MN3	2,228	39.6	1,886	33.5	0	0	123	2.2
MN4	1,378	29.2	1,144	24.3	118	2.5	19	0.4
MN5	1,415	28.5	2,176	43.9	40	0.8	112	2.3
MN Total	5,573	14.0	22,899	57.6	198	0.5	5,107	12.8
<b>North Dakota</b>								
ND1	19,203	45.9	15,327	36.7	4,073	9.7	1,653	4.0
ND2	2,056	7.6	22,537	83.4	537	2.0	3,796	14.0
ND3	2,375	10.3	13,622	59.2	80	0.3	1,647	7.2
ND4	4,510	17.0	21,362	80.5	485	1.8	4,338	16.4
ND5	8,916	29.4	19,772	65.1	140	0.5	4,816	15.9
ND Total	37,060	24.9	92,620	62.3	5,315	3.6	16,250	10.9
<b>Northharvest Total</b>	<b>42,633</b>	<b>22.6</b>	<b>115,519</b>	<b>61.3</b>	<b>5,513</b>	<b>2.9</b>	<b>21,357</b>	<b>11.3</b>

<sup>a</sup> Respondents' acres only.



were lost to flooding, 16% in ND4, 16% in ND5 and 14% in ND2. In MN1, ND4, ND2 and ND5 where flooding damage was greatest, respondents' harvested 66%, 77%, 79% and 81% of their acres (Table 11).

Hail damage in the Northharvest area was up from 12% of respondents' acres in 1992 (4) to 23% in 1994 (Table 10). Hail damaged a higher percentage of North Dakota respondents' acres in 1994 with 25% than in 1992 with 14%, and of Minnesota respondents' acres with 14% in 1994 compared to 7% in 1992. Hail damage was greatest in ND1 where 46% of respondents' acres were damaged, followed by MN3 where 40% of respondents' acres were damaged. There were 10% of respondents' acres lost to hail in ND1 and 2.5% in MN4.

## Production Problems

The worst production problems for Northharvest survey respondents were diseases, followed by weeds and harvesting (Table 12). Diseases were reported to be the worst production problem by 39% of survey respondents representing 34% of the acres reported. Weeds were reported to be the worst production problem by 22% of survey respondents representing 16% of the acres reported, and harvesting was reported to be the worst production problem by 16% of survey respondents representing 15% of the acres reported. These data are in contrast to 1992 when weeds were the worst production problem followed by harvesting and diseases (4).

**Table 11. Acres harvested in 1994 by respondents in each Northharvest district in Minnesota and North Dakota.**

Northharvest District	Respondents' Acres Harvested (%)
<b>Minnesota</b>	
MN1	65.6
MN2	99.6
MN3	90.9
MN4	97.7
MN5	96.7
MN Total	82.5
<b>North Dakota</b>	
ND1	79.8
ND2	79.3
ND3	86.0
ND4	77.4
ND5	81.3
ND Total	80.6
<b>Northharvest Total</b>	<b>81.0</b>

Diseases were reported as the worst production problem in Minnesota by 31% of that state's respondents representing 34% of respondents' acres. Weeds were reported as the worst production problem in Minnesota by 25% of that state's respondents representing 23% of respondents' acres. Harvesting was reported as the worst production problem in Minnesota by 12% of the state's respondents representing 8% of respondents' acres.

Diseases were reported as the worst production problem in North Dakota by 42% of that state's respondents representing 34% of their acres. Harvesting was reported as the worst production problem in North Dakota by 20% of that state's respondents representing 14% of their acres. Weeds were reported as the worst production problem by 17% of North Dakota respondents representing 17% of acres reported (Table 12).

Diseases, the worst production problem for Minnesota respondents, were especially severe in MN2 and MN4 with 66% and 50% of respondents' acres reported affected in these districts. Weeds, the second worst production problem for Minnesota respondents, were worst in MN1 with

**Table 12. Worst production problem in 1994 for respondents in Minnesota and North Dakota.**

Worst Production Problem	--- Respondents ---		--- Acres Reported* ---	
	Number	%	Number	%
<b>Minnesota</b>				
Diseases	47	31.3	13,641	34.3
Weeds	38	25.3	9,007	22.6
Harvesting	18	12.0	3,355	8.4
Emergence/Stand	6	4.0	1,036	2.6
Herbicide Injury	4	2.7	617	1.6
Micronutrient Deficiency	1	0.7	530	1.3
Other	1	0.7	100	0.3
None	35	23.3	4,286	10.8
<b>North Dakota</b>				
Diseases	149	42.2	50,920	34.2
Harvesting	70	19.8	21,182	14.2
Weeds	61	17.3	24,768	16.7
Emergence/Stand	6	1.7	1,008	0.7
Other	1	0.3	50	0.0
None	66	18.7	16,194	10.9
<b>Northharvest</b>				
Diseases	196	39.0	64,561	34.3
Weeds	108	21.5	30,189	16.0
Harvesting	79	15.7	28,123	14.9
Emergence/Stand	12	2.4	2,044	1.1
Other	7	1.4	1,297	0.7
None	101	20.1	20,480	10.9

\* Respondents' acres only.

37% of respondents' acres affected followed by MN5 with 20% of respondents' acres affected. Only 6% of MN4 respondents' acres and 7% of MN2 respondents' acres were reported to have weeds as the worst production problem. Harvest problems, the third worst production problem for Minnesota respondents, affected 17% of MN4 and 13% of MN3 respondents acres, but none of MN2 respondents' acres (Table 13).

Diseases, the worst production problem for North Dakota respondents, were especially severe in ND1 with 50% of respondents' acres reported affected; in contrast, only 20% of ND5 respondents' acres were affected. Weeds, the second worst production problem for North Dakota respondents, were most severe in ND3 and ND4 where 20% and 19% of respondents' acres were affected, and least severe in ND1 where 7% of respondents' acres were affected. Harvest problems, the third worst production problem for North Dakota respondents, affected 30% of ND3 and 29% of ND5 respondents' acres, but only 7% of ND2 respondents' acres (Table 13).

In MN4, 4% of respondents' acres were lost to disease; in ND1, 3% of respondents' acres were lost to disease. In MN1, 6% of respondents' acres were lost to weeds; in ND5 and ND4, 1% of respondents' acres were lost to weeds. In ND4, ND3 and ND2, 4%, 2% and 1% of respondents' acres were lost to harvest problems (Table 14).

## Weed Problems

Wild mustard was the worst weed problem for 22% of Northharvest survey respondents representing 22% of the acres reported. This is down considerably from 1992 when it was the worst weed problem for 37% of respondents representing 40% of acres reported (4). Volunteer grain, not reported as a weed problem in 1992, was the worst weed problem in 1994 for 16% of respondents representing 15% of the acres reported. Eastern black nightshade was the worst weed problem for 13% of respondents representing 13% of the acres reported, foxtail was worst for 11% of respondents representing 9% of the acres reported, common cocklebur for 7% of respondents representing 7% of the acres reported, and redroot pigweed for 7% of respondents representing 6% of the acres reported. Other commonly reported weed problems included kochia, common lambsquarters, Canada thistle and wild oats (Table 15).

In Minnesota, common lambsquarters was the worst weed problem for 15% of survey respondents representing 12% of the Minnesota acres reported. Redroot pigweed was the worst weed for 9% of respondents representing 11% of Minnesota acres reported, eastern black nightshade was the worst for 18% of respondents representing 10% of the acres reported, common cocklebur was the worst for 13% of respondents representing 9% of the acres reported, wild mustard was the worst for 7% representing 7% of the acres reported, and foxtail was the worst for 13% representing 6% of the acres reported (Table 16).

