

1985 Research and Cropping Results

Second Annual Progress Report

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Contents Relate to Cooperative Agreement between
USDA-ARS and Area IV Soil Conservation Districts
represented by the Area IV SCD Research Advisory Committee

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F. NW1/4 Sec 17 - Research Activities

1. Conservation Bench Area (19 ac) - Benches are in bromegrass and were harvested for hay in 1985 to support the animal nutrition research of ARS. Dr. Jim Karn, Animal Nutritionist, is determining the value of phosphorus supplementation before and during first calf and second calf cycle of a cow herd involving 52 head. The hay is being used to maintain the herd during the 1985-86 winter.
2. Barley in 1984, planted to sunflowers in 1985 (19 ac). Undercut April 18 and applied 1.0 lb/ac (ai) Treflan granules and broadcast apply 30 lbs N/ac before planting. Undercut again May 7 and planted to sunflower 'Sokota 4000' May 22, 1985; banded 35 lbs N/ac beside the row. The sunflowers yielded about 1000 lbs/ac, had 30 lbs/bu test weight, and 42% oil content.
3. Sunflowers in 1984, planted to Bowman barley on May 3, 1985. Undercut and applied Treflan 0.7 lb/ac (ai) April 19, 1985 to one half of the field where Prowl had been used on sunflower in 1984. Undercut the other half and the entire field received 30 lbs N/ac broadcast April 11, 1985. Sprayed for weed control, May 20, 1985 using a mixture of 2,4-D and Bromoxynil (Brominal). This barley yielded 41 bu/ac.
4. Sunflowers in 1984, planted to Wheaton spring wheat May 2, 1985 with a double-disk no-till drill. The field was undercut once April 23, 1985 after a broadcast application of 30 lbs N/ac on April 11, 1985. The wheat averaged about 35 bu/acre.
5. ARS Lease (27.2 ac)
 - a. Spring Wheat and Barley Performance - Spring wheat and barley cultivars were planted on summerfallow on April 26, 1985; emergence was about May 3. The seed of most cultivars was supplied by the Dickinson Experiment Station. The same number of viable seeds--about one million per acre--is planted of each cultivar. We measure the germination percentage, kernel weight, and kernel water concentration to determine the actual weight of seed to plant.

Cultivar	Measurement							
	Seedling population no/m ² ‡	Heads no/m ²	Grain yield [†] bu/ac	Kernel weight [†] grams¶	Kernels/head no.	Straw yield [†] lbs/ac	Height inches	Test weight lbs/bu
Alex	174	486	45.5	25.32	25.3	4787	42	59.3
Butte	195	516	46.9	24.41	26.5	4937	43	50.6
Coteau	180	377	41.5	25.73	28.4	4363	42	57.0
Glenman	181	429	49.3	28.60	31.8	4736	36	58.2
Sinton	158	406	41.1	25.39	27.9	4847	44	56.1
Stoa	192	501	44.6	23.84	29.4	5145	43	56.8
Wheaton	178	386	53.4	26.61	33.3	4161	34	56.7
Zhong 7902	159	344	56.9	36.83	30.9	4299	36	60.2
Azure	194	423	61.3	29.61	38.4	5051	44	45.5
Bowman	212 [§]	626	69.2	42.69	17.2	4637	40	51.0
Hazen	195	355	58.1	27.95	41.9	4271	43	43.7
Hector	166 [§]	682	58.9	32.69	19.3	5151	43	47.6
Robust	148	316	53.1	27.05	50.4	4693	43	44.3
LSD	32	61	2.9	1.30	3.4	469	2	1.0

†All units of mass (weight) are expressed on a dry basis. (Drying temperature is 69°C or 156°F).

‡To convert to no/yard², multiply by 0.836.

§Two-row barley; others are six-rowed.

¶An ounce is equivalent to 28.35 grams.

b. Wheat Stubble Height - Continuous Cropping - Summerfallow Comparison of Water Storage and Grain Yields

A spring wheat-spring wheat-summerfallow sequence was established in 1977 and each year since measurements have been made of water storage from autumn-to-spring and of grain yield. An adjacent area has been maintained in continuous wheat since 1977 and the same measurements are made there.

