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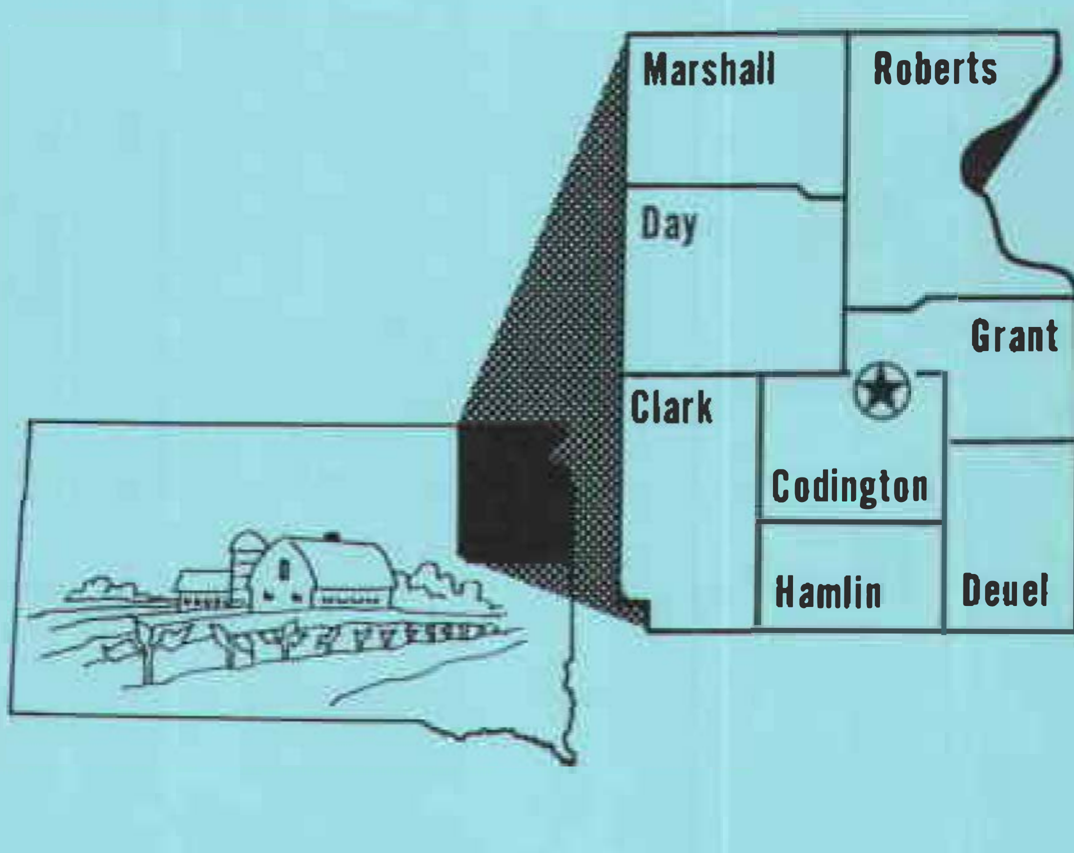
ANNUAL PROGRESS REPORT

January 1987

1986 ANNUAL PROGRESS REPORT Northeast Research Station Watertown, South Dakota



PLANT SCIENCE DEPARTMENT
South Dakota State University
Brookings, South Dakota 57007

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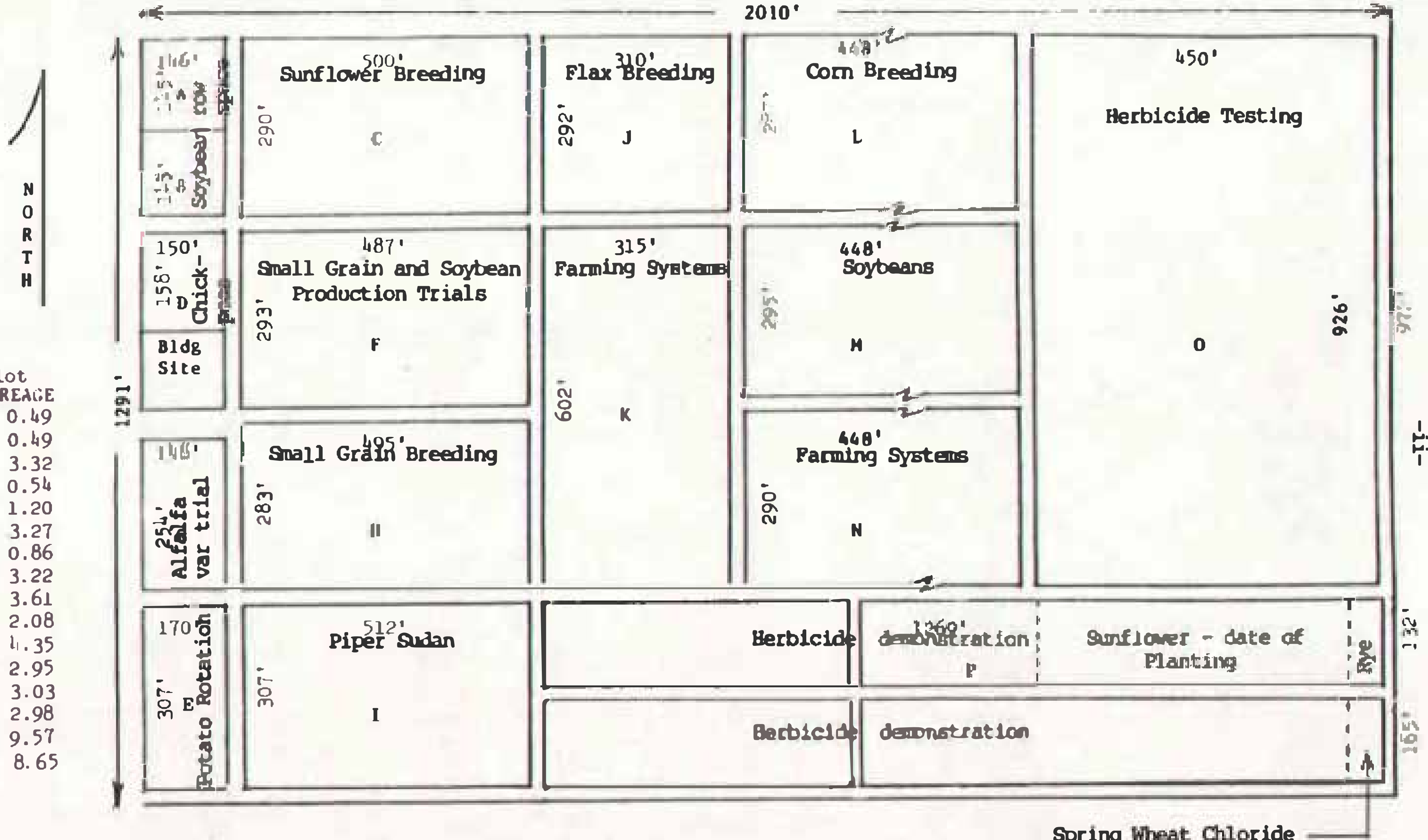
Land use
Northeast Research Station (Watertown)
Year 1986



Plot ACREAGE

Plot	Acreage
A	0.49
B	0.49
C	3.32
D	0.54
E	1.20
F	3.27
G	0.86
H	3.22
I	3.61
J	2.08
K	4.35
L	2.95
M	3.03
N	2.98
O	9.57
P	8.65

ROADWAYS
25 feet wide
Acreage in farm 59.6
Experimental Acreage 50.5

ANNUAL PROGRESS REPORT, 1986
Northeast Research Station
Watertown, South Dakota

A word to characterize the 1986 growing season would be 'wet'. Precipitation for the season was 8.1 inches above normal. Rainfall in April and May was over 5 inches above normal, which hampered field operations. The majority of crops were planted in a timely manner, although seedbed conditions were frequently less than ideal. The excess moisture also interfered with herbicide performance. The wet spring followed by frequent rains and heavy dews in June and July resulted in significant disease development in most of the small grain crops. Leaf rust, stem rust, Septoria, tan spot and bacterial diseases were prevalent, and no doubt were yield-limiting on susceptible varieties. The heavy disease pressure did afford the small grain breeders an excellent opportunity to evaluate progress in development of resistant varieties.

There were no significant disease or insect problems in flax, corn or soybeans, and yields were very good. Ascochyta blight devastated the chickpea variety trial, and it was not possible to obtain yield data. Above normal precipitation in August and September resulted in considerable head rot in sunflowers. Sclerotinia head rot was most severe with lesser amounts of Rhizopus and Botrytis head rot. Several area fields had 60 to 70% of the heads infected with Sclerotinia, and conservative yield loss estimates ranged from 20 to 30%. A complicating factor with this disease is its effect on future rotation plans. This fungus survives as long-lived sclerotia (fungal bodies) in the soil and a heavily infected field will produce large quantities of sclerotia. These in turn will present a threat to future susceptible crops such as dry beans, potatoes and sunflowers. Current recommendations for heavily infected fields suggest a 7 - 8 year rotation between susceptible crops and a 4 year rotation for fields with light infection levels. Both October and November were below normal in precipitation which allowed for timely row crop harvest and fall tillage operations.

Approximately 300 people attended the summer field tour. Producers were able to obtain first hand information on disease development and lodging in small grains as well as alfalfa, flax and small grain variety development. The tour also included herbicide demonstrations and discussions of row crop insects and the farming systems studies. The area Crop Improvement Associations sponsored a meal which was very capably prepared by the area County Agents. Two tours scheduled in September were both cancelled because of rain.

NOTE: Much of the information contained in this report is based on ongoing studies and results should therefore be considered tentative. This report does not contain detailed tabular information concerning small grain, flax and soybean performance. This information is available in Extension Circulars EC 774 and EC 775, and is available at County Extension offices. Results of the herbicide demonstrations are also not included and this information is available in the 1987 Herbicide Report (EC678).

AGRICULTURAL ADVISORY GROUP, 1986
Northeast Research Station, Watertown, SD
Lyle Kriesel, Chairman

Laird Larson	Clark County	86-89
Sherman Hustel	Roberts County	83-86
Lynn Eberhart	Marshall County	84-87
Steve Witt	Day County	84-87
Edwin Krause	Deuel County	83-86
Randy Frederick	Hamlin County	84-87
Lyle Kriesel	Grant County	84-87
Harlan Haugen	Codington County	86-89
Orrin Korth	Codington County	Permanent
Maurice Horton	SDSU, Head, Plant Science Department	
Loyal Evjen	Ag. Technician	
Merlin Fleming	Summer Field Assistant	
James Smolik	SDSU, Station Manager	

Extension Service

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Lorne Tilberg	Marshall County
Jim Wilson	Day County
Dale Wiitala	Deuel County
Donald Guthmiller	Hamlin County
Bob Schurrer	Codington County

Table 1. Growing season precipitation

Month	Amount (in.)	Normal	Departure	Greatest Amount	Date
April	5.55	2.10	+3.45	2.20	14
May	4.64	2.97	+1.67	1.70	8
June	3.62	3.75	-0.13	1.32	10
July	4.14	2.67	+1.47	1.90	31
August	3.11	2.78	+0.33	0.97	7
September	4.19	1.85	+2.34	0.92	16
October	0.13	1.16	-1.03	0.09	24
Total:	25.38	17.28	+8.10		

Temperatures: Last frost - 24° F, May 2
First frost - 22° F, October 9
Frost free period: 159 days

APPLICATION OF CHLORIDE FOR WHEAT

R. Gelderman, J. Gerwing, P. Fixen, and B. Farber

PURPOSE

Recent studies in North Dakota, South Dakota and Oregon have shown that added fertilzer chloride can increase wheat yields. There are a number of explanations for why this response occurs. In South Dakota, research has shown a definite reduction in foliar leaf diseases such as tanspot and leaf rust. Not all of the yield response can be explained by the disease reduction, however. Other explanations for this yield increase are being looked at.

The South Dakota work indicates that a soil test for chloride can successfully be used to determine which soils will respond to additional chloride. The objective of this experiment at Watertown and others conducted throughout eastern South Dakota was: to determine the rate of chloride fertilization that is needed to achieve yield increases for wheat.

METHODS

The design of the experiment to answer the rate question consisted of five levels of chloride. The rates used were 0, 20, 40, 50, and 80 pounds per acre of chloride. This was applied as potassium chloride - the common 0-0-60 grade fertilizer. Adequate nitrogen and phosphorus were also applied to eliminate them as limiting factors. Each chloride rate was repeated five times within the experiment area. The site used at the station had wheat as the previous crop with a chisel-disc tillage operation. Because of extremely wet soil conditions, Marshall wheat was planted on May 22, 1986. The fertilizer was broadcast on the surface one day after seeding. Yields were taken with a small plot combine August 28, 1986.

The soil tests taken at planting were as follows:

Chloride (0-24") lb/A	19 (low)
Nitrate-N (0-24") lb/A	4 (low)
Organic Matter %	3.6 (medium)
Phosphorus lb/A	64 (v. high)
Potassium lb/A	250 (high)
pH	6.1
Texture	Fine

RESULTS

The average yields (five replications) for the Watertown station site (Codington Co.) and the other seven sites are shown in Table 2.

Table 2. Yields of chloride rate studies, 1986.

Experiment Site	Chloride Rate lb/A 0	20	40	60	80	Response	Variety	Soil Chloride Level
	yield, bu/A							
Codington	34	37	39	39	36	yes	Marshal	low
Day	24	31	34	38	35	yes	Len	medium
Spink 1	48	49	47	45	48	no	Marshal	high
Spink 2	27	32	30	29	29	yes	Butte	medium
Faulk	35	36	36	35	36	no	Len	low
Potter	41	45	47	46	47	yes	Butte	low
Hughes	34	38	37	38	38	yes	Butte	low
Hyde	23	26	26	27	27	no	Butte	low

The yields at the station were good considering the late planting date. There was a definite increase to added chloride at this site. A 5 bu/A yield increase was seen with addition of 40 lb/A of chloride (Table 2).

Because of the late planting and the excellent moisture conditions in 1986, leaf disease was heavy at this site. At the time grain fill was occurring, leaf disease reductions to added chloride were noted in the field. Samples were taken for laboratory identification of disease present and treatment effects. These data are not yet complete.

Five of the seven 1986 sites that tested low or medium in soil chloride gave yield responses to chloride (Table 2). These results are similar to previous years studies which indicated that a response to fertilizer chloride from wheat could be predicted using a soil test.

A summary of all South Dakota chloride research on spring wheat from the last several years is shown in Table 3.

Table 3. Summary of spring wheat chloride calibration data in South Dakota.

