



E1952 (April 2020)

2019 DRY BEAN Grower Survey



*of Production, Pest Problems
and Pesticide Use*

in Minnesota and North Dakota

**J.J. Knodel, P.B. Beauzay, G.J. Endres,
D.W. Franzen, J.T. Ikley, H.J. Kandel,
S.G. Markell, J.M. Osorno and J.S. Pasche**

North Dakota State University

*In cooperation with the
Northarvest Bean Growers Association*



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North Dakota State University, Fargo, ND

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Introduction

The 2019 dry bean grower survey is the 30th annual survey of varieties grown, pest problems, pesticide use and grower practices of the Northharvest Bean Growers Association, an association of dry edible bean growers in Minnesota and North Dakota. Research and Extension faculty at North Dakota State University and the directors of the Northharvest Bean Growers Association developed the survey form (Appendix I). The survey was mailed to all Northharvest bean growers. All participants in the survey were anonymous.

Results of previous surveys dated 1987-1992, 1994-2000, 2002 and 2004-2018 have been published (see References). No surveys were conducted in 1993 and 2001. In 2003, the survey was completed by dry bean producers who attended the Northharvest Bean Day in Fargo during the winter. However, the lack of responses made processing and analyses of results unreliable, so no report was compiled.

Data reported in the figures represent totals for the entire Northharvest survey unless otherwise noted. Data reported in the tables are broken down by state and also are totaled for the entire Northharvest survey. Percent values in tables and figures are rounded to one decimal for clear presentation. Consequently, percent values in some tables and figures may not total exactly 100 (for example, 99.9 or 100.1) when the presented values are added. Other instances in which percent values do not total 100 are explained in footnotes to the tables.

Throughout this report, trade names of chemicals often are presented as an aid for clearer communication. Mention of trade names does not constitute endorsement or recommendation by North Dakota State University or the Northharvest Bean Growers Association.



Acknowledgments

A grant from the Northharvest Bean Growers Association funded the survey.

Production

Table 1. Number of Northharvest dry bean growers responding, acres planted by respondents and total state acres in 2019.

Growers	No. of respondents	Respondents' acres	Total acres ^a	Acres surveyed (% of total)
Minnesota	88	39,575	210,000	18.8
North Dakota	168	101,889	615,000	16.6
Northharvest	256	141,464	825,000	17.1

^aTotal of dry bean acres planted for Minnesota and North Dakota (source: USDA National Agricultural Statistics Service).

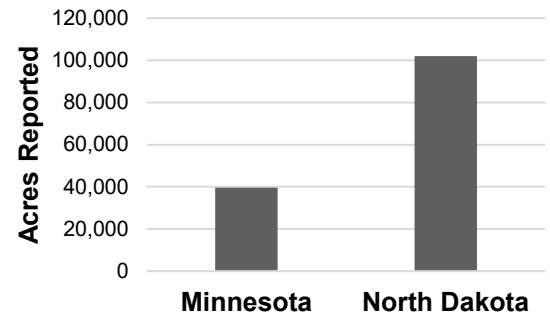


Figure 1. Northharvest dry bean acres planted by state in 2019 (respondents' acres only).

Table 2. Dry bean production by county in 2019.

Minnesota	No. of respondents ^a	Acres ^b	North Dakota	No. of respondents ^a	Acres ^b
Polk	15	6,608	Grand Forks	32	16,189
Mahnomen	6	4,235	Walsh	35	15,299
Swift	12	3,407	Pembina	17	12,163
Otter Tail	7	3,326	Wells	8	9,993
Stearns	6	2,675	Traill	13	7,678
Pennington	6	2,540	Benson	18	7,521
Hubbard	2	2,469	Steele	14	6,689
Norman	3	2,226	Ramsey	5	4,161
Chippewa	8	1,852	McLean	3	3,945
Wadena	3	1,566	Nelson	8	3,631
Marshall	4	1,338	Cavalier	7	2,724
Kandiyohi	5	1,121	Barnes	3	1,520
McLeod	3	978	Pierce	3	1,239
Stevens	5	966	Stutsman	3	1,190
Grant	1	568	Dickey	3	1,152
Renville	3	491	Griggs	5	1,030
Becker	1	454	Ransom	3	986
Pope	2	435	LaMoure	3	872
Morrison	3	385	Mercer	1	700
Sherburne	1	320	Eddy	4	642
Benton	1	250	Cass	2	575
Crow Wing	1	230	McHenry	1	550
Red Lake	1	230	Towner	3	550
Sibley	1	210	Foster	2	395
Beltrami	1	180	Burleigh	1	200
Todd	2	155	Richland	1	140
Big Stone	1	100	Oliver	1	115
Lyon	1	100	Sargent	1	40
Lac qui Parle	1	80			
Wilkin	1	80			
Total		39,575	Total		101,889

^aSome respondents had dry bean acreage in more than one county.

^bRespondents' acres only.

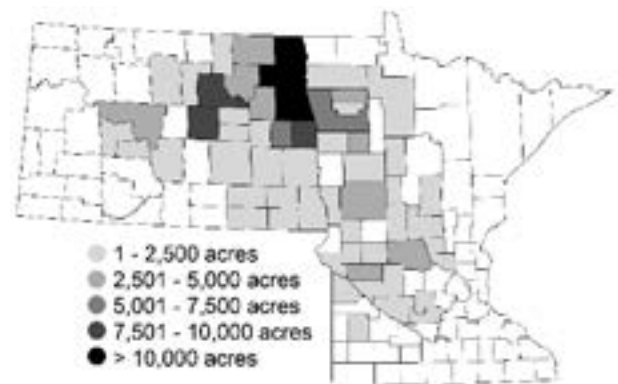


Figure 2. Northharvest dry bean production by county in 2019 (respondents' acres only).

Table 3. Dry bean acres planted, harvested, irrigated, on tile-drained ground and damaged by water in 2019.

	Acres reported (no.) ^a	Acres reported (%) ^a
Minnesota		
Planted	39,575	100
Harvested	38,340	96.9
Irrigated	11,636	29.4
Tile-drained	9,454	23.9
Water damage (beans harvested)	10,762	27.2
Water damage (beans not harvested)	1,093	2.8
North Dakota		
Planted	101,889	100
Harvested	88,787	87.1
Irrigated	1,289	1.3
Tile-drained	5,248	5.2
Water damage (beans harvested)	20,619	20.2
Water damage (beans not harvested)	10,549	10.4
Northharvest		
Planted	141,464	100
Harvested	127,127	89.9
Irrigated	12,925	9.1
Tile-drained	14,702	10.4
Water damage (beans harvested)	31,381	22.2
Water damage (beans not harvested)	11,642	8.2

^aRespondents' acres only.

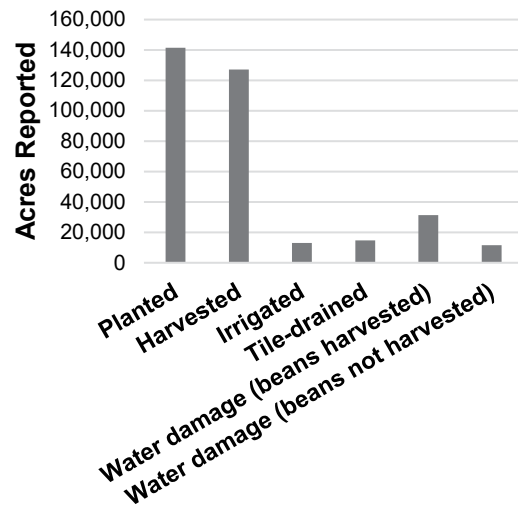


Figure 3. Northharvest respondents' reported acres from Table 3.

Table 4. Dry bean market classes grown in 2019.

Market class	Acres reported (no.) ^a	Acres reported (%) ^a
Minnesota		
Kidney	16,171	40.9
Black	11,419	28.9
Navy	8,684	21.9
Pinto	2,321	5.9
Pink	900	2.3
Red	80	0.2
Cranberry	0	0
Great Northern	0	0
Total	39,575	100
North Dakota		
Pinto	62,835	61.7
Black	19,822	19.5
Navy	11,002	10.8
Red	4,550	4.5
Great Northern	1,430	1.4
Pink	1,191	1.2
Cranberry	606	0.6
Kidney	453	0.4
Total	101,889	100
Northharvest		
Pinto	65,156	46.1
Black	31,241	22.1
Navy	19,686	13.9
Kidney	16,624	11.8
Red	4,630	3.3
Pink	2,091	1.5
Great Northern	1,430	1
Cranberry	606	0.4
Total	141,464	100

^aRespondents' acres only.

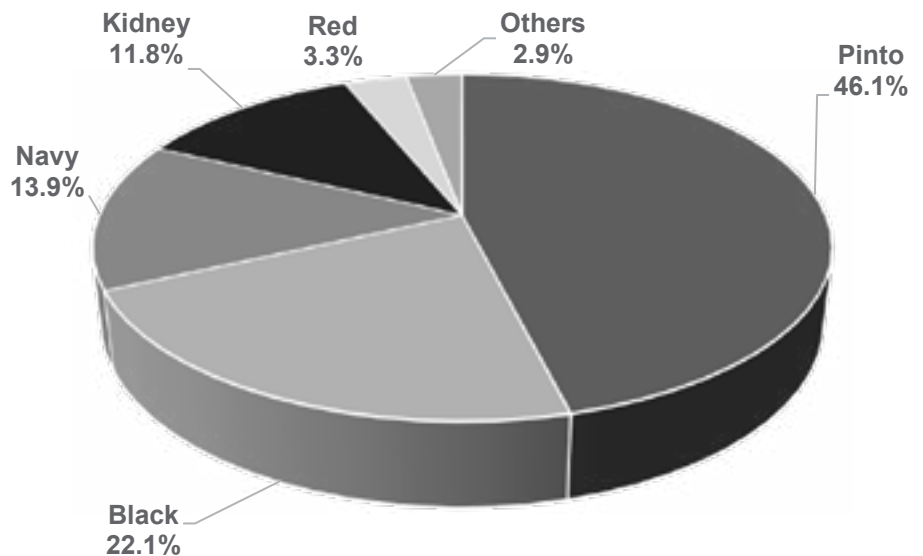


Figure 4. Northharvest dry bean market classes grown in 2019.

Table 5. Dry bean varieties grown in 2019.

Variety	Class	Minnesota ^a	% ^b	North Dakota ^a	% ^b	Northarvest ^a	% ^b
Eclipse	Black	7,859	19.9	12,874	12.6	20,733	14.7
Zorro	Black	2,050	5.2	1,742	1.7	3,792	2.7
Black Tail	Black	350	0.9	3,418	3.4	3,768	2.7
Black Cat	Black	400	1	963	0.9	1,363	1
Black Beard	Black	0	0	800	0.8	800	0.6
Zenith	Black	550	1.4	0	0	550	0.4
Unspecified	Black	210	0.5	0	0	210	0.1
Black Bear	Black	0	0	25	0	25	0
Total Black	Black	11,419	28.9	19,822	19.5	31,241	22.1
Etna	Cranberry	0	0	606	0.6	606	0.4
Total Cranberry	Cranberry	0	0	606	0.6	606	0.4
Draco	GN	0	0	1,140	1.1	1,140	0.8
Taurus	GN	0	0	290	0.3	290	0.2
Total GN^c	GN	0	0	1,430	1.4	1,430	1
Dynasty	Kidney	4,107	10.4	0	0	4,107	2.9
Montcalm	Kidney	3,043	7.7	163	0.2	3,206	2.3
Clouseau	Kidney	2,359	6	0	0	2,359	1.7
Pink Panther	Kidney	1,563	3.9	290	0.3	1,853	1.3
Red Hawk	Kidney	1,118	2.8	0	0	1,118	0.8
Chaparral	Kidney	1,000	2.5	0	0	1,000	0.7
Talon	Kidney	659	1.7	0	0	659	0.5
Red Rover	Kidney	635	1.6	0	0	635	0.4
Epic	Kidney	590	1.5	0	0	590	0.4
Beluga	Kidney	534	1.3	0	0	534	0.4
Big Red	Kidney	263	0.7	0	0	263	0.2
Cabernet	Kidney	100	0.3	0	0	100	0.1
Ronnie's Red	Kidney	100	0.3	0	0	100	0.1
Rampart	Kidney	60	0.2	0	0	60	0
Red Cedar	Kidney	40	0.1	0	0	40	0
Total Kidney	Kidney	16,171	40.9	453	0.4	16,624	11.8
HMS Medalist	Navy	2,515	6.4	7,592	7.5	10,107	7.1
T-9905	Navy	5,251	13.3	2,520	2.5	7,771	5.5
Blizzard	Navy	570	1.4	350	0.3	920	0.7
T-9903	Navy	0	0	475	0.5	475	0.3
Ensign	Navy	106	0.3	0	0	106	0.1
Merlin	Navy	100	0.3	0	0	100	0.1
Unspecified	Navy	100	0.3	0	0	100	0.1
Norstar	Navy	0	0	65	0.1	65	0
Alpena	Navy	42	0.1	0	0	42	0
Total Navy	Navy	8,684	21.9	11,002	10.8	19,686	13.9
Rosetta	Pink	250	0.6	366	0.4	616	0.4
Floyd	Pink	150	0.4	415	0.4	565	0.4
Rogers 922	Pink	500	1.3	0	0	500	0.4
Sedona	Pink	0	0	260	0.3	260	0.2
Unspecified	Pink	0	0	150	0.1	150	0.1
Total Pink	Pink	900	2.3	1,191	1.2	2,091	1.5
Monterrey	Pinto	362	0.9	11,706	11.5	12,068	8.5
Torreón	Pinto	593	1.5	9,853	9.7	10,446	7.4
La Paz	Pinto	655	1.7	9,066	8.9	9,721	6.9
Windbreaker	Pinto	500	1.3	6,801	6.7	7,301	5.2
Vibrant (SD) ^d	Pinto	0	0	6,319	6.2	6,319	4.5
Cowboy	Pinto	0	0	3,625	3.6	3,625	2.6
ND Palomino (SD) ^d	Pinto	57	0.1	3,323	3.3	3,380	2.4
Santa Cruz	Pinto	0	0	3,215	3.2	3,215	2.3
Radiant (SD) ^d	Pinto	0	0	2,370	2.3	2,370	1.7
Sinaloa	Pinto	0	0	1,699	1.7	1,699	1.2
ND 307	Pinto	0	0	1,173	1.2	1,173	0.8
Maverick	Pinto	0	0	1,000	1	1,000	0.7
Stampede	Pinto	0	0	808	0.8	808	0.6
Lariat	Pinto	0	0	475	0.5	475	0.3
Buster	Pinto	0	0	462	0.5	462	0.3
SV6139GR	Pinto	120	0.3	300	0.3	420	0.3
Rough Rider	Pinto	0	0	360	0.4	360	0.3
Unspecified	Pinto	0	0	180	0.2	180	0.1
Winchester	Pinto	0	0	100	0.1	100	0.1
ND Falcon	Pinto	34	0.1	0	0	34	0
Total Pinto	Pinto	2,321	5.9	62,835	61.7	65,156	46.1
Ruby	Small Red	0	0	3,399	3.3	3,399	2.4
Viper	Small Red	0	0	1,151	1.1	1,151	0.8
Ryder	Small Red	80	0.2	0	0	80	0.1
Total Small Red	Small Red	80	0.2	4,550	4.5	4,630	3.3
Grand Total	All Classes	39,575	100	101,889	100	141,464	100

^aRespondents' acres only. ^bPercent of respondents' total dry bean acreage. ^cGN = Great Northern. ^d(SD) = Slow darkening pinto variety.

