SOIL PESTICIDE RESIDUES

Russell S. Adams, Jr.

This was the last year for the herbicide interaction plots. Field data for 1969 and four year averages are given in Tables 1 and 2. In these plots atrazine was incorporated in a split plot design across plots receiving no chemical, linuron (2 1/2 lb/A), CDAA (5 lb/A), amiben (3 lb/A) and trifluralin (1 lb/A). Atrazine was applied at four rates, 0, 1/4, 1/2 and 1 lb/A. All plots were cultivated for weed control.

Results were in great contrast between stations in 1969. At Waseca no significant rain occurred within the first 30 days after planting of the soybeans. As a result atrazine, even a 1 lb/A, had little affect on stands or yields. By contrast, water stood in the plots much of the time the first 30 days after planting of the soybeans at Lamberton. The affect of atrazine was severe. Interaction effects were clearly visible. Linuron treated plots were most affected by atrazine residues. Injury occurred even with 1/4 lb/A of atrazine. The water logged conditions appeared to contribute to pathogenic activity and damping off at Lamberton. Stands in the trifluralin plots were severely reduced. Atrazine residue seemed to counteract this effect. Growth chamber studies had indicated several years earlier that this possibility existed. However, at three locations and over four years of study this particular effect was observed only this one time. As a result it cannot be judged of economic significance and should not be considered in management decisions. Especially since yields were not appreciably affected.

Injury from atrazine to soybeans at Lamberton in 1969 was least in the CDAA treated plots.

Data in Table 1 and Table 2 indicate that at Waseca neither yield nor

stand were significantly affected by any interaction between atrazine residue at 1 lb/A and the herbicides in the experiment. This rate of atrazine may not have been high enough to produce the effects observed at the other two stations.

At Lamberton and Morris atrazine injury was significantly greater in the linuron treatments. At Lamberton and Morris CDAA and trifluralin treatments showed the least injury from atrazine residue. When compared to the no atrazine treatments, a "residue" of 1 lb/A of atrazine in the linuron treatments reduced yields by 5 to 7 bushels more than 1 lb/A atrazine in the cultivated checks. Atrazine at 1 lb/A in the CDAA and trifluralin treatments reduced yields to about the same extent as in the cultivated checks.

"Residual" atrazine gave some benefit from weed control. At Lamberton and Morris weeds were a problem. As a result a 5 to 9 bushel loss in yield was experienced in the cultivated control due to weed competition. As a result of weed infestation stand reduction was not well correlated to yield reductions.

Loss in yield of soybeans was well correlated at Lamberton and Morris to soil moisture content and total precipitation occurring between April 1 and June 15. The more moisture available in the soil during this critical period the more likely injury from atrazine residues was to occur.

One must be careful in interpreting the effects of trifluralin. Other research has indicated that trifluralin may prune the roots of soybeans in the zone of application. This might prevent the absorption of atrazine. If the atrazine "residue" had been plowed down, so that the atrazine and trifluralin occurred at different levels in the soil, more injury from the atrazine might have resulted.

Table 1. Yield of Chippewa 64 soybeans as affected by herbicide treatments and residue amounts of atrazine. Four replications.

"Residual" atrazine	Cultivated check		Linuron		CDAA		Amiben		Trifluralin	
	1969	4 year average	1969	4 year average	1969	4 year average	1969	4 year average	1969	4 year average
lb/A					bu/A					
					Lamberton					
0 (weed free check)	31.6	24.5								
0	27.5	19.1	29.7	21.5	32.8	23.1	32.3	22.6	28.8	22.1
1/4	28.3	18.5	18.7	20.0	31.0	22.1	31.2	21.4	26.4	21.0
1/2	18.6	16.4	8.1	15.5	26.0	21.4	29.2	20.0	27.1	21.0
1	5.2	13.0	0.2	11.1	15.0	16.2	7.2	14.5	6.7	16.2
					Morris					
0 (weed free check)	26.7	25.6								
0	22.1	16.6	25.0	23.4	23.4	20.4	23.0	23.3	24.2	23.9
1/4	23.2	19.4	22.7	24.1	23.0	22.3	22.3	23.9	22.6	25.4
1/2	21.9	17.9	23.9	20.5	22.0	19.2	22.8	21.2	21.9	23.4
1	21.4	16.2	22.5	15.9	25.9	19.4	25.1	19.6	25.1	23.0
					Waseca					
0 (weed free check)	32.1	37.1								
0	34.8	34.0	35.9	34.5	33.2	34.6	32.3	34.4	35.0	33.8
1/4	35.2	34.1	37.4	35.6	34.2	34.3	30.5	33.1	34.0	33.4
1/2	30.0	30.6	32.0	31.0	31.9	33.2	32.6	33.0	32.2	32.3
1	31.4	28.2	29.3	28.5	31.6	30.5	32.8	29.8	32.6	30.0

Table 2. Stand of Chippewa 64 soybeans as affected by herbicide treatments and residue amounts of atrazine. Four replications.