Spring wheat planted on summerfallow is cut at harvest to provide strips about 200 feet square with 2, 8-10, and 13-15 inch stubble. Four access tubes are placed in each stubble height to measure soil water with a neutron probe. Access tubes are also put in the summerfallow area and the continuous crop area at the same time. An undercutter is used for all tillage operations on summerfallow.

Fertilizer nitrogen is broadcast in the fall to supply 40-50 lbs N/ac (from 34-0-0) to the stubble height strips and to the continuous cropping. The same spring wheat cultivar is planted on all areas, on the same date, with a double disk drill hitched in tandem to an off-set disk, and 70 lbs/ac 18-46-0 applied with the seed. (Cultivars planted have been Sinton, Olaf, and Wheaton).

Effect of management on change in soil water content from autumn to spring, and available soil water content in the spring.

Change in soil water, autumn to spring to four feet

Management †	Year								Avg.
	<u>77-78</u>	<u>78-79</u>	<u>79-80</u>	<u>80-81</u>	<u>81-82</u>	<u>82-83</u>	<u>83-84</u>	<u>84-85</u>	
	inches water								
Short	1.47	3.93	0.44	2.36	1.19	1.66	5.51	4.95	2.69
Medium	1.38	5.37	1.34	2.36	1.86	1.06	5.80	5.44	3.08
Tall	1.51	6.80	4.67	2.13	2.24	1.42	7.16	5.78	3.96
Fallow	1.30	1.06	0.09	1.37	2.14	-0.63 ‡	3.89	2.48	1.46
C. Crop	1.48	4.07	2.03	2.37	2.51	1.45	5.61	4.07	2.95

Inches available soil water to four feet

	Year, spring								Avg.
	<u>78</u>	<u>79</u>	<u>80</u>	<u>81</u>	<u>82</u>	<u>83</u>	<u>84</u>	<u>85</u>	
Short	4.31	2.21	1.17	1.64	0.99	3.26	3.44	4.44	2.68
Medium	4.33	4.28	2.33	1.27	2.33	3.17	4.47	4.37	3.32
Tall	4.66	5.89	4.61	1.43	1.92	3.67	5.06	5.34	4.07
Fallow	4.59	6.25	4.13	2.18	6.57	5.03	6.11	8.67	5.44
C. Crop	4.74	3.90	2.51	2.72	2.32	3.24	2.51	4.87	3.35

† Stubble height: Short = 2 inches, medium = 8-10 inches, tall 13-15 inches, fallow = 0, continuous crop = 9-12 inches.

‡ Water was lost over the fall to spring period.

Effect of management on wheat grain yield.

	Year							Avg.	
	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>		<u>1985</u>
	bushels per acre								
			†						
Short	29.2	21.6	-	20.2	29.8	29.7	25.1	35.5	26.6
Medium	28.8	27.4	-	22.1	30.0	30.9	26.3	39.5	29.3
Tall	28.8	27.7	-	22.5	35.0	30.0	24.4	33.5	28.8
Fallow	25.1	29.0	-	28.0	27.3	28.7	31.2	40.3	29.9
C. Crop	26.3	19.5	-	21.5	31.7	26.1	25.5	35.5	26.6

† Hailed out.