Table 6. Are slow-darkening (SD) pinto varieties a good alternative to regular darkening pinto varieties for pinto bean production in the Northarvest production region?

Response	Respondents (no.) ^a	Respondents (%) ^a	Acres reported (no.) ^b	Acres reported (%) ^b
Minnesota				
Yes	3	37.5	1,075	46.3
No	1	12.5	500	21.5
I don't know	4	50	746	32.1
Total	8	100	2,321	100
North Dakota				
Yes	50	42.7	32,570	52.2
No	24	20.5	14,997	24.1
I don't know	43	36.8	14,768	23.7
Total	117	100	62,335	100
Northarvest				
Yes	53	42.4	33,645	52
No	25	20	15,497	24
I don't know	47	37.6	15,514	24
Total	125	100	64,656	100

^aRespondents who grew pinto beans in 2019.

^b2019 pinto bean production acres only.

Table 7. If more seed of SD pintos was available, would you grow more SD pintos compared with regular darkening pintos?

Response	Respondents (no.) ^a	Respondents (%) ^a	Acres reported (no.) ^b	Acres reported (%) ^b
Minnesota				
Yes	6	75	1,787	77
No	2	25	534	23
Total	8	100	2,321	100
North Dakota				
Yes	48	43.6	25,045	44.5
No	62	56.4	31,270	55.5
Total	110	100	56,315	100
Northarvest				
Yes	54	45.8	26,832	45.8
No	64	54.2	31,804	54.2
Total	118	100	58,636	100

^aRespondents who grew pinto beans in 2019.

^b2019 pinto bean production acres only.

Table 8. Why do you think SD pintos are not a good alternative?

Reason	Respondents (no.) ^a	Respondents (%) ^b
Minnesota		
Price	4	66.7
Poor agronomic performance of SD varieties	3	50
Lack of markets	2	33.3
Lack of consumer knowledge about benefits of SD pintos	2	33.3
Lack of industry knowledge about benefits of SD pintos	1	16.7
North Dakota		
Poor agronomic performance of SD varieties	39	48.8
Price	33	41.3
Lack of grower knowledge about benefits of SD pintos	19	23.8
Lack of markets	18	22.5
Lack of industry knowledge about benefits of SD pintos	17	21.3
Lack of consumer knowledge about benefits of SD pintos	15	18.8
Northarvest		
Poor agronomic performance of SD varieties	42	48.8
Price	37	43
Lack of markets	20	23.3
Lack of grower knowledge about benefits of SD pintos	19	22.1
Lack of industry knowledge about benefits of SD pintos	18	20.9
Lack of consumer knowledge about benefits of SD pintos	17	19.8

^aRespondents who grew pinto beans in 2019. ^bPercentages do not total 100 because respondents could choose multiple responses.

Table 9. Dry bean production problems reported in 2019.

Production problem	Respondents (no.)	Respondents (%)	Acres reported (no.) ^a	Acres reported (%) ^a
Minnesota				
Water damage (beans harvested)	49	60.5	10,762	29.4
Diseases	33	40.7	10,420	28.5
Hail	23	28.4	6,751	18.4
Harvest	20	24.7	6,692	18.3
Delayed planting	14	17.3	4,559	12.4
Emergence/stand	14	17.3	3,211	8.8
Insects	12	14.8	2,943	8
Weeds	16	19.8	2,292	6.3
Water damage (beans not harvested)	22	27.2	1,093	3
Micronutrient deficiency	1	1.2	880	2.4
Applied herbicide injury	6	7.4	760	2.1
Wind	4	4.9	640	1.7
Drought	3	3.7	280	0.8
Herbicide drift injury	2	2.5	122	0.3
Frost	2	2.5	120	0.3
Soil salinity	5	6.2	119	0.3
North Dakota				
Drought	55	34.8	31,642	31.9
Harvest	55	34.8	23,323	23.5
Water damage (beans harvested)	63	39.9	20,619	20.8
Hail	53	33.5	18,602	18.8
Delayed planting	33	20.9	14,608	14.7
Snow	25	15.8	13,468	13.6
Diseases	32	20.3	12,665	12.8
Water damage (beans not harvested)	71	44.9	10,549	10.6
Wind	18	11.4	7,107	7.2
Emergence/stand	20	12.7	5,891	5.9
Weeds	41	25.9	5,530	5.6
Insects	11	7	5,521	5.6
Soil salinity	55	34.8	3,654	3.7
Applied herbicide injury	6	3.8	2,423	2.4
Frost	9	5.7	2,210	2.2
Herbicide drift injury	4	2.5	1,779	1.8
Herbicide carryover injury	2	1.3	745	0.8
Wildlife	1	0.6	100	0.1
Northharvest				
Drought	58	24.3	31,922	23.5
Water damage (beans harvested)	112	46.9	31,381	23.1
Harvest	75	31.4	30,015	22.1
Hail	76	31.8	25,353	18.7
Diseases	65	27.2	23,085	17
Delayed planting	47	19.7	19,167	14.1
Snow	25	10.5	13,468	9.9
Water damage (beans not harvested)	93	38.9	11,642	8.6
Emergence/stand	34	14.2	9,102	6.7
Insects	23	9.6	8,464	6.2
Weeds	57	23.8	7,822	5.8
Wind	22	9.2	7,747	5.7
Soil salinity	60	25.1	3,773	2.8
Applied herbicide injury	12	5	3,183	2.3
Frost	11	4.6	2,330	1.7
Herbicide drift injury	6	2.5	1,901	1.4
Micronutrient deficiency	1	0.4	880	0.6
Herbicide carryover injury	2	0.8	745	0.5
Wildlife	1	0.4	100	0.1

^aRespondents' acres only.

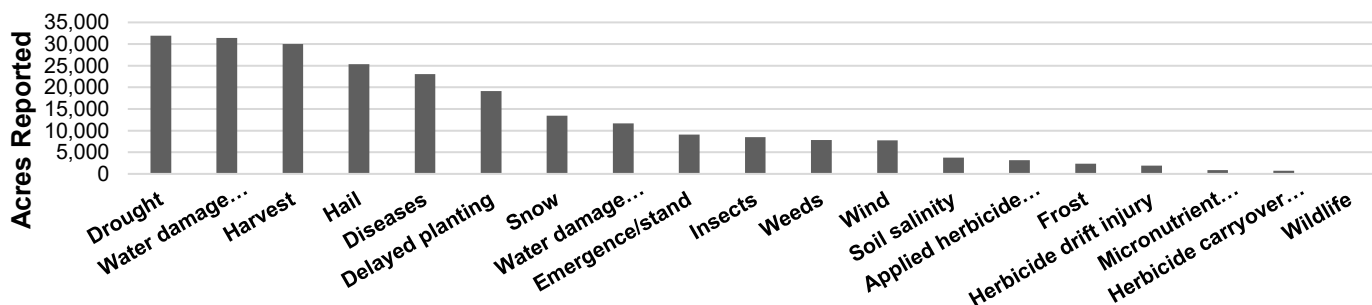


Figure 5. Northharvest respondents' reported acres for dry bean production problems in 2019.

Table 10. Purchased seed size problems that affected acreage planting intentions in 2019.

Variety	Class	Respondents (no.)	Acres reported ^a	Not enough seed			Too much seed		
				Respondents (no.)	Acres affected ^a	%	Respondents (no.)	Acres affected ^a	%
Minnesota									
Epic	Kidney	3	590	1	10	1.7	0	0	0
Montcalm	Kidney	9	3,043	1	5	0.2	2	80	2.6
Pink Panther	Kidney	7	1,563	1	5	0.3	0	0	0
North Dakota									
Black Cat	Black	5	963	1	11	1.1	0	0	0
Eclipse	Black	35	12,874	0	0	0	1	10	0.1
Medalist	Navy	24	7,592	1	10	0.1	1	8	0.1
Cowboy	Pinto	12	3,625	1	80	2.2	0	0	0
La Paz	Pinto	27	9,066	1	30	0.3	0	0	0
Torreon	Pinto	24	9,853	1	20	0.2	0	0	0
Northarvest									
Black Cat	Black	6	1,363	1	11	0.8	0	0	0
Eclipse	Black	62	20,733	0	0	0	1	10	0
Epic	Kidney	3	590	1	10	1.7	0	0	0
Montcalm	Kidney	10	3,206	1	5	0.2	2	80	2.5
Pink Panther	Kidney	8	1,853	1	5	0.3	0	0	0
Medalist	Navy	41	10,107	1	10	0.1	1	8	0.1
Cowboy	Pinto	12	3,625	1	80	2.2	0	0	0
La Paz	Pinto	29	9,721	1	30	0.3	0	0	0
Torreon	Pinto	26	10,446	1	20	0.2	0	0	0

^aRespondents' acres only.

Table 11. Row spacing by dry bean market class in 2019.

Row spacing	Black ^a		Cranberry		Great Northern		Kidney		Navy ^a		Pink		Pinto ^a		Red		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Minnesota																	
< 11 inches	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 to 15 inches	3	8.8	0	0	0	0	0	0	3	9.4	0	0	1	14.3	0	0	0
16 to 20 inches	3	8.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 to 25 inches	21	61.8	0	0	0	0	9	36	19	59.4	2	100	1	14.3	0	0	0
26 to 30 inches	7	20.6	0	0	0	0	15	60	10	31.3	0	0	5	71.4	0	0	0
> 30 inches	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0
Total	34	100	0	0	0	0	25	100	32	100	2	100	7	100	0	0	0
North Dakota																	
< 11 inches	1	2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 to 15 inches	8	16.7	0	0	0	0	0	0	1	4.2	0	0	10	8.8	1	10	0
16 to 20 inches	7	14.6	0	0	0	0	0	0	1	4.2	0	0	9	7.9	0	0	0
21 to 25 inches	22	45.8	2	100	1	50	1	50	13	54.2	4	80	34	29.8	3	30	0
26 to 30 inches	9	18.8	0	0	1	50	1	50	9	37.5	1	20	60	52.6	6	60	0
> 30 inches	1	2.1	0	0	0	0	0	0	0	0	0	0	1	0.9	0	0	0
Total	48	100	2	100	2	100	2	100	24	100	5	100	114	100	10	100	0
Northarvest																	
< 11 inches	1	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 to 15 inches	11	13.4	0	0	0	0	0	0	4	7.1	0	0	11	9.1	1	10	0
16 to 20 inches	10	12.2	0	0	0	0	0	0	1	1.8	0	0	9	7.4	0	0	0
21 to 25 inches	43	52.4	2	100	1	50	10	37	32	57.1	6	85.7	35	28.9	3	30	0
26 to 30 inches	16	19.5	0	0	1	50	16	59.3	19	33.9	1	14.3	65	53.7	6	60	0
> 30 inches	1	1.2	0	0	0	0	1	3.7	0	0	0	0	1	0.8	0	0	0
Total	82	100	2	100	2	100	27	100	56	100	7	100	121	100	10	100	0

^aBlack, navy and pinto varieties are typically Type II (upright) varieties.

Table 12. Seeding rate by dry bean market class in 2019.

Seeding rate ^a	Black ^b		Cranberry		Great Northern		Kidney		Navy ^b		Pink		Pinto ^b		Red		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Minnesota																	
<60,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 to 69,000	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0
70 to 79,000	1	3	0	0	0	0	10	40	0	0	0	0	3	42.9	0	0	0
80 to 89,000	1	3	0	0	0	0	5	20	0	0	2	100	4	57.1	0	0	0
90 to 99,000	1	3	0	0	0	0	9	36	0	0	0	0	0	0	0	0	0
100 to 109,000	6	18.2	0	0	0	0	0	0	4	12.5	0	0	0	0	0	0	0
110 to 119,000	19	57.6	0	0	0	0	0	0	12	37.5	0	0	0	0	0	0	0
120 to 129,000	4	12.1	0	0	0	0	0	0	11	34.4	0	0	0	0	0	0	0
> 129,000	1	3	0	0	0	0	0	0	5	15.6	0	0	0	0	0	0	0
Total	33	100	0	0	0	0	25	100	32	100	2	100	7	100	0	0	0
North Dakota																	
<60,000	1	2.2	0	0	0	0	0	0	1	4.5	0	0	2	1.9	0	0	0
60 to 69,000	0	0	0	0	1	0	0	0	0	0	0	0	11	10.2	0	0	0
70 to 79,000	0	0	0	0	0	0	0	0	0	0	4	80	42	38.9	0	0	0
80 to 89,000	0	0	0	0	0	0	0	0	0	0	1	20	35	32.4	3	37.5	0
90 to 99,000	7	15.6	1	100	0	0	0	0	5	22.7	0	0	13	12	4	50	0
100 to 109,000	12	26.7	0	0	0	0	0	0	3	13.6	0	0	3	2.8	0	0	0
110 to 119,000	16	35.6	0	0	0	0	0	0	9	40.9	0	0	1	0.9	1	12.5	0
120 to 129,000	8	17.8	0	0	0	0	0	0	4	18.2	0	0	0	0	0	0	0
> 129,000	1	2.2	0	0	0	0	0	0	0	0	0	0	1	0.9	0	0	0
Total	45	100	1	100	0	0	0	0	22	100	5	100	108	100	8	100	0
Northarvest																	
<60,000	1	1.3	0	0	0	0	0	0	1	1.9	0	0	2	1.7	0	0	0
60 to 69,000	0	0	0	0	1	0	1	4	0	0	0	0	11	9.6	0	0	0
70 to 79,000	1	1.3	0	0	0	0	10	40	0	0	4	57.1	45	39.1	0	0	0
80 to 89,000	1	1.3	0	0	0	0	5	20	0	0	3	42.9	39	33.9	3	37.5	0
90 to 99,000	8	10.3	1	100	0	0	9	36	5	9.3	0	0	13	11.3	4	50	0
100 to 109,000	18	23.1	0	0	0	0	0	0	7	13	0	0	3	2.6	0	0	0
110 to 119,000	35	44.9	0	0	0	0	0	0	21	38.9	0	0	1	0.9	1	12.5	0
120 to 129,000	12	15.4	0	0	0	0	0	0	15	27.8	0	0	0	0	0	0	0
> 129,000	2	2.6	0	0	0	0	0	0	5	9.3	0	0	1	0.9	0	0	0
Total	78	100	1	100	0	0	25	100	54	100	7	100	115	100	8	100	0

^aLive seeds per acre.

^bBlack, navy and pinto varieties are typically Type II (upright) varieties.

Table 13. Percent of total dry bean acres harvested by direct combining in 2019.

Percent direct combined	Respondents (no.)	Respondents (%)	Acres reported ^a	Acres reported ^a (%)
Minnesota				
1 to 25%	1	1.3	3,480	10.4
26 to 50%	2	2.6	966	2.9
51 to 75%	2	2.6	1,560	4.6
76 to 99%	5	6.4	2,116	6.3
100%	54	69.2	16,608	49.4
No direct harvest	14	17.9	8,890	26.4
Total	78	100	33,620	100
North Dakota				
1 to 25%	4	2.6	4,445	5.2
26 to 50%	8	5.2	4,637	5.5
51 to 75%	11	7.2	6,050	7.1
76 to 99%	4	2.6	4,420	5.2
100%	118	77.1	62,331	73.3
No direct harvest	8	5.2	3,136	3.7
Total	153	100	85,019	100
Northharvest				
1 to 25%	5	2.2	7,925	6.7
26 to 50%	10	4.3	5,603	4.7
51 to 75%	13	5.6	7,610	6.4
76 to 99%	9	3.9	6,536	5.5
100%	172	74.5	78,939	66.5
No direct harvest	22	9.5	12,026	10.1
Total	231	100	118,639	100

^aRespondents' harvested acres only.

