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ANNUAL PROGRESS REPORT

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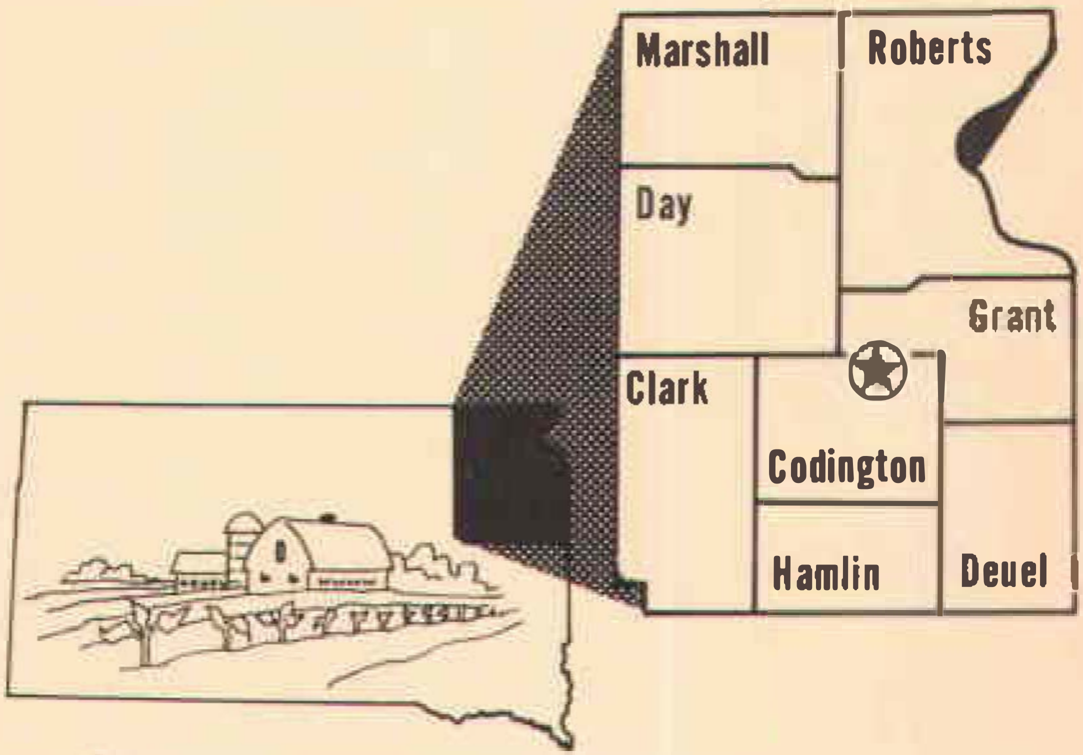
1985
ANNUAL PROGRESS REPORT
Northeast Research Station
Watertown, South Dakota



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

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The 1985 growing season was generally good, although yields were below those obtained in 1984. A warm spring allowed for timely planting of crops; however, precipitation in June and the first three weeks of July was well below normal and crop development was retarded. Precipitation in late July through September was above average, which hampered small grain harvest and slowed growth of row crops. Overall growing season precipitation was nearly 5" above normal.

Two well attended crop tours were held. An evening tour July 8 to observe small grains and a row crop tour September 11. Refreshments at both tours were provided by the Hamlin County Crop Improvement Association.

NOTE: Much of the information contained in this report is based on ongoing studies and results should therefore be considered tentative. Also, 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.

AGRICULTURAL ADVISORY GROUP, 1985
Northeast Research Station, Watertown, SD
Randy Frederick, Chairman, Don Guthmiller, Secretary

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Steve Witt	Day County	84-87
Edwin Krause	Deuel County	83-86
Randy Frederick	Hamlin County	84-87
Lyle Kriesel	Grant County	84-87
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Table 1. Growing season precipitation

Month	Amount (in.)	Normal	Departure	Greatest Amount	Date
April	1.93	2.10	-0.17	0.86	23
May	3.90	2.97	+0.93	3.00	11
June	2.07	3.75	-1.68	0.45	11
July	5.21	2.67	+2.54	3.87	18
August	3.65	2.78	+0.87	1.39	23
September	3.77	1.85	+1.92	1.81	3
October	1.59	1.16	+0.43	0.75	15
Total:	22.12	17.28	+4.84		

Temperatures: Last frost - 20° F, April 8
First frost - 28° F, September 24
Frost free period: 167 days

INFLUENCE OF NITROGEN APPLICATION ON WHEAT YIELD AND PROTEIN LEVEL

R. Gelderman and J. Gerwing

Objectives:

Determine effect of nitrogen additions on wheat grain yield and protein levels on a high nitrogen fertility soil.

Methods:

The study was located in the southeast corner of the Watertown Station on a Brookings soil. These soils are deep silty clay loam loess over glacial till. Results of soil tests from samples taken in the spring of 1985 are shown in Table 2.

Table 2. Spring soil test results of nitrogen wheat study, Watertown Station.

NO_3-N						
0-6"	0-24"	0-48"	O.M.	P	K	pH
lb/A			%	lb/A		
28	107	268	3.8	69	350	6.4

The tests indicate a very high level of fertility at this site. Much of the nitrogen is below the standard two foot deep testing zone.

The previous crop was wheat. The stubble was plowed and disked before seeding 'Guard' wheat on April 15. The nitrogen treatments were surface broadcast as ammonium nitrate just before germination. The rates used were 0, 25, 50, 75, 100 and 125 lb/A of actual nitrogen.

Results and Discussion

The results of the study are shown in Table 3.

Table 3. Yields and protein levels of Guard wheat due to N treatment.

Nitrogen rate (lb/A)	0	25	50	75	100	125
Yield (bu/A)	66[a]	69	65	63	65	60
Protein (%)	13.8	13.8	14.0	14.6	14.5	14.2

[a] Avg of 4 replications.

The addition of nitrogen did not increase wheat yields. This would be expected given the high levels of soil nitrate. In years of limited subsoil moisture, some of this deep (2-4') soil nitrogen may be only partially available. However, the spring of 1985 found excellent soil moisture conditions at this depth. Thus, roots could take up water as well as nitrogen from this soil zone.

Added nitrogen appeared to cause a small increase in grain protein at this site. With high protein premiums being paid for wheat in 1985, the increase in protein at the 75 lb/A rate would have paid for the added fertilizer. Other studies in northeast South Dakota have shown similar trends. The data in Table 4 divides 12 nitrogen experiments on wheat in to two groups; those that had a yield response to added nitrogen and those that did not. It is interesting to note that even on the nonresponsive group, an increase in protein levels could be seen up to 75 lb/A. Assuming a 30¢/bu premium per percentage of protein, this yield level would have returned $21.84 per acre. Assuming 20c/lb nitrogen, the added nitrogen would have cost only $15.00/acre. It is apparent that even when yields are not raised, additional nitrogen can often increase protein levels. However, one needs to be aware that these high protein premiums have been the exception rather than the rule. It would still be advisable to apply recommended nitrogen rates based on soil test and optimistic yield goals rather than striving for maximum protein and high protein premiums. If this is done, added yields plus protein benefits can both be realized in most years.

Table 4. Influence of nitrogen rate on spring wheat grain yield and protein, 1985.

Nitrogen Rate	No Nitrogen Response[1]		Nitrogen Response[2]	
	Yield	Protein	Yield	Protein
lb/A	bu/A	%	bu/A	%
0	57	14.9	40	13.0
25	57	15.3	45	13.4
50	55	15.9	48	14.0
75	56	16.2	51	14.6
100	56	16.3	51	15.2
125	55	16.4	52	15.7
0-2' NO_3-N (lb/A)[3]	106		44	

1 Average of 6 sites - Brookings, Grant, Codington, McPherson, Spink and Hamlin Counties.

2 Average of 6 sites - Deuel, Grant, Roberts, Marshall (2) and Brown Counties.

3 Spring soil tests.

SPRING WHEAT BREEDING

F. A. Cholick and K. M. Sellers

The advanced yield trial was grown at eight locations throughout the spring wheat production area in addition to the Northeast Research Station. The primary objective of this nursery is to identify new varieties. In 1985, 34 experimental lines from the SDSU breeding program were compared to 14 check (named) varieties. Mean grain yield in 1985 was 45.9 bu/A which was approximately equal to the six year average. The range in grain yield was 61.0 to 40.3 bu/A. Among the named varieties Stoa had the highest yield at 55.6 bu/A and the long-term check Chris the lowest at 40.3 bu/A. When three year averages are compared Stoa produced the highest yields followed by Guard and Butte at 49.9 bu/A. Five experimental lines equaled or exceeded Stoa's yield in the three year average. Experimental line SD 8026 (3 year average 51.7 bu/A) is being increased for variety release and a second line SD 2956 (3 year average 53.3 bu/A) will be considered for increase this year. The average protein content was 14.8 percent with a range of 13.7 to 15.7. Plots were fertilized for a 50 bu/A yield goal which is nearly equal to the average yield achieved. The 2.0 percent range among the lines and varieties in the nursery is a typical range observed among varieties and is the genetic component of protein content.

CHLORIDE STUDY

An experiment to evaluate the effect of broadcast applied chloride (Cl) was conducted in conjunction with P. Fixen, J. Gerwing, R. Gelderman, G. Buchenau, and T. Schumacher. Rates of 0, 30, 60, 120, and 180 lbs/A of KCl were applied and incorporated pre-plant. The addition of Cl did not produce significant effects on grain yield. However, at other sites in 1985 Cl additions produced greater grain yield and foliar disease supression. Chloride additions at this site did produce significant foliar disease supression early in the growing season. The soil Cl levels are being determined and may explain why some sites responded to Cl while others did not. There has been some indication at responsive sites that not all spring wheat varieties will respond to the addition of Cl.

The plots were planted on April 17, 1985 at a seeding rate of 75 lbs/A adjusted for kernel size. Herbicides were applied for both grassy and broadleaf weeds and there was little or no problem with weeds. Harvest was completed on August 12, 1985.

OATS RESEARCH

D. L. Reeves

The herbicide test was probably the one of greatest interest to most people. This is our third year for the test at this location. This test contains 10 varieties which are sprayed with MCPA or 1/4, 1/2, or 3/4 lb/A rates of 2,4-D. At the 1/2 lb rate, yield losses varied from 0 to 13% while MCPA losses varied from 0 to 9%. These losses were greater than in 1984, but not as large as those noted at Brookings or Centerville. A slight increase was noted for test weight for a half pound of 2,4-D, but MCPA had a 1.3% drop. Sprayed plots had a small increase in the number of stems producing grain per unit area.

Most of the oats grown here in 1985 were part of our varietal development program. This station usually has our best grain quality, therefore it provides a measure of the best grain a selection will produce. The variety development part of our project tested over 300 different selections here this year. Over 900 plots were cut in the yield trials.

One regional nursery is planted here. This is the Uniform Midseason oat test which is planted at 22 locations from New York to Winnipeg and Kansas. This test had 35 entries and includes selections which are about to be released as varieties. There were four South Dakota entries in the test this year. Our other test which has selections which have been tested several years is our Purity Increase Test. There were a total of 72 entries with half being of early maturity.

Our Advanced tests had 38 early entries and 29 late selections. These could go into regional tests next year. The Preliminary Yield tests had 34 early selections and 30 which were midseason to late. The F_3 test contained 68 crosses which were midseason or late. This is only the second year these crosses have been grown in the field.

BARLEY AND RYE TESTING

D. L. Reeves

The Mississippi Valley barley test has been grown at this station the last two years. This is a regional test in which new lines are tested before being released as a variety. This is the only location in the state where these new selections are grown. This year there were 14 different entries in this test.

In the spring of 1984 it was decided to have a rye test at the station which would include released varieties and new selections. This test was planted in the fall, but unfortunately due to dry soil and other problems most of the stand was lost. Therefore, the test was discarded in the spring of 1985. Eleven entries were planted in September 1985 for the next years test. Only four of these are varieties presently grown in the state. The other seven are either nearing release, being imported by dealers or new varieties under development.

