

Table 18. Pesticide usage and application method in other hays, North Dakota, 1978.

Herbicides	Acres of other hay treated <sup>1</sup>		Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application			
							Airplane		Ground	
							Surface (%)	Incorp. (%)	Surface (%)	Incorp. (%)
MCPA <sup>2</sup>	0.1	<0.1	—	—	100	0	0	0	100	0
MCPA amine	0.7	<0.1	0.25	0.2	100	0	—	—	—	—
Paraquat	0.2	<0.1	1.00	0.2	100	0	0	0	100	0
Picloram	9.8	0.6	0.30	3.0	100	0	0	0	100	0
Profluralin	0.1	<0.1	—	—	100	0	0	0	100	0
2,4-D <sup>2</sup>	7.0	0.4	0.75	5.2	97	3	0	0	100	0
2,4-D amine	0.7	<0.1	0.50	0.4	44	56	0	0	100	0
2,4-D ester	0.6	<0.1	—	—	0	100	100	0	0	0
Total	19.2	1.0	—	9.0	94	6	3	0	97	0
<b>Insecticides</b>										
Naled	0.4	<0.1	—	—	0	100	100	0	0	0
Parathion	0.4	<0.1	—	—	0	100	100	0	0	0
Toxaphene	0.7	<0.1	—	—	100	0	0	0	100	0
Total	1.5	<0.1	—	—	47	53	47	0	53	0

<sup>1</sup>Herbicides applied as a tank mixture were considered separately unless a commercial premix was used. Each application to the same acreage was totaled the same as individual applications to separate acreages. Thus acres treated can exceed 100% of planted acres.

<sup>2</sup>Compound identity was not given.

Table 19. Pesticide usage and application method in pasture and rangeland, North Dakota, 1978.

Herbicides	Acres of pasture treated <sup>1</sup>		Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application			
							Airplane		Ground	
							Surface (%)	Incorp. (%)	Surface (%)	Incorp. (%)
Dicamba	13.2	0.1	0.65	8.6	63	37	37	0	63	0
Glyphosate	0.3	<0.1	1.00	0.3	100	0	0	0	100	0
MCPA <sup>2</sup>	1.3	<0.1	1.00	1.3	—	—	—	—	—	—
MCPA amine	2.1	<0.1	0.60	1.3	100	0	0	0	100	0
MCPA ester	5.4	<0.1	0.88	4.8	87	13	13	0	87	0
Picloram	81.2	0.7	0.99	80.6	17	83	5	0	95	0
2,4-D <sup>2</sup>	49.3	0.4	1.00	49.3	55	45	19	1	80	0
2,4-D amine	82.9	0.7	1.44	119.4	19	81	5	0	95	0
2,4-D ester	40.4	0.3	1.25	50.4	34	66	65	0	35	0
2,4,5-T	<0.1	<0.1	—	—	—	—	—	—	—	—
Unknown	5.4	<0.1	0.50	2.7	0	100	100	0	0	0
Total	281.6	2.7	—	318.7	34	66	24	1	75	0
<b>Insecticides</b>										
Toxaphene	<0.1	<0.1	—	—	100	0	—	—	—	—

<sup>1</sup>Herbicides applied as a tank mixture were considered separately unless a commercial premix was used. Each application to the same acreage was totaled the same as individual applications to separate acreages. Thus acres treated can exceed 100% of planted acres.

<sup>2</sup>Compound identity was not given.

Table 20. Target weeds in wheat, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>								
		Wild oats (%)	Fox-tail (%)	Kochia (%)	Wild mustard (%)	Wild buckwheat (%)	Thistles (%)	Sun-flower (%)	Pig-weed (%)	Field bindweed (%)
Barban	>5000	96	1	0	2	0	0	0	1	0
Bromoxynil	1001-5000	0	0	69	0	10	6	15	0	0
Bromoxynil + MCPA	1001-5000	0	0	23	34	5	0	12	27	0
Diallate	1001-5000	1	0	99	0	0	0	0	0	0
Dicamba	>5000	0	0	10	7	44	22	4	4	10
Dicamba + MCPA	>5000	0	1	55	8	14	6	7	4	5
Diclofop	<250	59	41	0	0	0	0	0	0	0
Difenzoquat	1001-5000	96	0	4	0	0	0	0	0	0
Glyphosate	251-500	21	48	7	21	0	0	0	0	2
MCPA <sup>2</sup>	>5000	0	0	49	26	8	3	5	5	4
MCPA amine	>5000	1	0	34	38	2	9	7	9	1
MCPA ester	>5000	0	0	44	25	7	6	10	6	2
Picloram	>5000	0	3	25	18	16	20	4	3	12
Profluralin	251-500	0	35	65	0	0	0	0	0	0
Propanil	1001-5000	4	89	4	3	0	0	0	0	0
Triallate	>5000	93	4	2	2	0	0	0	0	0
Trifluralin	>5000	6	88	2	2	0	0	0	2	0
2,4-D <sup>2</sup>	>5000	1	2	51	26	5	3	2	6	3
2,4-D, amine	>5000	0	1	40	33	6	6	1	6	6
2,4-D, ester	>5000	0	1	42	29	8	6	2	6	7

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

<sup>2</sup>Compound identity was not given.