"Residual" atrazine	Cultivated check		Linuron		CDAA		Amiben		Trifluralin	
	1969	4 year average	1969	4 year average	1969	4 year average	1969	4 year average	1969	4 year average
	% of control									
	Lamberton									
0	100	100	61	86	101	102	93	96	54	86
1/4	83	85	22	79	102	93	88	96	64	80
1/2	72	84	11	66	78	89	68	81	55	85
1	29	68	0	54	70	79	31	74	31	73
	Morris									
0	100	100	98	99	101	104	97	107	95	110
1/4	96	102	100	107	94	100	97	97	93	115
1/2	93	96	101	89	108	88	102	92	98	108
1	88	88	69	63	80	81	71	75	85	90
	Waseca									
0	100	100	100	102	100	105	104	105	98	99
1/4	100	104	104	107	105	104	100	104	100	98
1/2	100	107	105	98	102	103	100	100	100	102
1	100	89	102	92	95	96	100	94	103	94

NUTRIENT CONCENTRATION OF DRAINAGE TILE WATER IN CENTRAL MINNESOTA

J. E. Ellis, Lowell Hanson, J. M. MacGregor and Robert Munter

During the summer of 1968, plans were made for collection and analysis of tile line drainage water samples from farms in south central Minnesota. J. E. Ellis agreed to take responsibility for selecting and making arrangements with farmer cooperators and collecting the samples. A total of 19 farms were selected in the counties of Kandiyohi, McLeod, Meeker, Renville, Sibley and Wright.

Considerations involved in selection of sample sites included:

1) Tile outlets which drained one specific field under one crop and one rate of fertilization.
2) Tile lines without surface inlets.
3) Tile lines in mineral soils.
4) A range of rates of fertilization from low to high.
5) A cooperator who would be willing to supply field information and rainfall records.

Collection of samples were planned for roughly two week intervals with the understanding that the schedule would have to be somewhat flexible due to weather conditions and other programs of the area soils agent.

The types of data considered important were:

Field data:

Farm location and soil types

Crop record (1967, 68, 69 and current year)

Fertilizer application record (same years)

Soil samples for routine soil test

(Field data - continued)

Estimate of flow rate

Water temperature

Analytical data:

Concentration of NO_3-N

Concentration of NO_2-N

Concentration of PO_4-P

Concentration of K

Electrical conductivity

The initial samples were collected during October of 1968. During the winter of 1969, information developed by Dr. Robert Holt indicated that surface water runoff was an important source of soluble phosphorus. As a result of this, plans were made to also collect open ditch water samples in the immediate vicinity of the tile outlet sample sites wherever feasible during the spring and summer of 1969.

Following are the analytical data for samples collected during 1968 and 1969. Missing data indicate lack of flow or high water conditions preventing sampling. Some of the sampling sites do not have open ditch sites available for sampling.

Table 1. NO_3-N in ppm in water samples. County, Farm and Code Number.

Sampling Period		Sample Site: Kandiyohi			McLeod		
		Damhof K-1	Johnson K-2	Pioneer Seed Corn K-3	Huebert Mc-1	Katzenmeyer Farms Mc-2	Rickert Mc-3
1st round Oct. 1968	Tile	35.4	10.8	20.3	11.7	9.2	19.1
2nd round April-May 1969	Tile	14.5		18.3	17.1	14.9	35.0
	Ditch		9.8				
3rd round April-May-June 1969	Tile	19.5		27.4		13.2	41.0
	Ditch	9.5		8.8	10.5		
4th round April-May-June 1969	Tile	17.6	11.5	29.1	31.0	13.7	38.0
	Ditch	16.4	4.1	3.5	13.8		10.7
5th round April-May-June 1969	Tile	16.9		34.4		22.5	42.5
	Ditch	0.6		5.0			
6th round April-May-June 1969	Tile	[1]46.4		38.3		22.9	
	Ditch	0.4		7.0			
7th round April-May-June-July 1969	Tile	43.0		36.0		22.3	
	Ditch	0.7		6.1			
Crop&Fertilizer History	1967	Corn 120+60+30	Corn 75+54+54	Corn 200+100+100	Corn 115+60+60	Corn 110+90+110	Corn 125+54+54
	1968	Corn 185+80+90	Idle None	Corn 200+100+150	Corn 115+60+60	Corn 110+90+110	Corn 125+54+54
	1969	Corn 130+40+40	Idle & Alf None	Corn 215+100+100	Soybeans 9+21+63	Corn 110+90+110	Oats-Alf. 80+54+54

[1]The sixth and seventh round represent a different tile than the previous samples. This line has a surface inlet and a manure pile may have affected the drainage water.