SMALL GRAIN VARIETY TRAILS - CPT

J. J. Bonnemann

Small grain trials with four spring-seeded crops were conducted at the Northeast Farm during the 1985 season. Crops seeded were spring wheat, durum, oats and barley. Excellent yields were obtain from all trials. The cool, moist conditions during much of the growing season favored high yields of good quality grain.

One- and available three-year averages of all released materials included in the trials are reported in EC 774 (rev.), 1986 Variety Recommendations (1985 Crop Performance Results) for Small Grains and Flax. These reports are now available at County Extension offices or the Bulletin Room, SDSU, Brookings.

CORN BREEDING PROJECT

Z. Wicks and G. 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 the hybrids which are tested in the advanced yield trials on research stations in eastern South Dakota.

In 1985, 100 entries were evaluated for yield in three different tests. Also in another test, 58 WCR-2 entries were yield tested from material developed in the North Central Regional District. Yield data from this station and others will help us select our best inbred lines which could be released in years to come.

In an additional experiment 150 lines from a population were yield tested. These 150 lines from a first self generation and hybrid crosses from the same 150 S1's were yield tested. This experiment was duplicated in two stress environments and in one more favorable environment. We will select material on the basis of yield of the S1's in the drought stress area and on yield of the S1's hybrid crosses in the favorable environment. After ranking the yields we will resynthesize the population from the top lines that yielded high in the stress environment and that yielded high in the favorable environment. This should result in a more drought resistant population.

ALFALFA VARIETY TRIAL

Northeast Research Station, 1985
Clive Holland and Robin Bortnem

Two alfalfa variety trials are currently being conducted at the NE Station--44 varieties planted on April 26, 1984 and 45 varieties planted on May 20, 1985.

The 1984 seeding of 44 varieties was harvested 3 times last year, with the last cut on October 28. There was no winterkill of any varieties at the Station, but several of the less dormant varieties that were also planted at the SE Station, near Beresford, sustained moderate winterkilling at that more southern location. No winterkill was experienced at the NE Station apparently because the late winter temperatures did not rise sufficiently, as they did at the SE Station, to break dormancy in the alfalfa plant before freezing again. These 44 varieties were harvested 4 times in 1985 producing an average dry-matter yield of 6.27 tons per acre (Table 5). The evaluation of alfalfa varieties should not be made just on seeding year performance because of the possibility of winterkill and subsequent poor stands. As seen in Table 5, the varieties for this second year of growth show a ranking that is more indicative of adaptability to South Dakota's climatic conditions. Three years of testing is considered normal before making final recommendations as to the suitability of alfalfa varieties for specific locations.

The alfalfa trial seeded in 1985 was first planted on April 29th, but a heavy rain of 3.2 inches washed soil from an adjoining area onto parts of the experiment, covering almost half the plots with about 2 inches of soil. The area was plowed and reseeded on May 20. Additional herbicide, to control the weeds, was not used with the replanting because of the danger of carryover from the first application. Broadleaved and grassy weeds became a problem so on June 28 the area was sprayed with Poast, for annual grassy-weed control. On July 5 the alfalfa and broadleaved weeds were mown to a height of 6 inches. Two harvests were made during the year--cut 1 on August 21 and cut 2 on October 18. Average dry matter yield from the 45 varieties was 2.35 tons per acre (Table 6). Similar varieties planted a year earlier at the same location, but on a date almost one month earlier, yielded in 1984 an average of 4 tons per acre. Timely seeding and good weed control are essential for profitable first-year alfalfa yields.

The herbicide used with the first seeding was undoubtedly diluted when it was mixed, by plowing, with a deeper layer of soil. However, a second application at reseeding would likely have killed the alfalfa when it combined with the residual of the first spraying. Farmers in the same situation of having to reseed alfalfa, for whatever reason, should not make a second application of herbicide because of the danger of killing the alfalfa.

Table 5. 2nd-year forage yields from 1984 alfalfa variety trial, Expt. 431, Northeast Research Station, Watertown, SD.

		1984 Forage Yield	1985 Forage Yields (Tons DM/A)					2 Year Average	
Variety	Dev./Supplier	(T DM/A)	6/4	7/11	8/21	10/17	4-cut Total	T/A	% Vernal
Big 10	Great Lakes	4.41	2.85	1.80	1.55	0.83	7.03	5.72	110
526	Pioneer	4.11	3.18	1.68	1.62	0.75	7.23	5.67	109
Spectrum	Cenex Seed	4.32	2.48	1.83	1.76	0.78	6.85	5.58	107
Cimarrow	Great Plains	4.35	2.50	1.82	1.50	0.93	6.75	5.55	106
H-150	Soybean/Farm	4.65	2.29	1.88	1.50	0.76	6.43	5.54	106
532	Pioneer Hi-Bred	4.04	2.64	1.88	1.67	0.68	6.87	5.46	105
Endure	PAG Seeds	4.22	2.63	1.58	1.61	0.86	6.68	5.45	105
80-16 PCa3	Michigan State	4.26	2.49	1.74	1.64	0.71	6.58	5.42	104
Iroquois	NY Ag Expt Sta	4.18	2.63	1.67	1.56	0.76	6.62	5.40	104
NAPB 21	Agri Pro	4.14	2.56	1.67	1.58	0.78	6.59	5.36	103
Shenandoah	Great Plains	3.98	2.50	1.69	1.65	0.84	6.68	5.33	102
120	Dekalb-Pfizer	4.06	2.57	1.71	1.50	0.78	6.56	5.31	102
Eagle	O's Gold	4.05	2.48	1.71	1.56	0.78	6.53	5.29	102
DK-135	Dekalb-Pfizer	4.08	2.48	1.67	1.56	0.78	6.49	5.28	101
NY 8302	Cornell Univ.	4.08	2.28	1.69	1.64	0.83	6.44	5.26	101
Blazer	Land O'Lakes	4.09	2.51	1.68	1.50	0.73	6.42	5.26	101
NY 8301	Cornell	3.89	2.53	1.68	1.52	0.87	6.60	5.24	100
Apollo II	Agri Pro	4.00	2.43	1.79	1.50	0.77	6.49	5.24	100
Hi-phy	Cenex Seed	3.99	2.26	1.59	1.75	0.88	6.48	5.24	100
H-125 VW	Sexauer	3.91	2.45	1.69	1.63	0.77	6.54	5.22	100
Vernal	Wis Ag Expt Sta	4.01	2.56	1.58	1.55	0.72	6.41	5.21	100
SX 217	Sexauer	4.39	2.24	1.52	1.58	0.66	6.00	5.20	100
NAPB 20	Agri Pro	3.97	2.58	1.62	1.34	0.82	6.36	5.16	99
Advantage	Dekalb-Pfizer	4.11	2.38	1.66	1.47	0.71	6.22	5.16	99
Decathlon	Cargill Seeds	4.03	2.44	1.51	1.41	0.84	6.20	5.12	98
Drummer	Northrup King	4.01	2.40	1.56	1.44	0.81	6.21	5.11	98
Saranac	NY Ag Exp Sta	4.07	2.48	1.56	1.42	0.68	6.14	5.10	98
LL 3018	Land O'Lakes	4.02	2.74	1.59	1.45	0.34	6.12	5.07	97
Challenger	Cargill Seeds	4.00	2.39	1.59	1.47	0.68	6.13	5.06	97
WL 313	W-L Research	4.05	2.47	1.65	1.22	0.74	6.08	5.06	97
NY 3501 (Mohawk)	Cornell Univ	3.87	2.45	1.58	1.46	0.72	6.21	5.04	97
F-144	Sexauer	4.15	3.07	1.52	1.46	0.79	5.84	5.00	96
Ca 7931-32	W-L Research	3.99	2.32	1.60	1.40	0.67	5.99	4.99	96
Valor	Land O'Lakes	3.78	2.61	1.62	1.28	0.68	6.19	4.98	96
LL 3110A	Research Seeds	3.77	2.46	1.55	1.37	0.80	6.18	4.98	96
MT-0	SD State Univ.	3.90	2.49	1.58	1.36	0.56	5.99	4.94	95

---continued---

Table 5. Continued

Variety	Dev./Supplier	1984 Forage Yield (T DM/A)	1985 Forage Yields (Tons DM/A) 6/4	7/11	8/21	10/17	4-cut Total	2 Year Average T/A	% Vernal
Saranac AR	NY Ag Expt Sta	4.00	2.45	1.51	1.20	0.71	5.87	4.94	95
82-5	W-L Research	3.91	2.42	1.45	1.22	0.80	5.89	4.90	94
Oneida	NY Ag Expt Sta	3.94	2.30	1.57	1.18	0.79	5.84	4.89	94
SX 424	Sexauer	3.94	2.27	1.45	1.30	0.70	5.72	4.83	93
Heinrichi	Agric Canada	3.64	2.40	1.47	1.24	0.65	5.76	4.70	90
MT-1	SD State Univ.	3.68	2.39	1.28	1.14	0.41	5.22	4.45	85
Teton	SD State Univ.	3.37	2.31	1.40	1.04	0.51	5.26	4.32	83
Travois	SD State Univ.	3.34	2.46	1.36	0.92	0.42	5.16	4.25	82
Average		4.57	2.47	1.62	1.45	0.73	6.27		
LSD (0.010		0.70	0.40	NS	0.44	0.25	1.19		
C.V. (%)		8.01	8.38	13.88	16.05	18.07	9.98		

5/11/85 - Slight hail damage, no winterkill.
Seeded: 4/25/84, 3 lb/ EPtam/A, 0.5 lb Ridomil/A, 15 lb PLS/A.
Plot Size: 3 x 25 feet with 5 rows at 6-inch spacings.
Plot Harvested: 3 x 22 feet. Design: Randomized block, 4 replications.
Soil Type: Kranzburg silt loam. Soil pH: 6.8

Table 6. Seeding-year forage yields from 1985 alfalfa variety trial, Expt 531, Northeast Station, Watertown, SD.

Variety	Dev. Supplier	1984 Forage Yields (Tons/A) 8/21	10/18	2-cut Total	% Vernal
DK-135	Dekalb-Pfizer	2.00	0.91	2.91	123
Futura	Dairyland Res Int'l	1.69	1.22	2.91	123
H-154	Farm Seed Res Corp	1.86	0.88	2.74	116
NAPB 23	Agri Pro	1.68	0.98	2.66	112
Magnum	Dairyland Res Int'l	1.76	0.88	2.64	112
Sparta	Land O'Lakes	1.84	0.79	2.63	111
120	Dekalb-Pfizer	1.71	0.87	2.58	109
Cimarrow	Great Plains Res Co Inc	1.77	0.77	2.54	107
Endure	PAG Seeds	1.91	0.63	2.54	107
Spectrum	Cenex	1.67	0.84	2.51	106
XAR 32	Pioneer Hi-Bred Int'l	1.76	0.74	2.50	106
Horizon	Arrowhead Inc	1.63	0.87	2.50	106
Vernema	WA St/USDA	1.64	0.84	2.48	105
Thunder	Agri Pro	1.61	0.86	2.47	104
*Elevation	Jacques Seed Co	1.80	0.66	2.46	104
03305	Dairyland Res Int'l	1.62	0.83	2.45	104

Table 6. Continued.