Table 21. Target weeds in barley, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>								
		Wild oats (%)	Fox-tail (%)	Kochia (%)	Wild mustard (%)	Wild buckwheat (%)	Thistles (%)	Sun-flower (%)	Pig-weed (%)	Field bindweed (%)
Barban	>5000	94	0	5	1	0	0	0	0	0
Bromoxynil	501-1000	0	0	0	50	23	0	27	0	0
Bromoxynil + MCPA	1001-5000	0	0	28	20	10	0	22	20	0
Diallate	<250	100	0	0	0	0	0	0	0	0
Dicamba	1001-5000	0	0	22	7	20	28	0	0	24
Dicamba + MCPA	<250	0	0	17	22	0	17	43	0	0
Diclofop	<250	50	50	0	0	0	0	0	0	0
Difenzoquat	1001-5000	93	0	3	4	0	0	0	0	0
Glyphosate	<250	0	50	0	50	0	0	0	0	0
MCPA <sup>2</sup>	>5000	2	3	53	25	5	6	2	5	0
MCPA amine	>5000	0	0	33	39	2	7	7	10	0
MCPA ester	>5000	0	7	62	19	0	7	5	0	0
Picloram	1001-5000	0	7	18	24	2	25	11	4	9
Profluralin	<250	0	50	0	0	0	0	50	0	0
Propanil	<250	0	100	0	0	0	0	0	0	0
Triallate	>5000	93	2	1	0	0	0	4	0	0
Trifluralin	>5000	10	82	3	6	0	0	0	0	0
2,4-D <sup>2</sup>	>5000	0	3	65	22	0	1	4	4	1
2,4-D, amine	>5000	0	1	44	35	4	8	2	4	2
2,4-D, ester	>5000	0	1	47	25	5	5	5	8	4

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicated sample size. Percentages are based upon acres reported.

<sup>2</sup>Compound identity was not given.

Table 22. Target weeds in oats, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>								
		Wild oats (%)	Fox-tail (%)	Kochia (%)	Wild mustard (%)	Wild buckwheat (%)	Thistles (%)	Sun-flower (%)	Pig-weed (%)	Field bindweed (%)
Barban	<250	100	0	0	0	0	0	0	0	0
Bromoxynil + MCPA	<250	0	0	100	0	0	0	0	0	0
Dicamba	501-1000	0	0	14	16	30	25	0	0	15
Dicamba + MCPA	<250	0	0	71	0	0	29	0	0	0
Glyphosate	<250	0	0	0	0	0	100	0	0	0
MCPA <sup>2</sup>	>5000	1	1	35	37	11	8	2	2	3
MCPA amine	>5000	0	0	29	41	1	16	2	3	7
MCPA ester	1001-5000	6	0	26	52	0	12	0	0	3
Picloram	251-500	0	48	0	0	35	16	0	0	0
Triallate	<250	25	0	75	0	0	0	0	0	0
2,4-D <sup>2</sup>	1001-5000	0	0	57	14	1	8	0	8	12
2,4-D amine	>5000	2	1	29	38	5	12	2	2	10
2,4-D ester	1001-5000	0	7	35	26	4	6	0	4	17

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

<sup>2</sup>Compound identity was not given.

Table 23. Target diseases for seed treatments in wheat, barley, and oats, North Dakota, 1978.

Seed Treatments in crops	Acres reported	Target pests reported <sup>1</sup>	
		Smut (%)	Root rot (%)
<b>Wheat</b>			
Maneb 50% + HCB 10%	501-1000	100	0
Maneb 50% + lindane 18.7%	>5000	97	3
Mercury compounds 1.4-7.7%	1001-5000	69	31
<b>Barley</b>			
Carboxin + thiram	<250	100	0
Maneb 50% + HCB 10%	251-500	100	0
Maneb 50% + lindane 18.7%	>5000	79	21
Mercury compounds 1.4-7.7%	251-500	47	53
<b>Oats</b>			
Maneb 50% + lindane 18.7%	251-500	100	0
Mercury compounds 1.4-7.7%	<250	100	0

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 24. Target insects in wheat, barley, and oats, North Dakota, 1978.