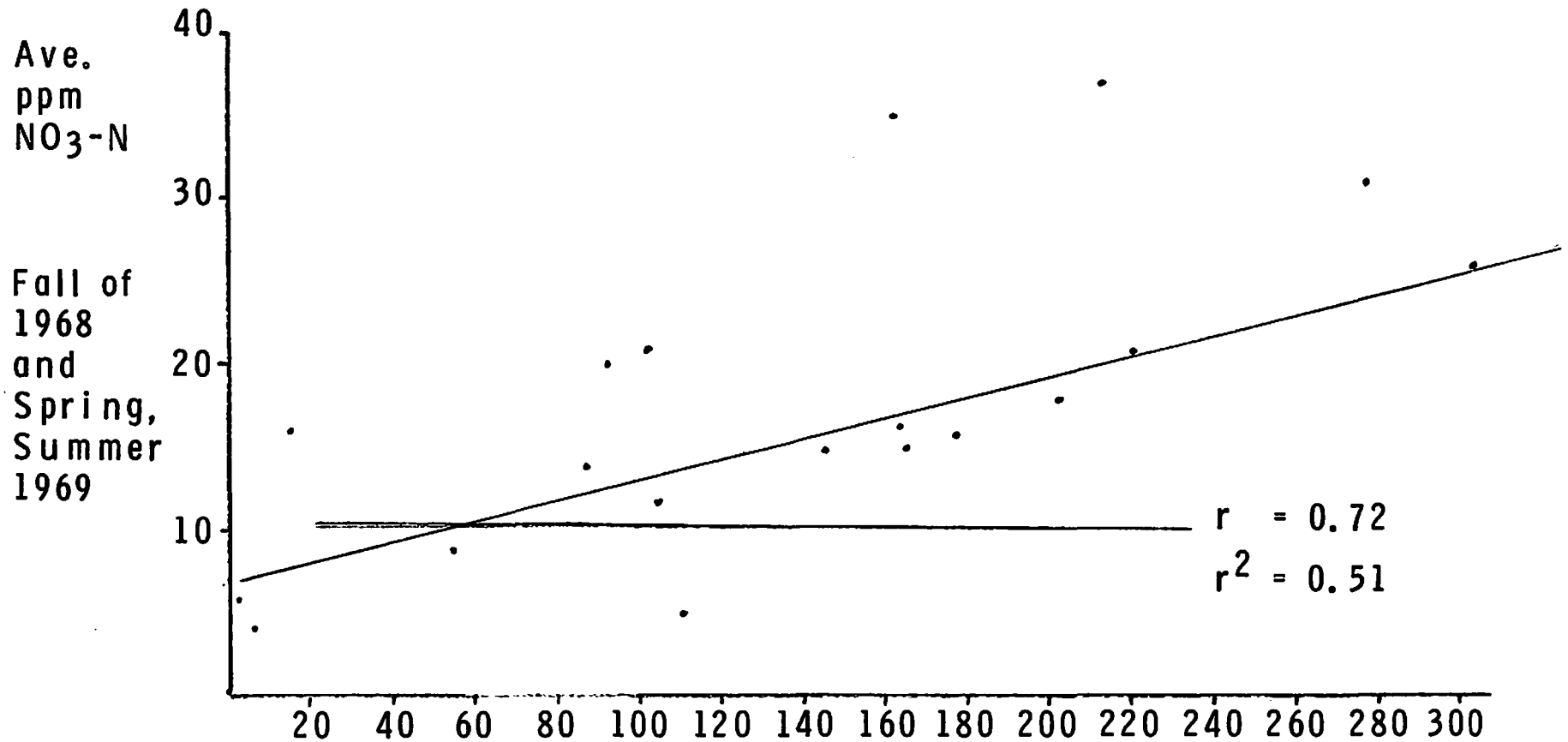
(Table 1. continued)