Variety	Dev. Supplier	1984 Forage Yields (Tons/A) 8/21	10/18	2-cut Total	% Vernal
Iroquois	NY Ag Expt Sta	1.63	0.81	2.44	103
Maxim	Cenex	1.56	0.85	2.41	102
Vernal	Wisc. Ag Expt Sta	1.54	0.84	2.38	101
526	Dairyland Res Int'l	1.60	0.77	2.37	100
Dawson	NE AES/USDA	1.61	0.75	2.36	100
**Vernal	Wisc Ag Expt Sta	1.64	0.71	2.35	99
M-156	Farm Seed Res Corp	1.58	0.76	2.34	99
Saranac AR	NY Ag Expt Sta	1.51	0.82	2.33	98
Peak	Research Seeds Inc	1.58	0.75	2.33	98
Megaton	Arrowhead Inc	1.84	0.47	2.31	98
Arrow	Agri Pro	1.50	0.81	2.31	98
W/N 5617	U of Minn	1.52	0.79	2.31	98
Max 85	Seed Tec	1.64	0.67	2.31	98
Agate	U of Minn AE	1.57	0.68	2.25	95
XAF 31	Pioneer Hi-Bred Int'l	1.50	0.73	2.23	94
532	Pioneer Hi-Bred Int'l	1.52	0.70	2.22	94
Big 10	Great Lakes Hybrids	1.61	0.60	2.21	93
Oneida	NY Ag Expt Sta	1.51	0.70	2.21	93
Baker	NE AES/USDA	1.46	0.72	2.18	92
Blazer	Land O'Lakes	1.50	0.67	2.17	92
MN 6209	Great Lake Hybrid	1.37	0.80	2.17	92
8016 PCa3	NY Ag Expt Sta	1.45	0.72	2.17	92
Oneida VR	NE AES/USDA	1.34	0.79	2.13	90
MN 6216	Land O'Lakes	1.32	0.74	2.06	87
NY 8412	U of Minn	1.41	0.64	2.05	87
Epic	Mich State Univ	1.29	0.73	2.02	85
83-3-F	Cornell Univ	1.56	0.46	2.02	85
NY 8413	U of Minn	1.32	0.67	1.99	84
Mohawk	Cornell Univ	1.26	0.72	1.98	84
Saranac	Research Seeds Inc	1.35	0.61	1.96	83
Average		1.59	0.76	2.35	
LSD (0.01)		0.47	0.29	0.63	
C.V. (%)		15.66	19.79	14.17	

7/5/85 New seeding was mowed at 6" to curtail excessive weeds.

* The variety "Elevation" was entered in 1984 tests as LL 3110 A.

** Not sufficient seed on hand for tmt #33 NK 82503, Vernal seeded as tmt #33. Average of the two Vernals used for % Vernal.

Seeded: 5/20/85 at 12 lb PLS/A.
6/29/85 sprayed with Poast to control grassy weeds.
7/16/85 sprayed with Butyrac for broadleaf weed control.

Plot Size: 3 x 25 feet, with 5 rows at 6-inch spacings.

Plot Harvested: 3 x 22 feet. Design: Randomized block, 4 replications.

Soil Type: Brookings soil. Soil pH: 6.4

1985 FLAX REGIONAL TRIAL

Watertown NE Farm

Rank	Entry	CI Number	Pedigree	Seed Yield* bu/A	Plant Height (cm)
1	22	CI3138	U406, Culb/Bsn//Culb/Bsn	27.2	55
2	19	CI3135	N412, Z181/Culb 79	27.0	51
3	10	CI3108	FP800, Kubanskij/Lnt	26.5	53
4	14	CI3130	SDT8407, Lnt/2444//Lnt/2543	26.4	51
5	21	CI3137	U404, Culb/Bsn//Culb/Bsn	26.0	54
6	24	CI3140	M413, H.O. 1135	25.8	51
7-8	17	CI3133	N407, Z158/Culb 79	25.8	49
7-8	23	CI3139	U412, Culb/Bsn//Culb/Bsn	25.8	52
9	7	CI3101	N306, Z2236/CI2838	25.6	50
10	5	CI2938	M903, Culb/5017	25.5	47
11-12	3	CI2776	Culbert	25.3	47
11-12	20	CI3136	N421, Z1067/Culb 79	25.3	50
13	4	CI2814	Dufferin	25.3	54
14	9	CI3107	FP796, Duff/2820	24.9	53
15	16	CI3132	SDT8414, M803//Lnt/Nrd	24.6	48
16	13	CI3129	SDT8406, M803//Lnt/Nrd	24.2	48
17	8	CI3105	U313, Culb/Bsn M3P3 3113-1	24.2	55
18	15	CI3131	SDT8412, BFP/Culb	23.7	50
19	6	CI3096	N213, CI2847/Culb 79	23.6	51
20	1	CI389	Bison	23.6	56
21	12	CI3128	SDT8405, BFP/CI2915	23.3	49
22	18	CI3134	N410, Z1067/Culb 79	23.3	48
23	11	CI3127	SDT8404, Nrstr/2444//Lnt/Nrd	22.8	48
24	2	CI2522	Linott	21.6	45
			$\bar{x}$	24.9	51
			c.v.	8.7	4.0

* Means estimated by least squares.

Seeding date: May 2, 1985
Harvesting area: 2.1 m^2
Space between rows: 7 inches

1985 FLAX SOUTH DAKOTA TRISTATE

K. Grady and C. Lay
Watertown NE Farm

Table 8.

Entry	CI Number	Pedigree	Seed Yield* bu/A	Plant Height (cm)
12	Rahab	CI2943	29.2	54
9	McGregor	CI2921	29.1	58
30	SD84164	N707/CI2777//N419	28.8	52
10	Linton	CI2934	28.7	53
6	Dufferin	CI2814	28.4	53
15	CI3101	N306, Z2236/Culb 79	28.2	57
29	SD84126	N707/CI2777//N419	27.9	48
17	CI3107	FP796, Duff/2820	27.6	60
7	Flor	CI2896	27.6	54
28	SD84104	N707/CI2777//N419	27.0	51
13	CI2938	M903, Culb/5017	26.9	52
11	NorMan	CI3065	26.9	55
14	CI3096	N213, CI2847/Culb 79	26.8	53
3	Culbert	CI2776	25.9	51
5	Clark	CI2925	25.8	50
16	CI3105	U313, Culb/Bsn M3P3	25.6	62
4	Culb 79	CI2838	25.5	49
18	CI3108	FP800	25.4	55
8	NorLin	CI2935	25.4	53
23	CI3132	SDT8414, M803//Lnt/Nrd	25.1	50
25	SD84107	Clark selection	25.1	52
21	CI3131	SDT8412, 8FP/Culb	24.8	53
26	SD84140	Clark selection	24.6	55
2	Wishek	CI2822	24.4	52
31	CI3130	SDT8407, Lnt/2444//Lnt/2543	24.2	51
22	CI3129	SDT8406, M803//Lnt/Nrd	24.0	50
24	SD84102	Clark selection	23.7	53
19	CI3128	SDT8405, BFP/CI2915	23.6	52
1	Linott	CI2522	22.6	49
20	CI3127	SDT8404, Nrstr/2444//Lnt/Nrd	22.1	50
27	SD84147	Clark selection	21.8	51
		$\bar{x}$	25.9	53
		c.v.	9.4	4.6

* Means estimated by least squares.
Seeding date: May 2, 1985
Harvesting area: 2.1 m^2
Space between rows: 7 inches

POTATO VARIETY DEMONSTRATION - 1985 NE FARM

D. J. Gallenberg and L. A. Evjen

Ten potato varieties commonly grown in South Dakota either for commercial (processing) production or for certified seed production were planted in a completely randomized design on May 7, utilizing four single row replications of each variety. Included were the varieties Atlantic, Kennebec, LaRouge, Norchip, Norgold Russet, Norland, Red LaSoda, Red Pontiac, Shepody and Superior. Certified seed obtained from North Dakota, Minnesota or Wisconsin was used except for Atlantic and Norgold Russet, for which locally-produced seed was used.

Stand establishment was estimated 8 weeks after planting. No significant disease development was noted in any of the varieties, with the exception of Atlantic and Norgold Russet which had some blackleg evident. Tubers were harvested from one end of the plot on August 20 (105 days after planting), and again on September 23 (139 days after planting) from the other end of the plot. Total tuber weight was taken, and the mean of the four replications for each variety calculated and converted to cwt per acre. Tuber characteristics (e.g. size, shape) at harvest were also noted. Results for stand, yield and tuber characteristics are given in Table 9. The generally low yields for the varieties Atlantic and Norgold Russet reflect the lower quality of seed used compared to the other eight varieties. Late harvest yields were higher in some varieties, but not others which partially reflects the different maturities present.

Table 9. Yield of potato varieties at early and late harvest.

Variety	Stand	Yield (cwt/A) Early	Late	Tuber Characteristics at Harvest
Atlantic	poor	93.4	76.7	Mostly medium size; good shape; significant amount of tuber rot
Kennebec	good	217.5	245.2	Medium to large; generally good shape
LaRouge	fair/good	181.1	180.9	Mostly medium; good shape
Norchip	good	196.0	204.7	Mostly medium; good shape
Norgold Russet	poor/fair	105.5	117.2	Mostly medium; good shape; some tuber rot
Norland	fair	181.1	156.7	Mostly medium; good shape
Red LaSoda	good	254.8	269.5	Medium to large; some odd shaped
Red Pontiac	good	208.2	232.3	Medium to large; some odd shaped
Shepody	good	194.2	230.1	Mostly large; some odd shaped
Superior	fair/good	189.5	172.3	Mostly medium; good shape
	L.S.D. (0.05)	15.6	27.9	

SUNFLOWER DATE OF PLANTING STUDY

J. Smolik, L. Evjen, P. Evenson and D. Walgenbach

Objectives: I. Determine influence of planting date on yield and oil content of two sunflower hybrids and on seed weevil and banded sunflower moth damage.

II. Measure effect of Furadan 15G applied in-furrow at planting on stem insects and on sunflower yield.

Prior to planting plots were fertilized with 45 lbs N/A and Sonalan was applied at 2½ pt/A and incorporated. Sigco 432 and 455 were planted in 36" rows and plant stand was 24,000/A. Weed control was excellent.

Planting date significantly influenced both yield and oil content and highest levels of each occurred on the earlier dates of planting (Table 10). Oil contents decreased 1-2% with each week's delay in planting. There were no significant differences in oil content between hybrids. Lodging as a result of a late August thunderstorm was also influenced by date of planting. Lodging ranged from 20 to 95% in the June plantings. In addition to lodging, plants on the last three dates of planting were also damaged by frost. Furadan had no significant effect on yields or oil content of Sigco 432 or 455 (Table 10).

We thank Matt Byers and Shirley Evenson for their assistance in evaluation of insect damage.

Table 10. Influence of planting date and Furadan on yield and oil content of two sunflower hybrids.

Planting Date	Hybrid: Sigco 432, Furadan 15G-IF: Yield (lb/A)	% Oil	Sigco 432, No Furadan: Yield (lb/A)	% Oil	Sigco 455, Furadan 15G-IF: Yield (lb/A)	% Oil	Sigco 455, No Furadan: Yield (lb/A)	% Oil
May 1	893[a]	41.1	1124	39.1	1629	41.8	1471	42.0
May 8	1200	40.4	1133	38.5	1575	39.7	1827	37.6
May 22	1701	37.6	1372	37.7	1283	38.3	1275	37.9
May 28	1230	37.2	907	35.4	1048	36.4	1325	37.1
June 5	560	34.5	469	33.6	675	33.8	667	34.2
June 11	268	34.1	342	34.0	467	32.7	397	34.5
June 20	385	32.6	295	31.8	340	30.5	334	32.6
June 25	222	27.2	70	25.0	255	26.7	167	28.7

[a] Average of four replications.

NOTES: Hybrid 432 had moderate bird damage (35-40% of heads with some feeding damage) on first 2 planting dates - 455 had less damage on these dates. Bird damage was minimal on all other dates. Lodging as a result of a heavy thunderstorm August 23: May 1 through May 28 less than 5%; June 5, 50%; June 11 and 20, 85-95%; June 25, 20%.

Populations of plant feeding nematodes were low in the study area (Table 11) and samples were removed from only the first two dates of planting. Furadan treatment generally reduced nematode numbers.

Table 11. Effect of Furadan on nematode populations in two sunflower hybrids.

