Plant Science Pamphlet #73 December, 1983

ANNUAL PROGRESS REPORT

CENTRAL CROPS AND SOILS RESEARCH STATION

HIGHMORE, SOUTH DAKOTA

BRIEF HISTORY

The Central Research Station Advisory Board met in Highmore, December 6, 1983 to discuss research on the station. At this meeting, Scott Ingel of Beadle County was elected president and Dick Fadgen of Beadle County secretary for 1984. New advisors to the Advisory Board for 1984-87 are Val Goetz of Faulk County and Lynn Metzinger of Hughes County.

Due to the late spring, the soil preparation and planting of crops were delayed till late April in 1983. The planting of small grain and other crops progressed smoothly after the soil dried down enough. Many of the small grain crops were shorter than usual due, in part, to the cool soil. Some flooding reduced stands and in other areas drown out the crop completely. In 1983, 16.5 inches of moisture were received on the station. The long time average rainfall for April through October is 17.2 inches. Except for the months of May, June, and September, the precipitation was below normal. There were 20 days in July and 28 in August when the air temperature was 90°F or higher.

An evening crop tour was conducted on the station July 10th to view the various research experiments being conducted. In 1984, an evening tour is scheduled for July 10 at 6:30 PM. The winter meeting is set up for December 11th with an alternate date of December 18th, in case of severe weather conditions, at Highmore.

NOTE: This is a progress report and, therefore, the results presented are not necessarily complete nor conclusive. Any interpretation given is strictly tentative because additional data from continuation of these experiments may produce conclusions different than those of any one year. These data reflect the 1983 growing season.

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Central Research Station, 1983
Highmore, South Dakota

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Mike Volek	Highmore	Ag. Technician	
Quentin Kingsley	SDSU	Station Manager	

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1983 Crop Season

Total rainfall for growing season by months with their departure from long-time average on Central Research Station, Highmore, S.D.

Rainfall	Inches	Normal	Departure*	Greatest Day	Date
April	1.13	1.87	-0.74	0.20	12
May	3.05	2.55	+0.50	0.95	12
June	5.75	3.97	+1.78	1.70	12
July	2.13	2.54	-0.41	1.25	28
August	1.60	3.45	-1.85	0.50	20
September	1.90	1.61	+0.29	0.60	10
October	0.95	1.25	-0.30	0.30	1
Total	16.51				

Long term average 17.24 inches April through October.

Number of days during month with temperature 90° or above: June 3; July 20; August 28; September 9.

Last frost - Spring (May 15)
First frost - Fall (September 21) Frost free period - 128 days

CROP ROTATION - SOIL MOISTURE USAGE RELATIONSHIP 1983

Q. Kingsley and M. Volek

OBJECTIVE OF EXPERIMENT:

1. To compare various crops with different maturities for soil moisture usage and yielding ability under similar soil and climatic conditions.

DISCUSSION:

Crops chosen for this experiment are of different maturities. Barley, oats and wheat are the shorter season crops and corn, grain sorghum and sunflowers are the long season crops. Planting and harvest dates are the same as * Inches used period below Table 1.

The sunflowers in this crop rotation study were severely damaged by birds and were not harvested for yield. The soil moisture usage of the crop was taken to provide continuity in the experiment.

RESULTS: Central Research Station, Highmore, S.D. 1983

Table 1

Crop	Yield in Bu or lb/A	Moisture loss from profile plus precip. inches used*	Bu/or lbs. per Inch of Water Used**	Test Weight	Protein or Oil
Barley					
Glenn	40.7	13.60	3.0	46.7	12.9
Oats					
Nodaway 70	69.1	14.02	4.9	39.4	15.1
Wheat					
Centa	34.4	13.86	2.5	57.7	15.8
Corn					
Sokota 222	30.4	15.97	1.9	53.0	11.2
Sorghum					
Western 205	4788.8	16.27	294.3	55.4	12.5
Sunflower					
PAG SF 102	0.0	15.94	0.0	0.0	--

*Inches used: Includes 11.6 inches of rain from April 22 to August 1 for barley, oats, and wheat.
Corn, sunflowers and grain sorghum - June 3 to September 24, 10.7 inches.

** Calculated by: $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used

The corn, sorghum, and sunflower seeds were provided by the companies listed for each crop.

HAY, HAYLAGE AND SILAGE PRODUCTION
Central Research Station, 1983
Q. Kingsley and M. Volek

TITLE: Dry Matter Production for Small Grains, Millet and Forage Sorghum.

OBJECTIVES OF EXPERIMENT:

1. Compare various crops for dry matter production.
2. Obtain regrowth data after first harvest for green chop or haylage.

DISCUSSION:

Four oat varieties of various degrees of maturity were used for this study. The earliest variety, Nodaway 70, when considering all three stages of cutting, produced the most tonnage of dry haylage. Grain yield of this variety was not as high as the other three, but protein in the grain was better. Highest yields in tons per acre occurred during the dough stage as indicated in Table 2.

RESULTS:

Table 2. Small Grain Haylage, Tons of Dry Matter* (DM) per acre at stages of maturity. First planting May 5, 1983.

	Yield in tons per acre							
Variety and Maturity	Milk 7/11	% Protein	Dough 7/18	% Protein	Late Dough 7/22	% Protein	Grain Bu/A 7/30	% Protein
Nodaway 70 Medium E.	5.1	10.7	6.1	10.6	5.0	9.5	68.6	15.4
Burnett Medium	5.1	12.2	5.4	12.0	5.1	11.3	72.4	13.9
Lancer Medium	5.4	12.5	5.0	10.9	4.7	12.1	72.4	14.6
Benson Medium L.	5.4	13.0	5.4	12.4	4.8	11.4	77.4	14.4
Average	5.25		5.48		4.90		72.7	

Hay (88% OM); Haylage (50% DM); Silage (33% OM).

* To determine yields of hay, haylage or silage: Divide tons of DM by percent DM in hay, haylage or silage. Example (DM average for dough if divided by 0.88 equals tons of 12% moisture hay, etc.)

Harvested: Listed above under column heading.

DISCUSSION:

The percent protein of the milk and dough stages were consistent with those shown in Table 2 but protein in the late dough haylage was lower. Weather conditions at this time had a detrimental effect on the crops. Grain yields dropped some and production was about the same for all varieties.

RESULTS:

Table 3. Small Grain Haylage, Tons of Dry Matter* (DM) per acre at stages of maturity. Second planting May 25, 1983.

Variety and Maturity	Milk 7/10**	% Protein	Dough 7/22	% Protein	Late Dough 7/30	% Protein	Bu/A 8/4	% Protein
Nodaway 70 Early	5.1	10.4	5.7	10.7	5.9	8.7	68.6	15.1
Burnette Medium	4.9	12.3	5.5	12.2	6.4	11.0	69.9	13.8
Lancer Medium	5.1	12.5	5.8	11.6	5.5	10.2	69.9	14.6
Benson Medium L.	5.1	12.9	5.7	12.5	6.1	10.7	68.6	14.8
Average	5.05		5.68		5.98		69.3	

*Refer to Table 2 to determine yield at various stages
**Harvested: Listed above under column heading

FORAGE SORGHUM - MILLET

DISCUSSION:

The tonnage produced from these various forage crops reflects the environmental conditions during 1983. Yields were taken at the green chop stage August 22, and at silage cutting time, September 10th. Each entry, including Sudan grass, was put into a Type* category and listed according to yield. The crops in Tables 4 and 5 were planted in 30 inch rows and those in Table 6 were planted using a grain drill. Corn was harvested at both stages, green chop and for silage.

Weeds were the main problem in the forage crops this year, particularly grassy types.

The forage sorghums were planted June 3rd in a well prepared seedbed.

Table 4. Forage Study, Green Chop 1983, Central Research Station, Highmore, SD.