Sampling Period		Sample Site: Meeker			Sample Site: Renville		
		Burgstahler M-1	Peterson M-2	Pravecher M-3	Muetzel R-1	Scheibel R-2	Wertish R-3
1st round Oct. 1968	Tile	36.8	22.3	16.4	13.1	25.2	10.7
2nd round April-May 1969	Tile	18.0	13.9	21.4	12.9	23.8	11.0
	Ditch	12.8	1.5				6.1
3rd round April-May-June 1969	Tile	17.5	14.0	19.4	14.1	37.2	13.6
	Ditch	11.1	1.3			16.5	5.0
4th round April-May-June 1969	Tile	12.1	14.8		22.6	27.0	11.7
	Ditch	6.2	1.6			13.8	1.5
5th round April-May-June 1969	Tile	19.9	18.2	14.9		45.2	22.5
	Ditch	3.1	4.9			15.4	0.5
6th round April-May-June 1969	Tile	10.0	23.5	30.0			
	Ditch	12.8	4.4				
7th round April-May-June-July 1969	Tile						
	Ditch						
Crop&Fertilizer History	1967	Soybeans None	Corn	Corn 100+100+100	Soybeans None	Corn 150+100+100	Idle & Oats None
	1968	Corn 130+90+90	Corn 147+25+25	Corn 215+84+108	Corn 115+108+54	Corn 180+100+100	Oats None
	1969	Corn 140+68+68	Corn 147+25+25	Corn 90+100+100	Corn 140+102+98	Corn 200+75+75	Corn 115+50+50

(Table 1. continued)

Sampling Period		Sample Site: Sibley: Forsberg S-1	Sibley: Kuhlman S-2	Sibley: Lagerstedt S-3	Sibley: Lundgren S-4	Wright: Booth W-1B	Wright: Streich W-2D	Wright: Varner W-3G
1st round Oct. 1968	Tile	10.8	3.0	3.2		11.0	24.5	8.3
2nd round April-May 1969	Tile	15.4	6.4	6.6		10.0	27.8	15.0
	Ditch	14.7	6.1	8.7	0.08			11.7
3rd round April-May-June 1969	Tile	14.8	5.2	5.2	2.1	5.5	28.8	17.4
	Ditch	8.7	6.7	8.8	10.8			8.4
4th round April-May-June 1969	Tile	15.1	3.7	4.3	7.1	6.6	35.6	16.1
	Ditch	6.6	4.8	16.4	22.8			
5th round April-May-June 1969	Tile	16.9	2.2	8.9	10.0		53.5	12.4
	Ditch	9.6	5.1	9.0	20.9			
6th round April-May-June 1969	Tile	20.0	6.9	7.0	11.2			
	Ditch	13.6	7.9	12.0	17.1			
7th round April-May-June-July 1969	Tile	19.2						
	Ditch	7.4						
Crop&Fertilizer History	1967	SwCorn & Corn 100+36+36	Soybeans 6+24+24	Soy & Corn None	Alfalfa	None	Corn 14+37+48	Corn 120+85+85
	1968	Corn 137+124+142	Oats None	Soybeans 6+24+24	Sugarbeets 100+85+250	Plowed Fall None	Corn 165+37+48	Corn 120+85+85
	1969	Corn 194+90+97	Soybeans 12+48+48	Soybeans None	Corn & Oats 75+60+30	Fallow None	Corn 165+37+48	Oats & Alf. 15+60+60

Relationship of Average NO_3-N Concentrations in Tile Line Drainage Water to a Weighted Average of Applied Nitrogen Webster and Glencoe Soils, South Central Minnesota



Weighted average of nitrogen applied per acre

Factors used 1967 0.25 x total N
68 0.50 x " "
69 0.75 x " "

Equation for line:
$y = 6.6 + 0.08\,x$

OL/2-H7-68

Table 2. NO_2-N in ppm in water samples. County, Farm and Code Number.