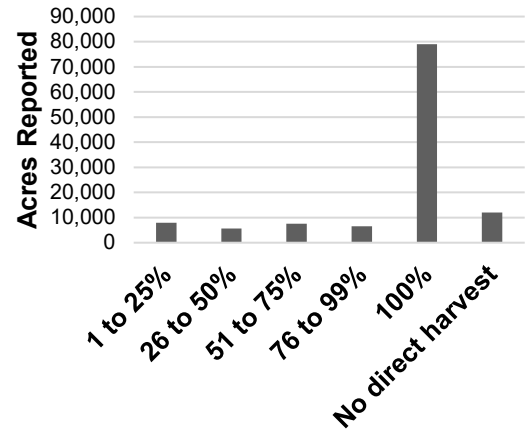


Figure 6. Northharvest percent of dry bean acres harvested by direct combining in 2019.

Table 14. Estimated yield loss in harvested dry beans in 2019.

Estimated yield loss	Direct Harvest		Indirect Harvest	
	Respondents (no.)	Respondents (%)	Respondents (no.)	Respondents (%)
Minnesota				
0%	0	0	1	4.2
1 to 5%	30	47.6	14	58.3
6 to 10%	22	34.9	8	33.3
11 to 15%	4	6.3	1	4.2
16 to 20%	7	11.1	0	0
Total	63	100	24	100
North Dakota				
0%	2	1.4	1	2.7
1 to 5%	45	31	29	78.4
6 to 10%	53	36.6	5	13.5
11 to 15%	21	14.5	1	2.7
16 to 20%	23	15.9	1	2.7
21 to 25%	1	0.7	0	0
Total	145	100	37	100
Northharvest				
0%	2	1	2	3.3
1 to 5%	75	36.1	43	70.5
6 to 10%	75	36.1	13	21.3
11 to 15%	25	12	2	3.3
16 to 20%	30	14.4	1	1.6
21 to 25%	1	0.5	0	0
Total	208	100	61	100

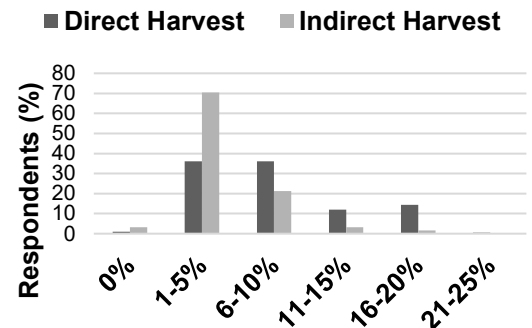


Figure 7. Northharvest estimated yield loss in harvested dry beans in 2019.

Table 15. Dry bean field tillage practices in 2019.

Tillage practice	Acres reported (no.) ^a	Acres reported (%) ^a
Minnesota		
Conventional	34,346	87.6
Minimum	4,380	11.2
Strip-tillage	290	0.7
No-till	214	0.5
Total	39,230	100
North Dakota		
Conventional	65,601	65.1
Minimum	18,383	18.2
No-till	11,856	11.8
Strip-tillage	4,932	4.9
Total	100,772	100
Northarvest		
Conventional	99,947	71.4
Minimum	22,763	16.3
No-till	12,070	8.6
Strip-tillage	5,222	3.7
Total	140,002	100

^aRespondents' acres only.

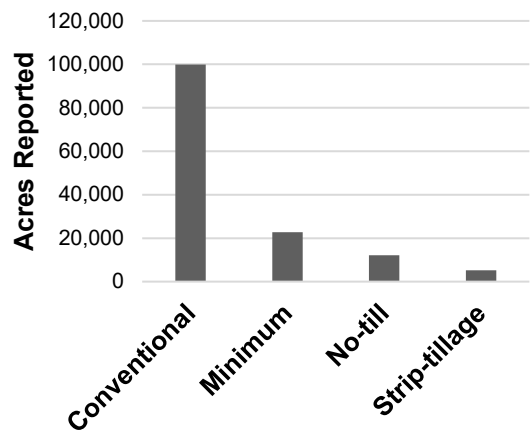


Figure 8. Northarvest dry bean field tillage practices in 2019.

Agronomy

Table 16. Cover crop use on dry bean fields in 2019.

Cover crop use	Respondents (no.)	Respondents (%)	Acres reported (no.) ^a	Acres reported (%) ^a
Minnesota				
Yes	20	23.3	13,581	34.8
No	66	76.7	25,419	65.2
Total	86	100	39,000	100
North Dakota				
Yes	25	15	20,006	20
No	142	85	79,883	80
Total	167	100	99,889	100
Northarvest				
Yes	45	17.8	33,587	24.2
No	208	82.2	105,302	75.8
Total	253	100	138,889	100

^aRespondents' acres only.

Table 17. Reasons for cover crop use on dry bean fields in 2019.

Cover crop practice	Respondents (no.)	Respondents (%) ^a
Minnesota		
Soil conservation	20	100
Moisture conservation	2	10
Weed control	2	10
Biodiversity	1	5
Soil tilth	1	5
North Dakota		
Soil conservation	23	92
Weed control	10	40
Moisture conservation	7	28
Reclaim nitrogen	1	4
Northarvest		
Soil conservation	43	95.6
Weed control	12	26.7
Moisture conservation	9	20
Biodiversity	1	2.2
Soil tilth	1	2.2
Reclaim nitrogen	1	2.2

^aPercentages do not total 100% because some respondents gave more than one reason.

Table 18. Seasonal use of cover crops on dry bean fields in 2019.

Cover crop practice	Respondents (no.)	Respondents (%) ^a
Minnesota		
Before/After dry bean production	19	95
During dry bean production	0	0
Not specified	1	5
Total	20	100
North Dakota		
Before/After dry bean production	20	80
During dry bean production	3	12
Not specified	2	8
Total	25	100
Northarvest		
Before/After dry bean production	39	86.7
During dry bean production	3	6.7
Not specified	3	6.7
Total	45	100

Table 19. Cover crop species composition on dry bean fields in 2019.

Cover crop practice	Respondents (no.)	Respondents (%) ^a
Minnesota		
Cereal grass species only (barley, oats, rye, wheat)	17	85
Broadleaf species only (pea, radish, turnip)	0	0
Cereal grass + broadleaf species	2	10
Not specified	1	5
Total	20	100
North Dakota		
Cereal grass species only (barley, oats, rye, wheat)	18	72
Broadleaf species only (clover, flax, pea, radish, turnip)	0	0
Cereal grass + broadleaf species	6	24
Not specified	1	4
Total	25	100
Northarvest		
Cereal grass species only	35	77.8
Broadleaf species only	0	0
Cereal grass + broadleaf species	8	17.8
Not specified	2	4.4
Total	45	100

Table 20. Ground rolling on dry bean fields in 2019.

Timing	Respondents (no.)	Respondents (%) ^a	Acres reported (no.) ^b	Acres reported (%) ^b
Minnesota				
Pre-plant	9	11.5	2,505	7.2
Pre-emerge	31	39.7	9,440	27.1
Post-emerge	7	9	2,901	8.3
Did not roll	37	47.4	19,934	57.3
Total			34,780	100
North Dakota				
Pre-plant	17	10.5	6,525	6.7
Pre-emerge	93	57.4	58,597	60.3
Post-emerge	9	5.6	2,989	3.1
Did not roll	54	33.3	29,075	29.9
Total			97,186	100
Northharvest				
Pre-plant	26	10.8	9,030	6.8
Pre-emerge	124	51.7	68,037	51.6
Post-emerge	16	6.7	5,890	4.5
Did not roll	91	37.9	49,009	37.1
Total			131,966	100

^aPercentages do not total 100 percent because some respondents practiced more than one timing. ^bRespondents' acres only.

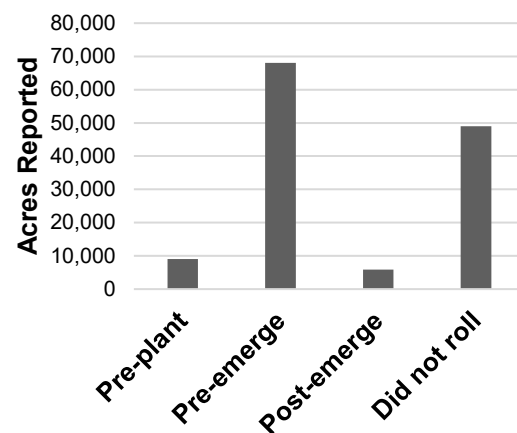


Figure 9. Northharvest ground rolling on dry bean fields in 2019.

Table 21. Ground rolling and direct harvest on dry bean fields in 2019.

Percent Direct Combined	Ground Rolling			
	Yes		No	
Minnesota	Respondents (no.)	Respondents (%)	Respondents (no.)	Respondents (%)
0%	1	2.1	13	35.1
1 to 25%	1	2.1	1	2.7
26 to 50%	2	4.3	1	2.7
51 to 75%	2	4.3	1	2.7
76 to 99%	1	2.1	5	13.5
100%	40	85.1	16	43.2
Total	47	100	37	100
North Dakota				
0%	0	0	8	16.3
1 to 25%	1	0.9	3	6.1
26 to 50%	3	2.6	6	12.2
51 to 75%	6	5.2	8	16.3
76 to 99%	4	3.5	2	4.1
100%	101	87.8	22	44.9
Total	115	100	49	100
Northharvest				
0%	1	0.6	21	24.4
1 to 25%	2	1.2	4	4.7
26 to 50%	5	3.1	7	8.1
51 to 75%	8	4.9	9	10.5
76 to 99%	5	3.1	7	8.1
100%	141	87	38	44.2
Total	162	100	86	100

Table 22. Use of fertilizers on dry bean fields in 2019.

Fertilizer	Respondents (no.)	Respondents (%)
Minnesota		
Nitrogen	76	100
Phosphorus	66	86.8
Potash	56	73.7
Zinc	38	50
Sulfur	39	51.3
North Dakota		
Nitrogen	115	97.5
Phosphorus	105	89
Potash	49	41.5
Zinc	90	76.3
Sulfur	49	41.5
Northarvest		
Nitrogen	191	98.5
Phosphorus	171	88.1
Potash	105	54.1
Zinc	128	66
Sulfur	88	45.4

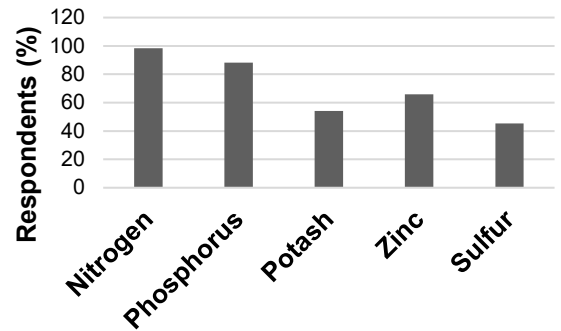


Figure 10. Northarvest use of fertilizers on dry bean fields in 2019.

Table 23. Fertilizer application methods on dry bean fields in 2019.

Fertilizer	Respondents (no.)	Respondents (%)
Minnesota		
Broadcast	85	97.7
In-furrow	28	32.2
Banded	11	12.6
Foliar	16	18.4
North Dakota		
Broadcast	137	87.3
In-furrow	54	34.4
Banded	31	19.7
Foliar	9	5.7
Northarvest		
Broadcast	222	91
In-furrow	82	33.6
Banded	42	17.2
Foliar	25	10.2

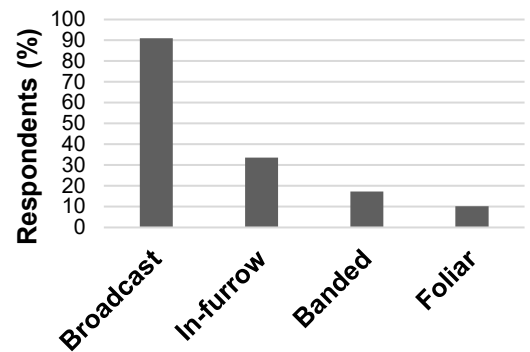


Figure 11. Northarvest fertilizer application methods on dry bean fields in 2019.

Table 24. Use of soil test prior to fertilization of dry bean fields in 2019.

Soil test	Respondents (no.)	Respondents (%)
Minnesota		
Soil test used	68	81.9
Soil test not used	15	18.1
Total	83	100
North Dakota		
Soil test used	128	80
Soil test not used	32	20
Total	160	100
Northarvest		
Soil test used	196	80.7
Soil test not used	47	19.3
Total	243	100

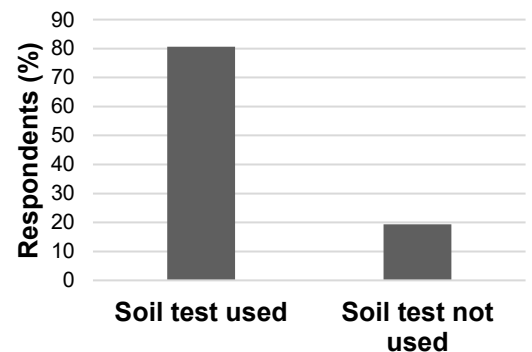


Figure 12. Northarvest use of soil test in 2019.

Table 25. Use of *Rhizobium* inoculants on dry bean fields in 2019.

<i>Rhizobium</i> use	Respondents (no.)	Respondents (%)
Minnesota		
Inoculant used	17	21.8
Inoculant not used	61	78.2
Total	78	100
North Dakota		
Inoculant used	37	24.3
Inoculant not used	115	75.7
Total	152	100
Northarvest		
Inoculant used	54	23.5
Inoculant not used	176	76.5
Total	230	100

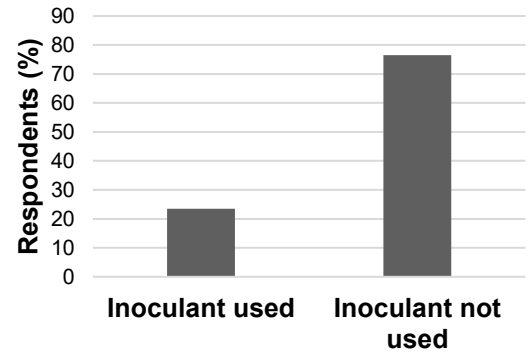


Figure 13. Northarvest use of inoculant in 2019.

Table 26. Use of site-specific nutrient management (SSNM) on dry bean fields in 2019.

	Respondents (no.)	Respondents (%)
Minnesota		
SSNM used	32	39
SSNM not used	50	61
Total	82	100
North Dakota		
SSNM used	39	25
SSNM not used	117	75
Total	156	100
Northarvest		
SSNM used	71	29.8
SSNM not used	167	70.2
Total	238	100

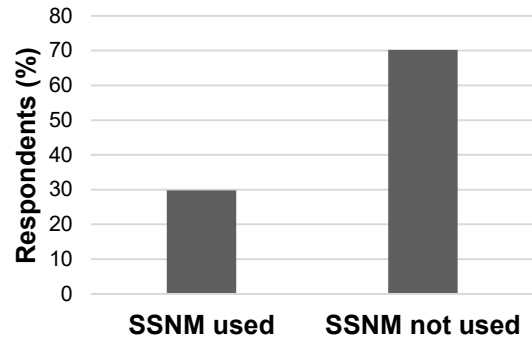


Figure 14. Northarvest use of site-specific nutrient management in 2019.

Table 27. Desiccants used on dry beans in 2019.