Insecticides in crops	Acres reported	Target insects reported <sup>1</sup>		
		Cutworms (%)	Aphids (%)	Grasshoppers (%)
<b>Wheat</b>				
Chlordane	<250	100	0	0
Malathion	<250	0	100	0
Methyl parathion	501-1000	0	100	0
Toxaphene	501-1000	0	0	100
<b>Barley</b>				
Carbaryl	<250	0	100	0
Chlordane	251-500	100	0	0
Malathion	<250	0	76	24
Methyl parathion	<250	0	100	0
Methyl parathion (encap)	<250	0	100	0
Toxaphene	501-1000	0	0	100
<b>Oats</b>				
Malathion	<250	0	100	0
Toxaphene	<250	0	0	100

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 25. Target weeds, insects, and diseases in flax, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>						
		Broad- leaf (%)	Wild mustard (%)	Thistles (%)	Foxtail (%)	Wild oats (%)	Pig- weed (%)	Sun- flower (%)
Barban	251-500	0	9	0	0	91	0	0
Bromoxynil	<250	100	0	0	0	0	0	0
Diallate	<250	0	0	0	0	100	0	0
Dicamba	251-500	48	18	0	16	0	0	18
Dicamba + MCPA	501-1000	5	44	0	6	0	44	0
MCPA <sup>2</sup>	>5000	27	31	21	10	0	2	9
MCPA amine	>5000	42	36	9	3	1	7	0
MCPA ester	<250	48	45	0	0	0	7	0
Triallate	501-1000	15	0	51	12	8	10	0
Trifluralin	501-1000	27	13	18	37	0	0	5
2,4-D <sup>2</sup>	<250	65	35	0	0	0	0	0
2,4-D amine	251-500	68	27	0	2	0	0	0
2,4-D ester	251-500	7	82	0	11	0	0	0
Insecticides and fungicides	Acres reported	Target insects and diseases reported <sup>1</sup>						
		Grass- hopper (%)	Wire- worm (%)	Smut (%)	Root rot (%)			
Toxaphene	<250	100	0	0	0			
Maneb 50% + lindane 18.7%	501-1000	0	0	29	71			

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

<sup>2</sup>Compound identity not given.

Table 26. Target weeds, insects, and diseases in corn, North Dakota, 1978.

Herbicides	Acres reported	Target weeds, reported <sup>1</sup>								
		Quack-grass	Fox-tail	Wild oats	Lambs-quarters	Thistles	Pig-weed	Rag-weed	Cockle-bur	Broad-leaf
		(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Alachlor	>5000	8	61	3	4	0	1	1	3	18
Atrazine	>5000	18	58	14	0	2	1	0	0	7
Bentazon	<250	0	0	0	0	25	75	0	0	0
Butylate	251-500	0	60	0	0	0	0	0	0	40
Cyanazine	>5000	7	48	0	3	6	1	0	3	32
Diallate	<250	0	100	0	0	0	0	0	0	0
Dicamba	1001-5000	0	14	7	0	29	6	0	0	44
EPTC	<250	0	50	50	0	0	0	0	0	0
EPTC + R-25788	1001-5000	4	69	2	0	7	7	0	2	8
Linuron	<250	0	100	0	0	0	0	0	0	0
Metolachlor	251-500	0	80	0	0	0	0	0	0	20
MCPA ester	<250	0	0	0	0	26	0	0	74	0
Pendimethalin	251-500	0	27	0	0	0	0	0	0	73
Picloram	<250	0	0	0	0	0	0	0	100	0
Propachlor	<250	0	100	0	0	0	0	0	0	0
Trifluralin	<250	0	100	0	0	0	0	0	0	0
2,4-D amine	1001-5000	0	2	6	0	8	16	7	5	57
2,4-D ester	501-1000	0	20	0	0	2	24	0	5	59

  

Insecticides and fungicides	Acres reported	Target insects and diseases reported <sup>1</sup>		
		Cutworm	Wireworm	Rootworm
		(%)	(%)	(%)
Carbofuran	501-1000	0	86	14
Fonofos	<250	0	0	100
Phorate	<250	48	0	52
Toxaphene	251-500	74	26	0
Captan 25% + lindane 12.4%	<250	0	100	0
Maneb 50% + lindane 18.7%	<250	0	100	0

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 27. Target weeds, insects, diseases and others in sunflowers, North Dakota, 1978.

Herbicides	Acres reported	Target weeds or desiccant use reported <sup>1</sup>							
		Foxtail (%)	Wild oats (%)	Kochia (%)	Thistle (%)	Desiccant (%)	Broad leaf (%)	Pig-weed (%)	Lambs-quarter (%)
Alachlor	<250	94	0	0	0	0	6	0	0
Barban	501-1000	0	100	0	0	0	0	0	0
Chloramben	<250	42	3	0	0	0	50	0	5
Cyanazine	<250	100	0	0	0	0	0	0	0
Diallate	<250	80	20	0	0	0	0	0	0
Dinitramine	1001-5000	76	6	0	0	0	19	0	0
EPTC	>5000	40	26	0	3	0	30	0	0
Fluchloralin	<250	100	0	0	0	0	0	0	0
Glyphosate	<250	100	0	0	0	0	0	0	0
Paraquat	1001-5000	59	27	0	0	2	12	0	0
Pendimethalin	<250	50	50	0	0	0	0	0	0
Profluralin	>5000	70	16	0	0	0	10	3	1
Trifluralin	>5000	75	8	2	1	0	12	2	0
Triallate	>5000	9	74	16	0	0	2	0	0
2,4-D amine	<250	80	0	0	20	0	0	0	0

