Plant Science Pamphlet #90
Annual Progress Report

February, 1985

ANNUAL PROGRESS REPORT, 1984

Northeast Research Station
Watertown, South Dakota

The 1984 growing season at the NE Farm was generally excellent. Precipitation for the period was over 5" above normal and the very good growing conditions resulted in spring planted small grain yields that were well above average. Winter wheat survival was very poor. Two crop tours were held at the station, an evening tour in July to observe small grains and a row crop tour in September. Refreshments at both tours were provided by Marshall Co. Crop Improvement Association.

The advisory group met in Watertown, February 21, to discuss 1985 research plans. Mr. Randy Frederick was elected president and Mr. Don Guthmiller, Secretary for 1985. Mr. Edwin Krause is the new research advisor from Deuel Co. Dr. Ray Moore, Director of Ag. Exp. Station and Dr. Maurice Horton, Head, Plant Science Dept. provided very informative comments on budgetary matters and research concerns. The group then engaged in considerable, very useful discussion of 1985 research plans. The 1985 crop tours will be held at 7:00 p.m. July 8 and 2:00 p.m. September 11.

NOTE: This report does not contain detailed tabular information concerning small grains and flax. This information is contained in Extension Circular EC774, 1985 Variety Recommendations, Spring Grains and Flax and is available at County Extension Offices. Also, much of the information presented in this report is based on ongoing studies and results should therefore be considered tentative.

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Northeast Research Station, Watertown, SD

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Table 1. Growing Season Precipitation

Month	(Inches) Amount	Normal	Departure	Greatest amount	& Date
April	2.88	2.08	+0.80	0.79	26
May	1.66	2.97	-1.31	0.95	7
June	7.45	3.70	+3.75	2.32	15
July	1.85	2.67	-0.82	0.72	23
August	3.09	2.78	+0.31	1.51	3
September	1.14	1.85	-0.71	0.98	23
October	4.69	1.16	+3.53	1.97	14
Total	22.76	17.21	+5.55		

Temperatures

Dates of 90°F and above July 9, 12, 13, 30, 31, August 1, 13, 16, 17, 27, 28, September 18 and 19.

Last Frost (32°F) - Spring - May 1.

First Frost (32°F) - Fall - September 25 - Frost free period 146 days.

Killing Frost (28°F) - Spring - May 1.

Killing Frost (28°F) - Fall - September 26.

DATE OF PLANTING STUDY, NE STATION, 1984

Q. Kingsley, L. Evjen. K. Korth

Objective: Measure effect of planting date on yield of various crops.

Table 2. Yield of crops at various planting dates.

Crop	Planting Date	Yield (Bu/A)	Crop	Planting Date	Yield (Bu/A)
Robust	4/25	107	Lancer	4/25	149
Barley	5/3	101	Oats	5/3	118
	5/9	96		5/9	116
	5/16	96		5/16	95
	5/23	58		5/23	57
	5/30	49		5/30	51
	6/14	7		6/14	17
	6/21	1		6/21	7
Len Spring	4/25	63	Vic Duram	4/25	81
Wheat	5/3	55		5/3	65
	5/9	44		5/9	58
	5/16	37		5/16	51
	5/23	27		5/23	43
	5/30	28		5/30	25
	6/14	9		6/14	12
	6/21	8		6/21	9

Crop	Planting Date	Yield	Crop	Planting Date	Sigco Dwarf (lbs/A)	PAG102 (lbs/A)
Clark Flax	4/25	9	Sunflowers	4/25	1629	1799
	5/3	12		5/3	1553	1229
	5/9	17		5/9	1009	1544
	5/16	18		5/16	283	655
	5/23	17		5/23	602	656
	5/30	14		5/30	1076	1250
	6/14	-		6/14	799	816
	6/21	-		6/21	253	180

POTATO FERTILITY STUDY - NE FARM, 1984

Q. Kingsley, L. Evjen and K. Korth

Objective: Determine effect of various fertilizer rates on yield of potatoes.

Potatoes (var. Norchip) planted May 1 at 1200 lbs/A, 40" rows, Thimet was applied at planting. Plots were harvested September 17.

Table 3. Effect of various rates of fertilizer on yield of potatoes.

Rate (N-P-K) lbs	Yield (cwt/A)	Rate (N-P-K) lbs	Yield (cwt/A)
0-0-0	155.7 [a]	150-0-25	167.8
30-25-25	104.6	150-25-0	163.8
60-25-25	151.7	150-50-25	187.4
90-25-25	172.7	150-75-25	180.8
120-25-25	170.7	150-25-75	174.3
150-25-25	167.4	150-25-125	167.4
180-25-25	166.8	150-25-175	142.6

a/ Average of three replications.

SPRING RAPE VARIETY EVALUATION TRIALS - NE FARM, 1984

Q. Kingsley, L. Evjen and K. Korth

Objective: Measure yield of various spring rape varieties.

Entries were planted in 6" rows. Furadan applied at planting at 1 lb ai/A gave excellent flea beetle control. Planted May 24, harvested August 14.

Table 4. Spring Rape Variety Yields.

Entry	Yield (lb/A)	Entry	Yield (lb/A)
DANISH		SWEDISH	
BS-15-82	1589[a]	WW1319	1876
BS-107-82	1578	WW1350	1535
BS-108-82	1695	WW1375	1684
BS-111-82	1514	WW1383	1599
BS-123-82	1418	Hanna	1631
BS-124-82	1567	Olga	1663
BS-125-82	1663	CANADIAN	
BS-134-82	1759	Westar	1247
BS-136-82	1951	Regent	1237

a/ Average of four replications.

Spring Wheat Breeding

F. Cholick and K. Sellers

The advanced yield trial was grown at the Northeast Research Station and 7 additional sites throughout the spring wheat production area. This experiment was conducted to compare experimental lines from the SDSU breeding project with standard varieties. In 1984, 33 experimental lines were evaluated. Grain yield for 1984 and 1983 and the average of all test sites, maturity, plant height and percent protein content are presented in Table 1. Mean grain yield was 66.1 bu/A, which was 36.0 bu/A greater than last year and approximately 20 bu/A greater than the long-term average. The excellent growing conditions that produced these high yields was reflected in two additional ways: 1) the number of days from planting to heading was 3-6 days longer, and 2) the plant height was 5-8 inches taller than normal. There was very little lodging even with the additional plant height and high grain yield. The protein content was 1 to 1.5 percent less than normal but acceptable given the high yields. Soil tests were taken and 70 lbs/A of nitrogen was applied post-plant to have sufficient nitrogen for a 55 lb/A yield goal.