Entry	Type*	Dry Yield Ton/A	Waller Grouping **	Percent Protein	Plant Height Inches
DeKalb FS-5	FS	6.09	A	5.87	66
NK 367	FL	5.81	B A	6.87	78
Cenex Sweet Suso	SxSo	5.81	B A	8.84	68
DeKalb FS-4	F	5.43	B A C	7.06	80
NK Sucro Sorgo 405	SoxSo	5.20	B O A C	9.00	63
Cargill 250S	F	5.09	B D A C	7.18	67
Pioneer 988	GxS	4.91	E B D A C	5.93	72
NK Silo Milo 2	FL	4.91	E B C A CF	5.50	72
Pioneer 931	FL	4.83	E B D AGCF	4.93	79
NK Sordan 79	GxS	4.75	E B DHAGCF	8.37	66
DeKalb FS-25A+	F	4.71	E BIDHAGCF	9.00	75
NK 326	F	4.66	E BIDHAGCF	6.93	72
Rose Sweet N Red	F	4.62	E BIDHAGCF	6.06	66
Sokota 320F	F	4.58	E BIDHAGCF	4.93	80
NK 300	DP	4.48	E BIDH GCF	5.68	71
Pioneer XSG	GxS	4.44	E BIDHJGCF	4.75	89
Cenex Highland Sweet	SxSo	4.37	E BIDHJGCF	6.87	64
Cargill 200F	F	4.25	E IDHJGCF	5.68	68
Sigco Sooner Sweet	GxS	4.19	E IDHJGCF	6.81	76
Cenex 700T	GxF	4.07	E IDHJGCF	6.00	68
Sigco Super Sile 20	SoxSo	4.07	E IDHJGCF	5.12	72
Pioneer 947	GxF	4.02	E IDHJGCF	6.50	62
Rose Leoti	FL	4.01	E IDHJGCF	6.68	72
Cenex Hiland Green	GxS	3.95	E KIDHJGCF	6.62	76
Rose Atlas	FL	3.77	E KIDHJGLF	9.68	64
NK Sucro Sorgo 301	SoxSo	3.76	E KIDHJGLF	7.25	75
Rancher	F	3.55	E KI HJGLF	5.25	82
DeKalb ST-6+	GxS	3.52	E KI HJGLF	5.93	83
Sigco 4300	Corn	3.45	E KIMHJGLF	8.43	73
Sigco Super Sweet 10	SxSo	3.44	E KIMHJGLF	4.75	85
DeKalb FS-1A+	OP	3.38	KIMHJGLF	7.25	72
Sigco Bet-R-Sile	GxF	3.35	KIMHJGL	7.06	60
Cargill SS100	GxS	3.33	KIMHJGL	6.50	62
Pioneer 956	GxF	3.29	KIMHJ L	5.87	72
NK XS 191	Corn	3.28	KIMHJ L	6.72	61
NK SX 7902	Corn	3.28	KIMHJ L	6.61	75
Sigco Sooner Sue	FxS	3.19	N KIM J L	5.43	73
NK Trudan 8	S	2.93	N K M J LO	4.84	83
Rose Hegri	GxF	2.43	N K M LO	6.06	67
NK x 8264F	GxS	2.39	N M LO	6.12	76
NK x 8261F	S	1.95	N M LO	3.59	80
NK x 8262F	S	1.73	N O	4.84	72
Piper Sudan	S	1.54	O	5.35	75

* Type: S - Sudan; DP - Dual Purpose; FL - Forage Leafy; F - Forage; FxS - Forage x Sudan; GxF - Grain x Forage; GxS - Grain x Sudan; SoxSo - Sorgo x Sorgo; SxSo - Sudan x Sorgo.

**, Means with the same letter are not significantly different.

Rainfall June 3 to August 22, 9.2 inches.
Seed provided for this study by companies listed under entry heading.

Table 5. Forage Study, Cut for Silage 1983, Central Research Station, Highmore, SD.

Entry	Type*	Dry Yield Ton/A	Waller Grouping **	Percent Protein	Plant Height Inches
DeKalb ST-6+	GxS	3.22	A	8.12	66
NK Sordan 79	GxS	3.17	A	6.12	72
DeKalb FS-4	F	3.09	A	8.12	60
Pioneer 947	GxF	3.07	A	7.18	63
Cenex Hiland Sweet	SxSo	3.04	A	6.81	59
Sigco Super Sweet 10	SxSo	2.99	A	7.37	78
DeKalb FS-5	F	2.96	A	8.43	73
Pioneer 988	GxS	2.80	A	6.31	84
NK XS191	Corn	2.65	A	7.43	64
Cenex Hiland Green	GxS	2.65	A	7.50	61
Pioneer XSG	GxS	2.63	A	8.56	83
NK Silo Milo 2	FL	2.59	A	6.18	59
Pioneer 956	GxF	2.59	A	6.18	64
Sigco Bet-R-Sile	GxF	2.58	A	8.12	58
NK Sucro Sorgo 301	SoxSo	2.52	A	9.06	71
Sokota 320F	F	2.50	A	8.37	57
Cenex Sweet Suso	SoxSo	2.47	A	6.31	54
Sigco Sooner Sweet	GxS	2.45	A	9.50	78
Cargill 250S	F	2.44	A	6.31	61
Pioneer 931	FL	2.42	A	4.68	63
Sigco Sooner Sue	FxS	2.39	A	7.06	83
Rose Sweet N Red	F	2.35	A	6.50	60
Cargill SS100	GxS	2.34	A	8.43	64
Rose Hegri	GxF	2.34	A	7.25	68
NK Sucro Sorgo 405	SoxSo	2.33	A	8.18	71
NK 367	FL	2.27	A	7.68	63
NK 300	DP	2.62	A	6.43	67
Sigco Super Sile 20	SoxSo	2.25	A	6.87	65
DeKalb FS-1A+	DP	2.22	A	9.31	89
NK 326	F	2.21	A	4.75	70
Rose Leoti	FL	2.20	A	7.37	73
NK SX7902	Corn	2.16	A	5.79	65
Rose Atlas	FL	2.13	A	7.56	61
Sigco 4300	Corn	2.12	A	5.37	65
DeKalb FS-25A+	F	2.11	A	6.75	68
Cargill 200F	F	2.00	A	5.93	55
NK 8262F	S	1.99	A	6.00	61
Piper Sudan	S	1.97	A	8.12	68
Rancher	F	1.96	A	8.68	69
Cenex 700T	GxF	1.85	A	7.50	63
NK 8261F	S	1.75	A	6.87	71
NK 8264F	GxS	1.66	A	7.00	71
NK Trudan 8	S	1.14	A	5.68	67

* Type: S - Sudan; DP - Dual Purpose; FL - Forage Leafy; F - Forage; FxS - Forage x Sudan; GxF - Grain x Forage; GxS - Grain x Sudan; SoxSo - Sorgo x Sorgo; SxSo - Sudan x Sorgo.

** Means with the same letter are not significantly different.

Rainfall June 3 to September 10, 10.7 inches.
Seed provided for this study by companies listed under entry heading.

RESULTS:

Table 6. Dry Matter Production of Millets, Tons of Dry Matter per acre*, Foxtail Types. Central Research Station, 1983.

Entry	Dry Yield Tons/A*	% Protein	Waller** Grouping
Japanese Millet	3.0	10.9	A
Rose Early African	2.6	11.0	A
NK Millex 24	2.4	11.3	A
Manta	2.3	10.8	A
Sno Fox	2.2	10.2	A
WS Mil Hy 100	2.0	11.8	A
German Strain	1.9	11.5	A

* All yields are reported on an oven dry basis.
** Means with the same letter are not signficiantly different.

DISCUSSION:

This study was planted June 3 and harvested August 3. These plantings were solid seedings using a grain drill with 7" spaced openers. The planting rate was 15 pounds per acre. Rainfall during this period was 7.8 inches.