G. SWL/4 Sec 8 - Research Activities

1. Populus Progeny Testing - (Dr. Richard Cunningham); 16 ac devoted to:
 - a. 81 different clones in 1983 planting.
 - b. 64 different clones in 1984 planting.
 - c. 32 different clones in 1985 planting.
2. Grass Breeding Evaluation - (Dr. Reed Barker) 4 ac devoted to:
 - a. 400 selections of Western wheatgrass from a 1977 collection.
 - b. Recurrent selection in a Crested wheatgrass population involving about 1000 plants.
3. Field strip no-till planting of seven winter wheat cultivars in 8 to 10 inch barley stubble (35 ac) on Sept. 1984. Replicated N-fertilizer trial involved rates of 0, 30, 50, 70, and 90 lbs N/ac from 33-0-0 were established as a spring topdressing on the east end of the field. The remainder of the field to the west was topdressed at a rate of 50 lbs N/ac. The cultivars planted in this trial in east-west strips from south to north were: Agassiz, Norwin, Archer, Rocky, Norstar, Roughrider and Mironovskaya. Yield and economic data for these cultivars are shown in the following table as influenced by N-fertilization.
4. Spring wheat-summerfallow cropping: 15.3 crop, 13.5 ac summerfallow in 1985. Foundation seed of cultivar Stoa was planted using a conventional till-plant method with 50 lbs/ac of 18-46-0 with the seed. Field G6 was sprayed for weed control with a mixture of 2 1/2 pt. Hoelon and 1/2 pt. Brominal. The wheat yielded 35.5 bu/ac with 13.3% protein.

Table 1. Agronomic data and economics of N-fertilization of seven winter wheat cultivars no-till seeded into barley stubble in 1985.

Variety	N-Added lb N/A	Straw lb/A	Grain lb/Ac	Straw/Grain Ratio	Grain bu/Ac	Test wt lb/bu	Protein %	*Net Income \$/A
Agassiz	0	3510	2040	1.72	33.9	62	11.0	71.88
	30	4880	2440	2.00	40.7	62	11.3	78.57
	50	5430	2560	2.12	42.7	61	12.6	94.33
	70	5260	2480	2.12	41.3	60	12.9	85.67
	90	5240	2220	2.36	37.0	59	14.3	80.84
Norstar	0	2600	1660	1.57	27.7	62	8.0	33.79
	30	4120	2320	1.78	38.7	63	8.2	39.50
	50	5130	2790	1.84	46.5	63	10.3	71.78
	70	5440	2660	2.05	44.3	62	10.7	62.63
	90	5420	2600	2.08	43.3	62	10.9	55.68
Roughrider	0	2480	1620	1.53	27.0	64	10.6	49.14
	30	4280	2330	1.84	38.8	64	9.9	51.27
	50	4780	2590	1.85	43.2	64	9.7	52.81
	70	5630	2910	1.93	48.5	64	12.2	103.75
	90	5880	3220	1.84	53.7	63	12.8	111.65
Rocky	0	2490	2130	1.17	35.5	63	10.7	64.61
	30	3940	3050	1.29	50.8	62	11.7	99.99
	50	4540	3280	1.38	54.7	62	12.1	124.45
	70	5200	3610	1.44	60.2	63	9.5	73.51
	90	5870	3520	1.67	58.7	62	10.8	83.70
Archer	0	2480	2160	1.15	36.0	62	9.7	54.72
	30	3790	3060	1.24	51.0	61	10.8	85.11
	50	3840	2990	1.28	49.8	61	11.9	92.73
	70	4660	3170	1.47	52.8	58	13.6	122.46
	90	4410	3180	1.39	53.0	58	13.6	117.85
Norwin	0	2870	1860	1.54	31.0	62	9.4	47.27
	30	4300	2700	1.59	45.0	62	9.5	60.69
	50	4200	2760	1.52	46.0	62	9.2	57.07
	70	5110	3110	1.64	51.8	62	10.4	76.29
	90	5290	3230	1.64	53.8	62	12.3	111.91
Mironovskaya	0	2840	2160	1.31	36.0	60	9.1	54.72
	30	4720	3200	1.48	53.3	59	10.0	89.38
	50	4180	2840	1.47	47.3	58	9.7	58.95
	70	4960	3270	1.52	54.5	58	10.5	81.20
	90	5020	3280	1.53	54.7	58	11.4	92.83

*Net income = Income per acre based on price quoted per bushel with protein premiums on September 30, 1985 less cost of nitrogen.