An experiment to evaluate the effects of drill applied Chloride (Cl) was conducted in conjunction with P. Fixen, J. Gerwing, R. Gelderman, G. Buchenau, and T. Schumacher. The addition of 33 lbs. of KCl (18 lbs. of Cl/A) produced no effects on grain yield. However; at other sites Cl addition produced greater grain yields and foliar disease supression. These sites received higher rates of Cl and it appears that the low rate applied through the drill was not sufficient to produce a positive affect on grain yield. Additional experiments are planned to evaluate the effects of chloride additions on grain yield and foliar diseases.

The plots were planted on April 25, 1984 at a seeding rate of 75 lbs/A adjusted for kernel size. The previous crop was soybean and there was little or no problem with weeds. Harvest was completed on August 13, 1984.

Oats Research
Dale Reeves

The Northeast Research Farm is a major research site for the oats project. The only station with more selections being tested is Brookings. Conditions at this station are generally good for small grains. Therefore we use this location as our best indicator of the yield and test weight potential of the material being tested. Most of the entries grown here are at some stage of development in our variety development program. Almost 400 different lines were tested here in 1984 in this program.

In 1984 we had nine different oats tests on this station. In addition to these trials, six of our lines which we hoped would be released as varieties were included in the Standard Variety Oat Trials conducted by J. J. Bonnemann. The Uniform Midseason Performance Nursery had 36 entries and was grown at 19 locations from Winnipeg to Kansas and New York. Entries in this test are believed to be good enough to release as varieties. This year there were four South Dakota entries in the test.

We have an informal region test with North Dakota and Minnesota where each state submits 10 new entries each year. The full test is not planted at this station, so we plant our entries along with the check varieties here. The best entries in this test are usually in the uniform midseason regional test the next year.

Our Purity Increase test contained 64 of our most promising selections. These are all lines developed here. The best of this test will be placed in a regional test next year.

There were two advanced yield trials which we called Gold and Silver. These are the better of our lines being developed. The best performing of these will likely go into the Tristate test next year. Gold has the earlier maturing selections while Silver entries were later.

Earlier generation material was in our Alpha and Omega tests. These tests had 97 entries grown only here and Brookings. This is a severe test as these selections must be good enough to get into the advanced yield trials or they will be dropped.

Bulks of 99 different crosses were also grown here at this station. Based upon the data we obtain, only 10 to 20 of these will be planted next year. This is the first time we've had the opportunity to see what these look like in four row plots. Therefore straw strength and other agronomic traits are closely examined.

HERBICIDE TEST - This is our second year of testing oats to see if they are sensitive to recommended herbicides. This test contains 10 varieties with different pedigrees which are sprayed with MCPA and three different rates of 2,4-D. The data is not all analyzed, however results indicate varieties are responding differently when recommendations are followed. Visual evidence of injury was quite evident, however varietal differences were also noted.

Alfalfa Variety Trials, Expt 431
Northeast Research Station, 1984

Clive Holland & Robin Halvorson

Forty-four alfalfa varieties were clear seeded on April 5, 1984, for evaluation of yield, disease resistance, and winterhardiness. Clear seeding is the planting of alfalfa alone in early spring, with a herbicide (Eptam 3.0 lb ai/A) for weed control instead of a companion crop. With good management and seeding early, before the end of April, 2 to 3 tons of hay per acre is a realistic yield to expect in a normal year when clear seeding alfalfa.

The 1984 growing season was recorded in South Dakota as the tenth wettest in the last 95 years. Excellent alfalfa seeding-year yields of just over 4.0 tons of DM/A were produced, largely due to adequate soil moisture throughout the growing period.

Varietal selection should not be based on data from one year only. Alfalfa is a perennial crop and must survive South Dakota winters to be recommended for seeding in this region. Yield data is more meaningful after alfalfa has survived at least one winter.

This study will be conducted for a minimum of two more years and winter survival will be reported next year. A new seeding of additional alfalfa varieties is planned for 1985.

Table 5. Seeding-year forage yields from 1984 alfalfa variety trial, Expt 431, North East Research Station, Watertown, South Dakota.

		1984 Forage Yield (Tons DM/A)				%
Variety	Developer/Supplier	7/12	8/15	10/28	Total	Vernal
H-150	Sexauer/Farm Seed	2.09	1.84	0.72	4.65	116
Big 10	Great Lakes Hybrids	2.18	1.59	0.64	4.41	110
SX 217	Sexauer/Farm Seed	2.22	1.55	0.62	4.39	109
Cimarron	Great Plains Res.	1.99	1.59	0.77	4.35	108
Spectrum	Cenex Seed	2.16	1.32	0.84	4.32	108
Mich. 80-16	Mich. State Univ.	1.98	1.67	0.61	4.26	106
Endure	PAG Seeds	2.06	1.51	0.65	4.22	105
Iroquois	NY Ag. Expt. Sta.	2.19	1.42	0.57	4.18	104
F-144	Sexauer/Farm Seed	1.99	1.48	0.68	4.15	103
NAPB 21	AgriPro	2.07	1.46	0.61	4.14	103
526	Pioneer Hi-Bred Intl.	2.03	1.52	0.56	4.11	102
Advantage	DeKalb-Pfizer	2.13	1.44	0.54	4.11	102
Blazer	Land O'Lakes	1.95	1.49	0.65	4.09	102
DK-135	DeKalb-Pfizer	1.91	1.44	0.73	4.08	102
NY 8302	Cornell Univ.	1.92	1.48	0.68	4.08	102
Saranac	NY Ag. Expt. Sta.	2.04	1.50	0.53	4.07	101

(Continued)