Soil Test Category	Soil Cl	No. of sites	Response frequency	Ave. Response resp. sites	Ave. Response all sites	Ave. Cl Req.* fert. Cl	Ave. Cl Req.* soil + fert. Cl
	lbs/A-2'		%	bu/A	bu/A	lbs/A-2'	lbs/A-2'
Low	≤ 30	16	69	5.0	4.0	36	58
Medium	30-60	13	31	6.3**	2.6	28	67
High	> 60	7	0	---	0.3	—	—
Total		36	42	5.4	2.8	34	60

* Average chloride required, responsive sites only.
** Three sites averaging 4.3 bu/A and 1 site at 12.3 bu/A.

SPRING WHEAT BREEDING

F. Cholick and K. Sellers

To evaluate the yield potential and yield stability of experimental lines developed by the breeding program, the Advanced Yield Trial was grown at the Northeast Research Station and eight additional locations. This trial consists of 35 experimental lines and 14 checks. Each year new promising experimental lines are added to this trial and lines are eliminated due to poor agronomic or quality characteristics. This nursery was planted on May 2nd and harvested on August 11th. Individual plots were sown at a seeding rate of 75 lbs/A adjusted for kernel size and fertilized for a 60 bu/A yield goal. Herbicides were applied for both grassy and broadleaf weeds. Broadleaf weed control was excellent. However, foxtail control particularly late in the growing season was less than desired. Mean grain yield was 49.3 bu/A. This was approximately 4 bu/A higher than the long-term average and the highest yielding site among the nine sites grown in 1986. Grain yield ranged from 60.5 to 35.2 bu/A. The highest yield group consisted of nine experimental lines ranging from 60.5 to 55.2 bu/A with the highest yielding line being SD 8026. SD 8026 is presently being increased with intent for release in 1987. The highest yielding check variety was Butte 86 (52.7 bu/A) closely followed by Stoa (52.3 bu/A). Protein content averaged 14.3% and ranged from 12.8 to 16.4%. The average of 14.3% is about one-half percent lower than the long-term average. Given the cooler temperatures, rainfall during grain fill and maturation of the 1986 crop this lower protein content is not surprising. Grain protein content is primarily determined by three inter-related factors: variety, nitrogen available, and environment. For the plant to accumulate protein in the kernel generally there has to be some stress (i.e. moisture or heat) during maturity. Test weight (lbs/bu) averaged 57.5 with a range from 54 to 62 lbs/bu. The range was similar to what was observed in previous years; however, the average was approximately 1461 bu less than the long-term averge.

In cooperation with R. Gelderman a preliminary experiment was conducted to evaluate a number of varieties to their response to different soil nitrogen levels. The primary objective was to determine if varieties differ in their grain yield and protein content at different soil nitrogen levels. The results were difficult to interpret due to high soil nitrogen levels in the 2 to 4 foot portion of the soil profile. The experiments will be repeated in 1987.

OATS RESEARCH

D. L. Reeves

The herbicide testing will probably be of the greatest interest to most people. It is being continued but we are now looking at a larger number of herbicide treatments and using fewer varieties. This year we looked at 16 different herbicide treatments on 5 varieties. The herbicides being used include 2,4-D amine, MCPA, bromoxynil, banvel and combinations of these. We are trying to see if these may be having some effect on the oats of which we are not currently aware. Unfortunately, plots this year suffered from excess rain. This will be repeated next year.

In cooperation with Tim Gutormson of the seed lab a test looking at the effects of seed size was put out this year. This test used the varieties Kelly, Burnett and Moore. For each variety five seed size treatments were used. These ranged from bulk seed through screening for size and picking. We are looking at how seed size affects seedling emergence, tiller production, grain size and yield.

The Uniform Midseason oat nursery is always grown at this station. It consists of 36 entries which are grown from New York to Kansas and Winnipeg. Most varieties adapted for South Dakota are grown in this test prior to being released. This year we had three South Dakota entries in this test.

Most of the oats we plant at this station are part of our variety development program. This year we had eight different tests of advanced lines at this station which included 220 different selections. The best of these will have a small increase plot next year and also go into a regional test. Due to the favorable growing conditions at this location, we use grain from here to determine maximum grain quality.

BARLEY AND RYE TESTING

D. L. Reeves

The Mississippi Valley barley test has been grown at this station the last three years. This is a regional test which includes some of the major varieties in addition to new lines being tested for possible release. This is the only location in South Dakota where this test is grown. There were 20 entries in the test this year.

The rye test had 11 entries planted in the fall of 1985 (Table 4). This is planned to be an annual test.

Table 4. Rye, 1986. Northeast Research Station, Watertown, SD.

Variety	Yield (bu/A)	TW (lb/bu)	Height (in.)	Protein (%)
Chulipan	80	46.2	46	11.6
Cougar	67	47.3	45	9.3
Frederick	92	51.7	46	12.6
Musketeer	94	46.2	47	11.4
Prima	87	50.2	46	12.1
Puma	73	50.0	47	13.9
Rymin	68	48.2	48	12.2
X73-19*	59	45.0	33	12.2
X83-3*	63	44.9	38	11.8
Rymin/Chulipan*	62	46.0	47	14.9

* Experimental lines from SDSU. The two numbered entries are semi-dwarfs.

The other variety tested, "Danko", was tested at the request of a company to determine its potential in South Dakota. At all locations it has suffered excessive winterkilling.

SMALL GRAIN TRIALS - CPT

J. J. Bonnemann

The Crop Performance Testing Program conducted trials with four small grains and two maturity groups of soybeans at the Northeast Farm during the 1986 cropping season. Crops seeded were spring wheat and durum, oats, barley, Group 0 and Group I soybeans. The proprietary soybean entries are the choice of the entering companies and are included on a fee basis.

Yields were generally good for the small grains (Tables 5 and 6) and excellent for the soybeans (Table 7). The soybeans were late because of the wet, cool growing season. A hard freeze several weeks earlier than recorded would have resulted in poor quality and lower yields. The results of the small grains and soybeans and more agronomic details are reported in EC 774 (rev.), 1987 Variety Recommendations (1986 Crop Performance Results) for Small Grains and Flax, and EC 775 (rev.) 1987 Soybean Recommendations (1986 Crop Performance Results). These reports are available at County Extension Offices or from the Bulletin Room, SDSU, Brookings, SD, 57007.

Table 5. Small Grain Trials, Northeast Research Farm, Watertown, SD, 1986, CPT

OATS

Entry	Height, inches	Test wt.	Yield 1986	Yield 3-yr
Bates	36	32	83	90
Benson	42	27	55	86
Burnett	43	25	48	88
Centennial	39	30	70	97
Don	37	36	101	—
Hazel	37	34	98	—
Hytest	43	37	72	97
Kelly	40	36	80	93
Lancer	38	27	64	98
Lyon	44	25	53	89
Moore	41	29	65	95
Noble	37	23	33	78
Nodaway 70	41	25	38	70
Ogle	37	23	54	99
Otee	38	27	50	75
Pierce	39	34	73	94
Porter	37	22	43	85
Preston	37	35	80	94
Proat	40	35	93	94
Sandy	43	33	77	95
Starter	39	37	83	—
Steele	39	33	101	104
Webster	37	31	74	92
Wright	39	34	77	94
Haylander II (B1)	41	28	64	90
Means	39	31	71	91

CV - % 10.4 LSD(.05) 10.4

Seeded April 29 - 4 replications

SPRING WHEAT

Entry	Height, inches	Test wt.	Yield 1986	Yield 3-yr
Alex	38	58	38	44
A99ar	38	56	36	46
Butte	36	55	29	43
Butte 86	35	58	38	—
Centa	36	56	25	39
Chris (ck)	37	58	31	37
Stoa	37	55	37	44
Angus	33	57	34	45
Apex 83	30	56	31	42
Buckshot	32	55	31	42
Celtic	33	57	40	—
Challenger	32	56	34	46
Erik	29	54	41	46
Guard	32	57	41	48
Len	30	55	31	43
Leo 747	31	54	33	—
Marshall	29	56	39	44
Norak	32	58	39	47
Norseman	29	54	41	47
Olaf	30	55	27	43
Oslo	30	55	31	45
Success	29	53	39	48
Wheaton	31	54	37	48
2369	33	58	42	49
Nordic	32	56	38	—
Telemark	28	55	34	—
Means	33	56	37	45

CV - % 9.6 LSD(.05) 9.1

Seeded April 29 - 3 replications

Table 6. Small Grain Trials, Northeast Research Farm, Watertown, SD, 1986, CPT (Cont.)

BARLEY

Entry	Height, inches	Test wt.	Yield 1986	Yield 3-yr
Azure	35	47	74	91
Bowman	32	49	61	84
Bumper	34	46	73	89
Glenn	33	45	68	82
Hazen	33	47	72	88
Larker	34	47	66	78
Morex	34	45	49	75
Primus II	34	46	64	74
Robust	32	47	65	85
B1601	35	45	65	—
Lewis	34	48	63	—
Means	34	46	65	83
CV - % 5.0		LSD(.05)	5.0	

Seeded April 29 - 3 replications

DURUM

Entry	Height, inches	Test wt.	Yield 1986	Yield 3-yr
Crosby	35	55	29	44
Edmore	36	58	28	42
Laker	29	50	22	—
Lloyd	45	47	21	41
Monroe	37	56	33	—
Rugby	36	58	35	43
Vic	35	58	28	41
Ward	36	56	31	43
Means	34	55	28	43
CV - % 9.6		LSD(.05)	3.6	

Seeded April 29 - 4 replications

Table 7. Soybean Trials, Northeast Research Farm, Watertown, SD, 1986, CPT

Group 0's

Entry	Mat. Group	Yield B/A	Height inches	Mature mo/day
Evans ck	0	51	36	9/29
Dawson	0	49	37	9/30
Pride X609	0	48	38	10/5
Pride B095	0	47	48	10/3
Arrowhead 8450	0	46	37	10/4
Hofler X1986-1	0	46	38	10/3
DeKalb CX282	0	45	35	10/4
Ozzie	0	45	34	9/29
Sands	0	45	36	10/3
King Brand KG60	0	44	35	9/30
Weber ck	I	44	39	10/9
Swift	0	44	39	10/2
Mustang M-1000	0	44	38	10/4
Weber 84 ck	I	43	41	10/10
Simpson	0	43	36	10/2
King Brand KG31	0	42	36	9/26
McCall ck	00	41	35	9/20
Dassel	0	40	32	10/3
Means		45	37	10/2

CV - % 7.1 LSD(.05) 4.5

Group I's

Entry	Mat. Group	Yield B/A	Height inches	Mature mo/day
Sands SOI X166	I	53	37	10/9
King Brand KG71	I	51	37	10/5
Stine 1350A	I	50	37	10/4
Mustang Exp-9	I	49	39	10/6
Arrowhead 8550	I	48	38	10/5
Sands SOI 142	I	47	38	10/5
Evans ck	0	47	39	9/28
Cenex 8410	I	47	37	10/5
Mustang M-1180 B1	I	46	39	10/5
Interstate 545	I	46	33	10/1
Lakota	I	46	52	10/8
Hofler Opal	I	44	36	10/5
King Brand PS80	I	44	41	10/5
Interstate 546	I	44	41	10/3
Weber ck	I	43	41	10/8
King Brand KG81	I	43	41	10/9
Sibley	I	43	39	10/5
Weber 84 ck	I	42	44	10/9
Mustang M-1120A	I	41	46	10/7
Hodson 78	I	41	39	10/4
Corsoy 79 ck	II	41	43	10/10
BSR 101	I	40	39	10/9
SRF Exp 164	I	39	43	10/4
Hardin	I	38	42	10/6
Means		45	40	10/5

CV - % 4.9 LSD(.05) 3.0

Seeded May 30, - 4 replications in each trial.

ALFALFA PRODUCTION AND MANAGEMENT

A. Boe and R. Bortnem

The 1986 growing season was good for alfalfa production. A total yield (4-cuts) high of 8.41 tons DM/A was achieved by Cimarron in its third year of production (Table 8). A grand mean of 7.19 tons DM/A was produced by the second year variety trial (Table 9). Some winterkill occurred and was noted according to variety.

Table 8. 1984 Alfalfa Variety Trial, Expt 431, Northeast Research Station, Watertown, SD 1986.

		Forage Yield (T DM/A)								
				1986					3-Yr Av	
				Cut1	Cut2	Cut3	Cut4	4-Ct		%
Variety	Dev/Supplier	1984	1985	6/17	7/16	8/28	10/14	Total	T/A	Vernal
Cimarron	Great Plains Res	4.35	6.75	3.31	1.92	2.26	0.92	8.41	6.50	111
Spectrum	Cenex Seeds	4.32	6.85	3.10	1.89	2.18	0.78	7.95	6.37	108
Big 10	Great Lakes Hyb	4.41	7.03	3.22	1.72	2.09	0.55	7.58	6.34	108
526	Pioneer Hi-Bred	4.11	7.23	3.26	1.70	2.09	0.60	7.65	6.33	108
NAPB 21	AgriPro	4.14	6.59	3.24	1.88	2.21	0.54	7.87	6.20	106
532	Pioneer Hi-Bred	4.04	6.87	3.16	1.70	2.12	0.68	7.66	6.19	105
Eagle	O's Gold Seed Co	4.05	6.53	2.98	1.98	2.11	0.76	7.83	6.14	104
Endure	PAG Seeds	4.22	6.68	3.13	1.65	2.14	0.56	7.48	6.13	104
Shenandoah	Great Plains Res	3.98	6.68	3.06	1.84	2.09	0.66	7.65	6.10	104
80-16 PCa3	Mich State Univ	4.26	6.58	3.06	1.76	2.10	0.53	7.45	6.10	104
H-150	Sexauer/Farm Seed	4.65	6.43	2.76	1.68	2.06	0.72	7.22	6.10	104
H-Phy	Cenex Seeds	3.99	6.48	3.21	1.65	2.20	0.64	7.70	6.06	103
NY 8301	Cornell Univ	3.89	6.60	3.20	1.80	2.12	0.56	7.68	6.06	103
Iroquois	NY Ag Expt Sta	4.18	6.62	3.25	1.64	2.06	0.32	7.27	6.02	102
Drummor	Northrup King	4.01	6.21	3.48	1.84	1.94	0.57	7.83	6.02	102
Decathlon	Cargill Seeds	4.03	6.20	3.12	1.85	2.14	0.70	7.81	6.01	102
Advantage	DeKalb-Pfizer	4.11	6.22	3.56	1.53	2.09	0.51	7.69	6.01	102
120	DeKalb-Pfizer	4.06	6.56	3.21	1.64	2.02	0.54	7.41	6.01	102
NY 8302	Cornell Univ	4.08	6.44	2.95	1.74	2.06	0.71	7.46	5.99	102
Apollo II	AgriPro	4.00	6.49	2.98	1.77	1.96	0.69	7.40	5.96	102
Blazer	Land O'Lakes	4.09	6.42	3.13	1.67	2.02	0.56	7.38	5.96	102
DK-135	DeKalb-Pfizer	4.08	6.49	2.62	1.86	2.18	0.64	7.30	5.96	102
H-125VW	Sexauer/Farm Seed	3.91	6.54	2.72	1.84	2.20	0.62	7.38	5.94	101
NAPB 20	AgriPro	3.97	6.36	3.11	1.72	1.92	0.57	7.32	5.88	100