Planting Date	Hybrid: Sigco 432, Furadan 15G-IF	Sigco 432, No Furadan	Sigco 455, Furadan 15G-IF	Sigco 455, No Furadan
	-----Number of plant feeding nematodes/100 cc soil-----			
May 1	80[a]	164	105	284
May 8	143	125	84	393

[a] Average of four replications, sampled at harvest.

Populations of spotted stem weevil were very low in the study area and in much of South Dakota in 1985. However, Apion (black stem weevil) were present in moderate numbers and Furadan significantly reduced their numbers (Table 12) as well as numbers of Dectes. This reduction in numbers of stem insects also reduced the severity of stalk rot (Table 12).

Table 12. Effect of Furadan on stem insect populations and stalk rot in two sunflower hybrids at various dates of planting.

Planting Date	Hybrid											
	Sigco 432						Sigco 455					
	Furadan 15G-IF			No Furadan			Furadan 15G-IF			No Furadan		
	Apion	Dectes	Stalk Rot	Apion	Dectes	Stalk Rot	Apion	Dectes	Stalk Rot	Apion	Decetes	Stalk Rot
May 1	0.8[a]	0.4	1.1[b]	8.0	0.8	1.4	4	0.4	1.4	10.5	0.5	2.3
May 8	0.7	0.3	1.5	8.7	0.8	1.7	0.2	0.3	1.6	1.8	1.1	1.9
May 22	1.2	0.2	1.1	6.0	0.0	1.7	5.8	0.2	1.2	8.6	0.6	1.3
May 28	2.5	0.4	1.4	7.8	0.5	1.7	1.8	0.4	1.4	5.0	0.5	1.5
June 5	0.2	0.3	1.4	0.8	1.4	1.6	0.2	0.5	1.9	0.1	1.1	1.5
June 11	0.4	0.7	1.2	0.4	0.5	1.4	1.4	0.4	1.4	0.4	1.2	1.1
June 20	0.2	0.3	1.2	0.2	0.5	1.1	0.4	0.3	1.0	0.6	0.4	1.2
June 25	0.7	0.2	1.2	0.1	0.0	1.1	0.2	0.0	1.1	0.1	0.5	1.0

[a] Average of four replications - 10 stalks split/rep.
[b] Stalk rot rating scale:
1 = none to slight discoloration, 2 = mod-heavy discoloration, 3 = severe rot - bundles exposed

Furadan applied at 1 lb ai/A at planting.

Date of planting also influenced both seed weevil and banded sunflower moth damage (Table 13), although overall levels of damage were less than half of those recorded in this area in 1984. Damage levels on the early maturing Sigco 432 were low on the first date of planting, increased to highest levels from late May to mid-June then declined. Planting date had less influence on damage levels in the later maturing Sigco 455 and levels were nearly the same on all dates except the last two in June. These results are in contrast to those obtained in 1984 in which damage levels of both early and late maturing hybrids were reduced at the earlier dates of planting. It is probable the cool, moist 1985 growing season was responsible for this difference since the flowering period, and thus the susceptible period to weevils and moths, would have been extended.

Table 13. Influence of date of planting on seed weevil and banded sunflower moth damage on two sunflower hybrids.

	Hybrid			
	Sigco 432		Sigco 455	
Planting Date	% Weevil Damage	% Banded Moth Damage	% Weevil Damage	% Banded Moth Damage
May 1	7	4	14	2
May 8	11	3	17	2
May 22	17	3	17	2
May 28	16	2	15	2
June 5	14	6	12	6
June 11	15	3	19	2
June 20	5	2	9	3
June 25	6	4	7	2

[a] Average of eight replications.

SOYBEAN ROW SPACING STUOY

R. G. Hall and L. A. Evjen

Objective:

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

Methods and Procedures:

1. Varieties: Simpson and Weber

2. Plant populations: 150-, 175-, and 200-thousand plants per acre.

3. Row spacings: 7-, 14-, 21-, and 28-inch row spacings.

4. Seeding: Plots consisting of every combination of varieties (2), plant population (3), and row spacings (4) were replicated four times and seeded on May 21, 1985. Each plot measured 20 ft. long and plot width was 92 inches for 7-, 14-, and 28-inch row spacings and 78 inches for 21-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 28, 1985. 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 were no significant interactions between the main effects variety, population, or row spacing. There were, however, two significant main effects. First, the variety Simpson out yielded the variety Weber. The second significant main effect was for row spacing where the 7- and 28-inch row spacing out yielded the 14- and 21-inch row spacing.

Overall, the results indicated the narrowest and the widest row spacings were clearly better in yield than the intermediate row spacings. There were no significant differences among the three populations used in this study. (Table 14).

Table 14. The effects of variety, plant population, and row spacing on soybean yields at the Northeast Farm in 1985.

Variable		Yield (Bu/A)
Variety:	Simpson	27.8 a*
	Weber	24.8 b
Population:	150,000 (plants/acre)	26.3
	175,000	26.7 NS**
	200,000	25.9
Row Spacings:	7-inch	28.1 a*
	28-inch	27.6 a
	14-inch	25.1 b
	21-inch	24.4 b

* Averages followed by the same letter are not significantly different at the 5% level of probability.

** NS - indicates there are no significant differences among the averages.

Discussion:

Although the 7-inch row spacings out yielded the intermediate spacings, soybean growers must exercise caution when going to such narrow spacings. When using a narrow spacing the prior cropping history of the field is important.

The use of 7-inch row spacings on a clean field will likely increase yields. On a field with a history of weed problems, however, 7-inch row spacings may prove to be a disaster. Some producers may use 14- or 21-inch row spacings in combination with skip-rows because they afford the opportunity to get in the field and spray should should weeds become a problem.

Clearly in 1985 there was no yield advantage of the narrow spacings over the wide 28-inch spacings. This illustrates the crop had a great capacity to adjust to field conditions even though the in-row seed spacing and the distance between rows were different. The elemental analysis of Simpson and Weber respectively was: 6.46% N (40.0% crude protein), 0.74% P, 1.95% K and 6.12% N (38.3% crude protein), 0.62% P, 2.05% K.

FABABEAN AND LUPINE ROW SPACING STUDY

R. G. Hall and L. A. Evjen

Objective:

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

Methods and Procedures:

1. Type of legume: Lupine - Kiev
   Fababean - Variety unknown
2. Plant populations: 70-, 105-, and 140-thousand plants per acre.
3. Row spacings: 7- and 28-inch row spacings.
4. Seeding: Plots consisted of every combination of type of legume varieties (2), plant population (3), and row spacings (2) were replicated four times and seeded on May 21, 1985. Each plot measured 20 ft. long and plot width was 92 inches for the 7- and 28-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 28, 1985. 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.

Table 15. Mean yields for lupine and fababeans at three populations and two rowspacings at the Northeast Farm in 1985.

	Type of Bean							
	Lupine				Fababean			
	Row Spacing							
	7-Inch		28-Inch		7-Inch		28-Inch	
Population	Mean	Standard Error	Mean	Standard Error	Mean	Standard Error	Mean	Standard Error
(plants/A)	lbs./A							
70,000	1077	442	1305	132	1632	286	1367	0
105,000	1305	637	1523	527	1585	132	1616	747
140,000	1336	220	1041	418	1896	108	1787	593

Results

The yields obtained in this study were quite variable as indicated by the standard error of the mean values shown in Table 15. Examination of both the means and standard error values indicates there is likely an advantage of 7-inch row spacings over the wider 28-inch row spacings in the fababeans. In contrast, the means and standard errors were similar at both row spacings in lupines. Regardless of plant population, fababeans on 7-inch row spacings appeared to be better than any other combination of legume and row spacings. In both legumes on 7-inch row spacings the 140,000 population tended to yield higher with less variation compared to the other populations.

Present results indicate a population of 140,000 plants on 7-inch row spacings and a population of 100,000 plants on 28-inch row spacings would be acceptable. Overall, the yields of fababeans appear to be consistently higher than the yields of lupines. The elemental analysis of fababeans and lupines respectively was: 4.52% N (28.3% crude protein), 0.62% P, 1.20% K and 4.68% N (29.3% crude protein), 0.43% P, 1.15% K. The elemental analysis data along with the yield data indicates there was likely a slight advantage in crude protein yield of fababeans over lupines.

FARMING SYSTEMS STUDY

Northeast Research Station

Principal Investigators:

Jim Smolik (Project Leader), Paul Fixen, Bob Hall, Bob Kohl, Jim Gerwing, Russel McKinney and Leon Wrage

Cooperators:

Robin Bortnem, George Buchenau, Paul Evenson, Sharon Hanson and Paul Johnson

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 nematode populations.

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.

Long-term farming systems studies were initiated in 1985. Plots are comparatively large scale (2000-3000 sq. ft.) in an attempt to minimize border effects. The systems under study and the rotation schedules are shown in Tables 16 and 17.

Table 16. Farming Systems Study I - Rotation Schedule

Treatment	1985	1986	1987	1988	1989	1990	Plot No.'s
A Alternate-no syn. fertilizer, pesticide or moldboard plow	Oats/Alf	Alfalfa	Soybean	Corn	Oats/Alf	Alfalfa	(5,18,27,32)
	Alfalfa	Soybean	Corn	Oats/Alfa	Alfalfa	Soybean	(7,20,29,33)
	Soybean	Corn	Oats/Alf	Alfalfa	Soybean	Corn	(4,11,30,34)
	Corn	Oats/Alf	Alfalfa	Soybean	Corn	Oats/Alf	(6,16,21,37)
B Conventional	Corn	Soybean	Sp. Wheat	Corn	Soybean	Sp. Wheat	(10,15,28,38)
	Soybean	Sp. Wheat	Corn	Soybean	Sp. Wheat	Corn	(3,19,26,36)
	Sp. Wheat	Corn	Soybean	Sp. Wheat	Corn	Soybean	(8,12,23,35)
C Ridge-Til	Corn	Soybean	Sp. Wheat	Corn	Soybean	Sp. Wheat	(2,13,22,40)
	Soybean	Sp. Wheat	Corn	Soybean	Sp. Wheat	Corn	(1,17,25,39)
	Sp. Wheat	Corn	Soybean	Sp. Wheat	Corn	Soybean	(9,14,24,31)

Table 17. Farming Systems Study II - Rotation Schedule

Treatment	1985	1986	1987	1988	1989	1990	Plot No.'s
I Conventional	Soybean	Sp. Wheat	Barley	Soybean	Sp. Wheat	Barley	(2,17,29,43)
	Sp. Wheat	Barley	Soybean	Sp. Wheat	Barley	Soybean	(6,14,23,28)
	Barley	Soybean	Sp. Wheat	Barley	Soybean	Sp. Wheat	(10,18,30,34)
II Minimum-Till	Soybean	Sp. Wheat	Barley	Soybean	Sp. Wheat	Barley	(3,16,27,42)
	Sp. Wheat	Barley	Soybean	Sp. Wheat	Barley	Soybean	(8,15,31,39)
	Barley	Soybean	Sp. Wheat	Barley	Soybean	Sp. Wheat	(1,13,28,36)
III Alternate-no pesticide, syn. fertilizer or moldboard plow	Oats-Sweet Clover	S. Clover	Soybean	Sp. Wheat	Oats/Sweet Clover	Sweet Clover	(7,21,24,44)
	Sweet Clover	Soybean	Sp. Wheat	Oats/Sweet Clover	Sweet Clover	Soybean	(4,20,33,40)
	Soybean	Sp. Wheat	Oats-Sweet Clover	S. Clover	Soybean	Sp. Wheat	(5,12,32,35)
	Sp. Wheat	Oats-Sweet Clover	S. Clover	Soybean	Sp. Wheat	Oats/S. Clover	(9,19,25,37)
IV Continuous winter wheat	Winter wheat	W. Wheat	W. Wheat	W. Wheat	W. Wheat	W. Wheat	(11,22,26,41)

Cultural practice information for the various systems is presented in Tables 18-21. Tillage, fertilizer and pesticide inputs will vary from year to year as needs indicate. Butte spring wheat was planted in 1985 (Table 20) to provide stubble for the no-till winter wheat.