Table 5. Continued

120	DeKalb-Pfizer	1.90	1.48	0.68	4.06	101
Eagle	O's Gold Seed Co.	1.91	1.48	0.66	4.05	101
WL 313	W-L Research	1.94	1.47	0.64	4.05	101
532	Pioneer Hi-Bred Intl.	1.85	1.60	0.59	4.04	101
Decathlon	Cargill Seeds	2.01	1.39	0.63	4.03	100
LL 3018	Land O'Lakes	1.86	1.45	0.71	4.02	100
Drummor	Northrup King	1.95	1.49	0.57	4.01	100
Vernal	Wis. Ag. Expt. Sta.	2.08	1.41	0.52	4.01	100
Apollo II	AgriPro	1.94	1.38	0.68	4.00	100
Challenger	Cargill Seeds	2.00	1.33	0.67	4.00	100
Saranac AR	NY Ag. Expt. Sta.	1.93	1.46	0.61	4.00	100
CA 7931-32	W-L Research	1.96	1.39	0.64	3.99	100
Hi-Phy	Cenex Seed	1.99	1.33	0.67	3.99	100
Shenandoah	Great Plains Res.	1.79	1.49	0.70	3.98	99
NAPB 20	AgriPro	1.96	1.38	0.63	3.97	99
Oneida	NY Ag. Expt. Sta.	1.93	1.40	0.61	3.94	98
SX 424	Sexauer/Farm Seed	2.00	1.40	0.54	3.94	98
H-125 VW	Sexauer/Farm Seed	1.85	1.37	0.69	3.91	98
82-5	W-L Research	2.06	1.30	0.55	3.91	98
MT-0	SD State Univ.	2.11	1.43	0.36	3.90	97
NY 8301	Cornell Univ.	1.87	1.35	0.67	3.89	97
NY 3501	Cornell Univ.	1.81	1.43	0.63	3.87	97
Valor	Land O'Lakes	1.87	1.38	0.53	3.78	94
LL 3110A	Research Seeds	1.89	1.56	0.32	3.77	94
Teton	SD State Univ.	1.99	1.41	0.28	3.68	92
Heinrichs	Agric. Canada	1.93	1.38	0.33	3.64	91
MT-1	SD State Univ.	1.94	1.13	0.30	3.37	84
Travois	SD State Univ.	1.97	1.19	0.18	3.34	83
Average		1.98	1.44	0.59	4.02	
LSD (0.05)		0.19	0.29	0.21	0.48	
CV (%)		6.98	14.30	25.84	8.60	

Seeded: 4/25/84, 3 lb Eptam/A, 0.5 lb Ridomil/A, 15 lb PLS/A
Plot size: 3x25 feet with 5 rows at 6 inch spacings
Plot harvested: 3x22 feet
Design: Randomized block, 4 replications
Soil type: Kranzburg silt loam
Soil pH: 6.8

GLEAN CARRYOVER STUDY

M. A. Peterson and W. E. Arnold

Glean was applied postemergence to spring wheat at the James Valley Research Center, Redfield, SD and at the Northeast Research Station, Watertown, SD in the spring of 1981. The experiments were duplicated in 1982. Corn, flax, grain sorghum, soybeans, and sunflowers were planted each growing season in order to evaluate Glean carryover injury.

Crop injury ratings are presented in the accompanying table. There was much less carryover injury at the Watertown location than at the Redfield location. The main reason for this difference appears to be a lower soil pH at Watertown (pH = 5.6) than at Redfield (pH = 6.6). A higher organic matter content at Watertown may have also contributed to the lower Glean activity at that site. All crops proved to be sensitive to residual Glean.

Table 6. Glean carryover injury at two locations in eastern South Dakota. All values represent an average of evaluations from two separate years.

		Months after Application			
		% injury			
	Rate (OZ/A)	Redfield	Watertown	Redfield	Watertown
Corn	1/3	47	13	7	2
	2/3	55	17	20	3
	4/3	82	26	50	2
Flax	1/3	37	2	0	3
	2/3	55	5	4	3
	4/3	78	13	10	0
Sorghum	1/3	55	9	3	0
	2/3	70	13	13	0
	4/3	92	28	18	2
Soybeans	1/3	48	3	11	0
	2/3	70	7	20	0
	4/3	89	15	29	0
Sunflowers	1/3	32	2	10	0
	2/3	56	4	32	2
	4/3	85	19	33	0

WEED CONTROL IN SUNFLOWERS

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

A number of treatments were tested for control of foxtail species and wild mustard in sunflowers. Tank mix combinations of either Treflan, Eptam, or Prowl with Amiben applied pre-plant incorporated gave very good foxtail control and fair to good wild mustard control.

Several experimental compounds were also evaluated. Fluorochloridane applied preemergence following pre-plant incorporated application of either Treflan or Eptam gave excellent control of wild mustard. Application of Acifluorfen when sunflowers were in the 6-leaf stage gave good control of wild mustard but produced unsatisfactory grass control. Sethoxydim applied at the same growth stage gave good foxtail control but did not control wild mustard. These new compounds may be labeled for grower use within the next few years.

Table 7. Weed Control in Sunflowers. NE Research Station, 1984.

Treatment[1]	Application Stage[2]	Rate[3] (lb/A)	% Control Foxtail Species	% Control Wild Mustard
Treflan + Amiben	PPI	0.75 1.80	91	60
Eptam + Amiben	PPI	3.00 1.80	90	74
Prowl + Amiben	PPI	1.25 1.80	90	60
Treflan Fluorochloridane	PPI PRE	0.75 0.38	88	98
Eptam Fluorochloridane	PPI PRE	2.00 0.38	89	98
Acifluorfen	6-leaf	0.12	24	82
Sethoxydim + Crop oil	6-leaf	0.20 (1 qt.)	87	0

1/ Treatments containing a '+' indicate that the herbicides were tank mixed.

2/ PPI = Incorporated twice with a tandem disk before planting.
PRE = Preemergence.
6-leaf = Stage of crop.

3/ All rates expressed in pounds of active ingredient per acre.

1984
POTATO HERBICIDE SCREENING
Northeast Station

W. Arnold, L. Wrage, and P. Johnson

Control of early season grasses and broadleaved weeds, including late season broadleaves, must be controlled. Several herbicides are labeled by the Environmental Protection Agency (EPA) for use on this crop.

Purpose

Plots were established to compare performance of labeled herbicides. Plots were evaluated for annual grass and annual broadleaf control.

Methods

Preplant incorporated (PPI), postplant incorporated (POPI), and preemergence (PRE) treatments were applied May 11, 1984. Potatoes were planted May 11, 1984. PPI treatments were incorporated immediately with two tandem diskings; POPI treatments were harrowed and PRE herbicides applied to the surface. All herbicides were applied with a plot sprayer at 40 psi delivering 20 gpa. Plots were 10' x 60' each; designed in two replicates. Postemergence (POST) treatment was applied May 18, 1984. Plots were visually evaluated prior to cultivation.