Desiccant	Respondents (no.)	Respondents (%)	Acres reported (no.) ^a	Acres reported (%) ^a
Minnesota				
Sharpen	57	73.1	19,493	55.8
Valor	18	23.1	8,857	25.3
None used	16	20.5	6,522	18.7
Paraquat	8	10.3	2,501	7.2
Glyphosate	6	7.7	1,933	5.5
Sodium chlorate	4	5.1	827	2.4
Desiccant Total			33,611	
North Dakota				
Sharpen	101	71.6	52,196	61.9
Glyphosate	49	34.8	26,251	31.1
Paraquat	22	15.6	11,934	14.2
Valor	21	14.9	10,176	12.1
None used	24	17	8,489	10.1
Sodium chlorate	5	3.5	2,590	3.1
Desiccant Total			103,147	
Northarvest				
Sharpen	158	72.1	71,689	60.1
Glyphosate	55	25.1	28,184	23.6
Valor	39	17.8	19,033	16
None used	40	18.3	15,011	12.6
Paraquat	30	13.7	14,435	12.1
Sodium chlorate	9	4.1	3,417	2.9
Desiccant Total			136,758	

^aRespondents' acres only.

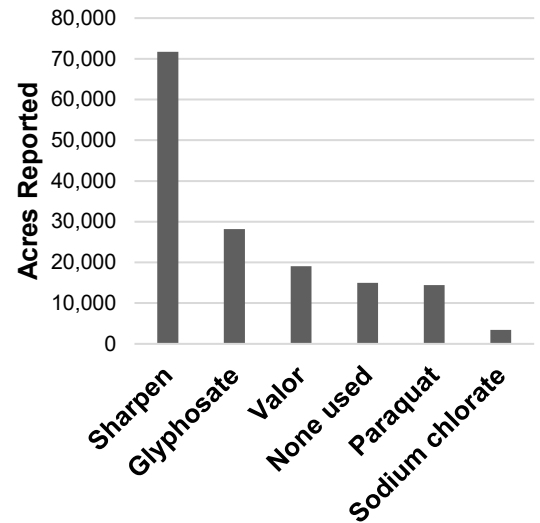


Figure 15. Northharvest desiccants used on dry beans in 2019.

Table 28. Desiccant tank-mixes used on dry beans in 2019.

Desiccant Combination	Respondents (no.)	Acres reported (no.)
Minnesota		
Sharpen + Valor	2	1,400
Paraquat + Sharpen	3	705
Glyphosate + Paraquat + Sharpen	1	600
Glyphosate + Sharpen	2	538
Glyphosate + Valor	2	440
Sharpen + Sodium Chlorate	1	275
Paraquat + Valor	1	110
North Dakota		
Glyphosate + Sharpen	29	14,693
Glyphosate + Valor	6	5,635
Paraquat + Sharpen	7	3,257
Paraquat + Valor	2	700
Sharpen + Valor	2	572
Glyphosate + Paraquat + Sharpen	1	310
Paraquat + Sodium Chlorate	1	282
Sharpen + Sodium Chlorate	1	282
Glyphosate + Sharpen + Valor	1	117
Northarvest		
Glyphosate + Sharpen	31	15,231
Glyphosate + Valor	8	6,075
Paraquat + Sharpen	10	3,962
Sharpen + Valor	4	1,972
Glyphosate + Paraquat + Sharpen	2	910
Paraquat + Valor	3	810
Sharpen + Sodium Chlorate	2	557
Paraquat + Sodium Chlorate	1	282
Glyphosate + Sharpen + Valor	1	117

Table 29. Frequency of previous crops (2015 - 2018) in fields planted to dry beans in 2019.

Year	2018	2017	2016	2015	4-year average
Crop	Respondents (%)	Respondents (%)	Respondents (%)	Respondents (%)	Respondents (%)
Minnesota					
Corn	54.1	29.8	48.1	40.5	43.1
Soybeans	7.1	41.7	23.5	27.8	25
Dry beans	3.5	16.7	23.5	35.4	19.8
Wheat	25.9	15.5	19.8	10.1	17.8
Sugarbeets	20	10.7	6.2	11.4	12.1
Potatoes	2.4	2.4	2.5	3.8	2.8
Barley	2.4	2.4	1.2	2.5	2.1
Field peas	0	3.6	1.2	0	1.2
Hay/grass	0	1.2	1.2	1.3	0.9
Oats	1.2	1.2	1.2	0	0.9
Alfalfa	0	0	1.2	1.3	0.6
North Dakota					
Wheat	67.3	27.7	50.3	25.2	42.6
Corn	34.6	13.5	34.9	14	24.3
Dry beans	4.3	27.7	14.8	47.6	23.6
Soybeans	1.2	34.2	12.1	28	18.9
Sugarbeets	16	11.6	2.7	7.7	9.5
Barley	4.9	3.2	4.7	2.1	3.7
Canola	0.6	7.1	1.3	0.7	2.4
Potatoes	0	1.9	3.4	1.4	1.7
Field peas	0.6	1.9	0	0	0.6
No crop	0	0	0.7	0.7	0.3
Hay/grass	0	0	0.7	0	0.2
Sunflowers	0	0.6	0	0	0.2
Flax	0.6	0	0	0	0.2
Northarvest					
Wheat	53	23.4	39.6	19.8	34
Corn	41.3	19.2	39.6	23.4	30.9
Dry beans	4	23.8	17.8	43.2	22.2
Soybeans	3.2	36.8	16.1	27.9	21
Sugarbeets	17.4	11.3	3.9	9	10.4
Barley	4	2.9	3.5	2.3	3.2
Potatoes	0.8	2.1	3	2.3	2
Canola	0.4	4.6	0.9	0.5	1.6
Field peas	0.4	2.5	0.4	0	0.8
Hay/grass	0	0.4	0.9	0.5	0.4
Oats	0.4	0.4	0.4	0	0.3
Alfalfa	0	0	0.4	0.5	0.2
No crop	0	0	0.4	0.5	0.2
Sunflowers	0	0.4	0	0	0.1
Flax	0.4	0	0	0	0.1

Table 30. Number of years dry beans are grown in dry bean crop rotation program.

Number of years	Respondents (no.)	Respondents (%)
Minnesota		
1 of past 5 years	34	39.5
2 of past 5 years	44	51.2
3 of past 5 years	5	5.8
4 of past 5 years	1	1.2
5 of past 5 years	2	2.3
Total	86	100
North Dakota		
1 of past 5 years	69	42.6
2 of past 5 years	52	32.1
3 of past 5 years	37	22.8
4 of past 5 years	3	1.9
5 of past 5 years	1	0.6
Total	162	100
Northarvest		
1 of past 5 years	103	41.5
2 of past 5 years	96	38.7
3 of past 5 years	42	16.9
4 of past 5 years	4	1.6
5 of past 5 years	3	1.2
Total	248	100

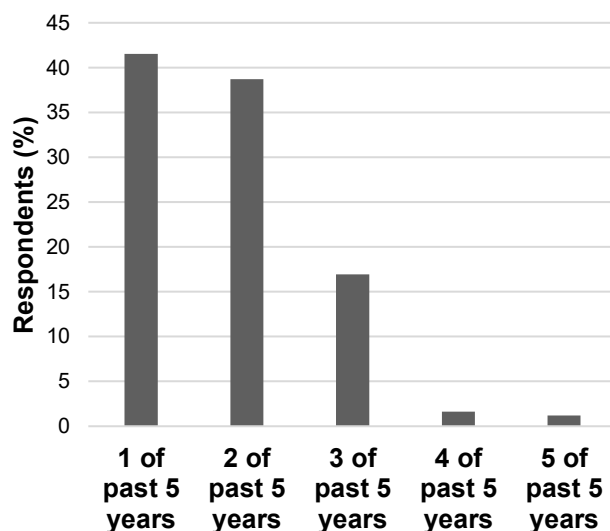


Figure 16. Northarvest number of years dry beans are grown in dry bean crop rotation program.

Insect Pests and Insecticide Use

Table 31. Worst insect problem in dry beans in 2019.

Insect ^a	Respondents (no.)	Respondents (%)	Acres reported (no.) ^{b,c}	Acres reported (%) ^{b,c}
Minnesota				
None	37	42	13,477	34.1
Leafhoppers	24	27.3	12,192	30.8
Foliage caterpillars	9	10.2	6,117	15.5
Grasshoppers	7	8	3,549	9
Aphids	3	3.4	2,070	5.2
Cutworms	3	3.4	960	2.4
Bean leaf beetle	3	3.4	930	2.3
Armyworms	1	1.1	140	0.4
Seed corn maggot	1	1.1	140	0.4
Total	88	100	39,575	100
North Dakota				
None	74	44	44,505	43.7
Grasshoppers	55	32.7	32,874	32.3
Foliage caterpillars	11	6.5	7,657	7.5
Leafhoppers	7	4.2	3,672	3.6
Wireworms	6	3.6	2,794	2.7
Spider mites	2	1.2	2,550	2.5
Armyworms	3	1.8	2,545	2.5
Aphids	3	1.8	2,517	2.5
Cutworms	5	3	1,522	1.5
Seed corn maggot	1	0.6	1,150	1.1
Bean leaf beetle	1	0.6	103	0.1
Total	168	100	101,889	100
Northarvest				
None	111	43.4	57,982	41
Grasshoppers	62	24.2	36,423	25.7
Leafhoppers	31	12.1	15,864	11.2
Foliage caterpillars	20	7.8	13,774	9.7
Aphids	6	2.3	4,587	3.2
Wireworms	6	2.3	2,794	2
Armyworms	4	1.6	2,685	1.9
Spider mites	2	0.8	2,550	1.8
Cutworms	8	3.1	2,482	1.8
Seed corn maggot	2	0.8	1,290	0.9
Bean leaf beetle	4	1.6	1,033	0.7
Total	256	100	141,464	100

^aRanked as No. 1 insect problem by respondents.

^bRespondents' acres only.

^cInsect problem may not have been present across all reported acres.

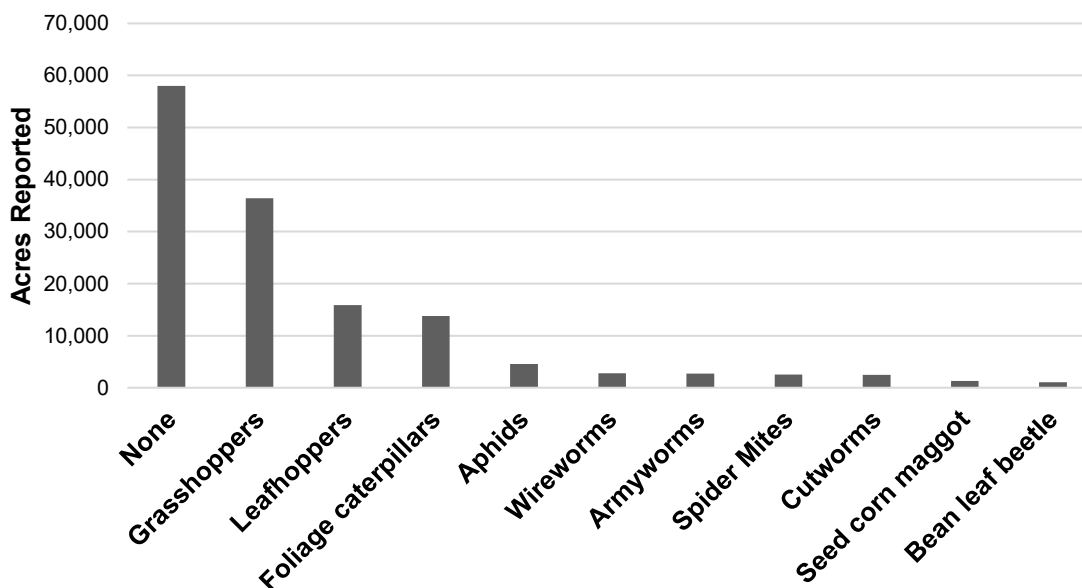


Figure 17. Northarvest worst insect problem in dry beans in 2019.

Table 32. Insects ranked as one of the three worst in dry beans in 2019.

Insect ^a	Respondents (no.)	Respondents (%)	Acres reported (no.) ^{b,c}	Acres reported (%) ^{b,c}
Minnesota				
Leafhoppers	36	40.9	20,165	51
None	37	42	13,477	34.1
Foliage caterpillars	16	18.2	9,791	24.7
Grasshoppers	22	25	8,826	22.3
Bean leaf beetle	15	17	7,581	19.2
Aphids	5	5.7	3,055	7.7
Cutworms	6	6.8	2,038	5.1
Spider mites	3	3.4	1,370	3.5
Armyworms	3	3.4	926	2.3
Wireworms	2	2.3	313	0.8
Seed corn maggot	1	1.1	140	0.4
North Dakota				
Grasshoppers	80	47.6	48,904	48
None	74	44	44,505	43.7
Foliage caterpillars	24	14.3	16,037	15.7
Leafhoppers	19	11.3	9,701	9.5
Cutworms	17	10.1	9,394	9.2
Aphids	13	7.7	8,535	8.4
Wireworms	15	8.9	7,439	7.3
Armyworms	11	6.5	6,906	6.8
Spider mites	9	5.4	5,434	5.3
Seed corn maggot	6	3.6	3,448	3.4
Bean leaf beetle	5	3	1,928	1.9
Northarvest				
None	111	43.4	57,982	41
Grasshoppers	102	39.8	57,730	40.8
Leafhoppers	55	21.5	29,866	21.1
Foliage caterpillars	40	15.6	25,828	18.3
Aphids	18	7	11,590	8.2
Cutworms	23	9	11,432	8.1
Bean leaf beetle	20	7.8	9,509	6.7
Armyworms	14	5.5	7,832	5.5
Wireworms	17	6.6	7,752	5.5
Spider mites	12	4.7	6,804	4.8
Seed corn maggot	7	2.7	3,588	2.5

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

^bRespondents' acres only.

^cInsect problem may not have been present across all reported acres.

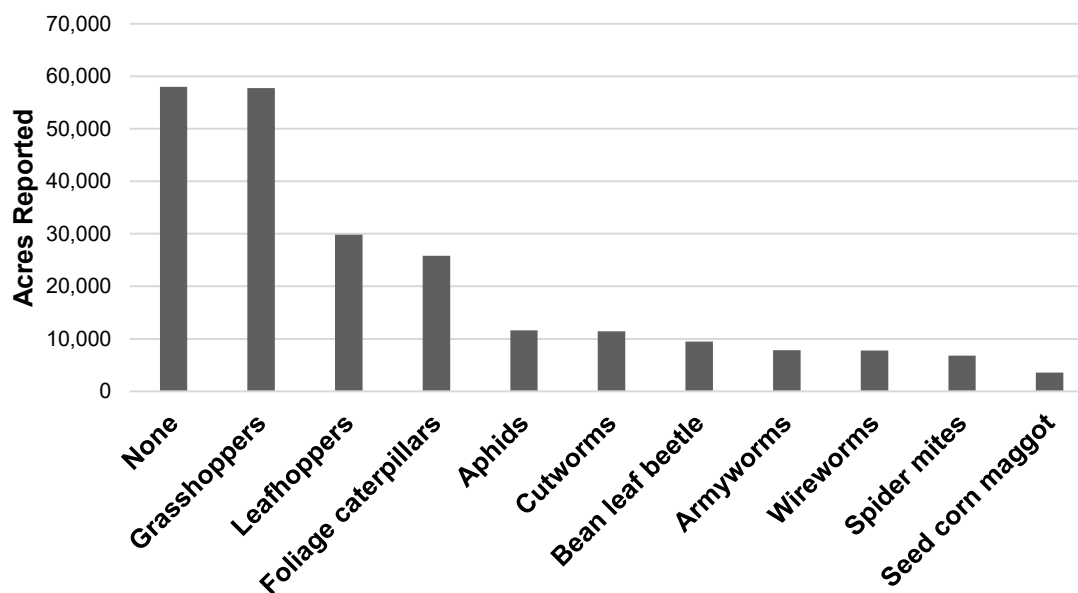


Figure 18. Northarvest insects ranked as one of the three worst in dry beans in 2019.

