INTRODUCTION

The 1978 crop season was a fairly productive year when compared to 1977. Soil moisture was adequate but late moisture in 1977 caused some sheeting of ice and some winter wheat and alfalfa stands were reduced. In the poorly drained areas of the station, some winter barley was suffocated due to this sheeting. Rainfall in April prevented tillage of the soil and resulted in late plantings of small grain. During May, rainfall was above average but in June the amount of precipitation was too low to thoroughly wet the soil surface.

Fall plantings this year germinated and were well stooled at freeze up time. The lack of rainfall in September and October has affected the sub soil moisture, which is low at this time.

A twilight tour of the station, June 28th, covered small grains, weed control, horticultural plantings, vegetable garden, a new tree planting by the SCS Plant Materials Branch and the Sheep Unit, which is now in its second year of testing lambs of wool and meat breeds.

The Board of Directors met in Highmore, December 28, 1978, and the yearly station results plus future plans were discussed. The new machine was looked over by some members.

In 1979, the twilight tour will be conducted on Wednesday, June 27th. Emphasis this year is on tillage and fertility, crop rotations, horticultural crops and points of interest at that time.

The Annual Winter Meeting is set for Wednesday, December 19th at 9:30 a.m. in the Hyde County Extension building, Highmore, SD.

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 1978 growing season.

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<td>31</td>
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</tbody>
</table>
1978 CROP SEASON

Total Rainfall for Growing Season by Months with their Departure from Long-time Average at Central Research Station, Highmore, SD

<table>
<thead>
<tr>
<th>Rainfall</th>
<th>Inches</th>
<th>Departure*</th>
<th>Greatest day</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>3.72</td>
<td>+1.85</td>
<td>1.40&quot;</td>
<td>10th</td>
</tr>
<tr>
<td>May</td>
<td>3.44</td>
<td>+0.89</td>
<td>0.06</td>
<td>26th</td>
</tr>
<tr>
<td>June</td>
<td>1.15</td>
<td>-2.82</td>
<td>0.30</td>
<td>30th</td>
</tr>
<tr>
<td>July</td>
<td>3.10</td>
<td>+0.56</td>
<td>1.00</td>
<td>12th</td>
</tr>
<tr>
<td>August</td>
<td>3.66</td>
<td>+1.31</td>
<td>2.31</td>
<td>15th</td>
</tr>
<tr>
<td>September</td>
<td>0.80</td>
<td>-0.81</td>
<td>0.40</td>
<td>17th</td>
</tr>
<tr>
<td>October</td>
<td>0.23</td>
<td>-1.02</td>
<td>0.18</td>
<td>13th</td>
</tr>
</tbody>
</table>

Number of days during month with temperatures 90° or above:
- June - 6; July - 19; August - 15; September - 12
- Last frost - Spring (May 19)
- First frost - Fall (Oct. 6)

*Departure from longtime rainfall average April through October:
-0.04 inches on the Central Research Station. Total for crop season 16.10 inches.
TITLE: Tillage Methods and Cropping Sequences

OBJECTIVES OF EXPERIMENTS (Eight experiments in number):

1. Soil moisture change with tillage method or crop sequences.
2. Effect of fertility on yield of grain or silage.
3. Comparison of tillage tools used for weed control.
4. Effect of cropping sequences on yields.

TILLAGE TREATMENTS:

1. Chisel plow, narrow sweeps, disk once or when needed.
2. Mulch, 32" wide sweeps, disk once or when needed.
3. Stubble, no till, chemical weed control.
4. Fallow, black, narrow or wide sweeps + disk or duckfoot until black.
5. Fallow, some residue, narrow or wide sweeps + disk or duckfoot until nearly black.

CROP SEQUENCE: (Numbers on side refer to tillage treatments)

<table>
<thead>
<tr>
<th>Spring Grain</th>
<th>Winter Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 wheat</td>
<td>1-2 wheat</td>
</tr>
<tr>
<td>1-2 wheat-oats</td>
<td>1-2 wheat-oats</td>
</tr>
<tr>
<td>1-2 wheat-row crop (grain)</td>
<td>1-2 wheat-row crop (silage)</td>
</tr>
<tr>
<td>3-4-5 wheat-fallow</td>
<td>3-4-5 wheat-fallow</td>
</tr>
</tbody>
</table>

FERTILITY:

- 0- 0-0 Phosphorus applied with grain (P₂O₅)
- 45- 0-0 Nitrogen broadcast on surface
- 45-30-0

PLANTING SPACE:

- Small grain, 7 inch
- Row crop, 36 inches

PLOT SIZE:

- 20 ft. x 32 ft.

STARTING SOIL SAMPLES:

- Every plot 0-6", 5-12", 12-18", 18-24"

REPLICATIONS: 4
CROP YEAR HISTORY:

Planted:  
- HRS wheat, VS 1809, May 1
- corn, Pioneer 3965, May 15
- oats, Chief, May 1
- winter wheat, Centurk, Sept. 77

Harvested:  
- S. wheat, July 25
- corn, Sept. 27
- oats, July 18
- winter wheat, July 26

Herbicide:  Ramrod, 6#/A  
7" band, corn

Insecticide: Thinet, 1#/active/A on corn

Row Space:  
wheat 7"
corn 36"

Fertilizer:  
45-30-0 45# N-30# P2O5-0# K2
45-0-0 Broadcast application
0-30-0 Applied with the grain drill (P2O5)

Cultivation:  Corn, two times

Tillage:  Chisel plow or with 32" sweeps to depths of about 4 to 6 inches

Corn - Silage, Pioneer 3965  
Planted May 15  
Harvested August 22

Sunflowers  
Planted May 15  
Harvested NONE

Safflower  
Planted May 9  
Harvested Aug. 21

Soil type: Glenham-Cavour loam

DISCUSSION:

No discussion of the results will be given because notes about the experiments and crops grown were incomplete. Grain yields are given for interpretation by those familiar with growing conditions during the season.

Experiment 3, Continuous Winter Wheat and Experiment 6, Degree of Fallow Tillage for Winter Wheat were not harvested. The stands were thin and weed growth was excessive. An examination for Hessian fly damage to the crop was not made.
RESULTS:

Table 1. Influence of Tillage and Fertility on Yields in a Spring Wheat - Corn Rotation. Experiment 1.

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Wheat Yields</th>
<th>Moisture Loss</th>
<th>Bushels per Inch of Water Used</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protein Bu/A</td>
<td>From Profile plus Precipitation inches Used*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>17.0</td>
<td>15.4</td>
<td>5.52</td>
<td>2.79</td>
</tr>
<tr>
<td>45-0-0</td>
<td>16.9</td>
<td>14.4</td>
<td>3.67</td>
<td>3.92</td>
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<tr>
<td>0-30-0</td>
<td>17.2</td>
<td>12.4</td>
<td>4.27</td>
<td>2.90</td>
</tr>
<tr>
<td>0-0-0</td>
<td>16.6</td>
<td>16.1</td>
<td>5.02</td>
<td>3.21</td>
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<tr>
<td>Tillage: Mulch with 32 Inch Sweeps</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>16.8</td>
<td>16.0</td>
<td>6.89</td>
<td>2.32</td>
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<tr>
<td>45-0-0</td>
<td>16.8</td>
<td>17.0</td>
<td>6.26</td>
<td>2.72</td>
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<tr>
<td>0-30-0</td>
<td>17.0</td>
<td>20.0</td>
<td>6.60</td>
<td>3.03</td>
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<td>0-0-0</td>
<td>17.1</td>
<td>15.5</td>
<td>5.40</td>
<td>2.87</td>
</tr>
<tr>
<td>Tillage: Chisel Plow</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Table 2.

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Corn Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protein Bu/A</td>
</tr>
<tr>
<td>45-30-0</td>
<td>12.56</td>
</tr>
<tr>
<td>45-0-0</td>
<td>12.50</td>
</tr>
<tr>
<td>0-30-0</td>
<td>12.69</td>
</tr>
<tr>
<td>0-0-0</td>
<td>12.44</td>
</tr>
<tr>
<td>Tillage: Mulch with 32 Inch Sweeps</td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>12.69</td>
</tr>
<tr>
<td>45-0-0</td>
<td>12.88</td>
</tr>
<tr>
<td>0-30-0</td>
<td>12.56</td>
</tr>
<tr>
<td>0-0-0</td>
<td>12.63</td>
</tr>
<tr>
<td>Tillage: Chisel Plow</td>
<td></td>
</tr>
</tbody>
</table>

* Inches used: Spring wheat, includes 7.69" of rain from May 1 - July 25; Corn, includes 11.22" of rain from May 15 - Sept. 27

** Calculated by \( \frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}} \) per inch of water used.
## RESULTS:

Table 3. Effect of Tillage and Fertility on Yields in a Winter Wheat - Corn Silage Rotation. Experiment 2.