Results

Grass species present were green and yellow foxtail; broadleaves evaluated included rough pigweed, kochia and lambsquarters. Eptam provided the best grass control; preemergence Lasso, Dual or Prowl used in combination treatments were also satisfactory. Sencor/Lexone provided the highest level broadleaf control. The reduced effectiveness of the POPI treatments is partly associated with the difficulty in incorporating satisfactorily after planting in a ridged seedbed. Rainfall (0.3 inches the first week; 0.75 inches the second week) was marginal for best preemergence activity.

1984
POTATO HERBICIDE SCREENING
Table 8. Northeast Station

Treatment	lb/A act.	Percent Weed Control Gr	Percent Weed Control Bdlf
PREPLANT INCORPORATED			
Check	--	0	0
Eptam/Genep	4	95	54
Eptam/Genep + Sencor/Lexone	3+.5	96	90
POSTPLANT INCORPORATED			
Treflan	1	37	56
Treflan+Eptam	.75+3	66	46
Prowl	1.25	36	42
PREEMERGENCE			
Prowl	1.25	38	48
Lasso	3	72	42
Dual	2.5	78	41
Dacthal	7.5	36	42
Sencor/Lexone	.75	27	38
Dual+Sencor/Lexone	2+.75	96	92
Lasso+Sencor/Lexone	2+.75	84	78
Dual+Lorox	2+1	81	75
Prowl+Sencor/Lexone	1.25+.75	85	89
POSTEMERGENCE			
Sencor/Lexone	.5	19	82

SEED PLACEMENT OF UREA UREA PHOSPHATE FOR SMALL GRAIN

Paul Fixen, Jim Gerwing, Ron Gelderman

Placement of fertilizer in direct contact with the seed is a common practice for small grain production in South Dakota. The type of fertilizer material used influences the maximum rates that can be safely applied with the drill. Urea will react with water to eventually form ammonia which can result in seed injury due to ammonia toxicity. Because of this tendency, lower maximum rates of urea containing materials are recommended for seed placement than ammonium nitrate containing materials.

Urea urea phosphate is a new fertilizer material that is formed by reacting urea with phosphoric acid. When this material dissolves in soil water, a much lower pH develops than when urea dissolves independently. This lower pH decreases the tendency for ammonia formation and should, theoretically, diminish the toxicity of urea urea phosphate. The following study was conducted in 1983 and 1984 to compare urea, urea urea phosphate, and ammonium nitrate when placed in direct seed contact with small grain.

Materials and Methods

The study was conducted at 2 locations in east central South Dakota in 1983 and again in 1984. One site each year was located on the Brookings Agronomy farm. The soil at the Brookings site was a Vienna loam (Udic Haploboroll). Vienna soils are loamy soils formed in silty material and calcareous loamy glacial till. The second site in 1983 was located in Deuel County on a Kranzburg soil (Udic Haploboroll). Kranzburg soils are silty clay loams formed in 20-40 inches of silty material over clay loam glacial till. The fourth site was located in Codington County on a Brookings silty clay loam (Pachic Udic Haploborolls). Brookings soils are formed in 1½ to 4 feet of loess over glacial till. Results of soil tests taken at planting are shown in Table 9.

Table 9. Soil test results for urea urea phosphate study.

Site	NO_3-N 0-24"	Organic Matter	Bray P	Exch. K	pH	1:1 Salts	Water Content
	lbs/A	%	lb/A	lb/A		mmho/cm	%[1]
Brookings 1983	34	3.1	97	475	6.8	0.5	18
Deuel 1983	81	4.9	24	380	7.3	0.5	FC[2]
Brookings 1984	55	2.6	106	420	6.9	0.4	FC
Codington 1984	69	3.4	48	370	6.8	0.4	FC

1 weight basis after planting
2 field capacity

In 1983 the seedbed in Brookings County was somewhat cloddy and resulted in generally poorer stands of flax than at Deuel Co. Very little precipitation (0.18") occurred for a two week period after planting, while 4.5, 3.5 and 4.3 inches of precipitation were recorded for the months of June, July and August respectively at the Brookings site.

At the Deuel Co. site the seedbed was excellent and resulted in good stands of all crops in 1983. Soil moisture was good at planting and for several weeks following planting. Seasonal precipitation was similar to the Brookings site.

In 1984, soils at both the Brookings site and Codington County site were near field capacity at planting. Adequate precipitation occurred at both sites to keep soils at field capacity for several weeks following planting. At the Codington Co. site, 0.9 inches of rain fell within 6 days after planting.

The plots were seeded with a 4 foot plot drill having double disk openers set at 6" spacings. Seed placed fertilizer was applied down the same tube as the seed and was, therefore, in direct contact with the seed. Each plot was 20 or 25 feet long depending on location. All plots were brought up to a total N level of 150 lbs/A-2 feet with ammonium nitrate topdressed except the Deuel Co. site which was brought up to 180 lbs. N. Broadcast nitrogen was applied at or within 10 days of planting depending on location. All plots were brought up to a phosphorus rate of 30 lbs. P_2O_5/A using concentrated superphosphate (0-46-0) applied with the drill.

The experimental design was a randomized complete block with three replications of a factorial combination of fertilizer sources and rates. The fertilizer sources were urea (45-0-0), cogranulated urea urea phosphate supplied by TVA (38-12-0), and ammonium nitrate (34-0-0). Rates used were 0, 10, 20, 40, and 60 lbs N/A. The experiment was conducted on Butte wheat, Moore oats and Culbert 79 flax. Only results from the wheat and oats, however, will be reported in this paper. Stand counts were taken in late May or early June, depending on location, just prior to small grain stooling.

Results and Discussion

The influence of seed placed fertilizer on small grain stand is graphed in figures 1 to 6.

Ammonium nitrate did not appear to cause seedling loss for wheat at the Brookings site in 1983 even at the 60 lb. rate (Fig. 1). Urea phosphate did not cause stand loss until the N rate exceeded 40 lbs/A. Urea caused more injury than other sources and caused stand reductions at the 20 lbs N/A rate. The 60 lb. rate of urea resulted in nearly a 50% loss of seedlings for wheat.

Wheat stands showed only minor effects of seed placed N at the Deuel Co. site in 1983 and the Brookings and Codington Co. sites in 1984. The mean wheat stands for the 4 site years are graphed in figure 2. Ammonium nitrate and urea phosphate showed little or no stand reductions while urea appeared to cause some seedling loss, especially at the 40 to 60 lbs. N/A rates.