Table 8. (Continued)

Variety	Dev/Supplier	1984	1985	1986 Cut1 6/17	1986 Cut2 7/16	1986 Cut3 8/28	1986 Cut4 10/14	1986 4-Ct Total	3-Yr Avg T/A	3-Yr Avg % Vernal
		Forage Yield (T DM/A)								
Vernal	Wisc Ag Expt Sta	4.01	6.41	3.17	1.45	1.92	0.64	7.18	5.87	100
Ca 7931-32	W-L Research	3.99	5.99	3.08	1.76	2.11	0.68	7.63	5.87	100
Wl 313	" "	4.05	6.08	2.94	1.67	2.16	0.72	7.49	5.87	100
LL 3018	Land O'Lakes	4.02	6.12	3.10	1.72	2.05	0.56	7.43	5.86	100
LL 3110A	Research Seeds	3.77	6.18	3.19	1.64	1.98	0.75	7.56	5.84	99
SX 217	Sexauer/Farm Seed	4.39	6.00	2.88	1.66	1.96	0.55	7.05	5.81	99
Mohawk	Cornell Univ	3.87	6.21	2.97	1.64	2.05	0.52	7.18	5.75	98
82-5	W-L Research	3.91	5.89	3.15	1.68	2.02	0.58	7.43	5.74	98
Saranac AR	NY Ag Expt Sta	4.00	5.87	3.10	1.60	2.06	0.56	7.32	5.73	98
Challenger	Cargill Seeds	4.00	6.13	2.79	1.63	2.06	0.59	7.07	5.73	98
Oneida	NY Ag Expt Sta	3.94	5.84	3.25	1.64	1.92	0.56	7.37	5.72	97
SX 424	Sexauer/Farm Seed	3.94	5.72	2.97	1.60	2.34	0.47	7.38	5.68	97
Saranac	NY Ag Expt Sta	4.07	6.14	3.18	1.44	1.79	0.30	6.71	5.64	96
F-144	Sexauer/Farm Seed	4.15	5.84	2.58	1.78	1.88	0.66	6.90	5.63	96
Valor	Land O'Lakes	3.78	6.19	2.77	1.58	1.94	0.50	6.79	5.59	95
MT-0	SD State Univ	3.90	5.99	3.07	1.29	1.68	0.05	6.09	5.33	91
Heinrichs	Agric Canada	3.64	5.76	3.20	1.54	1.65	0.14	6.53	5.31	90
Teton	SD State Univ	3.37	5.26	3.26	1.37	1.53	0.15	6.31	4.98	85
MT-1	" " "	3.68	5.22	3.15	1.15	1.39	0.04	5.73	4.88	83
Travois	" " "	3.34	5.16	3.14	1.09	1.36	0.04	5.63	4.71	80
Average		4.02	6.27	3.09	1.66	2.00	0.54	7.30		
LSD (0.05)		0.48	0.87	0.43	0.20	0.18	0.12	0.71		
CV (%)		8.60	9.98	10.05	8.67	6.54	16.36	6.95		

4/24/86 No visual winterkill.
Seeded: 4/25/84, 3 lb Eptam/A, 0.5 lb Ridomil/A, 15 lb PLS/A
Soil type: Kranzburg Silt Loam (Udic Haploboralls fine-silty, mixed)
Soil pH: 6.6

Table 9. 1985 Alfalfa Variety Trial, Expt. 531, Northeast Research Station, Watertown, SD 1986.

				1986 Forage Yield, (T DM/A)					2-Yr Avg	
				1986						
Variety	Dev/Supplier	1985 (Tot)	Winter Kill* (Av %)	Cut1 6/17	Cut2 7/16	Cut3 8/28	Cut4 10/14	4-Cut Total	T/A	% Vernal
5432	Pioneer Hi-Bred	2.50	1.0	2.96	2.01	2.20	0.76	7.93	5.22	116
Futura	Dairyland Res	2.91	2.0	3.12	1.88	2.06	0.48	7.54	5.22	116
Spectrum	Cenex Seeds	2.51	1.0	3.07	1.97	2.24	0.62	7.90	5.20	116
Cimarron	Gt. Plains Res	2.54	1.5	2.89	2.11	2.18	0.67	7.85	5.20	116
DK-135	Dekalb-Pfizer	2.91	0.5	2.72	1.92	2.17	0.68	7.49	5.20	116
Maxim	Cenex Seeds	2.41	2.0	3.09	2.04	2.21	0.58	7.92	5.16	115
Surpass	Cenex Seeds	2.66	2.2	3.03	1.90	2.14	0.55	7.62	5.14	114
Sparta	Land O'Lakes	2.63	0.5	2.94	1.93	2.07	0.66	7.60	5.12	114
Horizon	Arrowhead Inc	2.50	1.8	2.96	2.02	2.16	0.51	7.65	5.08	113
H-154	Farm Seed Res	2.74	0.5	2.61	1.97	2.16	0.64	7.38	5.06	113
DS 305	Dairyland Res	2.45	0.0	2.84	1.89	2.16	0.69	7.58	5.02	112
120	Dekalb-Pfizer	2.58	1.0	2.90	1.80	2.07	0.60	7.37	4.98	111
MN 5617	Univ of MN	2.31	1.2	2.96	1.73	2.12	0.78	7.59	4.95	110
526	Pioneer Hi-Bred	2.37	1.5	2.88	1.92	2.05	0.64	7.49	4.93	110
Magnum	Dairyland Res	2.64	2.2	2.82	1.82	2.10	0.46	7.20	4.92	110
Arrow	AgriPro	2.31	1.0	2.78	1.99	2.10	0.63	7.50	4.90	109
Iroquois	NY Ag Expt Sta	2.44	1.8	2.93	1.84	2.07	0.52	7.36	4.90	109
Vernema	WA St/USDA	2.48	1.0	2.79	1.86	2.10	0.56	7.31	4.90	109
Peak	Research Seeds	2.33	1.8	2.94	1.92	2.01	0.55	7.42	4.88	108
Thunder	AgriPro	2.47	2.5	3.03	1.80	1.96	0.49	7.28	4.88	108
MN 6216	Univ of MN	2.06	1.8	3.09	1.84	2.09	0.63	7.65	4.86	108
**Elevation	Jacques Seed Co	2.46	1.8	2.80	1.87	2.00	0.57	7.24	4.85	108
Saranac AR	NY Ag Expt Sta	2.33	1.8	2.86	1.88	2.04	0.58	7.36	4.84	108
Dawson	NE AES/USDA	2.36	1.5	3.10	1.68	2.05	0.41	7.24	4.80	107
H-156	Farm Seed Res	2.34	0.5	2.52	1.99	2.09	0.60	7.20	4.77	106
83-3-F	W-L Research	2.02	2.0	2.87	1.86	2.17	0.60	7.50	4.76	106
532	Pioneer Hi-Bred	2.22	2.8	2.45	1.88	2.08	0.82	7.23	4.72	105
XAF31	" "	2.23	1.0	2.82	1.87	1.99	0.54	7.22	4.72	105
Max 85	Seed Tec	2.31	1.8	2.82	1.77	1.96	0.57	7.12	4.72	105
Vernal	WI Ag Expt Sta	2.38	2.8	2.84	1.61	1.96	0.49	6.90	4.64	103
Endure	PAG Seeds	2.54	6.5	2.46	1.68	2.02	0.54	6.70	4.62	103
Oneida VR	Cornell Univ	2.13	1.2	2.82	1.87	1.84	0.54	7.07	4.60	102

Table 9. (Continued)

Variety	Dev/Supplier	1985 (Tot)	Winter Kill (Av %)	1986 Forage Yield, (T DM/A) 1986 Cut1 6/17	Cut2 7/16	Cut3 8/28	Cut4 10/14	4-Cut Total	2-Yr Avg T/A	% Vernal
Oneida	Cornell Univ	2.21	1.2	2.80	1.74	1.96	0.50	7.00	4.60	102
NY 8412	" "	2.05	2.5	2.80	1.74	1.87	0.68	7.09	4.57	102
Mohawk	" "	1.98	2.0	2.99	1.73	1.94	0.48	7.14	4.56	102
Agate	U of MN AES	2.25	2.2	2.83	1.68	1.89	0.46	6.86	4.56	102
Epic	Research Seeds	2.02	2.5	2.45	1.86	2.09	0.55	6.95	4.48	100
Blazer	Land O'Lakes	2.17	10.0	2.48	1.81	1.98	0.49	6.76	4.46	99
8016 PCa3	Mich State Univ	2.17	8.5	2.56	1.77	1.93	0.47	6.73	4.45	99
Megaton	Arrowhead Inc	2.31	5.0	3.08	1.67	1.64	0.15	6.54	4.42	98
MN 6209	Univ of MN	2.17	2.0	2.45	1.67	1.98	0.52	6.62	4.40	98
***Vernal	WI Ag Expt Sta	2.35	2.0	2.72	1.58	1.72	0.32	6.34	4.34	97
NY 8413	Cornell Univ	1.99	2.8	2.43	1.80	1.87	0.57	6.67	4.33	96
Saranac	NY Ag Expt Sta	1.96	2.0	2.70	1.61	1.81	0.34	6.46	4.21	94
Big 10	Great Lakes Hyb	2.21	1.8	2.24	1.56	1.88	0.42	6.10	4.16	93
Baker	NE AES/USDA	2.18	5.0	2.34	1.65	1.76	0.33	6.08	4.13	92
Average		2.35	2.2	2.80	1.82	2.02	0.55	7.19		
LSD (0.05)		0.46	NS	NS	0.15	0.16	0.12	0.81		
CV (%)		14.17	166.16	15.19	6.11	5.69	16.00	8.05		

* 4/24/86 Winerkill visual estimation.
** The variety "Elevation" was entered in 1984 tests as LL3110A.
*** Not sufficient seed on hand for tmt #33 (NK 82503), Vernal seeded as tmt #33. Average of the two Vernal as % Vernals used as % Vernal.

Seeded: 5/20/85, 12 lb PLS/A.
Soil Type: Brookings Soil (Pachic Udic Haploborolls fine-silty, mixed).
Soil pH: 6.8

1986 FLAX BREEDING

K. A. Grady and C. L. Lay

An advanced yield trial of flax experimental lines and named varieties was grown at the Northeast Research Station and three other locations in South Dakota. The same varieties and lines were also tested at several locations in North Dakota and Canada in cooperation with NDSU, USDA, and Agric. Canada. The main purpose of this test was to identify possible new varieties.

In 1986, 22 experimental lines from the SDSU flax breeding program were tested against 13 named varieties (checks) and 8 experimental lines from ND, MN, and CAN (Table 10). The highest-yielding check at the NE Research Station was Rahab at 42.3 bu/A. The highest-yielding experimental lines were SD 843018 (42.5), SD 843013 (42.3), SD 844049 (42.2), CI 3096 (43.1), and CI 3101 (42.1). The mean yield across all varieties was 38.7 bu/A.

Table 10. Yield and plant height of flax varieties in the 1986 flax South Dakota Tristate test grown at the Northeast Research Station, Watertown, SD.

Variety	Origin-Year	Seed yield (bu/A)	Plant ht. (cm)
SD843072	SD-experimental	40.6	64
SD845002	" "	40.0	63
SD844070	" "	37.2	61
SD843087	" "	40.9	60
SD843018	" "	42.5	56
SD845084	" "	37.0	69
SD844065	" "	35.2	65
SD843031	" "	41.7	62
SD845076	" "	34.9	72
SD845097	" "	38.7	67
SD844086	" "	39.1	66
SD844021	" "	37.8	66
SD843013	" "	42.3	59
SD844049	" "	42.2	62
SD84118	" "	36.9	60
SD84116	" "	40.3	60
SD84145	" "	38.0	62
SD84149	" "	38.9	61
CI 3243	" "	39.9	63
CI 3244	" "	33.9	59
CI 3245	" "	31.7	61
Linott	CAN-1966	36.6	63
Wishek	ND-1979	40.7	64
Culbert	MN-1975	38.6	59

Table 10. (Continued)

Variety	Origin-Year		Seed yield (bu/A)	Plant ht. (cm)
Culbert 79	SD-1979		41.4	61
Clark	SD-1983		41.2	62
Flor	ND-1981		38.7	63
NorLin	CAN-1983		37.8	65
Linton	ND-1985		40.5	59
NorMan	CAN-1984		41.4	60
Rahab	SD-1985		42.3	65
Dufferin	CAN-1975		39.6	64
McGregor	CAN-1982		40.5	61
CI 2938	MN-experimental		41.8	66
CI 3131	SD- "		41.8	60
CI 3096	ND- "		43.1	65
CI 3101	ND- "		42.1	66
Vimy	CAN-1986		25.3	67
CI 3107	CAN-experimental		35.3	68
CI 3133	ND- "		33.6	58
CI 3135	ND- "		35.1	63
CI 3136	ND- "		38.8	61
CI 3137	ND- "		38.3	59
		Mean	38.7	63
		C.V.	6.2	3.3

Seeded: 4/29/86
Plot size: 5 ft x 14 ft, 7 rows at 7-inch spacings.
Harvested area: 24.5 sq ft.
Harvested date: 8/8/86

CORN BREEDING AND RESEARCH

Zeno W. Wicks, III and Gary Scholten

The Northeast Research Station is one of our locations for conducting advanced yield trials on our short season experimental corn lines. These experiments were conducted to compare experimental lines from the SDSU breeding project. We select our inbred lines for earliness, fast dry down, disease resistance, insect resistance, standability, and most importantly yield. Our most promising lines are crossed with a common inbred tester to form hybrids which are tested in the advanced yield trials. This year we had advanced yield trials for white corn and yellow corn. Some of the white corn lines look promising for release this next year. In the yield trial there were 2 combinations of white corn hybrids that surpassed or equaled the yield of the Pioneer checks (3906 & 3790).

After developing a new selection scheme for drought resistance last year, this drought resistant population was yield tested in 23 locations with the Northeast Farm as one of those locations. At the NE Farm, our new population yielded 2 - 4 bu/A more than drought resistant populations developed using the old conventional methods. Over drought environments our new population yielded at least 6 bushels higher than resistant populations developed by the conventional methods. Also, 56 entries from the North Central Region (NCR2) were yield tested. These inbreds were crossed onto two common inbred testers. Yield testing over the entire North Central Region will give all the breeders from the region an idea how their inbreds will perform over environments.

In conjunction with our corn pathologist we also did some disease resistance screening for Goss' wilt. The population we developed for resistance was found to be quite resistant.

CHICKPEA RESEARCH

S. Tuwafe

In the 1986 crop season a yield trial consisted of 24 chickpea lines and a screening nursery of 54 entries at the Watertown Research Station. Due to very wet conditions, a severe epidemic of Ascochyta blight disease caused complete yield loss. However, previous research results at Watertown have shown that the crop could be grown successfully when conditions are drier than the ones observed during the current crop season.

