Southeast Research Farm  
RR 3 Box 93  
Beresford, South Dakota 57004

The purpose of this page is to grab your attention and convince you to join the Southeast Experiment Farm Corporation. The Southeast Farm Corporation consists of people just like you from southeast South Dakota and the surrounding area.

Around 1955, a group of progressive farmers began efforts to create an association that would be concerned with agricultural research in southeast South Dakota. On May 3, 1956, a non-profit organization, the Southeast Experiment Farm Corporation, was formed. The purpose of the corporation was to acquire and disseminate information concerning crop and livestock production.

The business affairs of the corporation are handled by a very active Board of Directors. Members of the board are elected for a two-year term from each participating county. An annual meeting is held each year to allow members to review the activities of the corporation and hear reports on progress of research projects and make suggestions on research that may need to be added to solve upcoming problems. Because the corporation is non-profit, all funds generated by the corporation are used to advance research through improvement of buildings and facilities located at the station.

We are currently working to add more new members to the Southeast Experiment Farm Corporation. Lifetime memberships to the corporation are $25. You will not be asked for more than that. This is a one-time $25 membership. Those memberships are also transferable. If you know of someone who has retired from farming and is a member, that membership can be transferred to you or anyone else.

This membership to the corporation is not a large amount, but it helps us in many ways. If you become a member, you will automatically receive our annual report, right off the press, in January; as well as letters during the year to keep you informed of activities at the farm and what dates and times tours will be held. The other important thing we get from you becoming a member is; the more members we have on the roster shows the strong support and proof that there is a great deal of interest and need for agricultural research in southeast South Dakota.

We hope that if you are not a member that you will join us. If you decide to join, send a check to the Southeast Farm Corporation for $25 to the above address. If you have a membership that needs to be transferred, clip this page out on the line and fill out the information needed on the back side. We will then process your certificate and add you to our permanent mailing list. Thanks.
Subject: Transfer of Membership

The Board of Directors would like to see existing memberships, that are not active, transferred to a relative or an interested party participating in agriculture located in the same county, if possible. The reason for this transfer, is that a county must maintain a certain number of voting shares in order to elect a director. The directors look after the business affairs of the research farm, make known the research needs of each county, and participate in management decisions of the farm. It is important that each county maintain their representation in order to participate in these affairs.

If this transfer meets with your approval, please enter the name of the party you wish to transfer the membership to, sign your name in the proper blanks below and send this letter, together with the membership share, if possible, to the address listed above.

If there are no interested relatives, you may wish to use option #2, and delegate the responsibility to the Board of Directors to locate any interested party in the same county.

Option #1:
Please Transfer membership to: __________________________

Address: __________________________

Signature
Address: __________________________

Option #2:
I wish to transfer this membership to the Board of Directors, authorizing them to give this voting membership to an interested party within the county.

Signature
Address: __________________________
This thirty-fourth annual report of the research program at the Southeast South Dakota Research Farm has special significance for those engaged in agriculture and the agriculturally related businesses in the ten county area of Southeast South Dakota. The results shown are not necessarily complete or conclusive. Interpretations given are tentative because additional data resulting from continuation of these experiments may result in conclusions different from those based on any one year.

Trade names are used in this publication merely to provide specific information. A trade name quoted here does not constitute a guarantee or warranty and does not signify that the product is approved to the exclusion of other comparable products. Some herbicide treatments may be experimental and not labeled. Read and follow the entire label before using.

South Dakota Agricultural Experiment Station
Brookings, SD 57007

Dr. David Bryant, Dean                      Dr. Fred Cholick, Director
### BOARD OF DIRECTORS

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<tr>
<th>BOARD MEMBER</th>
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<tr>
<td>John Fahlberg, President</td>
<td>Lincoln</td>
<td>Beresford</td>
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<td>Dean Knutson, Treasurer</td>
<td>Turner</td>
<td>Centerville</td>
</tr>
<tr>
<td>Dennis Auch, Secretary</td>
<td>Hutchinson</td>
<td>Olivet</td>
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<td>John Olbertson, Vice</td>
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<td>Beresford</td>
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<td>Clay</td>
<td>Meckling</td>
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<td>Ron Johnson</td>
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<td>Charles Mix</td>
<td>Wagner</td>
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<td>Leroy Larson</td>
<td>Clay</td>
<td>Vermillion</td>
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### COUNTY EXTENSION AGENTS

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<td>Lea Lanfear</td>
<td>Lake Andes</td>
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<td>Yankton</td>
<td>Craig Anthony</td>
<td>Yankton</td>
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</table>

Larry Tideman, Program Leader, Ag & Field Operation
Les Schoffelman, Southeast DES
Lloyd Hansen, Extension Program Development Coordinator

### RESEARCH FARM EMPLOYEES

| Robert Berg, Research Manager       | Brad Rops, Research Assistant |
| Dale DuBois, Ag Technician           | Garold Williamson, Ag Technician |
| Bruce Jurgensen, Maintenance         | Ruth Stevens, Secretary       |
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INTRODUCTION........................................................................Robert K. Berg

This has truly been a year to remember! The staff here at Southeast Research Farm has more than 80 years of experience among us and it is an honor to work together as a team meeting the challenges of today's agriculture. We are especially thankful for Garold Williamson, our Livestock Technician from Centerville, for earning his 20-year Career Service Award with South Dakota State University. Dr. Bryant, Dean of our College of Agriculture and Biological Sciences, publicly recognized Garold for his service and dedicated our Summer Tour in his honor. We also welcome Dr. Fred Cholick as the new Director of the South Dakota Agricultural Experiment Station.

This year began with average temperatures during January and February that were close to 10 degrees below normal. March was relatively mild and dry with no measurable precipitation. This deficit continued throughout the rest of the year which ended up 5 inches below normal precipitation. The growing season from April through September was mild and fairly dry. This provided ideal conditions for hay and crop growth. July and August were cool (nearly 5 to 10 degrees below normal) and we received 15.5 inches of precipitation or nearly 4 inches less than usual during the growing season. There were 3,065 growing-degree days this season which was within 137 of our 30-yr average. The coldest day of the year was -28°F on February 10 and the hottest temperature recorded was 97°F on June 15. The last freeze this spring was on May 1 and the first freeze in the fall occurred October 29 providing 161 frost-free days (32°F basis). The same interval for hard killing frosts (28°F or below) was 179 days from April 29 to October 25. The long fall had nearly perfect weather for harvesting the record-breaking yields of silage and grain for row crops. We closed out the year with warmer than usual temperatures in November and December and received a total of 20 inches of annual precipitation (6 inches below normal).

Livestock research had excellent progress for both beef cattle and swine in spite of low market prices throughout much of the year. Repairs were completed in our confinement hog building and we are back in the hog business once again. It now has a hairpin gutter system and upgraded ventilation and heating equipment. We harvested both silage and high moisture shelled corn that are stored in large plastic bags to be fed to research cattle this winter. A major project was the addition of a new grain bin purchased entirely from grant monies provided by the South Dakota Corn Utilization Council and the Southeast Experiment Farm Corporation.

As we reflect on the successes and challenges of the past year we are thankful for the bountiful harvest and eagerly looking forward to the coming year. Please feel free to stop by and visit whenever you can. If we can be of assistance in any way, don't hesitate to let us know.

We can be reached by mail or telephone at:

Southeast Research Farm
RR 3 Box 93
Beresford, SD 57004-9115
Phone: 605-563-2989
FAX: 605-563-2941
### Table 1. Temperatures at the Southeast Research Farm - 1994

<table>
<thead>
<tr>
<th>Month</th>
<th>1994 Average Air Temps. (°F)*</th>
<th>30-year Average Air Temps. (°F)</th>
<th>Departure from 30-year Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>January</td>
<td>17.1</td>
<td>-0.9</td>
<td>26.4</td>
</tr>
<tr>
<td>February</td>
<td>22.5</td>
<td>1.7</td>
<td>32.5</td>
</tr>
<tr>
<td>March</td>
<td>47.5</td>
<td>26.3</td>
<td>45.5</td>
</tr>
<tr>
<td>April</td>
<td>60.4</td>
<td>31.4</td>
<td>61.9</td>
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<tr>
<td>May</td>
<td>74.2</td>
<td>49.3</td>
<td>74.6</td>
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<tr>
<td>June</td>
<td>81.4</td>
<td>60.2</td>
<td>84.1</td>
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<tr>
<td>July</td>
<td>79.7</td>
<td>56.6</td>
<td>88.5</td>
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<tr>
<td>August</td>
<td>80.0</td>
<td>56.0</td>
<td>86.1</td>
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<tr>
<td>September</td>
<td>76.9</td>
<td>51.0</td>
<td>77.1</td>
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<td>October</td>
<td>64.5</td>
<td>39.6</td>
<td>64.5</td>
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<tr>
<td>November</td>
<td>47.5</td>
<td>25.9</td>
<td>45.1</td>
</tr>
<tr>
<td>December</td>
<td>28.9</td>
<td>11.9</td>
<td>30.2</td>
</tr>
</tbody>
</table>

*Computed from daily observations

### Table 2. Precipitation at the Southeast Research Farm - 1994

<table>
<thead>
<tr>
<th>Month</th>
<th>Precipitation 1994 (inches)</th>
<th>30-year Average (inches)</th>
<th>Departure from Avg. (inches)</th>
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<tbody>
<tr>
<td>January</td>
<td>0.93</td>
<td>0.48</td>
<td>+0.45</td>
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<tr>
<td>February</td>
<td>0.32</td>
<td>0.70</td>
<td>-0.38</td>
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<tr>
<td>March</td>
<td>0.00</td>
<td>1.50</td>
<td>-1.50</td>
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<tr>
<td>April</td>
<td>2.47</td>
<td>2.41</td>
<td>+0.06</td>
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<tr>
<td>May</td>
<td>1.51</td>
<td>3.36</td>
<td>-1.85</td>
</tr>
<tr>
<td>June</td>
<td>4.39</td>
<td>4.27</td>
<td>+0.12</td>
</tr>
<tr>
<td>July</td>
<td>3.39</td>
<td>3.66</td>
<td>-0.27</td>
</tr>
<tr>
<td>August</td>
<td>1.41</td>
<td>2.99</td>
<td>-1.58</td>
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<tr>
<td>September</td>
<td>2.30</td>
<td>2.64</td>
<td>-0.34</td>
</tr>
<tr>
<td>October</td>
<td>1.59</td>
<td>1.84</td>
<td>-0.25</td>
</tr>
<tr>
<td>November</td>
<td>0.97</td>
<td>1.10</td>
<td>-0.13</td>
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<tr>
<td>December</td>
<td>0.43</td>
<td>0.66</td>
<td>-0.23</td>
</tr>
<tr>
<td>Totals</td>
<td>19.71</td>
<td>25.61</td>
<td>-5.90</td>
</tr>
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</table>
Summary: Two hybrids were each planted on five dates for the ninth year in 1994 to continue monitoring long-term effects of planting date on production of medium and late maturing corn hybrids associated with growing conditions in southeast South Dakota. Planting dates this year began April 21 and ended May 25. Both hybrids had similar yields of at least 165 bu/ac when planted from mid April through mid May then decreased dramatically to 135 bu/ac when planted in late May. The full-season hybrid (116 day) did not dry down as well and had lighter test weight compared to the medium maturity hybrid (103 day).

Methods: The goal of this research is to begin planting in mid April about one week before most producers typically begin and continue at approximately 10-day intervals through late May. Dates actually planted this year were April 21, April 25, May 5, May 13, and May 25. The hybrids tested were the same as those evaluated in recent years (Pioneer 3615 and Hoegemeyer 2680). Grain moisture and test weight were measured directly in the field during harvest. Stand counts were taken this year to monitor the plant populations. This study was cultivated once for additional weed control (June 14). Table 1 outlines additional management factors for the study in 1994.

Table 1. Crop Management Practices for Planting Date Study; SE Research Farm; 1994.

<table>
<thead>
<tr>
<th>1993 Crop</th>
<th>Soybean</th>
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<tr>
<td>Tillage</td>
<td>Ridge-Till</td>
</tr>
<tr>
<td>Planting Rate</td>
<td>25,800 seeds/acre</td>
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<tr>
<td>Herbicide</td>
<td>Dual + Bladex + 2,4-D, EPP</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>123 lb N/acre Sidedress (28-0-0)</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>27 lb P2O5/acre Pop-up (10-34-0)</td>
</tr>
<tr>
<td>Harvest</td>
<td>Oct. 12</td>
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Results and Discussion: Conditions this spring were much better for planting than a year ago. Planting dates were within two to four days and generally earlier than our long-term target dates. Table 2 summarizes how these hybrids performed in 1994.

Planting date strongly influenced nearly all responses measured again this year. There was a 47 bu/ac spread in the average yields among planting dates. Grain yield had a slight increase associated with the late April planting date. Otherwise yields were fairly stable between 165 to 170 bu/ac
when planted through mid May with both hybrids usually yielding within 2 bu/ac of each other. Their yields dropped dramatically to 135 bu/ac when planted in late May as commonly occurs.

Grain moisture content increased whereas test weight decreased as planting dates became later as we would also expect. This type of trend for plant population (stand count) was less obvious in that steady increases or decreases with time were not observed. The April 25 and May 13 planting dates tended to have a little higher populations which may reflect better soil moisture conditions at some dates than others. Moisture was not short during planting or at any other time during the season. However, if the surface was even a little wet when planted, some seed may have adhered to the packer wheels. In any case this was not a major problem because plant populations were usually greater than 21,000 plants/ac which accounted for 80% or more of the seeds that were planted.

Table 2. Effect of Planting Date on Corn Performance: SE Research Farm 1994.

<table>
<thead>
<tr>
<th>Hybrid (RM)</th>
<th>Planting Date</th>
<th>Grain Yield (\text{bu/ac}^1)</th>
<th>Moisture Content (%)</th>
<th>Test Weight (\text{lb/bu})</th>
<th>Stand Count (\text{plants/ac})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 21</td>
<td>167</td>
<td>15.1</td>
<td>58.1</td>
<td>21,750</td>
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<tr>
<td>Apr 25</td>
<td>171</td>
<td>15.2</td>
<td>57.9</td>
<td>22,880</td>
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<tr>
<td>May 5</td>
<td>166</td>
<td>15.5</td>
<td>58.0</td>
<td>20,750</td>
<td></td>
</tr>
<tr>
<td>May 13</td>
<td>166</td>
<td>16.9</td>
<td>57.6</td>
<td>23,500</td>
<td></td>
</tr>
<tr>
<td>May 25</td>
<td>136</td>
<td>20.8</td>
<td>55.8</td>
<td>19,880</td>
<td></td>
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<tr>
<td>H-2680 (116)Apr 21</td>
<td>169</td>
<td>21.6</td>
<td>57.6</td>
<td>19,750</td>
<td></td>
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<tr>
<td>Apr 25</td>
<td>181</td>
<td>22.1</td>
<td>57.0</td>
<td>21,500</td>
<td></td>
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<tr>
<td>May 5</td>
<td>168</td>
<td>22.7</td>
<td>57.0</td>
<td>20,630</td>
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<tr>
<td>May 13</td>
<td>165</td>
<td>25.2</td>
<td>55.4</td>
<td>22,000</td>
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<td>May 25</td>
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<td>30.8</td>
<td>54.9</td>
<td>20,500</td>
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<tr>
<td>Avg.</td>
<td>162</td>
<td>20.6</td>
<td>56.9</td>
<td>21,313</td>
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LSD 0.10  

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<thead>
<tr>
<th>CV %</th>
<th>13</th>
<th>0.7</th>
<th>0.8</th>
<th>1,780</th>
</tr>
</thead>
</table>

\(^1\) Grain yield standardized to 15% moisture content and 56 lb/bu test weight.

The primary significant differences between hybrids this year were with grain moisture and test weight. The medium maturity hybrid (103 day) dried down much better and had heavier test weight than the late maturity hybrid (116 day). The medium hybrid consistently had drier grain at harvest than the late hybrid which dried down poorly this fall regardless of when it was planted. Test weights were quite heavy this year with most planting dates averaging between 56 and 58 lb/bu. The medium hybrid had heavier grain by as much as 1 to 2 lb/bu for many planting dates.

Conclusions: It is interesting that yield differences between these hybrids were negligible no matter when they were planted. The full-season hybrid did not outyield the medium hybrid even though growing conditions were ideal. Neither the yield advantage for the long-season hybrid at the earlier planting dates nor for the medium maturity hybrid planted in late May were expressed this year.
The long-term trend still indicates that slightly longer-season corn planted before the middle of May normally has a good probability of yielding as good as or better than early hybrids planted at the same time (Table 3). Their yield is similar when planted the middle of May. After that yield reductions continue for both maturities but the advantage shifts more in favor of the shorter-season hybrid which expresses better yield potential with less growing season. While yield is very important it should never be the only factor to consider. Many characteristics, including a hybrid's ability to dry down or withstand pests and other stresses, coupled with good sound management and marketing also greatly affect profitability. The benefits from utilizing more growing season by planting corn during middle to late April and continuing throughout the planting season with quality seed of more than one maturity to increase the time when pollination is occurring should not be overlooked as an important management tool.


<table>
<thead>
<tr>
<th>Hybrid Maturity</th>
<th>Apr 17</th>
<th>Apr 27</th>
<th>May 7</th>
<th>May 17</th>
<th>May 27</th>
</tr>
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<tr>
<td>103 Day</td>
<td>125</td>
<td>126</td>
<td>125</td>
<td>122</td>
<td>108</td>
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<tr>
<td>116 Day</td>
<td>134</td>
<td>135</td>
<td>132</td>
<td>121</td>
<td>96</td>
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</tbody>
</table>
Summary: This study evaluates the performance of early and late Group II soybean varieties as influenced by a range of five planting dates from early May through mid June. Soybean yields were outstanding this season ranging from 40 to 62 bu/ac. 'Conrad' produced 5 to 10 bu/ac more grain and was as much as 5 inches taller than 'Elgin 87', however, 'Elgin 87' had heavier test weight. Best yields occurred when these varieties were planted in early to mid May. Yield decreased by 8 to 10 bu/ac between the early June and mid June planting dates.

Methods: Our goal in this research is to intentionally begin planting soybean earlier than normal for the first date then continue with optimum and later than usual seedings at approximately 10-day intervals. 'Conrad' (early to mid Group II) and 'Elgin 87' (mid to late Group II) varieties were evaluated in 30-inch rows again in 1994. This year's planting dates were May 5, May 13, May 25, June 2, and June 14. All plots were cultivated once in June as well as spot sprayed with a bean buggy and walked during the summer for weed control. Table 1 reports additional management practices for this study in 1994.