  

Insecticides and fungicides, etc.	Acres reported	Target insects and other pests reported <sup>1</sup>							
		Cut worm (%)	Beetle (%)	Moth (%)	Weevil (%)	Grass-hopper (%)	Root-worm (%)	Wire-worm (%)	Black birds (%)
Methidathion	<250	0	3	42	52	2	0	0	0
Methyl parathion	<250	36	0	10	0	55	0	0	0
Toxaphene	<250	62	0	0	0	38	0	0	0
Captan 25% + lindane 12.4%	<250	13	0	0	0	0	1	86	0
4-AP	<250	0	0	0	0	0	0	0	100

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 28. Target weeds, insects, and diseases in sugarbeets, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>							
		Wild oats (%)	Foxtail (%)	Pig-weed (%)	Buck-wheat (%)	Broad leaf (%)	Lambs-quarters (%)	Kochia (%)	Wild mustard (%)
Barban	1001-5000	75	25	0	0	0	0	0	0
Cycloate	1001-5000	0	41	8	2	0	31	18	0
Dalapon	1001-5000	8	83	0	0	8	0	0	0
Dalapon + TCA	<250	0	100	0	0	0	0	0	0
Desmedipham	>5000	0	9	56	0	29	2	1	2
Diallate	>5000	79	6	5	0	10	0	0	0
Diethatyl	<250	0	0	100	0	0	0	0	0
EPTC	>5000	11	26	22	4	26	4	3	3
Endothall	501-1000	0	11	34	55	0	0	0	0
Phenmedipham	1001-5000	2	0	33	0	22	27	0	16
Pyramin	1001-5000	0	18	38	0	18	9	0	17
Triallate	1001-5000	56	8	16	0	21	0	0	0
Trifluralin	251-500	0	61	39	0	0	0	0	0
TCA	1001-5000	8	51	25	5	8	4	0	0
2,4-D amine	<250	0	0	0	0	100	0	0	0

  

Insecticides and fungicides	Acres reported	Target insects and diseases reported <sup>1</sup>				
		Maggots (%)	Aphid (%)	Cut-worm (%)	Wire worm (%)	Leaf spot (%)
Aldicarb	1001-5000	92	7	0	0	0
Diazinon	501-1000	100	0	0	0	0
Fonofos	1001-5000	93	0	7	0	0
Phorate	251-500	100	0	0	0	0
Terbufos	1001-5000	100	0	0	0	0
Toxaphene	<250	0	0	100	0	0
Trichlorfon	<250	0	0	100	0	0
Captan 25% + lindane 12.4%	251-500	0	0	0	100	0
Thiabendazole	251-500	0	0	0	0	100
Triphenyltin hydroxide	501-1000	0	0	0	0	100

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 29. Target weeds, insects, diseases or desiccant usage in potatoes, North Dakota, 1978.

Herbicides	Acres reported	Target weeds or desiccant use reported <sup>1</sup>				
		Desiccant (%)	Broad leaf (%)	Wild oats (%)	Foxtail (%)	Pigweed (%)
Diallate	1001-5000	54	0	46	0	0
EPTC	1001-5000	0	78	2	10	10
Linuron	<250	0	93	0	7	0
Metribuzin	<250	0	100	0	0	0
Paraquat	<250	0	100	0	0	0
Trifluralin	<250	0	0	100	0	0
Dinoseb	1001-5000	100	0	0	0	0

  

Insecticides	Acres reported	Target insects reported <sup>1</sup>			
		Potato beetle (%)	Aphid (%)	Leaf hopper (%)	Wire worm (%)
Aldicarb	1001-5000	57	24	15	5
Azinphos-methyl	>5000	90	1	8	0
Carbaryl	501-1000	100	0	0	0
Disulfoton	>5000	63	14	23	0
Endosulfon	1001-5000	54	39	7	0
Methamidophos	251-500	0	50	50	0
Monocrotophos	1001-5000	85	0	15	0
Parathion	<250	100	0	0	6
Phorate	1001-5000	56	18	27	0
Phosphamidon	1001-5000	86	15	0	0

  

Fungicides	Acres reported	Target diseases reported <sup>1</sup>	
		Blight (%)	Rot (%)
Captafol	501-1000	100	0
Mancozeb	>5000	100	0
Triphenyltin hydroxide	1001-5000	100	0
Zineb	<250	100	0
Diazinon 25% + captan 25% + streptomycin sulfate 6.26%	<250	100	0
Zineb 8% + streptomycin sulfate 0.01%	251-500	0	100

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.