In 1985 a total of 107 germplasm and breeding materials were evaluated for yield and adaptability in two screening nurseries (South Dakota Chickpea Screening Nursery (SDCSN) and Chickpea International Screening Nursery (CISN-84). Forty-seven and sixty lines in SDCSN and CISN-84, respectively, were tested for various agronomic characters including yield. Most of the entries in SDSCN exhibited very low yields. A range of 210 to 1237 lb/A was observed for yield. Among the 47 entries 16 failed to grow, four showed higher yields that 1000 lb/A, and the remaining showed much lower yields. The check had the highest yield. Varietal mean (547 lb/A) was low. The CISN-84 nursery entries showed much better yields than the ones in SDCSN. Seed yield in CISN-84 ranged from 406 to 1844 lb/A, check entries showed approximately 1000 lb/A, and the varietal mean (988 lb/A) was much higher. Over 30 entries showed higher yields than the yield (970 lb/A) of the best check.

RESPONSE OF SELECTED CORN HYBRIDS TO FERTILIZER

J. Smolik and L. Evjen

Objective:

Determine if a selected group of corn hybrids respond differentially to nutrient stress.

Methods:

Thirteen commercial corn hybrids and one open pollinated line (Reid yellow dent) were planted on May 15 in 2 row plots 20' long with 3' row spacing. Lasso II was banded at 7 lb/A for weed control. Fertilized plots received 80 lb N and 30 lb P prior to planting. Plots were cultivated twice and hand harvesting was completed October 30. Each of the treatments was replicated four times. We thank representatives of companies listed in Table 11 for supplying corn seed.

Results and Discussion:

The overall yields in this study were 20 - 25 bu less than what was expected based on corn yields in other locations at the station. The lower yields apparently were a result of the uneven stands obtained with the cone-planter. Stands were consistently uneven across entries and replications and thus we feel the objective of the study was fairly tested. The yield response to fertilizer was highly significant (Table 11). Also, the analysis of variance revealed no significant entry by fertilizer interaction. The lack of a significant interaction indicates that none of the entries responded differentially to nutrient stress. Entries that yielded highest with fertilizer also tended to be highest yielding when nutrients were withheld.

Table 11. Response of selected corn hybrids to fertilizer.

		Fertilized		Not Fertilized	
Entry	Maturity	Yield (Bu/A)	Moisture	Yield (Bu/A)	Moisture
Stauffer S3303	95	86.1[a]	29%	47.0	22%
Pioneer 3906	91	85.3	25%	52.0	25%
PAG SX123		83.7	22%	50.0	20%
Pioneer 3881	83	82.9	25%	53.1	29%
Stauffer 2202	90	82.8	22%	46.7	24%
Pioneer 3953	74	81.7	20%	37.0	20%
PAG SX180		80.1	28%	47.4	24%
Stauffer S2184	85	78.9	28%	45.6	23%
Cenex 2096	95	77.6	27%	47.9	30%
Sokota 270	85	73.6	24%	50.9	23%
Sokota 222	82	69.4	23%	48.7	24%
Cenex 2093	95	68.9	20%	39.7	25%
Sokota 204	80	65.7	21%	45.2	21%
Open Pollinated		55.5	31%	33.3	31%
		FLSD = 10.6 Bu.			

[a] Avg of four replications. Yield increase due to fertilizer significant (P>.01)

POTATO FUNGICIDE SEEDPIECE TREATMENT TRIAL

D. Gallenberg and L. Evjen

Objective:

Test the effectiveness of three common fungicide seedpiece treatments on stand counts of two potato cultivars.

Materials and Methods:

Plots were planted on May 16, 1986 in a randomized complete block design. Rows were spaced at approximately 38" with 12" between seedpieces in the row. Individual treatments consisted of 50' sections of row, and were replicated four times. In addition to the check, the three fungicide seedpiece treatments consisted of: captan plus streptomycin (fir bark dust), mancozeb (slurry), and thiophanate methyl (dust). Certified seed of the cultivars Norchip and Kennebec were used for planting.

Stand counts were taken at 6 weeks after planting, using % emergence in randomly selected 20' row sections. Plots were observed periodically throughout the season for disease development.

Results:

Table 12 contains the results of stand counts for each of the treatment x cultivar combinations. There were no significant differences among treatments within either cultivar, although thiophanate methyl performed the best in both cases. Some variability was due to skips in the planting process.

Disease pressure during the season was low. Some Rhizoctonia was observed in all treatments at harvest.

Yields of the two cultivars (averaged over all treatments) converted to 207.9 cwt/A for Norchip, and 224.4 cwt/A for Kennebec after 133 days.

Table 12.

Cultivar	Treatment	Stand count[a]
Norchip	captan plus streptomycin	78.8
	mancozeb	75.0
	thiophanate methyl	81.3
	check	68.8
	LSD	13.3
Kennebec	captan plus streptomycin	78.8
	mancozeb	75.0
	thiophanate methyl	83.8
	check	75.0
	LSD	11.5

[a] % emergence in 20' row sections; average of 4 replications; 6 weeks after planting.

SOYBEAN ROW SPACING STUDY

R. G. Hall and L. A. Evjen

Objective:

To determine the effects of soybean plant population and row spacing on yields at the Northeast Farm.

Methods and Procedures:

1. Varieties: Simpson
2. Plant populations: 150-, 175-, and 200-thousand plants per acre.
3. Row spacings: 7-, 14-, 21-, 28-, and 35-inch row spacings.
4. Seeding: Plots consisting of each combination of plant population (3), and row spacings (5) were replicated four times and seeded on May 30, 1986. Each plot measured 20 ft. long and plot width was 105 inches for 21-, and 35-inch row spacings, 12 inches for 14- and 21-inch row spacings, and 119" for 7-inch row spacings. All plots had a 3-foot spacing between adjacent plots.

   Plots were seeded with a cone drill seeder having 9 ports on 7-inch spacings.
5. Weed control: Lasso 4E (2 lbs. act/A)
6. Harvesting and threshing: Plots were machine harvested on October 16, 1986. Plot yields were weighed and a subsample was obtained for clean seed determinations. Final plot yields were adjusted according to the amount of clean seed obtained from the subsample.

Results:

Analysis of variance procedures indicated there was a significant (5% level of probability) main effect for row spacing. A plot of yield versus row spacing (Fig. 1) shows the 7-inch was significantly lower in yield compared to the other row spacings. In turn the 14-inch row spacing resulted in the highest yields and was similar in yielding potential to the 21- and 28-inch row spacings. In contrast, the 35-inch row spacing was significantly lower than the 14-inch spacing, but was similar to the 21- and 28-inch spacings.

There were no other main effects or interaction between population and row spacing. The yield resulting from each population was 31 bushels/A (200,000 and 150,000 plants per acre) and 29 bushels/A (175,000 plants per acre).

In summary, the soybean row spacing study at this location indicates the best row spacings would be the 14-, 21-, or 28-inch row spacings. Any of these spacings would be suitable provided the population seeded will result in a final plant population between 150,000 to 200,000 plants per acre.

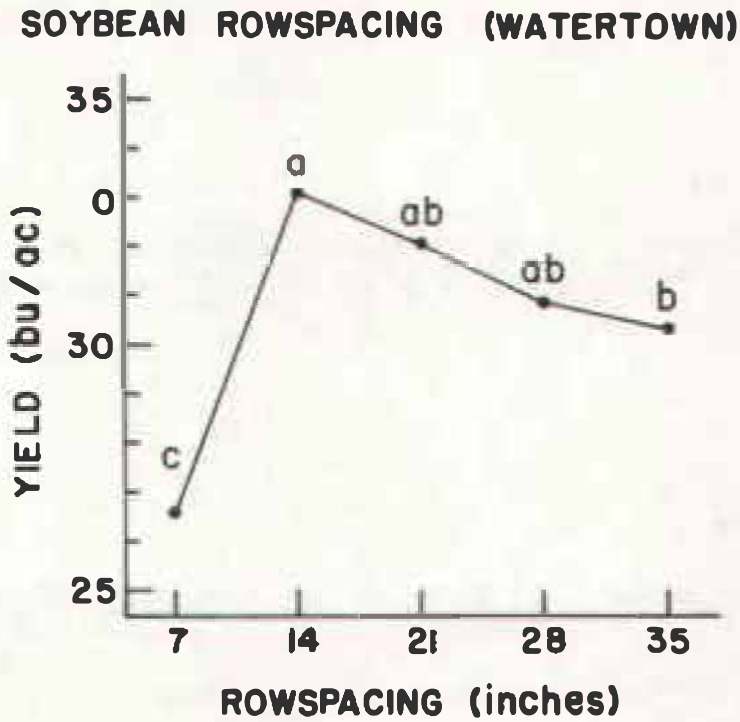


Figure 1. The relationship between yield and row spacing in soybeans at the Northeast Farm. Data points with the same letter adjacent to them are not significantly different from one another.

FARMING SYSTEMS STUDIES, 1986

Principal Investigators:

Jim Smolik (Project Leader), Paul Fixen, Jim Gerwing, Bob Hall, Bob Kohl, Russel McKinney and Leon Wrage; Ag. Technician: Loyal Evjen

Cooperators:

Robin Bortnem, George Buchenau, Tom Dobbs, Paul Evenson, Paul Johnson, Diane Rickerl and Don Taylor.

Objectives:

A. Measure yields and economic returns.

B. Determine influence of farming system on soils ability to supply plants with mineral nutrients.

C. Compare rates of soil erosion.

D. Measure beneficial and harmful arthropod populations and measure insect damage.

E. Compare populations of plant feeding, predaceous and microbial feeding nematodes.

F. Determine populations of fungi and bacteria, and measure mycorrhizal associations and soil fungistatic properties.

G. Determine effect of farming systems on earthworm populations.

H. Determine weed species present and densities.

I. Measure effect of farming systems on soil water contents.

We are pleased with the addition of several new cooperators in these studies. Dr. Diane Rickerl recently joined the Plant Science Department and she will be involved in reduced tillage research. Dr. Tom Dobbs and Dr. Don Taylor of the Economics Department will provide the economic analyses of these studies.

The farming systems studies were established in 1985. With the exception of continuous no-till winter wheat the systems consist of three or four year rotations. We envision these as comparatively long-term studies (6 - 8 years) since the effects of rotations are best measured after completion of several cycles. The plots are relatively large scale (3000 sq. ft. in Study I and 2000 sq. ft. in Study II) in an attempt to minimize border effects. The systems under study and the rotation schedules are shown in Tables 13 and 14.

Table 13. Farming Systems Study I - Rotation Schedule

Treatment	
A Alternate (organic)- no syn. fertilizer, pesticide or moldboard plow	Oats/Alf———>Alfalfa———>Soybean———>Corn
B Conventional	Corn————>Soybean———>Sp. Wheat
C Ridge-till	Corn————>Soybean———>Sp. Wheat

Table 14. Farming Systems Study II - Rotation Schedule

Treatment	
I Conventional	Soybean———>Sp. Wheat———>Barley
II Minimum-Till	Soybean———>Sp. Wheat———>Barley
III Alternate (organic) - no pesticide, syn. fertilizer or moldboard plow	Oats-Sweet Clover———>S. Clover———>Soybean———>Sp. Wheat
IV Continuous no-till winter wheat	

Cultural practice information for the various systems is presented in Tables 15 - 18. Fertilizer and herbicide inputs in the conventional, ridge-till, no-till and min-till systems are based on current Plant Science Department recommendations.

Table 15. Cultural practice information - farming systems studies.

Study I	Planting date	Fertilizer N-P-K (lb/A)	Manure	Herbicide (Actual/A)	Hand weeding (hr/A)
Corn					
Alternate	May 19	—		—	—
Conventional	May 14	100-0-0		Lasso II, 7 lb. band	—
Ridge-till	May 19	100-0-0		Lasso II, 7 lb. band	—
Soybean					
Alternate	May 28	—			1.14
Conventional	May 20	—		Treflan 1 1/2 pt.	1.07
Ridge-till	May 19	—		Lasso II, 7 lb. band, Blazer 1 1/2pt + Poast 1 1/2 pt	1.34
Spring Wheat					
Conventional	April 29	90-0-0		Hoelon 2 pt. + MCPA 1/2 pt.	—
"Ridge"-till	April 29	90-0-0		Hoelon 2 pt. + MCPA 1/2 pt.	—
Oats/Alfalfa	April 23	—	2 T/A dry matter (equivalent to 32.7 - 31.1 - 143.0 lb/A N-P-K) Applied in Sept.	—	—
Alfalfa		—			—

NOTE: Seeding rates (lbs/A); Oats 48, Alfalfa 9.5, Spring Wheat 75.

Table 16. Cultural practice information - farming systems studies.

Study I	Tillage Pre-Plant	Tillage Post-Plant
Corn		
Alternate	Disc and field cultivate	Rotary hoe 2X and Cultivate 2X, fall disc
Conventional	Disc and field cultivate	Cultivate 2X
Ridge-till	—	Cultivate 2X, ridge at last cultivation
Soybean		
Alternate	Disc and field cultivate	Rotary hoe once and Cultivate 2X
Conventional	Disc 2X	Cultivate 2X
Ridge-till	—	Cultivate 2X
Spring Wheat		
Conventional	Field cultivate and disc	Fall plow
"Ridge"-till	Field cultivate	Ridges built post harvest w/ridge-till cultivator
Oats/Alfalfa	Disc 2X, field cultivate + harrow	
Alfalfa	—	Subsurface sweep and chisel in Sept.

Note: The "ridge"-till spring wheat was seeded with a hoe-drill. All row crops in these studies are planted in 36" rows.

Table 17. Cultural practice information - farming systems studies.

Study II	Planting date	Fertilizer N-P-K (lb/A)	Herbicide (Actual/A)	Hand weeding (hr/A)
Spring Wheat				
Alternate	May 21	—	—	—
Conventional	April 23	90-0-0	Hoelon 2 pt + 1/2 pt MCPA	—
Minimum-till	April 23	90-0-0	Hoelon 2 pt + 1/2 pt MCPA	—
Soybean				
Alternate	May 28	—	—	2.80
Conventional	May 22	—	Treflan 1 1/2 pt	1.49
Minimum-till	May 20	—	Lasso II, 7 lb band Blazer 1 1/2pt + Poast 1 1/2 pt	1.30
Barley				
Conventional	April 23	70-0-0	Hoelon 2 pt + 1/2 pt MCPA	—
Minimum-till	April 23	70-0-0	Hoelon 2 pt + 1/2 pt MCPA	—
Oats/Sweet Clover	April 23	—	—	—
Sweet Clover		—	—	—
No-Till Winter Wheat	Sept 9	90-0-0	Fall-1 pt Roundup + 1/2 pt 2,4-D	—

NOTE: Seeding rates (lbs/A); Oats 48, Sweet Clover 9.5, Spring Wheat 75, Barley 58.