**Table 13. Worst production problem in 1994 for respondents by district in 1994, Minnesota and North Dakota.**

Northharvest District	Acres Affected <sup>a</sup>				% Acres Affected <sup>a</sup>			
	Disease	Emergence	Harvest	Weeds	Disease	Emergence	Harvest	Weeds
<b>Minnesota</b>								
MN1	4,513	500	1,395	6,542	25.2	2.8	7.8	36.6
MN2	4,343	220	0	440	66.1	3.3	0	6.7
MN3	1,170	210	744	776	20.8	3.7	13.2	13.8
MN4	2,369	106	807	280	50.2	2.2	17.1	5.9
MN5	1,246	0	409	969	25.1	0	8.2	19.5
MN Total	13,641	1,036	3,355	9,007	34.3	2.6	8.4	22.6
<b>North Dakota</b>								
ND1	20,711	270	4,162	3,039	49.6	0.6	10.0	7.3
ND2	9,179	315	1,939	4,331	34.0	1.2	7.2	16.0
ND3	5,386	336	6,961	4,631	23.4	1.5	30.3	20.1
ND4	9,626	0	2,946	5,063	36.3	0	11.1	19.1
ND5	6,018	87	8,760	4,118	19.8	0.3	28.9	13.6
ND Total	50,920	1,008	24,768	21,182	34.2	0.7	16.7	14.2
<b>Northharvest Total</b>	<b>64,561</b>	<b>2,044</b>	<b>28,123</b>	<b>30,189</b>	<b>34.3</b>	<b>1.1</b>	<b>14.9</b>	<b>16.0</b>

<sup>a</sup> Respondents' acres only.

**Table 14. Acres lost to production problems in 1994 for respondents in each Northarvest district in Minnesota and North Dakota.**

Northarvest District	Acres Lost to <sup>a</sup>				% Acres Lost to <sup>a</sup>			
	Disease	Emergence	Harvest	Weeds	Disease	Emergence	Harvest	Weeds
<b>Minnesota</b>								
MN1	0	300	160	1,000	0	1.7	0.9	5.6
MN2	0	0	0	5	0	0	0	0.1
MN3	6	0	22	0	0.1	0	0.4	0
MN4	195	13	0	1	4.1	0.3	0	0
MN5	0	0	0	21	0	0	0	0.4
MN Total	201	313	182	1,027	0.5	0.8	0.5	2.6
<b>North Dakota</b>								
ND1	1,233	0	1,269	10	2.6	3.0	0	0
ND2	463	136	352	215	1.7	0.5	1.3	0.8
ND3	40	0	521	168	0.2	0	2.3	0.7
ND4	224	0	1,085	275	0.8	0	4.1	1.0
ND5	196	68	255	435	0.6	0.2	0.8	1.4
ND Total	2,156	204	3,482	1,103	1.4	0.1	2.3	0.7
<b>Northarvest Total</b>	<b>2,357</b>	<b>517</b>	<b>3,664</b>	<b>2,130</b>	<b>1.3</b>	<b>0.3</b>	<b>1.9</b>	<b>1.1</b>

<sup>a</sup> Respondents' acres only

**Table 15. Worst weed problem<sup>a</sup> in 1994 for all Northarvest respondents in Minnesota and North Dakota.**

Worst Weed Problem	--- Respondents ---		--- Acres Reported <sup>b</sup> ---	
	Number	%	Number	%
Wild Mustard	134	22.0	41,768	22.2
Volunteer Grain	95	15.6	27,889	14.8
E. Black Nightshade	76	12.5	25,082	13.3
Foxtail	67	11.0	16,446	8.7
Cocklebur	42	6.9	12,161	6.5
Redroot Pigweed	40	6.6	11,770	6.2
Kochia	24	3.9	10,546	5.6
Lambsquarters	38	6.3	8,200	4.4
Canada Thistle	16	2.6	3,961	2.1
Wild Oats	19	3.1	3,939	2.1
Other	45	7.4	10,123	5.4
None	12	2.0	1,609	0.9

<sup>a</sup> Ranked as No. 1 weed problem on more than 0.5% of respondents' acres.

<sup>b</sup> Respondents' acres only.

**Table 16. Worst weed problem<sup>a</sup> in 1994 for respondents in Minnesota and North Dakota.**

Worst Weed Problem	--- Respondents ---		-- Acres Reported <sup>b</sup> --	
	Number	%	Number	%
<b>Minnesota</b>				
Lambsquarters	24	14.6	4,719	11.9
Redroot Pigweed	15	9.1	4,304	10.8
E. Black Nightshade	29	17.7	4,112	10.3
Cocklebur	21	12.8	3,390	8.5
Wild Mustard	12	7.3	2,613	6.6
Foxtail	22	13.4	2,523	6.3
Volunteer Grain	6	3.7	1,876	4.7
Kochia	3	1.8	1,845	4.6
Canada Thistle	3	1.8	1,045	2.6
Wild Oats	3	1.8	1,010	2.5
Other	23	14.0	5,307	13.3
None	3	1.8	215	0.5
<b>North Dakota</b>				
Wild Mustard	122	27.5	39,155	26.3
Volunteer Grain	89	20.0	26,013	17.5
E. Black Nightshade	47	10.6	20,970	14.1
Foxtail	45	10.1	13,923	9.4
Cocklebur	21	4.7	8,771	5.9
Kochia	21	4.7	8,701	5.9
Redroot Pigweed	25	5.6	7,466	5.0
Lambsquarters	14	3.2	3,481	2.3
Wild Oats	16	3.6	2,929	2.0
Canada Thistle	13	2.9	2,916	2.0
Other	22	5.0	4,816	3.2
None	9	2.0	1,394	0.9

<sup>a</sup> Ranked as No. 1 weed problem on more than 0.5% of respondents' acres for that state.

<sup>b</sup> Respondents' acres only.

In North Dakota, wild mustard was the worst weed problem for 28% of survey respondents representing 26% of North Dakota acres reported. This is down from 46% of North Dakota respondents' acres in 1992 (4). Volunteer grain was the worst weed for 20% of respondents representing 18% of the acres reported, black nightshade was the worst for 11% of respondents representing 14% of the acres reported, and foxtail was the worst for 10% of respondents representing 9% of the acres reported (Table 16).

Wild mustard was reported as the worst weed problem, based on percent of respondents' acres affected, in ND1, ND2, and ND4, with 42%, 34% and 26% of acres affected. Eastern black nightshade was reported as the worst

weed in ND5, MN5, and ND4, with 49%, 24% and 18% of respondents' acres affected. Common lambsquarters was the worst weed in MN3 and MN2, with 27% and 13% of acres affected; redroot pigweed was the worst weed in MN1 with 18% of acres affected and volunteer grain was the worst weed in ND3 with 33% of acres affected (Table 17).

Weeds that were most frequently ranked as one of the three worst weeds by Minnesota respondents included redroot pigweed on 37% of respondents' acres reported, followed by wild mustard on 32%, common lambsquarters on 29%, and eastern black nightshade on 26%. Weeds ranked as one of the three worst weeds by North Dakota respondents were wild mustard on 64% of respondents'

**Table 17. Worst weed problem<sup>a</sup> in 1994 for respondents in each Northarvest district of Minnesota and North Dakota.**

Northarvest District	Worst Weed Problem	--- Respondents ---		--- Acres Reported <sup>b</sup> ---	
		Number	%	Number	%
<b>Minnesota</b>					
MN1	Redroot Pigweed	7	15.9	3,211	17.9
	Wild Mustard	9	20.5	2,313	12.9
	Volunteer Grain	6	13.6	1,876	10.5
	Kochia	3	6.8	1,845	10.3
MN2	Lambsquarters	3	21.4	880	13.4
MN3	Lambsquarters	6	16.2	1,491	6.5
	E. Black Nightshade	9	24.3	1,114	19.8
	Cocklebur	5	13.5	939	16.7
	Foxtail	9	24.3	776	13.8
MN4	E. Black Nightshade	8	19.0	833	17.7
	Foxtail	6	14.3	803	17.1
	Cocklebur	9	21.4	750	15.9
MN5	E. Black Nightshade	7	25.9	1,205	24.3
	Redroot Pigweed	4	14.8	694	14.0
	Cocklebur	3	11.1	689	13.9
	Lambsquarters	6	22.2	518	10.4
<b>North Dakota</b>					
ND1	Wild Mustard	60	43.5	17,382	41.6
	Volunteer Grain	26	18.8	6,723	16.1
	Kochia	11	8.0	4,540	10.9
ND2	Wild Mustard	25	29.4	9,303	34.4
	Volunteer Grain	26	30.6	6,757	25.0
	Foxtail	7	8.2	3,287	12.2
ND3	Volunteer Grain	24	32.9	7,585	33.0
	Wild Mustard	14	19.2	3,003	13.1
ND4	Wild Mustard	15	21.7	6,944	26.2
	Foxtail	16	23.2	5,523	20.8
	Volunteer Grain	11	15.9	4,168	15.7
	E. Black Nightshade	9	13.0	3,638	13.7
ND5	E. Black Nightshade	31	39.2	14,741	48.6
	Cocklebur	9	11.4	3,572	11.8

<sup>a</sup> Ranked as the No. 1 weed problem on more than 10% of respondents' acres for that district.