Table 1. Management Practices for Date of Planting Soybean; SE Research Farm: 1994.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Ridge-Till</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993 Crop</td>
<td>Corn</td>
</tr>
<tr>
<td>Herbicide</td>
<td>Dual EPP</td>
</tr>
<tr>
<td>Basagran, Post</td>
<td></td>
</tr>
<tr>
<td>Seeding Rate</td>
<td>52 lb/ac</td>
</tr>
<tr>
<td>Harvest Date</td>
<td>Sept. 28 and Oct. 11</td>
</tr>
</tbody>
</table>

Plant height and population (stand count) were also measured near harvest time. The first three planting dates were harvested on September 28 along with the fourth planting date for 'Conrad' and the remaining dates combined on October 11. Grain moisture and test weight were determined from each plot directly in the field at harvest. All yields were standardized to 13% moisture content to more accurately measure the effect of planting date. Protein and oil content of these grain samples are being conducted at SDSU. These results are not back yet from the laboratory.

Results and Discussion: Conditions were extremely conducive for outstanding soybean production in this study during 1994 and are summarized in Table 2. Soybean yields ranged between 40 to 62 bu/ac even though the growing season was relatively dry, with 4 inches below normal precipita-
tion, and fairly cool temperatures especially in July and August. Grain moisture at harvest was generally around 10.5%, test weight commonly between 57 to 59 lb/bu, and plant heights from 30 to 40 inches were observed.

Table 2. Effect of Planting Date on Soybean Performance; SE Research Farm, Beresford, SD; 1994.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Planting Date</th>
<th>Grain Yield&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Moisture Content</th>
<th>Test Weight</th>
<th>Stand Count</th>
<th>Plant Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>bu/ac</td>
<td>%</td>
<td>lb/bu</td>
<td>plt/ac</td>
<td>inch</td>
</tr>
<tr>
<td>'Conrad'</td>
<td>May 5</td>
<td>62</td>
<td>10.5</td>
<td>57.1</td>
<td>96,000</td>
<td>40.1</td>
</tr>
<tr>
<td></td>
<td>May 13</td>
<td>62</td>
<td>10.4</td>
<td>56.9</td>
<td>100,500</td>
<td>39.9</td>
</tr>
<tr>
<td></td>
<td>May 25</td>
<td>59</td>
<td>10.7</td>
<td>56.9</td>
<td>102,500</td>
<td>39.4</td>
</tr>
<tr>
<td></td>
<td>Jun 2</td>
<td>54</td>
<td>12.9</td>
<td>55.9</td>
<td>106,625</td>
<td>36.7</td>
</tr>
<tr>
<td></td>
<td>Jun 14</td>
<td>44</td>
<td>10.4</td>
<td>58.6</td>
<td>107,375</td>
<td>32.6</td>
</tr>
<tr>
<td>'Elgin 87'</td>
<td>May 5</td>
<td>52</td>
<td>10.1</td>
<td>58.4</td>
<td>64,875</td>
<td>36.2</td>
</tr>
<tr>
<td></td>
<td>May 13</td>
<td>56</td>
<td>10.2</td>
<td>58.9</td>
<td>94,375</td>
<td>38.2</td>
</tr>
<tr>
<td></td>
<td>May 25</td>
<td>53</td>
<td>10.3</td>
<td>58.6</td>
<td>96,000</td>
<td>35.9</td>
</tr>
<tr>
<td></td>
<td>Jun 2</td>
<td>48</td>
<td>9.2</td>
<td>58.3</td>
<td>75,000</td>
<td>32.1</td>
</tr>
<tr>
<td></td>
<td>Jun 14</td>
<td>40</td>
<td>10.7</td>
<td>59.4</td>
<td>79,875</td>
<td>30.1</td>
</tr>
<tr>
<td>Avg.</td>
<td></td>
<td>53</td>
<td>10.5</td>
<td>58.9</td>
<td>92,313</td>
<td>36.1</td>
</tr>
<tr>
<td>LSD 0.10</td>
<td></td>
<td>3</td>
<td>0.7</td>
<td>0.7</td>
<td>13,482</td>
<td>2.9</td>
</tr>
<tr>
<td>CV %</td>
<td></td>
<td>5.10</td>
<td>5.30</td>
<td>0.95</td>
<td>12.07</td>
<td>6.69</td>
</tr>
</tbody>
</table>

<sup>1</sup> Grain yield standardized to 13% moisture content and 60 lb/bu test weight.

Varieties and planting dates both significantly influenced all five responses measured this year. Variety responses among planting dates (variety x planting date interactions) showed that they behaved in a similar manner for grain yield and plant height but differed for grain moisture, test weight, and plant populations at harvest.

'Conrad' consistently produced more grain than 'Elgin 87' by as much as 5 to 10 bu/ac. As in previous years, grain yields were greatest when planted in early and mid May. Lost yield potentials associated with waiting until late May amounted to 3 bu/ac with an additional loss of 5 bu from late May to early June, and a further reduction of 8 to 10 bu by mid June. This year severely delayed planting could have cost nearly 15 bu/ac in lost production. This is 25 to 30% of this year's optimum yield or at least half or more of an average year's yield.

The higher yield of 'Conrad' can be explained by several factors. For one thing it was the taller of the two varieties, sometimes by as much as 5 inches which provided more area for pods to develop. The height of both varieties declined by 7 to 8 inches as planting was delayed from mid May until mid June.
Another important yield consideration was differences related to plant population between these varieties. 'Conrad' consistently had close to 100,000 plants/ac regardless of when it was planted. This was just under 2/3 of the initial seeding rate. 'Elgin 87' on the other hand only had populations that approximated those of 'Conrad' when planted during mid and late May. 'Elgin 87' survived poorly at the early May and again at the June planting dates when only about half of the seeds that were planted matured. These plots were not specifically ranked for problems like diseases or other pests because discrepancies of this nature were not observed during the growing season. Differences in seed quality apparently played a key role here.

Another factor that could also have a bearing on yield was differences in seed size. 'Conrad' seed was smaller (3300 seeds/lb vs. 2835 seeds/lb) based on seed tag information. This gives seeding rates of 171,600 seeds/ac for 'Conrad' compared to 147,420 seeds/ac with 'Elgin 87'. The relative yield when adjusted to a uniform plant density showed that both varieties generated nearly 2/3 to 3/4 of a bushel of grain for every 1000 plants/ac when planted in early or mid May. They tapered down to 1/2 bu per 1000 plants/ac or less for the mid June plantings.

Test weight, however, was better for 'Elgin 87' by 1 to 2 lb/bu. This variety consistently had 58.5 lb/bu test weight grain that increased to a little more than 59 lb/bu with the last planting date. 'Conrad' grain was 57 lb/bu when planted in May and also climbed at the last planting to 58.5 lb/bu. Test weight for 'Conrad' dipped to 56 lb/bu with the June 2 planting date. This happened because during harvest this fourth planting date for 'Conrad' was threshed along with the first three planting dates of both varieties. It's maturity for harvest then was borderline and we made a judgement call to take it then rather than risk having it shatter before the rest of the trial was ready to reap. This trial is routinely combined on two dates to prevent shatter losses that would occur if we wait until all plots are ready to cut at once. The reason test weight increased for both varieties planted June 14 probably is a result of the mild temperatures we experienced in July and August.

This is even more evident as indicated by grain moisture levels. Grain harvested from most plots was consistently at 10 to 10.5% moisture except for the June 2 (fourth) planting date. 'Conrad' had a grain moisture of 13% on September 28 and 'Elgin 87' was greener then but had dried down to 9% when harvested 2 wk later.

Table 3 shows the long-term yields from 1986 to 1994 as pooled averages. The production from this year increased the means reported last year by 1 to 3 bu/ac. The early to mid Group II soybean tested ('Corsoy 79' or 'Conrad') generally yield an average of 2 or 3 bu/ac more than the mid to late Group II varieties ('Century' or 'Elgin 87') when planted in early to mid May and nearly 3 to 5 bu/ac more when planted in late May or June. Long-term yields for a given group are fairly uniform in the low 40 bu/ac range for the early Group IIs when planted through early June where as the mid Group IIs often yield better if planted in early May and steadily lose between 1 to 2 bu/ac every 10 days through the June 4 planting. Both groups loose yield at a faster rate (3 to 5 bu/ac) when planted in mid June but the early Group IIs still produce 3 bu/ac more grain than the late Group II soybean.
These results obviously vary from year to year, sometimes dramatically depending on the climate, planting conditions, and many other factors throughout the growing season. As always caution is needed in extrapolating results from any one year very far. Soybean is a tremendous crop with great capacity to adapt to the various growing conditions in this region.

Table 3. Nine-Year Average Yields (1986-1994) for Date of Planting Soybean Study; SE Research Farm, Beresford, SD; 1994.

<table>
<thead>
<tr>
<th>Variety</th>
<th>May 5</th>
<th>May 15</th>
<th>May 25</th>
<th>June 4</th>
<th>June 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Group II</td>
<td>42</td>
<td>41</td>
<td>42</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>Mid Group II</td>
<td>40</td>
<td>38</td>
<td>37</td>
<td>36</td>
<td>32</td>
</tr>
</tbody>
</table>
Introduction: It is commonly mentioned that modern corn hybrids can produce greater yields at higher populations than older hybrids. Interest continues regarding the need to determine which combinations of seeding rate and row spacing will provide optimum levels of corn production in various climatic situations. This type of information is useful for no-till producers wanting to plant in narrow rows (22-inch) or others wanting to quickly establish a full crop canopy without planting at rates dense enough to cause crowding. This trial continues to examine the effects that row spacing and seeding rates have on corn production in this region.

Methods: Corn was planted in 20-, 30-, and 36-inch rows at three different populations of 20,000, 25,000, and 30,000 seeds/ac within each row spacing. A plate planter was used so that individual units could be moved easily to change the distances between rows. The resulting nine treatments were the same as those tested in 1992 and 1993. We also experienced a rain event during planting that delayed getting the 30-in row combinations in for 4 days. Final stand counts, grain yield, moisture content, and test weight were monitored. Other management practices for 1994 are outlined in Table 1.

<table>
<thead>
<tr>
<th>Previous Crop</th>
<th>Soybean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tillage</td>
<td>Spring Field Cultivate</td>
</tr>
<tr>
<td>Herbicide</td>
<td>Bladex + Eradicane + Atrazine</td>
</tr>
<tr>
<td>Planting Date</td>
<td>May 5 (20(^a), 36(^a)); May 9 (30(^a))</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Pioneer 3362</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>120 lb N + 20 lb P(_2)O(_5) /ac as 28-0-0 &amp; 10-34-0 incorporated at planting</td>
</tr>
<tr>
<td>Harvest Date</td>
<td>October 21</td>
</tr>
</tbody>
</table>

Results and Discussion: Table 2 reports the responses measured for 1994. Final stand counts averaged approximately 85 to 90% of the initial seeding rates for most treatments tested. Grain yield averaged 165 bu/ac with a moisture content of 18%, and heavy test weight (57 lb/bu).

The effects of seeding rates and row spacings were not as dramatic this year as in the past couple of growing seasons. Seven of the nine combinations yielded very close to 165 bu/ac. The higher yield for 30-in rows at 30,000 seeds/ac and the lower yield for 36-in rows at 20,000 seeds/ac are directly related to the final stand counts.
Soil moisture was adequate to abundant and growing conditions were ideal throughout the season, even though we received nearly 5 inches below normal precipitation. The best explanation for these results may simply be that we did not receive enough precipitation to get better yields from the highest seeding rate (30,000 seeds/ac) and the climate was so favorable that corn produced well across a broad range of row spacings and seeding rates. Additional research that includes less favorable conditions will be needed before the limiting factors associated with these treatments can be more closely identified.

Table 2. Row Spacing and Seeding Rate Effects on Corn Production, SE Research Farm: Bresford, SD: 1994.

<table>
<thead>
<tr>
<th>Row Spacing inch</th>
<th>Seeding Rate seeds/ac</th>
<th>Stand Count plts/ac</th>
<th>Grain Yield bu/ac</th>
<th>Grain Moisture %</th>
<th>Test Weight lb/bu</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20,000</td>
<td>18,875</td>
<td>169</td>
<td>18.3</td>
<td>57.4</td>
</tr>
<tr>
<td></td>
<td>25,000</td>
<td>22,750</td>
<td>161</td>
<td>18.1</td>
<td>57.3</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>23,750</td>
<td>168</td>
<td>17.5</td>
<td>57.3</td>
</tr>
<tr>
<td>30</td>
<td>20,000</td>
<td>19,750</td>
<td>166</td>
<td>18.6</td>
<td>57.1</td>
</tr>
<tr>
<td></td>
<td>25,000</td>
<td>21,625</td>
<td>165</td>
<td>18.5</td>
<td>57.4</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>27,625</td>
<td>180</td>
<td>17.9</td>
<td>57.0</td>
</tr>
<tr>
<td>36</td>
<td>20,000</td>
<td>14,750</td>
<td>142</td>
<td>18.0</td>
<td>57.6</td>
</tr>
<tr>
<td></td>
<td>25,000</td>
<td>19,250</td>
<td>167</td>
<td>18.4</td>
<td>57.1</td>
</tr>
<tr>
<td></td>
<td>30,000</td>
<td>25,125</td>
<td>169</td>
<td>18.6</td>
<td>57.4</td>
</tr>
<tr>
<td>Avg.</td>
<td></td>
<td>21,500</td>
<td>165</td>
<td>18.2</td>
<td>57.3</td>
</tr>
</tbody>
</table>

| LSD 0.10 | 2,131 | 12 | 0.4 | NS |
| CV %     | 8.19  | 5.93 | 2.76 | 0.90 |

1 Grain yield at 15% moisture and 56 lb/bu test weight. NS = Not Significant
Summary: This is the third year of a study designed to examine the effects cultivation has on crop performance in a no-till corn and soybean rotation where both crops are monitored each year. No-till cultivations increased soybean yields by 2 to 4 bu/ac and reduced plant height by as much as 5 inches, but had no measurable effect on corn production.

Methods: This trial was designed with replicated strip plots in 1992 to compare no-till corn and soybean with zero, one, two, and three cultivations during the growing season. Crops are rotated but otherwise cultivation schemes were maintained in exactly the same field and configuration as previous years. Herbicides were used on all plots but the main intent is to examine effects of cultivation rather than strictly weed control.

Field operations for this trial continued as scheduled in 1994. Responses measured this year included stand count, grain yield, moisture content and test weight for both crops. In addition, plant height for soybean and relative grain yield, seeding rate efficiency and economic returns were evaluated for corn. Relative grain yield is the grain yield produced for each 1000 plants/ac. Seeding rate efficiency is the ratio of stand count in the fall to the number of seeds planted in the spring. Economic return is the gross income of corn priced at $1.80/bu after discounting moisture at $.05/point and selling at harvest. Test weight dockage was not an issue in this study during 1994. Other management factors regarding this study are presented in Table 1.

Table 1. Management Practices: No-Till Cultivation; SE Research Farm; 1994.

<table>
<thead>
<tr>
<th></th>
<th>Corn</th>
<th>Soybean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tillage</td>
<td>No-Till Planted</td>
<td>No-Till Planted</td>
</tr>
<tr>
<td>Past Crop</td>
<td>Soybean</td>
<td>Corn</td>
</tr>
<tr>
<td>Hybrid/Variety</td>
<td>DeKalb 512</td>
<td>Conrad</td>
</tr>
<tr>
<td>Planting Date</td>
<td>May 11</td>
<td>May 18</td>
</tr>
<tr>
<td>Seeding Rate</td>
<td>25,800 seeds/ac</td>
<td>171,600 seeds/ac (52 lb/ac)</td>
</tr>
<tr>
<td>Herbicide</td>
<td>Roundup + Bladex (PRE)</td>
<td>Dual (Banded at Planting)</td>
</tr>
<tr>
<td></td>
<td>Accent (Post)</td>
<td>Pursuit (Early Post)</td>
</tr>
<tr>
<td></td>
<td>2,4-D (Post)</td>
<td>Galaxy (Post)</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>6 lb N + 23 lb P_2O_5/ac</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>10-34-0 popup</td>
<td></td>
</tr>
<tr>
<td></td>
<td>118 lb N/ac 28-0-0 sidedressed</td>
<td></td>
</tr>
<tr>
<td>Cultivation Dates</td>
<td>June 3, 10, 14</td>
<td>June 10, 22, 27</td>
</tr>
<tr>
<td>Harvest Date</td>
<td>Oct. 11</td>
<td>Sept. 29</td>
</tr>
</tbody>
</table>
Results and Discussion: Corn grew to nearly 10 ft tall in this study. Grain yield averaged 184 bu/ac (Table 2) and dried down well to 15.6% at harvest. Test weights were a little light (55 lb/bu). More than 90% of the seeds planted in the spring survived to maturity in the late summer and final plant population was almost 24,000 plants/ac. Relative yield was almost 8 bu/1000 plants. Corn sold at harvest generated more than $300/ac. Cultivating these rows during the growing season did not affect no-till corn production in 1994.

Cultivation significantly increased soybean grain yield by 2 to 4 bu/ac and plants became shorter as the number of cultivations increased (Table 3). Soybean yielded 54 bu/ac without cultivating and were 36" tall. Two thirds of seed planted survived to maturity and 1/2 bu grain was produced/1000 plants.

Possible compaction from previous years may account for the shorter plants, however, taller plants generally have more pods. Tillage may have enhanced aeration, mineralized more soil organic matter, stimulated microbial activity and soil enzymes that resulted in better no-till soybean yield this fall.

Table 2. Effect of Cultivation on No-Till Corn Performance; SE Research Farm; 1994.