Table 18. Cultural practice information - farming systems studies.

Study II	Tillage Pre-Plant	Tillage Post-Plant
Spring Wheat		
Alternate	Disc and field cultivate	Fall chisel
Conventional	Disc and field cultivate	Fall plow
Minimum-till	—	Fall chisel
Soybean		
Alternate	Disc 2X, field cultivate	Rotary hoe once, Cultivate 2X
Conventional	Disc 2X	Cultivate 2X
Minimum-till	—	Cultivate 2X
Barley		
Conventional	Disc and field cultivate	Fall plow
Minimum-till	—	Fall chisel
Oats/Sweet Clover	Disc and field cultivate + harrow	—
Sweet Clover	—	Subsurface sweep, and chisel
No-Till Winter Wheat	—	—

NOTE: The min-till spring wheat and barley were seeded with a hoe-drill. The min-till soybeans were seeded with a ridge-till planter.

Small grain, row crop and forage yields are listed in Tables 19 - 21. As mentioned earlier we feel it will be several years before the effects of the rotations are apparent, however, we believe it is important to record yields and other data as the rotations develop. Yield of conventional spring wheat was significantly greater than "ridge"-till in Study I. This difference is difficult to explain since there was no significant difference in yield of conventional and min-till spring wheat in Study II. The development of spring wheat in both studies was slower in the reduced-till treatments, possibly as a result of cooler soil temperatures. This slower development coupled with a slightly later date of planting in Study I may have resulted in the yield decrease. Due to an error, planting of alternate spring wheat was delayed nearly one month. Therefore we estimated yield for this treatment using results of Dr. Fred Cholick's date of planting study in which a four week delay in planting reduced spring wheat yields 48% in 1986.

Conventional barley yields were significantly greater than min-till (Table 19). There was considerable lodging in the min-till treatment which apparently resulted in reduced yield. Except for oats the overall small grain yields were 10 - 20 bu higher in 1986 compared to 1985 results in these studies. Oat yields were about 30 bu less in 1986, although test weights were higher. There were significant amounts of rust in this year's oat crop, and it is also probable nutrients were limiting at this stage of the rotation which together resulted in the reduced yield. Yield of continuous no-till winter wheat was good (Table 19). However, leaf rust was moderately severe and we estimated a 10 - 15% yield loss.

Table 19. Small grain yields, farming systems studies.

	Spring wheat var. Guard	
Study I	Yield (Bu/A)[a]	Test wt.
Conventional	57.9*	54.6
"Ridge"-till	50.9	53.7
	Oats var. Moore	
	Yield (Bu/A)	Test wt.
Oats/Alfalfa	57.3	35.2

Table 19. (continued)

Study II	Spring wheat var. Guard	
	Yield (Bu/A)	Test wt.
Conventional	56.4	56.0
Alternate	55.1 (28.6)[b]	—
Minimum-till	55.8	55.9
	Winter Wheat var. Rose	
	Yield (Bu/A)	Test wt.
Continuous, no-till winter wheat	51.1	57.7
	Barley var. Robust	
	Yield (Bu/A)	Test wt.
Conventional	88.9*	48.5
Minimum-till	76.9	49.3
	Oats var. Moore	
	Yield (Bu/A)	Test wt.
Oats/Sweet Clover	60.2	34.5

[a] Avg of four replications. * Indicates significant increase at .05 level.
[b] Planted late, yield estimated - actual yield in parenthesis - see text.

Highest corn yields were obtained in the ridge-till treatment (Table 20). The wet year may have been of particular advantage to the ridge-till system since soil in ridges would have tended to dry and warm earlier than in the conventional and alternate systems. Another factor that may have been involved is the increased capability of the ridge-till planter to seed under comparatively adverse soil conditions which were experienced in this wet year. We noted a substantial difference in plant stand between systems, and at harvest there were approximately 16,000 plants/A in the alternate and conventional and 22,000 plants/A in the ridge-till. The stand in the ridge-till is higher than what is recommended for this area under dryland conditions, however, in the wet year we experienced it may have increased yield. An earlier maturing hybrid (Pioneer 3953) was used in the alternate system since this treatment is planted later. Plants in the alternate system were uneven and tended to be off-color early in the growing season. The appearance of this treatment improved considerably after mid-July, and while

yields were significantly less than the other treatments they were still quite good considering no fertilizer or herbicide was used. 1986 corn yields over all systems were approximately 30 bu/A higher than those measured in 1985.

In Study I the highest soybean yields were obtained in the alternate and conventional treatments, while yields of ridge-till soybeans were significantly reduced (Table 20). Reasons for the lower yields in ridge-till were not readily apparent, although there did appear to be more weed pressure in this treatment early in the season. Interestingly, in Study II the reverse occurred, and yield of min-till soybeans was significantly higher than conventional and alternate. Again, there were no obvious reasons for this difference. Soybean yields in the conventional and min-till systems were similar to those obtained in 1985, however, yields in the alternate system were approximately 10 bu/A higher than those obtained last year.

Table 20. Row crop yields - farming systems studies.

Study I	Corn - Pioneer 3906 Yield (Bu/A) No. 2
Conventional	114.6[a]
Ridge-till	119.6
Alternate (Pioneer 3953)	99.5
FLSD .05 =	4.6
	Soybeans - Simpson Yield (Bu/A) 13% Moisture
Conventional	28.1
Ridge-till	24.7
Alternate	29.8
FLSD .05 =	2.8
	Soybeans - Simpson
Study II	Yield (Bu/A)
Conventional	29.4
Minimum-till	33.3
Alternate	27.5
FLSD .05 =	2.9

[a] Avg of four replications.

The above normal precipitation resulted in very good alfalfa yields (Table 21). Sweet clover forage was not removed after cutting since the primary purpose of this crop is to improve soil nutrition and tilth and, along with alfalfa, to aid in erosion and weed control.

Table 21. Forage crop yields - farming systems studies.

Study I	1st Cutting (June 18)	2nd Cutting (July 15)	3rd Cutting (Aug 28)	Total (T/A) Dry Matter
Alfalfa - Vernal	2.52	1.63	1.99	6.14
Study II				
Sweet Clover (not removed)	1.36			1.36

[a] Avg of four replications.

Tissue analysis (% N-P-K):		
Alfalfa	1st cutting,	2.4-0.23-2.16
	2nd cutting,	3.23-0.29-2.34
	3rd cutting,	3.06-0.32-1.80
Sweet Clover		1.78-0.26-2.16

Preliminary estimates of cash costs per acre for the various farming systems are listed in Table 22. Input costs in the alternate systems were approximately 38 to 44% less than those in the other systems. Reduced costs in the alternate system result not only from elimination of herbicides and synthetic fertilizer, but also the inclusion of a forage crop in the rotation. As indicated, these are preliminary estimates and are based on what we planned to do in 1986. The actual cash costs will probably be somewhat different since some of the inputs were altered from original plans. We hope to have a more complete set of costs and returns available for next summer's tour.

Table 22. Preliminary estimates of cash costs in farming systems studies.[a]

Study I	Alternate	Conventional	Ridge-Till
Average Cash Costs/A	$36.20	$58.87	$57.67

Study II	Alternate	Conventional	Min-Till	Continuous Winter Wheat
Average Cash Costs/A	$31.82	$51.07	$50.77	$56.87

[a] Estimates prepared by Ron Thaden, Economics Department.

There were interesting differences in the incidence of Fusarium (a root rot fungus) on soybean roots in the various systems (Table 23). Corn is involved in the rotations in Study I and the overall incidence of Fusarium was substantially higher in this study. Also, it has been reported that trifluralin (Treflan) may enhance Fusarium in soybean roots. Treflan was used in the conventional treatment in Study I and incidence of Fusarium was higher in this treatment, although the difference is not statistically significant. Treflan was also applied in the conventional treatment in Study II where it had no effect on Fusarium incidence. These systems were sampled once in early September and it appears it may be worthwhile to obtain additional samples over the growing season in 1987.

Table 23. Incidence of Fusarium on roots of soybean-farming systems studies.

	Study I			Study II	
	Primary Root	Secondaries		Primary Root	Secondaries
Alternate	23[a]	49	Alternate	9	19
Conventional	33	59	Conventional	4	20
Ridge-Till	29	51	Min-Till	19	26

[a] Percent of roots with lesions - Average of 4 reps. Data collected by Colette Beaupré, Plant Science Department.

There was very little difference in weed populations in corn between systems (Table 24). Numbers of annual grasses appeared to be substantially higher in conventional and ridge-till soybeans compared to alternate. The types of annual grasses were similar to those present in 1985, however, the broadleaf population shifted from prostrate pigweed in 1985 to populations dominated by dandelion, pigweed and smartweed in 1986. The higher incidence of smartweed was likely a result of the above normal precipitation. In study II grassy weed numbers were higher in min-till soybeans and annual broadleaf populations were higher in alternate soybeans (Table 25). The very high numbers of annual grasses in the alternate spring wheat is probably a result of the late planting date. Compared to conventional, grassy weed numbers were higher in both min-till barley in Study II and "ridge"-till spring wheat in Study I.

Table 24. Weed populations - farming systems studies.

Study I	Alternate	Conventional	Ridge-till
Corn			
Annual grasses	15[a]	15	14
Annual broadleaves	4	4	2
Soybeans			
Annual grasses	5	14	11
Annual broadleaves	4	4	6

Table 24. (Continued)

	Alternate	Conventional	Ridge-Till
Spring Wheat			
Annual grasses	—	7	12
Annual broadleaves	—	4	5
Oats/Alfalfa			
Annual grasses	31		
Annual broadleaves	2		
Alfalfa			
Annual grasses	22		
Annual broadleaves	7		

[a] Number/3 sq ft - avg of four replications - green and yellow foxtail dominant grasses. Dandelion, pigweed and smartweed were most common broadleaves. Sampled August 14.

Table 25. Weed populations - farming systems studies.

Study II	Alternate	Conventional	Minimum-till
Soybean			
Annual grasses	6[a]	4	25
Annual broadleaves	11	4	5
Spring Wheat			
Annual grasses	34	1	8
Annual broadleaves	10	9	9
Barley			
Annual grasses	—	11	21
Annual broadleaves	—	11	15
Oats/Sweet Clover			
Annual grasses	20		
Annual broadleaves	8		
Sweet Clover			
Annual grasses	3		
Annual broadleaves	5		
Continuous No-Till Winter Wheat			
Annual grasses			27
Annual broadleaves			11

[a] Numbers/3 sq ft - avg of four replications, green and yellow foxtail dominant grasses. Oxalis, dandelion, pigweed and smartweed were most common broadleaves. Sampled August 14.

Dagger nematode populations increased substantially over the growing season in oats overseeded to alfalfa and sweet clover (Tables 26 and 27). This nematode has been associated with significant damage to alfalfa in Iowa and, while numbers in these studies are currently low to moderate, it will be worthwhile to continue population measurements. Dagger nematode numbers were also quite high in alternate soybean in Study II. The effects of this nematode on soybean have not been well documented, but it is probable that high populations would cause significant damage. The highest populations of earthworms (Oligochaeta) occurred in alternate corn in Study I and alternate soybean in Study II. In general, earthworm numbers declined over the growing season in both studies.

Table 26. Nematode and earthworm populations - farming systems studies.

Study I	Sampling date	Dagger	Lance	Earthworm
Corn				
Alternate	June	7[a]	3	23
	October	8	2	1
Conventional	June	8	6	14
	October	12	45	1
Ridge-till	June	12	1	9
	October	19	1	2
Soybean				
Alternate	June	3	10	12
	October	9	3	3
Conventional	June	6	3	8
	October	2	1	9
Ridge-till	June	5	1	4
	October	4	0	3
Spring Wheat				
Conventional	June	40	2	6
	August	10	17	5
"Ridge"-till	June	12	1	5
	August	31	4	6
Oats/Alfalfa	June	6	3	8
	August	119	14	5
Alfalfa	June	13	1	6
	October	34	4	2

[a] Number/500 cc soil - Average of four replications.

Table 27. Nematode and earthworm populations, farming systems studies.

Study II	Sampling date	Dagger	Lance	Earthworm
Spring Wheat				
Alternate	June	10[a]	8	14
	August	79	24	6
Conventional	June	1	1	7
	August	2	5	8
Minimum-till	June	14	2	3
	August	11	3	5
Soybean				
Alternate	June	146	3	20
	October	109	0	1
Conventional	June	65	12	15
	October	46	14	2
Minimum-till	June	22	19	6
	October	9	2	1
Barley				
Conventional	June	16	22	7
	August	44	70	10
Minimum-till	June	21	7	3
	August	101	38	5
Oats/Sweet Clover	June	5	3	6
	August	56	11	12
Sweet Clover	June	98	38	7
	October	63	52	11
No-Till Winter Wheat	June	10	6	6
	August	79	3	7

[a] Number/500 cc soil - Average of four replications.

The highest populations of total plant feeding nematodes occurred at harvest in conventional and ridge-till soybeans in Study I and in conventional and min-till soybeans in Study II (Tables 28 and 29). It is noteworthy that these high populations occurred in the conventional and reduced-till treatments in both studies. Although it is too early in this project to attribute this response to the rotations it will be interesting to determine if this continues in future years. Nematodes included among the plant feeders are stunt, spiral, pin, lesion, lance, dagger and the Tylenchinae. The dominant plant feeder in the above soybean treatments was the pin nematode. This nematode is not usually considered to be highly damaging, however, it is capable of reducing plant growth at high populations.

Populations of predaceous nematodes tended to decline over the growing season in most crops in Study I, while in Study II numbers generally increased. Predaceous nematodes feed on a variety of soil animals including microbial feeding nematodes. Numbers of microbial feeders generally declined over the growing season in Study I and increased in most instances in Study II, which may account in part for the population responses of the predators.

NOTE: Different extraction techniques are employed in collecting data in Tables 26 and 27 vs 28 and 29. Numbers in Tables 26 and 27 are based on 500 cc (ca 1 pint) of soil and residues are collected on a 100 mesh screen. This screen collects primarily larger nematodes (including most of the dagger and lance) and the Oligochaeta (earthworms), and allows the use of a coarse screen in the Baermann funnel which increases the extraction efficiency for the larger worms. Incidently, most of the worms included in the Oligochaeta counts are very tiny (1/8 - 1/4" long) members of this group. Data in Tables 28 and 29 is based on extractions from 100 cc of soil using a 400 mesh screen. The use of a 400 mesh screen also requires the use of a finer screen in the Baermann funnel, which in our experience can retard the passage of the larger nematodes and the Oligochaeta.

Table 28. Plant feeding, predaceous and microbial feeding nematode populations, farming systems studies.