**WINTER WHEAT**

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Moisture Loss From Profile plus Precipitation Inches Used*</th>
<th>Bushels per Inch of Water Used**</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-P_2O_5-K_2O</td>
<td>Protein</td>
<td>Wheat Yield Bu/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>14.7</td>
<td>16.5</td>
<td>16.58</td>
</tr>
<tr>
<td>45- 0-0</td>
<td>14.3</td>
<td>15.8</td>
<td>16.85</td>
</tr>
<tr>
<td>0-30-0</td>
<td>13.4</td>
<td>15.2</td>
<td>17.55</td>
</tr>
<tr>
<td>0- 0-0</td>
<td>12.4</td>
<td>15.5</td>
<td>16.62</td>
</tr>
</tbody>
</table>

**Tillage: Mulch with 32 Inch Sweeps**

|                      |                                                              |                                 |                                                |
|                      |                                                              |                                 |                                                |
|                      | Protein           | Wheat Yield Bu/A                  |                                                |
|                      |                  |                                 |                                                |
| 45-30-0             | 15.3             | 22.6                             | 17.84                                              |
| 45- 0-0             | 14.9             | 19.7                             | 18.96                                              |
| 0-30-0              | 13.3             | 22.9                             | 17.06                                              |
| 0- 0-0              | 12.9             | 20.2                             | 17.97                                              |

**Tillage: Chisel Plow**

|                      |                                                              |                                 |                                                |
|                      |                                                              |                                 |                                                |
|                      | Protein           | Wheat Yield Bu/A                  |                                                |
|                      |                  |                                 |                                                |
| 45-30-0             | 11.2             | 3.7                              | 5.46                                               |
| 45- 0-0             | 9.6              | 3.2                              | 3.75                                               |
| 0-30-0              | 8.0              | 2.9                              | 5.43                                               |
| 0- 0-0              | 9.7              | 3.2                              | 5.00                                               |

**Inches Used: Winter wheat, includes 11.41" rains from April 1 - July 26**

**Calculated by**

\[
\text{bushels of grain produced per inch of water used} = \frac{\text{bushels of grain produced}}{\text{inches used}}
\]

Table 4.

**CORN SILAGE**

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Moisture Loss From Profile plus Precipitation Inches Used*</th>
<th>Tons DM per Inch of Water Used**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-P_2O_5-K_2O</td>
<td>Corn Silage Tons/A</td>
<td>Corn DM Yield Tons/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>10.0</td>
<td>3.3</td>
</tr>
<tr>
<td>45- 0-0</td>
<td>9.1</td>
<td>3.0</td>
</tr>
<tr>
<td>0-30-0</td>
<td>9.1</td>
<td>3.0</td>
</tr>
<tr>
<td>0- 0-0</td>
<td>8.6</td>
<td>2.9</td>
</tr>
</tbody>
</table>

**Tillage: Mulch with 32 Inch Sweeps**

|                      |                                                              |                                 |                                                |
|                      |                                                              |                                 |                                                |
| 45-30-0             | 11.2                                                         | 3.7                              | 5.46                                               |
| 45- 0-0             | 9.6                                                          | 3.2                              | 3.75                                               |
| 0-30-0              | 8.0                                                          | 2.9                              | 5.43                                               |
| 0- 0-0              | 9.7                                                          | 3.2                              | 5.00                                               |

**Inches Used: Silage Corn, includes 9.07" rain from May 15 - Aug. 22**

**Calculated by**

\[
\text{tons of DM produced per inch of water used} = \frac{\text{tons of DM (dry matter) produced}}{\text{inches used}}
\]
Table 5. Continuous Spring Wheat. Experiment 4.

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Protein</th>
<th>Wheat Yield</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;-K&lt;sub&gt;2&lt;/sub&gt;O Lb/A</td>
<td>(f)</td>
<td>Bu/A</td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>15.5</td>
<td>17.6</td>
<td>56.8</td>
</tr>
<tr>
<td>45-0-0</td>
<td>15.4</td>
<td>14.9</td>
<td>56.3</td>
</tr>
<tr>
<td>0-30-0</td>
<td>15.3</td>
<td>18.0</td>
<td>56.5</td>
</tr>
<tr>
<td>0-0-0</td>
<td>15.5</td>
<td>16.5</td>
<td>56.0</td>
</tr>
</tbody>
</table>

Tillage: Mulch with 32 Inch Sweeps

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Protein</th>
<th>Wheat Yield</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;-K&lt;sub&gt;2&lt;/sub&gt;O Lb/A</td>
<td>(f)</td>
<td>Bu/A</td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>15.7</td>
<td>16.4</td>
<td>56.8</td>
</tr>
<tr>
<td>45-0-0</td>
<td>15.9</td>
<td>14.4</td>
<td>55.5</td>
</tr>
<tr>
<td>0-30-0</td>
<td>15.6</td>
<td>17.2</td>
<td>56.8</td>
</tr>
<tr>
<td>0-0-0</td>
<td>15.5</td>
<td>16.3</td>
<td>57.5</td>
</tr>
</tbody>
</table>

Tillage: Chisel Plow

* Inches used: Spring wheat, includes 7.69" of rain from May 1 - July 27.
### RESULTS:

Table 6. Degree of Fallow Tillage for Spring Wheat. Experiment 5.

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Protein</th>
<th>Wheat Yield Bu/A</th>
<th>Moisture Loss From Profile inches Used*</th>
<th>Bushels per Inch of Water Used**</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;-K&lt;sub&gt;2&lt;/sub&gt;O Lb/A</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>16.4</td>
<td>23.1</td>
<td>7.28</td>
<td>3.17</td>
<td>57.3</td>
</tr>
<tr>
<td>45-0-0</td>
<td>16.3</td>
<td>21.9</td>
<td>7.42</td>
<td>2.95</td>
<td>57.3</td>
</tr>
<tr>
<td>0-30-0</td>
<td>16.5</td>
<td>26.9</td>
<td>8.46</td>
<td>3.18</td>
<td>57.3</td>
</tr>
<tr>
<td>0-0-0</td>
<td>16.0</td>
<td>20.7</td>
<td>8.10</td>
<td>3.39</td>
<td>57.3</td>
</tr>
</tbody>
</table>

**Tillage: No Till***

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Protein</th>
<th>Wheat Yield Bu/A</th>
<th>Moisture Loss From Profile inches Used*</th>
<th>Bushels per Inch of Water Used**</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>45-30-0</td>
<td>16.3</td>
<td>26.0</td>
<td>10.03</td>
<td>2.59</td>
<td>56.3</td>
</tr>
<tr>
<td>45-0-0</td>
<td>16.3</td>
<td>18.2</td>
<td>10.33</td>
<td>1.76</td>
<td>56.3</td>
</tr>
<tr>
<td>0-30-0</td>
<td>16.4</td>
<td>19.4</td>
<td>9.56</td>
<td>2.03</td>
<td>57.3</td>
</tr>
<tr>
<td>0-0-0</td>
<td>16.2</td>
<td>18.1</td>
<td>9.37</td>
<td>1.93</td>
<td>57.3</td>
</tr>
</tbody>
</table>

**Tillage: Some Till***

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Protein</th>
<th>Wheat Yield Bu/A</th>
<th>Moisture Loss From Profile inches Used*</th>
<th>Bushels per Inch of Water Used**</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>45-30-0</td>
<td>16.5</td>
<td>19.3</td>
<td>8.01</td>
<td>2.41</td>
<td>57.3</td>
</tr>
<tr>
<td>45-0-0</td>
<td>16.5</td>
<td>15.6</td>
<td>8.14</td>
<td>1.92</td>
<td>57.0</td>
</tr>
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<td>0-30-0</td>
<td>16.7</td>
<td>18.5</td>
<td>11.01</td>
<td>1.68</td>
<td>57.5</td>
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<td>0-0-0</td>
<td>16.5</td>
<td>21.7</td>
<td>9.86</td>
<td>2.20</td>
<td>58.0</td>
</tr>
</tbody>
</table>

---

* Inches Used: Includes 7.69 Inches of rain from May 1 to July 27

** Calculated by Bushels of grain produced × Bushels of grain produced Loss + precipitation Per inch of water used

*** Tillage: No till -- Weed control with chemicals
Some till -- Chisel plow twice but maintain organic matter
Most till -- Weed free using a chisel plow
RESULTS:

Table 7. Tillage Methods, Fertility and Yield in a Spring Wheat - Oats Rotation. Experiment 7.

### SPRING WHEAT

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Moisture Loss</th>
<th>Bushels per Inch of Water Used</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P₂O₅-K₂O</td>
<td>Protein</td>
<td>Oats Yield</td>
<td>From Profile plus Precipitation</td>
</tr>
<tr>
<td>Lb/A</td>
<td>Bu/A</td>
<td>Bu/A</td>
<td>Bushels per Inch of Water Used**</td>
</tr>
<tr>
<td>45-30-0</td>
<td>15.7</td>
<td>17.0</td>
<td>10.48</td>
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<td>15.9</td>
<td>12.5</td>
<td>11.18</td>
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<td>15.9</td>
<td>18.0</td>
<td>11.05</td>
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<tr>
<td>0-0-0</td>
<td>15.4</td>
<td>9.2</td>
<td>10.70</td>
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</tbody>
</table>

#### Tillage: Mulch with 32 Inch Sweeps

#### Tillage: Chisel Plow

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Moisture Loss</th>
<th>Bushels per Inch of Water Used</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P₂O₅-K₂O</td>
<td>Protein</td>
<td>Oats Yield</td>
<td>From Profile plus Precipitation</td>
</tr>
<tr>
<td>Lb/A</td>
<td>Bu/A</td>
<td>Bu/A</td>
<td>Bushels per Inch of Water Used**</td>
</tr>
<tr>
<td>45-30-0</td>
<td>15.7</td>
<td>17.5</td>
<td>12.13</td>
</tr>
<tr>
<td>45-0-0</td>
<td>15.7</td>
<td>23.2</td>
<td>11.29</td>
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<td>15.4</td>
<td>19.9</td>
<td>11.58</td>
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<tr>
<td>0-0-0</td>
<td>15.7</td>
<td>21.0</td>
<td>10.97</td>
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</table>

Table 8. Tillage Methods, Fertility and Yield in a Spring Wheat - Oats Rotation. Experiment 7.