<table>
<thead>
<tr>
<th>Cultivations</th>
<th>Grain Yield (^1)</th>
<th>Moisture Content</th>
<th>Test Weight</th>
<th>Stand Count</th>
<th>Economic Return</th>
<th>Relative Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bu/ac</td>
<td>%</td>
<td>lb/bu</td>
<td>plts/ac</td>
<td>$/ac</td>
<td>bu/1000 plts</td>
</tr>
<tr>
<td>0</td>
<td>184</td>
<td>16.1</td>
<td>54.9</td>
<td>24,500</td>
<td>328</td>
<td>7.5</td>
</tr>
<tr>
<td>1</td>
<td>186</td>
<td>15.6</td>
<td>55.3</td>
<td>23,750</td>
<td>331</td>
<td>7.8</td>
</tr>
<tr>
<td>2</td>
<td>185</td>
<td>15.3</td>
<td>55.6</td>
<td>22,750</td>
<td>330</td>
<td>8.1</td>
</tr>
<tr>
<td>3</td>
<td>183</td>
<td>15.5</td>
<td>55.1</td>
<td>24,125</td>
<td>327</td>
<td>7.6</td>
</tr>
<tr>
<td>Avg.</td>
<td>187</td>
<td>15.6</td>
<td>55.2</td>
<td>23,781</td>
<td>329</td>
<td>7.7</td>
</tr>
<tr>
<td>LSD 0.10</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>CV %</td>
<td>2.07</td>
<td>3.53</td>
<td>0.74</td>
<td>7.60</td>
<td>1.94</td>
<td>7.02</td>
</tr>
</tbody>
</table>

\(^1\) Grain yield standardized to 15% moisture and 56 lb/bu test weight
NS = Not Significant
Table 3. Effect of Cultivation on No-Till Soybean Performance;

<table>
<thead>
<tr>
<th>Cultivations</th>
<th>Grain Yield 1</th>
<th>Moisture Content</th>
<th>Test Weight</th>
<th>Stand Count</th>
<th>Plant Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bu/ac</td>
<td>%</td>
<td>lb/bu</td>
<td>plts/ac</td>
<td>inch</td>
</tr>
<tr>
<td>0</td>
<td>53.6</td>
<td>10.3</td>
<td>56.9</td>
<td>111,750</td>
<td>36.3</td>
</tr>
<tr>
<td>1</td>
<td>57.6</td>
<td>10.3</td>
<td>56.9</td>
<td>106,625</td>
<td>34.7</td>
</tr>
<tr>
<td>2</td>
<td>56.2</td>
<td>10.3</td>
<td>57.0</td>
<td>105,750</td>
<td>33.2</td>
</tr>
<tr>
<td>3</td>
<td>55.6</td>
<td>10.4</td>
<td>56.8</td>
<td>108,125</td>
<td>31.3</td>
</tr>
<tr>
<td>Avg.</td>
<td>55.7</td>
<td>10.31</td>
<td>56.9</td>
<td>108,063</td>
<td>33.9</td>
</tr>
<tr>
<td>LSD 0.10</td>
<td>1.5</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>2.48</td>
</tr>
<tr>
<td>CV %</td>
<td>2.08</td>
<td>1.06</td>
<td>0.69</td>
<td>9.11</td>
<td>5.64</td>
</tr>
</tbody>
</table>

1 Grain yield at 13% moisture and 60 lb/bu test weight.
NS = Not Significant
Summary: There has been great interest among producers the past few years about whether broadcast planting is an efficient method of establishing soybean. This practice is appealing especially from the standpoint of time when wet spring weather often delays planting like in 1990 and 1993. The main drawbacks that have been associated with broadcasting then incorporating seed with a field cultivator are stand problems resulting from non-uniform seed depths and reduced germination if windy weather dries out a loose fluffy seedbed shortly after planting (ie during germination or before seedlings become well established). Broadcast seeding of soybean yielded as well as the more conventional seeding methods (drill or planter) tested. Drilled soybean provided the best support for tall soybean with light to moderate lodging.

Methods: Broadcast seeding of soybean has been evaluated here during 1994 and 1992 using replicated field plots. The use of an air seeder was simulated by removing the tubes at the base of the seed cups on a press wheel drill allowing soybean to be randomly metered to the soil surface. After planting these seeds were shallowly incorporated with a single pass using a field cultivator fitted with a rear-mounted spring tine harrow. The drilled soybean was in 7.5-inch rows using a John Deere 752 No-till Drill. The third treatment was a conventional planter set for 30-inch rows.

Crop responses measured this year included grain yield, moisture content, test weight, stand count, plant height, and lodging score. Other management practices for the study are summarized in Table 1.

Table 1. Management practices for broadcast, drilled and row-planted soybean, SE Research Farm; 1994.

<table>
<thead>
<tr>
<th>Past Crop</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tillage</td>
<td>Fall Chisel</td>
</tr>
<tr>
<td>Variety</td>
<td>'Conrad'</td>
</tr>
<tr>
<td>Herbicide</td>
<td>Pursuit (Early Post)</td>
</tr>
<tr>
<td>Planting Date</td>
<td>May 17</td>
</tr>
<tr>
<td>Seeding Rate</td>
<td>Broadcast 330,000 seeds/ac (100 lb/ac)</td>
</tr>
<tr>
<td></td>
<td>Drilled 257,400 seeds/ac (78 lb/ac)</td>
</tr>
<tr>
<td></td>
<td>30&quot; Rows 171,600 seeds/ac (52 lb/ac)</td>
</tr>
<tr>
<td>Harvest Date</td>
<td>September 29</td>
</tr>
</tbody>
</table>
Results and Discussion: Crop performance from these planting methods in 1994 is outlined in Table 2. Soil and weather conditions were favorable at planting. As a result soybean yielded nearly 56 bu/ac regardless of the planting method used. Seeding methods influenced stand count, grain moisture levels, and the amount of lodging at harvest. The broadcast-seeded soybean did not dry down as quickly as those that were in rows (either drilled or planted) and contained about 0.5% more moisture in the grain when combined. Soybean raised in this field were 3.5 ft tall and exhibited a slight to moderate degree of lodging. Even though lodging here was not severe, the drilled soybeans were supported better and only lodged half as much as those that had been broadcast or planted in 30-inch rows (13 vs. 24%).

Table 2. Broadcast, drilled and row-planted soybean performance, SE Research Farm; 1994.

<table>
<thead>
<tr>
<th>Seeding Method</th>
<th>Row Space</th>
<th>Grain Yield1</th>
<th>Moisture Content</th>
<th>Test Weight</th>
<th>Stand Count</th>
<th>Plant Height</th>
<th>Lodging Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bu/ac</td>
<td>%</td>
<td>lb/bu</td>
<td>plts/ac</td>
<td>inch</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Broadcast2</td>
<td>Random</td>
<td>56</td>
<td>11.5</td>
<td>56.0</td>
<td>255,000</td>
<td>41.9</td>
<td>23</td>
</tr>
<tr>
<td>Drill</td>
<td>7.5</td>
<td>55</td>
<td>10.9</td>
<td>56.4</td>
<td>240,000</td>
<td>42.9</td>
<td>13</td>
</tr>
<tr>
<td>Planter</td>
<td>30.0°</td>
<td>56</td>
<td>10.8</td>
<td>56.3</td>
<td>121,000</td>
<td>40.6</td>
<td>25</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>56</td>
<td>11.1</td>
<td>56.2</td>
<td>205,000</td>
<td>41.8</td>
<td>20</td>
</tr>
<tr>
<td>LSD .10</td>
<td>NS</td>
<td>0.2</td>
<td>NS</td>
<td>66,000</td>
<td>NS</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>CV %</td>
<td>1.96</td>
<td>1.41</td>
<td>0.61</td>
<td>23.50</td>
<td>4.03</td>
<td>33.33</td>
<td></td>
</tr>
</tbody>
</table>

1 Grain yield standardized to 13% moisture and 60 lb/bu.
2 Seed incorporated at planting

Soybean planted in 30-inch rows was relatively more efficient at producing grain than the other planting methods. The plant populations (stand count) in 30-inch rows was only half that of the other methods, but produced nearly 0.5 bu of grain/1000 plants compared to 0.25 bu/1000 plants for the drilled or broadcast treatments.

So far broadcast seeding has worked well in the conditions we experienced during 1992 and 1994. Additional testing in other types of climatic situations will help determine whether broadcasting is a dependable seeding method in this region.
INTRODUCTION: This report outlines the continued progress for the tillage and cropping system research project that began here in 1990. It is primarily designed to evaluate the production and economics associated with conventional (fall chisel or disk) versus no till using two-, three-, and four-crop rotations in southeastern South Dakota. It also looks at the effect of ridge-till in a two-crop rotation as well as low-input farming where rotational practices and tillage are substituted for off-farm inputs like fertilizers and herbicides in a four-crop rotation. This research measures interactions between tillage systems for crop rotations in this area and is helpful for selecting or modifying tillage strategies in various cropping systems. The unique aspect of this year's research is that it begins to document recovery of these systems after a year of prevented planting in 1993.

METHODS: This trial was established in a soybean field using conventional tillage practices during the spring of 1990 on Trent and Egan soils. Results were previously summarized for 1991 and 1992 in our 31st and 32nd Annual Progress Reports by Dale Sorensen. Extremely wet conditions from the fall of 1992 to the summer of 1993 prevented any hope of planting these crops last year. Crop residues from 1992 were measured the following spring then maintained by mowing and chemical fallow through the summer. Fall tillage in 1993 consisted of fall chisel for every two- and three-crop rotation conventionally tilled plot and moldboard plowing for all reduced input plots in the four-crop rotation. In 1994 red clover was substituted for second-year alfalfa in order to have a legume to plant corn into in 1995 because most alfalfa plots drowned out during 1993.

The specific crop rotation and tillage system combinations for 1994 are given in Table 1 and represent the main practices used in this region. The crop rotations used included corn-soybean (C-S), corn-soybean-small grain (C-S-W), or corn-soybean-oat/alfalfa-red clover (C-S-OA-L). The two-crop system is the basic rotation with corn following soybean. In the three-crop system, corn follows small grain, soybean follows corn, and small grain follows soybean. The four-crop system has corn following alfalfa, soybean following corn, alfalfa seeded with a small-grain nurse crop into soybean stubble, and second-year alfalfa harvested for hay (red clover green manured in 1994). The tillage systems evaluated were no till (NT), ridge till (RT), conventional tillage (CT), and conventional tillage with reduced inputs (CTRI). The no-till system generally involves planting
without tillage or cultivation. Conventional tillage consists of fall chisel for corn stalks and small-grain stubble and spring disking of soybean residue as primary tillage with second-year alfalfa plowed in the fall. Row crops are planted on ridges using cleaning attachments on the planter and weeds controlled primarily with cultivation in the ridge-till system whenever possible.

Table 1. Tillage and crop rotation systems: Southeast Research Farm; 1994.

<table>
<thead>
<tr>
<th>Tillage System</th>
<th>Crop Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Till (NT)</td>
<td>Corn-Soybean (C-S)</td>
</tr>
<tr>
<td>Ridge-Till (RT)</td>
<td>Corn-Soybean (C-S)</td>
</tr>
<tr>
<td>Conventional (CT)</td>
<td>Corn-Soybean (C-S)</td>
</tr>
<tr>
<td>No-Till (NT)</td>
<td>Corn-Soybean-Wheat (C-S-W)</td>
</tr>
<tr>
<td>Conventional (CT)</td>
<td>Corn-Soybean-Wheat (C-S-W)</td>
</tr>
<tr>
<td>No-Till (NT)</td>
<td>Corn-Soybean-Oat/Alf-Clover (C-S-OA-L)¹</td>
</tr>
</tbody>
</table>

¹ L = Legume (Red Clover instead of 2nd-year alfalfa in 1994)

Table 2 reports soil test results from the fall of 1991. These values are the average of the surface (0-6 inch) for all individual plots within each system. Plot size is 60 ft x 300 ft (0.4 acre) so that all field activities can be performed with full-sized farm equipment. The exact same group of plots is managed as a particular rotation system and each crop is grown in its respective system every year. There are a total of twenty treatments and each is replicated four times. The border rows between plots are excluded from all response measurements taken to eliminate any differences in sunlight, moisture, or other types of competition crop.

Tables 3, 4, and 5 indicate the specific management and cultural practices associated with each system for 1994. Fertilizer and herbicide strategies in general were similar to previous years in terms of rates and methods of application and were based on SOSU recommendations. The main differences in weed control strategies this year were that no early preplant applications were made on NT; Roundup was applied as a burndown at planting for NT soybean, and a single cultivation for NT corn was attempted as a possible substitute for one or more post emerge herbicide applications. Planting dates were normal for this area and soil conditions were either favorable or a little wet at planting. Corn was planted at 25,800 seeds/ac as in 1992. Soybean seeding rates were reduced a little from previous years in order to prevent over planting because seed size was smaller this year. Spring wheat was sown at little heavier this year (100 vs. 90 lb/ac) to help compete with weeds and because soil moisture was not limiting.
Table 2. Fall soil test results; Southeast Research Farm; (1991).

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Rotation</th>
<th>pH</th>
<th>O.M. %</th>
<th>P lbs/ac</th>
<th>K lbs/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT</td>
<td>C-S</td>
<td>6.0</td>
<td>3.2</td>
<td>42</td>
<td>876</td>
</tr>
<tr>
<td>RT</td>
<td>C-S</td>
<td>6.0</td>
<td>3.2</td>
<td>36</td>
<td>787</td>
</tr>
<tr>
<td>CT</td>
<td>C-S</td>
<td>6.2</td>
<td>3.3</td>
<td>41</td>
<td>739</td>
</tr>
<tr>
<td>NT</td>
<td>C-S-W</td>
<td>6.1</td>
<td>3.5</td>
<td>39</td>
<td>736</td>
</tr>
<tr>
<td>CT</td>
<td>C-S-W</td>
<td>5.9</td>
<td>3.3</td>
<td>34</td>
<td>727</td>
</tr>
<tr>
<td>NT</td>
<td>C-S-OA-L</td>
<td>6.0</td>
<td>3.3</td>
<td>31</td>
<td>855</td>
</tr>
<tr>
<td>CTRI</td>
<td>C-S-OA-L</td>
<td>6.2</td>
<td>3.5</td>
<td>24</td>
<td>707</td>
</tr>
<tr>
<td>AVG.</td>
<td></td>
<td>6.1</td>
<td>3.4</td>
<td>34</td>
<td>772</td>
</tr>
</tbody>
</table>

0-6 inch, Fall 1991 Soil Taxonomy = Fine-silty, mixed, mesic Udic Haplustolls (Egan series) and Pachic Haplustolls (Trent series).

Table 6 shows the equipment inventory and costs for each tillage system. This is the same as in previous reports and is designed to satisfy at least the minimum requirements for a 640-acre farm. Depreciation costs are important factors in selecting tillage systems and are therefore included in the economic analyses of these systems.

Responses measured in 1994 included crop residue before planting, stand counts (row crops), grain yield, moisture, test weight, protein (wheat, soybean), and oil content (soybean). The straw was baled for small grain plots at harvest again this year. The value of bedding and expenses of baling and hauling oat straw was included in the economic analysis for the four-crop rotation.

RESULTS AND DISCUSSION: This was a rebuilding year for this project and I attempted to manage it the same as in previous years. This site was well managed before this study began and these systems were successfully established until the weather prevented planting any portion of this study in 1993. The challenges of getting back on track again are tremendous, however, they also provide an excellent opportunity to examine recovery from this type of natural disaster that so much of our country has had to deal with during the past year. Because of these and other reasons, caution is needed in relying too heavily on a single year’s data. It will take a long-term investigation to monitor various market as well as both dry and wet climatic conditions before meaningful conclusions can be reliably made for this area.
<table>
<thead>
<tr>
<th>Tillage System</th>
<th>1994 Crop Rotation</th>
<th>Before Planting</th>
<th>After Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT Corn Soybean</td>
<td></td>
<td></td>
<td>1X Cultivation</td>
</tr>
<tr>
<td>RT Corn Soybean</td>
<td></td>
<td></td>
<td>2X Cultivation</td>
</tr>
<tr>
<td>CT Corn Soybean</td>
<td>Fall Chisel Soybean Stubble</td>
<td>2X Cultivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 2X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT Corn Wheat</td>
<td>Fall Chisel Wheat Stubble</td>
<td>2X Cultivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 2X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fall Chisel Soybean Stubble</td>
<td>Field Cultivate 1X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 2X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT Corn Soybean</td>
<td></td>
<td></td>
<td>1X Cultivation</td>
</tr>
<tr>
<td>NT Corn Soybean</td>
<td>Rotary Hoe</td>
<td>Drag Harrow</td>
<td></td>
</tr>
<tr>
<td>NT Corn Soybean</td>
<td>Oat+Alf Clover</td>
<td>Drag Harrow; Mowed 2X</td>
<td></td>
</tr>
<tr>
<td>CTRI Corn Soybean</td>
<td>Fall Plow Alfalfa</td>
<td>2X Cultivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 2X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybean Fall Plow Corn Stalks</td>
<td>2X Cultivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 2X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oat+Alf Fall Plow Soybean Stubble</td>
<td>Drag Harrow</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 2X</td>
<td>2X Disk</td>
<td></td>
</tr>
<tr>
<td>Clove Fall Plow Oat+Alfalfa</td>
<td>Drag Harrow; Mowed 2X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field Cultivate 1X</td>
<td>1X Disk; (green manure)</td>
<td></td>
</tr>
</tbody>
</table>

1 1992 Crop Residue
Table 4. Herbicide and fertilizer rates for tillage & rotation system study, Southeast Research Farm; 1994.

<table>
<thead>
<tr>
<th>Tillage &amp; Rotation</th>
<th>Crop</th>
<th>Planting Date</th>
<th>Fertilizer $^{1}$</th>
<th>Herbicide $^{2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT C·S</td>
<td>C</td>
<td>April 25</td>
<td>124·23·0</td>
<td>1 pt Dual+1.6# Bladex+0.5# Atrazine PP 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>4 oz Pursuit + 1.75 pt Prowl + 1 pt Roundup PP 5/12; 2 pt Galaxy post 6/17</td>
</tr>
<tr>
<td>NT C·S-W</td>
<td>C</td>
<td>April 25</td>
<td>124·23·0</td>
<td>2 pt Dual in bend 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>1 pt Roundup PP 5/12; 2.0 pt Dual in 15· bend 5/13; 2 pt Galaxy post 6/17</td>
</tr>
<tr>
<td>CT C·S</td>
<td>C</td>
<td>April 25</td>
<td>124·23·0</td>
<td>3.4 pt Eradicane PPI 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>1.5 pt Treflan + 4 oz Pursuit PPI 5/12; 2 pt Galaxy post 6/17</td>
</tr>
<tr>
<td>CT C·S-W</td>
<td>C</td>
<td>April 25</td>
<td>124·23·0</td>
<td>1 pt Dual+1.6# Bladex+0.5# Atrazine PP 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>1 pt Roundup + 2.5 pt Dual + 0.5# Sencor PP 5/12; 2 pt Galaxy post 6/17</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>April 7</td>
<td>72·0·0</td>
<td>2 pt Curtail post 5/26; 1 pt Roundup applied to stubble 7/28</td>
</tr>
<tr>
<td>CT C·S-W</td>
<td>C</td>
<td>April 25</td>
<td>124·23·0</td>
<td>3.4 pt Eradicane PPI 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>3 pt Sonalan + 0.5# Sencor PPI 5/11; 2 pt Galaxy post 6/17</td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>April 7</td>
<td>72·0·0</td>
<td>2 pt Curtail post 5/25; 1 pt Roundup applied to stubble 7/28</td>
</tr>
<tr>
<td>NT C·S-OA-L</td>
<td>C</td>
<td>April 25</td>
<td>124·23·0</td>
<td>1 pt Dual+1.6# Bladex+0.5# Atrazine PP 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>1 pt Roundup + 2.5 pt Dual + 0.5# Sencor PP 5/12; 2 pt Galaxy post 6/17</td>
</tr>
<tr>
<td></td>
<td>OA</td>
<td>April 11</td>
<td>48·0·0</td>
<td>1 pt Roundup applied to stubble 7/28</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>April 22</td>
<td></td>
<td>1 pt Round-up + 1 pt 2,4·D applied to stubble 8/5</td>
</tr>
<tr>
<td>CTRI C·S-OA-L</td>
<td>C</td>
<td>April 25</td>
<td></td>
<td>1 pt Dual+1.6# Bladex+0.5# Atrazine PP 4/25; 0.6 pt 2,4·D post 6/17; 0.67 oz Accent post 6/20</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>May 13</td>
<td></td>
<td>1 pt Round-up + 1 pt 2,4·D applied to stubble 8/5</td>
</tr>
<tr>
<td></td>
<td>OA</td>
<td>April 11</td>
<td></td>
<td>1 pt Round-up + 1 pt 2,4·D applied to stubble 8/5</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>April 22</td>
<td></td>
<td>1 pt Round-up + 1 pt 2,4·D applied to stubble 8/5</td>
</tr>
</tbody>
</table>

$^{1}$ Fertilizer for corn consisted of 6·23·0 applied pop-up with planter as 10·34·0 plus 110 lb N/acre sidedressed as 26% VAN. Spring wheat plots received broadcast application of 72 lb N/acre just before planting.