There were no statistical differences in yield due to stand variabilities. There was a significant reduction in yield from dry matter production in 1982. High moisture and temperatures seriously hindered the plant growth and stooling ability of the crop. Only one cutting of all millets was taken in 1983. Yields and other data are presented in Table 6.

TILLAGE AND PLANTING METHODS, 1983

Q. S. Kingsley and M. Volek

TITLE: Tillage and Row Crop Planting Methods.

OBJECTIVES:

1. Compare various row crop responses to tillage methods, namely: chisel plow, plow and no till.
2. Compare conventional, lister and furrow type plantings using corn, grain sorghum and sunflowers.
3. Determine soil moisture usage for each crop, planting and tillage method.

DISCUSSION:

This experiment was started in 1981 on a summer fallowed piece of ground. A 4 acre piece was planted to wheat in preparation for the no till, plow and chisel plow phase of this experiment in 1983. Yields were taken from all crops to determine if planting method had much effect as shown in Table 7.

RESULTS:

Table 7. Tillage and Row Crop Comparisons

Crop and Tillage	Planting Methods: Conventional			Furrow			Lister		
	Test wt.	% Protein	Yield Bu/A	Test wt.	% Protein	Yield Bu/A	Test wt.	% Protein	Yield Bu/A
Corn									
No Till		10.9	44.2		10.5	74.2		10.5	57.2
Chisel		10.8	41.6		10.4	68.5		10.6	57.7
Plow		10.8	43.9		10.5	77.9		10.5	59.9
Grain Sorghum			lb/A			lb/A			lb/A
No Till	56.3	12.2	6200.4	52.8	12.1	4453.2	55.3	12.0	6489.3
Chisel	53.0	12.1	6230.8	56.0	12.1	3920.2	53.0	12.0	6121.5
Plow	52.5	12.5	6827.7	55.5	12.4	4221.4	53.3	12.2	6462.7
Sunflowers		Oil	lb/A		Oil	lb/A		Oil	lb/A
No Till									
Chisel									
Plow									

Corn: Sokota 222, 16,000 plants/A, planter set on 1st gear
Sunflower: PAG SF 102, 16,000 plants/A, planter set on 1st gear
Sorghum: Western WS 205, 5-6#/A or 4 seeds/foot
All crops planted June 3, Harvest sorghum September 29, corn October 7. Rainfall during this period to September 29, 11.1" and to October 7, 11.7 inches.

SAFFLOWER TRIALS

Q. Kingsley and M. Volek

TITLE: Safflower Trials and Row Spacings

OBJECTIVES:

1. What entry performs most satisfactorily in this area of South Dakota?
2. Will various row spacings affect the yield and physical condition of the crop?

DISCUSSION:

Two row spacings, 7 and 14 inch, were used to plant safflower this year. The planting rate was 20 pounds per acre. This seemed to be adequate for the type of a season which occurred. The crop was planted April 22 and harvested August 23. There was 11.6 inches of moisture received during this period.

Safflower should be planted about the same time as wheat. The plant will produce some top growth and then seem to go dormant. It is during this dormant period that roots are growing and when a certain stage is reached the top will elongate. Late plantings set the plant back and roots are not as extensive in the soil. The results of this study are shown in Table 8. One of the varieties exceeded the 40 pound test weight.

RESULTS:

Table 8. Safflower Variety Row Space and Yield Study.
Central Research Station, 1983.

	Row Spacing in Inches					
	7 inch			14 inch		
Entry	test wt.	% oil	yield lb/A	test wt.	% oil	yield lb/A
S-541	36.1	40.7	1510.9	35.1	35.6	1601.0
S-208	38.2	36.4	1558.0	36.2	35.2	1455.6
Rehbein	39.5	34.8	1696.7	38.2	39.4	1667.0
Hartman	36.7	35.3	1469.2	38.0	37.3	1598.3
Lesaf 34 COO	36.3	31.5	1447.3	40.7	31.6	1496.2
Lesaf 34 AY 000	34.2	32.7	1264.9	37.5	31.9	1377.7
2793-2	36.2	37.5	1630.0	33.8	37.1	1305.0
Average yield			1511.0			1500.1

Spring Wheat Breeding
Highmore

F. A. Cholick, K. W. Sellers, and G. W. Buchenau

The results of the spring wheat advanced yield trial are presented in Table 9. This trial is conducted to compare the best experimental lines from the breeding program with selected check varieties to identify new varieties. Due to environments varying from location to location as well as year to year, this nursery is grown at 9 locations throughout the spring wheat production area.

Grain yields in 1983 were similar to 1982 and considerably greater than the long-term average. This was reflected in the number of days from planting to heading which was approximately 5 days longer than normal. Test weights were a little low, indicating some stress late in the growing season.

A seed treatment study with two varieties, Olaf and Centa, and treatments of Benlate T, Vitavax200 and an untreated control was conducted to evaluate the effects of seed treatments on yield. Sound seed samples with little or no scab or loose smut were used to determine the effects of seed treatment in the absence of these diseases. The seed treatments did not produce a significant effect on grain yield at Highmore or at any of the five sites where this experiment was grown.

The plots were planted on April 22, 1983 at a rate of 75 lbs/A with fair-poor top soil moisture. Soil tests were taken and all experiments were fertilized for a 45 bu/A yield goal. Experimental site is in a wheat-fallow rotation. There were little or no problems with weeds or diseases. Harvest was completed on August 4, 1983.

Table 9. 1983 Highmore Advanced Yield Trial

Variety	Pedigree	Yield 1983	Yield 1982	Test Weight	Planting to Heading	Height	Protein
		bu/A		lbs/bu	days	inches	%
Butte		42.8	35.4	58.4	64	36	15.9
Centa		32.7	34.0	58.1	62	35	15.6
James		34.7	36.1	57.2	62	34	15.9
Oslo		35.9	35.8	55.6	63	30	15.6
Olaf		36.5	29.9	57.2	65	33	16.6
Len		38.1	33.4	55.4	65	34	16.9
Guard		39.0	34.0	57.1	63	32	16.3
Era		33.9	27.9	53.7	67	32	16.4
Marshall		33.9	31.5	54.0	66	32	16.6
Wheaton		29.3	33.0	51.9	66	29	17.2
Angus		32.5	--	56.4	66	32	16.4
Eureka		33.4	32.4	56.3	63	38	16.9
Alex		35.4	37.8	58.0	65	39	17.0
ND 582	ND 527/Coteau S//Era	44.0	--	57.2	64	37	16.6
SD 2854	James/SD 2049	42.1	34.6	57.0	64	36	16.7
SD 2861	EE/Prodax	39.4	37.1	56.8	62	31	15.5
SD 2881	PRT/RL6010	37.3	36.8	58.4	65	35	16.8
SD 2912	PRT/RL6010//Marshall	36.8	38.6	56.3	64	32	16.4
SD 2925	Butte/James	36.9	32.1	57.0	64	34	16.6
SD 2942	Butte/EE (SD 2835-6)	35.1	34.4	57.8	65	36	16.5
SD 2943	Butte/EE (SD 2837-2)	33.4	37.8	56.7	64	36	16.1
SD 2946	Butte/SD 2271//MN 70181	36.4	34.8	52.6	64	31	16.9
SD 2948	PRT/RL 6010//James	35.9	36.0	51.5	67	35	17.6
PRO 711		40.0	35.3	57.7	65	32	16.1
SD 2952	PRT/RL 6010//Marshall	36.7	33.5	57.0	65	30	17.0
SD 2955	2167/MN 70181//SD 2853	39.8	32.6	55.8	63	32	16.3
SD 2956	Butte/CO 53427//WS 1809	43.0	35.3	56.5	65	31	16.3
SD 2960	MN 7378/SD 2845	39.1		58.0	64	35	15.9
SD 2961	Butte/SD 2700	37.1		56.8	64	33	16.5
SD 2962	SD 2827/5/BGS.../4/CNO	41.1		57.8	64	34	16.1
SD 2963	Era/Olaf//PRT	35.6		55.3	66	33	16.7
SD 2964	E/JM/2049/3/M7083/742191	37.4		56.3	65	35	17.3
SD 2965	Alex/MN 7125	42.5		53.2	65	32	14.9
SD 2966	Alex/MN 7125	38.6		55.6	65	32	15.2
SD 2967	Len/Junco S	32.8		59.9	66	34	16.5
SD 2968	SD 2256/Wheaton	38.1		58.2	66	33	15.7
SD 2969	SD 2700/SD 2818	37.2		59.1	64	34	16.5
SD 2970	2167/MN 70181//SD 2853	33.0		57.4	65	31	16.1
SD 2971	AGT/3/.../4/Butte/5/Len	40.4		59.1	64	31	16.2
SD 2972	SD 2838/MN 7460//PRT	36.8		56.8	64	31	16.5
SD 2973	SD 2847/CGT700//Butte	37.7		54.6	64	31	16.5
SD 2974	SD 2869/SD 74115//Centa	36.5		59.9	65	36	15.7
SD 2975	NK5511/SD 2827//Butte	33.1		53.4	65	33	16.5
SD 2976	Coteau/Dawn//2902	36.9		57.0	65	38	16.2
SD 8026	Coteau/Dawn	36.3		58.1	63	36	15.9
SD 8035	Butte 2*/65 49-8-101-16	39.7		60.6	63	34	16.2
SD 8036	Butte 2*/Arthur 71	43.4		59.5	64	33	15.9
SD 8048	Coteau/Dawn (8026R)	30.3		57.8	62	34	16.6
SD 8049	Guard/SD 2892	40.6		58.0	65	36	16.0