Study I	Sampling date	Plant Feeding	Predaceous	Microbial Feeding
Corn				
Alternate	June	387[a]	788	755
	October	468	459	646
Conventional	June	253	576	859
	October	354	271	350
Ridge-till	June	369	493	571
	October	173	197	688
Soybean				
Alternate	June	140	617	1209
	October	778	547	634
Conventional	June	114	571	1673
	October	1336	534	741
Ridge-till	June	363	780	771
	October	1997	550	359
Spring Wheat				
Conventional	June	130	421	876
	August	285	530	1018
"Ridge"-till	June	105	263	576
	August	193	380	834
Oats/Alfalfa	June	146	404	629
	August	414	380	684
Alfalfa	June	256	209	493
	October	318	118	388

[a] Number/100 cc soil - Average of four replications.

Table 29. Plant feeding, predaceous and microbial feeding nematode populations, farming systems studies.

Study II	Sampling date	Plant Feeding	Predaceous	Microbial Feeding
Spring Wheat				
Alternate	June	185[a]	795	1180
	August	348	463	1475
Conventional	June	43	96	396
	August	88	138	716
Minimum-till	June	243	280	494
	August	348	280	804
Soybean				
Alternate	June	176	513	1405
	October	230	359	917
Conventional	June	93	479	775
	October	1821	1109	971
Minimum-till	June	131	205	513
	October	2123	680	471
Barley				
Conventional	June	55	238	598
	August	301	488	798
Minimum-till	June	80	405	801
	August	300	255	1016
Oats/Sweet Clover	June	80	329	668
	August	346	434	1192
Sweet Clover	June	126	305	829
	October	101	547	1468
Continuous No-Till Winter Wheat	June	134	304	1014
	August	239	413	747

[a] Number/100 cc soil - Average of four replications.

Populations of plant feeding and predaceous arthropods were highest in alfalfa in an early season sampling (Table 30). In general, insects were not a problem in any of the systems in 1986 except for sweet clover, where clover weevils caused light to moderate damage. It has been noted in other studies that this weevil can be a problem in smaller plantings of sweet clover, however, it is seldom a problem in field-scale plantings. Low populations of corn borers were also detected, but numbers were not sufficient to cause significant damage. Grasshopper populations reached moderate levels in the grassed roadways and two malathion sprays were applied to these areas early in the season.

Table 30. Arthropod populations in alfalfa, sweet clover and winter wheat - farming system studies.

	Plant feeding	Predaceous
Alfalfa	42[a]	33
Sweet Clover	12[b]	9
Continuous no-till winter wheat	21[c]	3

[a] Number/100 sweeps, Avg of 4 reps. Dominant plant feeders were root weevils, dominant predators were ladybird beetles.

[b] Number/4 sq. ft. Avg of 4 reps. Dominant plant feeders were clover weevils - damage was light to moderate.

[c] Number/100 sweeps. Avg of 4 reps. Dominant plant feeders were leaf hoppers.

Sampled May 16.

Assays for soil fungistatic properties, mycorrhizal associations and populations of several soil fungi are currently incomplete. No information relative to soil nutrients was collected in 1986, we plan to obtain soil samples for nutrient analyses in spring, 1987.

SUNFLOWER INSECT STUDIES

G. Hein and L. Evjen

I. Banded Sunflower Moth Population Monitoring

Objectives:

1. To determine if populations of banded sunflower moth were present in Codington County.

2. To determine the seasonal occurrence of the banded sunflower moth in Codington County.

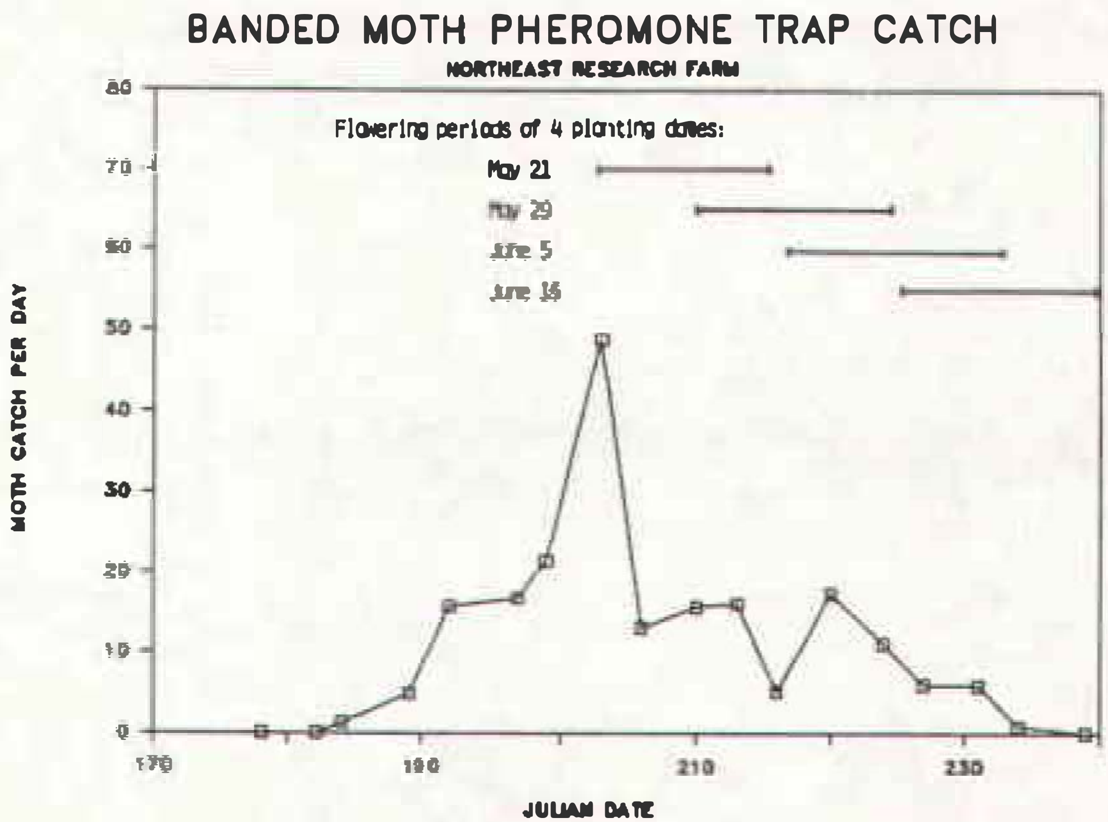
Materials and Methods:

Delta-type sticky traps, baited with banded sunflower moth sex pheromone sources, were placed out at two locations on the Northeast Research Station. The trap locations were on the edge of a June 16 planting of sunflowers adjoining the station. The traps were monitored twice per week, beginning on June 20 and ending on August 29. Checking the traps consisted of counting and removing the banded sunflower moths in the trap. Traps were replaced with fresh sticky traps periodically through the season.

Results:

The first capture of moths was observed on July 3, and moth catches gradually rose to a peak of 49 moths per trap per day (Figure 2). Moth captures dropped off sharply and gradually declined to zero in late August. Sex pheromone traps attract only male moths. Therefore, the sharp decline in moth captures after July 22 does not necessarily mean that moth populations were declining. It is likely that the drop in catch is the result of competition with females emitting their own pheromone and males seeking to mate. This study demonstrates the presence of relatively high populations of banded sunflower moth present at the Northeast Research Station. High populations of banded sunflower moth were present during the latter part of July and mating and subsequent oviposition is likely to begin at this time.

Figure 2.



Date	JDate	Trap 1	Trap 2	MN catch	Catch/day	Comments
June 20	171					*Traps out
June 24	175	0	0	0.00	0.00	
June 27	178	0	0	0.00	0.00	
July 1	182	0	0	0.00	0.00	
July 3	184	1	4	2.50	1.25	
July 8	189	38	11	24.50	4.90	
July 11	192	52	43	47.50	15.83	
July 16	197	46	122	84.00	16.80	
July 18	199	34	52	43.00	21.50	*Traps replaced
July 22	203	208	183	195.50	48.88	
July 25	206	64	15	39.40	13.17	
July 29	210	61	65	63.00	15.75	
Aug. 1	213	22	75	48.50	16.17	
Aug. 4	216	19	12	15.50	5.17	*Traps replaced
Aug. 8	220	57	82	69.50	17.38	
Aug. 12	224	49	40	44.50	11.13	
Aug. 15	227	22	14	18.00	6.00	
Aug. 19	231	26	21	23.50	5.88	
Aug. 22	234	3	2	2.50	0.83	
Aug. 27	239	0	0	0.00	0.00	
Aug. 29	241	0	0	0.00	0.00	

II. Sunflower Date of Planting.

Objective:

Determine the influence of planting date on sunflower yield and on banded sunflower moth and seed weevil damage.

Materials and Methods:

Two varieties (Sigco 432 and 455) were each planted on four planting dates from May 21 to June 16. These eight treatments were used in a randomized complete block design with four replications. Plots were eight rows (36" rows) wide and 40 feet long. The average plant stand for all the planting dates was 16,400 plants per acre.

At harvest 1/500 acre areas of each plot were harvested and machine threshed to determine yield. Separate samples were hand threshed and used to determine seed weevil and banded sunflower moth infestations. Five stalks per plot were dissected to determine the number of insect exit holes (Apion) and the number of insects infesting the stalks.

Disease incidence was also evaluated in the plots. The incidence of Sclerotinia head rot was determined by counting the number of heads showing disease symptoms in approximately 0.002 acres. These estimates were taken in all plots on October 1 and again on October 20.

The stalks that were dissected to determine insect infestations were also evaluated for the severity of stalk rot and rated on a 0-4 scale. The scale was divided as follows:

0 = clean stalk; no discoloration
1 = areas of discoloration present, but not severe enough to form cavities
2 = discoloration and cavities found; total cavity length less than two inches
3 = discolored cavities of total length from two to six inches
4 = discolored cavities totalling greater than six inches

Results:

The plots in this study were subjected to a great deal of insect pressure. The May 21 planting date was flowering at the time that the banded sunflower moths were beginning to mate and the female moths were searching for oviposition sites (see Figure 2). As a result, the early planted plots were heavily infested with banded moth (Table 31). There was a significant reduction in banded moth damage with the later planting dates. Also, there were dramatic differences in the yield and oil content of the different planting dates. These differences are likely the result of heavy banded moth damage and also some sunflower head moth damage in the early planting dates.

There were no differences between varieties or planting dates for seed weevil damage, stalk rot infestation, or insects/stalk (Mordellidae and

Dectes). However, there were significant differences between planting dates for Apion exit holes, with the earlier planting dates showing higher infestations.

The presence of Scerotinia head rot throughout the plots was evident. Significant differences in head rot were obtained, with the later planting dates showing a higher incidence of head rot.

Table 31. Northeast Research Station date of planting study.

Variety	Planting date	Yield #/A	Oil %	Banded moth % damage	Seed weevil % damage
Sigco 432	May 21	239 C	32.3 D	64.3 A	15.3
Sigco 432	May 29	584 B	34.8 C	36.8 B	21.5
Sigco 432	June 5	821 B	37.8 BC	21.3 C	17.3
Sigco 432	June 16	765 B	38.0 B	7.5 D	21.8
Sigco 455	May 21	683 B	36.5 B	41.7 B	16.8
Sigco 455	May 29	1422 A	40.9 A	20.0 C	16.3
Sigco 455	June 5	1257 A	40.5 A	10.0 D	12.0
Sigco 455	June 16	1203 A	40.0 A	6.5 D	23.3
		Sclerotinia % infected	Stalk rot	Exit holes	Insects stalk
Sigco 432	May 21	5.4 DE	2.6	3.2 AB	0.6
Sigco 432	May 29	1.8 E	2.7	3.9 A	0.8
Sigco 432	June 5	12.5 BCD	1.8	2.5 ABC	0.7
Sigco 432	June 16	18.6 ABC	2.4	1.2 CD	0.7
Sigco 455	May 21	9.4 DE	2.0	2.7 AB	1.5
Sigco 455	May 29	20.8 AB	2.7	2.1 BCD	1.2
Sigco 455	June 5	11.9 CD	2.4	2.1 BCD	1.0
Sigco 455	June 16	25.2 A	2.1	1.0 D	1.3

All values are expressed as means of four replications.
Means sharing the same letter did not differ significantly according to Duncan's New Multiple Range Test.

III. Control of Stalk-Infesting Insects with Furadan and Magnum.

Objective:

Determine the degree of control of stalk-infesting insects for Magnum seed treatment and Furadan 15G applied in the seed furrow at planting.

Materials and Methods:

Three treatments were planted on May 21 in a randomized complete block design with four replications. The treatments were Furadan 15G placed in the seed furrow at a rate of 1.0 lb a.i./A, seed treated with Magnum at a rate of 1.0 lb/CWT, and an untreated check. The variety IS 987 was used. A poor seedbed resulted in a less than desired plant stand of 11,000 plants/A. Treatment plots were two rows by 40 ft with two buffer rows between each plot.

Yields were determined by harvesting and threshing heads in 1/500 A. Five stalks per plot were split and the number of exit holes, the presence of stalk infesting insects, and a stalk-rot rating were determined.

Results:

The results from this study are summarized in Table 32. There were no significant differences between the three treatments. The severity of stalk rot in all plots was evident. Also, bird damage throughout these plots was severe and estimated to be about 44% of the seed.

Table 32. Northeast Farm, Furadan-Magnum study.

Treatment	Yield (#/A)	% Oil	Stalk rot	Exit holes	Stalk insects
Furadan 15G 1.0#	762	42.4	3.3	1.4	1.0
Magnum 1.0#/CWT	599	41.4	3.5	2.8	1.3
Untreated check	740	41.3	3.2	2.3	1.1

SUNFLOWER HYBRID TRIALS

C. Lay and K. Grady

Table 33. Hybrid sunflower yield trial grown at South Shore, SD in 1986.

Hybrid Identification	Seed Yield (lbs/A)	Plant Height (in)	Lodging %
Agassiz 747	1287	70	5
Agassiz 767	1542	68	18
AH 747	1281	70	8
Cargill 205	1077	70	8
Cargill 207	1307	78	7
Cargill 208	1780	59	0
Cenex 6101	1274	71	2
Cenex 8101	982	74	0
Challenger	1160	69	2
DO 705	1383	74	0
DO 730	1294	75	2
DO 855	1270	73	2
Hybrid 894	1302	70	2
Hysun 33	1142	91	18
Hysun 354	1623	67	5
IS Exp 51011	1165	76	2
IS Exp 51012	648	86	57
IS Exp 51014	715	82	43
IS 3001	1410	74	0
IS 3007	975	74	0
IS 3312	863	73	2
IS 7111	1183	73	0
IS 7116	1352	80	0
Jacques Exp 8611	1731	71	3
Keltgen K066	1497	75	2
Keltgen K070	1290	73	0
Seedtec X30084	1319	74	10
Seedtec 316	1473	76	0
Seedtec 317	1726	76	2
SF 100	2162	63	0
SF 103	1400	76	3
Sigco 465	1710	73	0
Sigco 475	2234	76	3
Sokota 2057	1057	74	0
Sokota 5000	1420	74	2
Stauffer EX8413	1600	72	3
Stauffer S1296	1235	69	0
Stauffer 1300	1258	65	0
Stauffer S1424	1204	75	2
Sunbred 262	1489	78	3
Sunbred 277	1715	75	0
Sunbred 285	1456	74	3
Test Mean	1356	74	5
CV (%)	11	4	142
LSD (10%)	206	4	10

Planting date, June 1; Harvest date Nov. 19.