Table 18. Cultural practice information - farming systems studies.

Study I	Planting date	Fertilizer N-P-K (lb/A)	Manure	Herbicide	Hand weeding (hr/A)
Corn					
Alternate	May 20	--		--	1.4
Conventional	May 8	100-0-0		Ramrod, 10 lb. band	--
"Ridge"-till[a]	May 8	100-0-0		Ramrod, 10 lb. band	--
Soybean					
Alternate	May 31	--		--	2.0
Conventional	May 21	--		Lasso, 3 qt/A	1.4
"Ridge"-till[a]	May 21	--		Lasso, 3 qt/A	1.8
Spring Wheat					
Conventional	April 26	100-0-0		Bronate, 1/2 pt	--
"Ridge"-till	April 26	100-0-0		Bronate, 1/2 pt	--
Oats/Alfalfa	April 29	--	1 T/A dry matter (equivalent to 44-10.6-45.2 lb/A N-P-K)		--
Alfalfa	April 29	--		Eptam ('85 only) 3 lb ai/A	--

[a] Since this was the first year of study no ridges were in place.

Table 19. Cultural practice information - farming systems studies.

Study I	Tillage: Pre-plant	Tillage: Post-Plant
Corn		
Alternate	Fall chisel, spring disc, field cultivate	Cultivate 3X
Conventional	Fall chisel, spring disc	Rotary hoe and Cultivate 2X
"Ridge"-till	Fall chisel, spring disc	Rotary hoe and cultivate 2X, ridge at last cultivation
Soybean		
Alternate	Fall chisel, spring disc and field cultivate	Cultivate 2X
Conventional	Fall chisel, spring disc	Cultivate 2X
"Ridge"-till	Fall chisel, spring disc	Cultivate 2X
Spring wheat		
Conventional	Fall chisel, spring disc 2X	Fall plow
"Ridge"-till	Fall chisel, spring disc 2X	Ridges built post harvest
Oats/Alfalfa	Fall chisel, spring disc 2X and harrow	
Alfalfa	Fall chisel, spring disc 2X, and harrow	Fall chisel and subsurface sweep 2X

NOTE: previous crop in this field was small grain.

Table 20. Cultural practice information - farming systems studies.

Study II	Planting date	Fertilizer N-P-K (lb/A)	Manure	Herbicide	Hand weeding (hr/A)
Spring Wheat					
Alternate	May 2	--		--	--
Conventional	April 25	100-0-0		Bronate, 1/2 pt	--
Minimum-till	April 25	100-0-0		Bronate, 1/2 pt	--
Soybean					
Alternate	May 31	--		--	2.7
Conventional	May 21	--		Lasso, 3 qt/A	1.6
Minimum-till	May 21	--		Lasso, 3 qt/A	1.4
Barley					
Conventional	April 25	100-0-0		Bronate, 1/2 pt	--
Minimum-till	April 25	100-0-0		Bronate, 1/2 pt	--
Oats/Sweet Clover	April 29	--	1 T/A dry matter (equivalent to 44-10.6-45.2 lb/A N-P-K)		--
Sweet Clover	April 29	--		Eptam ('85 only) 3 lb ai/A	--
"Butte"	April 25	100-0-0		1/2 pt Bronate (Spring) Fall-1 pt Roundup + 1/2 pt 2,4-D	--

Table 21. Cultural practice information - farming systems studies.

Study I	Tillage: Pre-plant	Tillage: Post Plant
Spring Wheat		
Alternate	Fall chisel, spring disc 2X	Fall chisel
Conventional	Fall chisel, spring disc 2X	Fall plow
Minimum-till	Fall chisel, spring disc	Fall chisel
Soybean		
Alternate	Fall chisel, spring disc 2X, field cultivate	--
Conventional	Fall chisel, spring disc 2X	--
Minimum-till	Fall chisel, spring disc	--
Barley		
Conventional	Fall chisel, spring disc 2X	Fall plow
Minimum-till	Fall chisel, spring disc	Fall chisel
Oats/Sweet Clover	Fall chisel, spring disc 2X, + harrow	--
Sweet Clover	Fall chisel, spring disc 2X, + harrow	Fall chisel - subsurface sweep 2X
"Butte"	Fall chisel, spring disc	No-till seeded to Rose winter wheat on September 20

NOTE: previous crop was flax.

Small grain, row crop and forage yields in the various farming systems are listed in Tables 22-24. Yield estimates were obtained from the center area of each plot. Since this was the first year of the studies yield data is of limited use because it does not reflect the effects of rotations or tillage practices. We feel it will probably be 3-4 years before these effects are apparent. Nevertheless, certain of the yield comparisons are of interest. In Study II (Table 22) the addition of 100 lbs. N in the conventional planting did not increase spring wheat yields although protein levels were increased. Highest spring wheat yields were obtained in the alternate planting. The minimum-till spring wheat and barley were seeded with a no-till planter that left substantial soil ridges between furrows. A heavy rain several weeks after planting leveled the ridges and substantially reduced stands which significantly reduced yields (Table 22). Corn and soybean yields in the conventional and minimum-till plantings were significantly higher than the alternate (Table 23). The alternate corn and soybean plantings were delayed 10-12 days in order to allow an additional shallow cultivation for weed control. Row crop development was generally poor at the NE Farm in 1985 and the delay in planting probably was in part responsible for the lower yields. Total sweet clover forage yields were higher than alfalfa, principally as a result of higher yields at the second cutting (Table 24). Sweet clover forage was not removed after cutting since the primary purpose of this crop in the alternate system is to improve soil nutrition and tilth and, along with alfalfa, to aid in weed control.

Table 22. Small grain yields, farming systems studies.

	Yield (Bu/A)	Test wt.	Protein %
Study I. Spring wheat var. Guard			
Conventional	44.1[a]	59.0	14.2
"Ridge"-till	42.4	58.4	14.7
Oats var. Moore			
Oats/Alfalfa	98.4	33.5	16.6
Study II. Spring wheat var. Guard			
	Yield (Bu/A)	Test wt.	Protein %
Conventional	46.9	57.5	15.8
Alternate	49.6	57.3	14.7
Minimum-till	37.7	57.5	14.2
Var. Butte (to be planted to winter wheat)	39.9	56.9	14.7
$FLSD_{.05}$ =	6.6		

Table 22. (continued)

	Barley var. Robust		
	Yield (Bu/A)	Test wt.	Protein %
Conventional	66.5	44.1	15.3
Minimum-till	45.8	43.9	13.5
	Oats var. Moore		
	Yield (Bu/A)	Test wt.	Protein %
Oats/Sweet Clover	91.8	31.9	18.2

[a] Avg of four replications.

Table 23. Row crop yields - farming systems studies.

Study I	Corn - Pioneer 3906	
		Yield (Bu/A)
Conventional		82.1[a]
"Ridge"-till[b]		86.6
Alternate		70.6
FLSD$_{.05}$ =		9.3
	Soybeans - Evans	Yield (Bu/A)
Conventional		27.0
"Ridge"-till[b]		26.6
Alternate		18.4
FLSD$_{.05}$ =		3.8
Study II	Soybean - Evans	Yield (Bu/A)
Conventional		24.9
Minimum-till		25.4
Alternate		15.5
FLSD$_{.05}$ =		5.7

[a] Avg of four replications.
[b] Corn was hilled at last cultivation.

Table 24. Forage crop yields - farming systems studies.

	1st Cutting	2nd Cutting	Total (T/A)
Study I			
Alfalfa - Vernal (1st year)	1.15[a]	0.86	2.01
Study II			
Sweet Clover (1st year - not removed)	1.04	1.19	2.23

[a] Avg of four replications.

Tissue analysis (% N-P-K):
Alfalfa 1st cutting, 2.4-0.22-1.86;
2nd cutting, 4.0-0.29-2.10;
Sweet Clover 1st cutting, 3.0-2.4-1.92;
2nd cutting, 3.8-0.28-2.04.

Weed populations were low to moderate in both studies (Tables 25 and 26). There was little difference in weed numbers among the corn systems. Grassy weed numbers (green and yellow foxtail) were higher in the alternate vs conventional and minimum till soybeans. The reverse occurred in spring wheat in which grassy weed numbers were lower in the alternate plantings (Table 26). The dominant broadleaf in both studies was prostrate pigweed. This weed is not usually associated with significant reductions in yield.

Table 25. Weed populations - farming systems studies.

Study I	Alternate	Conventional	"Ridge"-till
Corn			
Annual grasses	3[a]	2	7
Annual broadleaves	11	18	14
Soybeans			
Annual grasses	11	0	1
Annual broadleaves	9	6	8
Spring Wheat			
Annual grasses	--	20	46
Annual broadleaves	--	2	0
Oats/Alfalfa			
Annual grasses	10		
Annual broadleaves	9		
Alfalfa			
Annual grasses	3		
Annual broadleaves	20		

[a]Number/3 sq ft - avg of four replications - green and yellow foxtail dominant grasses, prostrate pigweed was dominant broadleaf. Sampled August 13.

Table 26. Weed populations - farming systems studies

Study II	Alternate	Conventional	Minimum-till
Soybean			
Annual grasses	5[a]	1	2
Annual broadleaves	6	6	4
Spring Wheat			
Annual grasses	17	29	32
Annual broadleaves	4	0	0
Barley			
Annual grasses	--	15	33
Annual broadleaves	--	3	2
Oats/Sweet Clover			
Annual grasses	19		
Annual broadleaves	10		
Sweet Clover			
Annual grasses	4		
Annual broadleaves	18		
"Butte" (Continuous winter wheat)			
Annual grasses			37
Annual broadleaves			3

[a]Numbers/3 sq ft - avg of four replications, green and yellow foxtail dominant grasses, prostrate pigweed was dominant broadleaf. Sampled August 13.

The primary purpose of the 1985 soil tests (Tables 27 and 28) is to serve as a "baseline" for future years comparisons. Soil nitrate levels were higher in fertilized systems in both studies and in some instances (particularly spring wheat - Study II) were higher than anticipated. Mineralization of soil organic matter was higher than normal this year in most of South Dakota and these higher releases of nutrients coupled with the addition of fertilizer resulted in the substantial N levels remaining after harvest.

Table 27. Soil test results - farming systems studies.

Study I	NO_3-N lbs/A 0-24"	P ppm	K ppm	Zinc ppm	Organic Matter %	pH	Salts
		------	------	------	0-6"	------	------
Corn							
Alternate	15[a]	29	184	1.22	2.8	6.0	0.3
Conventional	33	30	354	1.24	2.8	6.2	0.3
"Ridge"-till	55	19	174	0.95	2.6	6.2	0.3
Soybean							
Alternate	18	24	195	1.11	2.8	6.1	0.3
Conventional	21	30	206	1.09	2.7	6.1	0.3
"Ridge"-till	21	30	191	1.23	2.9	6.1	0.4
Spring Wheat							
Conventional	18	23	206	1.03	2.7	6.1	0.3
"Ridge"-till	17	21	196	1.08	2.8	6.1	0.3
Oats/Alfalfa	13	21	195	1.02	2.7	6.1	0.3
Alfalfa	14	21	193	1.02	2.7	6.2	0.3

[a]Average of four replications. Sampled September 17.

NOTE: ppm x 2 = lbs/A.

Table 28. Soil test results - farming systems studies.

Study II	NO_3-N lbs/A 0-24"	P ppm	K ppm	Zinc ppm	Organic Matter %	pH	Salts
		-------	-------	-------	0-6"	-------	-------
Spring Wheat							
Alternate	21[a]	21	171	1.13	2.8	6.0	0.3
Conventional	55	22	194	1.15	2.8	6.0	0.3
Minimum-till	44	22	176	1.14	2.8	6.0	0.3
"Butte"	63	26	189	1.28	2.9	5.9	0.4
Soybean							
Alternate	18	27	186	1.29	2.9	6.0	0.3
Conventional	17	26	183	1.27	2.8	6.1	0.3
Minimum-till	17	26	180	1.33	2.8	6.0	0.2
Barley							
Conventional	30	20	188	1.13	2.8	6.1	0.3
Minimum-till	33	23	194	1.21	2.7	6.0	0.3
Oats/Sweet Clover	18	21	179	1.37	2.8	6.2	0.3
Sweet Clover	19	21	179	1.18	2.7	6.1	0.3

[a]Average of four replications. Sampled September 18. NOTE: ppm x 2 = lbs/A.