Table 33. Foliar insecticide use in dry beans in 2019.

Insecticide	Respondents (no.)	Respondents (%)	Acres reported (no.) ^{a,b}	Acres reported (%) ^{a,b}
Minnesota				
None	58	65.9	20,150	50.9
Warrior II	14	15.9	10,233	25.9
Hero	2	2.3	3,975	10
Asana XL	9	10.2	3,885	9.8
Tombstone	2	2.3	1,780	4.5
Brigade	3	3.4	1,272	3.2
ProAxis	1	1.1	140	0.4
Lorsban*	1	1.1	116	0.3
Baythroid XL	1	1.1	80	0.2
Insecticide Total			21,481	
North Dakota				
None	135	93.5	81,880	94.1
Warrior II	157	3.6	1,969	1.9
Lorsban*	6	0.6	650	0.6
BlackHawk	1	0.6	600	0.6
Baythroid XL	1	1.2	378	0.4
Tombstone	2	0.6	178	0.2
Brigade	1	0.6	25	0
Insecticide Total			3,800	
Northarvest				
None	224	84	116,296	82
Warrior II	215	7.8	12,202	8.6
Hero	20	0.8	3,975	2.8
Asana XL	9	3.5	3,885	2.7
Tombstone	3	1.2	1,958	1.4
Brigade	4	1.6	1,297	0.9
Lorsban	2	0.8	766	0.5
BlackHawk	1	0.4	600	0.4
Baythroid XL	3	1.2	458	0.3
ProAxis	1	0.4	140	0.1
Insecticide Total			25,281	

^aRespondents' acres only. Multiple applications count as multiple acres.

^bPercentages do not total 100 percent because some respondents treated more than once with the same product and/or treated the same acreage with more than one product.

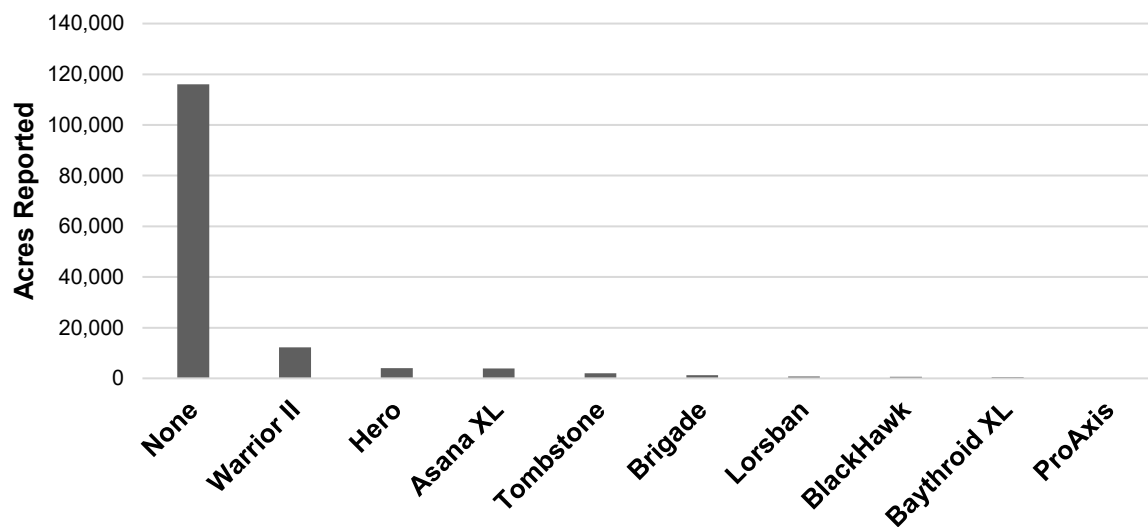


Figure 19. Northarvest foliar insecticide use in dry beans in 2019.

Table 34. Soil insecticide and seed treatment use in dry beans in 2019.

Seed Treatment	Respondents (no.)	Respondents (%)	Acres reported (no.) ^{a,b}	Acres reported (%) ^{a,b}
Minnesota				
Cruiser Maxx	41	46.6	21,720	54.9
None	33	37.5	9,728	24.6
Lorsban	5	5.7	5,318	13.4
Gaucho 600FS	3	3.4	3,583	9.1
Dyna-Shield Imidacloprid	2	2.3	3,275	8.3
Cruiser 5FS	6	6.8	2,178	5.5
Capture LFR ^c	1	1.1	1,200	3
Don't know	5	5.7	1,192	3
Cruiser Maxx Vibrance	1	1.1	840	2.1
Insecticide Total			39,306	
North Dakota				
None	80	47.6	46,829	46
Cruiser Maxx	53	31.5	31,722	31.1
Don't know	14	8.3	11,263	11.1
Cruiser Maxx Vibrance	11	6.5	6,218	6.1
Cruiser 5FS	6	3.6	5,480	5.4
Capture LFR ^c	5	3	4,287	4.2
Lorsban	6	3.6	3,040	3
Gaucho 600FS	1	0.6	300	0.3
Insecticide Total			62,310	
Northharvest				
None	113	44.1	56,557	40
Cruiser Maxx	94	36.7	53,442	37.8
Don't know	19	7.4	12,455	8.8
Lorsban	11	4.3	8,358	5.9
Cruiser 5FS	12	4.7	7,658	5.4
Cruiser Maxx Vibrance	12	4.7	7,058	5
Capture LFR ^c	6	2.3	5,487	3.9
Gaucho 600FS	4	1.6	3,883	2.7
Dyna-Shield Imidacloprid	2	0.8	3,275	2.3
Insecticide Total			101,616	

^aRespondents' acres only

^bPercentages do not total 100 percent because some respondents treated more than once with the same product and/or treated the same acreage with more than one product.

^cSoil-applied insecticide.

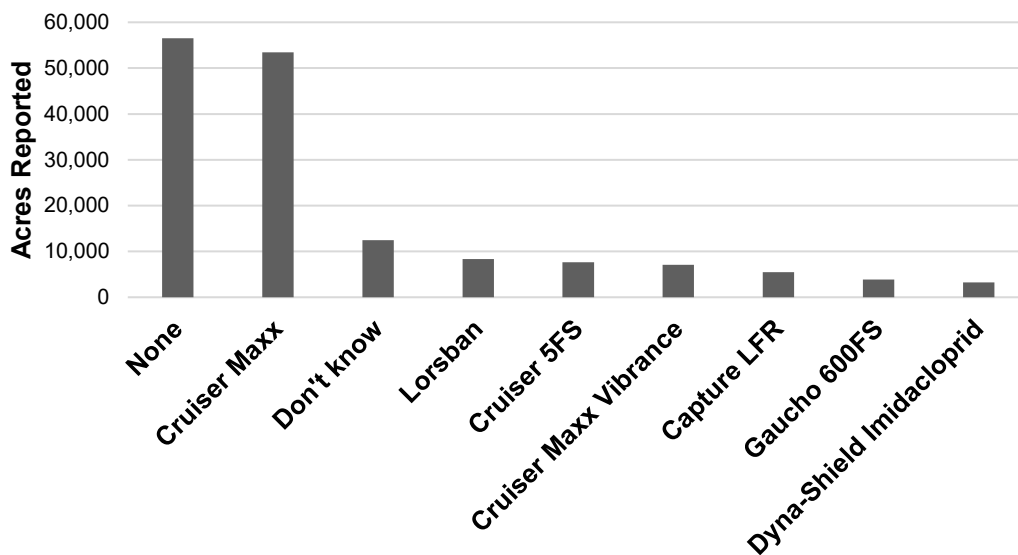


Figure 20. Northharvest insecticide seed treatment and soil insecticide use in dry beans in 2019.

Plant Diseases and Fungicide Use

Table 35. Worst disease problem in dry beans in 2019.

Disease ^a	Respondents (no.)	Respondents (%)	Acres reported (no.) ^{b,c}	Acres reported (%) ^{b,c}
Minnesota				
White mold	45	51.1	20,394	51.5
None	21	23.9	7,298	18.4
Root rot	6	6.8	3,460	8.7
Common bacterial blight	8	9.1	3,412	8.6
Bacterial wilt	2	2.3	2,100	5.3
Bacterial brown spot	4	4.5	1,481	3.7
Rust	2	2.3	1,430	3.6
Total	88	100	39,575	100
North Dakota				
None	67	39.9	46,361	45.5
White mold	77	45.8	42,753	42
Common bacterial blight	10	6	4,300	4.2
Rust	5	3	2,045	2
Root rot	2	1.2	1,947	1.9
Bean common mosaic virus	1	0.6	1,450	1.4
Bacterial wilt	1	0.6	1,300	1.3
Anthracnose	4	2.4	1,233	1.2
Bacterial brown spot	1	0.6	500	0.5
Total	168	100	101,889	100
Northharvest				
White mold	122	47.7	63,147	44.6
None	88	34.4	53,659	37.9
Common bacterial blight	18	7	7,712	5.5
Root rot	8	3.1	5,407	3.8
Rust	7	2.7	3,475	2.5
Bacterial wilt	3	1.2	3,400	2.4
Bacterial brown spot	5	2	1,981	1.4
Bean common mosaic virus	1	0.4	1,450	1
Anthracnose	4	1.6	1,233	0.9
Total	256	100	141,464	100

^aRanked as No. 1 disease problem by respondents.

^bRespondents' acres only.

^cDisease problem may not have been present across all reported acres.

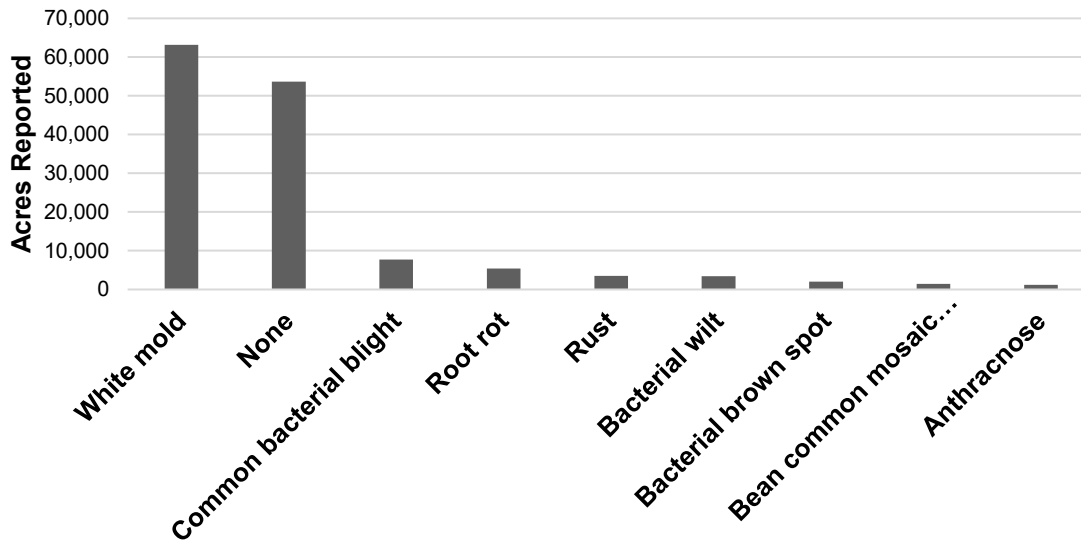


Figure 21. Northharvest worst disease problem in dry beans in 2019.

Table 36. Diseases ranked as one of the three worst in dry beans in 2019.

Disease ^a	Respondents (no.)	Respondents (%)	Acres reported (no.) ^{b,c}	Acres reported (%) ^{b,c}
Minnesota				
White mold	64	72.7	31,307	79.1
Common bacterial blight	28	31.8	15,074	38.1
Root rot	27	30.7	13,862	35
None	21	23.9	7,298	18.4
Rust	8	9.1	4,482	11.3
Bacterial brown spot	12	13.6	3,932	9.9
Anthracnose	5	5.7	2,523	6.4
Bacterial wilt	3	3.4	2,232	5.6
Viruses (general)	4	4.5	928	2.3
Halo blight	4	4.5	600	1.5
North Dakota				
White mold	88	52.4	49,079	48.2
None	67	39.9	46,361	45.5
Common bacterial blight	41	24.4	22,112	21.7
Root rot	35	20.8	20,231	19.9
Rust	23	13.7	13,358	13.1
Bacterial brown spot	9	5.4	7,436	7.3
Anthracnose	12	7.1	4,586	4.5
Bacterial wilt	4	2.4	2,615	2.6
Bean common mosaic virus	2	1.2	1,700	1.7
Viruses (general)	3	1.8	1,413	1.4
Halo blight	5	3	1,135	1.1
Northarvest				
White mold	152	59.4	80,386	56.8
None	88	34.4	53,659	37.9
Common bacterial blight	69	27	37,186	26.3
Root rot	62	24.2	34,093	24.1
Rust	31	12.1	17,840	12.6
Bacterial brown spot	21	8.2	11,368	8
Anthracnose	17	6.6	7,109	5
Bacterial wilt	7	2.7	4,847	3.4
Viruses (general)	7	2.7	2,341	1.7
Halo blight	9	3.5	1,735	1.2
Bean common mosaic virus	2	0.8	1,700	1.2

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

^bRespondents' acres only.

^cDisease problem may not have been present across all reported acres.

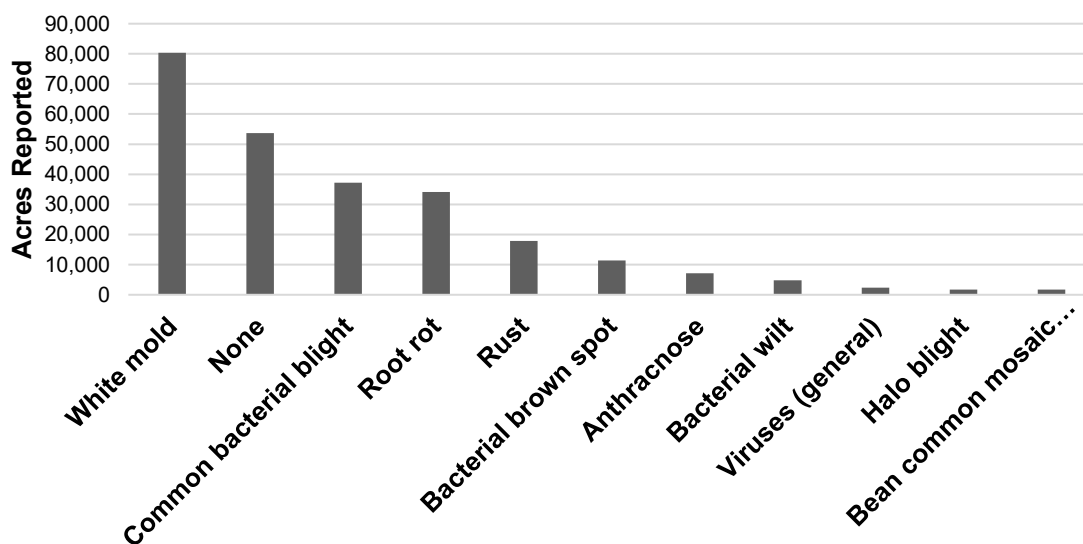


Figure 22. Northarvest diseases ranked as one of the three worst in dry beans in 2019.