Sampling Period		Sample Site: Kandiyohi			McLeod		
		Damhof K-1	Johnson K-2	Pioneer Seed Corn K-3	Huebert Mc-1	Katzenmeyer Farms Mc-2	Rickert Mc-3
1st round Oct. 1968	Tile						
2nd round April-May 1969	Tile				0.01	0.1	0.1
	Ditch		0.01		0.5-1.0		
3rd round April-May-June 1969	Tile	0.5		0.1		0.1	.1
	Ditch	0.1	0.1	0.1	0.1		
4th round April-May-June 1969	Tile	0.3	0.1	0.1	0.1	0.1	0.1
	Ditch	0.2	0.8	0.3	0.2		0.2
5th round April-May-June 1969	Tile	0.3		0.1		0.1	0.1
	Ditch	0.1	0.4				
6th round April-May-June 1969	Tile [1]	0.2		0.2		0.1	
	Ditch	0.2		0.5			
7th round April-May-June-July 1969	Tile	0.1		0.1		0.1	
	Ditch	0.1		1.0			
Crop&Fertilizer History	1967	Corn 120+60+30	Corn 75+54+54	Corn 200+100+100	Corn 115+60+60	Corn 110+90+110	Corn 125+54+54
	1968	Corn 185+80+90	Idle None	Corn 200+100+150	Corn 115+60+60	Corn 110+90+110	Corn 125+54+54
	1969	Corn 130+40+40	Idle & Alf None	Corn 215+100+100	Soybeans 9+21+63	Corn 110+90+110	Oats-Alf 80+54+54

[1] The sixth and seventh round represent a different tile than the previous samples. This line has a surface inlet and a manure pile may have affected the drainage water.

(Table 2. continued)

Sampling Period		Sample Site: Meeker			Sample Site: Renville		
		Burgstahler M-1	Peterson M-2	Pravecher M-3	Muetzel R-1	Scheibel R-2	Wertish R-3
1st round Oct. 1968	Tile						
2nd round April-May 1969	Tile	0.1	0.1	0.1	0.1		
	Ditch	0.1	0.1				
3rd round April-May-June 1969	Tile	0.1	0.1	0.1	0.1	0.1	0.1
	Ditch	0.1	0.1			0.1	0.1
4th round April-May-June 1969	Tile	0.1	0.1		.1	0.1	0.1
	Ditch	1.0	0.1			1.0	0.3
5th round April-May-June 1969	Tile	.1	.1	.1		.1	.1
	Ditch	.2	.2			.5	.1
6th round April-May-June 1969	Tile	0.1	0.2	0.2			
	Ditch	0.1	0.2				
7th round April-May-June-July 1969	Tile						
	Ditch						
Crop&Fertilizer History	1967	Soybeans None	Corn	Corn 100+100+100	Soybeans None	Corn 150+100+100	Idle & Oats None
	1968	Corn 130+90+90	Corn 147+25+25	Corn 215+84+108	Corn 115+108+54	Corn 180+100+100	Oats None
	1969	Corn 140+68+68	Corn 147+25+25	Corn 90+100+100	Corn 140+102+98	Corn 200+75+75	Corn 115+50+50

(Table 2. continued)

Sampling Period		Sample Site: Sibley				Sample Site: Wright		
		Forsberg S-1	Kuhlman S-2	Lagerstedt S-3	Lundgren S-4	Booth W-1B	Streich W-2	Varner W-3
1st round Oct. 1968	Tile					0.1	2.0	
2nd round April-May 1969	Tile	0.1	0.1	0.1	0.1	0.1	2.0	0.1
	Ditch	0.1	0.1	0.1	1.0			0.1
3rd round April-May-June 1969	Tile	0.1	0.1		0.1	0.1	0.3	0.1
	Ditch	0.1	0.1	0.1	0.3			0.1
4th round April-May-June 1969	Tile	0.1	0.1	0.1	.1	0.1	0.3	0.1
	Ditch	0.5	1.0	0.2	.2			
5th round April-May-June 1969	Tile	.1	.1	.1	0.1		0.8	0.1
	Ditch	.5	.2	.2	1.0			
6th round April-May-June 1969	Tile	0.1	0.1	0.1	0.1			
	Ditch	0.3	0.1	0.2	0.9			
7th round April-May-June-July 1969	Tile	0.1						
	Ditch	0.5						
Crop&Fertilizer History	1967	SwCorn & Corn 100+36+36	Soybeans 6+24+24	Soy & Corn None	Alfalfa	None	Corn 14+37+48	Corn 120+85+85
	1968	Corn 137+124+142	Oats None	Soybeans 6+24+24	Sugarbeets 100+85+250	Plowed Fall None	Corn 165+37+48	Corn 120+85+85
	1969	Corn 194+90+97	Soybeans 12+48+48	Soybeans None	Corn & Oats 75+60+30	Fallow None	Corn 165+37+48	Oats & Alf. 15+60+60

Table 3. PO_4-P in ppm in water samples. County, Farm and Code Number.