H. NEL/4 Section 18 - Research Activities

1. Conservation Tillage - Cropping Systems Research Project (65 ac)

A. Spring wheat - fallow system

1. (a) Spring wheat plots: Since the 1984 summerfallow plots had been in sunflowers in 1983, tillage treatments were not initiated during fallow in 1984. In the spring of 1985 prior to planting spring wheat we applied 0, 20, and 40 lbs N/ac with a 10-foot width Barber fertilizer spreader April 8-9, 1985. We used a cultivator and double-disk press drill in tandem for tillage and planting. Sprayed for weed control June 4, 1985 using a mixture of 2,4-D and Brominal at 5 oz(ai) each.

(b) Spring wheat grain yield data:

Cultivar	Rate of nitrogen lbs N/ac	Conventional tillage	Minimum tillage bu/ac	No-till	Average (for N rates)
Butte	0	45.3	45.0	38.1	42.8
	20	45.4	41.4	37.1	41.4
	40	<u>41.3</u>	<u>41.7</u>	<u>39.3</u>	<u>40.8</u>
	Avg	44.0	42.7	38.3	41.7
Stoa	0	46.1	44.0	40.8	43.6
	20	43.1	43.1	40.7	42.3
	40	<u>42.9</u>	<u>38.2</u>	<u>38.9</u>	<u>40.0</u>
	Avg	44.0	41.8	40.1	42.0
Avg (tillage)		44.0	42.3	39.2	

2. (a) Summerfallow Plots: Schedule of operations for tillage systems.

Date	Conventional tillage	Minimum tillage	No-till
May 9	--	--	Roundup + 2,4-D ^{1/}
May 20	Undercut	Undercut	--
June 20	Undercut	Roundup + 2,4-D	Roundup + 2,4-D
July 19	Undercut	--	--
July 22	--	Roundup + 2,4-D	Roundup + 2,4-D
Aug 26	--	--	Roundup + 2,4-D ^{2/}
Aug 28	Undercut	Undercut	--
Oct 29	Glean ^{3/}	Glean	Glean

^{1/} Roundup and 2,4-D LV. ester applied at 0.4 lb/ac and 4 oz/ac ai, respectively.

^{2/} Would not have been needed except for skips on previous date of spraying.

^{3/} Glean applied at a rate of 1/3 oz material [0.25 oz/ac (ai)].

B. Spring wheat-winter wheat-sunflower system

1. (a) Spring wheat plots: Schedule of operations for each tillage system.

Date	Conventional tillage	Minimum tillage	No-till
April 8	(Applied 30,60,90 N treatments using 34-0-0 & Barber spreader)		
April 23	Tandem disk	Undercut	--
April 27	(Planted Butte & Stoa with no-till Bettenson drill (70lbs/ac)		
May 20	--	--	2,4-D + Brominal ^{1/}
June 4	2,4D + Brominal	2,4D + Brominal	--
Aug 15	Combine harvest	Combine harvest	Combine harvest

^{1/} 2,4D LV. ester and Brominal mixture with 5 oz/ac(ai) each.

1. (b) Spring wheat yield data for continuous cropping sequence

Cultivar	Rate of nitrogen lb N/ac	Conventional tillage	Minimum tillage bu/ac	No-till	Average (for N rates)
Butte	30	34.4	31.6	30.2	32.1
	60	31.1	31.7	31.2	31.3
	90	<u>30.3</u>	<u>28.7</u>	<u>28.3</u>	<u>29.1</u>
	Avg	31.9	30.7	29.9	30.8
Stoa	30	27.3	26.7	27.9	27.3
	60	27.4	29.4	28.6	28.5
	90	<u>25.2</u>	<u>30.5</u>	<u>31.1</u>	<u>28.9</u>
	Avg	26.6	28.9	29.2	28.2
Avg (tillage)		29.2	29.8	29.6	

2. (a) Winter wheat plots: Schedule of operations for each tillage system.