There were no substantial differences in percent N, P or K in corn grain (Table 29). Nitrogen content of soybean seed in the alternate systems was slightly higher. The alternate soybeans were less mature at frost and therefore contained a higher proportion of nitrogen to carbohydrate, which resulted in the higher nitrogen percent.

Table 29. Elemental analysis of grain: corn and soybean.

	% N	% P	% K
Corn			
Alternate	1.80	0.32	0.60
Conventional	1.83	0.38	0.65
"Ridge"-till	1.73	0.34	0.65
Soybean - Study I			
Alternate	6.26	0.64	1.85
Conventional	6.08	0.62	1.90
"Ridge"-till	6.14	0.60	1.90
Soybean - Study II			
Alternate	6.16	0.69	2.00
Conventional	5.95	0.70	1.80
Minimum-till	5.94	0.73	1.90

Both dagger and lance nematode populations increased substantially in small grains in both studies (Tables 30 and 31). Both nematodes can be very detrimental to crop growth, however, current populations are below the damage threshold. Earthworm (Oligochaeta) populations declined over the growing season in all crops except soybeans where populations remained comparatively constant, particularly in Study I.

Table 30. Nematode and earthworm populations - farming systems studies.

Study I	Sampling date	Dagger	Lance	Earthworm
Corn				
Alternate	June	10[a]	4	15
	October	4	5	2
Conventional	June	0.5	1	30
	October	1	0.3	6
"Ridge"-till	June	2	0.5	19
	October	33	1	6
Soybean				
Alternate	June	4	5	13
	October	0.5	2	11
Conventional	June	1	3	13
	October	0.5	0.3	13
"Ridge"-till	June	29	3	16
	October	3	0.3	10
Spring Wheat				
Conventional	June	0.5	1	26
	August	22	7	3
"Ridge"-till	June	1	1	31
	August	12	7	3
Oats/Alfalfa	June	0.5	1	38
	August	7	9	11
Alfalfa	June	0	2	24
	October	9	2	0.5

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

Table 31. Nematode and earthworm populations, farming systems studies.

Study II	Sampling date	Dagger	Lance	Earthworm
Spring Wheat				
Alternate	June	1[a]	2	13
	August	32	6	8
Conventional	June	0.5	7	10
	August	14	17	5
Minimum-till	June	1	1	25
	August	90	12	3
Soybean				
Alternate	June	6	17	6
	October	6	7	15
Conventional	June	1	7	7
	October	0.2	0.2	7
Minimum-till	June	4	6	5
	October	1	0.5	10
Barley				
Conventional	June	0.3	1	15
	August	5	20	5
Minimum-till	June	1	5	19
	August	20	22	2
Oats/Sweet Clover	June	6	8	15
	August	63	11	6
Sweet Clover	June	2	3	16
	October	8	0.2	1
"Butte"	June	2	1	13
	August	12	4	3

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

Total plant feeding, predaceous and microbial feeding nematode populations were also measured (Tables 32 and 33). In Study I plant feeding populations declined over the growing season in all crops except soybeans. In Study II plant feeders increased or remained nearly constant in most crops. Nematodes included among the plant feeders are stunt, spiral, pin, dagger, lance and the Tylenchinae. Populations of predaceous and microbial feeding nematodes declined in most crops in both studies. Predaceous nematodes feed on a variety of soil animals including other nematodes and, along with the microbial feeders, are generally considered beneficial.

Table 32. Plant feeding, predaceous and microbial feeding nematode populations, farming systems studies.

Study I	Sampling date	Plant Feeding	Predaceous	Microbial Feeding
<u>Corn</u>				
Alternate	June	256[a]	509	1037
	October	87	172	357
Conventional	June	535	597	1279
	October	83	157	294
"Ridge"-till	June	160	400	900
	October	94	196	362
<u>Soybean</u>				
Alternate	June	336	529	1054
	October	878	694	746
Conventional	June	597	733	1138
	October	422	452	596
"Ridge"-till	June	285	355	871
	October	223	353	353
<u>Spring Wheat</u>				
Conventional	June	210	543	1683
	August	114	240	447
"Ridge"-till	June	480	909	1524
	August	230	604	698
<u>Oats/Alfalfa</u>	June	240	571	2001
	August	165	407	613
<u>Alfafla</u>	June	280	535	1633
	October	131	207	267

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

Table 33. Plant feeding, predaceous and microbial feeding nematode populations, farming systems studies.

Study II	Planting date	Plant Feeding	Predaceous	Microbial Feeding
Spring Wheat				
Alternate	June	105[a]	759	1655
	August	74	209	707
Conventional	June	93	809	1583
	August	140	403	576
Minimum-till	June	96	268	587
	August	186	269	634
Soybean				
Alternate	June	51	380	747
	October	151	425	630
Conventional	June	134	280	599
	October	63	259	449
Minimum-till	June	101	267	900
	October	743	438	500
Barley				
Conventional	June	130	471	967
	August	59	286	1023
Minimum-till	June	80	546	1372
	August	74	194	535
Oats/Sweet Clover	June	109	325	909
	August	124	514	922
Sweet Clover	June	34	359	1342
	October	75	279	427
"Butte"	June	84	480	1233
	August	80	242	627

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

Insects were not a significant factor in either study in 1985. Low populations of corn borer were present, but they did not exceed the economic damage threshold. Grasshopper populations were quite high, particularly after small grain harvest. Most of the grasshoppers were present in the grassed alleyways and in field borders and several Malathion sprays were applied to those areas.

Bacteria and fungal populations were sampled on several dates in both studies, however, analyses of these samples are currently incomplete.

FOXTAIL AND PROSO MILLET CONTROL IN SOYBEANS

W. E. Arnold, M. A. Peterson, D. A. Vos, and M. A. Wrucke

Proso millet has become a significant weed problem in soybeans in many parts of the United States. Presently there are only small areas of infestation in South Dakota. The purpose of this experiment was to evaluate several new herbicides for control of this potential weed problem. Command is an experimental herbicide being evaluated in soybeans which has shown good activity on some grass species under some conditions. Poast, Verdict, and Fusilade 2000 are all postemergence grass herbicides presently being evaluated in soybeans.

The experiment site was located on a silty clay loam soil with 4.7% organic matter and 6.6 pH. 'Corsoy 79' soybeans were planted on May 22 in 36-inch rows at 60 lb/A. Treatments were arranged in a randomized complete block design with four replications. Preemergence treatments were applied on May 22 under partly cloudy skies, 62% relative humidity and 69 F air temperature. Unifoliate treatments were applied on June 28 under cloudy skies with 66% relative humidity and 59 F air temperature. Postemergence treatments were applied on July 9 under clear skies with 75% humidity and 65 F air temperature. All treatments were applied with a bicycle-wheeled plot sprayer at 42 psi and in 20 gallons of water per acre.

Command did not provide adequate control of either foxtail or proso millet in this study (Table 34). Only 0.24 inches of rainfall was received during the first two weeks after application; generally this is not considered enough rainfall to activate Command herbicide and probably resulted in the poor control. Poast, Verdict, and Fusilade 2000 gave good control of both foxtail and proso millet at all rates tested in this study. Proso millet control was higher than foxtail control in all cases indicating extreme sensitivity of proso millet to these three postemergence grass herbicides.

Table 34. Foxtail and proso millet control in soybeans.

Treatment	Rate (lb a.i./A)	Growth Stage	% Weed Control Foxtail	% Weed Control Proso Millet
Command	1.25	Pre	22	5
Command + Command + 10-34-0 surf.	0.75 0.50 1 qt.	Pre Unif Unif	27	0
Poast[a]	0.05	Post	75	88
Poast[a]	0.10	Post	86	94
Verdict[a]	0.05	Post	74	87
Verdict[a]	0.10	Post	85	95
Fusilade 2000[a]	0.047	Post	67	76
Fusilade 2000[a]	0.094	Post	86	95
Check			0	0
LSD (0.05)			17	12

[a] Treatment was applied with crop oil concentrate at 1 qt/A.

FUSILADE COMBINATIONS FOR WEED CONTROL IN SOYBEANS

W. E. Arnold, M. A. Peterson, D. A. Vos and M. A. Wrucke

Fusilade 2000 is a new formulation of Fusilade which is being evaluated for grass control in soybeans. Weed control tends to decrease with most of the new postemergence grass herbicides when they are tank-mixed with a postemergence broadleaf herbicide. The purpose of this study was to determine if the new formulation of Fusilade is also affected by tank-mixing with other herbicides.

'Evans' soybeans were planted in 36-inch rows at 60 lb/A on June 19, 1985. The experiment site was located on a silty clay loam soil with 4.7% organic matter and pH 6.6. Treatments were arranged in a randomized complete block design with four replications. All treatments were applied on July 29 when the soybeans were at the 2-3 trifoliate stage and foxtail varied from 6-14 inches. Treatments were applied with a bicycle-wheeled plot sprayer at 42 psi and in 20 gallons of water per acre.

Fusilade 2000 has greater activity than the standard Fusilade 4E formulation; this is indicated by slightly better control at a lower rate (Table 35). When Basagran was tank-mixed with Fusilade 2000, no decrease in foxtail control was observed. However, when Fusilade 2000 was tank-mixed with Blazer, control was significantly decreased. When Fusilade 2000 was tank-mixed with lower rates of Blazer and Basagran, a decrease in control was also observed. It appears from this study that Blazer is the primary cause for antagonism and that Fusilade 2000 and Blazer should not be tank-mixed.

Table 35. Fusilade combinations for weed control in soybeans.

Treatment	Rate (lb a.i./A)	Growth Stage	% Foxtail Control
Fusilade 4E[a]	0.25	2-3 Leaf	56
Fusilade 2000[a]	0.188	2-3 Leaf	64
Fusilade 2000 + Basagran[a]	0.188 1.0	2-3 Leaf	68
Fusilade 2000 + Blazer[b]	0.188 0.50	2-3 Leaf	47
Fusilade 2000 + Blazer + Basagran[b]	0.188 0.25 0.75	2-3 Leaf	34
Check			0
LSD (0.05)			12

[a] Crop oil concentrate was added to the treatment at 1 qt/A.
[b] X-77 surfactant was added to the treatment at 0.25% v/v.

POSTEMERGENCE WILD MUSTARD CONTROL IN SUNFLOWERS

W. E. Arnold, M. A. Peterson, and D. A. Vos

Wild mustard is a common weed problem in northeastern South Dakota sunflower fields. Currently, there is no labeled postemergence herbicide option available for its control. An experimental herbicide, AC 222-293 (tradename Assert) has been demonstrated to control several broadleaf weeds in wheat and barley. Acifluorfen (tradename Blazer) controls various broadleaf weeds in soybeans. The purpose of this experiment was to evaluate AC 222-293 and acifluorfen for wild mustard control in sunflowers.

Sunflowers (PAG SF102) were planted on May 29, 1985. Treatments were applied either on June 28 when wild mustard was 3 inches tall and sunflowers were in the 3-4 leaf stage, or on July 8 when wild mustard was about 18 inches tall and sunflowers were in the 8-10 leaf stage. All treatments were applied with a small plot sprayer calibrated to deliver a spray volume of 10 gallons per acre.