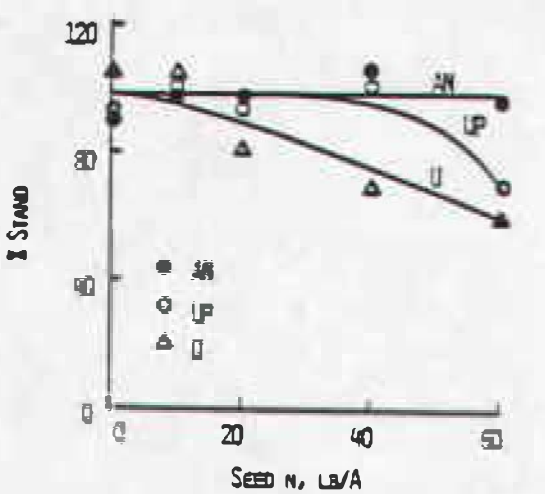

Fig. 1. Influence of seed placed N on wheat stand, Brookings Co. 1983

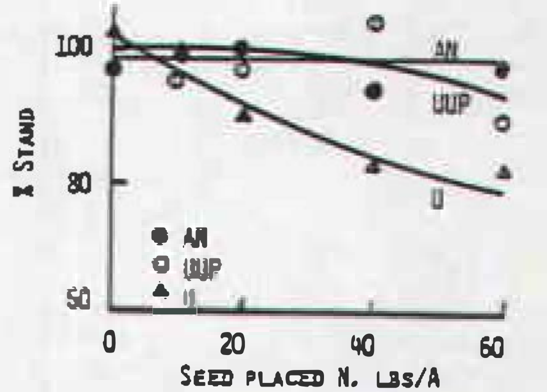

Fig. 2. Influence of seed placed N on the stand of wheat (mean of 4 sites).

All fertilizers caused flax stand losses at both sites in 1983 and again in 1984 (Figs. 3 to 6). At the Brookings site in 1983, ammonium nitrate caused the smallest stand reduction, urea the largest. Urea phosphate was intermediate (Fig. 3). At the Deuel Co. site in 1983 and the Brookings Co. site in 1984, urea phosphate and ammonium nitrate caused similar stand reductions in flax with the largest reductions caused by urea (Figs. 3 and 4). Ammonium nitrate caused the largest stand reduction in 1984 at the Codington Co. site (Fig. 5). This may have been due to movement of some of the urea beyond the seed zone by precipitation which fell within a few days of planting on soils which were already at field capacity.

The mean flax stands for the four site years are graphed in figure 6. Ammonium nitrate and urea phosphate were similar in their toxicity to flax seedlings. Urea was more toxic than either ammonium nitrate or urea phosphate.

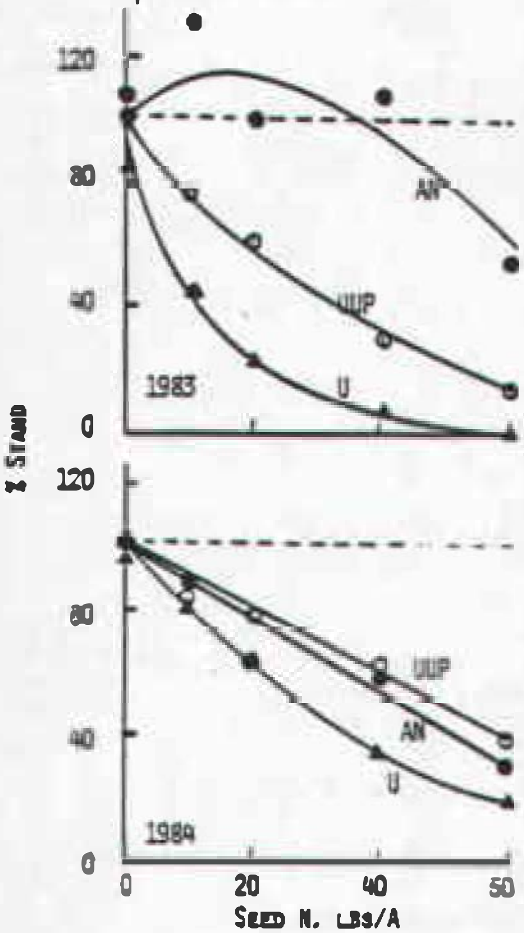

Fig. 3. Influence of seed placed N on flax stands. Brookings Co.

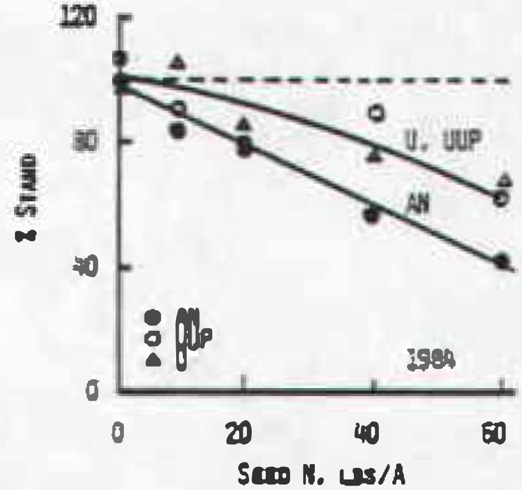

Fig. 5. Influence of seed placed N on flax stands. Codington Co.

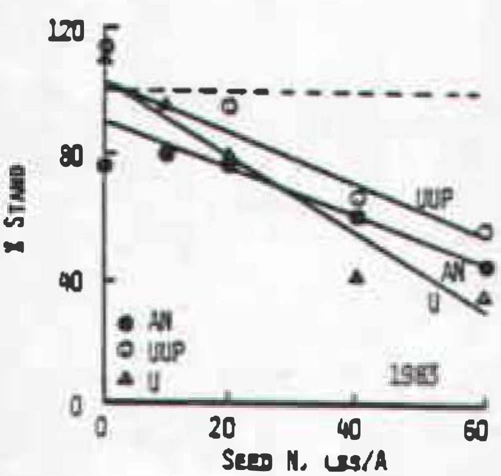

Fig. 4. Influence of seed placed N on flax stands. Deuel Co.