Date	Conventional tillage	Minimum tillage	No-till
Sept 19-84	Tandem disk	Undercut	---
Sept 21-84	(Planted Roughrider and Norstar with no-till Bettenson drill 65 lb/ac planting rate)		
April 8-85	(Applied 30,60,90 N treatments using 34-0-0 and Barber spreader)		
April 30	Roundup+2,4-D*	Roundup+2,4-D*	---
May 2	(Planted Butte and Stoa Sp.wheat w/Bettenson no-till drill)		
May 8	--	--	2,4D+Brominal
June 4	2,4D+Brominal	2,4D+Brominal	---
Aug 9	--	---	Combine harvest
Aug 15	Combine harvest	Combine harvest	---

*Severe winter killing occurred so we applied Roundup plus 2,4-D to kill any surviving winter wheat plants and weeds so re-planting to spring wheat could be done promptly.

2. (b) Winter wheat (or spring wheat substitute, yield data for continuous cropping sequence

Cultivar	Rate of nitrogen lb N/Ac	Conventional tillage	Minimum tillage bu/ac	No-till	Average (for N rates)
Roughrider	30	(25.9)	(31.6)	35.0	30.8
(Butte)	60	(27.5)	(32.6)	41.2	33.8
	90	(25.7)	28.4	38.0	30.7
Avg		(26.4)	(30.9)	38.1	38.1
Norstar	30	(26.9)	(28.0)	35.0	30.0
(Stoa)	60	(23.6)	(30.2)	35.5	29.8
	90	(23.8)	(21.8)	34.2	26.6
Avg		24.8	26.7	34.9	28.8
Avg (tillage)		25.6	28.8	36.5	

3. (a) Sunflower Plots: Schedule of operations for each tillage system.

Date	Conventional tillage	Minimum tillage	No-till
Sept 18-84	--	--	Surflan ^{1/}
April 8,9-85	(Applied 30,60,90 N-treatments using 34-0-0 and Barber spreader)		
April 23-85	Treflan-undercut ^{2/}	Treflan-undercut	--
May 22	--	Roundup+2,4-D	Roundup+2,4-D
May 23	Tandem disk	--	--
May 23	Planted Sokota 2057 and Hybrid 894 with IH 800 no-till row planter 36-inch rows with Furdan ^{3/}		
Aug 5	(Contract aerial sprayed sunflower for insect control)		
Oct 22	Harvested	Harvested	Harvested

^{1/}Surflan sprayed at rate of 1.25 lb/ac(ai).

^{2/}Treflan TR-10 granules applied at rate of 1 lb/ac(ai) with Grady air-flow applicator mounted on Haybuster undercutter.

^{3/}Furdan 15-G applied with seed at a rate of 1 lb/ac(ai) for 36-inch row spacing. We should apply 1.1 lb/ac(ai) to equal 8 oz/1000 ft of row as recommended. [For 30-inch row spacing, apply 1.3 lb/ac(ai)].

3. (b) Sunflower yield data for continuous cropping sequence:

Cultivar	Rate of nitrogen lb N/ac	Conventional tillage	Minimum tillage bu/ac	No-till	Average (for N rates)
Hyb-894	30	2060	2010	2230	2100
	60	2230	2250	2220	2230
	90	<u>2380</u>	<u>2250</u>	<u>2530</u>	<u>2390</u>
	Avg	2220	2170	2330	2240
Sokota 2057	30	1950	2050	2060	2020
	60	2110	2250	2130	2160
	90	<u>2230</u>	<u>2260</u>	<u>2370</u>	<u>2290</u>
	Avg	2100	2190	2190	2160
Avg (tillage)		2160	2180	2260	

2. Winter wheat cultivars in 1984 (27 ac) - Broadcast applied 40 lbs N/ac, April 11, 1985. This field was undercut, April 17, 1985 while applying 0.75 lb/ac (ai) Treflan granules, undercut again May 20 and planted sunflowers May 24, 1985 (Sokota 5000 and 2057) with a no-till unit planter (IH 800). The sunflowers yielded about 1700 lb/ac, 31 lb/bu test weight, and 42% oil content.