Table 30. Weed, insects, and disease targets in soybeans, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>							
		Wild oats (%)	Broad leaf (%)	Thistles (%)	Foxtail (%)	Pig-weed (%)	Wild mustard (%)	Lambs-quarter (%)	Cockle-bur (%)
Alachlor	1001-5000	0	29	0	34	8	24	7	0
Bentazon	501-1000	0	0	1	10	6	70	6	6
Chloramben	1001-5000	0	29	0	34	8	24	7	0
Dinitramine	501-1000	0	12	0	54	31	0	2	0
EPTC	<250	0	0	0	100	0	0	0	0
Fluchloralin	<250	0	0	0	0	50	0	50	0
Linuron	<250	0	100	0	0	0	0	0	0
Metribuzin	1001-5000	7	52	7	0	2	29	0	4
Pendimethalin	<250	16	0	68	16	0	0	0	0
Profluralin	501-1000	0	27	0	63	10	0	0	0
Triallate	<250	100	0	0	0	0	0	0	0
Trifluralin	>5000	2	14	0	64	12	6	1	0

  

Insecticides and fungicides	Acres reported	Target insects and diseases reported <sup>1</sup>	
		Grass-hopper (%)	Smut (%)
Malathion	<250	100	0
Toxaphene	251-500	100	0
Maneb 50% + lindane 18.7%	<250	0	100

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 31. Weed, insect, and disease targets in dry beans, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>						
		Wild oats (%)	Broad-leaf (%)	Thistle (%)	Foxtail (%)	Pig-weed (%)	Wild mustard (%)	Cockle-bur (%)
Alachlor	<250	0	0	0	100	0	0	0
Bentazon	<250	0	0	44	0	0	31	25
Chloramben	501-1000	0	39	0	23	23	16	0
Diallate	<250	100	0	0	0	0	0	0
Dinitramine	501-1000	0	11	0	60	29	0	0
EPTC	>5000	21	24	4	39	0	12	0
Linuron	<250	0	0	0	100	0	0	0
Profluralin	1001-5000	0	0	0	89	11	0	0
Triallate	251-500	87	0	0	0	0	13	0
Trifluralin	>5000	8	15	0	66	8	2	0

  

Insecticides and fungicides	Acres reported	Target insects and diseases reported <sup>1</sup>		
		Grass-hopper (%)	Rust (%)	Blight (%)
Toxaphene	<250	100	0	0
Copper hydroxide	501-1000	0	50	50
Mancozeb	251-500	0	50	50
Maneb	1001-5000	0	33	67
Maneb 7.5%	251-500	0	0	100
Zineb 8%	<250	0	100	0

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

Table 32. Weed and insect targets in alfalfa, other hay and pasture, North Dakota, 1978.

Herbicides	Acres reported	Target weeds reported <sup>1</sup>									
		Kochia (%)	Rag-weed (%)	Thistle (%)	Broad-leaf (%)	Leafy spurge (%)	Sage brush (%)	Milk weed (%)	Field bindweed (%)	Fox-tail (%)	Wild oats (%)
<b>Alfalfa</b>											
MCPA	<250	100	0	0	0	0	0	0	0	0	0
Picloram	<250	0	0	0	0	100	0	0	0	0	0
2,4-D	<250	0	0	0	0	100	0	0	0	0	0
<b>Other Hay</b>											
2,4-D	501-1000	0	0	13	4	83	0	0	0	0	0
MCPA	<250	0	91	0	0	9	0	0	0	0	0
Picloram	501-1000	0	0	0	0	100	0	0	0	0	0
<b>Pasture and Range</b>											
2,4-D <sup>2</sup>	1001-5000	0	0	32	4	51	13	0	0	0	0
2,4-D amine	1001-5000	0	0	1	4	93	0	1	0	2	0
2,4-D ester	1001-5000	0	0	5	47	14	31	0	0	3	0
Dicamba	251-500	0	0	64	0	33	0	0	3	0	0
Glyphosate	<250	0	0	0	71	14	0	14	0	0	0
MCPA amine	<250	0	0	0	0	100	0	0	0	0	0
MCPA ester	251-500	0	0	41	0	47	0	0	12	0	0
Picloram	1001-5000	0	0	0	3	97	0	0	0	0	0
Insecticides	Acres reported	Target insects reported <sup>1</sup>									
		Grass-hopper (%)	Weevil (%)	Cut-worm (%)	Flies (%)						
<b>Alfalfa</b>											
Carbaryl	<250	100	0	0	0						
Malathion	<250	100	0	0	0						
Parathion	<250	0	100	0	0						
Toxaphene	<250	43	0	57	0						
<b>Other Hay</b>											
Naled	<250	0	0	0	100						
Parathion	<250	0	0	0	100						

<sup>1</sup>Respondents to the questionnaire did not all report targets. Thus, the acres presented indicate sample size. Percentages are based upon acres reported.