### OATS

<table>
<thead>
<tr>
<th>Fertility Treatment</th>
<th>Moisture Loss</th>
<th>Bushels per Inch of Water Used</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P₂O₅-K₂O</td>
<td>Protein</td>
<td>Oats Yield</td>
<td>From Profile plus Precipitation</td>
</tr>
<tr>
<td>Lb/A</td>
<td>Bu/A</td>
<td>Bu/A</td>
<td>Bushels per Inch of Water Used**</td>
</tr>
<tr>
<td>45-30-0</td>
<td>16.4</td>
<td>47.4</td>
<td>11.10</td>
</tr>
<tr>
<td>45-0-0</td>
<td>15.8</td>
<td>54.0</td>
<td>10.01</td>
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<tr>
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<td>15.5</td>
<td>36.4</td>
<td>11.48</td>
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<tr>
<td>0-0-0</td>
<td>15.4</td>
<td>41.6</td>
<td>10.16</td>
</tr>
</tbody>
</table>

#### Tillage: Mulch with 32 Inch Sweeps

#### Tillage: Chisel Plow

* Inches used: Spring wheat, includes 7.69" of rain from May 1 - July 27
Oats, includes 6.29" of rain from May 1 - July 18

** Calculated by \( \frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}} \times \frac{\text{bushels of grain produced}}{\text{per inch of water used}} \)
RESULTS:

Table 9. Influence of Tillage Methods and Fertility on Yields in a Winter Wheat - Oats Rotation. Experiment 8.

<table>
<thead>
<tr>
<th>Fertility Treatment Lb/A</th>
<th>N-P₂O₅-K₂O</th>
<th>Protein</th>
<th>Wheat Yield Bu/A</th>
<th>Moisture Loss From Profile plus Precipitation Inches Used</th>
<th>Bushels per Inch of Water Used</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tillage: Mulch with 32 Inch Sweeps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
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<td>29.0</td>
<td>15.42</td>
<td>1.88</td>
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</tr>
<tr>
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<td>41.5</td>
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<td>2.82</td>
<td>58.8</td>
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<tr>
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<td>15.72</td>
<td>2.53</td>
<td>59.3</td>
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<td>31.8</td>
<td>15.80</td>
<td>2.01</td>
<td>58.5</td>
<td></td>
</tr>
<tr>
<td>Tillage: Chisel Plow</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>15.6</td>
<td>37.7</td>
<td>16.36</td>
<td>2.30</td>
<td>59.0</td>
<td></td>
</tr>
<tr>
<td>45-0-0</td>
<td>15.5</td>
<td>28.0</td>
<td>16.06</td>
<td>1.74</td>
<td>58.0</td>
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</tr>
<tr>
<td>0-30-0</td>
<td>14.0</td>
<td>32.1</td>
<td>16.21</td>
<td>1.98</td>
<td>59.5</td>
<td></td>
</tr>
<tr>
<td>0-0-0</td>
<td>15.0</td>
<td>27.5</td>
<td>16.56</td>
<td>1.66</td>
<td>59.0</td>
<td></td>
</tr>
</tbody>
</table>

* Inches used: Winter wheat, includes 10.0" of rain from April 1 - July 18

Table 10. Influence of Tillage Methods and Fertility on Yields in a Winter Wheat - Oats Rotation. Experiment 8.

<table>
<thead>
<tr>
<th>Fertility Treatment Lb/A</th>
<th>N-P₂O₅-K₂O</th>
<th>Protein</th>
<th>Oats Yield Bu/A</th>
<th>Moisture Loss From Profile plus Precipitation Inches Used</th>
<th>Bushels per Inch of Water Used</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tillage: Mulch with 32 Inch Sweeps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>17.3</td>
<td>43.5</td>
<td>14.26</td>
<td>3.05</td>
<td>33.0</td>
<td></td>
</tr>
<tr>
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<td>61.0</td>
<td>12.68</td>
<td>4.81</td>
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<tr>
<td>0-30-0</td>
<td>15.8</td>
<td>63.2</td>
<td>12.91</td>
<td>4.90</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>0-0-0</td>
<td>15.3</td>
<td>53.7</td>
<td>13.05</td>
<td>4.11</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>Tillage: Chisel Plow</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-30-0</td>
<td>16.8</td>
<td>59.4</td>
<td>13.23</td>
<td>4.49</td>
<td>29.5</td>
<td></td>
</tr>
<tr>
<td>45-0-0</td>
<td>17.1</td>
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<td>12.24</td>
<td>5.32</td>
<td>32.5</td>
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<tr>
<td>0-30-0</td>
<td>16.4</td>
<td>68.7</td>
<td>12.94</td>
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<tr>
<td>0-0-0</td>
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<td>42.3</td>
<td>12.79</td>
<td>3.31</td>
<td>31.0</td>
<td></td>
</tr>
</tbody>
</table>

* Inches used: Oats, includes 6.29" of rain from May 1 - July 18

** Calculated by Bu. of grain produced - bushels of grain produced Loss + precipitation per inch of water used
HAY, HAYLAGE AND SILAGE PRODUCTION
Q. Kingsley and M. Volek

TITLE: Dry Matter Production from Millets, Small Grains and Forage Sorghums.

OBJECTIVES OF EXPERIMENT:
1. Compare various crops for dry matter production.
2. Obtain regrowth data after first harvest.

RESULTS:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Planting Rate Bu/A</th>
<th>Tons per acre DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodaway Lyon</td>
<td>1.25</td>
<td>2.4</td>
</tr>
<tr>
<td>Nodaway Lyon</td>
<td>1.67</td>
<td>2.6</td>
</tr>
<tr>
<td>Nodaway Lyon</td>
<td>0.83</td>
<td>2.2</td>
</tr>
<tr>
<td>Nodaway Lyon</td>
<td>1.67</td>
<td>2.5</td>
</tr>
<tr>
<td>Nodaway Lyon</td>
<td>2.50</td>
<td>2.0</td>
</tr>
<tr>
<td>Barley (Prilar)</td>
<td>1.00</td>
<td>2.2</td>
</tr>
<tr>
<td>Barley Nodaway</td>
<td>0.50</td>
<td>2.4</td>
</tr>
<tr>
<td>Nodaway</td>
<td>1.25</td>
<td></td>
</tr>
</tbody>
</table>

DM Average 2.3

* To determine yields of hay, haylage or silage: Divide tons of DM by percent DM in hay, haylage and silage; Example (DM average 2.3 ÷ 0.85 = 2.6 or 2.6 tons of 12% moisture hay, etc.)

Planted 5/3/70
Harvested 7/13/70
RESULTS:

Table 12. Millet Haylage 1978, Tons of Dry Matter* (DM) per acre, Central Research Station

<table>
<thead>
<tr>
<th>Variety</th>
<th>Tons DM per acre</th>
<th>Date Harvested</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Wonder - Foxtail</td>
<td>5.4</td>
<td>9/8</td>
</tr>
<tr>
<td>Red Siberian - Foxtail</td>
<td>5.7</td>
<td>8/31</td>
</tr>
<tr>
<td>Cerise</td>
<td>6.5</td>
<td>8/13</td>
</tr>
<tr>
<td>IPH 1129</td>
<td>6.9</td>
<td>8/12</td>
</tr>
<tr>
<td>Albarr</td>
<td>6.4</td>
<td>8/23</td>
</tr>
<tr>
<td>Minco</td>
<td>4.8</td>
<td>8/25</td>
</tr>
<tr>
<td>ISCA 474</td>
<td>6.6</td>
<td>8/31</td>
</tr>
<tr>
<td>Panhandle</td>
<td>6.9</td>
<td>8/25</td>
</tr>
<tr>
<td>Dawn IPH 1108</td>
<td>6.5</td>
<td>8/12</td>
</tr>
</tbody>
</table>

DM Average 6.2

DM average 6.2
Hay (80% DM) 7.0
Haylage (50% DM) 12.4
Silage (33% DM) 18.8

* Formula same as Small Grain Haylage, Table 11

Planted 6/9/78
Planting rate  Foxtail 6"/A
                Proso 20"/A
### RESULTS:

**Table 13. Forage Sorghum Tons of Dry Matter* (DM) per acre, Central Research Station**

<table>
<thead>
<tr>
<th>Plant Type and Variety</th>
<th>Seeding Rate Lbs/A</th>
<th>Tons per acre of DM</th>
<th>Plant height inches Harvest</th>
<th>Regrowth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acco HS 33</td>
<td>12</td>
<td>3.5</td>
<td>8/14/78</td>
<td>71</td>
</tr>
<tr>
<td>Cal West Piper</td>
<td>12</td>
<td>3.3</td>
<td>9/11/78</td>
<td>45</td>
</tr>
<tr>
<td>Forage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asgrow Merit</td>
<td>4</td>
<td>5.2</td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Sorgo X Sorgo</td>
<td></td>
<td>6.4</td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>Acco Aztec</td>
<td></td>
<td>6.4</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Forage X Sudan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acco Sweet Sioux IV</td>
<td>4</td>
<td>6.7</td>
<td>70</td>
<td>41</td>
</tr>
<tr>
<td>NK X 4224</td>
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<td>6.6</td>
<td>90</td>
<td>34</td>
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<tr>
<td>Grain X Sudan</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pioneer 911</td>
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<td>5.1</td>
<td>59</td>
<td>31</td>
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<tr>
<td>Acco S-99</td>
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<td>39</td>
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<tr>
<td>Asgrow Grazer N-2</td>
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<td>74</td>
<td>40</td>
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<tr>
<td>Grain X Forage</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pioneer 956</td>
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<td>6.0</td>
<td>68</td>
<td>29</td>
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<tr>
<td>Acco FS 401=R</td>
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<td>6.9</td>
<td>61</td>
<td>29</td>
</tr>
<tr>
<td>Asgrow Titan E</td>
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<td>5.4</td>
<td>59</td>
<td>30</td>
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<tr>
<td>Dual Purpose</td>
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<td>NK 300</td>
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<tr>
<td>Acco 2912</td>
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<td>48</td>
<td>29</td>
</tr>
<tr>
<td>NK Silo Milo</td>
<td>4</td>
<td>4.5</td>
<td>55</td>
<td>32</td>
</tr>
<tr>
<td>Forage, Leafy</td>
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<td></td>
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<td>5.9</td>
<td>73</td>
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</tr>
</tbody>
</table>

**DM Average 5.5**

**Hay (88% DM) 6.3**

**Haylage (50% DM) 11.0**

**Silage (33% DM) 16.7**

* Formula same as Small Grain Haylage, Table 11

Planted: June 2

Cut: Aug. 14
RESULTS:

Table 14. Forage Sorghum Tons of Dry Matter* (DM) per acre, Central Research Station

<table>
<thead>
<tr>
<th>Plant type and variety</th>
<th>Seeding Rate Lbs/A</th>
<th>Tons per acre of DM</th>
<th>Plant height inches</th>
<th>Percent Headed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acco HS33</td>
<td>12</td>
<td>6.4</td>
<td>77</td>
<td>100</td>
</tr>
<tr>
<td>Cal West Piper</td>
<td>12</td>
<td>3.0</td>
<td>74</td>
<td>100</td>
</tr>
<tr>
<td>Forage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asgrow Merit</td>
<td>4</td>
<td>7.2</td>
<td>76</td>
<td>100</td>
</tr>
<tr>
<td>Sorgo X Sorgo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acco Aztec</td>
<td>4</td>
<td>9.6</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Forage X Sudan</td>
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<td></td>
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<tr>
<td>Acco Sweet Sioux IV</td>
<td>4</td>
<td>8.3</td>
<td>77</td>
<td>100</td>
</tr>
<tr>
<td>NK X 4224</td>
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<td>7.8</td>
<td>82</td>
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<tr>
<td>Grain X Sudan</td>
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</tr>
<tr>
<td>Pioneer 911</td>
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<td>76</td>
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<tr>
<td>Acco S-99</td>
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</tr>
<tr>
<td>Asgrow Grazer N-2</td>
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<td>75</td>
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<tr>
<td>Grain X Forage</td>
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<td></td>
</tr>
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<td>100</td>
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<td>100</td>
</tr>
<tr>
<td>Asgrow Titan E</td>
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<td>9.5</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Dual Purpose</td>
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</tr>
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<td>NK Silo Milo</td>
<td>4</td>
<td>8.5</td>
<td>67</td>
<td>100</td>
</tr>
<tr>
<td>Forage Leafy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pioneer 989</td>
<td>4</td>
<td>7.8</td>
<td>76</td>
<td>100</td>
</tr>
<tr>
<td>Acco FS 531</td>
<td>4</td>
<td>14.9</td>
<td>113</td>
<td>30</td>
</tr>
<tr>
<td>NK 367</td>
<td>4</td>
<td>17.8</td>
<td>113</td>
<td>100</td>
</tr>
<tr>
<td>Corn (25,000 Pop/A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NK PX32</td>
<td></td>
<td>10.3</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>DM Average</td>
<td></td>
<td>9.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DM average 9.2
Hay (88% DM) 10.5
Haylage (50% DM) 18.4
Silage (33% DM) 27.9

* Formula same as Small Grain Haylage, Table 11

Planted: June 2
Cut: Sept. 11
RESULTS:

Table 15. Average yield comparison of various forage crops in tons per acre of hay, haylage and silage*

<table>
<thead>
<tr>
<th>Crop</th>
<th>DM Average</th>
<th>98% DM Hay</th>
<th>50% DM Haylage</th>
<th>33% DM Silage</th>
<th>Harvest Date 1978</th>
<th>Days Planting to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Grain</td>
<td>2.3</td>
<td>2.6</td>
<td>4.6</td>
<td>7.0</td>
<td>7/13</td>
<td>71</td>
</tr>
<tr>
<td>Millet</td>
<td>6.2</td>
<td>7.0</td>
<td>12.2</td>
<td>18.8</td>
<td>8/24</td>
<td>64</td>
</tr>
<tr>
<td>Sudan Grass</td>
<td>3.4</td>
<td>3.9</td>
<td>6.8</td>
<td>10.3</td>
<td>8/14</td>
<td>73</td>
</tr>
<tr>
<td>Sudan Grass</td>
<td>4.7</td>
<td>5.3</td>
<td>9.4</td>
<td>14.2</td>
<td>9/11</td>
<td>101</td>
</tr>
<tr>
<td>Forage Sorghum</td>
<td>5.5</td>
<td>6.3</td>
<td>11.0</td>
<td>16.7</td>
<td>8/14</td>
<td>73</td>
</tr>
<tr>
<td>Forage Sorghum</td>
<td>9.2</td>
<td>10.5</td>
<td>18.4</td>
<td>27.9</td>
<td>9/11</td>
<td>101</td>
</tr>
<tr>
<td>Corn</td>
<td>5.9</td>
<td>6.7</td>
<td>11.8</td>
<td>17.9</td>
<td>8/14</td>
<td>73</td>
</tr>
<tr>
<td>Corn</td>
<td>10.3</td>
<td>11.7</td>
<td>20.6</td>
<td>31.2</td>
<td>9/11</td>
<td>101</td>
</tr>
</tbody>
</table>

* Data taken from Tables 11, 12, 13 and 14
Formula same as Small Grain Haylage, Table 11

Planting dates: Small Grain May 3
               Millet June 9
               Sudan, Forage Sorghum, Corn June 2
CROP ROTATION - SOIL MOISTURE USAGE RELATIONSHIP
Q. Kingsley and K. Volek

OBJECTIVE OF EXPERIMENT:
1. To compare various crops with different naturities for soil moisture usage and yielding ability under similar soil and climatic conditions.

DISCUSSION:

Crops chosen for this experiment are of different naturities. Barley is a short season crop. Corn and sunflowers are long season crops. Safflower, in 1978, was earlier maturing than sunflowers.

The major weed problems were in the safflower plantings. Where no Tolban was applied, the weeds reduced yields of safflower to 420 pounds compared to the less weedy safflower yields shown in Table 16. Weeds reduced yields from 879.9 pounds to 420 pounds, a loss of 459.9 pounds per acre due to poor weed control.

The sunflower land was treated with Tolban and no untreated check for weed control was used.

This is a replicated study and will be continued on a rotation bases where a short season crop may follow a long season crop or vice versa.

RESULTS:

Table 16. Crop Rotation - Soil Moisture Usage Relationship

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield in Bu or Lb/A</th>
<th>Moisture Loss From Profile Plus Precipitation Inches Used*</th>
<th>Bu or Lbs per Inch of Water Used**</th>
<th>Test Weight</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley</td>
<td>25.1</td>
<td>10.80</td>
<td>2.32</td>
<td>43.0</td>
<td>14.54</td>
</tr>
<tr>
<td>Corn</td>
<td>42.9</td>
<td>7.71</td>
<td>5.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td>44.5</td>
<td>12.16</td>
<td>3.66</td>
<td>32.0</td>
<td>15.47</td>
</tr>
<tr>
<td>Safflower</td>
<td>879.9</td>
<td>7.69</td>
<td>114.42%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>22.0</td>
<td>12.21</td>
<td>1.80</td>
<td>58.3</td>
<td>15.85</td>
</tr>
</tbody>
</table>

* Inches used: Includes soil water loss in the 4-foot section of soil from planting to harvest plus precipitation received during this period. Even though some is lost, all figure into the total used.