$^{2}$ NT and CTRI soybean plots were banded in 1994 to remove any escaped broadleaf weeds.
Table 5. Management for tillage and crop rotation systems; Southeast Research Farm: 1994.

<table>
<thead>
<tr>
<th>Tillage Rotation</th>
<th>&quot;PIO 3394&quot; Corn seeds/ac</th>
<th>&quot;Sturdy&quot; Soybean seeds/ac</th>
<th>&quot;Butte B6&quot; Spring Wheat seeds/ac</th>
<th>&quot;Settler&quot; Oat seeds/ac</th>
<th>&quot;Blend&quot; Alfalfa seeds/ac</th>
<th>&quot;Mammoth&quot; Red Clover seeds/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT C-S</td>
<td>25,800</td>
<td>218,000</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>RT C-S</td>
<td>25,800</td>
<td>143,000</td>
<td>(68) drill 218,000</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>CT C-S</td>
<td>25,800</td>
<td>218,000</td>
<td>(45) 30&quot;</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>NT C-S-W</td>
<td>25,800</td>
<td>218,000</td>
<td>(68) drill 218,000</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>CT C-S-W</td>
<td>25,800</td>
<td>218,000</td>
<td>(68) drill 218,000 (100)</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>NT C-S-OA-L</td>
<td>25,800</td>
<td>218,000</td>
<td>(68) drill 218,000 (48) (12) (10)</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>CTRI C-S-OA-L</td>
<td>25,800</td>
<td>143,000</td>
<td>(43) 30&quot;</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

1 All corn planted in 30-inch rows; soybean planted in 30-inch or drilled in 7.5-inch rows; all small grains and small seeded legumes drilled in 7.5-inch rows.
2 Alfalfa blend was 'Ranger' and 'SO Common'.

Yields were very good this year for dryland row crops in this study, especially soybean. Small grain yields were moderated somewhat by disease pressure mainly caused by wet conditions during flowering. As expected, weed pressure was intense throughout the season for all systems. Market prices for crops at harvest were low for corn ($1.78/bu), soybean ($4.85/bu) and oat ($1.05) and moderate for and wheat ($3.37/bu). Oat straw for bedding was priced at $50/ton.

Residue levels were monitored early in the season without distinguishing between crop and weed residue types (Table 7). No-till plots averaged at least 80 to 90%, RT averaged nearly 60%, and CT treatments contained around 40% residue cover before spring tillage started. The reduced-input plots that were fall plowed only had 10 to 20% cover at this time. Measurements were not taken after planting in 1993 or 1994. Residue cover agrees well with tillage practices made each fall.

Corn yield and test weight were significantly influenced by tillage and crop rotation treatments this year (Table 8). Yields averaged in the low to mid 150 bu/ac range for most of the two- and three-crop rotations and had high test weights of 58 to 59 lb/bu. The four-crop systems tended to have lower
Table 6. Tillage and crop rotation systems, equipment inventories; Southeast Research Farm: 1994.

<table>
<thead>
<tr>
<th>NO-TILL EQUIPMENT</th>
<th>RIDGE-TILL EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>120-HP Tractor</td>
<td>120-hp Tractor</td>
</tr>
<tr>
<td>$45,000</td>
<td>$45,000</td>
</tr>
<tr>
<td>70-HP Tractor</td>
<td>70-hp Tractor</td>
</tr>
<tr>
<td>$17,000</td>
<td>$17,000</td>
</tr>
<tr>
<td>15 ft. JD Drill</td>
<td>6-row Planter w/</td>
</tr>
<tr>
<td>$20,000</td>
<td>Ridge-Till Equipment</td>
</tr>
<tr>
<td>6-Row 30&quot; Planter</td>
<td>6-row Cultivator</td>
</tr>
<tr>
<td>$10,000</td>
<td>$12,000</td>
</tr>
<tr>
<td>45 ft. Sprayer</td>
<td>45 ft. Sprayer</td>
</tr>
<tr>
<td>$2,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>6-Row Fertilizer</td>
<td></td>
</tr>
<tr>
<td>$2,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Equip. Cost</td>
<td>$97,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONVENTIONAL</th>
<th>REDUCED INPUT CONVENTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>120-HP Tractor</td>
<td>120-HP Tractor</td>
</tr>
<tr>
<td>$45,000</td>
<td>$45,000</td>
</tr>
<tr>
<td>70-HP Tractor</td>
<td>70-HP Tractor</td>
</tr>
<tr>
<td>$17,000</td>
<td>$17,000</td>
</tr>
<tr>
<td>13 ft. Chisel</td>
<td>13 ft. Chisel</td>
</tr>
<tr>
<td>$2,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>18 ft. Tandem Disk</td>
<td>5 Bottom Plow</td>
</tr>
<tr>
<td>$9,000</td>
<td>$2,500</td>
</tr>
<tr>
<td>19 ft Field Cultivator</td>
<td>18 ft. Tandem Disk</td>
</tr>
<tr>
<td>$8,500</td>
<td>$9,000</td>
</tr>
<tr>
<td>6-Row Planter</td>
<td>19 ft. Field Cultivator</td>
</tr>
<tr>
<td>$10,000</td>
<td>$8,500</td>
</tr>
<tr>
<td>15 ft. Drill</td>
<td>6-Row Planter</td>
</tr>
<tr>
<td>$6,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>6-Row Cultivator</td>
<td>6-Row Rotary Hoe</td>
</tr>
<tr>
<td>$4,500</td>
<td>$2,700</td>
</tr>
<tr>
<td>45 ft. Sprayer</td>
<td>6-Row Cultivator</td>
</tr>
<tr>
<td>$2,500</td>
<td>$4,500</td>
</tr>
<tr>
<td></td>
<td>15 ft. Drill</td>
</tr>
<tr>
<td></td>
<td>$6,000</td>
</tr>
<tr>
<td>Total Equip. Cost</td>
<td>$104,500</td>
</tr>
</tbody>
</table>

corn yields, especially CTRI which had both reduced yield and lighter test weight. Less corn yield in the CTRI system was associated with smaller ears in terms of weight and length as well as fewer filled kernels per row and they were also much shorter and N deficient throughout most of the growing season. The final population of 20,400 plants/ac was nearly 80% of the initial seeding rate and grain moisture content was about 20% at harvest and neither of these two responses differed significantly among tillage systems.

Soybean yields in 1994 were the highest ever recorded for this project (Table 9) ranging from 31 to 58 bu/ac. Tillage significantly influenced soybean yield and final plant populations within each rotation. The best soybean yields occurred with the NT tillage in each cropping system and again was dramatically less for the CTRI system. Among the corn-soybean rotations, ridge-tilled soybean yielded less than either the no-till or conventional
Table 7. Crop residue levels; rotation study; Southeast Research Farm; 1993 & 1994.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Cropping History</th>
<th>Crop Residue Cover</th>
<th>%</th>
<th>4-23-93</th>
<th>3-24-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT</td>
<td>Corn Fallow Soybean</td>
<td>91</td>
<td>93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>93</td>
<td>88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT</td>
<td>Corn Fallow Soybean</td>
<td>75</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>90</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td>Corn Fallow Soybean</td>
<td>83</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>66</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT</td>
<td>Corn Fallow Wheat</td>
<td>83</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>91</td>
<td>86</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring Wheat Fallow Soybean</td>
<td>77</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td>Corn Fallow Wheat</td>
<td>60</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>52</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring Wheat Fallow Soybean</td>
<td>70</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT</td>
<td>Corn Fallow Alfalfa</td>
<td>80</td>
<td>93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>79</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oat+Alfalfa Fallow Soybean</td>
<td>78</td>
<td>82</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clover Fallow Oat+Alfalfa</td>
<td>97</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTRI</td>
<td>Corn Fallow Alfalfa</td>
<td>27</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soybean Fallow Corn</td>
<td>69</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oat+Alfalfa Fallow Soybean</td>
<td>84</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clover Fallow Oat+Alfalfa</td>
<td>96</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>77</td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD (0.10)</td>
<td></td>
<td>ND</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>ND</td>
<td>11.30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

tillage treatments. On the average, around 75% (63-85%) of the seeds initially planted survived to maturity and yields were outstanding even though final populations were somewhat low. Drilled soybean in conventionally tilled seedbeds provided the best stands (172,000 plants/ac), but NT consistently gave greater yields. This reflects the tremendous capacity of soybean to compensate with increased grain yield in spite of lower populations. Among soybean that were no-till drilled, final populations decreased as the number of crops in the rotation increased. The lowest populations were established with the planter at 30-inch row spacings. Production like this is remarkable considering that both the amount of grass pressure in these plots and the final populations were less than ideal. Results of protein and oil content of soybean grain are not yet available from the laboratory.
### Table 8. Effects of tillage and crop rotation systems on corn production; Southeast Research Farm: 1994.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Rotation</th>
<th>Past Crop 1992-1993</th>
<th>Stand Count</th>
<th>Grain¹</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>plts/ac</td>
<td>Yield</td>
<td>Moisture %</td>
</tr>
<tr>
<td>NT</td>
<td>C-S</td>
<td>S-F</td>
<td>19,600</td>
<td>142</td>
<td>20.2</td>
</tr>
<tr>
<td>RT</td>
<td>C-S</td>
<td>S-F</td>
<td>21,100</td>
<td>151</td>
<td>19.7</td>
</tr>
<tr>
<td>CT</td>
<td>C-S</td>
<td>S-F</td>
<td>20,000</td>
<td>157</td>
<td>20.1</td>
</tr>
<tr>
<td>NT</td>
<td>C-S-W</td>
<td>W-F</td>
<td>21,300</td>
<td>152</td>
<td>21.0</td>
</tr>
<tr>
<td>CT</td>
<td>C-S-W</td>
<td>W-F</td>
<td>21,000</td>
<td>154</td>
<td>20.3</td>
</tr>
<tr>
<td>NT</td>
<td>C-S-OA-L</td>
<td>A-F</td>
<td>18,900</td>
<td>129</td>
<td>21.8</td>
</tr>
<tr>
<td>CTRI</td>
<td>C-S-OA-L</td>
<td>A-F</td>
<td>20,600</td>
<td>64</td>
<td>22.3</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>20,400</td>
<td>136</td>
<td>20.8</td>
</tr>
<tr>
<td>LSD .10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CV(%)</td>
<td></td>
<td></td>
<td>12.01</td>
<td>13.42</td>
<td>7.94</td>
</tr>
</tbody>
</table>

¹ Grain yields at 15% moisture and 56 lb/bu test weight. Harvest date = October 11, 1994.

### Table 9. Effect of Tillage and crop rotation systems on soybean production; Southeast Research Farm: 1994.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Rotation</th>
<th>Past Crop 1992-1993</th>
<th>Stand Count</th>
<th>Grain¹</th>
<th>Test Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>plts/ac</td>
<td>Yield</td>
<td>Moisture %</td>
</tr>
<tr>
<td>NT</td>
<td>C-S</td>
<td>C-F</td>
<td>164,000</td>
<td>58</td>
<td>10.4</td>
</tr>
<tr>
<td>RT</td>
<td>C-S</td>
<td>C-F</td>
<td>104,000</td>
<td>45</td>
<td>10.6</td>
</tr>
<tr>
<td>CT</td>
<td>C-S</td>
<td>C-F</td>
<td>173,000</td>
<td>52</td>
<td>10.5</td>
</tr>
<tr>
<td>NT</td>
<td>C-S-W</td>
<td>C-F</td>
<td>159,000</td>
<td>52</td>
<td>10.3</td>
</tr>
<tr>
<td>CT</td>
<td>C-S-W</td>
<td>C-F</td>
<td>171,000</td>
<td>46</td>
<td>11.0</td>
</tr>
<tr>
<td>NT</td>
<td>C-S-OA-L</td>
<td>C-F</td>
<td>137,000</td>
<td>55</td>
<td>10.5</td>
</tr>
<tr>
<td>CTRI</td>
<td>C-S-OA-L</td>
<td>C-F</td>
<td>122,000</td>
<td>31</td>
<td>11.1</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>147,000</td>
<td>48</td>
<td>10.6</td>
</tr>
<tr>
<td>LSD .10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CV(%)</td>
<td></td>
<td></td>
<td>4.00</td>
<td>6</td>
<td>NS</td>
</tr>
</tbody>
</table>

¹ Grain yields at 13% moisture and 60 lb/bu test weight; Harvest date = September 27, 1994.

Spring wheat produced about 26 bu/ac of grain with 15% protein and 420 lb/ac of straw was baled after harvest (Table 10). Conventionally tilled wheat had heavier test weight and was drier at harvest than the NT grain. This protein level resulted in a $0.17/bu premium when sold at the elevator. The oat nurse...
Table 10. Effects of tillage and crop rotation systems on wheat production; Southeast Research Farm: 1994.

<table>
<thead>
<tr>
<th>Tillage Rotation 1992-1993</th>
<th>1994 Past Crop</th>
<th>Yield</th>
<th>Test Weight</th>
<th>Moisture</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grain</td>
<td>Straw</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bu/ac</td>
<td>lb/ac</td>
<td>1b/bu</td>
<td></td>
</tr>
<tr>
<td>NT</td>
<td>C-S-W</td>
<td>27</td>
<td>410</td>
<td>56.5</td>
<td>15.3</td>
</tr>
<tr>
<td>CT</td>
<td>C-S-W</td>
<td>25</td>
<td>440</td>
<td>58.1</td>
<td>14.3</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>26</td>
<td>420</td>
<td>57.3</td>
<td>14.3</td>
</tr>
<tr>
<td>LSD .10</td>
<td></td>
<td>NS</td>
<td>NS</td>
<td>0.9</td>
<td>1.3</td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>20.47</td>
<td>28.17</td>
<td>0.93</td>
<td>5.35</td>
</tr>
</tbody>
</table>

1. Grain yield at 13% moisture and 60 lb/bu test weight
2. Baled after grain harvest

Crop yielded 58 bu/ac of grain with a test weight of 33 lb/bu and nearly 15% moisture at harvest. Oat grown with NT management produced almost twice as much straw for baling as the CT treatment.

The only forage measured this year was small-grain straw baled after grain harvest. Alfalfa stands with the nurse crop were poor in some but not all plots and were replanted in late summer rather than risk erratic populations next year. Adequate precipitation fell within 24 hr of planting in August. There was also moderate to heavy pressure from volunteer oat late in the season because of the long, warm weather this autumn. No forage yields were possible from second-year alfalfa this year because many of the plots drowned out in 1993. Red clover was substituted as an annual legume to plant corn into for 1995. This was mowed several times during the season to control foxtail and other weeds then was terminated to conserve soil water and for easier weed control in late summer. Red clover production was not measured before mowed or green manured.

Economic Analysis: The profitability of these systems is a function of the yields, management practices and other costs of production, and market prices each year. Economic indices are similar as those shown in previous years and are based on average yields within a rotation unless the statistical analysis indicates significant yield differences and then actual tillage-system yields are utilized instead. Spreadsheet calculations were performed using Maximum Economic Yield (MEY) Systems software (Potash and Phosphate Institute, 1986) without farm program participation options to eliminate possible confounding issues that may differ among rotations. This strategy only provides broad, general information because it is based on treatment averages rather than individual plots. Fixed cash ($90/ac) and fixed non-cash or depreciation ($13 to 15/ac) costs are similar for each crop.

For corn production (Table 12), average yields (150 and 153 bu/ac) were used with the two- and three-crop rotations, but actual yields (129 and 64 bu/ac) in the four-crop rotation. Total variable costs for corn were about half for the CTRI system ($77 vs. 155-160/ac). Net income was generally $5 to 15/ac for the all but the four-crop rotations which were not profitable.
Table 11. Effects of tillage and crop rotation systems on oat production (nurse crop); Southeast Research Farm; 1994.

<table>
<thead>
<tr>
<th>Tillage Rotation</th>
<th>Past Crop 1992-1993</th>
<th>Grain Yield</th>
<th>Straws</th>
<th>Test Weight</th>
<th>Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>bu/ac</td>
<td>lb/ac</td>
<td>lb/bu</td>
<td>%</td>
</tr>
<tr>
<td>NT C·S-OA-L</td>
<td>S·F</td>
<td>56</td>
<td>858</td>
<td>33.0</td>
<td>13.9</td>
</tr>
<tr>
<td>CTRI C·S-OA-L</td>
<td>S·F</td>
<td>60</td>
<td>524</td>
<td>32.6</td>
<td>15.7</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>58</td>
<td>691</td>
<td>32.8</td>
<td>14.8</td>
</tr>
<tr>
<td>LSD .10</td>
<td></td>
<td>NS</td>
<td>238</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>32.13</td>
<td>20.66</td>
<td>2.69</td>
<td>10.07</td>
</tr>
</tbody>
</table>

1 Grain yield at 13% moisture and 32 lb/bu test weight.
2 Baled after grain harvest Harvest date = July 18, 1994

Break-even prices were about $1.70/bu or just under the market price at harvest except for the four-crop rotation which exceeded $2.00/bu. It took 0.5 to 0.75 hr/ac of seasonal labor for NT and RT systems but at least 1 hr/ac for CT systems.

Actual yield for each tillage and cropping system was used for soybean production (Table 13). Variable costs were $44 to 98/ac with CTRI again being half of most of the other systems and RT being almost $10/ac less than NT or RT (C·S). Net income from soybean was $30 to 92/ac except for the CTRI system which barely broke even. Break-even prices for soybean were $0.5 to $1.5/bu lower than the market price at harvest except for CTRI. Seasonal labor requirements were 0.33 hr/ac for most NT systems (0.72 hr/ac for four-crop NT system) and from 0.5 to 1 hr/ac for CT or RT systems.