<sup>b</sup> District respondents' acres only.

acres reported, followed by common cocklebur on 29%, volunteer grain on 26%, eastern black nightshade on 26% and foxtail on 21%. Weeds ranked as one of the three worst weeds by all respondents in both states were wild mustard on 57% of respondents' acres reported, followed by common cocklebur on 27%, eastern black nightshade on 26%, volunteer grain on 23% and redroot pigweed on 21% (Table 18).

Wild mustard was ranked most frequently as one of the three worst weeds in MN1, ND1, ND2, ND3 and ND4. Common lambsquarters was ranked most frequently as one of the three worst weeds in MN2 and MN3; eastern black nightshade was most frequently ranked as one of the three worst in MN5 and ND5; and foxtail was most frequently ranked as one of the three worst in MN4 (Table 19, page 16).

**Table 18. Weeds ranked as one of the three worst<sup>a</sup> in 1994 by respondents in Minnesota and North Dakota.**

No. 1, 2 or 3 Weed Problem	--- Respondents ---		-- Acres Reported <sup>b</sup> --	
	Number	%	Number	%
<b>Minnesota</b>				
Redroot Pigweed	52	28.0	14,848	37.3
Wild Mustard	39	21.0	12,696	31.9
Lambsquarters	69	37.1	11,572	29.1
E. Black Nightshade	55	29.6	10,317	25.9
Cocklebur	45	24.2	6,602	16.6
Foxtail	46	24.7	6,043	15.2
Kochia	13	7.0	5,379	13.5
Wild Oat	16	8.6	4,342	10.9
<b>North Dakota</b>				
Wild Mustard	271	57.1	94,478	63.5
Cocklebur	98	20.6	43,384	29.2
Volunteer Grain	131	27.6	39,324	26.4
E. Black Nightshade	87	18.3	39,317	26.4
Foxtail	108	22.7	31,106	20.9
Kochia	84	17.7	27,655	18.6
Redroot Pigweed	82	17.3	24,818	16.7
Wild Oat	93	19.6	24,801	16.7
<b>Northarvest</b>				
Wild Mustard	310	46.9	107,174	56.9
Cocklebur	143	21.6	49,986	26.5
E. Black Nightshade	142	21.5	49,634	26.3
Volunteer Grain	144	21.8	42,724	22.7
Redroot Pigweed	134	20.3	39,666	21.0
Foxtail	154	23.3	37,149	19.7
Kochia	97	14.7	33,034	17.5
Wild Oat	109	16.5	29,143	15.5
Lambsquarters	115	17.4	24,051	12.7

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

<sup>b</sup> Respondents' acres only.

## Weed Control Practices

The most common chemical weed control practice was spring pre-plant incorporation of Sonalan, used on 64% of respondents' acres. Other common chemical weed control practices included post-application of bentazon (Basagran, others) on 28% of their acres, spring pre-plant incorporation of trifluralin on 19% and post-application of Poast on 16% (Table 20).

The most common cultural weed control practice was row cultivation, used by 81% of respondents on 82% of their acres (Table 20). Total acres cultivated were 1.9 times the acres cultivated, indicating an average of 1.9 cultivations by respondents (Table 21). Nearly 60% of respondents used two cultivations, over 27% used only one cultivation, and 13% used three or more cultivations (Table 22). The rotary hoe was used by 23% of respondents on 25% of their acres, which is similar to 1992 (4) (Table 23).

**Table 20. Weed control practices<sup>a</sup> in 1994 by all Northarvest respondents in Minnesota and North Dakota.**

Weed Control Practice	Respondents		Acres Treated <sup>b</sup>	
	Number	%	Number	%
Cultivation	536	81.1	153,946	81.7
Sonalan, spring applied	436	66.0	120,198	63.8
Bentazon (Basagran, others)	216	32.7	52,565	27.9
Rotary Hoe	152	23.0	47,319	25.1
Trifluralin, spring applied	151	22.8	36,413	19.3
Poast	185	28.0	29,587	15.7
Pursuit	80	12.1	10,970	5.8
Eptam, spring applied	41	6.2	9,331	5.0
Gramoxone Extra	54	8.2	7,526	4.0
Roundup, Preplant	57	8.6	7,465	4.0
Alachlor (Lasso, others)	22	3.3	5,982	3.2
Prowl	26	3.9	5,616	3.0
Trifluralin, fall applied	20	3.0	5,363	2.8
Sonalan, fall applied	27	4.1	5,318	2.8
Sodium chlorate	34	5.1	4,088	2.2
Trifluralin + Eptam	12	1.8	3,691	2.0
Dual	25	3.8	2,899	1.5
Amiben	7	1.1	1,290	0.7

<sup>a</sup> Includes all practices or herbicides used on more than 1,000 acres.

<sup>b</sup> Respondents' acres only.

**Table 19. Weeds ranked as one of the three worst<sup>a</sup> in 1994 in each Northharvest district in Minnesota and North Dakota.**

Northharvest District	No.1, 2, or 3 Weed Problem	--- Respondents ---		-- Acres Reported <sup>b</sup> --	
		Number	%	Number	%
<b>Minnesota</b>					
MN1	Wild Mustard	29	59.2	11,288	63.1
	Redroot Pigweed	19	38.8	9,940	55.4
	Kochia	11	22.4	5,311	29.7
	Wild Oat	14	28.6	3,822	21.4
MN2	Lambsquarters	9	56.3	2,970	45.2
	E. Black Nightshade	7	43.8	2,500	38.1
MN3	Lambsquarters	21	57.7	3,249	57.7
	E. Black Nightshade	11	39.8	2,239	39.8
	Cocklebur	15	36.7	2,068	36.7
	Redroot Pigweed	8	32.4	1,821	32.4
	Foxtail	14	28.3	1,593	28.3
MN4	Foxtail	16	34.0	1,840	39.0
	E. Black Nightshade	18	38.3	1,775	37.6
	Cocklebur	19	40.4	1,753	37.2
	Lambsquarters	23	48.9	1,456	30.9
	Redroot Pigweed	12	25.5	1,117	23.7
MN5	E. Black Nightshade	14	46.7	2,423	48.9
	Lambsquarters	12	40.0	1,651	33.3
	Redroot Pigweed	10	33.3	1,388	28.0
	Cocklebur	5	16.7	1,119	22.6
	Wild Mustard	6	20.0	999	20.1
<b>North Dakota</b>					
ND1	Wild Mustard	100	65.8	29,710	71.1
	Wild Oat	44	28.9	12,544	30.0
	Volunteer Grain	40	26.3	11,141	26.7
	Kochia	35	23.0	10,390	24.9
	Redroot Pigweed	28	18.4	9,117	21.8
ND2	Wild Mustard	52	59.8	20,082	74.3
	Volunteer Grain	35	40.2	9,637	35.7
	Cocklebur	18	20.7	5,880	21.8
	Wild Oat	23	26.4	5,852	21.6
ND3	Wild Mustard	49	63.6	15,237	66.3
	Cocklebur	23	29.9	10,163	44.2
	Volunteer Grain	32	41.6	9,700	42.2
	Kochia	14	18.2	5,727	24.9
	E. Black Nightshade	11	14.3	4,838	21.0
ND4	Wild Mustard	44	59.5	18,727	70.6
	Foxtail	27	36.5	10,557	39.8
	E. Black Nightshade	19	25.7	8,433	31.8
	Volunteer Grain	18	24.3	7,466	28.1
ND5	E. Black Nightshade	50	58.8	23,020	75.8
	Cocklebur	34	40.0	19,013	62.6
	Wild Mustard	26	30.6	10,722	35.3
	Lambsquarters	26	30.6	6,777	22.3

<sup>a</sup> Ranked as No. 1, 2, or 3 on more than 20% of respondents' acres for that district.

<sup>b</sup> District respondents' acres only.