** Calculated by \( \frac{Bu \text{ of grain produced}}{Loss + Precipitation} \) = bushels of grain produced per inch of water used
WOODY ORNAMENTALS

J. E. KLETT

Nine woody ornamental plants were planted on May 17, 1978, in the woody ornamental research trial plots located at the Highmore Experiment Station Plots. Five new tree species were planted along with four new shrub species. Included in this year's trials were three birch species, along with two maple species. Evaluation records were also taken from the 1968, 1973, and 1978 plantings (1, 5, 10 year reports). Data was forwarded to the Plant Introduction Station in Ames, Iowa, where it is being compiled along with other cooperating states in the North Central Region. A considerable amount of winter damage was observed on the plants due to both cold temperatures and rodent and rabbit damage. Annual flowers were again planted as a display near the manager's home which included many of the All-American Selections from the past several years.
Grass tests to determine forage and seed production of new selections and varieties were seeded on August 25, 1975. These tests were irrigated using lawn sprinklers to get the grass seed germinated. Creeping foxtail did not become established because it needed more moisture than was available. It is suited to low areas that flood in the spring. There were, however, nine replicates of varieties of smooth brome grass, intermediate wheatgrass and crested wheatgrass established. These came through the winter and in spite of the very low rainfall produced some forage and seed in the summer of 1976. They were harvested with a plot combine on July 13. No significant differences in forage or seed production were found among the varieties of brome grass and crested wheatgrass. Regro yielded more forage and seed than the other varieties but differences were not significant. Likewise, Norsun crested wheatgrass yielded more forage and seed than the other varieties but the differences were not significant. In the intermediate wheatgrass test, Oahe yielded significantly more forage but Slate yielded significantly more seed than the other varieties.

The brome grass and intermediate wheatgrass varieties had higher forage yield than the crested wheatgrass in 1976.

In 1977, no seed was harvested, but yield data was obtained for forage. No significant differences in forage production were found among the varieties of brome grass, crested wheatgrass or intermediate wheatgrass. Lincoln yielded more forage than the other brome grass varieties. Suff crested wheatgrass yielded more forage than the other varieties, and Slate yielded more forage than the other intermediate wheatgrass varieties. Due to the dry conditions of the previous year and prior to the 1977 harvest in early June crested wheatgrass out-yielded the other two species.

In 1978 forage yield data was obtained for all three species. Lincoln smooth brome grass yielded significantly more than Regro. This difference occurred because Regro is designed to grow back and not spread out as does Lincoln. Therefore Regro should be seeded at a higher rate to fill out all the groundspace. Norsun crested wheatgrass performed better than the other two varieties but was not significantly better than Suff crested wheatgrass. Slate intermediate wheatgrass significantly out-yielded the other three varieties.
Table 17. Forage and Seed Yields (9 replications) of Smooth Bronegrass Under Dryland at Highmore 1976 through 1978.

<table>
<thead>
<tr>
<th></th>
<th>Forage (tons/acre)</th>
<th>Seed (lbs./acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regro</td>
<td>.98 a</td>
<td>2.08 a</td>
</tr>
<tr>
<td></td>
<td>2.09 b</td>
<td>254 a</td>
</tr>
<tr>
<td>SD 6</td>
<td>.99 a</td>
<td>2.04 a</td>
</tr>
<tr>
<td></td>
<td>2.17 b</td>
<td>238 a</td>
</tr>
<tr>
<td>Lincoln</td>
<td>.87 b</td>
<td>2.32 a</td>
</tr>
<tr>
<td></td>
<td>2.66 a</td>
<td>220 a</td>
</tr>
</tbody>
</table>

Table 18. Forage and Seed Yields (9 replications) of Crested Wheatgrass Under Dryland at Highmore 1976 through 1978.

<table>
<thead>
<tr>
<th></th>
<th>Forage (tons/acre)</th>
<th>Seed (lbs./acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordan</td>
<td>.89 a</td>
<td>2.19 a</td>
</tr>
<tr>
<td></td>
<td>2.51 a</td>
<td>317 a</td>
</tr>
<tr>
<td>Ruff</td>
<td>.84 a</td>
<td>2.31 a</td>
</tr>
<tr>
<td></td>
<td>2.34 ab</td>
<td>307 a</td>
</tr>
<tr>
<td>SD 711</td>
<td>.79 a</td>
<td>2.18 a</td>
</tr>
<tr>
<td></td>
<td>2.26 b</td>
<td>231 a</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Forage (tons/acre)</th>
<th>Seed (lbs./acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oahe</td>
<td>1.15 a</td>
<td>1.01 c</td>
</tr>
<tr>
<td></td>
<td>50 b</td>
<td></td>
</tr>
<tr>
<td>Slate</td>
<td>.98 b</td>
<td>2.34 a</td>
</tr>
<tr>
<td></td>
<td>1.73 a</td>
<td>158 a</td>
</tr>
<tr>
<td>SD 52</td>
<td>.97 b</td>
<td>2.09 a</td>
</tr>
<tr>
<td></td>
<td>1.13 bc</td>
<td>98 b</td>
</tr>
<tr>
<td>SD 51</td>
<td>.92 b</td>
<td>1.95 a</td>
</tr>
<tr>
<td></td>
<td>1.28 b</td>
<td>42 b</td>
</tr>
</tbody>
</table>
ALFALFA TESTS, CENTRAL RESEARCH STATION, 1978

G. L. Holborn, J. G. Ross, and T. J. Heilnan

This test was established to determine the yield potential of various alfalfa varieties in central South Dakota. Both hay-type and pasture-type alfalfas were seeded. Some of the varieties did not establish well; therefore, only one cutting was taken in 1978. Another such variety test was established this past season and will be included in next year's report.

Harvesting was accomplished with a ram flail plot harvester on June 15, 1978, when plants were in the 20 percent flowering stage of maturity. There were no significant differences in forage yield, but Vernal yielded more than any other variety and D2, Syn-2 was the highest yielding pasture variety. For percent stand, D2, Syn-2 was significantly better than T2-5, Syn-2. No other differences were noted.

<table>
<thead>
<tr>
<th>Entry</th>
<th>1978</th>
<th>1978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanza</td>
<td>59</td>
<td>1.49</td>
</tr>
<tr>
<td>Baker</td>
<td>59</td>
<td>1.45</td>
</tr>
<tr>
<td>Daneb 1</td>
<td>58</td>
<td>1.39</td>
</tr>
<tr>
<td>*T2-5 Syn-2</td>
<td>54</td>
<td>1.32</td>
</tr>
<tr>
<td>Vernal</td>
<td>70</td>
<td>1.68</td>
</tr>
<tr>
<td>Dawson</td>
<td>75</td>
<td>1.45</td>
</tr>
<tr>
<td>*D2 Syn-2</td>
<td>79</td>
<td>1.55</td>
</tr>
<tr>
<td>*Travois</td>
<td>65</td>
<td>1.47</td>
</tr>
<tr>
<td>Saranac</td>
<td>64</td>
<td>1.44</td>
</tr>
<tr>
<td>Mean</td>
<td>65</td>
<td>1.47</td>
</tr>
<tr>
<td>L.S.D. (0.05)</td>
<td>23</td>
<td>N.S.</td>
</tr>
<tr>
<td>C.V. (%)</td>
<td>25</td>
<td>19</td>
</tr>
</tbody>
</table>

* denotes pasture type alfalfa
The Breeder's Advanced Yield Trial (AYT) was grown at Highmore in 1978 (Table 21). Seeding rate was 60 lb/acre. This test was uniform (C.V. = 10%) and grain yield averaged 23.6 bushels/acre. SD 2273, a medium height, early heading line was the top yielding line. This variety has been approved for release next spring. The early maturing lines (i.e., Butte, W1S 1809) tended to yield better than the later lines. Leaf rust found in the nursery varied from 0 to 40% infection depending on the resistance of the entry. SD 2273 and Eureka were planted at 60, 75 and 90 lb/acre seeding rates. Grain yield increased 0.5 bushel from the 60 lb rate to the 75 lb rate and no increase was shown from the 75 lb rate to the 90 lb rate.