3. This field was in sunflowers in 1984 (46 ac). Planted Wheaton spring wheat with 70 lbs/ac 18-46-0 applied with the seed April 30, 1985. Nitrogen fertilizer was broadcast applied at a rate of 40 lbs N/ac April 11 before undercutting on April 25, 1985. This field was sprayed twice for weed control, May 21 and June 4 with 2,4D plus Brominal. West half of this field is set-up with 100 foot alternate strips of 'Bowman' barley and 'Wheaton' spring wheat to provide a site to study no-till winter wheat cultivar-disease interactions. Three winter wheat cultivars were planted into barley and spring wheat stubble on Sept. 1985. The barley yielded about 35 bu/ac and the Wheaton spring wheat yielded about 32 bu/ac.

4. ARS Lease (28.4 ac)

a. Third year of a study on winter wheat survival and production in a spring wheat-winter wheat-summerfallow rotation. The variables are: erect spring wheat stubble heights of 2-, 8-, and 14-inches, and a 2-inch stubble that was tilled before planting (tilled); cultivars Roughrider, Centurk, and Mironovskaya were planted on September 20, 1984 at about 900,000 seeds/ac; two types of no-till drills, double-disk and hoe-type openers; and two inches of supplemental water applied a week before planting and no supplemental water. Seventy lbs/ac 18-46-0 were applied in-the-row with the seed and about 40-50 lbs N/ac from 34-0-0 were applied broadcast after planting.

Yields and some agronomic measurements are shown in the following table:

Variable	Agronomic Measurements						
	Seedling population no/yd2	Head population no/yd2	Grain yield bu/ac	Test weight lbs/bu	1000-kernel weight grams	Straw yield lbs/ac	Kernels per head no.
Water (dryland)	55	267	33.1	58.0	26.70	3529	32.1
(added 2 inches)	99	362	43.5	60.2	28.68	4590	28.6
Stubble (14-inch) ^{1/}	82	329	40.9	59.1	27.67	4310	30.5
(8-inch)	73	300	35.7	59.2	27.71	3808	30.2
Drill (disk)	90	333	40.4	59.3	27.84	4193	29.5
(hoe)	64	296	36.3	58.9	27.54	3927	31.2
Cultivar (Roughrider)	123	388	41.5	61.4	27.87	4866	23.9
(Mironovskaya)	64	229	37.3	55.5	30.63	3925	36.0
(Centurk)	46	326	36.1	60.5	24.57	3387	31.2

^{1/}The 2-inch (disked) and 2-inch stubble treatments winterkilled.

- b. Sinton spring wheat, conventional height cultivar, was planted on summerfallow, April 30, 1985, applying 75 lbs/ac 18-46-0 with the seed. Beginning at a spike (head) water concentration of about 100% and every two days thereafter, we swathed four 10.5 by 50-foot areas. We determined spike water concentration at which spring wheat can be cut without losing yield, test weight, and protein.

Effect of date of windrowing on agronomic characters of Butte hard red spring wheat in 1985.

<u>Date</u> mo-day-yr	<u>SWC</u> [†] %	<u>Grain</u> <u>yield</u> bu/ac	<u>Kernel</u> <u>weight</u> mg‡	<u>Test</u> <u>weight</u> lbs/bu	<u>Grain</u> <u>nitrogen</u> %N§
7-23-85	92	29.4	20.31	54.7	
7-25-85	82	36.1	21.10	56.4	
7-27-85	76	41.6	22.05	58.1	
8-01-85	69	48.3	24.76	60.4	
8-05-85	48	49.4	25.69	59.7	
8-07-85	13	48.7	24.40	59.4	
8-14-85	13	52.2	25.61	60.3	
8-21-85¶	14	51.6	26.01	61.4	
LSD	5	3.1	1.44	0.8	

[†]Spike water concentration.

[‡]28350 mg (milligrams) = one ounce.

[§]Analysis not completed.

[¶]Straight combined.

- c. Sunflower cultivar trial - Cultivars were planted June 3, 1985 on a site cropped to spring wheat in 1984. Treflan TR-10 granules were applied at a rate of 1.0 lb/ac(ai) with undercutter, 40 lb N/ac was applied and then the site was disked prior to planting.