NOTE: This test was infested with both Sclerotina head and stalk rot which may have accounted for some of the observed lodging.

WEED CONTROL DEMONSTRATIONS

L. J. Wrage, P. O. Johnson and W. E. Arnold

Weed control demonstration plots provide comparisons of herbicide treatments under similar conditions. Plots are evaluated visually for weed control and crop effects. Treatments selected are those that are labeled or may be labeled in the near future. Rates used are those best suited for the site based on previous research. Plots are used for tours and data collected and plot visuals are used in educational programs.

The herbicide demonstration program has been expanded to include more of the major crops in the area. The demonstrations established in 1986 are listed below. Data are available in EMC 678, 1987 Herbicide Report and recommendations are printed in extension fact sheets available at county extension offices.

CORN WEED CONTROL. 40 treatments.
SOYBEAN WEED CONTROL. 36 treatments. Two-year averages.
SUNFLOWER WEED CONTROL. 19 treatments. Two-year averages.
POTATO HERBICIDES. 19 treatments. Three-year average. Yield harvested.
FLAX HERBICIDES. 20 treatments. Replicated; harvested for yield. Two-year data.
ALFALFA ESTABLISHMENT. 13 treatments. Two-year average.
EDIBLE BEANS. 20 treatments. Two-year average.

CORN HERBICIDE DEMONSTRATION

L. J. Wrage, P. O. Johnson, and W. E. Arnold

PURPOSE:

To evaluate performance of labeled herbicides in corn. Herbicide demonstration plots for this crop were added to the demonstration area to provide side-by-side comparisons under local conditions. The plots were included on field tours and the information used in educational programs. Special treatments were added to evaluate reduced rates as a possible cost-cutting option.

METHODS:

Plot Design: Demonstration, 20' x 50'
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH, 4.7% O.M.
Crop: TX-49
Planted: 5/20/86
Cultivation: None
Herbicide: Plot sprayer; 20 gpa
PPI: 5/19/86; 2X small tandem disk, 4-5" cut
SPPI: 5/19/86; 1X small tandem disk, 3-4" cut
PRE: 5/20/86
POST: 6/9/86; foxtail-1 lf, broadleaves emerging
LPOS: 6/20/86; foxtail 2-4 lf; pigweed 4-5 lf; mustard 4-5 lf; lambsquarters 5-6 lf.
Evaluated: 7/21/86

RESULTS:

Plots were visually evaluated for percent grass and broadleaf weed control. Data are presented in the table below. Cost per acre for each treatment is included for additional information. Prices are based on dealer survey response for small quantities.

Foxtail pressure was moderate. Redroot pigweed, mustard and lambsquarter pressure was light but continued to develop as the season progressed. Yellow foxtail was the predominant grass escape in treated plots.

Excellent weed control was obtained with several treatments. Rainfall the first week after application provided optimum conditions for preemergence herbicides. Atrazine or Bladex provided excellent broadleaf control; fourteen treatments exceeded 90% control of all species. Delayed or improper incorporation of Eradicane or Sutan+ reduced grass control at least 10%. Atrazine in the postemergence combinations provided excellent broadleaf control. Information from these plots is incorporated into the herbicide publications; FS 525C, "Weed Control in Corn".

1986 Corn Herbicide Demonstration

Treatment	lb/A act.	Percent Weed Control 1986 Gr	Percent Weed Control 1986 Bdlf	Cost/A
PREPLANT INCORPORATED				
Eradicane Extra	4	84	83	$ 20.45
Eradicane (8-12 hour delay)	4	75	57	12.85
Eradicane+Bladex+atrazine	4+1.5+.5	90	96	21.10
Sutan+	4	84	53	13.15
Sutan+ +atrazine	4+1	98	98	15.35
Sutan+ +Bladex	4+2	96	91	22.70
Sutan+ (Incorp. 1X w/field cult slow)	4	82	50	13.15
Sutan+ +Bladex+atrazine	4+1.5+.5	96	92	21.42
SHALLOW PREPLANT INCORPORATED				
atrazine	2.5	93	99	5.45
Lasso	3	87	92	16.15
Dual	2.5	89	74	16.05
PREEMERGENCE				
atrazine	2.5	97	99	5.45
Bladex	3	92	94	14.35
Lasso	3	88	89	16.15
Dual	2.5	95	92	16.05
Prowl	1.5	80	84	9.05
Ramrod	6	74	84	24.85
*Harness	2.5	91	96	----
Lasso+atrazine	2+1	96	96	12.95
Lasso	2	82	84	10.80
Lasso+Bladex	2+2	84	90	20.35
Dual	1.75	76	42	11.22
Dual+atrazine	2+1	96	98	15.00
Dual+Bladex	2+2	98	94	22.40
atrazine+Bladex	.75+2.25	88	98	12.40
Ramrod+Bladex	4+2	91	84	26.15
Lasso+Bladex+atrazine	2+1.5+.5	97	98	19.05
POSTEMERGENCE				
Prowl+atrazine 1/	1.5+1	90	98	11.20
Prowl+Bladex 1/	1.5+1.5	91	92	16.20
Atrazine+crop oil 1/	1.5+1 qt.	90	98	4.25
Bladex+X-77 1/	2+.38	88	83	11.55
Tandem+Bladex+atrazine+X-77 1/	.5+1+.5+.38	91	94	19.85

1986 Corn Herbicide Demonstration (Continued)

Treatment	lb/A act.	Percent Weed Control 1986 Gr	Bdlf	Cost/A
PREEMERGENCE & POSTEMERGENCE				
Bladex&Bladex 1/	2.5&1	90	88	$ 16.75
Ramrod&Banvel 1/	4&.5	84	86	23.70
Ramrod&Banvel 2/	4&.25	86	91	20.15
Ramrod&2,4-D amine 2/	4&.5	82	82	17.55
Ramrod&bromoxynil 2/	4&.38	75	84	24.75
Ramrod&bromoxynil+atrazine 2/	4&.25+.5	75	94	23.05
Ramrod&Banvel+atrazine 2/	4&.25+.5	75	94	21.22
Ramrod&Banvel+atrazine+oil 2/	4&.25+.5+1 qt	78	96	23.22

*Experimental treatment.

Gr=Grass
Bdlf=Broadleaf

SOYBEAN HERBICIDE DEMONSTRATION

L. J. Wrage, P. O. Johnson, and W. E. Arnold

PURPOSE:

To evaluate performance of labeled herbicides in soybeans. Demonstration plots provide side-by-side comparisons of treatments established under similar conditions. These plots provide area producers an opportunity to compare treatments on tours; the information is used in educational programs. Treatments in this study compare reduced rates and new application techniques for some treatments.

METHODS:

Plot Design: Demonstration; 10' x 50'
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH; 4.7% O.M.
Crop: Corsoy 79
Planted: 5/20/86
Cultivation: None
Herbicide: Plot sprayer; 20 gpa
- PPI: 5/19/86; 2X small tandem disk 3-4 in cut
- SPPI: 5/19/86; 1X small tandem disk; 2-3 in cut
- PRE: 5/20/86
- POST: 6/20/86; foxtail 2-4 lf; pigweed 4-5 lf; lambsquarters 4-6 lf; smartweed and mustard 3-6 lf.

Evaluated: 7/21/86

RESULTS:

Plots were visually evaluated for percent grass and broadleaf weed control. Data are presented in the table below. Cost per acre for each treatment is included for additional information. Prices are based on dealer survey response for small quantities.

Green and yellow foxtail densities were moderate and uniform. Yellow foxtail was the dominant escape in treated plots. Broadleaved weeds inclide redroot pigweed, lambsquarters, Pennsylvania smartweed, and wild mustard; infestation was light and uniform.

Foxtail control was very good for several treatments. Broadleaf control exceeded 90% for several combination treatments. Less than labeled rates of Treflan did not provide suitable control; grass control was reduced when Treflan was impregnated on dry fertilizer and incorporated. Preemergence treatments provided a high level of control; soil condition was good in the plot area; there was one inch of rain within the first week after application. Information from these plots is incorporated into the extension weed control publication, F.S. 525B, "Weed Control in Soybeans".

1986 Soybean Herbicide Demonstration

Treatment	lb/A act.	Percent Weed Control 1986 Gr	Bdlf	2-Year Avg. Gr	Bdlf	Cost/A
PREPLANT INCORPORATED						
Check	-----	0	0	—	—	$ 0.00
Treflan	.5	71	65	—	—	3.35
Treflan	.75	83	72	84	72	5.05
Treflan	1	87	78	—	—	6.70
Treflan (fertilizer impregnated)	.75	30	22	—	—	5.05
Treflan (PPI 1 pass field cult slow)	.75	76	65	—	—	5.05
Sonalan	1.1	90	84	92	81	8.85
Prowl	1.25	86	86	88	76	7.50
Treflan+Command	.75+1	90	90	—	—	19.75
Treflan+Sencor/Lexone	.75+.38	88	92	88	92	15.25
Reward	2.5	67	55	80	45	9.00
*Prowl+Scepter	1.25+.125	94	94	—	—	-----
SHALLOW PREPLANT INCORPORATED						
Lasso	3	73	81	70	63	16.15
Dual	2.5	86	80	69	58	16.00
PREPLANT INCORPORATED & PREEMERGENCE						
Treflan+Sencor/Lexone& Sencor/Lexone	.75+.25&.38	94	98	—	—	21.85
Treflan&Sencor/Lexone	.75&.5	98	99	—	—	18.50
PREEMERGENCE						
Amiben	3	86	81	72	66	25.65
Lasso	3	90	86	84	64	16.15
Dual	2.5	93	76	80	56	16.00
*Harness	2.5	96	91	94	84	-----
*Cinch	1.25	90	50	—	—	-----
Command	1.25	94	69	—	—	18.40
Command+Sencor/Lexone	1+.25	97	96	—	—	21.45
Lasso+Sencor/Lexone	2+.5	94	96	91	89	24.20
Dual+Sencor/Lexone	2+.5	93	96	89	90	26.25
Lasso+Amiben	2+2	89	91	88	86	27.85
Lasso+Lorox	2+1	86	86	88	85	23.90
Lasso+Modown	2+1.5	84	88	88	91	19.45

1986 Soybean Herbicide Demonstration

Treatment	lb/A act.	Percent Weed Control 1986 Gr	1986 Bdlf	2-Year Avg. Gr	2-Year Avg. Bdlf	Cost/A
PREEMERGENCE & POSTEMERGENCE						
Lasso&Basagran+oil	2&1+1 qt	80	94	76	90	$ 35.35
Lasso&Basagran+28%	2&1+4	80	94	—	—	34.30
Lasso&Blazer/Tackle+ X-77	2&.5+.38	87	96	80	94	23.10
Lasso&Dyanap	2&2.5	80	91	—	—	18.35
Lasso&Blazer/Tackle+ Basagran+X-77	2&.38+.5+.186	83	94	78	93	39.50
Lasso&Blazer+ Basagran+10-34-0	2&.38+.5+1	80	94	—	—	38.45
POSTEMERGENCE						
Fusilade 2000+oil	.187+1 qt	85	0	—	—	18.10
Poast+oil	.2+1 qt	82	0	—	—	15.90
Poast+Blazer/Tackle+ Basagran+oil	.3+.25+.5+1 qt	72	88	83	92	44.30

*Experimental treatment.

Gr=Grass
Bdlf=Broadleaf

SUNFLOWER HERBICIDE DEMONSTRATION

L. J. Wrage, P. O. Johnson, and W. E. Arnold

PURPOSE:

To evaluate the performance of herbicides for annual weed control in sunflower. Herbicides are used on over 75% of the acreage. Demonstration plots provide side-by-side visual comparisons under local conditions and provide information for educational programs.

METHODS:

Plot Design: Demonstration
Plot Size: 10' x 60'
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH; 4.7% O.M.
Crop: SF 102
Planted: 5/20/86
Cultivation: None
Herbicide: Plot sprayer; 20 gpa; 40 psi
PPI: 5/19/86; 2X small tandem disk
SPPI: 5/19/86; 1X small tandem disk
PRE: 5/20/86
POST: 6/20/86; foxtail 2-4 lf; pigweed 4-5 lf; Russian thistle 2 in.
Evaluated: 7/21/86

RESULTS:

Plots were visually evaluated for percent weed control. Data are presented for 1986 and for a 2-year average (1985-86) in the table below. Cost per acre for each treatment is included for additional information. Prices are based on dealer survey response for small quantities.

Green and yellow foxtail pressure was moderate. Redroot pigweed and Russian thistle pressure was moderate and uniform. Plots were not cultivated; weed pressure caused significant visual crop growth reduction as the season progressed. Generally, weed control was 5 to 10% lower than in previous years. Only one treatment provided over 90% control of both grass and broadleaves. Eptam, Sonalan, Treflan preplant incorporated and several combination treatments provided over 85% grass control; however at least one cultivation would have been required for maximum control. Sonalan alone and Sonalan or Treflan preplant incorporated followed by Amiben preemergence were the most effective treatments.

Experimental postemergence treatment of Poast was effective on grass; Assert controlled wild mustard but did not provide adequate control of other broadleaves.

Recommended rates of Treflan were superior to the lowest rate. This illustrates the effect of using reduced rates as a cost-cutting measure.

Two-year averages provide evaluations over a greater range of conditions. Several treatments provided 90% or greater grass control when averaged over two years.

1986 Sunflower Herbicide Demonstration

Treatment	lb/A act.	Percent Weed Control 1986 Gr	Percent Weed Control 1986 Bdlf	2-Yr. Avg. Gr	2-Yr. Avg. Bdlf	Cost/A
PREPLANT INCORPORATED & POSTEMERGENCE						
Check	—	0	0	—	—	$ 0.00
*Eptam&Assert	2&.187	75	44	—	—	—
PREPLANT INCORPORATED						
Eptam	3	88	52	90	56	9.85
Sonalan	1.1	89	91	90	82	8.85
Treflan	.5	66	65	—	—	3.35
Treflan	.75	81	74	83	78	5.10
Treflan	1	86	79	—	—	6.70
Prowl	1.25	72	75	77	72	7.50
Treflan+Amiben	.75+2	72	72	82	75	23.15
Treflan+Eptam	.75+3	81	66	86	67	14.85
SHALLOW PREPLANT INCORPORATED						
Lasso	3	61	52	50	48	16.15
Prowl	1.25	76	45	67	54	7.50
PREPLANT INCORPORATED & PREEMERGENCE						
Eptam&Amiben	2.5&2	84	38	—	—	25.30
Sonalan&Amiben	1.1&2	88	90	91	78	25.95
Treflan&Amiben	.75&2	94	90	92	79	22.15
PREEMERGENCE						
Amiben	3	58	72	55	64	25.65
Lasso	3	73	60	80	49	16.15
Prowl	1.25	66	49	74	49	7.50
Lasso+Amiben	2+2	80	74	85	72	27.85
POSTEMERGENCE						
*Poast+Assert+crop oil	.2+.187+1 qt	88	38	—	—	—
LSD (.05)				15	17	

*Experimental treatment.