**Table 21. Dry bean acres cultivated in 1994 by Northharvest respondents in Minnesota and North Dakota.**

	Respondents Cultivating		Acres Cultivated		Total Cultivation	
	Number	%	Number <sup>a</sup>	%	Acres <sup>b</sup>	Avg. Number <sup>c</sup>
Minnesota	149	80.1	31,580	79.4	63,662	2.0
North Dakota	387	81.5	122,366	82.3	233,562	1.9
Northharvest Total	536	81.1	153,946	81.7	297,224	1.9

<sup>a</sup> Number of acres cultivated

<sup>b</sup> Acres cultivated multiplied by number of cultivations

<sup>c</sup> Average number of cultivations (b/a)

**Table 22. Number of cultivations of dry beans in 1994 in each Northharvest district in Minnesota and North Dakota.**

Northharvest District	Number of Cultivations				
	1	2	3	4	5
	----- % of Respondents <sup>a</sup> -----				
<b>Minnesota</b>					
MN1	27.5	57.5	12.5	0	2.5
MN2	13.3	53.3	26.7	6.7	0
MN3	48.5	45.5	6.1	0	0
MN4	40.5	52.4	7.1	0	0
MN5	21.1	68.4	10.5	0	0
MN Total	33.6	54.4	10.7	0.7	0.7
<b>North Dakota</b>					
ND1	9.4	65.6	22.7	2.3	0
ND2	25.6	62.8	11.5	0	0
ND3	23.9	73.1	3.0	0	0
ND4	36.2	51.7	8.6	1.7	1.7
ND5	44.6	48.2	7.1	0	0
ND Total	24.3	61.8	12.7	1.0	0.3
<b>Northharvest Total</b>	26.9	59.7	12.1	0.9	0.4

<sup>a</sup> % of respondents answering question.

**Table 23. Use of rotary hoe on dry beans in 1994 in Minnesota and North Dakota.**

	Respondents		Acres		Number of Rotary Hoe Cultivations		
	Number	%	Number	%	1	2	3
	----- % of Respondents <sup>a</sup> -----						
Minnesota	33	17.7	13,767	34.6	69.7	30.3	0
North Dakota	119	25.1	33,552	22.6	80.7	15.1	4.2
Northharvest Total	152	23.0	47,319	25.1	78.3	18.4	3.3

<sup>a</sup> % of those responding to this question

Desiccants were used by 13% of survey respondents on 6% of their acres, with 4% of survey respondents' acres treated with Gramoxone Extra and 2% with sodium chlorate (Table 20). Use of desiccants was eight times as high in 1992, an unusually cool year (4).

Weed control practices in each state were similar except that spring pre-plant incorporated Sonalan was used on 39% of Minnesota respondents' acres and 70% of North Dakota respondents' acres. Poast was used on 21% of Minnesota respondents' acres and alachlor (Lasso, others) on

14% of Minnesota respondents' acres; by contrast, Poast was used on 14% of respondents' acres in North Dakota and alachlor (Lasso, others) use was minimal (Table 24).

Spring applied pre-plant incorporated Sonalan was the most commonly used herbicide in MN1, MN4, MN5, ND1, ND2, ND3, ND4, and ND5. Post-applied bentazon (Basagran, others) was the most commonly used herbicide in MN2 and spring applied pre-plant incorporated trifluralin was most common in MN3 (Table 25).

**Table 24. Common weed control practices<sup>a</sup> in 1994 by respondents in Minnesota and North Dakota.**

Weed Control Practice	Acres Treated <sup>b</sup>	
	Number	%
<b>Minnesota</b>		
Cultivation	31,500	79.4
Sonalan, spring applied	15,666	39.4
Rotary Hoe	13,767	34.6
Bentazon (Basagran, others)	11,069	27.8
Trifluralin, spring applied	10,395	26.1
Poast	8,420	21.2
Alachlor (Lasso, others)	5,552	14.0
Pursuit	4,011	10.1
<b>North Dakota</b>		
Cultivation	122,366	82.3
Sonalan, spring applied	104,532	70.3
Bentazon (Basagran, others)	41,496	27.9
Rotary Hoe	33,552	22.6
Trifluralin, spring applied	26,018	17.5
Poast	21,167	14.2
<b>Northharvest</b>		
Cultivation	153,946	81.7
Sonalan, spring applied	120,198	63.8
Bentazon (Basagran, others)	52,566	27.9
Rotary Hoe	47,319	25.1
Trifluralin, spring applied	36,413	19.3
Poast	29,587	15.7

<sup>a</sup> Practice used on more than 10% of respondents' acres.

<sup>b</sup> Respondents' acres only.

**Table 25. Herbicides commonly used in 1994 in each Northharvest district in Minnesota and North Dakota<sup>a</sup>.**

Northharvest District	Herbicide	--- Acres Reported <sup>b</sup> ---	
		Number	%
<b>Minnesota</b>			
MN1	Sonalan, spring applied	8,282	46.3
	Poast	5,310	29.7
	Trifluralin, spring applied	4,077	22.8
MN2	Bentazon (Basagran, others)	4,457	67.8
	Sonalan, spring applied	2,715	41.3
	Prowl	2,488	37.9
	Alachlor (Lasso, others)	1,815	27.6
MN3	Trifluralin, spring applied	3,122	55.5
	Pursuit	2,667	47.4
	Poast	1,633	29.0
	Bentazon (Basagran, others)	1,614	28.7
MN4	Sonalan, spring applied	1,268	22.5
	Sonalan, spring applied	1,173	24.9
	Trifluralin, spring applied	1,038	22.0
MN5	Pursuit	982	20.8
	Sonalan, spring applied	2,228	44.9
	Bentazon (Basagran, others)	1,500	30.2
North Dakota	Trifluralin, spring applied	1,308	26.4
	Alachlor (Lasso, others)	1,007	20.3
	Sonalan, spring applied	1,007	20.3
ND1	Sonalan, spring applied	28,986	69.4
	Bentazon (Basagran, others)	12,029	28.8
	Poast	10,682	25.6
ND2	Sonalan, spring applied	17,349	64.2
	Bentazon (Basagran, others)	7,667	28.4
	Trifluralin, spring applied	5,733	21.2
ND3	Sonalan, spring applied	20,202	87.9
	Bentazon (Basagran, others)	6,127	26.6
ND4	Sonalan, spring applied	14,940	56.3
	Bentazon (Basagran, others)	7,824	29.5
	Trifluralin, spring applied	6,655	25.1
ND5	Sonalan, spring applied	23,055	75.9
	Bentazon (Basagran, others)	7,849	25.9

<sup>a</sup> Herbicide use reported on more than 20% of respondents' acres.

<sup>b</sup> District respondents' acres only.



Respondents rated most weed control practices as providing good to excellent weed control. Amiben, alachlor (Lasso, others), Sonalan, trifluralin, Prowl, Pursuit, Poast and desiccants were among the herbicides rated as most effective (Table 26).

Respondents rated most weed control practices as giving no injury or only slight injury to beans. Amiben, trifluralin, Sonalan, pre-plant Roundup, and Poast were rated as providing the lowest level of bean injury (Table 27).

## Insect Problems

Potato leafhoppers were the worst insect problem for 4% of Northharvest survey respondents representing 3% of the dry bean acres reported. This is in contrast to 1992 when grasshoppers were the worst insect problem for 24% of respondents on 28% of their acres (4). Grasshoppers and the seed corn maggot were each reported as the worst

insect problem in 1994 on 1% of respondents' acres. The potato leafhopper was more frequently reported to be the worst insect problem by Minnesota respondents (10% of respondents representing 7% of Minnesota respondents' acres reported) than by North Dakota respondents (2% of respondents representing 2% of North Dakota respondents' acres reported). The spider mite was reported as the worst insect problem by 1% of Minnesota respondents representing 2% of their reported acres (Table 28).

The potato leafhopper was reported as the worst insect problem in MN2, MN3, MN4, ND1, and ND2. However, it was reported as the worst insect problem on less than 10% of respondents acres in three of these districts; in contrast, it was the worst insect problem on 37% of MN4 respondents' acres and 11% of MN2 respondents acres. The seed corn maggot was reported as the worst insect problem in MN5 and ND3, and grasshoppers were reported as the worst insect problem in ND4 and ND5 (all were small percentages of respondents' acres). Spider mites were reported as the worst insect problem in MN1 (Table 29).