<u>Cultivar</u>	<u>Yield</u> lb/ac	<u>Test weight</u> lb/bu	<u>Plants/acre</u> X 1000	<u>Oil content</u> %
Hybrid 894	1640	27	25.0	39.1
Sokota 4000	2480	29	25.8	41.2
Sokota 5000	2360	29	20.2	41.7
Sokota 6000	2180	29	17.7	41.2
Sokota 2057	2550	29	23.4	42.3
Sokota 81-307	2370	28	25.8	42.4
Sokota 81-950	2110	28	24.2	39.7
Sokota 82-2200	2530	30	22.6	37.4
Sokota 83-32221	2550	31	23.4	43.4
Sokota 83-8221	2460	29	25.8	42.8

I. NE 1/4 Sec 20 Research Activities

1. Field 1 (6.7 ac) was no-till planted to 'Wheaton' spring wheat May 8, 1985, with the Melroe drill, applying 50 lbs of 18-46-0 with the seed. One-half of this field received a broadcast application of 30 lbs N/ac, April 11, 1985. This field received 1/4 oz/ac (ai) Glean in July, 1984 so the field was relatively weed free at planting on May 8, 1985. We used 2,4-D and Hoelon post emergence on June 7. The wheat in this field which was in no-till spring wheat for the second year in a row, yielded about 30 bu/ac.
2. Field 2 (11.4 ac), summerfallowed in 1984. Planted foundation spring wheat 'Butte' May 3, 1985 using cultivator-double disk drill combination till-plant system, with 70 lbs/ac of 18-46-0 applied with the seed. Sprayed for weed control with Hoelon plus 2,4-D, June 7. The wheat yielded about 48 bu/ac with 14.2% protein and 59 lbs/bu test weight.
3. Field 3 (11.3 ac) - spring wheat in 1984, summerfallowed in 1985 using a combination of chemical spray and undercutter tillage operations. This field also contained a no-till and minimum-till summerfallow study involving; Treflan TR-10 granules applied in fall with or without undercutter tillage compared to spring applications with or without undercutter tillage. One-half of these plots were fallowed using herbicides and the other half with the Haybuster undercutter as needed for weed control. Quantity of crop residue was measured in fall, early spring and periodically during summerfallow. Soil water measurements were also taken in the early spring, during summerfallow and in the fall of 1985. These data have not been summarized.
4. Field 4 (20.4 ac) was summerfallowed in 1984. Planted foundation 'Stoa' spring wheat, May 3, 1985 using cultivator, double-disk drill combination till-plant system with 70 lbs/ac of 18-46-0 applied with the seed. Sprayed for weed control June 7, 1984 using a mixture of Hoelon plus 2,4-D. The wheat yielded about 50 bu/ac, with 12.5% protein and a test weight of 59 lbs/bu.
5. Field 5 (28.8 ac) was cropped to spring wheat in 1984. The major portion of this field was summerfallowed in 1985 using the undercutter and/or herbicides to attain a minimum-till system.

Field 5 also contained two major intensive research projects as follows:

- a. China Winter Wheat Project - The cultivars Norstar and Colt (Nebraska release) were planted September 19, 1984 into 9-12 inch spring wheat stubble with a Bettenson (disk opener) no-till drill at about 900,000 viable seeds per acre. The variables, in addition to cultivar, were nitrogen level and water level.

Yields and some agronomic measurements are shown in the following table:

Nitrogen s/ac ^{1/}	Cultivar	Water Level											
		1	2	3	1	2	3	1	2	3	1	2	3
		seedlings/yd ²			heads/yd ²			yield bu/ac			lbs/bu		
50	Colt	44	45	47	219	229	201	16.0	21.1	17.3	58.4	58.5	58.9
	Norstar	120	146	138	250	271	292	27.3	28.3	32.1	60.0	59.9	59.4
90	Colt	20	40	22	201	247	179	21.4	31.8	29.8	58.1	58.6	58.4
	Norstar	155	135	148	382	367	342	36.6	37.1	35.2	60.0	59.8	59.4
145	Colt	26	46	48	257	354	341	30.7	32.7	46.0	57.2	58.3	58.4
	Norstar	140	144	131	378	469	479	36.9	48.2	50.6	58.4	61.1	60.9
215	Colt	46	54	72	298	388	511	31.2	40.5	59.2	56.8	56.9	58.0
	Norstar	126	135	130	396	463	484	32.3	46.9	47.4	57.2	61.2	61.6

^{1/}Nitrate-nitrogen to four feet, soil and fertilizer.