Average wheat grain yields (without straw as bedding) of 26 bu/ac were used for the three-crop rotation (Table 14). Variable costs consumed almost all of the revenue generated by grain sales resulting in a net loss of over $84/ac. Market prices of more than $6.50/bu were required just to break even and seasonal labor was less than 0.5 hr/ac for NT. The situation was similar only worse for the oat nurse crop even including the value of straw as bedding shown as extra grain marketed (Table 15). Here net income losses exceeded $100/ac, market prices would have to approach $2.50/bu or more to break even. Seasonal labor requirements were 1 hr/ac or more for the four-crop rotation systems.

As in past years, the C-S rotations tend to be the most profitable on an annual basis. Relatively high land costs coupled with erratic yields, markets, and/or stands tend to help keep the small grain and forage systems from being competitive in this region for cash grain enterprises. I feel like this project is back on track again and that these systems have recovered remarkably well following a year like 1993 where planting was prevented by extremely wet weather.
<table>
<thead>
<tr>
<th>General Field Info.</th>
<th>MT C-S</th>
<th>RT C-S</th>
<th>CT C-S</th>
<th>NT C-S-W</th>
<th>CT C-S-W</th>
<th>MT C-S-0A-L</th>
<th>CT C-S-0A-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop</td>
<td>Corn</td>
<td>Corn</td>
<td>Corn</td>
<td>Corn</td>
<td>Corn</td>
<td>Corn</td>
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<tr>
<td>Acres</td>
<td>320</td>
<td>320</td>
<td>320</td>
<td>213</td>
<td>213</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>Yield Goal</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>153</td>
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Table 14. C-S-W Economic Analysis, Spring Wheat
Rotation: Southeast Farm; 1994

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<td>Other fixed cash expenses</td>
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<td>Total Fixed Cash Expenses</td>
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| Cash Income      | (70.55)   | (75.71)   |
| Fixed Non-Cash Expenses | 13.66 | 14.72 |
| Net Income       | (84.21)   | (90.42)   |
| Labor Hours/acre | 0.44      | 0.66      |

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<td>Net Income @ Yield</td>
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**PER ACRE AMOUNTS**

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**Fixed Cash Expenses**

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**Cash Income**

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<th>Item</th>
<th>NT</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Income</td>
<td>(95.63()</td>
<td>(88.76()</td>
</tr>
<tr>
<td>Fixed Non-Cash Expenses</td>
<td>13.64()</td>
<td>15.08()</td>
</tr>
<tr>
<td>Net Income</td>
<td>(109.27()</td>
<td>(103.84()</td>
</tr>
<tr>
<td>Labor hours/acre</td>
<td>0.96()</td>
<td>1.33()</td>
</tr>
</tbody>
</table>

**Ave/Bushel Costs**

<table>
<thead>
<tr>
<th>Item</th>
<th>NT</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable expenses</td>
<td>1.17()</td>
<td>1.02()</td>
</tr>
<tr>
<td>Fixed Cash Expenses</td>
<td>1.18()</td>
<td>1.23()</td>
</tr>
<tr>
<td>Fixed non-cash Expenses</td>
<td>0.18()</td>
<td>0.20()</td>
</tr>
<tr>
<td>Total Costs</td>
<td>2.53()</td>
<td>2.45()</td>
</tr>
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</table>

**OPERATOR SUMMARY**

<table>
<thead>
<tr>
<th>Item</th>
<th>NT</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Receipts</td>
<td>12,432()</td>
<td>12,432()</td>
</tr>
<tr>
<td>Total Variable Expenses</td>
<td>13,798()</td>
<td>12,099()</td>
</tr>
<tr>
<td>Total Fixed Cash Expenses</td>
<td>13,935()</td>
<td>14,536()</td>
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<tr>
<td>Total Cash Income</td>
<td>(15,301()</td>
<td>(14,202()</td>
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<tr>
<td>Fixed Non-Cash Expenses</td>
<td>2,183()</td>
<td>2,412()</td>
</tr>
<tr>
<td>Net Income &amp; Yield</td>
<td>(17,483()</td>
<td>(16,614()</td>
</tr>
<tr>
<td>Seasonal Labor Hours</td>
<td>153.6()</td>
<td>212.8()</td>
</tr>
</tbody>
</table>
INFLUENCE OF FERTILIZER AND LIME ON CORN YIELD ON HIGH TESTING SOIL

Jim Gerwing, Ron Gelderman and Bob Berg

Plant Science 94-7

INTRODUCTION

Some farmers in South Dakota are using phosphorus, potassium, sulfur, zinc and lime on soils with very high soil tests. Research by soil fertility staff at South Dakota State University during the last 30 years has not shown consistent economical responses to these fertilizer nutrients or lime when soil test levels are very high. The SDSU soil testing lab, therefore, does not recommend they be applied as fertilizer or lime unless soil test levels are lower than critical levels. These demonstrations reported on here were established to show the effects of each of these commonly used nutrients and lime on corn and soybean yields when applied to high testing soils.

MATERIALS AND METHODS

Two experimental sites were established, one on the SE experiment farm near Beresford in 1988 and another on the agronomy farm near the SDSU campus in Brookings in 1990. Fertilizer treatments have continued at each location on the same plots since establishment. A corn-soybean rotation was followed at both locations. Corn was the 1994 crop.

The soil at the SE Farm site is an Egan silty clay loam. Egan soils are well drained soils formed in silty drift over glacial till. The soil at the Brookings Agronomy Farm is classified as a Vienna loam. Vienna soils are well drained medium textured loam and clay loam soils formed from glacial till. Both soils are typical upland soils for their respective areas in the state.

Fertilizer treatments were 50 lbs K₂O, 25 lbs sulfur (as ammonium sulfate), 5 lbs zinc (as zinc sulfate) and lime at both locations (Table 1). In addition, the Brookings site had a 40 lb P₂O₅ treatment. The fertilizer treatments were applied each spring since the establishment year (1988 at Beresford and 1990 at Brookings) on the same plots. Lime was applied only once (the establishment year) at the SE Farm location and twice (1990 & 1992) at Brookings. All fertilizer materials were broadcast and followed by field cultivation for incorporation. Preplant herbicides were applied prior to tillage at both locations.

A randomized complete block design with four replications was used at both sites. Plot size was 15 by 50 feet at Beresford and 20 by 40 feet at Brookings.
An adapted corn hybrid was planted on May 10 and 16 at Beresford and Brookings, respectively, in 30 inch rows. Plots were cultivated once at Beresford but no cultivation was done at Brookings. Yields were determined by combine harvesting 3 rows 50 feet long per plot at Beresford. In Brookings yields were determined by hand harvesting 40 feet of row.

Results and Discussion

Soil test results from soil samples taken in November 1993 at both sites are presented in Table 2. Potassium soil test levels were very high at both locations and no K would have been recommended. After 6 years of 50 lb annual K applications at Beresford, the K soil test was increased 28 ppm. The 4 years of 50 lb annual K treatment had not affected the soil test at Brookings.

Sulfur soil test levels were low and medium for Beresford and Brookings respectively. These lower than normal soil tests were probably due to excessive precipitation during the previous 2 years. The SDSU Soil Testing Lab does not normally recommend sulfur on fine textured soil, however, with low soil tests it is suggested on a trial basis. Adding 25 lb S per year over the course of these studies increased the soil test.

Zinc soil tests at both locations were very high (above 1.0 ppm). Adding 5 lb Zn annually increased the Zn test to over 4 ppm at both locations. The pH at both locations was only slightly acidic and no lime would have been recommended. The lime treatments raised the pH to 6.6 and 7.2 respectively for Beresford and Brookings.

The phosphorus soil test level at the Brookings site was very high prior to the phosphorus application and no phosphorus would have been recommended. The 40 lb annual \( P_2O_5 \) applications at this site raised soil test levels 8 ppm. There was no phosphorus treatment at Beresford, however 25 lbs \( P_2O_5 \) per acre was applied to all plots as a starter in 1994.

Corn yields for 1994 are listed in Tables 3 and 4. At Beresford there was no difference in yield between the check and the potassium, sulfur and zinc treatments. That was not unexpected since soil test levels were high except for sulfur. Experience with sulfur in the past, however, has shown that yield increases from addition of this nutrient seldom occur on medium and fine textured soils. Statistics indicate there was a response to lime at the Beresford site. The response was inconsistent with previous years when yields were not significantly different than the check. There were, however, some trends toward a yield response in previous years.

Yields at Brookings (Table 4) were not significantly affected by any of the fertilizer treatments. Yields were more variable at this location, possibly due to late season stalk lodging. The yields, however, were consistent with previous studies on high testing soil and with current fertilizer recommendations made by SDSU.

Yield results and soil test levels from previous years for these two studies can be found in the SE Farm Progress Reports (1988-1993) and in 1990-1993 SDSU Plant Science Department Soil/Water Science Research Technical Bulletin No. 97 and 99.
Table 1. Fertilizer Treatments, Fertilizer and Lime Demonstration, Beresford and Brookings, 1994.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fertilizer Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beresford(^1)</td>
</tr>
<tr>
<td></td>
<td>lb/A</td>
</tr>
<tr>
<td>Check</td>
<td>0</td>
</tr>
<tr>
<td>Phosphorus (P(_2)O(_5))</td>
<td>40</td>
</tr>
<tr>
<td>Potassium (K(_2)O)</td>
<td>50</td>
</tr>
<tr>
<td>Sulfur</td>
<td>25</td>
</tr>
<tr>
<td>Zinc</td>
<td>5</td>
</tr>
<tr>
<td>Lime</td>
<td>3</td>
</tr>
</tbody>
</table>

\(^1\) Applied each spring, 1988-1994, all plots received 25 lb P\(_2\)O\(_5\)/A starter each year.


\(^3\) 4000 lb CaCO\(_3\) equivalent applied spring 1988.

\(^4\) 2500 and 2400 lb CaCO\(_3\) equivalent applied spring 1990 and 1992 respectively.

Table 2. Soil Test Levels, Fertilizer and Lime Demonstration, Beresford and Brookings.

<table>
<thead>
<tr>
<th>Soil Test</th>
<th>Beresford(^1)</th>
<th>Brookings(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Check</td>
<td>Treatment</td>
</tr>
<tr>
<td>Potassium, ppm, 0-6 in</td>
<td>256</td>
<td>204</td>
</tr>
<tr>
<td>Sulfur, lb/A 6 in</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Sulfur, lb/A 2 ft</td>
<td>1.58</td>
<td>4.27</td>
</tr>
<tr>
<td>Zinc, ppm</td>
<td>6.4</td>
<td>6.6</td>
</tr>
<tr>
<td>pH, 0-6 in</td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Phosphorus, ppm, 0-6 in</td>
<td>15</td>
<td>---</td>
</tr>
<tr>
<td>NO(_3)-N, lb/A 2 ft</td>
<td>20</td>
<td>---</td>
</tr>
<tr>
<td>Organic Matter, %</td>
<td>3.1</td>
<td>---</td>
</tr>
<tr>
<td>Salts, mmho/cm</td>
<td>.40</td>
<td>---</td>
</tr>
</tbody>
</table>

\(^1\) Sampled 11/4/93

\(^2\) Sampled 11/10/93

<table>
<thead>
<tr>
<th>Fertilizer Treatment</th>
<th>Corn Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>161 a</td>
</tr>
<tr>
<td>Potassium</td>
<td>158 a</td>
</tr>
<tr>
<td>Sulfur</td>
<td>157 a</td>
</tr>
<tr>
<td>Zinc</td>
<td>163 a b</td>
</tr>
<tr>
<td>Lime</td>
<td>172 b</td>
</tr>
</tbody>
</table>

(1) See Table 1 for rate.  
(2) All plots received 95 lb N/A.  
(3) Yields followed by the same letter are not statistically different at the 0.10 level, MSD= 10.4 bu, P>F=0.08, C.V.%= 3.4.


<table>
<thead>
<tr>
<th>Fertilizer Treatment</th>
<th>Corn Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>166</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>170</td>
</tr>
<tr>
<td>Potassium</td>
<td>184</td>
</tr>
<tr>
<td>Sulfur</td>
<td>170</td>
</tr>
<tr>
<td>Zinc</td>
<td>171</td>
</tr>
<tr>
<td>Lime</td>
<td>174</td>
</tr>
</tbody>
</table>

| Prob of > F | 0.54 |
| C.V. %      | 7.9  |

(1) See Table 1 for rate.  
(2) All plots received 98 lb N/A.
Introduction

Urea-containing fertilizers left on the soil surface have the potential to lose some nitrogen by volatilization. General recommendations are to incorporate urea and UAN (28-0-0) shortly after application to prevent any losses, especially when soil and air temperatures are warm. In no-till, however, there is no opportunity to incorporate fertilizer. In addition, surface residue in no-till may enhance volatilization losses. Surface residue may also reduce N use efficiency by immobilizing some of the nitrogen. One method of eliminating these potential losses of N would be subsurface applications such as knifing or spoke injection.

The objective of this study was to determine the difference in no-till corn yield response to surface broadcast and knifed-in UAN (28-0-0).

Materials and Methods

This experiment was located on the Southeast South Dakota Experiment Farm near Beresford. Soil at the experimental site was an Egan silty clay loam. Egan soils are well-drained soils formed in silty drift over glacial till.

The site had been in long term grass sod until about 6 years ago. Since that time it has been in a corn / soybean rotation. Tillage usually consisted of spring field cultivation or discing prior to planting until 1994. In 1994, corn (Dekalb 554) was planted directly into soybean residue on May 10 without tillage.

Soil test results from samples taken from the site just prior to planting are listed in Table 1. The two foot nitrate soil test was 84 pounds. Additional nitrogen credit would be expected from the 44 bushel 1993 soybean crop.

Nitrogen fertilizer material used was liquid urea-ammonium nitrate (28-0-0 UAN). Rates were 0, 40 and 80 lb N per acre. Fertilizer placement was either a broadcast spray over the entire surface area or knifed between the rows. The main plots were N rate and the split was the placement. Plots were 15 by 50 feet and replicated 4 times.

The fertilizer material was applied on May 17 just prior to corn emergence. The soil surface was dry at the time of application. The first measurable precipitation after fertilizer application occurred nine days later on May 26 but was only .04 inch. The next two precipitation events were .25 and .08 inches respectively on May 29 and June 2. The first large precipitation event, .97 inches, occurred on June 5.

The experimental plots were not cultivated in 1994. Yields were determined by combine harvesting 3 rows from each plot.
Results and Discussion

Corn grain yields are listed in Table 2. Yields were very good with check (no N fertilizer applied) yields averaging 164 bushels per acre. There was a trend toward increasing yield with the 40 lb N rate but this was not significant at the .10 level. Apparently the residual NO₃-N (84 lb/a 2 ft), the soybean N credit (44 bu soybeans in 1993), and the mineralization of organic matter supplied nearly enough N for maximum grain yield. The apparently large amount of mineralized N may have come from the recent history of long term grass sod at this site.

Although there appeared to be a trend toward higher yields with knifed N compared to broadcast (172 vs. 168 bu/a), these differences were not significant. Since there was not a significant increase in yield due to N fertilizer at the site, the experiment was unable to detect differences in placement even though the environmental conditions were ideal to promote volatilization losses.

Table 1. Soil Test Levels, Nitrogen Placement Study, Beresford; 1994.

<table>
<thead>
<tr>
<th>NO₃-N lb/a 2 ft</th>
<th>Bray P ppm</th>
<th>K</th>
<th>OM %</th>
<th>pH</th>
<th>Salts mmho/cm</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>8</td>
<td>231</td>
<td>4.0</td>
<td>6.3</td>
<td>0.40</td>
<td>fine</td>
</tr>
</tbody>
</table>

Table 2. Influence of Nitrogen Rate and Placement on Corn Yield, Beresford; 1994.

<table>
<thead>
<tr>
<th>N Rate (1)</th>
<th>Placement</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/a</td>
<td>Broadcast</td>
<td>Knife</td>
</tr>
<tr>
<td>0</td>
<td>162</td>
<td>165</td>
</tr>
<tr>
<td>40</td>
<td>168</td>
<td>172</td>
</tr>
<tr>
<td>80</td>
<td>171</td>
<td>171</td>
</tr>
</tbody>
</table>

(1) UAN at corn emergence
(2) Sig., Pr>F: rate 0.15, placement 0.37, C.V. 4.3%
INTRODUCTION

There is increasing concern about the effects of nitrogen fertilizer on the environment, especially groundwater quality. This concern has been intensified by reports of NO₃-N concentrations above the legal drinking standard of 10 ppm in several locations in eastern South Dakota, especially where aquifers are shallow and soils are very coarse. In some instances, nitrogen fertilizer moving below the root zone has been implicated.

This nitrogen management demonstration was established to show the effects of N rates in a corn-soybean rotation on nitrogen movement below the root zone. In most situations in South Dakota, if nitrogen moves below the root zone it stays there and only rarely moves back up. Therefore, once out of reach of crop roots, NO₃-N has the potential to move down to the groundwater with percolating water during periods of high moisture.

MATERIALS AND METHODS

This nitrogen management demonstration was established on the SE South Dakota Experiment Farm near Beresford in 1988. It is located on an Egan silty clay loam soil. Egan soils are well drained soils formed in silty drift over glacial till.

Corn was planted on the site in 1988, 1990, 1992 and 1994. Soybeans were planted in 1989, 1991 and 1993. The rates and timing of nitrogen fertilizer applied to the corn in 1994 are listed in Table One. The Treatments included a check (no N), the recommended rate applied in fall, spring or split between spring and just prior to the last cultivation and 200 and 400 lb rates applied regardless of the previous soil test. These treatments are applied to the same plots each year that corn is being planted in the rotation. The recommended rate, however, is adjusted according to the NO₃-N soil test level and for credit given for the previous years' soybeans (1 lb N credit for 1 bushel beans). The recommended nitrogen rate was 123, 62, 90 and 95 lb/A respectively for 1988, 1990, 1992 and 1994. Nitrogen is not applied in years soybeans are grown. All nitrogen was broadcast as urea and immediately incorporated by tillage except for the fall application which was not incorporated.

Phosphorus, potassium and pH soil test levels at the site are 15 and 256 ppm and 6.4 respectively. Twenty-five pounds of starter phosphorus is applied with the seed each year of planting. A randomized complete block design is used on this experiment with four replications. Plot size is 15 feet by 50 feet.

Appropriate preplant herbicides were incorporated with a field cultivator prior to planting corn (DK 554) at 25800 plants per acre in 30
inch rows on May 10. Spring broadcast spring applied urea was applied immediately prior to the tillage. Plots were cultivated once after the final split urea application to incorporate the fertilizer and prevent any possible volatilization losses. Yields were obtained by direct combining 3 rows 50 foot long from each plot. Soil samples were taken to a depth of 4 feet in one foot increments on the D, spring recommended, 200 and 400 lb rate treatments on November 22 and analyzed for NO$_3$-N.