**Table 26. Effectiveness of herbicides in 1994 reported by all Northharvest respondents in Minnesota and North Dakota.**

Weed Control Practice	Number of Respondents	Efficacy of Weed Control <sup>a</sup>			
		1	2	3	4
		----- % of Respondents -----			
Alachlor (Lasso, others)	22	9.1	63.6	27.3	0
Amiben	7	14.3	85.7	0	0
Bentazon (Basagran, others)	207	15.5	46.9	31.4	6.3
Desiccant	84	41.7	39.3	11.9	7.1
Dual	23	4.3	52.2	43.5	0
Eptam, spring applied	41	7.3	46.3	31.7	14.6
Roundup, preplant	55	29.1	36.4	20.0	14.5
Poast	177	36.2	45.2	14.7	4.0
Prowl	24	25.0	45.8	25.0	4.2
Pursuit	79	29.1	46.8	19.0	5.1
Sonalan, fall applied	26	19.2	53.8	19.2	7.7
Sonalan, spring applied	428	16.6	55.8	23.8	3.7
Trifluralin + Eptam	12	16.7	41.7	25.0	16.7
Trifluralin, fall applied	19	31.6	36.8	10.5	21.1
Trifluralin, spring applied	150	26.0	52.7	18.0	3.3

<sup>a</sup> 1 = Excellent control  
2 = Good  
3 = Fair  
4 = Poor control

*includes all herbicides used on more than 1,000 acres*

**Table 27. Bean injury from herbicides in 1994 reported by all Northharvest respondents in Minnesota and North Dakota.**

Weed Control Practice	Number of Respondents	Degree of Bean Injury <sup>a</sup>			
		1	2	3	4
		----- % of Respondents -----			
Alachlor (Lasso, others)	20	55.0	35.0	10.0	0
Amiben	7	71.4	28.6	0	0
Bentazon (Basagran, others)	181	47.5	48.1	3.9	0.6
Dual	19	57.9	36.8	5.3	0
Eptam, spring applied	35	82.9	14.3	0	2.9
Roundup, preplant	50	94.0	4.0	0	2.0
Poast	148	77.0	20.9	2.0	0
Prowl	21	71.4	19.0	9.5	0
Pursuit	75	33.3	53.3	12.0	1.3
Sonalan, fall applied	19	78.9	21.1	0	0
Sonalan, spring applied	367	77.7	20.4	1.6	0.3
Trifluralin + Eptam	8	87.5	0	12.5	0
Trifluralin, fall applied	16	93.8	6.3	0	0
Trifluralin, spring applied	131	71.0	24.4	4.6	0

<sup>a</sup> 1 = No injury  
2 = slight  
3 = moderate  
4 = severe injury

*table includes all practices or herbicides used on more than 1,000 acres*

## Insect Control Practices

Insecticides were used on less than 1% of Northharvest survey respondents' dry bean acres, with use in Minnesota slightly higher than in North Dakota (Table 30). Insecticide use in 1992 was also low (4).

Northharvest respondents listed crop rotation as the most common method of non-chemical insect management on 24% of their acres. Tillage was reported as the next most common method of non-chemical insect management on 14% of respondents' acres. Tillage was more commonly used by North Dakota respondents (15% of reported acres) than by Minnesota respondents (10% of reported acres) (Table 31).

**Table 28. Worst insect problem<sup>a</sup> in 1994 for respondents in Minnesota and North Dakota.**

Worst Insect Problem	Respondents		Acres Reported <sup>b</sup>	
	Number	%	Number	%
<b>Minnesota</b>				
Potato Leafhopper	19	10.2	2,952	7.4
Spider Mites	2	1.1	610	1.5
<b>North Dakota</b>				
Potato Leafhopper	7	1.5	2,266	1.5
Grasshopper	4	0.8	2,198	1.5
Seed Corn Maggot	6	1.3	1,601	1.1
<b>Northharvest Total</b>				
Potato Leafhopper	26	3.9	5,218	2.8
Grasshopper	5	0.8	2,276	1.2
Seed Corn Maggot	9	1.4	1,856	1.0

<sup>a</sup> Insect problems reported on more than 1% of respondents' acres.

<sup>b</sup> Respondents' acres only.

**Table 29. Worst insect problem<sup>a</sup> in 1994 in each Northharvest district for respondents in Minnesota and North Dakota.**

Northharvest District	Worst Insect Problem	--- Acre Reported <sup>b</sup> ---	
		Number	%
<b>Minnesota</b>			
MN1	Spider Mites	610	3.4
MN2	Potato Leafhopper	690	10.5
MN3	Potato Leafhopper	399	7.1
MN4	Potato Leafhopper	1,765	37.4
MN5	Seed Corn Maggot	205	4.1
	Potato Leafhopper	98	2.0
	Grasshopper	78	1.6
<b>North Dakota</b>			
ND1	Potato Leafhopper	1,000	2.4
ND2	Potato Leafhopper	296	1.1
ND3	Seed Corn Maggot	1,044	4.5
	Potato Leafhopper	570	2.5
ND4	Grasshopper	700	2.6
	Spider Mites	350	1.3
ND5	Grasshopper	1,498	4.9
	Spider Mites	425	1.4
	Seed Corn Maggot	363	1.2

<sup>a</sup> Insect problems reported on more than 1% of respondents' acres.

<sup>b</sup> District respondents' acres only.

**Table 30. Insecticide use<sup>a</sup> in 1994 by respondents in Minnesota and North Dakota.**

Insecticide	Acres Treated <sup>b</sup>	
	Number	%
<b>Minnesota</b>		
Carbaryl	259	0.7
Dimethoate	232	0.6
Asana	130	0.3
<b>North Dakota</b>		
Lindane	500	0.3

<sup>a</sup> Data includes any insecticide applied to over 0.3% of respondents' acres.

<sup>b</sup> Respondents' acres only.

**Table 31. Non-chemical insect management in 1994 by respondents in Minnesota and North Dakota.**

Management Practice	Acres Treated <sup>a</sup>	
	Number	%
<b>Minnesota</b>		
Crop Rotation	8,910	22.4
Tillage	3,837	9.6
<b>North Dakota</b>		
Crop Rotation	37,047	24.9
Tillage	21,922	14.7
<b>Northharvest Total</b>		
Crop Rotation	45,957	24.4
Tillage	25,759	13.7

<sup>a</sup> Respondents' acres only.

## Disease Problems

White mold was the worst disease problem for 48% of Northharvest survey respondents representing 50% of their dry bean acres, followed by rust for 25% of respondents representing 29% of respondents' acres, and root rot for 4% of respondents representing 5% of respondents' acres. White mold was the worst disease problem on 42% of Minnesota respondents' acres and 52% of North Dakota respondents' acres. Rust the worst disease problem on 33% of Minnesota respondents' acres and 28% of North Dakota respondents' acres. Root rot was the worst disease problem on 12% of Minnesota respondents' acres but only 3% of North Dakota respondents' acres. (Table 32).

White mold was ranked as one of the three worst disease problems by Northharvest survey respondents on 76% of dry bean acres reported. This is up from 53% in 1992 (4). Rust was ranked as one of the three worst diseases problems on 63% of respondents' acres followed by bacterial blight on 27% and root rot on 19% (Table 33). White mold was cited slightly more frequently as a problem in North

Dakota (78% of respondents' acres compared to 71% in Minnesota), rust was more frequently cited by North Dakota respondents (66% of respondents' acres compared to 52% in Minnesota) and root rot was more frequently cited as a problem in Minnesota (36% of respondents' acres compared to 15% in North Dakota). Bacterial blight was ranked about equally in both states (28% of respondents' acres in Minnesota and 26% in North Dakota). The ranking of rust was much higher in both states in 1994 than in 1992 (4).

White mold was ranked as the worst disease problem in MN3, MN4, MN5, ND2, ND3, ND4 and ND5 (Table 34). In general, districts that ranked white mold as the worst disease problem ranked it very high: 84% of respondents' acres in MN4, 62% in ND5, and 60% in ND2. Rust was ranked as the worst disease problem on 53% of respondents' acres in MN1, 48% in ND1, and 39% in MN2. Since MN2 is planted primarily to kidney beans, which are resistant to most current races of rust, the ranking of rust is not readily explained; unless there is evidence of new rust races, then misidentification might be the cause of this report.