Winter Wheat Herbicide Comparison

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

Effectiveness and crop tolerance are major considerations when selecting herbicides for winter wheat. Crop growth stage is an important factor in evaluating effects of herbicides on winter wheat.

OBJECTIVE

The purpose for the experiment was to evaluate the performance of labeled herbicide treatments applied to winter wheat at three growth stages.

PLOT INFORMATION

The plots were established in winter wheat which has been planted in the previous year's oat stubble. Plots were 10' x 50'; 4 replications. Soil was a well drained loam with 3.7% organic matter and 6.9 pH.

All herbicides were applied with a plot sprayer calibrated to apply 20 gpa at 39 psi pressure. Herbicide treatments were applied May 4 (2-3 new leaves), May 18 (early jointing) and June 3 (late boot). A light kochia and wild buckwheat infestation was present. Seedling weeds evident in early season failed to develop to the extent visual weed control evaluations could be estimated.

Plots were harvested using a plot combine. Harvest data are presented in Table 10.

RESULTS

Yield for 10 of the 14 herbicide treatments was greater than the untreated check. This indicates most treatments had little injurious effect on the crop at the stages treated or that the crop recovered as the result of favorable weather following application. At recommended growth stages, no treatments significantly reduced yields. Only 2,4-D ester at the late growth stage significantly reduced yield. This suggests careful evaluations before applying 2,4-D ester during the critical late boot stage. Other alternatives such as 2,4-D amine, or bromoxynil + MCPA may be considered if they will control the weeds present. Dicamba (Banvel) or picloram (Tordon 22K) combinations have shown adverse crop effects in other tests when applied at stages beyond those recommended. Less favorable mid-season weather may result in reduced crop tolerance from other treatments.

Table 10. Yield and Test Weight - Herbicide Screening in Winter Wheat.

Treatment	Rate lb/A act.	Crop Stage	Yield bu/A	Test Wt. lb/bu
Check	--	--	24.0	60.9
2,4-D ester	1/2	2-3LF	24.5	60.6
dicamba (Banvel)	1/8	2-3LF	25.9	60.9
+ 2,4-D amine	1/4	2-3LF		
bromoxynil	1/4	2-3LF	24.7	60.6
+ MCPA ester	1/4	2-3LF		
chlorsulfuron (Glean)	.003	2-3LF	27.3	60.8
+ X-77	1/2%	2-3LF		
2,4-D ester	1/2	4-LF	23.8	60.6
2,4-D amine	1/2	4-LF	28.0	60.7
chlorsulfuron (Glean)	.003	4-LF	22.9	60.7
+ X-77	1/2%	4-LF		
dicamba (Banvel)	1/8	4-LF	25.2	61.0
+ 2,4-D amine	1/4	4-LF		
bromoxynil	1/4	4-LF	26.2	60.4
+ MCPA ester	"	4-LF		
bromoxynil	3/8	4-LF	23.5	60.4
+ MCPA ester	3/8	4-LF		
picloram (Tordon)	1/64	4-LF	24.5	60.9
+ 2,4-D amine	1/4	4-LF		
picloram (Tordon)	1/48	4-LF	25.3	60.7
+ 2,4-D ester	3/8	4-LF		
2,4-D ester	1/2	Late Boot	16.9	60.4
dicamba (Banvel)	1/8	Late Boot	24.8	61.2
+ 2,4-D amine	1/4	Late Boot		
		LSD .05 =	5.9 bu/A	.43 lb/bu

Nematicide/Insecticide Field Trials and Related Information

James D. Smolik

Soil test results for the various locations are presented in Table 11.

Table 11. Soil test results - 1983 field studies.

Location	Organic matter %	pH	Salts	Texture	% Sand	% Silt	% Clay
Highmore	2.8	7.1	0.6	Clay-Loam	35.7	34.3	29.9
Oral - alfalfa	2.0	6.9	0.5	Silty-Clay-Loam	33.0	22.0	45.0
Cavour - wheat	2.8	7.2	0.6	Sandy-Clay-Loam	48.8	24.7	26.5
NE Farm	3.1	7.2	0.7	Clay-Loam	29.1	39.0	31.9
Ashton	4.1	6.3	0.5	Silty-Clay	13.7	43.4	42.9
Roscoe	3.7	6.5	0.3	Clay-Loam	23.3	38.7	38.0
Madison - Corn	4.5	6.7	0.6	Clay-Loam	25.0	38.0	37.0
Oral - Corn	1.3	7.7	1.1	Sandy-Loam	52.3	31.7	16.0

Both nematicide and fungicide treatments significantly increased alfalfa stands at two locations (Table 12). These results in combinatio with those obtained in previous years' studies provide additional evidence that nematodes and fungi are involved in alfalfa stand failures.

Table 12. Effect of nematicide and fungicide treatments on alfalfa stands at two locations.

Location	Treatment	No. Plants/ 2 ft. (June)	No. plant feeding nematodes/100 cc soil pre-treat
Highmore	Check	18.5	50
	2 pt. Furadan 4F	49.5*	
	Ridomil Seed Treat	55.5*	
	Captan Seed Treat	47.3*	
	Furadan + Ridomil	73.5*	
Oral	Check	6.8	63
	2 pt. Furadan 4F	15*	
	1 lb. Ridomil	17*	
	Furadan + Ridomil	10.5*	

* Indicates significant increase at .05 level. Average of 4 reps.