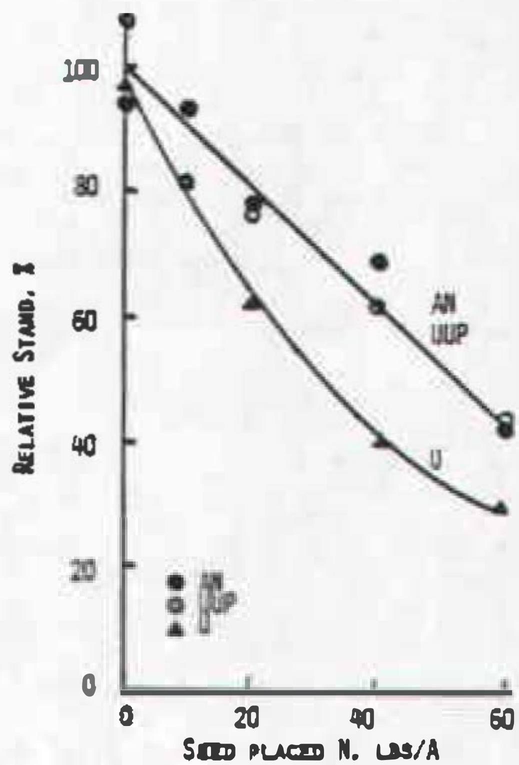

Fig. 6. Influence of seed placed N on the stand of flax (mean of 4 sites).

The influence of seed placed fertilizer on small grain yield is graphed in figures 7, 8, 9, and 10. Wheat grain yield was not influenced by seed placed fertilizer at the Deuel Co. site in 1983 or the Brookings and Codington sites in 1984 (Figs. 7 and 8). At the Brookings site in 1983, neither ammonium nitrate or urea phosphate caused wheat yield depression. Urea, however, did cause a loss of wheat yield (Fig. 7).

Flax grain yield response to seed placed fertilizer was similar to the stand response (Figs. 9 and 10). At the Deuel Co. site in 1983, urea phosphate and ammonium nitrate resulted in similar yield depressions while urea decreased yields more rapidly (Fig. 9). At the Brookings site, ammonium nitrate did not cause any yield loss even though some stand reduction occurred. Urea resulted in the most rapid yield decline while urea phosphate was intermediate (Fig. 9). In 1984, ammonium nitrate and urea phosphate caused similar yield reductions at both the Brookings and Codington sites. Urea resulted in a more rapid yield decline than either ammonium nitrate or urea (Fig. 10).

Based on 4 site years of data, it appears that urea phosphate is similar or only slightly more toxic than ammonium nitrate and certainly much less toxic than urea when seed placed with small grains.

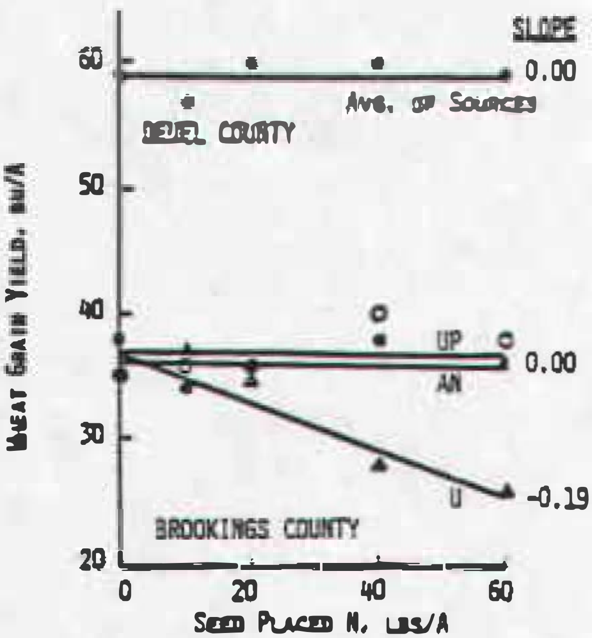

FIG. 7. INFLUENCE OF SEED PLACED N ON WHEAT GRAIN YIELD, 1983.

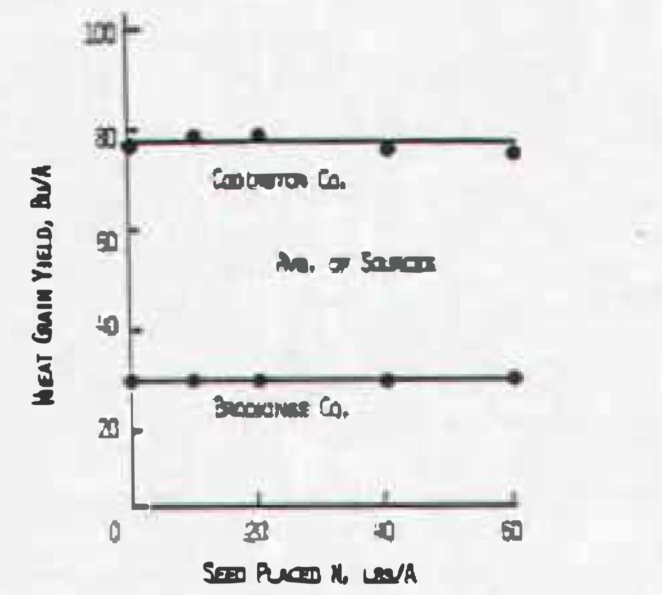

FIG. 8. INFLUENCE OF SEED PLACED N ON WHEAT GRAIN YIELD, 1984

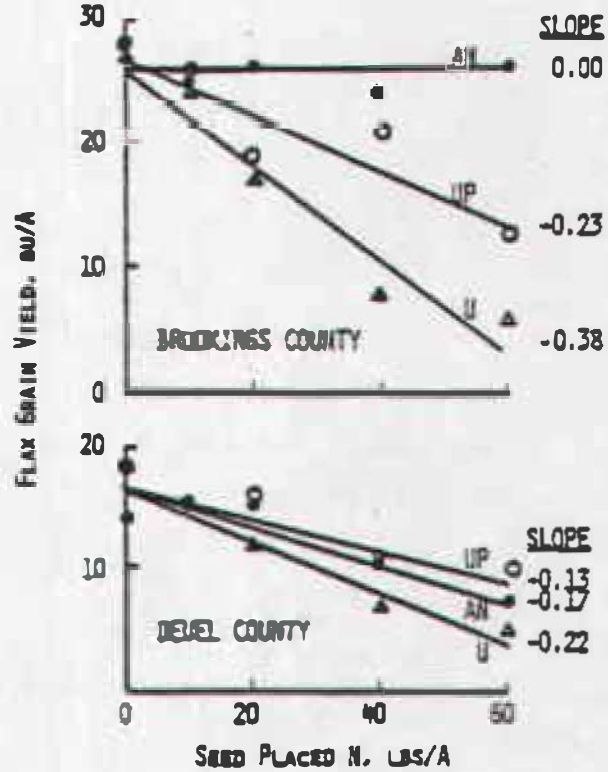

FIG. 9. INFLUENCE OF SEED PLACED N ON FLAX GRAIN YIELD, 1983.