**Table 32. Worst disease problem<sup>a</sup> in 1994 for respondents in Minnesota and North Dakota.**

Worst Disease Problem	Respondents		Acres Reported <sup>b</sup>	
	Number	%	Number	%
<b>Minnesota</b>				
White Mold	105	56.5	16,701	42.0
Rust	30	16.1	13,147	33.1
Root Rot	13	7.0	4,752	11.9
Bacterial Blight	3	1.6	497	1.2
None	22	11.8	2,917	7.3
<b>North Dakota</b>				
White Mold	214	45.1	77,240	51.9
Rust	134	28.2	40,869	27.5
Root Rot	16	3.4	4,043	2.7
Bacterial Blight	15	3.2	3,672	2.5
None	44	9.3	10,880	7.3
<b>Northharvest</b>				
White Mold	319	48.3	93,941	49.8
Rust	164	24.8	54,016	28.7
Root Rot	29	4.4	8,795	4.7
Bacterial Blight	18	2.7	4,169	2.2
None	66	10.0	13,797	7.3

<sup>a</sup> Ranked as No.1 disease problem by respondents.

<sup>b</sup> Respondents' acres only.

**Table 33. Diseases ranked as one of the three worst<sup>a</sup> in 1994 by respondents in Minnesota and North Dakota.**

No. 1, 2 or 3 Disease Problem	--- Respondents ---		-- Acres Reported <sup>b</sup> --	
	Number	%	Number	%
<b>Minnesota</b>				
White Mold	135	72.6	28,047	70.5
Rust	58	31.2	20,622	51.9
Root Rot	48	25.8	14,349	36.1
Bacterial Blight	32	17.2	11,088	27.9
None	22	11.8	2,917	7.3
<b>North Dakota</b>				
White Mold	332	69.9	116,027	78.0
Rust	279	58.7	97,833	65.8
Bacterial Blight	91	19.2	38,886	26.1
Root Rot	65	13.7	21,527	14.5
Alternaria	11	2.3	4,152	2.8
None	44	9.3	10,880	7.3
<b>Northharvest</b>				
White Mold	467	70.7	144,074	76.4
Rust	337	51.0	118,455	62.8
Bacterial Blight	123	18.6	49,974	26.5
Root Rot	113	17.1	35,876	19.0
Alternaria	11	1.7	4,152	2.2
None	66	10.0	13,797	7.3

<sup>a</sup> Ranked as No. 1, 2, or 3 disease problem by respondents.

<sup>b</sup> Respondents' acres only.

In addition to being ranked as the worst disease in all but three Northharvest districts, white mold was ranked as one of the three worst diseases in all Northharvest districts except MN1, MN2 and ND1. It was ranked as one of the three worst diseases on 87% of respondents' acres in MN4, 82% in ND5, 79% in ND4, 76% in MN5, 66% in MN3 and 65% in ND3 (Table 35). Rust was ranked as one of the three worst diseases on 83% of respondents' acres in ND1 and 81% in MN1. Root rot was ranked as one of the three worst disease on 74% of respondents' acres in MN2; this report of root rot is the same as in 1992 (4).

Previous surveys have shown a close correlation between July rainfall and the percent of respondents' acres on which white mold was reported as the number one disease problem (1). July rainfall in 1994 was 210% of normal in Fargo and 167% in Grand Forks. July rainfall averaged between Fargo and Grand Forks was slightly higher in 1994

**Table 34. Worst disease problem<sup>a</sup> in 1994 in each Northharvest district for respondents in Minnesota and North Dakota.**

Northharvest District	Worst Disease Problem	-- Respondents --		-- Acres Reported <sup>b</sup> --	
		Number	%	Number	%
<b>Minnesota</b>					
MN1	Rust	22	44.9	9,416	2.6
	White Mold	17	34.7	4,967	27.8
	Root Rot	4	8.2	2,106	11.8
MN2	Rust	2	12.5	2,553	38.9
	Root Rot	3	18.8	1,790	27.2
	White Mold	8	50.0	1,602	24.4
MN3	White Mold	30	68.2	3,547	63.0
MN4	White Mold	34	72.3	3,956	83.9
MN5	White Mold	16	53.3	2,629	53.0
	Rust	4	13.3	984	19.8
	Root Rot	3	10.0	611	12.3
<b>North Dakota</b>					
ND1	Rust	67	44.1	19,997	47.8
	White Mold	59	38.8	15,959	38.2
ND2	White Mold	44	50.6	16,207	60.0
	Rust	24	27.6	6,947	5.7
ND3	White Mold	33	42.9	11,188	8.7
	Rust	20	26.0	5,870	25.5
ND4	White Mold	42	56.8	15,044	56.7
	Rust	12	16.2	4,182	15.8
ND5	White Mold	36	42.4	18,842	62.1
	Rust	11	12.9	3,873	12.8
	Root Rot	12	14.1	2,979	9.8

<sup>a</sup> Diseases reported on more than 5% of respondents' acres.

<sup>b</sup> District respondents' acres only.

than in 1987, and the percent of acres with white mold reported as the number one problem was slightly lower than in 1987. However, rust was a greater problem in 1994 than in 1987, so that many respondents had to chose between two serious diseases as the number one disease problem in 1994.

**Table 35. Diseases ranked as one of three<sup>a</sup> worst in 1994 in each Northharvest district in Minnesota and North Dakota.**

Northharvest District	No. 1, 2 or 3 Disease Problem	-- Respondents --		-- Acres Reported <sup>b</sup> --	
		Number	%	Number	%
<b>Minnesota</b>					
MN1	Rust	35	71.4	14,534	81.2
	White Mold	35	71.4	12,920	72.2
	Bacterial Blight	14	28.6	5,962	33.3
	Root Rot	10	20.4	5,587	31.2
MN2	Root Rot	7	43.8	4,853	73.9
	White Mold	12	75.0	3,542	53.9
	Rust	3	18.8	3,393	51.6
	Bacterial Blight	2	12.5	2,773	42.2
MN3	White Mold	32	72.7	3,685	65.5
	Root Rot	11	25.0	1,555	27.6
	Rust	7	15.9	653	11.6
MN4	White Mold	36	76.6	4,123	87.4
	Bacterial Blight	9	19.1	1,340	28.4
	Root Rot	13	27.7	1,213	25.7
MN5	White Mold	20	66.7	3,777	76.1
	Rust	8	26.7	1,660	33.5
	Root Rot	7	23.3	1,141	23.0
	Bacterial Blight	4	13.3	578	11.7
<b>North Dakota</b>					
ND1	Rust	116	76.3	34,570	82.7
	White Mold	108	71.1	32,525	77.8
	Bacterial Blight	25	16.4	10,882	26.0
ND2	White Mold	65	74.7	22,517	83.3
	Rust	51	58.6	17,959	66.4
	Bacterial Blight	17	19.5	4,203	15.5
ND3	White Mold	48	62.3	15,007	65.3
	Rust	37	48.1	10,940	47.6
	Bacterial Blight	16	20.8	5,158	22.4
ND4	White Mold	55	74.3	21,004	79.2
	Rust	42	56.8	17,254	65.0
	Bacterial Blight	18	24.3	6,625	25.0
ND5	Root Rot	12	16.2	5,232	19.7
	White Mold	56	65.9	24,974	82.3
	Rust	33	38.8	17,110	56.4
Bacterial Blight	15	17.6	12,018	39.6	
	Root Rot	28	32.9	9,969	32.8

<sup>a</sup> Diseases reported on more than 10% of respondents' acres; those reporting no problem are not included.

<sup>b</sup> District respondents'.

## Disease Control Practices

Fungicides were used on 56% of Northharvest survey respondents' acres, up dramatically from 1992 when fungicides were used on 14% of respondents' acres. Fungicides were used on 63% of Minnesota respondents' acres and 56% of North Dakota respondents' acres (Table 36). The greatest use of fungicides in Minnesota was Benlate (24% of respondents' acres), maneb (17%), Topsin M (14%) and Bravo (8%). In North Dakota the greatest use of fungicides was maneb (31% of respondents' acres), followed by Bravo (10%), Topsin M (8%) and Benlate (6%).