Sampling Period		Sample Site: Kandiyohi, Damhof K-1	Kandiyohi, Johnson K-2	Kandiyohi, Pioneer Seed Corn K-3	McLeod, Huebert Mc-1	McLeod, Katzenmeyer Farms Mc-2	McLeod, Rickert Mc-3
1st round Oct. 1968	Tile	0.019	0.730	0.012	0.014	0.005	0.092
2nd round April-May 1969	Tile	0.073		0.06	0.08	0.08	0.01
	Ditch		0.06		0.14		
3rd round April-May-June 1969	Tile	0.34		0.01		0.02	0.04
	Ditch	0.13	0.12		0.25		
4th round April-May-June 1969	Tile	0.15	0.01	0.02	0.01	0.02	0.03
	Ditch	0.02	0.02	0.02	0.03		0.05
5th round April-May-June 1969	Tile	0.18		0.12		0.01	0.04
	Ditch	0.02	0.04				
6th round April-May-June 1969		1)					
	Tile	0.05		0.01	0.01	0.04	
	Ditch	0.03		0.01	0.01		
7th round April-May-June-July 1969		1)					
	Tile	0.02		0.01		0.01	
	Ditch	0.18		0.05			
Crop&Fertilizer History	1967	Corn 120+60+30	Corn 75+54+54	Corn 200+100+100	Corn 115+60+60	Corn 110+90+110	Corn 125+54+54
	1968	Corn 185+80+90	Idle None	Corn 200+100+150	Corn 115+60+60	Corn 110+90+110	Corn 125+54+54
	1969	Corn 130+40+40	Idle & Alf None	Corn 215+100+100	Soybeans 9+21+63	Corn 110+90+110	Oats-Alf 80+54+54

1) The sixth and seventh round represent a different tile than the previous samples. This line has a surface inlet and a manure pile may have affected the drainage water.

(Table 3. continued)

Sampling Period		Sample Site: Meeker			Sample Site: Renville		
		Burgstahler M-1	Peterson M-2	Pravecher M-3	Muetzel R-1	Scheibel R-2	Wertish R-3
1st round Oct. 1968	Tile	0.021	0.016	0.013	0.008	0.006	0.058
2nd round April-May 1969	Tile	0.01	0.01	0.03	0.03	0.06	0.05
	Ditch	0.01	0.15				0.15
3rd round April-May-June 1969	Tile	0.04	0.01	0.02	0.03	0.07	0.01
	Ditch	0.01	0.24			0.02	0.01
4th round April-May-June 1969	Tile	0.02	0.04		0.01	0.02	0.01
	Ditch	0.01	0.47			0.01	0.01
5th round April-May-June 1969	Tile	0.01	0.01	0.01		0.02	0.02
	Ditch	0.03	0.61			0.01	0.01
6th round April-May-June 1969	Tile		0.02	0.01			
	Ditch		0.40				
7th round April-May-June-July 1969	Tile						
	Ditch						
Crop&Fertilizer History	1967	Soybeans None	Corn	Corn 100+100+100	Soybeans None	Corn 150+100+100	Idle & Oats None
	1968	Corn 130+90+90	Corn 147+25+25	Corn 215+84+108	Corn 115+108+54	Corn 180+100+100	Oats None
	1969	Corn 140+68+68	Corn 147+25+25	Corn 90+100+100	Corn 140+102+98	Corn 200+75+75	Corn 115+50+50

(Table 3. continued)

Sampling Period		Sample Site: Sibley: Forsberg S-1	Sibley: Kuhlman S-2	Sibley: Lagerstedt S-3	Sibley: Lundgren S-4	Wright: Booth W-1B	Wright: Streich W-2	Wright: Varner W-3
1st round Oct. 1968	Tile	0.005	0.030	0.007		0.01	0.01	0.032
2nd round April-May 1969	Tile	0.02	0.04	0		0.01	0.05	0.03
	Ditch	0.14	0.21	0.18	0.04			0.17
3rd round April-May-June 1969	Tile	0.02	0.01		0.04	0.01	0.04	0.09
	Ditch	0.01	0.04	0.07	0.01			0.16
4th round April-May-June 1969	Tile	0.01	0.01	0.01	0.01	0.02	0.08	0.03
	Ditch	0.01	0.01	0.04	0.01			
5th round April-May-June 1969	Tile	0.01	0.02	0.01	0.04		0.04	0.03
	Ditch	0.01	0.01	0.78	0.03			
6th round April-May-June 1969	Tile	0.01	0.01	0.01	0.01			
	Ditch	0.03	0.01	0.05	0.04			
7th round April-May-June-July 1969	Tile	0.04						
	Ditch	0.03						
Crop&Fertilizer History	1967	SwCorn & Corn 100+36+36	Soybeans 6+24+24	Soy & Corn None	Alfalfa	None	Corn 14+37+48	Corn 120+85+85
	1968	Corn 137+124+142	Oats None	Soybeans 6+24+24	Sugarbeets 100+85+250	Plowed Fall None	Corn 165+37+48	Corn 120+85+85
	1969	Corn 194+90+97	Soybeans 12+48+48	Soybeans None	Corn & Oats 75+60+30	Fallow None	Corn 165+37+48	Oats & Alf 15+60+60