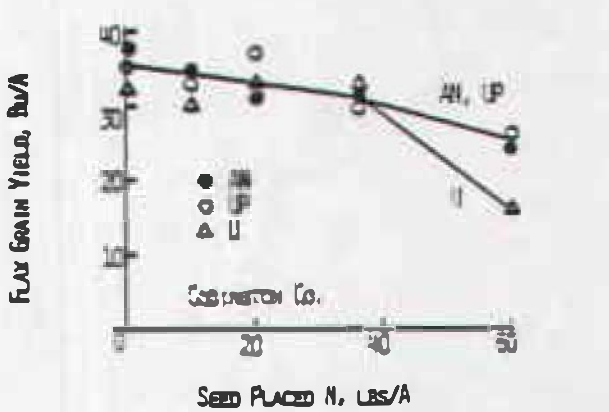

FIG. 10. INFLUENCE OF SEED PLACED N ON FLAX GRAIN YIELD, 1984

Sunflower Hybrid Testing

C. Lay & K. Grady

Table 10. Hybrid Identification and Test Sites for the 1984 South Dakota Sunflower Trial.

Company	Hybrid	N.E. Farm 84	N.E. Farm 83	N.E. Farm 82
Arrowhead	Bonus	X		
	AH 707B	X		
	AH 747	X	X	X
	AH 757	X		
Barzen	BAZ 3008	X		
	BAZ 3009	X		
	BAZ 3102	X		
	BAZ 4004	X		
Cargill	C 206	X	X	X
	C 207	X	X	X
	C 208	X		
Cenex	CX 8101			
Continental	Contiflor 5			
	Junin 1	X		
	Junin 2			
	Junin 3			
	Junin 4			
	Junin 5			
	Junin 6			
	Junin 7			
	Junin 8			
	Junin 9			
	Junin 10	X		
	Parana 1			
	Parana 2			
	Parana 3			
	Parana 5	X		
	Parana 6	X		
Dahlgren	DO 705	X	X	X
	OO 730	X		
	DO 855	X		
DATA	Data 82101	X	X	
DeKalb	DKS 42	X		
	DPG 3362	X		
GroAgri	GA 382	X		
	GA 2004	X	X	X
Homestead	Sodbuster			
	HX 1100			
Interstate	IS 3001			
	IS 3040	X		
	IS 3170	X		
	IS 7775S		X	
Jacques	J 3501	X		
	J 4402	X		
Keltgen	KO 66	X		
Northrup King	NKS 265	X		
	Sunbred 262	X		
	Sunbred 285	X		
Pacific Seeds	Hysun 32	X		
	Hysun 33	X		
	Kernel II	X		
	PAC 282	X		
	PAC 354	X		
	PAC 356	X		
	Sunbrid II	X		
PAG	SF 100	X		
	SF 102	X	X	X
	SF 103	X		
SeedTec	ST 316	X	X	X
	ST 317	X		
Sigco	SG 455	X	X	
	SG 468	X		
Sokota	SK 2057	X	X	X
	SK 5000	X		
Stauffer	S 1300	X	X	
	S 1888	X	X	X
	S 3101	X	X	X
TNT/Sunflo	TNT 634 B	X		
	L 12			
	Hybrid 894	X	X	X
	Hybrid 897	X		

X = Plots were planted and harvested.
a = Plots were planted but not harvested for some reason, usually an inadequate stand at harvest.

Table 11. Results of the 1984 Hybrid Sunflower Trial at South Shore, SD

Hybrid Identification	Seed yield (lbs/A)			Oil Content: Percent			Oil Content: lbs/A			Plant height (in)	Test weight (lbs/bu)
	1984	1983	1982	1984	1983	1982	1984	1983	1982		
SF 100	1251			24.1			303			57	18.8
SF 102	1197	1474	2264	27.8	36.8	38.1	333	543	863	63	18.2
Cargill 207	1192	1604	2277	25.3	32.6	36.6	302	528	833	66	18.8
DKS 42	1135			25.0			284			58	17.7
J 4402	1128			27.6			311			61	19.0
S 3101	1127			23.5			264			57	20.1
Parana 5	1124			29.2			328			60	17.8
OO 705	1123	1225	1835	28.9	36.4	39.0	324	445	716	58	18.6
Sunbred 285	1122			28.4			319			60	19.7
ST 316	1116	1510	1517	28.4	36.8	37.7	318	556	572	59	16.3
Cargill 208	1111			24.5			272			46	19.7
SD 317	1105			29.1			322			62	16.5
Sokota 2057	1092	1382	1640	29.2	36.1	37.3	320	499	612	60	20.4
Sigco 455	1090	1238		25.3	33.4		277	412		65	18.1
Cargill 206	1034			27.5			284			62	21.6
SF 103	1021			26.0			265			65	19.9
J 3501	1008			28.4			286			59	20.0
Barzen 3008	1006			21.0			212			55	18.0
Sokota 5000	992			26.5			263			58	18.1
DO 855	981			28.3			278			60	19.0
PAC 354	972			28.5			277			61	16.9
KO 66	962	1232		27.5	35.9		264	442		62	18.9
NKS 265	953	1472	1676	26.3	37.6	40.1	250	554	672	55	18.6
S 1888	946	1306	1791	26.5	36.8	38.4	251	482	688	56	18.3
AH 747	943	1064	2050	31.5	40.0	40.8	297	426	836	59	19.3
DATA 82101	935	1133		25.6	34.9		241	394		56	18.6
S 1300	932	1563		26.8	35.4		250	554		53	20.7
Hybrid 894 (ck)	929	1255	1832	26.4	37.2	38.1	245	468	698	62	18.6
AH 707 B	929	1412		25.8	35.5		240	504		58	21.2
DPG 3362	926			29.1			269			58	17.4
Barzen 4004	920			21.3			197			59	18.0
PAC 282	916			26.9			247			63	16.8
IS 3040	899			30.4			274			65	20.7
Bonus	883			26.4			232			56	18.9