^{2/}Water level 1 = dryland; 2 = supplemental water (4.5 inches); 3 = double supplemental water (9 inches).

China Spring Wheat Project - The Chinese cultivar Zhong 7902 and Sinton were planted May 29, 1985. (This is the second year of this study). Both cultivars were planted at about a million seeds/ac. Zhong 7902 produces seven leaves on the main stem and Sinton produces eight. Variables, in addition to cultivar, were nitrogen level and water level.

Yields and some other agronomic measurements are shown in the following table:

Nitrogen lbs/ac ^{1/}	Cultivar	Water Level											
		1	2	3	1	2	3	1	2	3	1	2	3
		heads/yd ²			mg/kernel			bu/ac			lbs/bu		
50	Sinton	240	218	238	29.30	31.15	32.35	26.8	25.1	26.1	59.2	59.2	59.2
	Zhong	182	182	181	36.20	37.26	38.39	25.1	23.6	23.8	59.3	59.0	58.5
90	Sinton	274	302	235	26.80	30.41	31.35	27.6	33.0	33.2	58.3	59.2	58.3
	Zhong	257	220	270	32.68	37.94	38.61	33.1	38.2	33.2	58.7	59.5	59.0
145	Sinton	313	334	313	23.66	28.32	32.33	30.9	34.4	39.2	56.2	58.2	59.1
	Zhong	279	279	298	29.69	35.39	38.97	36.0	38.7	44.8	57.6	59.0	59.7
215	Sinton	338	349	411	21.65	27.32	31.11	28.3	38.7	50.7	54.4	57.6	59.3
	Zhong	298	306	360	26.98	32.64	38.62	37.0	43.7	50.2	56.4	58.5	60.2

^{1/} Nitrate-nitrogen to four feet, soil fertilizer.

^{2/} Water level 1 = dryland; 2 = supplemental water (3.75 inches); 3 = double supplemental water (7.5 inches).

- b. Soil Erosion/Soil Productivity Study - This was the second year of a planned three-year study to assess the effect of topsoil loss by erosion on soil productivity, as measured by wheat yields. The available nitrogen (nitrate) and water levels were maintained uniformly among these three sites, each with different soil organic matter content in the upper foot. Wheaton spring wheat was planted at about one million viable seeds/ac on April 29, 1985. The grain yield data are shown on the following table.

Based on a comparison of the average yields of soil with 35.8 and 64.3 tons organic matter/acre/foot, each ton of organic matter increased yield about 15 lbs (1/4 bu) per acre.

Nitrate-nitrogen lbs/ac	Organic matter tons/ac/ft	Water Level			Avg
		1	2	3	
50	35.8	30.6	32.5	35.1	32.7
	48.4	30.7	31.1	33.3	31.7
	64.3	37.4	40.9	41.8	40.0
80	35.8	35.6	46.0	46.6	42.7
	48.4	38.0	46.8	52.2	45.7
	64.3	44.8	51.2	51.4	49.1
110	35.8	38.4	54.5	56.9	49.9
	48.4	44.2	55.8	61.8	53.9
	64.3	45.8	59.3	65.0	56.7

6. Field 6 (29.9 ac) was summerfallowed in 1984. Glean was applied to this field at a rate of 1/4 oz/ac(ai) in July, 1984. The field was planted to spring wheat about 10 acre each of foundation Butte and certified Wheaton, May 3, 1985. We used a cultivator-double disk drill combination till-plant system with 70 lbs/ac 18-46-0 applied with the seed. Sprayed for weed control with a mixture of Hoelon plus 2,4-D on June 7, 1985. The wheat yielded about 48 bu/ac, with 12% protein, and 59 lbs/bu test weight.