Table 21. 1978 AYT - Highmore

<table>
<thead>
<tr>
<th>Name</th>
<th>Entry No.</th>
<th>Grain Yield -bu/A-</th>
<th>Test Height -lb/bu-</th>
<th>Heading Date</th>
<th>Plant Height -inches-</th>
<th>Leaf Rust</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD 2273</td>
<td>45</td>
<td>32.0*</td>
<td>58</td>
<td>23</td>
<td>31</td>
<td>5MS</td>
</tr>
<tr>
<td>SD 2846</td>
<td>35</td>
<td>30.5*</td>
<td>58</td>
<td>22</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>SD 2845</td>
<td>34</td>
<td>29.8*</td>
<td>59</td>
<td>22</td>
<td>33</td>
<td>--</td>
</tr>
<tr>
<td>SD 2355</td>
<td>13</td>
<td>28.5*</td>
<td>56</td>
<td>28</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>Butte</td>
<td>5</td>
<td>26.4*</td>
<td>59</td>
<td>25</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>SD 2700</td>
<td>26</td>
<td>28.3*</td>
<td>60</td>
<td>24</td>
<td>27</td>
<td>10M</td>
</tr>
<tr>
<td>SD 2841</td>
<td>30</td>
<td>28.1*</td>
<td>58</td>
<td>25</td>
<td>28</td>
<td>25MS</td>
</tr>
<tr>
<td>SD 2843</td>
<td>32</td>
<td>28.0*</td>
<td>58</td>
<td>25</td>
<td>23</td>
<td>10M</td>
</tr>
<tr>
<td>SD 2167</td>
<td>7</td>
<td>27.1*</td>
<td>57</td>
<td>24</td>
<td>23</td>
<td>10MS</td>
</tr>
<tr>
<td>W1S 1809</td>
<td>4</td>
<td>26.7</td>
<td>58</td>
<td>23</td>
<td>25</td>
<td>10M</td>
</tr>
<tr>
<td>SD 2256</td>
<td>0</td>
<td>26.3</td>
<td>58</td>
<td>26</td>
<td>28</td>
<td>0, 25MS</td>
</tr>
<tr>
<td>SD 2678</td>
<td>22</td>
<td>26.1</td>
<td>59</td>
<td>24</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>SD 2329</td>
<td>11</td>
<td>26.1</td>
<td>57</td>
<td>26</td>
<td>24</td>
<td>2M</td>
</tr>
<tr>
<td>SD 2708</td>
<td>24</td>
<td>25.8</td>
<td>55</td>
<td>25</td>
<td>22</td>
<td>TM</td>
</tr>
<tr>
<td>SD 2536</td>
<td>17</td>
<td>25.6</td>
<td>59</td>
<td>23</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>SD 2840</td>
<td>29</td>
<td>25.5</td>
<td>57</td>
<td>27</td>
<td>30</td>
<td>10M</td>
</tr>
<tr>
<td>SD 2847</td>
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<td>23</td>
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<tr>
<td>Bounty 309</td>
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<td>25</td>
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<tr>
<td>Eureka</td>
<td>48</td>
<td>24.6</td>
<td>54</td>
<td>24</td>
<td>27</td>
<td>TM</td>
</tr>
<tr>
<td>Angus</td>
<td>39</td>
<td>24.5</td>
<td>58</td>
<td>27</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Era</td>
<td>2</td>
<td>23.8</td>
<td>58</td>
<td>27</td>
<td>23</td>
<td>25M</td>
</tr>
<tr>
<td>SD 2842</td>
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<td>23.5</td>
<td>57</td>
<td>25</td>
<td>22</td>
<td>40M</td>
</tr>
<tr>
<td>SD 2354</td>
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<td>24</td>
<td>10M</td>
</tr>
<tr>
<td>SD 2649</td>
<td>20</td>
<td>22.9</td>
<td>56</td>
<td>26</td>
<td>31</td>
<td>0, 10M</td>
</tr>
<tr>
<td>Prodx</td>
<td>42</td>
<td>22.8</td>
<td>56</td>
<td>26</td>
<td>22</td>
<td>40M</td>
</tr>
</tbody>
</table>
Table 21. (cont.)

<table>
<thead>
<tr>
<th>Entry</th>
<th>Grain Yield</th>
<th>Test Weight</th>
<th>Heading Date</th>
<th>Plant Height</th>
<th>Leaf Rust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-bu/acre-</td>
<td>-lb/bu-</td>
<td>-inches-</td>
<td>-inches-</td>
<td></td>
</tr>
<tr>
<td>SD 2016</td>
<td>6</td>
<td>22.7</td>
<td>56</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>Valderon</td>
<td>1</td>
<td>22.2</td>
<td>55</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td>SD 2448</td>
<td>14</td>
<td>22.2</td>
<td>57</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>SD 2716</td>
<td>25</td>
<td>22.2</td>
<td>56</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>SD 2607</td>
<td>18</td>
<td>22.1</td>
<td>58</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>SD 2502</td>
<td>15</td>
<td>21.9</td>
<td>53</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>SD 2323</td>
<td>10</td>
<td>21.8</td>
<td>58</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>MT 7416</td>
<td>38</td>
<td>21.6</td>
<td>57</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>SD 2660</td>
<td>21</td>
<td>21.6</td>
<td>58</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>SD 2640</td>
<td>19</td>
<td>21.3</td>
<td>56</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Olaf</td>
<td>3</td>
<td>20.8</td>
<td>57</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Solar</td>
<td>41</td>
<td>20.4</td>
<td>56</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Coteau</td>
<td>40</td>
<td>20.2</td>
<td>54</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>SD 2838</td>
<td>27</td>
<td>20.0</td>
<td>58</td>
<td>25</td>
<td>27</td>
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<td>SD 2526</td>
<td>16</td>
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<td>58</td>
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<td>18</td>
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<tr>
<td>SD 2697</td>
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<td>18.9</td>
<td>54</td>
<td>28</td>
<td>24</td>
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<tr>
<td>SD 2839</td>
<td>28</td>
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<td>58</td>
<td>27</td>
<td>23</td>
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<tr>
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<tr>
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<td>58</td>
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<tr>
<td>SD 2271</td>
<td>37</td>
<td>16.8</td>
<td>56</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

Average: 23.6, C.V. = 10%

\(^1/\) Average of three replications; harvested area 4.5' x 14.5'.

*The entries with an asterisk are not significantly lower than the highest yielding entry (L.S.D. \(0.01 = 5.1\) bu/\(A\)).
The 1978 Small Grain Variety Trials at the Central Substation were not exceptional for yield or quality. Winterkill affected the stands of winter wheat and the results were quite variable. The wet spring delayed spring grain seeding until May 2. Precipitation was limited and temperatures high during the filling and ripening stages of most entries and the yields and test weights were down.

The results are reported in Tables 22, 23, 24, and 25. Results of the remaining Standard Variety Small Grain Trials conducted by this project are published in Pamphlet #44 of the Plant Science Department, November 1970.
Table 22. 1978 Standard Variety Oat Trials

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. W.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1976 1977 1978 5 yr 1978 3 yr</td>
<td></td>
</tr>
<tr>
<td>Burnett</td>
<td>20.5 45.5 37.6</td>
<td>35</td>
</tr>
<tr>
<td>Triq</td>
<td>20.5 45.6 38.8</td>
<td>35</td>
</tr>
<tr>
<td>Diana</td>
<td>19.1 37.4 36.6</td>
<td>31</td>
</tr>
<tr>
<td>Holden</td>
<td>17.1 41.1 43.5</td>
<td>34</td>
</tr>
<tr>
<td>Portal</td>
<td>11.1 42.2 25.8</td>
<td>26</td>
</tr>
<tr>
<td>Nodaway 70</td>
<td>13.9 37.9 30.0</td>
<td>27</td>
</tr>
<tr>
<td>Froker</td>
<td>20.2 53.8 31.5</td>
<td>35</td>
</tr>
<tr>
<td>Chief</td>
<td>14.6 58.4 31.7</td>
<td>28</td>
</tr>
<tr>
<td>Otee</td>
<td>15.3 36.6 26.6</td>
<td>26</td>
</tr>
<tr>
<td>Dal</td>
<td>10.8 54.8 43.2</td>
<td>36</td>
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<tr>
<td>Astro</td>
<td>13.2 57.2 28.7</td>
<td>33</td>
</tr>
<tr>
<td>Noble</td>
<td>14.8 56.5 29.9</td>
<td>34</td>
</tr>
<tr>
<td>Stout</td>
<td>12.4 53.4 19.9</td>
<td>29</td>
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<tr>
<td>Spear</td>
<td>19.4 44.3 30.2</td>
<td>31</td>
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<tr>
<td>Lyon</td>
<td>11.9 62.2 37.5</td>
<td>37</td>
</tr>
<tr>
<td>Bates</td>
<td>19.1 58.2 35.0</td>
<td>37</td>
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<tr>
<td>Wright</td>
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<td>38</td>
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<td>SD 9095</td>
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</tr>
<tr>
<td>Lang</td>
<td>18.1 55.1 21.3</td>
<td>32</td>
</tr>
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<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WI 2456-2</td>
<td>47.8 37.3</td>
<td>28</td>
</tr>
<tr>
<td>MN 71211</td>
<td>44.3 33.5</td>
<td>27</td>
</tr>
<tr>
<td>MN 73231</td>
<td>51.6 48.5</td>
<td>28</td>
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</table>