Spring Grain Variety Trials
J. Bonnemann

Highmore 1983 & 3 yr

	1983		3 yr.	
	Bu/A	T.W.	Bu/A	T.W.
OATS				
Arrowhead Exp 400	85	31.7		
" 135E Blend	78	37.6		
" 335M Blend	87	34.1		
" Exp 300	97	33.6		
Burnett	85	37.3	75	37.0
Nodaway 70	83	37.9	83	38.2
Chief	76	33.4	75	34.7
Otee	78	35.5	71	36.5
Dal	82	34.8	67	34.2
Noble	99	33.4	83	34.9
Lyon	82	31.7	74	33.7
Bates	85	35.9	84	36.0
Wright	85	36.2	80	36.5
Lancer	91	33.4	84	34.4
Lang	87	34.7	86	34.7
Benson	95	33.9	80	34.7
Moore	92	33.6	82	34.1
Marathon	71	29.1	63	30.9
Larry	87	35.4	84	35.6
Ogle	92	31.7	90	32.0
Porter	102	33.4		
Preston	69	38.0	71	37.0
Pierce	88	33.3		
Centennial	78	34.4		
DURUMS				
Ward	42	59.3	43	59.9
Crosby	37	61.2	40	60.2
Rugby	43	60.4	41	60.1
Cando	42	55.5	44	57.2
Edmond	43	60.6	43	60.7
Vic	41	61.1	44	60.6
Lloyd	49	55.2		
WINTER WHEAT				
Scout 66	57	62.8	47	60.8
Larned	47	62.5	48	60.0
Bennett	45	61.5	46	60.3
TAM 105	50	60.4	55	59.2
BACA	54	63.1		
Sage	54	63.0	57	60.6
Gent	43	62.8	44	60.4
Nell	42	61.6	48	59.6
Buckskin	44	60.7	46	59.9
Dawn	53	63.4	52	60.4
Wings	51	63.2		

	1983		3 yr.	
	Bu/A	T.W.	Bu/A	T.W.
WINTER WHEAT Cont.				
Archer	54	60.6	56	57.6
Hawk	49	61.7		
Brule	52	60.7	56	57.7
Nebred	49	62.4	45	60.5
Lancer	49	62.4	52	60.0
Rita	51	61.9	53	56.8
Agate	53	62.7	50	58.8
Centurk 78	58	67.0	53	59.4
Rose	51	63.5	54	60.8
Rucky	55	62.3	52	60.2
Winoka	40	63.4	40	61.3
Roughrider	50	62.7	48	60.5
Norstar	46	61.9		
BARLEY				
Ferlbecks III	51	45.7	52	46.6
Larker	61	50.1	61	47.3
Primus II	62	49.6	56	48.4
Glenn	58	47.5	61	45.5
Morex	40	46.0	52	44.9
Clark	48	47.1		
Azure	59	48.2		
Robust	50	48.4		
Bumper	64	46.0	63	44.1
SPRING WHEAT				
Arrowhead AH x200	42	58.0		
Chris	38	59.6	35	57.9
Era	46	59.6	40	57.0
Olaf	44	59.3	41	57.5
Protor	46	59.3		
Lew	37	60.5	36	58.0
Butte	44	53.7	42	59.3
Eureka	34	57.0	34	55.1
Angus	45	61.6	44	59.6
Coteau	38	59.4	37	57.9
Len	42	60.1	40	58.3
James	44	58.7	43	55.8
Pondera	32	60.4	38	58.1
Oslo	51	59.4	46	57.5
Alex	42	61.1	41	59.6
Marshall	48	61.1	41	57.2
Guard	48	61.4		
Centa	42	60.4	43	59.0
Victory-283	37	60.2		
MPV-3	42	59.2		
Aggar	41	55.6		
Erik	48	58.4		
Walera	45	58.4	39	55.7
Solar	46	59.3	39	55.3
Probrand 711	42	60.4	41	57.9
Wheaton	52	58.7		
PR 2360	46	59.6		
PR 2369	46	59.4		
Challenger	47	58.6		
Aim	40	57.5	42	56.5
906R	40	59.2	43	56.1

Oat Breeding & Testing
D. L. Reeves

At the Highmore station, the oat breeding project had three different tests in 1983. Two of these tests contained advanced lines from material which we have developed. We anticipate that at least two of these will be given to the Foundation Seed organization for planting this next spring. As soon as the seed is increased to a sufficient volume, they would then be released to farmers.

For several years we have also grown our Tristate test at Highmore. This is a cooperative testing plan with the breeders in North Dakota and Minnesota. Each of us can submit up to 10 selections from our early generation material that we think has good potential. Each state has three testing locations so each line is tested over a wide geographic area. From the results of this test, we decide which ones look good enough to continue testing or to put in the regional test which is coordinated by the USDA.

In addition, we also had five of our most advanced lines entered in the Standard Variety Oat trials which are grown statewide. Two of these are being increased with hopes to release one in 1984 and another in 1985.

Winter Wheat Program at Highmore
J. L. Gellner

Approximtaely 250 advanced winter wheat lines were grown at Highmore in 1983, along with both Northern and Southern Regional Nurseries. Due to the mild winter, no winter-kill was recorded in any research plot.

This fall 60 of the advanced winter wheat lines were planted again for further yield testing. In addition, approximately 200 early generation bulk plots were planted to help in selection for lines adapted to Highmore conditions. Also, winter barley bulks were planted to test for winterhardiness in barley.

Chickpea Research

Arvid Boe and Solomon Tuwafe

Introduction

Chickpeas (Cicer arietinum), also called garbanzo beans, are a large-seeded drought tolerant legume currently being produced in India, Pakistan, Spain, Algeria, Mexico, and the U.S. Most of the U.S. production (3500 tons/year) is in California, and annual imports from Mexico have averaged over 10,000 metric tons. Decreasing production in California and Mexico has encouraged recent research in Idaho, Montana, Washington, and Saskatchewan on the adaptability of chickpeas to those climates and cropping systems. The research work in those regions has centered around agronomic evaluation (e.g., weed control, planting rates and dates, harvest methods) of a few commercial varieties. South Dakota research has focused on the initial screening of vast numbers of germplasms from worldwide sources. ICARDA (International Center for Agricultural Research in Dry Areas) has assisted the South Dakota program by providing seed from well over 1000 lines. Trials in South Dakota and other states have shown that chickpeas are adapted to several semiarid regions of the continental U.S. Market quality and price are determined by seed size and color. At present, the major market in the U.S. is for the "salad bar" garbanzo bean, which is the large cream-colored type. However, extensive variation for seed color (white, cream, green, red, brown, black) and seed size can be found in the present South Dakota germplasm stock.

In 1983, several experiments were conducted at Brookings, Rapid City, and Highmore. Results of the different trials at Highmore are presented below.

1983 Chickpea Screening Nursery

A total of 68 advanced breeding lines obtained from ICARDA were evaluated. The nursery was planted on April 22, 1983 in 10 ft single row plots with 2 ft interrow spacings. Out of the 68 entries, only 2 failed to germinate. Otherwise stands were acceptable to excellent and most of the lines exhibited normal growth and uniform maturity. Plots were harvested on August 16, 1983. Yields ranged from 822 to 4211 kg/ha. Eighteen lines yielded greater than 3000 kg/ha (Table 13) while only 5 lines averaged less than 1000 kg/ha.

1983 Chickpea Adaptation Trial

Sixteen lines originating from eight different countries were planted on April 22, 1983 in a 4-replicate randomized complete block design. Plot size was 10 by 4 ft with one foot spacing between rows. Spacing between plants within rows was approximately 4 inches. The two middle rows of each plot were harvested for seed yield on August 15, 1983. Seed yields ranged from 617 to 1938 kg/ha. The four highest yielding lines were of Indian origin (Table 14). Data on stand indicated a positive association between yield and stand.

1983 Chickpea International Yield Trial

The trial consisted of 24 entries planted in a 4-replicate randomized complete block design on April 22, 1983. Interrow and intrarow spacings were one foot and 4 inches respectively. The trial was harvested on August 16, 1983. The importance of a good stand for obtaining high yields was clearly evident in

this trial (Table 15). Yields ranged from 356 to 2455 kg/ha. The highest seed yield (2455 kg/ha) and percent stand (70%) was exhibited by ILC 480. Sixteen entries outyielded the check entry (1194 kg/ha) and 12 entries produced higher yields than the overall trial mean.