RESULTS AND DISCUSSION

Nitrate soil test levels taken in the fall of 1993 and 1994 are given in Table 2. After the wet years of 1992 and 1993, nitrate soil test levels were similar regardless of previously applied N rate and ranged from 39 to 48 pounds per acre 4 feet. That was likely due to leaching caused by the two extremely wet growing seasons (see 1993 report). After the 1994 growing season, however, nitrate levels in the 4 foot profile had increased sharply when N rates higher than the recommended rate were used (Table 2). The recommended rate (95 lb/a) had residual NO$_3$-N of 52 lb/a 4 foot depth while the 200 and 400 lb rate treatments had tests of 123 and 376 lb/a respectively. These large residual levels could be subject to leaching losses next spring if unusually heavy snow falls over winter or a wet spring or summer occurs similar to 1992 and 1993.

In 1994, growing season precipitation was near normal (Table 3). This amount of precipitation did not move much of the large amount of residual N in the 400 lb treatment below the root zone. Most of the N, 296 of the 376 lbs, remained in the top foot of soil.

Grain yields for 1994 are listed in Table 4. Yields are excellent, ranging from 111 bushels in the check which had not received any nitrogen since 1986, to a mean of 161 for all the fertilized treatments. None of the fertilized treatments were significantly different from each other. The lack of difference between the recommended rate (95 lb/a) and the higher 200 and 400 lb rates indicate the recommended rate was adequate to reach maximum yield.

Timing of N applications (fall, spring, or split between planting and sidedress) did not affect yields. Since timing of N usually affects yields only when N losses occur, especially leaching losses, it is not surprising that timing did not affect yield because the soil test data does not indicate leaching occurred.

Results from this year's study this year demonstrate several key nitrogen management issues: 1) The recommended N rate using the NO$_3$-N soil test will result in maximum yield even in high yield years; 2) When N rates higher than needed for maximum yield are used, residual NO$_3$-N soil test levels increase accordingly; and, 3) with normal rainfall, nitrate does not move rapidly through fine texture soil.

These plots will be rotated back to soybeans in 1995 and soil sampled in the fall to determine the amount and location of residual soil nitrate. Corn and soybean yields and soil tests from previous years of this study can be found in the SE Farm Progress Reports and in the Plant Science Department Soil/Water Science Research Annual Reports, 1988-1993.
Table 1. Nitrogen Fertilizer Treatments, Nitrogen Fertilizer Demonstration; Beresford, SD; 1994.

<table>
<thead>
<tr>
<th>Treatment No.</th>
<th>Time of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring¹</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>6</td>
<td>400</td>
</tr>
</tbody>
</table>

¹ May 9, 1994
² June 14, 1992
³ November 9, 1993

Table 2. Fall Nitrate Soil Test Levels, Nitrogen Management Demonstration, 1994 Beresford, SD.

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- - - 0 - -</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>11</td>
<td>22</td>
<td>14</td>
<td>31</td>
<td>13</td>
<td>82</td>
<td>14</td>
<td>296</td>
</tr>
<tr>
<td>1-2</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>18</td>
<td>6</td>
<td>46</td>
</tr>
<tr>
<td>2-3</td>
<td>9</td>
<td>6</td>
<td>10</td>
<td>7</td>
<td>9</td>
<td>13</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>3-4</td>
<td>10</td>
<td>6</td>
<td>14</td>
<td>7</td>
<td>15</td>
<td>10</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Total (0-4 ft)</td>
<td>36</td>
<td>39</td>
<td>44</td>
<td>52</td>
<td>43</td>
<td>123</td>
<td>48</td>
<td>376</td>
</tr>
</tbody>
</table>

¹ Rates applied were 123, 62, 90 and 95 lb N/acre in spring of 1988, 1990, 1992 and 1994 respectively.
Table 3. Rainfall at the SE Experiment Farm, Beresford, Nov. 1, 1993 to Nov. 30, 1994.

<table>
<thead>
<tr>
<th>Month</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall</td>
<td>1.4</td>
<td>0.3</td>
<td>0.9</td>
<td>0.3</td>
<td>0.0</td>
<td>2.5</td>
<td>1.5</td>
<td>4.4</td>
<td>3.4</td>
<td>1.4</td>
<td>2.3</td>
<td>1.6</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Table 4. Influence of Fertilizer Nitrogen Rate and Timing on Corn Yield: Beresford; 1994.

<table>
<thead>
<tr>
<th>Nitrogen Rate</th>
<th>Timing</th>
<th>Corn Grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/a</td>
<td></td>
<td>Yield</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>111 a¹</td>
</tr>
<tr>
<td>95</td>
<td>Fall</td>
<td>158 b</td>
</tr>
<tr>
<td>95</td>
<td>Spring</td>
<td>159 b</td>
</tr>
<tr>
<td>95</td>
<td>Split</td>
<td>161 b</td>
</tr>
<tr>
<td>200</td>
<td>Spring</td>
<td>164 b</td>
</tr>
<tr>
<td>400</td>
<td>Spring</td>
<td>162 b</td>
</tr>
</tbody>
</table>

¹ Yield or test weight followed by the same letter are not significantly different at the .10 level, Yield MSD .10=11.6 bu, C.V.=5.4%
LONG-TERM RESIDUAL PHOSPHORUS STUDY
Ron Gelderman and Jim Gerwing
Plant Science 94-10

Introduction

This study was reestablished in 1994 on the site of a P study that was begun in 1964. The low soil test P treatment of this experiment has not received fertilizer phosphorus for 30 years.

The objectives of this study are:

1. To determine optimum P soil test level under residual P management and under management where P is added each year.
2. To determine maintenance levels of P as affected by initial P soil test levels.
3. To compare the influence of annual P placements (broadcast vs band) upon crop yields.

Methods

Four soil test levels (Table 1) were established by broadcasting phosphorus fertilizer in the spring of 1993 and were chiseled for incorporation. Soybeans were planted in 1993 and the stubble moldboard plowed in the fall. Two low (L) soil test levels were established to compare placement effects for annually applied phosphorus rates.

Annual broadcast rates (0, 20, 40, and 60 lb/A P₂O₅) were applied and chiseled in the spring of 1994. The site was planted to DeKalb 554 at 25,600 plants/acre on 10 May 1994. Identical annual P rates were applied at planting with a fertilizer opener that placed the fertilizer 2 inches below and 2 inches to the side of the seed. The phosphorus fertilizer used for all treatments was 0-46-0. Five pounds of zinc/A (as zinc sulfate) was applied with all annual treatments (including the zero rate). Ninety pounds of N was applied over the site. Appropriate herbicides and cultivation were used for weed control.

Plot size was 15' x 45'. Three of the center rows were harvested for grain with a plot combine on 20 October 1994.
Soil samples were taken on all zero annual rate treatments for all soil test levels. In addition, soil samples were taken on all broadcast annual rate treatments. Samples were taken in 3 inch increments to a 9 inch depth. A grain sample was taken for P analysis to determine phosphorus removals.

Results and Discussion

Yields for the study were excellent and are found in Table 1 and presented in graphical form in Figure 1. Soil test influenced corn grain yields. The treatments that had not been fertilized for 30 years were almost 30 bushels less than the treatments that had phosphorus applied in 1993.

The banded $P_2O_5$ also produced increased yields. Twenty pounds of $P_2O_5$ produced a 14 bu/A increase on the very low soil test. In fact, 20 lbs of banded $P_2O_5$ per acre appeared to produce highest yields at all soil test levels. This was also true at the very low soil test level. Even though these soils were obviously lacking available P, more banded P was not needed by the plants. Higher soil test or bulk soil P was needed. These data show very clearly that although banding fertilizer P can provide a young plant with adequate early season P, banding alone does not provide enough P intake for a large plant on a low P testing soil. Root contact with the banded area is limited and the phosphorus needs of a large plant cannot be met.

It appears that in 1994 a medium P soil test with 20 lbs of banded $P_2O_5$ would have been the most economical treatment in this study. This study will be continued in 1995 with soybean as the test crop.
Table 1. Corn yields as influenced by soil test level, annual P rates and placement, long-term P study, 1994.

<table>
<thead>
<tr>
<th>Soil Test Category</th>
<th>Annual P₂O₅ Rates</th>
<th>Yield, bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>VL</td>
<td>128</td>
<td>142</td>
</tr>
<tr>
<td>L(row)</td>
<td>154</td>
<td>159</td>
</tr>
<tr>
<td>L(bct.)</td>
<td>157</td>
<td>161</td>
</tr>
<tr>
<td>M</td>
<td>157</td>
<td>164</td>
</tr>
<tr>
<td>VH</td>
<td>162</td>
<td>161</td>
</tr>
<tr>
<td>x</td>
<td>150</td>
<td>157</td>
</tr>
</tbody>
</table>

Pr>F: soil test level = 0.0001; annual rate = 0.0012; soil test *rate = 0.3 (NS). Placement = 0.85 (NS).
VL, L, M and H = very low (5 ppm), low (8 ppm), medium (13 ppm), and very high (25 ppm), respectively.

Fig. 1. The Influence of soil test P, placement and rate of fertilizer P₂O₅ on corn grain yield, SE farm, 1994.
INTRODUCTION

Many South Dakota farmers are planting corn and soybeans in no-till or limited-till situations. These tillage choices restrict the application of a non-mobile nutrient such as phosphorus (P). Banding P with the planter saves time and application costs, and places the nutrient for efficient plant uptake. A "2x2" placement has been shown to be an effective placement for corn and soybean. Disadvantages of such a placement include cost of openers, weight, trash clearance and soil disturbance. In addition, narrow row drill planting of soybean does not allow space for separate fertilizer openers. Because of these faults, many growers are considering placement of P fertilizers directly with the seed. Placing fertilizer with the seed creates the potential for seed injury.

The objective of this study is to evaluate the effect of some common forms of fertilizer material placed with the seed on corn and soybean emergence and yield.

METHODS

Four sites (two corn and two soybean) were selected for this study. One corn site (C1) was located on the NE 1/4 of the Southeast Farm, the other corn site (C2) was located at the Highmore Research Station. A soybean site (S1) was located on the south quarter of the Southeast Farm and the other soybean experiment (S2) was located about 5 miles west of the Farm on Highway 46.

Site and management characteristics are listed in Table 1 and soil tests for each site are listed in Table 2.
Table 1. Site characteristics for the fertilizer with seed studies, 1994.

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>Crop</th>
<th>Soil</th>
<th>Planting Soil Moisture (% by wt)</th>
<th>Past Crop</th>
<th>Tillage</th>
<th>Row Width</th>
<th>Planting Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>SE Farm</td>
<td>corn</td>
<td>Egan</td>
<td>25.9</td>
<td>soybean</td>
<td>no-till</td>
<td>30</td>
<td>11 May</td>
</tr>
<tr>
<td>C1</td>
<td>Highmore</td>
<td>corn</td>
<td>Stickney</td>
<td>8.6</td>
<td>oats</td>
<td>chisel</td>
<td>30</td>
<td>17 May</td>
</tr>
<tr>
<td>S1</td>
<td>SE Farm</td>
<td>soybean</td>
<td>Enet</td>
<td>19.9</td>
<td>fallow</td>
<td>chisel/disc</td>
<td>30</td>
<td>19 May</td>
</tr>
<tr>
<td>S2</td>
<td>Clay Co.</td>
<td>soybean</td>
<td>Egan</td>
<td>17.6</td>
<td>corn</td>
<td>disc</td>
<td>30</td>
<td>19 May</td>
</tr>
</tbody>
</table>
Table 2. Spring soil tests for the fertilizer with seed study sites, 1994.

<table>
<thead>
<tr>
<th>Site</th>
<th>Silt</th>
<th>Clay</th>
<th>Texture Class</th>
<th>P</th>
<th>K</th>
<th>pH</th>
<th>Salts</th>
<th>O.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>33</td>
<td>51</td>
<td>CL</td>
<td>19</td>
<td>249</td>
<td>5.5</td>
<td>0.30</td>
<td>3.6</td>
</tr>
<tr>
<td>C1</td>
<td>22</td>
<td>45</td>
<td>CL</td>
<td>75</td>
<td>1000</td>
<td>6.5</td>
<td>0.70</td>
<td>3.2</td>
</tr>
<tr>
<td>S1</td>
<td>20</td>
<td>38</td>
<td>CL</td>
<td>16</td>
<td>400</td>
<td>6.5</td>
<td>0.80</td>
<td>3.4</td>
</tr>
<tr>
<td>S2</td>
<td>40</td>
<td>28</td>
<td>CL</td>
<td>15</td>
<td>281</td>
<td>6.2</td>
<td>0.40</td>
<td>2.6</td>
</tr>
</tbody>
</table>

1 CL = clay loam.
The selected sites were all classified as medium to heavier textures although sand contents ranged from 15-40%. There was a wide range in moisture content at planting ranging from 9% to 26% water on a weight basis.

All phosphorus soil test levels were considered high or very high in available phosphorus. Approximately 75 pounds of N per acre was applied to the corn at Cl while no additional N was applied at site C2. Corn varieties DK 554 and Pio 3655 were planted at 25,600 and 21,100 plants per acre at Cl and C2, respectively. The Cl site was planted with a 6 row White planter. The C2 site was planted with a two row plot planter. Both planters utilized double disc openers and with both planters the liquid fertilizer tubes were set to drop the fertilizer as close to the seed as possible.

The soybean variety Conrad was seeded at the rate of 70 lbs/acre (≈ 200,000 plants per acre) in narrow (7 1/2") rows at both sites S1 and S2. The soybean sites were planted with a John Deere 750 no-till drill with the dry fertilizer metered directly into the seed tubes.

The experimental design for all sites consisted of a randomized split plot with four replications with rate of P₂O₅ as the whole plot and fertilizer material as the split. Plot size was: Cl - 15 x 60 feet, C2 10 x 40 feet, and S1 and S2 10 x 75 feet. The rate and type of fertilizers used are given in Tables 3 and 4. Liquid fertilizers (10-34-0, 7-21-7, 9-18-9) were used on the corn studies. Dry fertilizers [0-46-0 (TSP), 18-46-0 (OAP), 11-52-0 (MAP)] were used on the soybean studies.

Corn plant counts were made on two 10 foot sections of row. Soybean counts were made on three 10 foot sections of row. When counting began and the time intervals of the counts are listed in Tables 9-12. Plant counts began when emergence was first noted and continued until most seedlings appeared emerged. A final later season count was made for the final estimation of emergence. Corn yields were estimated by machine harvesting of 3 center rows at site C1 for the entire plot length. Yields were calculated at C2 by hand harvesting 20 foot of each of the two center rows. Soybean yields were estimated by machine harvesting a 5 x 36 foot area from the center of each plot.

Statistics were completed on yield results and the final stand counts. Statistics are given in the table footnotes.
Table 3. Rate and liquid fertilizer treatments used for corn studies, 1994.

<table>
<thead>
<tr>
<th>( \text{P}_2\text{O}_5 ) Rate</th>
<th>10-34-0 nutrient material</th>
<th>7-21-7 nutrient material</th>
<th>9-18-9 nutrient material</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-0-0 0(0)</td>
<td>0-0-0 0(0)</td>
<td>0-0-0 0(0)</td>
</tr>
<tr>
<td>12.5</td>
<td>3-12.5-0 37(3)</td>
<td>4-12.5-4 60(5)</td>
<td>6-12.5-6 70(6)</td>
</tr>
<tr>
<td>25</td>
<td>7-25-0 74(6)</td>
<td>8-25-8 119(11)</td>
<td>12-25-12 139(13)</td>
</tr>
<tr>
<td>50</td>
<td>14-50-0 148(13)</td>
<td>16-50-16 238(22)</td>
<td>25-50-25 278(25)</td>
</tr>
</tbody>
</table>

1 Amount of \( \text{N-P}_2\text{O}_5-\text{K}_2\text{O} \) = lb/acre
2 ( ) = gallons/acre.
Table 4. Rate of dry fertilizer treatments used for soybean studies, 1994.

<table>
<thead>
<tr>
<th>$P_2O_5$ Rate</th>
<th>TSP (0-46-0)</th>
<th>MAP (11-55-0)</th>
<th>DAP (18-46-0)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>nutrient(^1) material</td>
<td>nutrient material</td>
<td>nutrient material</td>
</tr>
<tr>
<td>0</td>
<td>0-0-0</td>
<td>0-0-0</td>
<td>0-0-0</td>
</tr>
<tr>
<td>25</td>
<td>0-25-0</td>
<td>5-25-0</td>
<td>10-25-0</td>
</tr>
<tr>
<td>50</td>
<td>0-50-0</td>
<td>10-50-0</td>
<td>20-50-0</td>
</tr>
<tr>
<td>100</td>
<td>0-100-0</td>
<td>20-100-0</td>
<td>39-100-0</td>
</tr>
</tbody>
</table>

\(^1\)Amount of $N\cdot P_2O_5\cdot K_2O$ in lb/acre.

RESULTS

Soil moisture was considered very good for crop emergence at all sites except C2. The surface soil was extremely dry at the C2 site (Table 1). Three days after planting 0.31 inches of rainfall was received at the C1, S1, and S2 sites. Only 0.05, 0.10 and 0.52 inches of rain fell at site C2 8, 13 and 14 days after planting, respectively.

CORN RESULTS

Liquid fertilizer placed in the seed zone with corn did have an influence on final plant stand (Table 5). However, only the high rate of the 9-19-9 decreased stand about 34 and 59% at the C1 and C2 sites, respectively. The 50 lb/acre $P_2O_5$ rate of 9-18-9 contains 75 lbs/acre of $N + K_2O$ whereas the 7-21-7 at this rate contains only 66 lbs/acre of $N + K_2O$ salts. The higher salt may explain part of the lower stands with this material. In addition, the 9-18-9 is formulated with urea as the nitrogen source and the ammonia derived from the urea is highly toxic to germinating seedlings.
Table 5. Influence of seed-placed liquid fertilizer on final corn stand, SE Farm (C1) and Highmore (C2), 1994.

<table>
<thead>
<tr>
<th>P₂O₅ Rate</th>
<th>Fertilizer</th>
<th>Cl</th>
<th>C2</th>
<th>Cl</th>
<th>C2</th>
<th>Cl</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/acre</td>
<td>% final stand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>97</td>
<td>100</td>
<td>105</td>
<td>99</td>
<td>98</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>90</td>
<td>107</td>
<td>108</td>
<td>105</td>
<td>105</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>109</td>
<td>101</td>
<td>106</td>
<td>99</td>
<td>98</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>86</td>
<td>89</td>
<td>93</td>
<td>80</td>
<td>66</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Influence of seed-placed liquid fertilizer on corn grain yield, SE Farm (C1) and Highmore (C2), 1994.