Table 37. Foliar fungicide use in dry beans in 2019.

Fungicide	Resp. (no.)	Resp. (%) ^b	Total acres treated (no.) ^a	Total acres treated (%) ^{a,b}	Acres treated by ground (no.) ^a	Acres treated by ground (%) ^a	Acres treated by air (no.) ^a	Acres treated by air (%) ^a
Minnesota								
Endura	29	33	18,294	46.2	18,194	27.1	100	0.1
Topsin	32	36.4	13,664	34.5	11,866	17.7	1,798	2.7
T-methyl	19	21.6	10,147	25.6	8,587	12.8	1,560	2.3
ProPulse	5	5.7	5,265	13.3	5,265	7.8	0	0
Priaxor	4	4.5	4,810	12.2	4,150	6.2	660	1
None	16	18.2	4,430	11.2	---	---	---	---
Omega	2	2.3	3,975	10	3,975	5.9	0	0
Miravis Neo	5	5.7	2,736	6.9	2,736	4.1	0	0
Incognito	3	3.4	2,020	5.1	2,020	3	0	0
Headline	3	3.4	1,851	4.7	1,851	2.8	0	0
Calcium	1	1.1	1,740	4.4	1,740	2.6	0	0
Proline	6	6.8	1,589	4	989	1.5	600	0.9
Kocide	1	1.1	485	1.2	485	0.7	0	0
Approach	1	1.1	230	0.6	230	0.3	0	0
Tebuconazole	1	1.1	200	0.5	0	0	200	0.3
OxiDate	1	1.1	140	0.4	140	0.2	0	0
Fungicide Total			67,146		62,228	92.7	4,918	7.3
North Dakota								
T-methyl	49	29.2	32,653	32	30,852	29.2	1,801	1.7
None	58	34.5	30,090	29.5	---	---	---	---
Topsin	27	16.1	19,813	19.4	17,553	16.6	2,260	2.1
Endura	31	18.5	17,421	17.1	15,502	14.7	1,919	1.8
Priaxor	20	11.9	9,886	9.7	9,416	8.9	470	0.4
Tebuconazole	9	5.4	8,509	8.4	7,509	7.1	1,000	0.9
Incognito	5	3	3,954	3.9	3,954	3.7	0	0
Headline	6	3.6	3,941	3.9	3,941	3.7	0	0
Approach	5	3	2,535	2.5	2,220	2.1	315	0.3
Quadris/Amstar	3	1.8	1,875	1.8	825	0.8	1,050	1
Proline	4	2.4	1,845	1.8	795	0.8	1,050	1
Miravis Neo	4	2.4	1,836	1.8	1,636	1.5	200	0.2
Orius	1	0.6	600	0.6	600	0.6	0	0
Onset	1	0.6	400	0.4	400	0.4	0	0
Omega	1	0.6	350	0.3	350	0.3	0	0
Zolera	1	0.6	103	0.1	103	0.1	0	0
OxiDate	1	0.6	60	0.1	0	0	60	0.1
Fungicide Total			105,781		95,656	90.4	10,125	9.6
Northarvest								
T-methyl	68	26.6	42,800	30.3	39,439	22.8	3,361	1.9
Endura	60	23.4	35,715	25.2	33,696	19.5	2,019	1.2
None	74	28.9	34,520	24.4	---	---	---	---
Topsin	59	23	33,477	23.7	29,419	17	4,058	2.3
Priaxor	24	9.4	14,696	10.4	13,566	7.8	1,130	0.7
Tebuconazole	10	3.9	8,709	6.2	7,509	4.3	1,200	0.7
Incognito	8	3.1	5,974	4.2	5,974	3.5	0	0
Headline	9	3.5	5,792	4.1	5,792	3.3	0	0
ProPulse	5	2	5,265	3.7	5,265	3	0	0
Miravis Neo	9	3.5	4,572	3.2	4,372	2.5	200	0.1
Omega	3	1.2	4,325	3.1	4,325	2.5	0	0
Proline	10	3.9	3,434	2.4	1,784	1	1,650	1
Approach	6	2.3	2,765	2	2,450	1.4	315	0.2
Quadris/Amstar	3	1.2	1,875	1.3	825	0.5	1,050	0.6
Calcium	1	0.4	1,740	1.2	1,740	1	0	0
Orius	1	0.4	600	0.4	600	0.3	0	0
Kocide	1	0.4	485	0.3	485	0.3	0	0
Onset	1	0.4	400	0.3	400	0.2	0	0
OxiDate	2	0.8	200	0.1	140	0.1	60	0
Zolera	1	0.4	103	0.1	103	0.1	0	0
Fungicide Total			172,927		157,884	91.3	15,043	8.7

^aRespondents' acres only. Includes acreage treated more than once with the same product.

^bPercentages do not total 100 percent because some respondents treated more than once with the same product and/or treated the same acreage with more than one product.

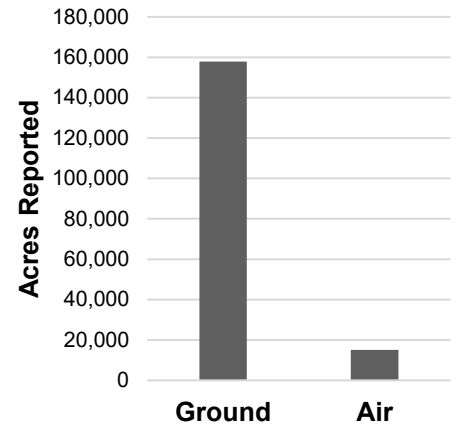
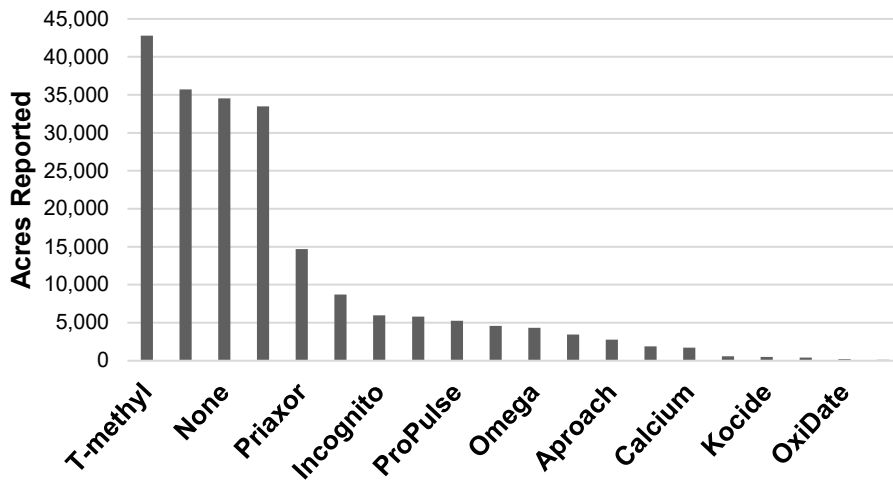


Figure 23. Northharvest foliar fungicide use in dry beans in 2019.

Figure 24. Northharvest fungicide application method in dry beans in 2019.

Table 38. In-furrow fungicide use in dry beans in 2019.

Fungicide	Respondents (no.)	Respondents (%)	Total acres treated (no.) ^a	Total acres treated (%) ^a
Minnesota				
None	78	88.6	34,824	88
Xanthion	3	3.4	2,456	6.2
Topsin (banded)	2	2.3	1,100	2.8
Azteroid	3	3.4	640	1.6
Serenade	1	1.1	230	0.6
Headline	1	1.1	150	0.4
Fungicide Total			4,576	11.6
North Dakota				
None	165	98.2	99,574	97.7
Topsin (banded)	1	0.6	1,450	1.4
Echo	1	0.6	775	0.8
Rovral	1	0.6	775	0.8
Fungicide Total			3,000	2.9
Northharvest				
None	243	94.9	134,398	95
Topsin (banded)	3	1.2	2,550	1.8
Xanthion	3	1.2	2,456	1.7
Echo	1	0.4	775	0.5
Rovral	1	0.4	775	0.5
Azteroid	3	1.2	640	0.5
Serenade	1	0.4	230	0.2
Headline	1	0.4	150	0.1
Fungicide Total			7,576	5.4

^aRespondents' acres only.

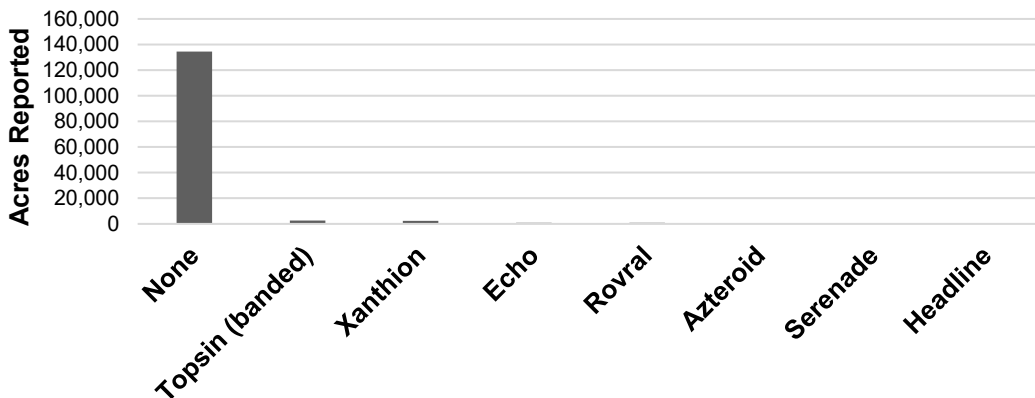


Figure 25. Northharvest in-furrow fungicide use in dry beans in 2019.

Table 39. Fungicide seed treatment use in dry beans in 2019.

Seed treatment	Respondents (no.)	Respondents (%) ^b	Total acres treated (no.) ^a	Total acres treated (%) ^{a,b}
Minnesota				
Cruiser Maxx	41	46.6	21,720	54.9
Rancona	12	13.6	12,148	30.7
Vibrance	10	11.4	11,453	28.9
Apron, Apron XL	10	11.4	10,858	27.4
Maxim	6	6.8	8,938	22.6
None	29	33	7,261	18.3
Apron Maxx	9	10.2	5,899	14.9
Captan	5	5.7	3,336	8.4
Dynasty	1	1.1	1,600	4
Thiram	1	1.1	900	2.3
Cruiser Maxx Vibrance	1	1.1	840	2.1
Vibrance Maxx	1	1.1	840	2.1
Don't know	3	3.4	783	2
Allegiance	1	1.1	200	0.5
Heads Up	1	1.1	160	0.4
Headline	1	1.1	78	0.2
Seed Treatment Total			79,753	
North Dakota				
Cruiser Maxx	53	31.5	31,927	31.3
None	58	34.5	28,688	28.2
Apron Maxx	20	11.9	14,567	14.3
Don't know	12	7.1	9,921	9.7
Vibrance Maxx	12	7.1	9,594	9.4
Apron, Apron XL	10	6	8,771	8.6
Maxim	13	7.7	8,653	8.5
Rancona	11	6.5	7,920	7.8
Cruiser Maxx Vibrance	11	6.5	6,218	6.1
Vibrance	8	4.8	4,740	4.7
Thiram	2	1.2	1,773	1.7
Dynasty	3	1.8	1,598	1.6
Vitavax	1	0.6	765	0.8
Chloroneb	1	0.6	500	0.5
Captan	2	1.2	275	0.3
Seed Treatment Total			107,222	
Northarvest				
Cruiser Maxx	94	36.7	53,647	37.9
None	87	34	35,949	25.4
Apron Maxx	29	11.3	20,466	14.5
Rancona	23	9	20,068	14.2
Apron, Apron XL	20	7.8	19,629	13.9
Maxim	19	7.4	17,591	12.4
Vibrance	18	7	16,193	11.4
Don't know	15	5.9	10,704	7.6
Vibrance Maxx	13	5.1	10,434	7.4
Cruiser Maxx Vibrance	12	4.7	7,058	5
Captan	7	2.7	3,611	2.6
Dynasty	4	1.6	3,198	2.3
Thiram	3	1.2	2,673	1.9
Vitavax	1	0.4	765	0.5
Chloroneb	1	0.4	500	0.4
Allegiance	1	0.4	200	0.1
Heads Up	1	0.4	160	0.1
Headline	1	0.4	78	0.1
Seed Treatment Total			186,975	

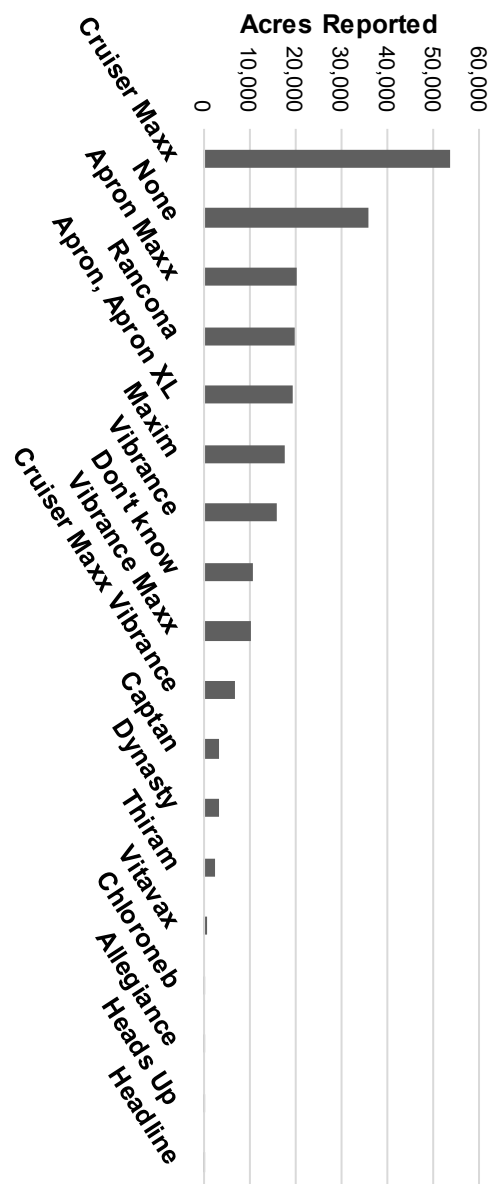


Figure 26. Northarvest fungicide seed treatment use in dry beans in 2019.

^aRespondents' acres only. Includes acreage treated with more than one product.

^bPercentages do not total 100 percent because some respondents treated the same acreage with more than one product.

Weeds and Herbicide Use

Table 40. Worst weed problem in dry beans in 2019.