1983 Large Seeded Chickpea International Trial

Nineteen large-seeded entries, with one 1982 SD selection as a check, were planted in a replicated randomized complete block design on April 22, 1983. Each plot consisted of four rows with 1 foot and 4 inch interrow and intrarow spacings, respectively. The middle two rows of each plot were harvested on August 15, 1983. Yields ranged from 1094 to 2833 kg/ha (Table 16). The largest seed (45 grams per 100 seeds) was produced by a Spanish entry (ILC 112) with an average seed yield of 1672 kg/ha. Eight entries outyielded the check for seed yield (2206 kg/ha) and seed size (20 grams per 100 seeds). The lowest yield (1094 kg/ha) was obtained from a Tunisian entry (ILC 629). As was observed in the other trials, stand played a very important role in seed yield.

1983 Chickpea Internation F_3 Trial

This trial consisted of 15 entries of F_3 generations selected in Syria. The main objective of this trial was to identify adapted segregating material to be used as breeding stock for South Dakota conditions.

Sixteen entries, including one 1982 SD selection as a check, were planted in four-row plots in a replicated randomized complete block design on April 22, 1983. The trial was harvested on August 16, 1983. All entries outyielded the check (Table 17). Yields ranged from 716 to 1461 kg/ha.

South Dakota Selections Trial

Ten entries chosen because of high seed yields at Highmore and Brookings in 1982 were evaluated in this trial.

The trial was planted April 22, 1983 in four row plots in a 4-replicate randomized complete block design with interrow and intrarow spacings of 1 foot and 4 inches, respectively. Plots were harvested on August 15, 1983.

The highest yield of 2739 kg/ha was produced by a Jordanian entry (ILC 1932). ILC 1934 was the second top yielder with relatively large seed size (34.2 grams per 100 seeds). The lowest yield was recorded for breeding material, FLIP 81-58, provided by ICARDA. However, the other two breeding materials, FLIP 81-34 and FLIP 11-64, were found to yield 1967 and 1928 kg/ha, respectively. Yields ranged between 1772 and 2739 kg/ha (Table 18).

Conclusions

Yields of the top-yielding lines at Highmore have been as high or higher than those reported from Idaho, Washington, Montana, California, and Saskatchewan. Data collected in South Dakota over the past three summers indicated that several of the germplasms evaluated are well-adapted to South Dakota conditions, particularly the western two-thirds of the state. The large-seeded cream-colored types have performed well at Highmore, but high yielding smaller seeded lines with dark seed color have also been identified. Those lines are high in protein (25%) and energy (700 calories per cup) and offer tremendous potential for export to areas where animal protein is limited and as a high protein, high energy livestock feed supplement in this country.

Future plans of the program are:

1) to increase seed of promising lines
2) continue to screen and evaluate additional germplasms and breeding stocks.
3) initiate research on cultural practices applicable to South Dakota farms and cropping systems.

Table 13. Agronomic data for the 18 highest yielding lines in the 1983 Chickpea Screening Nursery.

Entry	Origin	Height (cm)	Spread (cm)	Stand (%)	100 seed wt. (g)	Yield* (kg/ha)
FLIP 81-43	ICARDA**	50	45	70	34.4	4211
FLIP 81-179	ICARDA	38	65	90	41.8	4189
FLIP 81-119	ICARDA	35	50	75	33.6	4044
FLIP 81-93	ICARDA	35	50	60	31.6	3889
FLIP 81-97	ICARDA	35	70	60	37.2	3844
FLIP 81-183	ICARDA	40	45	80	29.0	3667
FLIP 81-187	ICARDA	35	55	90	30.2	3667
FLIP 81-37	ICARDA	45	50	70	30.4	3656
FLIP 81-57	ICARDA	40	40	85	36.0	3533
FLIP 81-230	ICARDA	35	50	80	37.0	3467
FLIP 81-95	ICARDA	45	45	85	31.8	3444
FLIP 81-39	ICARDA	30	55	70	24.0	3389
FLIP 81-130	ICARDA	40	60	90	34.6	3333
FLIP 81-61	ICARDA	35	45	90	28.0	3289
FLIP 81-38	ICARDA	35	55	90	23.6	3178
FLIP 81-198	ICARDA	38	60	60	28.4	3178
FLIP 81-56	ICARDA	35	40	90	24.2	3067
FLIP 81-181	ICARDA	40	65	60	42.4	3033

*Multiply by 0.9 to convert to pounds/acre.

**International Center for Agricultural Research in Dry Areas.

Table 14. Agronomic data for the 1983 Chickpea Adaptation Trial.

Entry	Height (cm)	Spread (cm)	Stand (%)	100 seed wt. (g)	Yield (kg/ha)
X81 TH 112	48	35	75	24	1461
X81 TH 120	48	33	75	24	1461
X81 TH 101	55	33	87	28	1372
X81 TH 105	54	33	82	31	1356
X81 TH 56	50	40	78	26	1333
X81 TH 111	57	34	90	25	1300
ICC 482	37	35	53	28	1300
X81 TH 85	48	30	78	28	1283
X81 TH 53	49	37	78	23	1278
X81 TH 104	49	31	72	29	1228
X81 TH 113	44	37	72	27	1211
X81 TH 126	50	34	77	28	1211
X81 TH 84	54	27	72	27	1167
X81 TH 125	55	34	78	26	1111
X81 TH 146	49	35	62	33	961
L. Check	37	39	28	24	716
Overall Mean	49	34	72	27	1234
Standard Deviation	5.8	3.2	14.7	2.7	187

Table 15. Agronomic data for the 1983 Chickpea International Yield Trial.

Entry	Origin	Height (cm)	Spread (cm)	Stand (%)	Seeds/ Pod	100 seed wt. (g)	Yield (kg/ha)
ILC 480	Turkey	45	48	70	1.0	33	2455
FLIP 81-46	ICARDA	38	35	54	1.3	27	2400
ILC 237	Spain	48	39	52	1.1	33	2200
ILC 493	Turkey	51	40	69	1.2	28	2161
ILC 295	Iran	46	36	65	1.0	32	2089
FLIP 80-2	ICARDA	56	42	60	1.2	25	2089
ILC 610	Tunisia	44	34	52	1.0	29	1744
ILC 464	Turkey	46	33	55	1.2	41	1733
FLIP 80-1	ICARDA	47	40	45	1.1	34	1600
FLIP 81-54	ICARDA	39	37	25	1.4	27	1533
FLIP 81-65	ICARDA	40	41	37	1.4	26	1444
FLIP 80-5	ICARDA	46	36	51	1.3	27	1439
ILC 66	Iraq	40	37	52	1.1	25	1427
FLIP 81-52	ICARDA	44	34	55	1.3	32	1417
FLIP 81-32	ICARDA	48	45	22	1.4	31	1267
ILC 1929	Syria	41	41	30	1.1	30	1206
Check	SD Sel.	45	35	51	1.5	21	1194
ILC 35	Syria	45	35	35	1.3	35	922
ILC 4	Jordan	44	32	23	1.4	26	833
FLIP 81-40	ICARDA	40	37	26	1.0	29	794
FLIP 81-45	ICARDA	31	25	29	1.1	32	750
FLIP 81-63	ICARDA	40	42	12	1.1	28	717
ILC 263	Turkey	36	35	14	1.3	29	550
FLIP 81-31	ICARDA	40	39	15	1.1	26	356
Overall Mean		43	37	41.6	1.2	29	1430
Standard deviation		5.2	4.7	17.9	0.2	4.1	599.5

Table 16. Agronomic data for the 1983 Large-seeded Chickpea International Yield Trial.