Table 4. Potassium concentration and conductivity of selected samples.

County	Farm	Code #	Sample Round	Site	[K] ppm	Conductivity mmhos/cm
Kandiyohi	Damhof	K-1-3	3	Tile	3.8	1.1
	"	K-1-3	3	Ditch	8.5	1.0
	"	K-1-4	4	Tile	3.0	0.7
	"	K-1-4	4	Ditch	2.2	0.7
	"	K-1-5	5	Tile	2.2	0.7
	"	K-1-5	5	Ditch	0.6	1.1
	Johnson	K-2-2	2	Ditch	5.6	1.1
	"	K-2-4	4	Tile	28.4	1.4
	"	K-2-4	4	Ditch	6.7	1.0
	Pioneer Seed Corn	K-3-3	3	Tile	0.8	1.0
	"	K-3-3	3	Ditch	7.1	1.0
	"	K-3-4	4	Tile	1.0	0.8
	"	K-3-4	4	Ditch	3.0	0.7
	"	K-3-5	5	Tile	0.8	0.8
	"	K-3-5	5	Ditch	3.1	0.8
McLeod	Huebert	Mc-1-3	3	Ditch	5.9	1.3
	Katzenmeyer Farms	Mc-2-3	3	Tile	0.6	0.6
	"	Mc-2-4	4	Tile	0.4	0.6
	Rickert	Mc-3-2	2	Tile	0.4	0.4
Meeker	Burgstahler	M-1-2	2	Tile	2.1	1.2
	"	M-1-2	2	Ditch	3.0	0.9
	"	M-1-3	3	Tile	1.4	0.9
	"	M-1-3	3	Ditch	3.6	1.0
	"	M-1-4	4	Tile	0.9	0.8
	"	M-1-4	4	Ditch	3.9	1.0
	Peterson	M-2-2	2	Tile	1.2	0.6
	"	M-2-2	2	Ditch	4.6	0.3
	"	M-2-3	3	Tile	1.0	0.5
	"	M-2-3	3	Ditch	6.9	0.3
	"	M-2-4	4	Tile	1.4	0.7
	"	M-2-4	4	Ditch	10.6	0.5
	Pravecher	M-3-2	2	Tile	0.7	0.7
	"	M-3-3	3	Tile	0.7	0.7

(Table 4. continued)

County	Farm	Code #	Sample Round	Site	[K] ppm	Conductivity mmhos/cm
Renville	Muetzel	R-1-2	2	Tile	1.5	0.9
	"	R-1-3	3	Tile	1.8	0.9
	Scheibel	R-2-3	3	Tile	1.6	0.7
	"	R-2-3	3	Ditch	1.6	0.7
	"	R-2-4	4	Tile	0.9	0.6
	"	R-2-4	4	Ditch	2.6	0.6
	Wertish	R-3-3	3	Tile	2.0	1.4
	"	R-3-3	3	Ditch	5.8	0.9
	"	R-3-4	4	Tile	3.0	1.5
	"	R-3-4	4	Ditch	4.4	1.0
Sibley	Forsberg	S-1-3	3	Tile	1.1	0.6
	"	S-1-3	3	Ditch	2.6	0.7
	"	S-1-4	4	Ditch	2.0	0.5
	"	S-1-4	4	Tile	0.8	0.3
	Kuhlman	S-2-3	3	Tile	2.0	0.6
	"	S-2-3	3	Ditch	2.9	0.7
	"	S-2-4	4	Tile	1.9	0.4
	"	S-2-4	4	Ditch	2.3	0.5
	Lagerstedt	S-3-3	3	Tile	0.7	0.8
	"	S-3-3	3	Ditch	5.4	0.8
	"	S-3-4	4	Tile	0.4	0.4
	"	S-3-4	4	Ditch	2.5	0.5
	Lundgren	S-4-2	2	Tile	0.9	0.6
	"	S-4-2	2	Ditch	2.3	0.7
	"	S-4-3	3	Tile	0.6	0.5
Wright	Booth	W-1A-1	1	Tile	0.4	0.4
	"	W-1A-2	2	Tile	0.8	0.7
	"	W-1B-1	1	Tile	0.3	0.5
	"	W-1B-2	2	Tile	0.4	0.7
	"	W-1B-3	3	Tile	0.1	0.4
	"	W-1B-4	4	Tile	0.4	0.5
	Streich	W-2-1	1	Tile	1.0	0.7
	"	W-2-2	2	Tile	1.0	0.8
	"	W-2-3	3	Tile	0.5	0.5
	"	W-2-4	4	Tile	0.7	0.7
	Varner	W-3-2	2	Creek	4.3	0.6
	"	W-3-2	2	Tile	0.8	0.5
	"	W-3-3	3	Creek	3.3	0.6
	"	W-3-3	3	Tile	1.3	0.6
	"	W-3-4	4	Tile	1.0	0.4