Weed ^a	Respon- dents (no.)	Respon- dents (%)	Acres reported (no.) ^{b,c}	Acres reported (%) ^{b,c}
Minnesota				
Lambsquarters	21	25.9	13,125	34.8
Ragweed	14	17.3	8,542	22.7
Waterhemp	30	37	8,169	21.7
Redroot pigweed	5	6.2	3,480	9.2
Nightshade	1	1.2	1,250	3.3
Canada thistle	3	3.7	1,130	3
Kochia	1	1.2	868	2.3
Foxtail	2	2.5	385	1
Wild mustard	1	1.2	370	1
Clover	1	1.2	180	0.5
Smartweed	1	1.2	89	0.2
None	1	1.2	88	0.2
Total	81	100	37,676	100
North Dakota				
Kochia	45	28.3	23,217	24
Lambsquarters	21	13.2	14,824	15.3
Ragweed	21	13.2	12,293	12.7
Foxtail	5	3.1	6,765	7
Waterhemp	8	5	6,310	6.5
Nightshade	7	4.4	6,137	6.3
Biennial wormwood	9	5.7	3,807	3.9
Prostrate pigweed	1	0.6	3,370	3.5
Cocklebur	4	2.5	2,768	2.9
Sunflowers	3	1.9	2,600	2.7
Wild oats	5	3.1	2,385	2.5
Wild mustard	5	3.1	2,204	2.3
Canada thistle	6	3.8	1,799	1.9
Wild buckwheat	5	3.1	1,561	1.6
Marestail	2	1.3	1,103	1.1
Redroot pigweed	3	1.9	1,100	1.1
Volunteer canola	2	1.3	1,100	1.1
Lanceleaf sage	1	0.6	1,000	1
Venice mallow	1	0.6	790	0.8
Black medic	1	0.6	700	0.7
None	2	1.3	694	0.7
Perennial sow thistle	1	0.6	307	0.3
Volunteer grain	1	0.6	75	0.1
Total	159	100	96,909	100
Northarvest				
Lambsquarters	42	17.5	27,949	20.8
Kochia	46	19.2	24,085	17.9
Ragweed	35	14.6	20,835	15.5
Waterhemp	38	15.8	14,479	10.8
Nightshade	8	3.3	7,387	5.5
Foxtail	7	2.9	7,150	5.3
Redroot pigweed	8	3.3	4,580	3.4
Biennial wormwood	9	3.8	3,807	2.8
Prostrate pigweed	1	0.4	3,370	2.5
Canada thistle	9	3.8	2,929	2.2
Cocklebur	4	1.7	2,768	2.1
Sunflowers	3	1.3	2,600	1.9
Wild mustard	6	2.5	2,574	1.9
Wild oats	5	2.1	2,385	1.8
Wild buckwheat	5	2.1	1,561	1.2
Marestail	2	0.8	1,103	0.8
Volunteer canola	2	0.8	1,100	0.8
Lanceleaf sage	1	0.4	1,000	0.7
Venice mallow	1	0.4	790	0.6
None	3	1.3	782	0.6
Black medic	1	0.4	700	0.5
Perennial sow thistle	1	0.4	307	0.2
Clover	1	0.4	180	0.1
Smartweed	1	0.4	89	0.1
Volunteer grain	1	0.4	75	0.1
Total	240	100	134,585	100

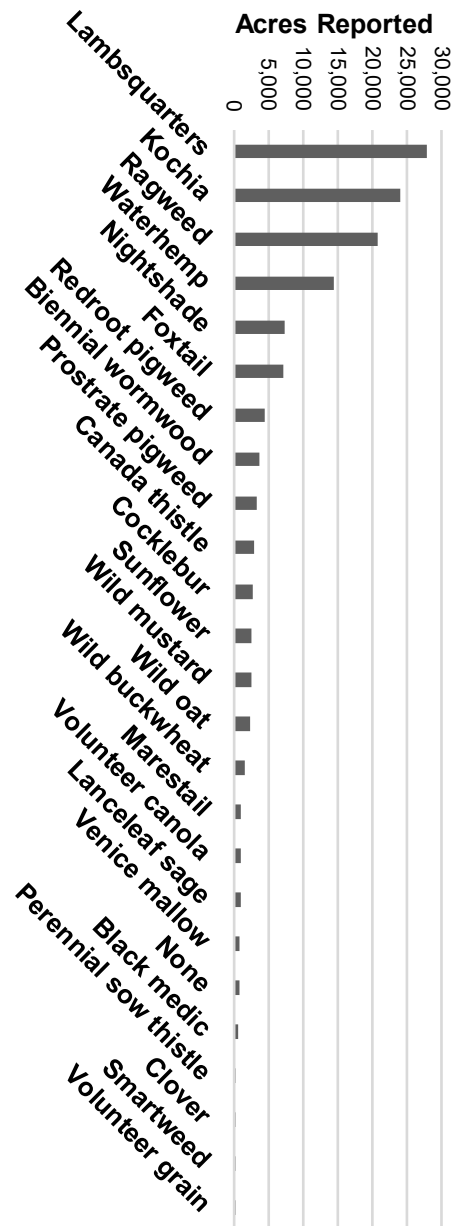


Figure 27. Northharvest worst weed problem in dry beans in 2019.

^aRanked as No. 1 weed problem by respondents.
^bRespondents' acres only.
^cWeed problem may not have been present across all reported acres.

Table 41. Weeds ranked as one of the three worst in dry beans in 2019.

Weed ^a	Respon- dents (no.)	Respon- dents (%)	Acres reported (no.) ^b	Acres reported (%) ^b	Weed ^a	Respon- dents (no.)	Respon- dents (%)	Acres reported (no.) ^b	Acres reported (%) ^b
Minnesota					Northharvest				
Lambsquarters	59	72.8	26,504	70.3	Lambsquarters	117	48.8	68,600	51
Ragweed	37	45.7	22,958	60.9	Kochia	84	35	53,481	39.7
Waterhemp	43	53.1	13,862	36.8	Ragweed	79	32.9	47,964	35.6
Redr. pigweed	24	29.6	12,187	32.3	Redr. pigweed	60	25	34,038	25.3
Nightshade	15	18.5	8,816	23.4	Waterhemp	61	25.4	24,968	18.6
Cocklebur	10	12.3	8,195	21.8	Nightshade	37	15.4	22,826	17
Vol. grain	9	11.1	5,538	14.7	Foxtail	23	9.6	19,576	14.5
Canada thistle	9	11.1	3,750	10	Cocklebur	30	12.5	19,290	14.3
Buckwheat	3	3.7	1,960	5.2	Bi. wormwood	32	13.3	18,526	13.8
Smartweed	4	4.9	1,505	4	Vol. grain	33	13.8	16,443	12.2
Bi. wormwood	1	1.2	1,250	3.3	Canada thistle	32	13.3	12,997	9.7
Foxtail	4	4.9	1,182	3.1	Buckwheat	18	7.5	10,659	7.9
Wild oats	4	4.9	1,010	2.7	Wild mustard	17	7.1	8,893	6.6
Kochia	2	2.5	968	2.6	Black medic	10	4.2	6,822	5.1
Wild mustard	2	2.5	610	1.6	Wild oats	13	5.4	6,325	4.7
Clover	1	1.2	180	0.5	Sunflowers	6	2.5	4,154	3.1
Sunflowers	1	1.2	113	0.3	Prst. pigweed	1	0.4	3,370	2.5
None	1	1.2	88	0.2	Curly dock	3	1.3	3,084	2.3
North Dakota					Vol. canola				
Kochia	82	51.6	52,513	54.2	Marestail	3	1.3	1,603	1.2
Lambsquarters	58	36.5	42,096	43.4	Smartweed	4	1.7	1,505	1.1
Ragweed	42	26.4	25,006	25.8	Lan. sage	2	0.8	1,179	0.9
Redr. pigweed	36	22.6	21,851	22.5	Venice mallow	2	0.8	950	0.7
Foxtail	19	11.9	18,394	19	Cheatgrass	1	0.4	585	0.4
Bi. wormwood	31	19.5	17,276	17.8	Quackgrass	1	0.4	565	0.4
Nightshade	22	13.8	14,010	14.5	Pnl. sow thistle	1	0.4	307	0.2
Waterhemp	18	11.3	11,106	11.5	Clover	1	0.4	180	0.1
Cocklebur	20	12.6	11,095	11.4	None	3	1.3	782	0.6
Vol. grain	24	15.1	10,905	11.3	^a Ranked as No. 1, 2 or 3 weed by respondents. ^b Respondents' acres only. ^c Weed problem may not have been present across all reported acres.				
Canada thistle	23	14.5	9,247	9.5					
Buckwheat	15	9.4	8,699	9					
Wild mustard	15	9.4	8,283	8.5					
Black medic	10	6.3	6,822	7					
Wild oats	9	5.7	5,315	5.5					
Sunflowers	5	3.1	4,041	4.2					
Prst. pigweed	1	0.6	3,370	3.5					
Curly dock	3	1.9	3,084	3.2					
Vol. canola	4	2.5	2,190	2.3					
Marestail	3	1.9	1,603	1.7					
Lan. sage	2	1.3	1,179	1.2					
Venice mallow	2	1.3	950	1					
None	2	1.3	694	0.7					
Cheatgrass	1	0.6	585	0.6					
Quackgrass	1	0.6	565	0.6					
Pnl. sow thistle	1	0.6	307	0.3					

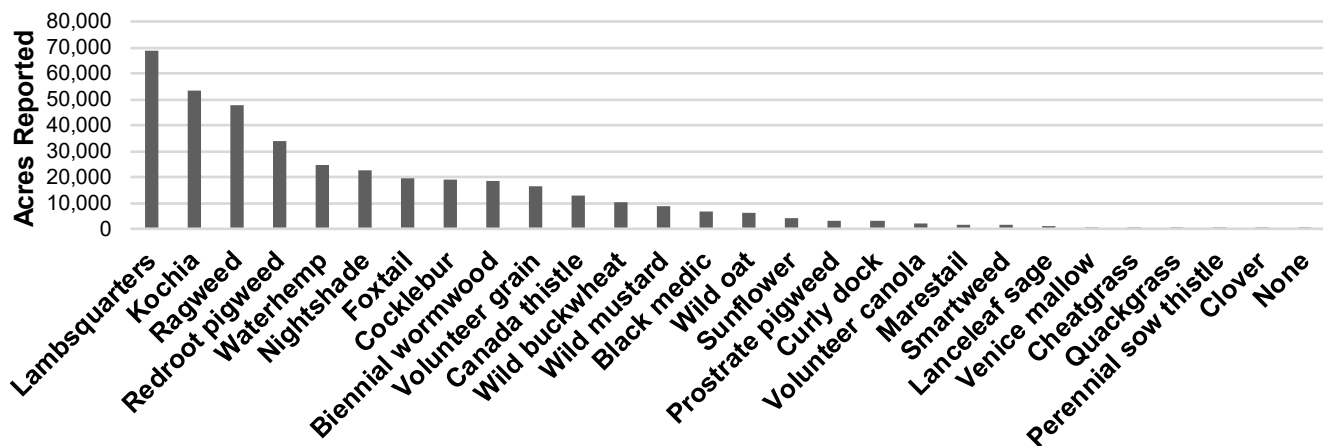


Figure 28. Northharvest weeds ranked as one of the three worst in dry beans in 2019.

Table 42. Weed control practices used in dry beans in 2019.

Herbicide or other practice	Respondents (no.)	Respondents (%)	Acres reported (no.) ^a	Acres reported (%) ^b	Herbicide or other practice	Respondents (no.)	Respondents (%)	Acres reported (no.) ^a	Acres reported (%) ^b
Minnesota					Northharvest				
Raptor	53	60.2	23,725	59.9	Basagran	144	58.3	98,192	71.6
Basagran	49	55.7	23,225	58.7	Raptor	116	47	68,705	50.1
Reflex	48	54.5	16,267	41.1	Reflex	121	49	61,713	45
Select	28	31.8	14,846	37.5	Select	88	35.6	57,685	42
Outlook	21	23.9	13,808	34.9	Sonalan	89	36	42,242	30.8
Eptam	18	20.5	12,418	31.4	Spartan	58	23.5	39,406	28.7
Sonalan	35	39.8	11,939	30.2	Varisto	69	27.9	38,699	28.2
Prowl	12	13.6	10,827	27.4	Glyphosate (pre)	39	15.8	25,169	18.3
Dual	16	18.2	7,311	18.5	Assure	21	8.5	19,807	14.4
Permit	16	18.2	6,429	16.2	Prowl	30	12.1	19,589	14.3
Trifluralin	13	14.8	5,008	12.7	Outlook	31	12.6	19,286	14.1
Varisto	20	22.7	4,886	12.3	NDSU microrate ^c	11	4.5	14,886	10.8
Pursuit	8	9.1	4,162	10.5	Trifluralin	28	11.3	14,779	10.8
NDSU microrate ^c	2	2.3	3,950	10	Eptam	23	9.3	14,227	10.4
Glyphosate (pre)	3	3.4	2,522	6.4	Dual	29	11.7	13,433	9.8
Assure	5	5.7	2,514	6.4	Permit	27	10.9	13,161	9.6
					Glyphosate (postharvest)	13	5.3	9,251	6.7
Fusilade DX	5	5.7	2,303	5.8	Pursuit	20	8.1	8,287	6
Spartan	4	4.5	1,192	3					
Glyphosate (postharvest)	3	3.4	918	2.3	Fusilade DX	8	3.2	5,703	4.2
Rezult	2	2.3	620	1.6	BroadAxe	8	3.2	3,806	2.8
Poast	2	2.3	335	0.8	Poast	5	2	1,495	1.1
BroadAxe	0	0	0	0	Spartan Elite	2	0.8	1,305	1
Spartan Elite	0	0	0	0	Rezult	3	1.2	730	0.5
Herbicide Total			169,205		Herbicide Total			591,556	
Cultivation	20	22.7	18,632	47.1	Cultivation	56	22.7	49,282	35.9
Rotary hoe	5	5.7	4,074	10.3	Rotary hoe	14	5.7	10,356	7.5
Manual labor	9	10.2	1,611	4.1	Cover crop	8	3.2	6,180	4.5
Cover crop	1	1.1	480	1.2	Manual labor	13	5.3	1,944	1.4
Nonherbicide Total			68,739		Nonherbicide Total			111,704	
Weed Control Total			237,944		Weed Control Total			703,260	
Basagran	95	59.7	74,967	76.8					
Reflex	73	45.9	45,446	46.5					
Raptor	63	39.6	44,980	46.1					
Select	60	37.7	42,839	43.9					
Spartan	54	34	38,214	39.1					
Varisto	49	30.8	33,813	34.6					
Sonalan	54	34	30,303	31					
Glyphosate (pre)	36	22.6	22,647	23.2					
Assure	16	10.1	17,293	17.7					
NDSU microrate ^c	9	5.7	10,936	11.2					
Trifluralin	15	9.4	9,771	10					
Prowl	18	11.3	8,762	9					
Glyphosate (postharvest)	10	6.3	8,333	8.5					
Permit	11	6.9	6,732	6.9					
Dual	13	8.2	6,122	6.3					
Outlook	10	6.3	5,478	5.6					
Pursuit	12	7.5	4,125	4.2					
BroadAxe	8	5	3,806	3.9					
Fusilade DX	3	1.9	3,400	3.5					
Eptam	5	3.1	1,809	1.9					
Spartan Elite	2	1.3	1,305	1.3					
Poast	3	1.9	1,160	1.2					
Rezult	1	0.6	110	0.1					
Herbicide Total			422,351						
Cultivation	36	22.6	30,650	31.4					
Rotary hoe	9	5.7	6,282	6.4					
Cover crop	7	4.4	5,700	5.8					
Manual labor	4	2.5	333	0.3					
Nonherbicide Total			42,965						
Weed Control Total			465,316						

^aRespondents' acres only. Includes acreage treated more than once with the same product.

^bPercentages do not total 100 percent because some respondents treated more than once with the same product and/or treated the same acreage with more than one product.

^cNDSU microrate is a reduced-rate tank mix of Basagran, Raptor, Reflex and Select.