Mean, B/A  34.9
LSD (.05)  7.6
C.V. - %  15.5

Table 23. 1978 Standard Variety Spring Wheat Trials

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard height</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortuna</td>
<td>12.8 29.4 23.9</td>
<td>22</td>
</tr>
<tr>
<td>Chris</td>
<td>11.6 25.5 18.9</td>
<td>18</td>
</tr>
<tr>
<td>Waldron</td>
<td>15.2 27.6 17.8</td>
<td>20</td>
</tr>
<tr>
<td>Ellar</td>
<td>14.1 26.9 21.0</td>
<td>21</td>
</tr>
<tr>
<td>Butte</td>
<td>11.2 29.8 22.5</td>
<td>21</td>
</tr>
<tr>
<td>Eureka</td>
<td>13.5 28.9 19.2</td>
<td>21</td>
</tr>
<tr>
<td>Coteau</td>
<td>26.7 17.2</td>
<td>57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-dwarf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Era</td>
<td>13.4 32.5 16.6</td>
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</tr>
<tr>
<td>WS 1809</td>
<td>9.7 30.4 22.9</td>
<td>21</td>
</tr>
<tr>
<td>Wared</td>
<td>23.4</td>
<td>59</td>
</tr>
<tr>
<td>Olaf</td>
<td>13.7 34.3 17.7</td>
<td>22</td>
</tr>
<tr>
<td>Kitt</td>
<td>11.7 28.0 13.4</td>
<td>18</td>
</tr>
<tr>
<td>Bounty 309</td>
<td>12.9 31.9 19.2</td>
<td>21</td>
</tr>
<tr>
<td>Profit 75</td>
<td>14.6 31.5 14.2</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prodax</td>
<td>9.2 27.3 18.6</td>
<td>18</td>
</tr>
<tr>
<td>Protor</td>
<td>10.9 32.4 16.7</td>
<td>20</td>
</tr>
<tr>
<td>Angus</td>
<td>32.5 20.0</td>
<td>58</td>
</tr>
<tr>
<td>Funks W444</td>
<td>33.9 15.5</td>
<td>57</td>
</tr>
<tr>
<td>WS 25</td>
<td>10.2 29.2 16.9</td>
<td>19</td>
</tr>
<tr>
<td>SD 2273</td>
<td>13.9 27.2 20.0</td>
<td>20</td>
</tr>
<tr>
<td>Solar</td>
<td>15.2</td>
<td>56</td>
</tr>
</tbody>
</table>

Mean, B/A  18.8
LSD (.05)  4.0
C.V. - %  15.1
Table 24. 1978 Standard Variety Winter Wheat Trials

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. V.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1974</td>
<td>1976</td>
</tr>
<tr>
<td>Nebred</td>
<td>27.9</td>
<td>22.6</td>
</tr>
<tr>
<td>Lancer</td>
<td>22.6</td>
<td>23.5</td>
</tr>
<tr>
<td>Scout 66</td>
<td>31.2</td>
<td>25.3</td>
</tr>
<tr>
<td>Winoka</td>
<td>19.4</td>
<td>24.6</td>
</tr>
<tr>
<td>Eagle</td>
<td>40.6</td>
<td>23.3</td>
</tr>
<tr>
<td>Centurk</td>
<td>39.8</td>
<td>21.6</td>
</tr>
<tr>
<td>TAM 101</td>
<td></td>
<td>9.2</td>
</tr>
<tr>
<td>HiPlains</td>
<td>28.3</td>
<td>17.6</td>
</tr>
<tr>
<td>Buckskin</td>
<td>34.9</td>
<td>20.3</td>
</tr>
<tr>
<td>Sage</td>
<td>44.4</td>
<td>26.6</td>
</tr>
<tr>
<td>Gent</td>
<td>37.3</td>
<td>23.5</td>
</tr>
<tr>
<td>Lancota</td>
<td>18.7</td>
<td>40.5</td>
</tr>
<tr>
<td>Roughrider</td>
<td>28.8</td>
<td></td>
</tr>
<tr>
<td>Lindon</td>
<td>19.1</td>
<td>33.7</td>
</tr>
<tr>
<td>Vona</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>Agate</td>
<td>19.2</td>
<td>40.3</td>
</tr>
<tr>
<td>Rall</td>
<td>34.6</td>
<td>25.3</td>
</tr>
<tr>
<td>Centurk 78</td>
<td>29.0</td>
<td></td>
</tr>
<tr>
<td>Bennett</td>
<td>41.4</td>
<td></td>
</tr>
</tbody>
</table>

Mean, B/A 33.4
LSD (.05) 13.7
C.V. - % 25.4

* 1975 and 1977 trials lost to winterkill

Table 25. 1978 Standard Variety Barley Trials

<table>
<thead>
<tr>
<th>Variety</th>
<th>Bushels per acre</th>
<th>T. V.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liberty</td>
<td>7.8</td>
<td>17.3</td>
</tr>
<tr>
<td>Firlebecks III</td>
<td>11.3</td>
<td>46.1</td>
</tr>
<tr>
<td>Larker</td>
<td>8.2</td>
<td>16.5</td>
</tr>
<tr>
<td>Primus II</td>
<td>9.2</td>
<td>43.0</td>
</tr>
<tr>
<td>Bonanza</td>
<td>8.5</td>
<td>35.0</td>
</tr>
<tr>
<td>Prilar</td>
<td>7.4</td>
<td>41.8</td>
</tr>
<tr>
<td>Beacon</td>
<td>8.5</td>
<td>43.7</td>
</tr>
<tr>
<td>Park</td>
<td>20.1</td>
<td></td>
</tr>
<tr>
<td>Glenn</td>
<td>21.2</td>
<td></td>
</tr>
<tr>
<td>Morex</td>
<td>30.3</td>
<td>22.3</td>
</tr>
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</table>

Mean, B/A 16.8
LSD (.05) 6.1
C.V. - % 25.8
Many new lines and check varieties or standard varieties of winter wheat were grown at the Highmore station in 10 different tests.

Six tests of SD lines developed at Brookings were grown. One test of lines of Dr. Welsh's from Colorado was grown. The cooperative Southern Regional and Northern Regional Nursery tests were grown. The SD standard test of varieties was seeded and harvested for Mr. Bonnemann. He will report its experimental results.

Soil moisture was adequate for good emergence in the fall and for good survival. The difficult winter, however, caused losses of stands in less hardy entries. An excessive concentration of herbicide used to control weeds severely damaged the tests in the spring but good yields of seed were still obtained.

Conventional harvesting of the center of three rows could not be done because of the irregular pattern of winter injury and damage by a herbicide. We cut five linear feet in a good portion of one of the three rows having good stands of wheat on either side.

Substantial progress has been made to increase yield, hardiness, or amount of protein in the seeds among the many new lines in comparison with the check varieties, Centurk and Gent.

Resistance to rust also has been improved in some lines. Not many notes were made on the occurrence of rust because summer drought did not favor the development of much rust. However, stem rust was fairly abundant on the top yielding entry, TX69A569-1, in the Southern Regional Performance Nursery.
Table 26. Experimental lines and selected check varieties tested in Mr. Joe Bonnemann's Standard Variety Winter Wheat Trial.*

Highmore, 1978

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield per acre bu.</th>
<th>Test wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD74221</td>
<td>47.2</td>
<td>59</td>
</tr>
<tr>
<td>SD73176</td>
<td>42.0</td>
<td>60</td>
</tr>
<tr>
<td>Bennett</td>
<td>41.4</td>
<td>59</td>
</tr>
<tr>
<td>Lancota</td>
<td>40.5</td>
<td>60</td>
</tr>
<tr>
<td>Agate</td>
<td>40.3</td>
<td>61</td>
</tr>
<tr>
<td>SD73177</td>
<td>37.8</td>
<td>59</td>
</tr>
<tr>
<td>Scout 66</td>
<td>37.8</td>
<td>62</td>
</tr>
<tr>
<td>Hinoka</td>
<td>35.6</td>
<td>61</td>
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<tr>
<td>Centurk</td>
<td>35.4</td>
<td>60</td>
</tr>
<tr>
<td>SD75375</td>
<td>35.2</td>
<td>60</td>
</tr>
<tr>
<td>SD73165</td>
<td>34.8</td>
<td>60</td>
</tr>
<tr>
<td>Gent</td>
<td>34.8</td>
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<tr>
<td>SD73160</td>
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<td>SD74211</td>
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<td>26.2</td>
<td>61</td>
</tr>
<tr>
<td>Vona</td>
<td>20.0</td>
<td>61</td>
</tr>
<tr>
<td>TAM 101</td>
<td>9.2</td>
<td>60</td>
</tr>
</tbody>
</table>

*Taken from Mr. Bonnemann's complete report for 1978.
Table 27. Preliminary Results of the 1978 SWIV Trials of J. J. Donnemann

<table>
<thead>
<tr>
<th></th>
<th>Quinn</th>
<th>Prosho</th>
<th>Highmore 1</th>
<th>3 Site Avg.</th>
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<tr>
<td></td>
<td>bu</td>
<td>surv</td>
<td>bu</td>
<td>surv</td>
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<td>63</td>
<td>67</td>
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<td>41.0</td>
<td>63</td>
<td>27</td>
<td>31.3</td>
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<td>43.5</td>
<td>63</td>
<td>62</td>
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<td></td>
<td></td>
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<tr>
<td>Agate</td>
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<td>64</td>
<td>72</td>
<td>34.5</td>
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<tr>
<td>Nebred</td>
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<td>63</td>
<td>56</td>
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<tr>
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<td>64</td>
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<td>62</td>
<td>30.3</td>
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<td>73</td>
<td>34.0</td>
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<td>63</td>
<td>63</td>
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<tr>
<td>Lancer</td>
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<td>64</td>
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<td>27.5</td>
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<td>20.5</td>
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<td>26.7</td>
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<td>85</td>
<td>32.2</td>
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<tr>
<td>HiPlains</td>
<td>41.3</td>
<td>63</td>
<td>65</td>
<td>19.4</td>
</tr>
<tr>
<td>Vona</td>
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<td>64</td>
<td>56</td>
<td>21.3</td>
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</tr>
<tr>
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<tr>
<td>Centurk 78</td>
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<td>63</td>
<td>57</td>
<td>18.8</td>
</tr>
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<td>TAM101</td>
<td>37.4</td>
<td>62</td>
<td>7</td>
<td>3.7</td>
</tr>
</tbody>
</table>

1Severe damage by a herbicide occurred to all plots; summarized by rank, D. G. Nells.
Two ram tests have been conducted at the Central Research Station in Highmore with a third in progress. The fall tests are primarily of wool breeds and the spring test meat type breeds. A spring sale was to be conducted in July, but was cancelled. A sale is again planned after completion of the spring test in July of 1979.