Entry	Origin	Height (cm)	Spread (cm)	Stand (%)	100 seed wt. (g)	Yield (kg/ha)
ICC 5003	India	41	29	84	22	1938
ICC 11529	India	42	36	77	24	1544
ICC 4918	India	43	24	66	28	1478
ICC 10136	India	35	31	66	14	1456
ILC 1919	India	42	51	39	22	1256
ILC 1934	Iran	44	37	54	30	1250
ILC 482	Turkey	36	37	40	30	1217
ILC 1932	Jordan	41	46	42	29	1178
ILC 1920	Morocco	37	41	30	31	1172
ILC 1931	Turkey	41	44	50	31	1167
ICC 4948	India	38	33	61	15	1044
ICC 11524	ICRISAT	39	34	52	14	972
ILC 519	Egypt	39	32	55	21	917
ICC 5810	India	47	52	62	14	817
ILC 3256	Cyprus	33	42	17	31	622
ILC 1929	Syria	36	37	20	28	617
Overall Mean		40	38	51	24	1165
Standard Deviation		3.7	7.7	18.9	6.7	343.7

Table 17. Agronomic data for the 1983 Chickpea International F_3 Trial.

Entry	Origin	Height (cm)	Spread (cm)	Stand (%)	Seeds/ Pod	100 seed wt. (g)	Yield (kg/ha)
ILC 116	Spain	51	47	57	1.1	41	2833
ILC 134	Spain	45	38	52	1.2	42	2755
ILC 496	Turkey	49	50	48	1.3	39	2539
ILC 135	Spain	47	38	46	1.2	42	2467
ILC 83	Spain	48	36	46	1.2	43	2411
ILC 132	Spain	46	44	40	1.1	42	2411
ILC 76	Spain	48	49	50	1.1	42	2344
ILC 254	Turkey	55	55	39	1.1	43	2278
Check	SD Sel.	49	43	52	1.3	20	2206
ILC 165	Tunisia	47	52	29	1.1	38	2167
ILC 464	Turkey	51	55	31	1.3	42	2089
ILC 451	Turkey	41	44	57	1.3	35	2067
ILC 136	Spain	47	45	50	1.2	39	2033
ILC 620	Morocco	43	47	37	1.3	42	1978
ILC 613	Tunisia	44	43	45	1.1	40	1833
ILC 112	Spain	51	49	31	1.3	45	1672
ILC 171	Tunisia	46	40	21	1.3	38	1183
ILC 35	Syria	37	44	23	1.2	36	1150
ILC 2587	Turkey	45	45	21	1.2	39	1150
ILC 629	Tunisia	45	51	17	1.2	41	1094
Overall Mean		47	46	40	1.2	39	2033
Standard Deviation		3.9	5.4	12.7	0.8	5.2	535

Table 18. Agronomic data for the 1983 South Dakota Selections Trial.

Entry	Origin	Height (cm)	Spread (cm)	Stand (%)	Seeds/ Pod	100 seed wt. (g)	Yield (kg/ha)
ILC 1932	Jordan	35	41	63	1.4	25.3	2739
ILC 1934	Iran	26	29	74	1.1	34.2	2561
ILC 1919	India	25	29	73	1.3	26.4	2522
ILC 519	Egypt	31	36	65	1.3	20.3	2511
ILC 482	Turkey	29	26	66	1.1	29.4	2256
FLIP 81-34	ICARDA	26	31	70	1.2	27.2	1967
FLIP 11-64	ICARDA	31	28	70	1.0	31.8	1928
ILC 480	Turkey	26	28	69	1.1	32.2	1811
ILC 4	Jordan	25	40	73	1.3	30.0	1811
FLIP 81-58	ICARDA	30	30	69	1.2	28.6	1772
Overall Mean		28	32	69	1.2	28.4	2188
Standard Deviation		3.3	5.3	3.6	0.1	3.9	370.7

Grass and Legume Forage Crop Research

Arvid Boe and Richard Wynia

Smooth bromegrass, crested wheatgrass, and intermediate wheatgrass forage yield trials planted in 1981 (see descriptions in 1982 Annual Progress Report) were harvested once in 1983. Dry matter forage yields for three crested wheatgrass entries (Ruff, Nordan, and SD 714) harvested on June 10 were not significantly different and the overall trial mean was 1.8 tons/acre. A significant difference for forage yield was found among three intermediate wheatgrass entries harvested on July 19. SD 54 (an experimental synthetic variety developed at SDSU) significantly outyielded Oahe and Slate. Dry matter forage yields for SD 54, Slate, and Oahe were 3.6, 2.9. and 2.7 tons/acre, respectively. Dry matter forage yields of Lincoln and Cottonwood bromegrass harvested on July 19 did not differ and the overall trial mean was 2.4 tons/acre.

Two grazing-type alfalfa forage yield trials were planted in 1983 on May 5 and July 15. In the spring-planted trial, good stands (greater than 75%), were obtained for Ladak, Maverick, and MT-0 and MT-1 (two experimentals developed at SDSU). In the summer-planted trial, the best stand (45%) was exhibited by MT-1. Stands of Ladak, Vernal, Travois, and Teton were 42, 39, 36, and 24%, respectively.

Sheep
RAM TEST STATION RESULTS
J. M. Thompson

The spring and fall ram tests conducted at the Central Research Station in Highmore provides seedstock producers valuable information on their rams. This information allows them to evaluate their breeding and selection programs. In addition, the information is valuable to the commercial sheep producers who purchase these rams for their flocks. The fall test is primarily for the wool breeds and the spring test for meat type breeds.

In the 1982 fall test, 16 producers entered 67 rams and 12 producers entered 46 rams in the 1983 spring test.

Results of the most recent spring and fall tests are presented in Tables 19 and 20, respectively.

The following formula was used to index the rams in the spring test period: I = 60 x (ADG) + 30 x (weight per day of age) + 5 x (muscle score) - 5 x (fat score) - 5 x (soundness score).

The following formula was used to index the rams in the fall test period: I = 60 x (ADG) x 4.0 x (staple length in inches) + 4.0 x (clean wool in pounds) - 3.0 x (face covering score) - 4.0 x (skin fold score).

Table 19. Results of 1983 Spring Ram Test

Breed	No.	Total Gain (lb)	ADG (lb)	Fat Score	Muscle Score	Soundness Score	Index
Suffolk	16	76.6	.89	2.3	6.4	1.12	96.5
Targhee	8	58.2	.68	2.9	5.6	1.0	73.3
Rambouillet	8	51.4	.60	2.7	5.5	1.12	64.1
Columbia	5	64.0	.74	2.3	5.3	1.0	80.9
Hampshire	9	78.4	.91	2.9	7.1	1.11	99.5

Table 20. Results of the 1982 Fall Ram Test

Breed	No.	Total Gain (lb)	ADG (lb)	Adj. 365 day Grease Fl. wt. (lb)	Adj. 365 day Clean Fl. wt. (lb)	Adj. 365 day Staple length (in.)	Face Score	Wrinkle Score	Index
Rambouillet	48	102.2	.70	23.01	11.53	4.14	1.89	1.6	92.35
Targhee	10	109.0	.75	23.6	11.73	4.3	1.4	1.2	100.21
Columbia	8	81.94	.56	23.94	12.46	4.78	1.3	1.12	94.20
Suffolk	1	92.0	.63	7.75	4.18	3.5	1.0	1.0	61.5

Horticulture-Forestry Department
Central Research Station Report

Fruit

The fruit planting at Highmore enables SDSU to evaluate varieties and advanced selections under the conditions of central South Dakota. The plot is irrigated during periods of drought. Valiant grape, introduced by SDSU in 1982, has produced well at Highmore for several years. Dietz plum has been extremely prolific at Highmore. This small European type plum is self fertile. The home gardener in central South Dakota will find a single tree will produce an abundance of fruit for fresh use, canning, and jams. Rabbits caused serious damage to the fruit trees four or five years ago, especially on the apple and pear trees. Trees of two pears developed by SDSU are recovering from rabbit damage and now are growing well at Highmore. Luscious pear, introduced in 1973, is an excellent dessert pear which may be stored until December. The other pear is an Asian type pear, a kind of pear new to the western world but now coming into great demand in the USA. The South Dakota selection is highly flavored and stores well. We anticipate releasing this pear in 1986 or earlier.