<sup>2</sup>Compound identity was not given.

Table 33. Herbicide usage in North Dakota, 1978.

Herbicides	Acres treated (1000)	Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application	
				Self (%)	Custom (%)	Airplane (%)	Ground (%)
Alachlor	150.2	1.40	210.3	84	16	1	99
Atrazine	61.9	1.52	93.8	78	22	6	94
Barban	624.2	0.27	168.4	71	29	24	76
Bentazon	16.9	0.64	10.9	47	53	69	31
Bromoxynil	21.2	0.31	6.6	45	55	45	55
Bromoxynil + MCPA	26.7	0.44	11.8	69	31	31	69
Chloramben	14.6	0.66	9.7	90	10	0	100
Cyanazine	127.5	1.26	160.3	75	25	4	96
Cycloate	6.0	1.12	6.7	100	0	0	100
Dalapon	48.8	2.43	118.4	61	39	23	77
Desmedipham	30.7	0.50	15.2	99	1	0	110
Diallate	72.1	1.45	104.5	97	3	2	98
Dicamba	135.2	0.22	30.3	75	25	12	88
Dicamba + MCPA	140.4	0.43	59.7	75	25	13	87
Diclofop	1.7	0.76	1.3	92	8	0	100
Diethatyl	0.1	1.00	0.1	100	0	0	100
Difenzoquat	66.9	0.62	41.7	83	17	13	87
Dinitramine	24.4	0.48	11.7	90	10	0	100
Endothall	2.9	0.48	1.4	72	28	22	78
EPTC	490.4	2.65	1300.0	95	5	2	98
EPTC + R-25788	27.7	3.45	95.7	93	7	6	94
Fluchloralin	2.6	0.19	0.5	100	0	0	100
Glyphosate	9.2	0.84	7.7	41	59	0	100
Linuron	1.6	1.19	1.9	100	0	0	100
MCPA	1744.4	0.35	681.2	77	23	11	89
Metolachlor	4.9	1.10	5.4	34	66	66	34
Metribuzin	12.7	0.21	2.7	91	9	0	100
Butylate	2.7	1.74	4.7	75	25	0	100
Paraquat	0.3	1.00	91.5	100	—	—	100
Pendimethalin	7.8	0.40	3.1	17	83	95	5
Phenmedipham	8.9	0.53	4.7	100	0	0	100
Picloram	374.2	0.24	24.9	68	32	6	94
Profluralin	147.0	0.78	115.0	72	27	2	98
Propachlor	0.5	—	—	100	0	0	100
Propanil	18.0	1.27	22.8	91	9	3	97
Pyrazon	15.7	2.76	43.3	91	9	0	100
TCA	23.7	2.95	69.8	79	21	12	88
Triallate	1045.9	1.01	1054.7	88	12	2	97
Trifluralin	2052.5	0.72	1487.3	85	15	3	97
2,4-D all	9339.1	0.42	3942.7	73	27	16	90
Unknown	45.3	0.25	11.3	45	55	9	87
Total	16947.3		10009.1	76	24	12	92

Table 34. Insecticide usage in North Dakota, 1978.

Insecticides	Acres treated (1000)	Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application	
				Self (%)	Custom (%)	Airplane (%)	Ground (%)
Aldicarb	31.3	2.39	74.7	99	1	0	100
Azinphos-methyl	72.8	1.50	108.9	97	3	12	88
Carbaryl	4.6	—	—	83	17	11	89
Carbofuran	12.4	0.85	10.6	100	0	0	100
Chlordane	4.9	1.16	5.7	100	0	0	100
Diazinon	2.5	1.84	4.6	100	0	0	100
Disulfoton	21.3	2.38	50.8	100	0	0	100
Endosulfan	11.1	2.24	24.9	90	10	58	42
Ethoprop	1.4	—	—	100	0	0	0
Fonofos	17.7	1.37	24.3	98	2	0	94
Methamidophos	0.7	1.57	1.1	100	0	0	100
Monocrotophos	15.1	0.31	4.7	100	0	0	100
Methyl parathion	17.7	0.06	1.0	55	45	67	33
Methyl parathion (encap.)	1.0	—	—	0	100	100	0
Malathion	6.3	—	—	12	88	47	30
Methidathion	9.9	—	—	40	60	60	40
Naled	0.4	—	—	0	100	100	0
Phorate	30.6	1.91	58.3	96	4	2	98
Phosphamidon	9.1	2.45	22.3	71	29	29	71
Terbufos	24.6	1.04	25.6	100	0	0	100
Trichlorfon	0.2	—	—	100	0	0	100
Toxaphene	65.1	1.38	89.9	50	50	49	50
Unknown	4.9	—	—	63	37	37	63
Total	365.6		507.4	83	17	21	79

Table 35. Fungicide usage in North Dakota, 1978.