<table>
<thead>
<tr>
<th>P₂O₅ Rate</th>
<th>Fertilizer</th>
<th>Cl</th>
<th>C2</th>
<th>Cl</th>
<th>C2</th>
<th>Cl</th>
<th>C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/acre</td>
<td>yield, bu/acre</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>167</td>
<td>148</td>
<td>169</td>
<td>151</td>
<td>171</td>
<td>151</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>162</td>
<td>145</td>
<td>179</td>
<td>162</td>
<td>171</td>
<td>139</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>169</td>
<td>158</td>
<td>176</td>
<td>144</td>
<td>175</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>164</td>
<td>146</td>
<td>173</td>
<td>153</td>
<td>148</td>
<td>63</td>
<td></td>
</tr>
</tbody>
</table>

stats: C1 pr >F; rate - 0.26, Fert - 0.041, Rt x Fert - 0.025.
C2 pr >F; rate 0.02, Fert -0.0001, Rt x Fert - 0.0003.

The influence of treatments on corn yields are summarized in Table 6 for both sites. Decreased yields parallel the poor stands for the high rate of the 9-18-9 treatment.
Soybean Results

Both rate and type of phosphate fertilizer placed with the seed decreased final soybean stand at both locations (Table 7). It appears that the highest rate of \( P_2O_5 \) (100 lb/acre) decreased stand, especially with the MAP and DAP fertilizers on these narrow row soybeans. This rate produced a 25-50% stand reduction with the OAP and MAP fertilizers (Table 7). It would appear that OAP > MAP > TSP for limiting germination and emergence of soybean plants.

Yield reductions due to added fertilizer or rate of fertilizer were not significant (Table 8). Even with a 50% stand reduction on the high DAP fertilizer rate (Table 7), yields were not affected (Table 8). Final stands were about 150,000 plants per acre, therefore a 50% stand reduction would give 75,000 plants/acre. Many years, soybean plants can compensate for such a loss through more branching. Complete emergence data for all sites are listed in Tables 9-12.

Summary

Corn is less sensitive to fertilizer salts placed with the seed than soybean. In general, 50 lb \( P_2O_5 \)/acre as 10-34-0 or 7-21-7 could be applied with corn in 30-inch rows. Very little fertilizer is recommended to be placed with soybean in 30-inch rows. However, with drilled soybeans in 7.5 inch rows, 25 lbs \( P_2O_5 \)/acre as MAP or TSP could be applied. Other data has shown OAP to be more harmful to germinating soybean than MAP or TSP.
Table 7. Influence of seed-placed dry fertilizer on final soybean stand, SE Farm, sites S1 and S2, 1994.

<table>
<thead>
<tr>
<th>P₂O₅ Rate</th>
<th>TSP</th>
<th>MAP</th>
<th>DAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/acre</td>
<td>S1</td>
<td>S2</td>
<td>S1</td>
</tr>
<tr>
<td>0</td>
<td>96</td>
<td>98</td>
<td>108</td>
</tr>
<tr>
<td>25</td>
<td>105</td>
<td>96</td>
<td>90</td>
</tr>
<tr>
<td>50</td>
<td>92</td>
<td>88</td>
<td>89</td>
</tr>
<tr>
<td>100</td>
<td>84</td>
<td>86</td>
<td>66</td>
</tr>
</tbody>
</table>

*drilled 7 1/2" row width

Table 8. Influence of seed-placed dry fertilizer on soybean yield. SE Farm, sites S1 and S2, 1994.

<table>
<thead>
<tr>
<th>P₂O₅ Rate</th>
<th>TSP</th>
<th>MAP</th>
<th>OAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/acre</td>
<td>S1</td>
<td>S2</td>
<td>S1</td>
</tr>
<tr>
<td>0</td>
<td>50</td>
<td>42</td>
<td>49</td>
</tr>
<tr>
<td>25</td>
<td>51</td>
<td>38</td>
<td>51</td>
</tr>
<tr>
<td>50</td>
<td>51</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>38</td>
<td>50</td>
</tr>
</tbody>
</table>

Statistics: S1; Pr >F: Fer = 0.24, Rate = 0.33, Fer x rate = 0.74.
S2; Pr >F: Fer = 0.10, Rate = 0.40, Fer x rate = 0.82.
Table 9. Influence of type and rate of liquid fertilizer placed with the seed on emergence of corn, SE Farm (C1) site, 1994.

<table>
<thead>
<tr>
<th>Fertilizer Material</th>
<th>Days after planting</th>
<th>0</th>
<th>12.5</th>
<th>25</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>--average number of plants per 10' row (%)&lt;sup&gt;1&lt;/sup&gt;---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-34-0</td>
<td>7</td>
<td>6.6(52)</td>
<td>6.3(49)</td>
<td>5.5(43)</td>
<td>2.6(21)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>7</td>
<td>6.8(53)</td>
<td>6.4(50)</td>
<td>2.4(19)</td>
<td>1.0(8)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>7</td>
<td>7.5(59)</td>
<td>5.3(41)</td>
<td>2.0(16)</td>
<td>0.1(1)</td>
</tr>
<tr>
<td>10-34-0</td>
<td>9</td>
<td>11.6(91)</td>
<td>11.0(86)</td>
<td>12.4(97)</td>
<td>10.6(83)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>9</td>
<td>12.9(101)</td>
<td>13.4(105)</td>
<td>12.3(96)</td>
<td>9.9(77)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>9</td>
<td>12.0(94)</td>
<td>12.2(96)</td>
<td>8.6(67)</td>
<td>2.8(21)</td>
</tr>
<tr>
<td>10-34-0</td>
<td>12</td>
<td>12.4(97)</td>
<td>11.6(91)</td>
<td>14.0(109)</td>
<td>13.1(102)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>12</td>
<td>13.4(105)</td>
<td>13.9(108)</td>
<td>13.1(103)</td>
<td>12.9(100)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>12</td>
<td>12.5(98)</td>
<td>13.1(103)</td>
<td>12.3(96)</td>
<td>7.1(56)</td>
</tr>
<tr>
<td>10-34-0</td>
<td>14</td>
<td>12.3(96)</td>
<td>11.6(91)</td>
<td>13.9(108)</td>
<td>12.9(101)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>14</td>
<td>13.4(105)</td>
<td>13.6(106)</td>
<td>13.5(105)</td>
<td>13.1(103)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>14</td>
<td>12.5(98)</td>
<td>13.4(105)</td>
<td>12.1(95)</td>
<td>8.1(64)</td>
</tr>
</tbody>
</table>

<sup>1</sup>Numbers in parenthesis indicates the percent of the final stand. The 100% stand was assumed to be the final count of the check rate (12.8 plants per 10' row).

Prob. >F (Day 14): Fer = 0.0002; Rate = 0.03; Fer X Rate = 0.0001.
Table 10. Influence of type and rate of liquid fertilizer placed with the seed on emergence of corn, Highmore (C2) site, 1994.

<table>
<thead>
<tr>
<th>Fertilizer Material</th>
<th>Days after Planting</th>
<th>P$_2$O$_5$ Rate, lb/acre</th>
<th>---average number of plants per 10' row (%)$^1$---</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>12.5</td>
</tr>
<tr>
<td>10-34-0</td>
<td>3</td>
<td></td>
<td>8.9(82)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>3</td>
<td></td>
<td>9.1(84)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>3</td>
<td></td>
<td>8.3(76)</td>
</tr>
<tr>
<td>10-34-0</td>
<td>7</td>
<td></td>
<td>10.1(93)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>7</td>
<td></td>
<td>10.4(95)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>7</td>
<td></td>
<td>9.5(87)</td>
</tr>
<tr>
<td>10-34-0</td>
<td>10</td>
<td></td>
<td>10.6(98)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>10</td>
<td></td>
<td>10.6(98)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>10</td>
<td></td>
<td>10.5(97)</td>
</tr>
<tr>
<td>10-34-0</td>
<td>13</td>
<td></td>
<td>10.8(99)</td>
</tr>
<tr>
<td>7-21-7</td>
<td>13</td>
<td></td>
<td>10.8(99)</td>
</tr>
<tr>
<td>9-18-9</td>
<td>13</td>
<td></td>
<td>10.8(99)</td>
</tr>
</tbody>
</table>

$^1$Numbers in parenthesis indicates the percent of the final stand. The 100% stand was assumed to be the final count of the check rate (10.9) plants per 10' row).

Prob. $>F$ (Day 13): Fer = 0.0001; Rate = 0.0001; Fer x Rate = 0.0001.
Table 11. Influence of type and rate of dry fertilizer placed with the seed on emergence of soybean. SE Farm (Sl) site, 1994.

<table>
<thead>
<tr>
<th>Fertilizer Material</th>
<th>Days after planting</th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSP</td>
<td>6</td>
<td>14.9(69)</td>
<td>14.0(65)</td>
<td>12.1(56)</td>
<td>9.8(45)</td>
</tr>
<tr>
<td>MAP</td>
<td>6</td>
<td>16.0(74)</td>
<td>13.8(64)</td>
<td>13.9(64)</td>
<td>8.7(40)</td>
</tr>
<tr>
<td>DAP</td>
<td>6</td>
<td>13.3(61)</td>
<td>13.5(62)</td>
<td>12.6(58)</td>
<td>7.6(35)</td>
</tr>
<tr>
<td>TSP</td>
<td>8</td>
<td>18.3(84)</td>
<td>18.4(85)</td>
<td>16.4(76)</td>
<td>13.8(64)</td>
</tr>
<tr>
<td>MAP</td>
<td>8</td>
<td>19.4(89)</td>
<td>16.7(77)</td>
<td>16.4(76)</td>
<td>12.0(55)</td>
</tr>
<tr>
<td>DAP</td>
<td>8</td>
<td>16.0(74)</td>
<td>16.8(77)</td>
<td>15.9(73)</td>
<td>11.6(53)</td>
</tr>
<tr>
<td>TSP</td>
<td>12</td>
<td>19.2(88)</td>
<td>19.4(89)</td>
<td>18.3(84)</td>
<td>16.3(75)</td>
</tr>
<tr>
<td>MAP</td>
<td>12</td>
<td>20.7(95)</td>
<td>17.3(80)</td>
<td>18.1(83)</td>
<td>14.0(65)</td>
</tr>
<tr>
<td>DAP</td>
<td>12</td>
<td>17.1(79)</td>
<td>19.0(88)</td>
<td>17.5(81)</td>
<td>13.0(60)</td>
</tr>
<tr>
<td>TSP</td>
<td>15</td>
<td>21.1(97)</td>
<td>20.4(94)</td>
<td>19.3(89)</td>
<td>16.7(77)</td>
</tr>
<tr>
<td>MAP</td>
<td>15</td>
<td>21.8(100)</td>
<td>18.7(86)</td>
<td>18.9(87)</td>
<td>14.0(65)</td>
</tr>
<tr>
<td>DAP</td>
<td>15</td>
<td>19.1(88)</td>
<td>20.2(93)</td>
<td>18.1(83)</td>
<td>13.3(61)</td>
</tr>
<tr>
<td>TSP</td>
<td>18</td>
<td>20.4(94)</td>
<td>21.8(100)</td>
<td>19.8(91)</td>
<td>17.7(82)</td>
</tr>
<tr>
<td>MAP</td>
<td>18</td>
<td>22.7(105)</td>
<td>18.8(87)</td>
<td>19.2(88)</td>
<td>14.1(65)</td>
</tr>
<tr>
<td>DAP</td>
<td>18</td>
<td>19.8(91)</td>
<td>20.6(95)</td>
<td>18.3(84)</td>
<td>14.8(68)</td>
</tr>
<tr>
<td>TSP</td>
<td>22</td>
<td>20.8(96)</td>
<td>22.7(105)</td>
<td>19.9(92)</td>
<td>18.3(84)</td>
</tr>
<tr>
<td>MAP</td>
<td>22</td>
<td>23.5(108)</td>
<td>19.6(90)</td>
<td>19.3(89)</td>
<td>14.4(66)</td>
</tr>
<tr>
<td>DAP</td>
<td>22</td>
<td>20.8(96)</td>
<td>21.4(99)</td>
<td>19.0(88)</td>
<td>15.3(71)</td>
</tr>
</tbody>
</table>

Numbers in parenthesis indicates the percent of the final stand. The 100% stand was assumed to be the final count of the check rate (21.7 plants per 10' of 7.5" row).
Prob. >F (Day 22): Fer = 0.34; Rate = 0.0001; Fer x Rate = 0.27.
Table 12. Influence of type and rate of dry fertilizer placed with the seed on emergence of soybean, SE Farm, (S2) site, 1994.

<table>
<thead>
<tr>
<th>Fertilizer Material</th>
<th>Days after planting</th>
<th>P₂O₅ Rate, lb/acre</th>
<th>0</th>
<th>25</th>
<th>50</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSP</td>
<td>6</td>
<td></td>
<td>18.9(80)</td>
<td>18.7(79)</td>
<td>15.3(65)</td>
<td>13.8(58)</td>
</tr>
<tr>
<td>MAP</td>
<td>6</td>
<td></td>
<td>21.9(92)</td>
<td>16.8(71)</td>
<td>15.6(66)</td>
<td>11.0(46)</td>
</tr>
<tr>
<td>DAP</td>
<td>6</td>
<td></td>
<td>19.4(82)</td>
<td>16.3(69)</td>
<td>13.6(57)</td>
<td>6.7(28)</td>
</tr>
<tr>
<td>TSP</td>
<td>8</td>
<td></td>
<td>22.1(93)</td>
<td>21.3(90)</td>
<td>18.7(80)</td>
<td>17.5(74)</td>
</tr>
<tr>
<td>MAP</td>
<td>8</td>
<td></td>
<td>23.9(101)</td>
<td>21.3(90)</td>
<td>19.4(82)</td>
<td>15.3(65)</td>
</tr>
<tr>
<td>DAP</td>
<td>8</td>
<td></td>
<td>22.8(96)</td>
<td>18.5(78)</td>
<td>17.5(74)</td>
<td>9.3(39)</td>
</tr>
<tr>
<td>TSP</td>
<td>12</td>
<td></td>
<td>22.9(97)</td>
<td>22.6(95)</td>
<td>20.2(87)</td>
<td>20.3(86)</td>
</tr>
<tr>
<td>MAP</td>
<td>12</td>
<td></td>
<td>24.8(105)</td>
<td>21.0(89)</td>
<td>20.2(87)</td>
<td>17.4(73)</td>
</tr>
<tr>
<td>DAP</td>
<td>12</td>
<td></td>
<td>22.8(96)</td>
<td>19.6(84)</td>
<td>19.1(81)</td>
<td>12.2(51)</td>
</tr>
<tr>
<td>TSP</td>
<td>15</td>
<td></td>
<td>22.8(96)</td>
<td>22.8(96)</td>
<td>20.3(86)</td>
<td>20.3(86)</td>
</tr>
<tr>
<td>MAP</td>
<td>15</td>
<td></td>
<td>24.9(105)</td>
<td>21.3(90)</td>
<td>20.7(87)</td>
<td>17.4(73)</td>
</tr>
<tr>
<td>DAP</td>
<td>15</td>
<td></td>
<td>22.6(96)</td>
<td>19.8(84)</td>
<td>19.3(81)</td>
<td>12.2(51)</td>
</tr>
</tbody>
</table>

1Numbers in parenthesis indicates the percent of the final stand. The 100% stand was assumed to be the final count of the check rate (23.7 plants per 10' of 7.5" row).

Prob. >F (Day 15): Fer = 0.0005; Rate = 0.0001; Fer x Rate = 0.018.
NITROGEN RATE STUDY
G.D. Dykstra, R.H. Gelderman, J.R. Gerwing
Plant Science 94-12

Introduction

This study is the second year of a two year nitrogen rate study on corn which was initiated in 1993. The objective of this study is to correlate and interpret the preplant soil NO3-N test and other N diagnostic tests for use in improving South Dakota N fertilizer recommendations for corn. Diagnostic tests included in this study are:

- Preplant 2 foot nitrate soil test
- V6 basal stem NO2-N
- Presidedress nitrate soil test
- Chlorophyll meter readings at the 10-12 leaf and silking plant growth stages
- Earleaf N content at silking

The correlation between the diagnostic test and yield response from added nitrogen will be the primary focus.

Methods & Materials

The study site was located on the NE 1/4, field 3B-B of the Southeast Experiment Farm. The soil type at the site is Egan. The previous crop was soybeans which yielded 38 bushels per acre.

On October 2, 1993 a composite soil sample was taken to a depth of five feet at the site to measure residual nitrogen and other soil parameters.

The site was divided into four replications, with each rep containing six rate plots. The rates used were 0, 30, 60, 90, 120, and 150 pounds of actual nitrogen per acre. Plot size was 15 feet by 60 feet.

On May 11 Pioneer 3417 was no-till planted at a population of 27,000 plants per acre in 30 inch rows. No starter fertilizer was applied. Recommended herbicides were applied to control weeds.

On May 24, 13 days after planting, the nitrogen fertilizer treatments were broadcast by hand on the soil surface. The fertilizer source used was ammonium nitrate.

When the corn reached the six leaf stage, June 9, a basal stem plant sample and a presidedress soil sample were taken. The basal stem sample consisted of taking a two inch stem segment just above the soil surface with the roots, first four leaves, and sheaths removed. Samples were taken from eight plants in the 0 and 60 pound nitrogen rate plots in each replicate. A one foot soil sample was also taken from the above mentioned plots at this time for the presidedress nitrate test.

At the 10-12 leaf stage, June 30, chlorophyll meter readings were taken. A Minolta SPAD-502 chlorophyll meter was used to obtain the readings. The meter produces a unitless, relative measure of leaf...
greenness, which is highly related to leaf chlorophyll content. Chlorophyll content can be used as an indicator of N status. The readings were taken on the uppermost fully expanded leaf midway between the stalk and the tip of the leaf and midway between the leaf margin and midrib. Fifteen plants were sampled and averaged for each plot.

When the corn reached silking, July 19, chlorophyll meter readings were taken from the ear leaf. In addition, fifteen earleaves were randomly removed to be analyzed for ear leaf N content.

Grain and silage yields were determined at black layer, September 29. Silage yields were taken by harvesting and weighing plants from 20 feet of row. A subsample was taken for N determination. Grain yields were estimated by harvesting and weighing 40 feet of row. A subsample was taken for N determination. On November 30, a five foot soil sample was taken from the 0 lb rate plots.

Results & Discussion

The weather conditions in 1994 were excellent for corn production in South Dakota. These weather factors set the potential for above average corn yields in the N rate experiment. There was 43 pounds of residual nitrogen in the soil before planting (Table 1). Adding to this figure was 38 pounds N credit for legume from the previous year's crop. The total estimated nitrogen available before fertilization was 81 pounds.

Table 1 also shows other parameters from the spring soil test. None of the parameters are at levels which would likely influence yield.