Table 28. Results of the 1977 Fall Test

<table>
<thead>
<tr>
<th>Breed</th>
<th>No.</th>
<th>Gain</th>
<th>Gain of Age (365 Days)</th>
<th>Total Daily Fleece</th>
<th>Fleece wt. (365 Days)</th>
<th>Staple Length</th>
<th>Face Wrinkle Score</th>
<th>Wrinkle Score Index</th>
</tr>
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<tbody>
<tr>
<td>Rambouillet</td>
<td>45</td>
<td>102</td>
<td>0.68</td>
<td>25.1</td>
<td>13.0</td>
<td>4.26</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Columbia</td>
<td>11</td>
<td>114</td>
<td>0.75</td>
<td>28.0</td>
<td>14.8</td>
<td>5.0</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Corriedale</td>
<td>5</td>
<td>95.6</td>
<td>0.63</td>
<td>25.9</td>
<td>13.9</td>
<td>5.1</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Suffolk</td>
<td>5</td>
<td>95.8</td>
<td>0.63</td>
<td>13.9</td>
<td>7.5</td>
<td>3.8</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Crossbred</td>
<td>2</td>
<td>99.5</td>
<td>0.66</td>
<td>15.0</td>
<td>7.9</td>
<td>3.6</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Hampshire</td>
<td>1</td>
<td>91.0</td>
<td>0.60</td>
<td>12.9</td>
<td>6.7</td>
<td>3.3</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Oxford</td>
<td>1</td>
<td>96.0</td>
<td>0.63</td>
<td>13.7</td>
<td>7.3</td>
<td>3.9</td>
<td>3.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

All wool breeds were indexed using the following formula:

\[ I = 60 \times (\text{A.D.G.}) + 4 \times (\text{Staple Length}) + 4 \times (\text{Clean Wool}) - 3 \times (\text{Facescore}) - 4 \times (\text{Skin Fold Score}) \]

All meat breeds were indexed using the following formula:

\[ I = \text{pounds gained on test} + 4 \times (\text{Clean Wool}) \]
Table 29. Results of the 1978 Spring Test

<table>
<thead>
<tr>
<th>No.</th>
<th>Total Gain</th>
<th>Daily Gain</th>
<th>Wt./day of age</th>
<th>Fat Score</th>
<th>Muscle Score</th>
<th>Soundness Score</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hampshire 7</td>
<td>77.9</td>
<td>0.88</td>
<td>0.94</td>
<td>3.1</td>
<td>7.4</td>
<td>1.1</td>
<td>96.67</td>
</tr>
<tr>
<td>Suffolk 12</td>
<td>87.67</td>
<td>1.04</td>
<td>1.03</td>
<td>2.8</td>
<td>7.4</td>
<td>1.4</td>
<td>109.44</td>
</tr>
<tr>
<td>Rambouillet 11</td>
<td>69.0</td>
<td>0.82</td>
<td>0.83</td>
<td>2.7</td>
<td>6.1</td>
<td>1.2</td>
<td>85.37</td>
</tr>
<tr>
<td>Columbia 6</td>
<td>66.8</td>
<td>0.80</td>
<td>0.82</td>
<td>2.3</td>
<td>6.8</td>
<td>1.3</td>
<td>86.32</td>
</tr>
<tr>
<td>Targhee 1</td>
<td>69.0</td>
<td>0.82</td>
<td>0.80</td>
<td>3.5</td>
<td>7.0</td>
<td>1.0</td>
<td>85.70</td>
</tr>
<tr>
<td>Oxford 2</td>
<td>78.5</td>
<td>0.94</td>
<td>0.97</td>
<td>2.5</td>
<td>6.5</td>
<td>1.0</td>
<td>100.20</td>
</tr>
</tbody>
</table>

The following Index was used on all rams in the spring test:

\[ I = 60 \text{ (Average Daily Gain)} + 30 \text{ (Wt./day of age)} + 5 \text{ (Muscle Score)} - 5 \text{ (Fat Thickness)} - 5 \text{ (Soundness Score)} \]

In the 1977 fall test, 22 producers entered 70 rams and 17 producers entered 39 rams in the spring test. Twenty-four producers entered 103 rams in the present fall test. This is an increase of 33 rams compared to one year ago. A good deal of interest has been shown for the Ram Test Station by producers throughout South Dakota.
EFFECT OF TILLAGE PRACTICE AND SEED TREATMENT ON SPRING WHEAT PRODUCTION AT HIGHMORE IN 1978

G. W. BUCHENAU, J. D. SMOLIK AND C. WIRTH

Introduction

Crop residue at the soil surface is known to benefit crop production through erosion reduction and by improving the soil moisture status. Surface residue also can have detrimental effects by increasing the level of overwintering of certain plant diseases and insects. This study is a portion of a series of studies designed to evaluate the effect of wheat surface residue on disease levels on the following wheat crop.

Two tillage practices were employed to provide low and medium levels of residue; these were fall plow--spring disc and fall chisel--spring disc respectively. These treatments were randomly applied to alternate strips and each was replicated five times. Seed treatments were applied across the two strips in each replication.

Results & Discussion

Stand was spotty in the plots, due in part to a planter malfunction. Due to this, we were unable to make valid assessments of root-and-crown disease. Both stand and yield were significantly better in fall chiseled plots than in fall plowed plots (Table 30). Seed treatment with fungicides did not result in stand or yield improvement; one experimental seed treatment reduced both stand and yield (Table 31).
Table 30. Effect of fall tillage on stand, yield, and surface in plots of Era spring wheat in 1970.

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>Yield bu/A</th>
<th>Stand</th>
<th>Preplant Residue g/㎡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plow</td>
<td>Disc</td>
<td>0.75</td>
<td>52.3</td>
<td>16.0</td>
</tr>
<tr>
<td>Chisel</td>
<td>Disc</td>
<td>11.81**</td>
<td>59.0**</td>
<td>46.0*</td>
</tr>
</tbody>
</table>

*Significantly greater than plow disc at: *95% probability  **99% probability

Table 31. Effect of seed treatment on stand and yield of Era spring wheat in 1978.

<table>
<thead>
<tr>
<th>Seed Treatment</th>
<th>Yield bu/A</th>
<th>Stand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>12.45</td>
<td>60.4</td>
</tr>
<tr>
<td>Captan</td>
<td>12.48</td>
<td>71.0</td>
</tr>
<tr>
<td>Benlate T</td>
<td>12.29</td>
<td>63.5</td>
</tr>
<tr>
<td>Vitavay</td>
<td>10.54</td>
<td>57.6</td>
</tr>
<tr>
<td>EL 228</td>
<td>5.14**</td>
<td>23.5**</td>
</tr>
<tr>
<td>RH 2161 2 oz.</td>
<td>10.41</td>
<td>51.6</td>
</tr>
<tr>
<td>RH 2161 1 oz.</td>
<td>10.09</td>
<td>51.8</td>
</tr>
<tr>
<td>RH 2161 ½ oz.</td>
<td>11.20</td>
<td>61.1</td>
</tr>
<tr>
<td>LSD .05</td>
<td>4.56</td>
<td>15.8</td>
</tr>
</tbody>
</table>


Plants for Central Research Station 1979

To work on landscape around the house
Establish 200 A & B into shrubs
SCS tree plantings on east end of 900, 1000, & 1100 D.
Continue all haylage and silage tests
   A. Small Grain    B. Forage Sorghums    C. Millet
Continue all cultural practice experiments
Continue crop rotation - soil moisture comparison
Sunflower experiments
Garden
Grass and Alfalfa Studies
Safflower
Small grain and flax demonstrations and breeder research
To locate a satellite farm for 1980, dry land
Evening crop tour, Tuesday, June 27th at 7:30p.m., Sully
Winter meeting - Highmore, Dec. 10th at 9:30a.m., 1979
Woody plant materials
Weed control
Nematode and disease studies
Start new tillage experiment in 1000 & 1100 B plus organic trenching
Horticulture will be starting over again in 1981
Add protein - regrowth and TDN to all haylage or silage experiments
Hessian fly report for field day