Fungicides	Acres treated (1000)	Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application	
				Self (%)	Custom (%)	Airplane (%)	Ground (%)
Benomyl	1.7	0.88	1.5	0	100	100	0
Captafol	5.0	2.34	11.7	100	0	0	100
Chlorothalonil	4.2	0.76	3.2	90	10	10	90
Copper hydroxide	2.9	—	—	0	100	100	0
Mancozeb	45.9	4.10	188.3	68	32	32	68
Maneb	15.1	1.45	21.9	50	50	100	0
Manzate 200	0.4	1.25	0.5	0	100	100	0
Thiabendazole	25.6	0.52	13.4	82	18	22	78
Zineb	3.0	—	—	100	0	0	100
Total	103.8		240.5	69	31	39	61

Table 36. Seed treatment usage in North Dakota, 1978.

Seed Treatments <sup>1</sup>	Acres treated (1000)	Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application	
				Self (%)	Custom (%)	Airplane (%)	Ground (%)
Captan 25%							
lindane 12.4%	87.5	0.01	0.83	97	3	0	92
Carboxin + thiram <sup>2</sup>	55.8	—	—	90	10	0	100
Diazinon 25%, captan 25% strepto- mycin sulfate 6.26%	1.5	—	—	100	0	0	100
Maneb 7.5%	1.6	—	—	0	100	100	0
Maneb 50% - lindane 18.7%	845.5	0.19	157.2	98	2	7	95
Maneb 50% + HCB 10%	51.6	0.14	7.4	84	4	0	100
Mercury compound 1.4 - 7.7%	117.5	0.12	13.7	17	83	0	100
TCMTB 3% 1.4 - 7.7%	19.3	0.05	0.9	100	—	0	100
Zineb 8%	0.4	—	—	0	100	100	0
Zineb 8% + streptomycin sulfate 0.01%	2.4	—	—	100	0	0	0
Total	1183.1		180.0	89	11	5	95

<sup>1</sup>Involves only on farm seed treatment and the acres treated is an estimate based upon amount of seed treated.

Table 37. Desiccants, bird repellents, and growth regulator usage in North Dakota, 1978.

Other Chemicals	Acres treated (1000)	Treatment rate (lb/A)	Total lb. a.i. (1000)	Applicator		Method of application	
				Self (%)	Custom (%)	Airplane (%)	Ground (%)
Dinoseb	27.7	1.91	53.0	30	70	57	43
Paraquat	50.8	0.82	41.8	19	81	51	48
Sodium chlorate	0.8	6.38	5.1	0	100	100	0
Sulfuric acid	3.8	—	—	0	100	0	100
4-AP	1.5	—	—	0	100	100	0
30% Maleic hydrazide	27.8	0.88	24.5	98	2	4	96
2,4-D ester	6.9	0.12	0.8	100	0	0	100
Total	119.3		125.2	44	56	38	62

Table 38. The acres not cropped and total acres operated by respondents to the pesticide use survey, Crop Reporting Districts, North Dakota, 1978.

Reporting district & No.	Average acres per respondent	
	Not cropped	Total operated
Northwest	1 460	1281
North central	2 435	1266
Northeast	3 311	1085
West central	4 435	1410
Central	5 363	1284
East central	6 226	1034
Southwest	7 618	1739
South central	8 371	1414
Southeast	9 232	954
STATE	360	1214

Table 39. Protective devices, irrigation, and type of nozzle used and pesticide container disposal, North Dakota, 1978.

Question	Affirmative responses <sup>1</sup> (%)
Were protective devices used (only respondents who applied pesticides)?	
Respirators	16
Spray unit or other protective clothing	14
Rubber gloves and boots	64
Goggles	27
Protective cab on tractor	27
Is a certified applicator on the farm?	68
Does a potential for water contamination exist on the farm?	5
Is irrigation used on the farm?	3
Are pesticides applied through irrigation system (irrigation users only)?	5
Method of empty pesticide container disposal?	
Burned	8
Buried	57
Retained and used	7
Disposal not specified	15
Commercial disposal	9
Burned and buried	4
Burned and other	1
Buried and other	1
Spray nozzle usage?	
Cone	19
Flat fan	63
Flood	8
Flood and flat fan	5
Cone and flood	1
Cone and flat fan	2
Cone, flat fan, and flood	1

<sup>1</sup>Percentages are based upon responses to these specific questions and not on total number of responses to the survey.