Table 5. Crop and fertilizer history of sample fields

County & Farm	Code #	Crop & Fertilizer (lbs. per acre) 1966	1967	1968	1969
Kandiyohi					
Damhof	K-1		Corn 120+60+30	Corn 185+80+90	Corn 130+40+40
Johnson	K-2		Corn 75+54+54	Idle None	Idle & Alf None
Pioneer Seed Corn	K-3		Corn 200+100+100	Corn 200+100+150	Corn 215+100+100
McLeod					
Huebert	Mc-1		Corn 115+60+60	Corn 115+60+60	Soybeans 9+21+63
Katzenmeyer Farms	Mc-2		Corn 110+90+110	Corn 110+90+110	Corn 110+90+110
Rickert	Mc-3	Corn 125+54+54	Corn 125+54+54	Corn 125+54+54	Oats & Alf 80+54+54
Meeker					
Burgstahler	M-1		Soybeans None	Corn 130+90+90	Corn 140+68+68
	M-1B		No Fertilizer Ever Applied		
Peterson	M-2		Corn	Corn 147+25+25 Heavy Manure	Corn 147+25+25 Heavy Manure
Pravecher	M-3	Corn	Corn 110+100+100	Corn 215+84+108	Corn 90+100+100

(Table 5. continued)

County & Farm	Code #	Crop & Fertilizer (lbs. per acre) 1966	1967	1968	1969
Renville					
Muetzel	R-1		Soybeans None	Corn 115+108+54	Corn 140+102+98
Scheibel	R-2	Corn 130+100+80	Corn 150+100+100	Corn 180+100+100	Corn 200+75+75
Wertish	R-3	Corn	Idle & Oats None	Oats None	Corn 115+50+50
Sibley					
Forsberg	S-1		SwCorn & Corn 100+36+36	Corn 137+124+142	Corn 194+90+97
Kuhlman	S-2	Soybeans 6+24+24	Soybeans 6+24+24	Oats None	Soybeans 12+48+48
Lagerstedt	S-3	Soybeans	Soybeans & Corn None	Soybeans 6+24+24	Soybeans None
Lundgren	S-4		Alfalfa	Sugarbeets 100+85+250	Corn & Oats 75+60+30
Wright					
Booth	W-1A	Alfalfa None	Wheat None	Corn 110+40+40	Diverted None
Booth	W-1B	Alfalfa None	None	Plowed Fall None	Fallow None
Streich	W-2	Alfalfa	Corn 14+37+48	Corn 165+37+48	Corn 165+37+48
Varner	W-3	Corn 120+85+85	Corn 120+85+85	Corn 120+85+85 Heavy Manure	Oats & Alf 15+60+60 Heavy Manure

SOIL TESTING

John Grava

Currently the University of Minnesota Soil Testing Laboratory processes more than twenty three thousand samples annually. The following data show the number of various types of samples analyzed in 1969.

Regular farm, garden and lawn samples		17,955
Florist (Greenhouse) samples		1,647
Specials:	Sulfur	1,267
	Zinc	834
	Soluble Salts	265
	pH	424
Limestone		44
Departmental research samples		1,101
	Total	23,537

The monthly distribution of regular soil samples received by the laboratory is shown in Table 1.

Table 1. Monthly distribution of soil samples received by the University of Minnesota Soil Testing Laboratory during 1969.

Month	Number of Samples
January	610
February	687
March	987
April	3,310
May	1,334
June	559
July	842
August	1,388
September	2,882
October	2,704
November	1,585
December	1,067

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