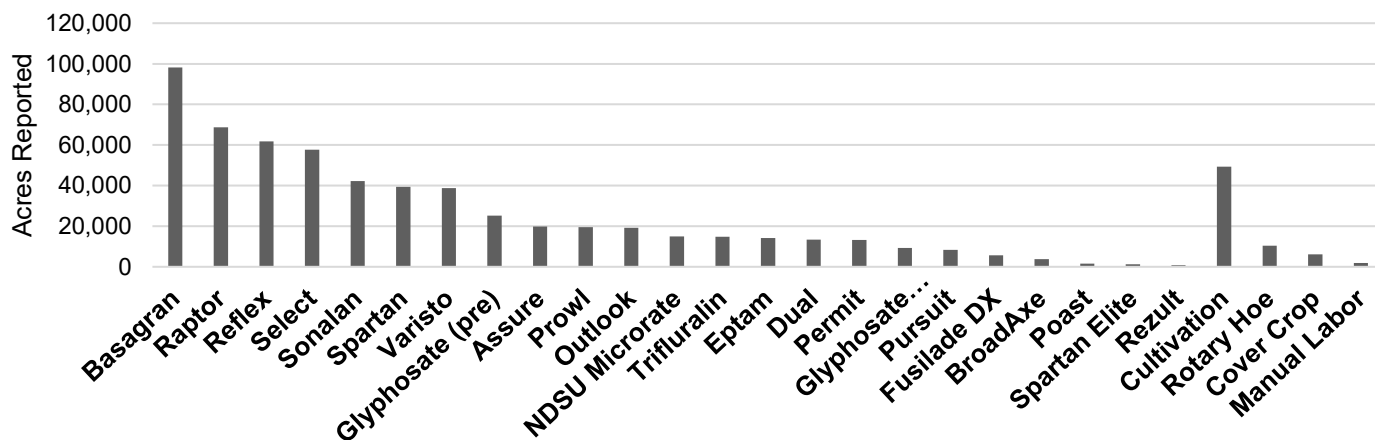


Figure 29. Northharvest weed control practices used in dry beans in 2019.

Scouting and Threshold Practices

Table 43. Scouting practices in dry beans in 2019.

	Insects		Diseases		Weeds	
	Respon- dents (no.)	Respon- dents (%)	Respon- dents (no.)	Respon- dents (%)	Respon- dents (no.)	Respon- dents (%)
Minnesota						
Crop consultant	32	36.8	37	42.5	33	37.9
Grower	43	49.4	41	47.1	45	51.7
Both	10	11.5	9	10.3	9	10.3
Don't scout	2	2.3	0	0	0	0
Total	87	100	87	100	87	100
North Dakota						
Crop consultant	79	47	85	51.2	73	44.2
Grower	77	45.8	70	42.2	76	46.1
Both	9	5.4	11	6.6	16	9.7
Don't scout	3	1.8	0	0	0	0
Total	168	100	166	100	165	100
Northharvest						
Crop consultant	111	43.5	122	48.2	106	42.1
Grower	120	47.1	111	43.9	121	48
Both	19	7.5	20	7.9	25	9.9
Don't scout	5	2	0	0	0	0
Total	255	100	253	100	252	100

Table 44. Use of economic thresholds for insects in dry beans in 2019.

	Respondents (no.)	Respondents (%)
Minnesota		
Economic thresholds used	81	93.1
Economic thresholds not used	6	6.9
Total	87	100
North Dakota		
Economic thresholds used	163	97.6
Economic thresholds not used	4	2.4
Total	167	100
Northharvest		
Economic thresholds used	244	96.1
Economic thresholds not used	10	3.9
Total	254	100

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APPENDIX I.

PLEASE COMPLETE ALL REQUESTED INFORMATION IN THE FOLLOWING TABLES FOR YOUR 2019 DRY BEAN CROP

State	County	Acres
Minnesota	1.	
	2.	
	3.	
North Dakota	1.	
	2.	
	3.	
Dry Bean Production in 2019		Acres
Total dry bean acres planted		
Total dry bean acres harvested		
Total irrigated dry bean acres		
Total dry bean acres on tile-drained ground		
Dry Bean Classes, Varieties and Acres Grown in 2019		
Bean Class	Variety	Acres
Black	Black Cat	
	Eclipse	
	Zenith	
	Zorro	
	Other black (please specify)	
Great Northern	Aries	
	Matterhorn	
	Orion	
	Powderhorn	
	Taurus	
	Other GN (please specify)	
Kidney	Beluga	
	Big Red	
	Cabernet	
	California Early LRK	
	Clouseau	
	Foxfire	
	Majesty	
	Montcalm	
	Pink Panther	
	Red Hawk	
	Rosie	
	Snowdon	
	Talon	
	Yeti	
	Other kidney (please specify)	
	Navy	Blizzard
Ensign		
Medalist		
Merlin		
Norstar		
T9905		
Teton		
Vigilant		
Vista		
Other navy (please specify)		

Pink	Floyd	
	Rosetta	
	Sedona	
	Other pink (please specify)	
Pinto	Buster	
	El Dorado	
	La Paz	
	Lariat	
	Maverick	
	Monterrey	
	ND 307	
	ND Palomino (SD)*	
	Radiant (SD)*	
	Santa Cruz	
	Sequoia	
	Sinaloa	
	Sonora	
	Stampede	
Staybright (SD)		
Torreón		
Vibrant (SD)*		
Windbreaker		
Other pinto (please specify)		
Small Red	Merlot	
	Viper	
	Ruby	
	Other red (please specify)	
Other Class	Other variety (please specify)	

*SD = Slow-darkening pinto variety. These varieties retain their light-brown color longer than non-SD varieties.

Do you consider the new slow-darkening (SD) pintos a good alternative for pinto bean production in the region?		
Yes	No	Don't know
If more seed of SD pintos was available, would you grow more SD pintos compared with regular darkening pintos?		
Yes	No	I don't grow pintos
Why do you think SD pintos are not a good alternative? (Circle all that apply)		
Price		
Lack of markets		
Lack of grower knowledge about benefits of SD pintos		
Lack of industry knowledge about benefits of SD pintos		
Lack of consumer knowledge about benefits of SD pintos		
Poor agronomic performance of SD varieties		
Other:		

Production Problems

For each production problem, please fill in acreage affected for each bean class you produced in 2019. Space is provided for up to three bean classes.			
	Bean Class:	Bean Class:	Bean Class:
Production Problem	Acreage Affected	Acreage Affected	Acreage Affected
Herbicide drift injury *List herbicide(s)			
Applied herbicide injury *List herbicide(s)			
Herbicide carryover injury *List herbicide(s)			
Planting rate (seeds per acre)			
Delayed planting			
Diseases			
Drought			
Emergence/stand			
Frost damage			
Hail damage			
Harvest			
Insects			
Micronutrient deficiency			
Soil salinity			
Water damage (beans harvested)			
Water damage (beans NOT harvested)			
Weeds			
Wind damage			
Other problem (please specify)			

Agronomy

Please list row spacing, planting rate and established stand for each bean class you planted in 2019.			
Bean Class	Row Spacing (inches)	Planting Rate (seeds per acre)	Established Stand (plants per acre)

Did the size of your purchased seed affect your ability to plant your intended dry bean acreage in 2019?		
Problem	Variety(ies)	Number of Acres (short or long)
Not enough seed		
Too much seed		
No problem		

Please list the crops in your dry bean crop rotation program for all fields you planted to dry bean in 2019.	
Year	List of Crops
2018	
2017	
2016	
2015	

Please list acreage for each tillage type listed below for your dry bean fields in 2019.			
Tillage Type	Acreage	Tillage Type	Acreage
Conventional		Strip-till	
Minimum		No-till	

Cover Crops in Dry Beans in 2019. Please answer the questions in the table below.		
Did you use a cover crop on your dry bean ground in 2019?	Yes	No
If you used a cover crop, what plant species did you use?		
Seasonally, when did you use the crop (circle all that apply)?		
Prior to planting dry beans	During dry bean production	After dry bean harvest
What was the purpose(s) of the cover crop? (circle all that apply)		
Moisture conservation	Soil conservation	Other _____
Weed control		

Did you use a ground roller on your dry bean ground in 2019?			
Timing	Bean Class	Acres Rolled	Percent rolled acres direct combined
Preplant			
Pre-emerge			
Post-emerge			
Didn't roll			

Please indicate pounds per acre for fertilizer components in dry beans in 2019 and answer the fertility questions .				
Nitrogen	Phosphate	Potash	Zinc	Sulfur
Did you inoculate with Rhizobium?			Yes	No
Did you soil test prior to fertilizer applications?			Yes	No
Did you use site-specific nutrient management for any fertilizers?			Yes	No

What fertilizer application methods did you use for dry beans in 2019? Please circle all that apply.			
Broadcast	Banded	In-furrow	Foliar

Harvest: Please circle answer for each question.					
What percentage of your dry bean crop was harvested using direct combining in 2019?					
0%	1-25%	26-50%	51-75%	76-100%	
Your estimated yield loss using direct combining?					
0%	1-5%	6-10%	11-15%	16-20%	N/A
Your estimated yield loss using indirect harvest methods (knifing/undercutting, swathing, Pickett, etc.)?					
0%	1-5%	6-10%	11-15%	16-20%	N/A

Insecticides and Insect Pests

Foliar Insecticides Used on Dry Beans in 2019. If you did not use a foliar insecticide, please write "0" for acres treated.			
Foliar Insecticide (write in name or number from the list below)	Acres Treated	No. of Applications	Application Method (circle one for each application)
			air ground
			air ground
			air ground

Foliar Insecticide Products		
1. Acephate/Orthene	8. Declare	15. Tombstone
2. Asana XL	9. Dimethoate	16. Transform
3. Baythroid XL	10. Hero	17. Voliam Xpress
4. Besiege	11. Lorsban/generics	18. Warrior/generics
5. Blackhawk	12. Mustang Maxx	19. None used
6. Brigade/generics	13. Sevin	20. Other (specify)
7. Coragen	14. Sivanto Prime	

Seed Treatment Insecticides Used on Dry Beans in 2019. If you did not use a seed treatment insecticide, please write "0" for acres treated.	
Seed Treatment Insecticide (write in name or number from the list below)	Acres Treated

Seed Treatment Insecticide Products	
1. Attendant 600 FS	7. Gaucho 600
2. Capture LFR	8. Lorsban
3. Cruiser SFS	9. Don't know
4. Cruiser Maxx	10. None used
5. Dyna-Shield imidacloprid 5	11. Other (specify)
6. Enhance AW	

Worst Insect/Mite Problem in Dry Beans in 2019. Please rank 1-3, with 1 = worst. Please rank ONLY the top three.			
Insect/Mite	Rank	Insect/Mite	Rank
Aphids		Leafhoppers	
Armyworms		Seed corn maggot	
Bean leaf beetle		Spider mites	
Cutworms		Wireworms	
Foliage caterpillars		None	
Grasshoppers			

Field Scouting in Dry Beans in 2019. For each question, please circle the best answer that applies to your operation.		
How do you scout for insects?	I do it	Crop consultant Don't scout
How do you scout for diseases?	I do it	Crop consultant Don't scout
How do you scout for weeds?	I do it	Crop consultant Don't scout
Do you follow recommended economic thresholds when making insect control decisions?	Yes	No

Fungicides and Disease Problems

Foliar Fungicides Used on Dry Beans in 2019.
If you did not use a foliar fungicide, please write "0" for acres treated.

Foliar Fungicide (write in name or number from the list below)	Acres Treated	No. of Applications	Application Method (circle one for each application)	
			air	ground
			air	ground
			air	ground
			air	ground

Foliar Fungicide Products

1. Approach	12. Microthiol	23. Quilt
2. Aprovia Top	13. Miravis Neo	24. Rovral
3. Bravo	14. Miravis Top	25. Satori
4. Cannonball	15. Omega	26. Serenade
5. Champ	16. Onset	27. Switch
6. Echo	17. Orius	28. T-methyl
7. Endura	18. Priaxor	29. Tebuzol
8. Equation	19. Proline	30. Topsin
9. Headline	20. ProPulse	31. Vertisan
10. Incognito	21. Quadris	32. None used
11. Kocide	22. Quadris Opti	33. Other (specify)

Seed Treatment Fungicides Used on Dry Beans in 2019.
If you did not use a seed treatment fungicide, please write "0" for acres treated.

Seed Treatment Fungicide (write in name or number from the list below)	Acres Treated

Seed Treatment Fungicide Products

1. Allegiance	10. Maxim	19. Vibrance
2. Apron Maxx	11. Mertect	20. Vibrance Maxx
3. Apron XL	12. Obvious	21. Vitaflo
4. Captan	13. Prevail	22. Vitavax
5. Chloroneb	14. Rancona	23. None used
6. Cruiser Maxx	15. Rancona Summit	24. Other (specify)
7. Cruiser Maxx Vibrance	16. Rizolex	
8. Dynasty	17. Stamina	
9. EverGol Energy	18. Thiram	

In-furrow Fungicide Applications Made on Dry Beans in 2019. If you did not make an in-furrow fungicide application, please write "0" for acres treated.

In-furrow Fungicide (write in name or number from Foliar Fungicide Product list.	Acres Treated

Worst Disease Problem in Dry Beans in 2019. Please rank 1-3, with 1 = worst. Please rank ONLY the top three.

Disease	Rank	Disease	Rank
Anthraconose		Other viruses [general]	
Bacterial brown spot		Root rot	
Bacterial wilt		Rust	
Bean common mosaic virus		White mold	
Common bacterial blight		None	
Halo blight			

Herbicides and Weed Problems

Weed Control Practices Used on Dry Beans in 2019. Count double herbicide applications, double cultivation, as double acres.

Weed Control Used (write in name or number from the list below)	Bean Class	Acres Treated

Weed Control Products and Practices

1. Assure	10. Outlook	19. Spartan Charge
2. Basagran/gen.	11. Permit	20. Trifluralin
3. BroadAxe/Spartan Elite	12. Poast	21. Varisto
4. Dual/generics	13. Prowl	22. Cover crops
5. Eptam	14. Pursuit	23. Cultivation
6. Fusillade DX	15. Raptor	24. Rotary hoe
7. Glyphosate (preplant)	16. Reflex	25. Manual labor
8. Glyphosate (postharvest)	17. Select/gen.	26. None
9. NDSU Micro-Rate	18. Sonalan	27. Other (specify)

Worst Weed Problem in Dry Beans in 2019. Please rank 1-3, with 1 = worst. Please rank ONLY the top three.

Weed	Rank	Weed	Rank
Biennial wormwood		Smartweed	
Black medic		Sunflower	
Canada thistle		Venice mallow	
Cocklebur		Volunteer canola	
Foxtail		Volunteer grain	
Kochia		Waterhemp	
Lambsquarters		Wild buckwheat	
Lanceleaf sage		Wild mustard	
Nightshade		Wild oat	
Ragweed		None	
Redroot pigweed		Other (specify)	

Preharvest or Desiccants Used on Dry Beans in 2019. Count double applications as double acres.

Desiccants Used (Write in name or number from the list below. If tank mixed, please write products on the same line). EXAMPLE: 1+3 or Glyphosate+Sharpen	Bean Class	Acres Treated

Desiccant Products

1. Glyphosate	3. Sharpen	5. Valor
2. Paraquat	4. Sodium chlorate (Leafex, Defol)	6. Aim

Thank you for completing the 2019 Dry Bean Grower Survey!

Cover photos (top to bottom)

S. Markell (NDSU)
diseased dry bean leaf

M. Kahn (NDSU)
green cloverworms

G. Endres (NDSU)
Monterrey and Falcon dry beans

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