## Diallate and Triallate User Survey, 1978.

The objective of the diallate and triallate user survey was to obtain information on methods of application relative to applicator exposure and alternatives for wild oats control which could be used should diallate and triallate be cancelled as a result of the RPAR process. The questions on diallate and triallate were included as part of the pesticide usage in major crops in North Dakota survey. The list of questions in the survey are presented in Table 40. Four hundred and sixteen complete responses to the diallate and triallate questionnaire were received for 14,556 diallate and 111,403 triallate-treated acres which represents approximately 20 and 10% respectively of the North Dakota usage.

The results of the questionnaire relative to usage are summarized in Table 41. The liquid formulation represented 83 and 85% of the usage for diallate and triallate, respectively. Tractors with cabs were used to apply 89 percent of the diallate and 81 percent of the triallate. The higher usage of tractors with cabs for diallate is probably because of the preplant incorporated type treatment compared to triallate applied preemergence and shallow incorporated which requires less power and thus smaller tractors which are less likely to have cabs. Eighty-three to eighty-four percent of both diallate and triallate were incorporated at the same time as application which would reduce operator exposure to the herbicides as compared to incorporating in a separate operation.

The second incorporation was with the use of a tractor with a cab for 65% of the diallate and 55% of the triallate. Twenty-eight percent of the diallate and thirty-nine percent of the triallate were only incorporated once.

The average size of sprayer used for diallate was 315 gallons and 44 feet wide and for triallate 338 gallons and 49 feet wide. Assuming a spray volume of 10 gallons per acre and the average acres treated with diallate of 198, and with triallate of 302, users of diallate would be involved in an average of 5.8 sprayer loadings and users of triallate in 8.9 loadings.

Diallate and triallate were both used by 8% of the individuals surveyed. The average acres treated by individuals using both diallate and triallate was 566 of which 370 acres were triallate.

The results of the question concerning use of alternative wild oat control practices should diallate and triallate no longer be available are given in Table 42. All but 2.2% of the respondents to this question indicated that they would use one or more of the four listed alternatives for wild oat control. One of the four alternatives would be used by 30.4%, two of the alternatives would be used by 33.8%, three of the alternatives would be used by 23.5%, and all four alternatives would be used by 10.1%. Substitution of barban was the most popular alternative with 65.9% of the respondents indicating that barban would be used alone or in combination with another practice. Changing crops and crop rotations would be used by 36.9%, difenzoquat would be substituted by 47.1%, and delayed crop seeding would be practiced by 59.0%.

Table 40. Questionnaire used to obtain information on diallate (Avadex) and triallate (Far-go) usage.

## AVADEX AND FAR-GO SURVEY

Avadex and Far-go are presently being reviewed by EPA. The questionnaire below is to give specific needed information on possible applicator exposure. Please return this information along with the pesticide use questionnaire. Questions on Far-go or Avadex usage, answer only if these herbicides were used.

	<b>Avadex</b>	<b>Far-go</b>
1. Far-go and Avadex usage:		
a. Acres treated:		
liquid formulation .....	_____	_____
granular formulation .....	_____	_____
b. Acres applied using tractor with cab .....	_____	_____
c. Acres incorporated at same time as applied .....	_____	_____
d. Was a second incorporation used? .....	Yes ____ No ____	Yes ____ No ____
e. Acres of second incorporation using tractor with cab .....	_____	_____
f. Size of sprayer — gallons .....	_____	_____
g. Size of sprayer — width in feet .....	_____	_____
h. Granular applicator — width in feet .....	_____	_____
2. If Avadex and Far-go were not available, would you:		
a. Change crops and crop rotation .....	Yes _____	No _____
b. Substitute Carbyne .....	Yes _____	No _____
c. Substitute Avenge .....	Yes _____	No _____
d. Practice delayed crop seeding .....	Yes _____	No _____

Table 41. Diallate and triallate formulations, tractors with cabs, sprayer size used by farmers in North Dakota as determined by a survey of 416 user respondents.

	Diallate	Triallate
Acres represented in survey	14,556	111,403
Acres treated per farmer	198	302
Percent of acres with liquid formulation	83	85
Percent of acres with granular formulation	17	15
Percent acres treated using tractor with cab	89	81
Percent acres with first incorporation at treatment	84	83
Percent acres of second incorporation using tractor with cab	65	55
Percent not incorporating the second time	28	39
Gallon-size of sprayer	315	338
Feet width of sprayer	44	49
Feet width of granular applicator	34	35

Table 42. Use of alternative wild oat control practices if diallate and triallate became unavailable.

Wild oat control practice	Respondents who would use practice (%)
a) Change crops and crop rotations	2.8
b) Substitute barban	12.8
c) Substitute difenzoquat	6.4
d) Practice delayed crop seeding	8.4
a & b)	3.6
a & c)	0.3
a & d)	6.4
b & c)	11.2
b & d)	8.9
c & d)	3.4
a, b & c)	1.7
a, b & d)	7.8
a, c & d)	4.2
b, c & d)	9.8
a, b, c & d)	10.1
none of the above	2.2
	100.0