Table 11. Continued

Hybrid Identification	Seed yield (lbs/A) 1984	1983	1982	Oil Content Percent 1984	1983	1982	Oil Content lbs/A 1984	1983	1982	Plant height	Test weight
AH 757	875			29.8			261			60	19.8
IS 3170	872			28.4			248			63	18.5
Sigco 468	855			31.7			271			56	19.3
Barzen 3009	844			25.8			217			53	17.5
TNT 634	837			28.1			235			60	17.5
Sunbred 262	831			27.8			231			58	18.4
Hybrid 897	827			27.2			225			59	18.5
Junin 10	823			25.0			207			62	16.8
Barzen 3102	812			26.4			214			57	18.2
PAC 356	796			25.7			204			59	17.3
DO 730	779			32.6			254			68	19.5
Sunbrid II	778			19.7			152			78	15.2
GroAgri 382	767	1162	1991	31.2	38.7	40.2	240	450	800	58	20.4
Hysun 32	764			31.3			240			63	20.0
GroAgri 2004	758			30.5			231			58	20.6
Hysun 33	735			23.8			175			72	16.8
Junin 1	658			29.1			191			64	20.3
Kernell II	478			21.4			103			64	16.9
Parana 6	335			27.3			92			70	17.7
Test Average	934			27.1			253			60	18.6
LSD_{10}	223			1.5			63			4	2.7
Correlation with seed yield	1.00			0.00			0.91			-0.24	0.00
Correlation with oil yield	0.91			0.41			1.00			-0.22	0.10

Planting date: 1982 - 6/10, 1983 - 6/7, 1984 - 6/25.
Harvest date: 1982 - 10/1, 1983 - 10/11, 1984 - 11/20.
Population at Harvest: 13,900

CULTURAL PRACTICE STUDIES - NEMATODES AND SUNFLOWER INSECTS

J. D. Smolik, L. Evjen, and K. Korth

The highest nematode populations in spring wheat following sunflower occurred at harvest in the spring disc and no-till treatments (Table 12). Nematode populations in the fall tillage area declined over the growing season, however, in the spring tillage area numbers increased in all treatments except plowing. The most common nematode in both areas was the pin (Paratylenchus projectus) nematode. This nematode frequently occurs at very high population levels in South Dakota sunflower fields.

Table 12. Effect of Tillage Practices on Nematode Populations in Spring Wheat Following Sunflower. NE Farm.

Tillage Treatment and Season	No. of Plant Feeding Nematodes/100 cc Soil May 21	August 14
Fall-Plow	146[a]	139
Fall-Chisel	359	131
Fall-Disc	272	127
Fall-No Till	302	209
Spring-Plow	389	143
Spring-Chisel	201	248
Spring-Disc	268	504
Spring-No Till	173	431

a/ Average of four replications - all plots were lightly disced prior to planting.

In tillage treatments established following sunflower the fall chisel, plow and disc treatments resulted in lower seed weevil emergence than the no-till treatment (Table 13). In the spring tillage treatments there was very little effect of treatments. Maximum weevil emergence occurred from August 8 to 21. Earliest weevil emergence was July 24 and ceased after September 4.

Table 13. Effect of Tillage Practices on Emergence of Red Seed Weevils. NE Farm.

Tillage Treatment[a]	Sampling Date and No. of Weevils/Plot								
	7/9	7/16	7/24	7/31	8/8	8/14	8/21	8/28	9/24
Fall-Plow	0[b]	0	0	0	4	1	.25	.25	0
Fall-Chisel	0	0	0	.25	3	.75	.5	.25	0
Fall-Disc	0	0	0	0	3	.5	.5	.25	0
Fall No-Till	0	0	0	0.5	7	1	0	0	0
Spring-Plow	0	0	.25	0	2	4	4	2	.5
Spring-Chisel	0	0	.25	0.5	4	5	3	3	.25
Spring-Disc	0	0	0	0	3	9	3	.75	.5
Spring No-till	0	0	0	0	5	5	2	2	0

a/ All tillage treatments were lightly disced prior to seeding with spring wheat on April 19.

b/ Average of 4 reps - 6-28 cm diameter randomly placed traps/plot.

Seed weevil and banded sunflower moth damage was measured on two hybrids planted on various dates at the NE Farm (Table 14.). Weevil and moth damage combined was near 50% in the Sigco dwarf on the May 16, 23 and 30 planting dates. Similar damage levels occurred in PAG 102 planted on May 16 and 23. Yields of both hybrids were also substantially reduced on May 16 and 23. Damage levels in the April 25 and May 3 and 9 plantings ranged from 9-24% and yields were also highest on the earlier dates of planting. Weevil and moth damage was low in the June 14 and 21 plantings, however, the plants did not mature prior to frost and yields were also low.

Table 14. Seed Weevil and Banded Sunflower Moth Seed Damage and Yield of Two Sunflower Hybrids at Various Dates of Planting. NE Farm.

	Hybrid					
	Sigco Dwarf			PAG 102		
Planting Date	Yield (lbs/A)	% Weevil Damage	% Banded Moth Damage	Yield (lbs/A)	% Weevil Damage	% Banded Moth Damage
April 25	1629[a]	11	5	1799	10	5
May 3	1553	6	3	1229	14	10
May 9	1009	15	8	1544	13	6
May 16	283	31	17	655	24	15
May 23	602	26	14	656	30	14
May 30	1076	31	14	1250	16	16
June 14	799	12	2	816	3	6
June 21	253	2	0	180	3	2

a/ Data is avg. of two sampling dates.

Tentative 1985 Research Plans

1. Soybean row space study.
2. Spring wheat, oats, rye, corn, flax and sunflower breeding trials will continue.
3. Alfalfa forage research.
4. Small grain fertility study.
5. Potato and soybean herbicide demonstration plots.
6. Sunflower date of planting, with and without insecticide/nematicide.
7. Small grain variety demonstration plots.
8. Flax seed treatment study.
9. Potato seed treatment and fungicide study.
10. Effects of tillage on survival of sunflower insects.
11. Long term farming systems studies will be initiated and will involve comparatively large plots to minimize border effects. Systems to be studied include conventional, minimum till and alternate (no pesticide) rotations and continuous no-till winter wheat.