In Minnesota, 38% of respondents' acres were sprayed with the benzimidazole fungicides Benlate or Topsin M for white mold control, compared to 14% of respondents' acres in North Dakota. In Minnesota, 22% of respondents' acres received a band application (directed spray) of benzimidazole fungicide, compared to 9% of North Dakota respondents' acres (Table 37). The acres that were band sprayed represented 59% of Minnesota respondents' acres and 65% of North Dakota respondents' acres that were sprayed for white mold. These are the second highest percentages treated by band spraying in the seven years the survey has been conducted, exceeded only by 1992 (2,3,4,5,6,8). Banded application (directed spray) reduces total fungicide per acre to approximately half that of the broadcast rate, limiting the amount of chemical applied to the soil, increasing the profit potential and providing a safer management practice for the environment.

**Table 36. Fungicide use<sup>a</sup> in 1994 by respondents in Minnesota and North Dakota.**

Fungicide	Method of Application <sup>b</sup>	-- Respondents --		--- Acres Treated <sup>c</sup> ---	
		Number	%	Number	%
<b>Minnesota</b>					
Benlate	Banded	17	9.1	7,648	19.2
Benlate	Broadcast	17	9.1	1,847	4.6
Bravo	—	10	5.4	3,225	8.1
Maneb	—	17	9.1	6,748	17.0
Topsin	Banded	9	4.8	1,279	3.2
Topsin	Broadcast	19	10.2	4,369	11.0
<b>North Dakota</b>					
Benlate	Banded	12	2.5	7,036	4.7
Benlate	Broadcast	11	2.3	2,124	1.4
Bravo	—	55	11.6	14,714	9.9
Maneb	—	119	25.1	45,604	30.7
Topsin	Banded	27	5.7	6,528	4.4
Topsin	Broadcast	35	7.4	5,035	3.4
<b>Northharvest</b>					
Benlate	Banded	29	4.4	14,684	7.8
Benlate	Broadcast	28	4.2	3,971	2.1
Bravo	—	65	9.8	17,939	9.5
Maneb	—	136	20.6	52,352	27.8
Topsin	Banded	36	5.4	7,807	4.1
Topsin	Broadcast	54	8.2	9,404	5.0

<sup>a</sup> Data includes any fungicide applied to 0.5% of respondents' acres. Other fungicides used included Champion, Kocide and Thiolux.

<sup>b</sup> Respondents were not asked method of application for Bravo or Maneb.

<sup>c</sup> Respondents' acres only.

**Table 37. Use of fungicides for white mold control in 1994 by respondents in Minnesota and North Dakota.**

Fungicide	----- Treatment -----					
	Band Applied		Broadcast		Total	
	Acres	%	Acres	%	Acres	%
<b>Minnesota</b>						
Benlate	7,648	19.2	1,847	4.6	9,495	23.9
Topsin M	1,279	3.2	4,369	11.0	5,648	14.2
Total <sup>a</sup>	8,927	22.4	6,216	15.6	15,143	38.1
<b>North Dakota</b>						
Benlate	7,036	4.7	2,124	1.4	9,160	6.2
Topsin M	6,528	4.4	5,035	3.4	11,563	7.8
Total <sup>a</sup>	13,564	9.1	7,159	4.8	20,723	13.9
<b>Northharvest</b>						
Benlate	14,684	7.8	3,971	2.1	18,655	9.9
Topsin	7,807	4.1	9,404	5.0	17,211	9.1
Total <sup>a</sup>	22,491	11.9	13,375	7.1	35,866	19.0

<sup>a</sup> Total of Benlate + Topsin M.

Due to heavy rust pressure late in 1994, maneb fungicide was used on 28% of Northharvest acres. Respondents in Minnesota used maneb on 17% of their acres compared to 31% in North Dakota. Bravo was used on 8% of Minnesota and 10% of North Dakota respondents' acres. Total acres sprayed for rust were 41% in North Dakota and 25% in Minnesota (Table 38).

Use of white mold fungicides was very high in MN2, where 91% of respondents' acres were banded with Benlate, 9% broadcast with Benlate, 4% banded with Topsin M and 4% broadcast with Topsin M. Use was also high in MN4, where 21% of respondents' acres were band sprayed with Benlate, 8% broadcast with Benlate, 5% banded with Topsin M and 22% broadcast with Topsin M. In MN5, 2% of respondents' acres were banded with Benlate, 2% were

broadcast with Benlate, 6% were banded with Topsin M and 40% were broadcast with Topsin M. In North Dakota, the greatest use of white mold fungicide was in ND1, where 3% of respondents' acres were band sprayed with Benlate, 2% broadcast with Benlate, 10% banded with Topsin M and 6% broadcast with Topsin. In ND5, 18% of respondents' acres were band sprayed with Benlate and 2% were broadcast with Benlate; no Topsin M was used (Table 39).

Fungicides for rust control were used most extensively in ND1, ND2 and MN1. In ND1, 92% of respondents' acres were sprayed for rust (65% maneb, 27% Bravo); in MN1, 52% were sprayed for rust (35% maneb, 17% Bravo); in ND2, 45% were sprayed for rust (40% maneb, 4% Bravo) (Table 39).

**Table 38. Use of fungicides for rust control in 1994 in Minnesota and North Dakota.**

	Treatment					
	---- Bravo ----		---- Maneb ----		Total Acres <sup>a</sup>	%
	Acres	%	Acres	%		
Minnesota	3,225	8.1	6,748	17.0	9,973	25.1
North Dakota	14,714	9.9	45,604	30.7	60,318	40.6
Northharvest	17,939	9.5	52,352	27.8	70,291	37.3

<sup>a</sup> Total of Bravo + Maneb

**Table 39. Use of fungicides in 1994 in each Northharvest district in Minnesota and North Dakota.**

Northharvest District	Benlate		Bravo	Maneb	Topsin M	
	(Banded)	(Broadcast)			(Banded)	(Broadcast)
----- % Respondents' Acres Treated -----						
<b>Minnesota</b>						
MN1	1.6	2.8	17.3	34.5	2.5	5.7
MN2	90.7	8.5	0	0	3.5	3.7
MN3	5.7	5.3	2.2	0	1.1	1.8
MN4	20.8	8.2	0	0	5.1	22.3
MN5	2.1	2.1	0	11.7	6.0	39.5
<b>North Dakota</b>						
ND1	3.3	1.8	27.2	65.1	9.6	5.9
ND2	0.3	0.6	5.2	40.2	3.9	4.0
ND3	0	0	0.6	11.9	0	0.2
ND4	0	2.5	4.4	14.6	5.4	5.4
ND5	18.3	1.9	2.1	3.0	0	0

Crop rotation was most commonly listed as the non-chemical disease control method used by respondents; it was used on 78% of respondents' acres in ND5, 69% in ND2, 65% in ND3, 63% in ND4 and 61% in MN5. Tillage was also frequently used, on 28% of respondents' acres in ND1, 27% in ND3, 23% in ND5, 22% in ND4 and 21% in MN3 (Table 40).

## Crop Rotations

Northharvest respondents reported use of crop rotation for 70% of respondents' acres. Rotation was reported on 72% of respondents' acres in North Dakota and 62% in Minnesota (Table 41).

Crop rotations used by Northharvest respondents usually involved several years between dry bean crops

**Table 40. Non-chemical disease control methods used in 1994 by respondents in Minnesota and North Dakota.**

Northharvest District	Crop Rotation	Tillage	Resistant Varieties
----- % Respondents Acres -----			
<b>Minnesota</b>			
MN1	51.6	17.0	9.3
MN2	47.1	1.3	7.9
MN3	41.2	21.0	16.6
MN4	50.4	15.9	5.3
MN5	61.3	11.3	3.8
<b>North Dakota</b>			
ND1	58.4	27.8	9.9
ND2	69.1	13.3	11.9
ND3	64.8	27.4	9.2
ND4	63.1	22.2	13.2
ND5	77.6	22.6	15.9

**Table 41. Use of crop rotation in 1994 by respondents in Minnesota and North Dakota.**

	Acres in Rotation <sup>a</sup>	
	Number	%
Minnesota	24,787	62.3
North Dakota	107,207	72.1
Northharvest	131,994	70.0

<sup>a</sup> Respondents' acres only.

(Table 42). The number of years since the previous dry bean crop had been grown was cited as two by 17% of respondents, three by 38%, four by 20%, five or more by 12% and never before (in that field) by 11%. More Minnesota respondents (22%) reported they had never planted dry beans in that field than North Dakota respondents (7%). The data indicate that there was a slight increase in the percentage of two to four year rotations and a decrease in the percentage of five or more year rotations when compared with the 1992 survey (4).