Connell Red, Redwell, and Haralson apples are also in the fruit planting as is a rootstock study in which apples are grafted on Siberian roots (the commonly used apple roots in South Dakota) and M 7 roots (a dwarfing root). Rabbits caused a major setback in this study. We anticipate planting two new SDSU apple selections in 1984.

Woody Ornamentals

There were no new woody ornamental plant materials from the NC-7 Plant Introduction Program planted at the Station in 1983. No additional plantings are planned for 1984. A new project leader has been hired for the Ames, Iowa Plant Introduction Station. We expect some new woody plant materials will be available for planting at the Central Research Station in 1985.

Plantings of Re. Maple and Forsythia appear to be growing quite well at the Station. The release of the new winter hardy forsythia cultivar 'Meadowlark' is scheduled for 1984. This will be a joint release with North Dakota State University.

Seed has been collected from an Amur Maple tree named Red Wing and will be distributed.

We hope to continue the evaluation of woody ornamental plants at the Station. Problems associated with the plantings continue to be rabbit and rodent damage and accomplishing the needed cultural practices for proper maintenance of the plant materials.

New Horticulture-Forestry Department Head

On January 1, 1984 Dr. Thomas D. Warner will become the new department head. Dr. Warner is a native of Indiana. He comes to SDSU from Kansas State University where he has held the position of Teaching Program Leader in the Department of Forestry and served as the Chairman of the Natural Resources Management Curriculum.

Soil Survey of Highmore Research Station
G. D. Lemme

A soils map of the Highmore research station was prepared at a scale of 1:24,000 and 1:2,514 by Milo Reber (SCS, Soil Scientist) and Gary Lemme using the Hyde County soil survey legend and one prepared specially for the station, respectively. The map, legend, map unit composition, classification, and soil properties are given in Figure 1, and Tables 21-24, respectively.

In most areas of the station, two major soils occur so closely intermingled or in such small areas that mapping them separately is not practical at the selected scale. Additional information can be obtained or the soils at an individual plot can be determined by contacting the Pedology section of the Plant Science Department.

Table 21. Map Legend

Symbol	Map Unit Name
Gj	Glenham-Java loams, 1-3% slope
Gp	Glenham-Prosper loams, 0-2% slope
Ph	Plankinton-Hoven silt loams
St	Stickney silt loam, 0-2% slope

Table 22. Map Unit Composition

Symbol	Soil Series Included
Gj	Glenham (70%) Java (20%) Others (10%)
Gp	Glenham (60%) Prosper (35%) Others (5%)
Ph	Plankinton (70%) Hoven (15%) Others (15%)
St	Stickney (85%) Others (15%)

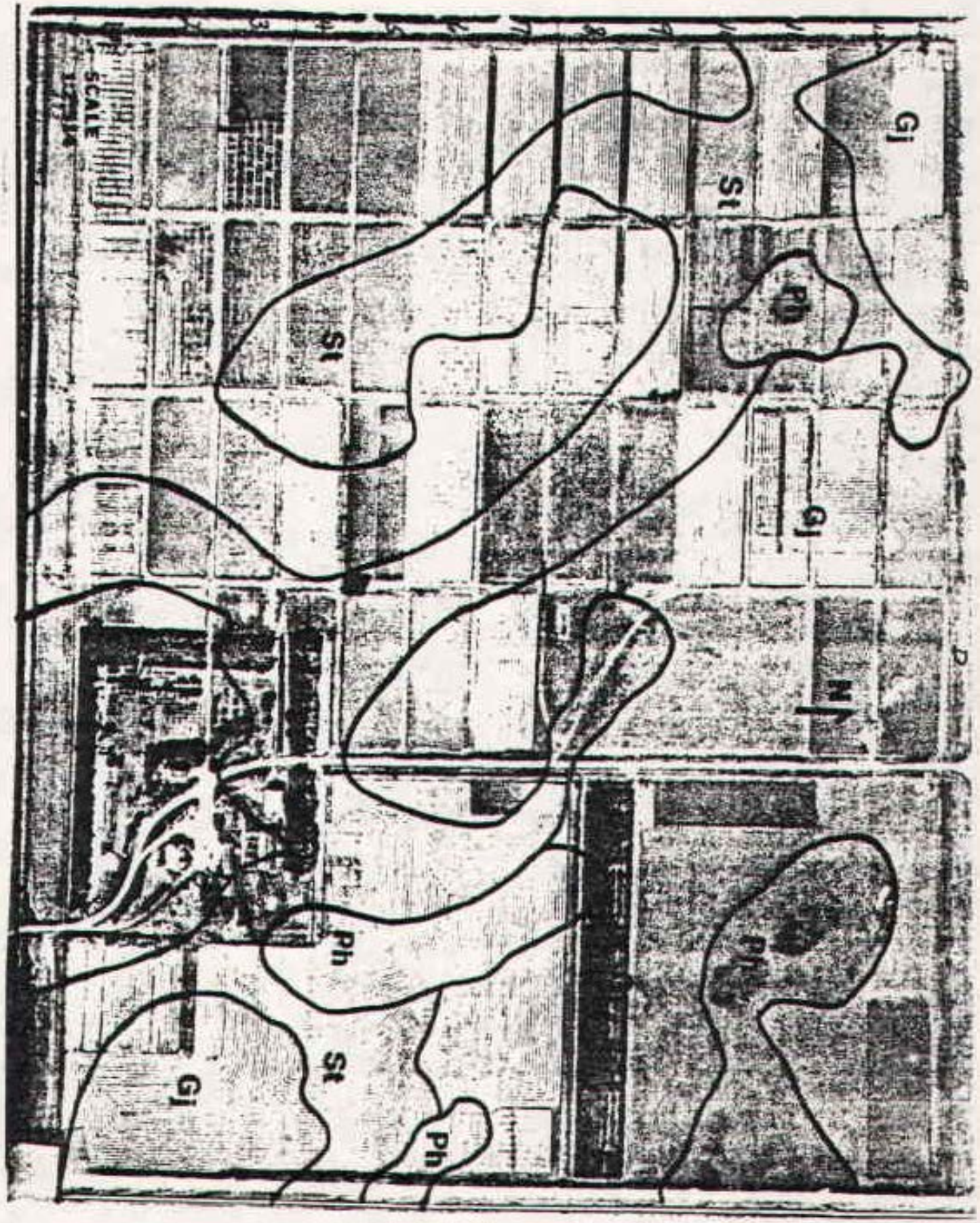
Table 23. Classification of Soils

Series	Family Classification
Glenham	Typic Argiustolls, fine-loamy, mixed, mesic
Hoven	Typic Natraquolls, fine, montmorillonitic, mesic
Java	Entic Haplustolls, fine-loamy, mixed, mesic
Plankinton	Typic Argialbolls, fine, montmorillonitic, mesic
Prosper	Pachic Argiustolls, fine-loamy, mixed, mesic
Stickney	Glossic Natrustolls, fine-montmorillonitic, mesic

Table 24. Soil Properties

Property	Glenham	Java	Prosper
landscape position	summit, backslope	shoulder, knobs	footslope, swale
parent material	glacial till	glacial till	glacial till
natural drainage	well	well	mod. well
capability class	2E	3E	1
sodium affected	No	No	No

Property	Stickney	Plankinton	Hoven
landscape position	level, upland	toeslope, depression	toeslope, depression
parent material	glacial till	alluvium	alluvium
natural drainage	mod. well	poorly	poorly
capability class	2S	4W	6S
sodium affected	Yes	Yes	Yes


SCALE
Gl
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