Table 36 presents the results of visual ratings of wild mustard control and crop injury. At the earlier application stage wild mustard control with Assert was excellent when 0.75 lb/A was applied. Control was still acceptable down to 0.25 lb/A. Applications made at the later growth stage gave significantly less control. Split applications of Assert resulted in the best overall control. For example, 0.125 lb/A applied twice gave better control than one treatment with 0.25 lb/A applied early. Sunflower injury with Assert treatments was relatively low. Blazer gave excellent control of wild mustard at the early application stage, but sunflower injury was 27%. Application of Blazer at the later stage did not give significant wild mustard control.

Table 36. Wild mustard control in sunflowers with postemergence herbicides.

Herbicide Rate	Application Stage	Wimu Control	Crop Injury
----lb a.i./A------	(Sunflower)	------------%-----------	
Assert .125	2-4 lf	60	5[a]
Assert .18	2-4 lf	65	6
Assert .25	2-4 lf	85	7
Assert .38	2-4 lf	83	7
Assert .75	2-4 lf	98	2
Assert .125	8-10 lf	46	5
Assert .18	8-10 lf	56	5
Assert .25	8-10 lf	73	6
Assert .38	8-10 lf	71	5
Assert .75	8-10 lf	88	7
Assert .125 + .125	2-4 + 8-10 lf	95	5
Assert .125 + .18	2-4 + 8-10 lf	96	6
Assert .18 + .125	2-4 + 8-10 lf	94	6
Assert .18 + .18	2-4 + 8-10 lf	94	5
Assert .25 + .125	2-4 + 8-10 lf	95	6
Assert .25 + .18	2-4 + 8-10 lf	97	5
Blazer .18	2-4 lf	92	27
Blazer .18	8-10 lf	17	25
LSD (0.05)		14	

[a] Amount of necrotic tissue compared to untreated.

ALFALFA ESTABLISHMENT SCREENING

L. Wrage, P. Johnson, B. Schurrer and J. Beskow

PURPOSE

The primary objective is to compare herbicide performance on new alfalfa seedings. Producers have shown increasing interest in using establishment methods other than a small grain overseeding. Several available herbicides have not been included in comparative trials and several experimental herbicides show promise, based on other data available.

METHODS

Plot Design:	Randomized complete block; 4 reps
Plot Size:	6' x 25'
Soil:	Moist at 2 inches; fine
Seedbed:	Plowed, disked; well worked, previous crop - small grain
Variety:	Vernal; planted in 6" rows with plot seeder
Herbicide:	Plot sprayer, 20 gpa, 40 psi, flat fan
Evaluated:	8/14
Planting Date:	5/2
PPI:	5/2; incorporated with small tandem disk set to cut 4-5 inches
POPI:	5/2; incorporated 1 X with harrow
PRE:	5/2
E POST:	5/12; buckwheat, 4 inches
POST:	5/29; grass 4-5 leaf
Rainfall:	1st week: 0.05 inches
	2nd week: 3.27 inches

RESULTS

Plots were visually evaluated August 14 for percent grass, broadleaf and wild/volunteer buckwheat control. Two observations per plot in each replicate were recorded. Forage samples were harvested on August 20, weighed and subsampled to determine percent dry matter. Oat silage (DM) yield from adjacent plot area is included for comparison. Data are presented in Table 37.

Eptam or Balan as labeled for use provided very good grass control and partial broadleaf control. Treflan is labeled for use with alfalfa cover crops and also provided very good annual grass control as a preplant treatment. It also reduced the buckwheat population, indicating it may not have sufficient tolerance for that crop. Preplant incorporated Treflan was superior to shallow incorporated postplant. Prowl performed similar to Treflan. 2,4-DB postemergence provided some broadleaf suppression, however, kochia and buckwheat were not adequately controlled.

Several experimental herbicides performed very well. Buctril at a low rate gave excellent buckwheat and broadleaf control with no apparent crop injury. Racer controlled some broadleaf weeds, crop tolerance appears good. It is most effective on mustard. Poast, Verdict, or Fusilade applied postemergence controlled annual grasses; yields tended to be lower for the total postemergence treatments. Herbicide use information, including rates, application directions and cost per acre are available in Extension weed control fact sheet, FS 525L.

Table 37. Weed control in alfalfa.

		Percent Weed Control			
Treatment	lb/A act.	Gr	Wild/Vol. Buckwheat	Bdlf	Tons DM/A
PREPLANT INCORPORATED					
Eptam	2.5	88	20	70	1.70
*Eptam + Racer	.25 + .375	82	23	68	1.82
Balan	1.5	86	58	83	1.73
Treflan	.5	88	63	78	1.84
Treflan	1	90	78	86	1.65
*Prowl	1.25	90	71	87	1.49
POSTPLANT INCORPORATED					
Treflan	1	63	22	56	1.50
PREEMERGENCE					
*Racer	.5	5	11	50	1.89
EARLY POSTEMERGENCE					
*2,4-DB + Buctril	.25 + .25	2	94	94	1.96
2,4-DB	1	1	44	70	1.86
2,4-DB	1.5	0	56	79	1.82
EARLY POSTEMERGENCE & POSTEMERGENCE					
*2,4-DB & Poast	1 & .2	89	46	70	1.33
*2,4-DB & Verdict	1 & .125	89	45	71	1.35
*2,4-DB & Fusilade	1 & .25	79	44	68	1.38
Check		0	0	0	1.74
Oat Silage (DM)					0.68
LSD (.05)		6	14	9	0.34

* = Experimental
Gr = Yellow, green foxtail (moderate)
Bdlf = Kochia, Russian thistle, lambsquarters, wild mustard

EDIBLE BEAN HERBICIDE DEMONSTRATION

L. Wrage, P. Johnson, B. Schurrer and J. Beskow

PURPOSE

To compare labeled herbicides on edible beans. There are limited performance data available. Recommendations are based on data from other states and on experience with the same herbicides in other crops. Demonstration plots repeated over several years may provide the necessary experience to provide producers with sound recommendations. The plots were also used for tour purposes.

METHODS

Plot Design:	Demonstration; 20' x 40'
Variety:	Navy beans
Herbicide:	Plot sprayer, 20 gpa, flat fan
Cultivation:	None
Evaluated:	8/21
Planting Date:	5/29
PPI:	5/29; incorporated 2 X with small tandem disk 4-5 inches
SPPI:	5/29; incorporated 1 X with small tandem disk 3 inches.
PRE:	5/29
POST:	6/21
Rainfall:	1st week: 0.41 inches
	2nd week: 0.88 inches

RESULTS

Data from visual evaluation for percent weed control are presented in Table 38. Annual grass pressure was light. Preplant incorporated treatments provided somewhat greater control than shallow preplant incorporated or preemergence treatments. Eptam and Sonalan provided excellent grass control. Combination treatments provided limited additional control of weeds present. Basagran postemergence over preplant Treflan provided the highest level of control.

Table 38. Weed control in edible beans.

Treatment	lb/A act.	Percent Control Gr	Bdlf
PREPLANT INCORPORATED			
Check	--	0	0
Eptam	4	88	83
Eptam + Treflan	3 + .5	88	89
Eptam + Sonalan	3 + 1	90	94
Eptam + Prowl	3 + .75	90	86
Eptam + Amiben	3 + 2	86	85
Treflan	.75	74	78
Treflan + Amiben	.75 + 2	84	90
Sonalan	1.1	68	84
Sonalan + Dual	1 + 2	88	88
Sonalan + Dual	1 + 2	84	97
Sonalan + Lasso	1 + 2	85	94
Sonalan + Amiben	1 + 2	78	88
Prowl	1.5	62	48
SHALLOW PREPLANT INCORPORATED			
Lasso	3	62	50
Dual	2.5	76	56
PREEMERGENCE			
Dual + Amiben	2 + 2	72	52
Amiben	3	81	86
PREPLANT INCORPORATED & POSTEMERGENCE			
Treflan & Basagran + oil	.75 + 1 + 1	91	96
Check	--	0	0

Gr = Yellow foxtail (light)
Bdlf = Kochia, Russian thistle, lambsquarters (moderate)

FLAX HERBICIDE SCREENING

L. Wrage, C. Lay, K. Grady, P. Johnson, B. Schurrer and J. Beskow

PURPOSE

To compare herbicide performance for weed control and crop tolerance on flax. Weeds compete severely with flax: labeled herbicides are limited. Several experimental products are in advanced stages of testing.

METHODS

Plot Design:	Randomized complete block; 4 reps
Plot Size:	10' x 40'
Soil:	Moist top 2 inches; fine, well worked
Variety:	Culbert 79 and Clark on half of each plot. Planted with plot seeder.
Herbicide:	Plot sprayer, 20 gpa, 40 psi, flat fan
Evaluated:	8/1
Planting Date:	5/2
PPI:	5/2; incorporated 2 X with small tandem disk 4-5 inches
PRE:	5/2
POST:	6/12
Rainfall:	1st week: 0.05 inches
	2nd week: 3.27 inches

RESULTS

Plots were visually evaluated for percent weed control. Data summarized from two evaluations per rep are presented in Table 39. Rainfall the first week was inadequate for performance of preemergence herbicides. Preplant and postemergence herbicides performed very well.

Eptam, Treflan and Poast, all applied as experimental treatments, provided excellent foxtail control. Eptam, Treflan and Verdict gave the best wild oat control. Bromoxynil and Tordon (experimental) gave excellent broadleaf control in combinations.

Several new herbicides and combinations appear promising for flax. Testing will be continued as the registration process continues.

Data from this test is used in preparing Extension fact sheet FS 525A, and rates, application directions, and cost per acre are included.

Table 39. Weed control in flax.

Treatment	lb/A act.	Percent Control Foxtail	Wild Oat	Wild Mustard	Bdlf
PREPLANT INCORPORATED					
Check	--	0	0	0	0
*Eptam	3	93	89	6	11
*Treflan	.75	81	92	3	35
PREPLANT INCORPORATED & POSTEMERGENCE					
*Eptam & MCPA ester	3 & .25	91	92	94	45
PREEMERGENCE					
*Dual	2.5	76	52	0	1
Lasso	2.5	63	43	8	14
*Ramrod	4	83	25	3	10
POSTEMERGENCE					
MCPA amine	.25	0	1	95	75
MCPA amine + Dalapon	.25 + .75	79	25	95	64
MCPA amine + Dalapon	.25 + .75	72	11	94	65
MCPA ester	.25	0	2	92	61
Bromoxynil + crop oil	.25 + 1 qt.	15	2	80	90
Bromoxynil	.25	15	15	90	90
Bromoxynil + MCPA ester	.25 + .25	10	0	95	86
*Tordon + MCPA ester	.015 + .25	2	2	90	81
*Tordon + MCPA + Dalapon	.015 + .25 + .75	60	9	95	80
*Hoelon + bromoxynil	1 + .25	81	76	92	89
*Fusilade + bromoxynil + crop oil	.25 + .25 + 1 qt	80	82	74	88
*Poast + bromoxynil + crop oil	.2 + .25 + 1 qt	92	78	94	76
*Verdict + bromoxynil + crop oil	.12 + .25 + 1 qt	72	94	--	92
LSD (.05)		22	27	--	24

* Experimental

POTATO HERBICIDE DEMONSTRATION

W. Arnold, L. Wrage and P. Johnson

PURPOSE

To compare herbicide performance for weed control and crop injury on potatoes. Weeds are a serious problem in production. Performance data for the production area in South Dakota are limited; these demonstration field tests provide for side-by-side comparisons at tours. Data are also used for educational meetings.

METHODS

Plot Design:	Demonstration; 10' x 50'
Soil:	Moist top 2 inches; fine, well worked
Variety:	Kennebec
Herbicide:	Plot sprayer, 20 gpa, 40 psi, flat fan
Cultivation:	None until layby
Evaluated:	7/8
Planting Date:	5/3
PPI:	5/2; incorporated 2 X with small tandem disk 4-5 inches
POPI:	5/4; incorporated 1 X with harrow
PRE:	5/4
Rainfall:	1st week: 0.00 inches
	2nd week: 0.78 inches

RESULTS

Plots were visually evaluated for percent weed control; averaging two observations per plot. Yields were determined from the entire plot area (Table 40).