Gr=Grass
Bdlf=Broadleaf

EDIBLE BEAN HERBICIDE DEMONSTRATION

L. J. Wrage, P. O. Johnson, and W. E. Arnold

PURPOSE:

To evaluate performance of labeled herbicides for weed control and crop tolerance for edible beans. Herbicide performance data for this crop are limited; this is the only site where side-by-side comparisons are established at experimental farms. Plots provide visual comparison for producers attending the field tour and information for education programs.

METHODS:

Plot Design: Demonstration
Plot Size: 10' x 60'
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH, 4.7% O.M.
Planted: 6/20/86
Cultivation: None
Herbicides: Plot sprayer; 20 gpa; 40 psi
PPI: 6/20/86; 2X small tandem disk
SPPI: 6/20/86; 1X small tandem disk
PRE: 6/20/86
POST: 7/9/86; foxtail 2-4 in.
Evaluated: 9/5/86

RESULTS

Plots were visually evaluated for percent grass control at late season. No visual crop effects were observed. Data for percent foxtail control are presented in the table below. Cost per acre for each treatment is included for additional information. Prices are based on dealer survey response for small quantities.

Green and yellow foxtail pressure was light; evaluation was delayed until late season. Broadleaf weeds were very light, scattered and present in insufficient densities to evaluate.

Several treatments provided very good control. The treatments that combined two herbicides, each considered effective on annual grass, tended to have the highest ratings. This may be more important in field situations where very heavy pressure from grassy weeds is anticipated. Experimental application of Command provided less grass control than for several other treatments.

1986 Edible Bean Demonstration

Treatment	lb/A act.	Percent Weed Control 1986 Gr	2-Year Avg. Gr	Cost/A
PREPLANT INCORPORATED				
Check	—	0	—	$ 0.00
Eptam	4	80	84	13.10
Eptam+Treflan	3+.5	92	90	13.20
Eptam+Sonalan	3+1	96	92	17.85
Eptam+Prowl	3+.75	92	91	14.35
Eptam+Amiben	3+2	88	86	26.90
Treflan	.75	82	78	5.05
Treflan+Amiben	.75+2	92	88	22.15
Sonalan	1.1	86	86	8.85
Sonalan+Dual	1+2	90	88	20.85
Sonalan+Lasso	1+2	88	86	18.80
Sonalan+Amiben	1+2	91	84	25.15
Prowl	1.5	86	74	9.05
SHALLOW PREPLANT INCORPORATED				
Lasso	3	80	70	16.15
Dual	2.5	78	77	16.05
PREEMERGENCE				
Dual+Amiben	2+2	75	74	33.10
Amiben	3	76	78	25.65
*Command	1	68	—	14.75
PREPLANT INCORPORATED & POSTEMERGENCE				
Treflan&Basagran+oil	.75&1+1 qt	86	88	29.60
Check	—	0	—	0.00

*Experimental treatment. Gr=Grass

POTATO HERBICIDE DEMONSTRATION

L. J. Wrage, P. O. Johnson, and W. E. Arnold

PURPOSE:

To evaluate herbicide performance of labeled herbicides for weed control and crop tolerance in potatoes. Performance data for herbicides on this crop are limited; this site provides side-by-side comparisons for treatments applied under similar conditions.

METHODS:

Plot Design: Randomized Complete Block; 2 reps
Plot Size: 20' x 60'
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH; 4.7% O.M.
Crop: Kennebec
Planted: 5/20/86
Cultivation: Lay-by after evaluation
Herbicide: Plot sprayer; 20 gpa; 40 psi
PPI: 5/19/86
POPI: 5/20/86
PRE: 5/20/86
POST: 6/20/86
Evaluated: 7/21/86

RESULTS:

Plots were visually evaluated for percent weed control and were harvested for yield; data are presented in the table below. Cost per acre for each treatment is included for additional information. Prices are based on dealer survey response for small quantities.

Green and yellow foxtail pressure was moderate; wild oat infestation was light but acceptable for evaluation. Redroot pigweed, lambsquarters, and wild mustard were principle broadleaf species.

Weed control was somewhat more variable than some years and only marginal for several treatments. Soil condition was moist, with some clods. Crop stand was low but uniform; partially explaining the low yields.

Eptam + Sencor or Lexone or preemergence Dual + Sencor or Lexone provided the highest level of grass and broadleaf control in 1986 or on a 3-year average (1984-86). Several treatments provided unsatisfactory control.

Yields reflected level of weed control.

Sencor or Lexone was the most effective broadleaf treatment; and was effective at all application dates. Experimental application of Poast or Fusilade provided excellent grass control.

1986 Potato Herbicide Screening

Treatment	lb/A act.	Percent Weed Control 1986 Gr	Bdlf	W Oat	3-Year Avg. Gr	Bdlf	1986 Yield cwt/A	Cost/A
PREPLANT INCORPORATED								
Check	—	0	0	0	0	0	8.5	$ 0.00
Eptam	4	90	25	93	93	49	30.9	13.10
Eptam+Sencor/Lexone	3+.5	86	81	91	89	86	60.3	23.25
Treflan	1	56	45	55	—	—	26.4	6.70
POSTPLANT INCORPORATED								
Treflan	1	83	82	90	63	67	12.5	6.70
Treflan+Eptam	.75+3	83	64	85	75	59	25.1	14.85
Prowl	1.25	62	52	61	55	55	24.4	7.50
PREEMERGENCE								
Prowl	1.25	54	36	30	50	46	40.6	7.50
Dual	2.5	71	36	18	69	40	22.7	16.05
Dacthal	7.5	46	30	31	38	38	27.6	45.00
Sencor/Lexone	.75	86	90	88	54	73	79.8	20.15
Dual+Sencor/Lexone	2+.75	91	90	93	81	89	97.7	33.00
Dual+Lorox	2+1	76	59	36	66	54	43.9	25.95
Prowl+Sencor/Lexone	1.25+.75	89	92	90	74	85	70.0	27.70
POSTEMERGENCE								
Sencor/Lexone	.5	57	89	46	—	—	66.9	13.45
Sencor/Lexone	1	68	95	65	—	—	75.4	26.85
*Sencor/Lexone+ Poast+crop oil	.5+.2+1 qt	92	93	90	—	—	99.7	29.35
*Fusilade 2000+ crop oil+ Sencor/Lexone	.187+1 qt+.5	89	90	92	—	—	82.1	31.55
LSD (.05)		16	19	24	25	24	36.5	

* Experimental treatment.

Gr=Grass
Bdlf=Broadleaf

FLAX HERBICIDE SCREENING

L. J. Wrage, C. Lay, P. O. Johnson, and K. Grady

PURPOSE:

To evaluate available herbicides for weed control and crop tolerance in flax. Weeds are highly competitive with flax. Crop tolerance to herbicides is an important consideration in herbicide selection. The plots were viewed as part of field tours; and information obtained is used in educational programs. The comparisons also provide for evaluating potential herbicides compared to current registered products.

METHODS:

Plot Design: Split plot with herbicides on whole plots and varieties as the subplot
Plot Size: 10' x 33'; whole plot; 4 reps
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH; 4.7% O.M.
Varieties: Culbert 79, Rahab
Planted: 5/20/86
Herbicide: Plot sprayer; 20 gpa
PPI: 5/19/86; 2X small tandem disk
PRE: 5/20/86
POST: 6/20/86; Crop 4-6 in., foxtail 2-4 lf, buckwheat 2-4 lf, mustard 4-5 lf.
Evaluated: Crop response: 7/2/86
Weed control: 7/21/86

RESULTS:

Plots were visually evaluated in early season for percent grass and broadleaf weed control and for crop response. Plots were harvested and yields determined. Data are reported in the table below. Culbert 79 or Rahab flax was seeded in half of each main herbicide plot. Visual crop response and weed control ratings were made across varieties; yields were determined for each variety separately.

Green and yellow foxtail pressure was moderately high; broadleaf weeds were uniformly present and continued to develop as the season progressed. Crop stand was good.

The test provides excellent comparative data. Eptam or Treflan provided the highest level of grass control for registered treatments. Experimental postemergence applications of Poast or Verdict also gave excellent control. Treflan and MCPA amine or ester provided at least 70% broadleaf control. Experimental treatments of Tordon combinations or bromoxynil plus crop oil provided at least 80% broadleaf control.

Early season visual ratings for crop leaf burn/stand reduction (VCRR) were highest for Eptam, Treflan, Ramrod, Poast + Assert + crop oil and Harmony + X-77.

Yield data reflect level of weed control and crop tolerance. Early visual evaluation of crop leaf burn or stand reduction was not useful in predicting effect on yield as the season remained favorable and allowed for crop recovery. Rahab, a later maturing variety, yielded more than Culbert 79 for all herbicide treatments except one; no varietal differential seems apparent. Yields were highest for Eptam, Treflan, Fusilade + bromoxynil, Poast + bromoxynil, and Verdict + bromoxynil.

The data indicate several potential herbicides have considerable promise for use in flax. The addition of crop oil with bromoxynil did not reduce yield or cause additional leaf burn; indicating potential for use with postemergence grass herbicides that require crop oil additives.

1986 Flax Herbicide Screening

Treatment	lb/A act.	% Weed Control Gr	% Weed Control Bdlf	Yield Culbert 79 bu/A	Yield Rahab bu/A	VCRR 1/
PREPLANT INCORPORATED						
Check	---	0	0	7.5	10.4	0.0
*Eptam	3	91	21	16.0	16.1	4.4
*Treflan	.75	89	85	17.7	18.3	3.4
PREEMERGENCE						
Ramrod	4	80	16	13.4	14.7	3.1
POSTEMERGENCE						
MCPA ester	.25	0	71	8.7	9.2	0.6
MCPA amine	.25	0	72	9.2	9.8	0.5
MPCA amine	.5	0	84	9.4	10.6	1.0
Dalapon	.75	74	0	9.4	10.9	0.0
Bromoxynil	.25	10	75	9.4	11.4	1.3
*Bromoxynil+crop oil	.25+1 qt.	0	84	10.1	11.9	0.9
*Tordon+MCPA ester	.015+.25	0	92	9.1	9.8	2.5
*Tordon+MCPA ester+ dalapon	.015+.25+.75	66	91	9.4	11.5	2.1
*Hoelon+bromoxynil+ MCPA ester	1+.25+.25	61	74	12.3	14.5	0.9
Hoelon+bromoxynil	1+.25	62	78	15.2	14.6	1.5
*Fusilade+bromoxynil+ crop oil	.187+.25+1 qt	82	52	15.7	18.1	0.6
*Poast+bromoxynil+ crop oil	.2+.25+1 qt	93	86	15.4	17.1	0.4
*Verdict+bromoxynil+ crop oil	.12+.25+1 qt	89	74	18.2	18.6	0.4
*Poast+Assert+crop oil	.2+.187+1 qt	94	42	14.6	15.1	3.8
*Harmony+X-77	.023+.187	25	90	10.4	12.8	3.1
LSD (.05)		9	9	2.2	2.6	1.4

*Experimental treatment.

Gr=Grass
Bdlf=Broadleaf

1/ VCRR (Visual Crop Response Rating)

0 = no symptoms
10 = complete kill

ALFALFA ESTABLISHMENT DEMONSTRATION

L. J. Wrage, P. O. Johnson, and W. E. Arnold

PURPOSE:

To evaluate performance of labeled herbicides for weed control and crop tolerance when used to establish new seedings of alfalfa without a companion crop. Several herbicides are available; side-by-side plot comparisons aid in selecting the treatment based on performance. There continues to be an increased interest in using herbicides for this purpose.

METHODS:

Plot Design: Demonstration
Plot Size: 10' x 60'
Previous Crop: Small grain
Soil: Silty clay loam; 6.6 pH; 4.7% O.M.
Crop: SX 217
Planted: 5/19/86
Herbicide: Plot sprayer; 20 gpa; 40 psi
PPI: 5/19/86; 2X small tandem disk, 4-5" cut
POPI: (postplant incorporated) 5/20/86; 1X harrow
POST: 6/20/86; broadleaf 1-3 in.
LPOS: 7/9/86; grass 4-6 in.
Evaluated: 8/1/86

RESULTS:

Plots were visually evaluated for percent grass and broadleaf weed control. Data for 1986 and for a 2-year (1985-86) average are presented in the table below. Data represent an average of 3 ratings for each plot.

Green and yellow foxtail pressure was moderate and uniform. Broadleaf weeds continued to make growth as the season progressed. Redroot pigweed, wild mustard and lambsquarters were the predominant broadleaf weeds. Alfalfa stand was excellent.

Eptam and Balan have been labeled for use on new seedings to be harvested for hay the seeding year. Eptam provided 87% grass control; Balan tended to be slightly lower but gave greater broadleaf control. Treflan also received approval for seeding year use and provided acceptable grass and broadleaf control. Treflan performance as a preplant incorporated treatment was superior to shallow incorporated application after planting.

Postemergence 2,4-DB gave suppression but inadequate control of pigweed. Experimental postemergence applications of Poast, Verdict and Fusilade provided excellent grass control and are promising options if registration is obtained.

1986 Alfalfa Establishment Demonstration

Treatment	lb/A act.	1986 Gr	1986 Bdlf	2-Year Ave. Gr	2-Year Ave. Bdlf
PREPLANT INCORPORATED					
Eptam	2.5	87	59	88	64
Balan	1.5	78	85	82	84
Treflan	.75	82	87	—	—
Prowl	1.25	79	79	84	83
Eptam+Balan	2+1	92	81	—	—
POSTPLANT INCORPORATED					
Treflan	.75	59	80	61	68
LATE POSTEMERGENCE 2/ & POSTEMERGENCE 1/					
2,4-DB+Buctril 2/ &crop oil 1/	.25+.25&.2+1 qt.	95	51	—	—
*2,4-DB 2/ &Poast+crop oil 1/	1&.2+1 qt.	94	51	92	60
*2,4-DB 2/ &Poast+crop oil 1/	1.5&.2+1 qt.	94	54	—	—
*2,4-DB 2/ &Verdict+crop oil 1/	1&.125+1 qt.	93	65	91	68
*2,4-DB 2/ &Fusilade 2000+ crop oil 1/	1&.25+1 qt.	91	65	85	66
*Harmony 2/ &Poast+crop oil 1/	.023&.2+1 qt.	94	50	—	—
Check	----	0	0	—	—

*Experimental treatments.

Gr=Grass
Bdlf=Broadleaf

1/ Postemergence 6/20/86
2/ Late Postemergence 7/9/86