Wheat was the crop that preceded dry beans for 65% of survey respondents, followed by corn for 17% and barley for 13%. There were differences between states, however, with wheat (74%) and barley (17%) used most frequently by North Dakota respondents and corn (44%) and wheat (43%) by Minnesota respondents (Table 43). These data are similar to those for 1992 (4).

**Table 42. Crop rotation in 1994 by respondents in Minnesota and North Dakota.**

No. of Years Since Previous Dry Bean Crop	Minnesota	North Dakota	Northharvest
----- % of Respondents -----			
1	1.3	2.0	1.8
2	14.7	18.0	17.1
3	25.6	42.3	37.6
4	19.2	20.8	20.3
5	9.6	6.5	7.4
6+	7.1	4.0	4.9
Never Before	22.4	6.5	11.0

**Table 43. Crop rotation. Crop grown by respondents in Minnesota and North Dakota preceding the 1994 dry bean crop.**

Preceding Crop	Minnesota	North Dakota	Northharvest
----- % of Respondents <sup>a</sup> -----			
Alfalfa	1.2	0	0.3
Barley	4.1	17.0	13.3
Corn	43.8	5.4	16.6
Oats	0.6	0.2	0.3
Potato	1.2	0	0.3
Rye	0	0.2	0.2
Soybeans	3.6	0	1.0
Sugarbeets	3.0	3.2	3.1
Summer Fallow	0	0.2	0.2
Wheat	42.6	73.7	64.7

<sup>a</sup> Percent of those responding to question.

## Pesticide Use

In 1994, 22% of Northharvest survey respondents reported more pesticide use than in past years, 61% reported the same, and 18% reported less (Table 44). About 65% of Minnesota respondents and 59% of North Dakota respondents reported that pesticide use in 1994 was the same as in past years.

Reasons most frequently cited by survey respondents for reduced pesticide use were "fewer pests," reported by 44% of respondents, and that the application was "not economically justified," reported by 34% of respondents (Table 45). Respondents in North Dakota more frequently reported "fewer pests" and "not economically feasible" than those in Minnesota. In contrast, Minnesota respondents more frequently reported "timely application" as a reason for reduced pesticide use.

**Table 44. Pesticide use in 1994 compared with past years in Minnesota and North Dakota.**

	Pesticide Use		
	Less	Same	More
	----- % of Respondents <sup>a</sup> -----		
Minnesota	15.1	64.7	20.1
North Dakota	19.0	58.9	22.1
Northharvest Total	17.9	60.6	21.5

<sup>a</sup> Percent of those responding to question.

**Table 45. Reasons for reduced pesticide use by Minnesota and North Dakota respondents in 1994.**

Reason for Decreased Use	Minnesota	North Dakota	Northharvest
		----- % of Respondents <sup>a</sup> -----	
Fewer pests	32.1	47.9	43.6
Better application techniques	7.1	4.1	5.0
Timely application	17.9	2.7	6.9
Lower use rates	3.6	0	1.0
Not economically feasible	28.6	35.6	33.7
Alternative practices	10.7	9.6	9.9

<sup>a</sup> Percent of those responding to question.

## Intended Use of IPM in the Next Five Years

The Clinton Administration has a stated objective that 75% of cropland will be managed under IPM by the year 2000. Without referring to this objective, we asked respondents if they wished to increase the use of IPM in the next five years, and if so, what techniques they planned to use. They were also asked to indicate the areas where they wanted more research and where they wanted more IPM training from extension.

Northharvest respondents indicated that they wished to increase the use of IPM in the next five years: 70% of all respondents answered "yes," they wished to increase the use of IPM; 66% of North Dakota respondents answered "yes" and 79% of Minnesota respondents answered "yes" (Table 46). Respondents from both states most frequently mentioned crop rotation as an IPM technique they plan to use (51% of Minnesota respondents and 39% of North Dakota respondents). The next most frequently mentioned IPM technique was resistant varieties, followed by tillage, increased pest monitoring and more timely application. The least frequently mentioned technique was better pest forecasting (Table 47).

**Table 46. Respondents from Minnesota and North Dakota in 1994 who wish to increase use of IPM in the next five years.**

	"Yes" Increased <sup>a</sup> IPM
	(% Responding)
Minnesota	79.4
North Dakota	66.4
Northharvest	70.1

<sup>a</sup>Percent of those responding to question.

**Table 47. Techniques respondents in Minnesota and North Dakota plan to use for dry bean IPM.**

IPM Technique	Minnesota	North Dakota	Northharvest
		----- % Respondents <sup>a</sup> -----	
Increased pest monitoring	28.0	24.4	25.4
Better pest forecasting	12.9	14.1	13.8
More timely application	19.4	15.4	16.5
Use of resistant varieties	38.7	31.6	33.6
Crop rotation	50.5	39.2	42.4
Tillage	34.4	25.3	27.8

<sup>a</sup>Percent of all respondents.



Respondents most frequently mentioned resistant varieties as an area where they wanted more IPM research (40% of Minnesota respondents and 47% of North Dakota respondents). Research on pest monitoring was a distant second, followed by pest forecasting (Table 48). Respondents wanted more IPM training from extension in pest monitoring (31% of Minnesota respondents and 35% of North Dakota respondents), followed by more timely application and pest forecasting (Table 49).

**Table 48. Areas where Minnesota and Northharvest dry bean respondents want more IPM research.**

IPM Area Requiring More Research	Minnesota	North Dakota	Northharvest
Pest monitoring	20.5	13.7	15.9
Pest forecasting	10.8	13.7	12.8
Timely application	12.0	10.3	10.9
Resistant varieties	39.8	47.4	45.0
Crop rotation	7.2	8.0	7.8
Tillage	9.6	6.9	7.8

<sup>a</sup> Percent of those responding to question.

**Table 49. Areas where Minnesota and North Dakota dry bean respondents want more IPM training from extension.**

IPM Area Requiring More Extension Training	Minnesota	North Dakota	Northharvest
Pest monitoring	30.6	35.1	34.0
Pest forecasting	22.2	19.8	20.4
More timely application	19.4	22.5	21.8
Use of resistant varieties	13.9	9.0	10.2
Crop rotation	2.8	7.2	6.1
Tillage	11.1	3.6	5.4

<sup>a</sup> Percent of those responding to question.

## Literature Cited

- Lamey, H.A. 1994. Management of White Mold of Dry Edible Beans. Proc. Second National Integrated Pest Management Symposium/Workshop:176 (Abstr.).
- Lamey, H.A., A.G. Dexter, D.K. McBride, R.C. Venette, and J.R. Venette. 1990. Problems and practices of Northharvest dry bean growers in 1988. N.D. Farm Res. 48(2):6-11, 14.
- Lamey, H.A., D.R. Berglund, M.P. McMullen, J.L. Luecke, J.R. Venette, D.K. McBride, R.K. Zollinger and K.F. Grafton. 1993. 1991 Dry Bean Grower Survey of Pest Problems and Pesticide Use in Minnesota and North Dakota. NDSU Extension Rpt. No. 13. 15 p.
- Lamey, H.A., D.R. Berglund, M.P. McMullen, J.L. Luecke, R.K. Zollinger, P.A. Glogoza, J.R. Venette, D.K. McBride and K.F. Grafton. 1994. 1992 Dry Bean Grower Survey of Pest Problems and Pesticide use in Minnesota and North Dakota. NDSU Extension Rpt. No. 19. 18 p.
- Lamey, H.A., D.R. Berglund, M.P. McMullen, R.K. Zollinger, J.R. Venette, D.K. McBride, S.J. Venette, and R.C. Venette. 1992. 1990 dry bean grower survey of pest problems and pesticide use in Minnesota and North Dakota. NDSU Extension Rpt. No. 10. 17 p.
- Lamey, H.A., R.K. Zollinger, D.K. McBride, R.C. Venette, and J.R. Venette. 1991. Production problems and practices of Northharvest dry bean growers in 1989. N.D. Farm Res. 49(2):17-24.
- USDA. 1994. USDA Crop Report — Dec. 1994 Bean Talk, December 1994:6.
- Venette, J.R., H.A. Lamey, D.E. Peterson, and R.C. Venette. 1989. Problems and practices of dry edible bean production in North Dakota and Minnesota, 1987. N.D. Farm Res. 46(5):25-31.

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