Rainfall for the week after planting in 1985 was less than required for preemergence treatments or for shallow incorporated postplant herbicides. Grass control was not acceptable, except for the preplant incorporated Eptam treatment. Sencor/Lexone was the superior broadleaf treatment used in combinations.

Yields primarily reflect early season weed control. Earlier cultivation would have improved control and increased yields, however, plots were not fertilized or managed for maximum yield.

Two-year averages are provided as a measure of weed control consistency. Preplant incorporated tank-mix of Eptam with Sencor/Lexone has provided outstanding control for the two-year period.

Table 40. Weed control in potatoes.

Treatment	lb/A act.	Percent Control 1985 Gr	Percent Control 1985 Bdlf	Percent Control 2 Yr. Avg. Gr	Percent Control 2 Yr. Avg. Bdlf	Yield cwt/A
PREPLANT INCORPORATED						
Check	--	0	0	0	0	60.8
Eptam	4	93	68	94	61	204.1
Eptam + Sen/Lex	3 + .5	86	88	91	89	231.2
POSTPLANT INCORPORATED						
Treflan	1	68	62	52	59	140.7
Treflan + Eptam	.75 + 3	75	68	70	57	190.0
Prowl	1.25	66	72	51	57	175.9
PREEMERGENCE						
Prowl	1.25	58	55	48	52	185.0
Dual	2.5	59	42	68	42	133.2
Dacthal	7.5	32	42	34	42	105.6
Sencor/Lexone	.75	48	91	38	64	133.2
Dual + Sen/Lex	2 + .75	55	84	76	88	102.0
Dual + Lorox	2 + 1	42	28	62	52	50.3
Prowl + Sen/Lex	1.25 + .75	48	74	66	82	68.9
LSD (.05)				7	12	

Gr = Yellow, green foxtail (moderate)
Bdlf = Redroot pigweed, lambsquarters (moderate)

SOYBEAN HERBICIDE DEMONSTRATION

W. Arnold, L. Wrage and P. Johnson

PURPOSE

To compare labeled herbicide treatments for weed control. Soybean acerages have expanded somewhat in the area; less experienced producers are not familiar with weed programs available.

METHODS

Plot Design:	Demonstration; 10' x 50'
Soil:	Silty clay loam; 4.7% O.M., 6.6 pH; well worked, good condition; dry top inch; fine
Variety:	Corsoy 79
Herbicide:	Plot sprayer, 20 gpa, 40 psi, flat fan
Cultivation:	None
Evaluated:	7/8
Planting Date:	5/21
PPI:	5/21; incorporated 2 X with small tandem disk 4-5 inches
SPPI:	5/21; incorporated 1 X with small tandem disk 3 inches
PRE:	5/25
POST:	6/29; grass 4-6 leaf; broadleaves 2-3 in; good moisture
Rainfall:	1st week: 0.08 inches 2nd week: 0.41 inches

RESULTS

Plots were visually evaluated for weed control and crop injury at two locations in each plot. Data recorded as percent grass and broadleaf control are presented in Table 41.

Rainfall was marginal the first two weeks. Data are an excellent example of performance with less than ideal rainfall. Preplant incorporated and preemergence combination treatments provided the highest level of control. Most herbicides regarded as primarily "grass herbicides" were much less effective on broadleaves. Shallow preplant incorporated treatments were not superior to the same herbicides applied preemergence. Treflan, Sonalan and Prowl provided generally similar results at rates used. The split preplant incorporated and preemergence treatments provided excellent control of both grasses and broadleaves.

Postemergence Basagran and/or Blazer gave excellent broadleaf control: weeds were small and conditions favorable at that time. The total postemergence program performed very well based on weed control data. Harness, an experimental preemergence herbicide, provided excellent grass control and better broadleaf control when compared to other preemergence treatments.

Data from this and other experiments are used in preparing Extension fact sheet FS 5258. Rates, application directions and cost per acre are given for each treatment.

Table 41. Weed control in soybeans.

Treatment	lb/A act.	Percent Weed Control Gr	Bdlf
PREPLANT INCORPORATED			
Check	--	0	0
Treflan	.75	85	73
Sonalan	1.1	94	78
Prowl	1.25	90	65
Reward	2.5	92	35
Treflan + Sencor/Lexone	.75 + .38	89	92
SHALLOW PREPLANT INCORPORATED			
Lasso	3	66	45
Dual	2.5	52	35
PREPLANT INCORPORATED & PREEMERGENCE			
Treflan & Sencor/Lexone	.75 & .5	94	96
Treflan & Amiben	.75 & 2	96	94
PREEMERGENCE			
Amiben	2	58	52
Lasso	3	79	42
Dual	2.5	68	37
*Harness	2.5	93	76
Lasso + Sencor/Lexone	2 + .5	88	82
Dual + Sencor/Lexone	2 + .5	85	85
Lasso + Amiben	2 + 2	88	82
Lasso + Lorox	2 + 1	90	84
Lasso + Modown	2 + 1.5	91	94
PREEMERGENCE & POSTEMERGENCE			
Lasso & Basagran	2 & 1	73	86
Lasso & Blazer	2 & .5	74	93
Lasso & Basagran + Blazer	2 & .5 + .38	72	92
POSTEMERGENCE			
Poast + Blazer + Basagran + oil	.3 + .25 + .5 + 1 qt	94	96

* Experimental
Gr = Yellow, green foxtail (light)
Bdlf = Kochia, redroot pigweed, lambsquarters (moderate)

SUNFLOWER HERBICIDE DEMONSTRATION

L. Wrage, P. Johnson, B. Schurrer and J. Beskow

PURPOSE

To compare herbicide performance of labeled and certain experimental herbicides on sunflower. Demonstration plots allow side-by-side comparisons useful for plot tours and provide field data for educational programs and recommendations.

METHODS

Plot Design:	Demonstration; 20' x 100'
Variety:	PAG 102
Herbicide:	Plot sprayer, 20 gpa, 40 psi, flat fan
Cultivation:	None
Evaluated:	7/8
Planting Date:	5/29
PPI:	5/29; incorporated 2 X with small tandem disk 4-5 inches
SPPI:	5/29; incorporated 1 X with small tandem disk 3 inches
PRE:	5/29
Rainfall:	1st week: 0.41 inches
	2nd week: 0.88 inches

RESULTS

Plots were visually evaluated for weed control. Data summarized from two observations per plot are presented in Table 42. Rainfall was marginally adequate during the first week.

Preplant incorporated Eptam, Sonalan, and preemergence Lasso provided the best foxtail control among individual herbicides. Broadleaf control was more variable, no treatment exceeded 80% control. Eptam, Sonalan, Treflan and Prowl controlled wild oats; with control decreasing according to the order listed. Racer, an experimental herbicide, provided excellent wild mustard control and exceeded other labeled herbicides by 30%.

Data from this and other experiments are used to prepare Extension fact sheet FS 525SF, Weed Control in Sunflowers. Rates, application directions and cost per acre for each herbicide are indicated.

Table 42. Weed control in sunflowers.

Treatment	lb/A act.	Gr	Bdlf	Wild Oat	Wild Mustard
		Percent Control			
PREPLANT INCORPORATED					
Check	--	0	0	0	0
Eptam	3	92	59	98	8
Sonalan	1.1	91	72	94	18
Treflan	.75	85	69	90	26
Prowl	1.25	82	70	85	40
*Racer	.5	5	42	5	93
Treflan + Amiben	.75 + 2	92	78	89	32
Treflan + Eptam	.75 + 3	90	68	85	18
Eptam + Amiben	2.5 + 2	78	58	78	22
SHALLOW PREPLANT INCORPORATED					
Lasso	3	40	45	0	29
Prowl	1.25	58	62	28	28
PREPLANT INCORPORATED & PREEMERGENCE					
Sonalan & Amiben	1.1 & 2	94	65	58	30
Treflan & Amiben	.75 & 2	89	68	57	60
*Eptam & Racer	2.5 & .5	92	78	94	96
PREEMERGENCE					
Amiben	3	52	55	28	49
Lasso	2.5	87	38	75	22
*Dual	2.5	72	15	84	55
Prowl	1.25	82	49	84	22
*Racer	.5	62	73	20	92
Lasso + Amiben	2 + 2	90	69	84	48
*Lasso + Racer	2 + .5	94	80	85	97

* Experimental
Gr = Yellow foxtail (heavy), green foxtail, wild oat (light)
Bdlf = Kochia, lambsquarters (moderate), wild mustard (light)

SUNFLOWER HYBRID TRIAL
C. Lay and K. Grady

Table 43. Hybrid sunflower trial - NE Farm - 1985.

Hybrid	Seed yield lbs per acre	Seed moisture	Oil Content Percent	Oil Content Lbs per acre	Flower height	Lodging
Cargill 208	1980[a]	10.7	38.9	769	60	2[b]
CX 6101	1926	10.5	40.8	787	73	2
Sigco 465	1885	15.3	38.6	730	79	2
SF 100	1868	10.5	28.8	720	64	4
CX 3472	1814	12.0	39.8	722	77	4
S 1300	1723	7.2	37.2	640	63	1
SF 103	1721	10.7	38.2	643	79	5
Sigco 475	1717	16.9	36.8	633	74	5
ST X30084	1662	11.5	29.1	637	76	2
Cargill 207	1631	10.6	39.5	645	80	6
CX 8101	1627	9.7	39.2	637	71	2
ST 317	1563	16.5	38.2	600	75	4
Challenger	1524	10.5	39.7	606	57	4
IS 7111	1517	10.3	40.5	616	73	4
DO 855	1511	11.1	38.6	583	74	4
IS 3001	1484	10.5	41.2	608	75	2
AH 757	1444	14.1	38.8	563	73	5
Discovery	1413	11.0	38.0	536	78	3
Columbia II	1403	10.4	40.0	560	71	3
Barzen 3012	1403	13.0	38.7	543	71	4
TNT XR38	1389	17.3	39.2	542	71	4
TNT 634	1347	10.6	40.2	542	66	4
AH 747	1342	9.9	41.4	559	75	4
DO 730	1340	10.5	40.6	545	75	2
GroAgri 2019	1333	11.0	39.8	527	69	6
Sungro 382	1333	8.9	39.8	531	71	4
AH 707B	1329	12.5	38.8	514	72	4
Sokota 2200	1315	8.3	36.8	485	70	3
Pacific 354	1308	14.5	39.4	516	74	3
Sokota 2057	1297	9.1	37.8	491	72	4
DATA 84109	1293	12.9	39.1	508	68	4
ST 316	1266	11.1	39.1	495	72	4

---continued---

Table 43. Continued

Hybrid	Seed yield lbs per acre	Seed moisture	Oil Content Percent	Oil Content Lbs per acre	Flower height	Lodging
TNT X80084	1253	11.9	38.1	472	72	6
DATA 82101	1247	11.1	36.8	458	72	6
Barzen 3003	1220	11.6	37.8	460	72	5
CX 7107	1163	10.7	38.9	452	75	5
Keltgen K066	1158	12.0	38.6	448	79	4
Cargill 206	1142	10.2	39.3	450	77	6
S 1888	1139	10.8	38.2	434	72	4
Sunbred 285	1093	14.0	40.0	433	73	7
Barzen 4004	1080	12.8	32.4	349	66	4
TNT XR28	1011	13.7	37.7	382	78	4
IS 3003	952	9.1	41.8	401	76	4
SF 102	904	9.6	39.8	361	68	7
Hybrid 894	603	11.2	37.0	220	74	8
Sunbred 262	463	11.0	39.3	181	71	9
Hysun 33	449	15.6	38.1	169	84	9
IS 3214	441	15.2	37.8	167	81	8
Mean	1327	12.0	38.8	514	73	4
LSD (0.1)	538	2.3	31.8	216	8	3
C.V. (%)	25	12	3	25	6	42

[a] Avg of three replications. Yield and oil at 10% moisture.
[b] Lodging scale, 0 = none; 9 = complete lodging.