Table 2 shows the results of the presidedress soil sample and the basal stem sample. The presidedress soil sample shows a total of 77 pounds of N in the 0 pound plots and 96 pounds in the 60 pound plots. There was a 19 pound rise in soil N between the 0 and 60 pound plots, which can be considered a significant rise. There is 34 pounds more of soil nitrogen showing in the presidedress sample than in the original sample taken in the fall. This is most likely due to mineralization of organic matter and breakdown of legume credits. A response to added nitrogen is also seen in the basal stem test. Values for the stem nitrate test are .81% in the plants in the 0 pound plots and .99% in the 60 pound plots.

Table 3 shows the response of the chlorophyll meter readings, at both growth stages, and yield to added nitrogen. Meter readings and yield both seemed to plateau in the 30 to 60 pounds of added N range. This can be seen graphically in figures 1 and 2.

Table 4 contains statistical data. The site is considered responsive to added nitrogen. The plot had a Pr>F value of .001. The r values for ten leaf and earleaf meter readings versus yield were .720 and .762, respectively. This shows good correlation between the chlorophyll meter readings and yield. This relationship can also be seen in figures 1 and 2.

Table 5 shows the post harvest soil sample results. The soil test is considered low, 64 pounds in a five foot sample. This is due to the high nitrogen uptake need to produce high yields.

Summary

The site was considered responsive to added nitrogen. The optimum rate for this particular site seems to fall somewhere in the 30 to 60 pound
rate. Both the presidedress soil sample and the basal stem sample showed response to added nitrogen. There was good correlation between chlorophyll meter readings and yield in response to added nitrogen at this site.

The data from this site incorporated with data from the other sites in the study will help to determine if these N diagnostic tests can be used in nitrogen management for corn.

Table 1. Fall soil test results, N rate study, SE Farm, 1994.

<table>
<thead>
<tr>
<th>NO₃-N</th>
<th>0-24&quot;</th>
<th>0-60&quot;</th>
<th>O.M.</th>
<th>P</th>
<th>K</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/A</td>
<td>%</td>
<td>ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>117</td>
<td>3.4</td>
<td>17</td>
<td>237</td>
<td>5.8</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Presidedress soil and basal stem nitrate content, N rate study, SE Farm, 1994.

<table>
<thead>
<tr>
<th>Diagnostic test</th>
<th>N rate, lb/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil nitrate</td>
<td>0</td>
</tr>
<tr>
<td>0-12&quot;, lb/A</td>
<td>77</td>
</tr>
<tr>
<td>Basal stem nitrate N, %</td>
<td>.81</td>
</tr>
</tbody>
</table>

Table 3. Chlorophyll meter readings and grain yield, N rate study, SE Farm, 1994.

<table>
<thead>
<tr>
<th>Nitrogen Rate</th>
<th>TL*</th>
<th>EL**</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>lb/A</td>
<td>Meter Readings</td>
<td>bu/A (15%)</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>41</td>
<td>39</td>
<td>134</td>
</tr>
<tr>
<td>30</td>
<td>46</td>
<td>46</td>
<td>162</td>
</tr>
<tr>
<td>60</td>
<td>50</td>
<td>50</td>
<td>187</td>
</tr>
<tr>
<td>90</td>
<td>51</td>
<td>52</td>
<td>178</td>
</tr>
<tr>
<td>120</td>
<td>50</td>
<td>56</td>
<td>186</td>
</tr>
<tr>
<td>150</td>
<td>52</td>
<td>55</td>
<td>183</td>
</tr>
</tbody>
</table>

* TL = Meter Readings at the 10 Leaf Stage
** EL = Meter Readings at the Ear Leaf Stage
Table 4. Statistical data, N rate study, SE Farm, 1994.

<table>
<thead>
<tr>
<th>Response to added N</th>
<th>Correlation values</th>
<th>Yield vs TL</th>
<th>Yield vs EL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr&gt;F</td>
<td>r Value</td>
<td>.0001</td>
<td>.720</td>
</tr>
</tbody>
</table>

- TL = Meter Readings at the 10 Leaf Stage
- EL = Meter Readings at the Ear Leaf Stage
- Pr>F = Probability >F

Table 5. Post harvest soil nitrate-N levels, N rate study, SE Farm, 1994.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Treatment O lb rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ft</td>
<td>NO₃-N, lb/A</td>
</tr>
<tr>
<td>0-1</td>
<td>17</td>
</tr>
<tr>
<td>1-2</td>
<td>6</td>
</tr>
<tr>
<td>2-3</td>
<td>7</td>
</tr>
<tr>
<td>3-4</td>
<td>14</td>
</tr>
<tr>
<td>4-5</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
</tr>
</tbody>
</table>
Figure 1. Influence of added nitrogen on chlorophyll meter reading, Ear leaf and yield, SE Farm, 1994.
INTRODUCTION: Poor seed quality can significantly reduce soybean stand establishment. Problems in emergence and early season growth can further be compounded by seed and seedling diseases. The purpose of the following study was to determine the effects of various fungicide seed treatments on 2 soybean seed lots differing in quality on stand count and yield.

MATERIALS AND METHODS: Trials were conducted at both the Southeast Research Farm and Northeast Research Farm during 1994. The seed sources, fungicide seed treatments and number of plots were the same at both locations.

The variety Lambert was used in this study. Seed harvested in 1993 was designated "good seed", while seed harvested in 1992 was designated "poor seed". Plots were planted on 5/04/94 at the Southeast Farm and on 5/11/94 at the Northeast Farm. Plots were 4 rows wide (30" row width) and 20 ft long. Treatments were replicated 4 times.

Fungicide seed treatments (see Table 1) were applied prior to planting to both seed lots. Stand counts (plants/m) were taken in the center 2 rows on 06/01/94 at the Southeast Farm and on 06/03/94 at the Northeast Farm.

Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

RESULTS AND DISCUSSION: Data are contained in Table 1. At the Southeast Farm, there were no significant differences in stand counts between fungicide seed treatments within the same seed lot. Two fungicide seed treatments (Vitavax 200 FL and Apron-Terraclor) had significantly higher stand counts with good seed compared to poor seed. There were no other differences in stand counts between the different seed sources. There were no significant differences between fungicide seed treatments or seed sources for yield or test weight.

At the Northeast Farm, there were no significant differences among the fungicide seed treatments within a seed source for stand count. Differences between seed sources were also not significant except for the untreated seed where good seed exhibited a significantly higher stand count compared to poor seed. There were no significant differences between fungicide seed treatments or seed sources for yield or test weight.
These data indicate that while the seed source was significant in 1994, fungicide seed treatment had no effect within a seed source.

Table 1. 1994 Soybean Fungicide Seed Treatment Trial

<table>
<thead>
<tr>
<th>SE Farm</th>
<th>Stand Count (plants/m)</th>
<th>Yield (bu/A)</th>
<th>Test Weight (lb/bu)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GS*</td>
<td>GS</td>
<td>GS</td>
</tr>
<tr>
<td>Untreated</td>
<td>24.1</td>
<td>34.5</td>
<td>55.5</td>
</tr>
<tr>
<td>Prevail</td>
<td>23.6</td>
<td>36.2</td>
<td>56.3</td>
</tr>
<tr>
<td>Vitavax 200 FL</td>
<td>23.4</td>
<td>37.3</td>
<td>54.9</td>
</tr>
<tr>
<td>Apron-Terraclor</td>
<td>21.3</td>
<td>35.5</td>
<td>55.1</td>
</tr>
<tr>
<td>Apron-Terraclor + Kodiak HB</td>
<td>24.8</td>
<td>35.3</td>
<td>56.6</td>
</tr>
</tbody>
</table>

|         | PS*                    | PS           | PS                 |
|         |                        |              |                    |
| Untreated | 29.5                  | 36.5         | 55.8               |
| Prevail  | 27.1                  | 36.6         | 55.7               |
| Vitavax 200 FL | 30.8              | 40.0         | 55.3               |
| Apron-Terraclor | 30.6            | 38.0         | 55.8               |
| Apron-Terraclor + Kodiak HB | 38.4       | 34.1         | 55.4               |

<table>
<thead>
<tr>
<th>NE Farm</th>
<th>Stand Count (plants/m)</th>
<th>Yield (bu/A)</th>
<th>Test Weight (lb/bu)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GS*</td>
<td>GS</td>
<td>GS</td>
</tr>
<tr>
<td>Untreated</td>
<td>24.4</td>
<td>42.3</td>
<td>57.1</td>
</tr>
<tr>
<td>Prevail</td>
<td>24.3</td>
<td>42.4</td>
<td>56.4</td>
</tr>
<tr>
<td>Vitavax 200 FL</td>
<td>26.0</td>
<td>41.1</td>
<td>56.4</td>
</tr>
<tr>
<td>Apron-Terraclor</td>
<td>25.3</td>
<td>41.8</td>
<td>56.2</td>
</tr>
<tr>
<td>Apron-Terraclor + Kodiak HB</td>
<td>27.4</td>
<td>44.7</td>
<td>56.0</td>
</tr>
</tbody>
</table>

|         | PS*                    | PS           | PS                 |
|         |                        |              |                    |
| Untreated | 33.4                  | 42.5         | 56.1               |
| Prevail  | 28.5                  | 43.2         | 55.8               |
| Vitavax 200 FL | 27.6              | 42.1         | 55.6               |
| Apron-Terraclor | 29.8            | 41.9         | 56.6               |
| Apron-Terraclor + Kodiak HB | 31.4       | 42.9         | 56.6               |

| LSD (.05) | 5.7 | 4.9 | 1.6 |

* GS - Good Seed
PS - Poor Seed
1994 OATS FOLIAR FUNGICIDE TRIAL
O. Gallenberg, O. Reeves, M. Thompson and L. Hall
Plant Science 94-14

INTRODUCTION: Oats are subject to attack from a variety of foliar diseases. Some of these diseases can be controlled or reduced through application of foliar fungicides. The purpose of the following study was to determine the effects of various foliar fungicide treatments on disease ratings, yield and test weight of oats.

MATERIALS AND METHODS: Trials were conducted at the Southeast Research Farm, Brookings Agronomy Farm and Northeast Research Farm during 1994. The variety Don was used in this study. The foliar fungicide treatments and number of plots were the same at all 3 locations. Treatments were replicated 4 times.

Fungicides used in the study were Tilt (propiconazole) and Dithane DF (mancozeb). Tilt is not currently labelled on oats and was applied as an experimental compound in a single application of 4 fl oz/A at flag leaf emergence (6/1/94 at Southeast Farm, 6/3/94 at Brookings, 6/9/94 at Northeast Farm). Three mancozeb treatments were used: Mancozeb I: 2 lb/A at boot (6/10/94 at Southeast Farm, 6/14/94 at Brookings, 6/14/94 at Northeast Farm) and again 10 days later; Mancozeb II: 1 lb/A before jointing (5/19/94 at Southeast Farm, 6/2/94 at Brookings, 6/3/94 at Northeast Farm), 2 lb/A at boot and again 10 days later; and Mancozeb III: 1 lb/A before jointing.

Plots were rated for % disease on the flag leaf (i.e. % non-green tissue) and given an overall plot rating (0-5 scale) on 7/5/94 at Southeast Farm and on 7/12/94 at Brookings and Northeast Farm.

Plots were harvested at the end of the season. Yields (bu/A) and test weights (lb/bu) were calculated.

RESULTS AND DISCUSSION: Data are contained in Table 1. At all 3 locations, all fungicide treatments significantly reduced the disease ratings and increased yield compared to the untreated check. All fungicide treatments significantly increased test weight at both Southeast Farm and Brookings.

Two mancozeb treatments (Mancozeb I and II) consistently gave greater numerical reductions in disease rating and increases in yield and test weight.
Several diseases including crown rust were present at all 3 locations, particularly late in the season. These data from 1994 indicate that consistent decreases in disease and increases in yield and test weight in oats can be achieved with applications of foliar fungicides.

Table 1. 1994 OATS FOLIAR FUNGICIDE TRIAL

<table>
<thead>
<tr>
<th>Disease Rating</th>
<th>% Flag Leaf Infected</th>
<th>Plot Rating Scale 0-5</th>
<th>Yield (bu/A)</th>
<th>Test Weight (lb/bu)</th>
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<td><strong>SE FARM</strong></td>
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<tr>
<td>Untreated</td>
<td>96.9</td>
<td>5.0</td>
<td>64.1</td>
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</tr>
<tr>
<td>Tilt</td>
<td>57.5</td>
<td>3.3</td>
<td>78.2</td>
<td>32.6</td>
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<tr>
<td>Mancozeb I</td>
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<td>80.8</td>
<td>33.2</td>
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<td>Mancozeb II</td>
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<td>1.0</td>
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<td>33.2</td>
</tr>
<tr>
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<td>72.8</td>
<td>32.2</td>
</tr>
<tr>
<td>LSD (.05)</td>
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<td>4.2</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>BROOKINGS</strong></td>
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<tr>
<td>Untreated</td>
<td>92.5</td>
<td>4.3</td>
<td>83.1</td>
<td>31.1</td>
</tr>
<tr>
<td>Tilt</td>
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<td>3.3</td>
<td>104.4</td>
<td>33.7</td>
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<td>110.1</td>
<td>34.9</td>
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<tr>
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<tr>
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</table>
The preliminary herbicide screening test is a cooperative effort with the oat project and the extension weed staff to screen established varieties and promising lines for herbicide injury. Recommended and doubled rates are applied to four varieties or lines at the 3-4 leaf stage. The data averaged over three years shows MCPA amine caused very little if any injury. The slight increase in yield may be the result of weed control. Bronate and low rates of 2,4-D amine and dicamba-MCPA amine caused a moderate yield loss. The high rate of 2,4-D amine and Dicamba-MCPA amine caused a significant yield loss. These results may change with the variety, location, year, or stage of plant development. Other data has shown plants are more sensitive to Bronate applied in the 6-7 leaf stage.

SOUTHEAST THREE YEAR AVERAGE

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Yield (bu/acre)</th>
<th>YLD% of check</th>
<th>TWT (lb/bu)</th>
<th>TWT% of check</th>
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<tr>
<td>MCPA AM 0.5</td>
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<td>102</td>
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<td>101</td>
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<td>MCPA AM 1</td>
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<td>102</td>
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<td>102</td>
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<tr>
<td>2,4-D AM 0.5</td>
<td>82.0</td>
<td>95</td>
<td>32.7</td>
<td>102</td>
</tr>
<tr>
<td>2,4-D AM 1</td>
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<td>83</td>
<td>32.4</td>
<td>101</td>
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<tr>
<td>Bronate 0.75</td>
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<td>95</td>
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<td>101</td>
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<td>Bronate 1</td>
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<tr>
<td>Dicamba+MCPA AM .25</td>
<td>84.8</td>
<td>98</td>
<td>31.5</td>
<td>98</td>
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<tr>
<td>Dicamba+MCPA AM .5</td>
<td>69.7</td>
<td>81</td>
<td>30.7</td>
<td>95</td>
</tr>
<tr>
<td>Mean</td>
<td>81.7</td>
<td>95</td>
<td>32.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Herbicides injury varies with environmental conditions, therefore several location-years are needed to show overall effects and interactions with variety, herbicide, and environment.

The breeding nurseries consist of lines selected for this area on the basis of maturity and disease resistance. The tri-state nursery is comprised of 35 lines that are selected from North Dakota, South Dakota, and Minnesota. Selected lines from the tri-state nursery will be entered in the uniform early or uniform midseason regional oat nursery the next year. The uniform early nursery has 34 selected lines from several states. These are promising lines which are being considered for release. The uniform early nursery is grown at several locations in the United States. An oat foliar fungicide test was also conducted with the cooperation of the extension pathologists. The results show fungicide treatments increased yield and test weight. A total of 780 yield plots were tested overall.
One alfalfa cultivar yield experiment was conducted at the SE station during 1994. This test was conducted to determine yield performance of alfalfa cultivars for use in SE South Dakota.

Four harvests were obtained from the experiment, which was seeded in 1991. Average four-cut total DM yield was 4.34 T/A, with significant differences detected among the 36 entries (Table 1). This total yield was similar to the total yield obtained in 1992, but was about 1 T/A lower than total yield reported in 1993. Average yields for the four harvests in 1994 ranged from 0.82 T/A for the fourth harvest to 1.47 T/A for the first harvest. Three-year average yield for this experiment was 4.72 T/A, with significant differences detected among the entries. The cultivar 'Blazer XL' yielded significantly lower than the other cultivars for three-year average yield. The low productivity of this cultivar was probably due to poor establishment during the seeding year. It is also interesting to note that three of the other lowest yielding cultivars (Riley, Baker, and Vernal) are all public cultivars that have been marketed for many decades.

An important role of the South Dakota Alfalfa Cultivar Yield Test is to evaluate lines that are in experimental stages of breeding programs. Companies and universities often enter promising alfalfa lines to test their suitability to stressful conditions in South Dakota. There are 8 experimental entries in the current experiment at the SE station. Results for experimental lines must be interpreted with caution. Seed for these lines are in early generations of the seed production process and natural inbreeding depression is expected as these lines are advanced to seed production stages. In essence, commercial seed derived from experimental lines may not have the same yield potential that that was observed in a state variety trial.

This is the end of the data collection from this trial. Results of this yield test are useful in the selection of alfalfa cultivars for forage production. Measurements of forage yield taken over several harvests and years are usually more useful than are averages from a single harvest. Another alfalfa cultivar yield trial was successfully seeded at the SE Station in 1994. This trial was cut twice during 1994, however, yield data were not collected.
Table 1. Forage yield of 36 alfalfa cultivars planted April 24, 1991 at the Southeastern Research Station, Beresford, SD.

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<tr>
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<td>0.96</td>
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<td>1.77</td>
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<td>0.86</td>
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<td>1.05</td>
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<td>0.66</td>
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<td><strong>0.15</strong></td>
<td><strong>0.23</strong></td>
<td><strong>0.62</strong></td>
<td><strong>0.55</strong></td>
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</table>

(a) Data for experimental lines should be used with caution. Commercial seed for these lines may not perform similarly.
The soybean breeding program is aimed at developing soybean cultivars in maturity groups 0, I, and II. Several different locations across the state are used for testing lines each year. In addition to cultivar development, research is done at these locations to generate supporting data for the breeding program. Lines that are in at least their second year of yield testing are called advanced lines. These are lines that have shown good yield potential, but still need to continue performing well for several more years. Most of them will not make it as cultivars, but at this point they have the potential. These are the lines that will be the center of the discussion in this report.

Table 1 gives a summary of the performance of advanced lines at different locations across the state. Normally, at Beresford we test maturity groups I and II in separate experiments. Because of the early frost in 1993, we were not able to separate lines into different maturity groups for 1994 testing. Consequently, maturity groups I and II lines were tested together in two experiments. Checks were included to cover MGO, MGI, and MGII.

Overall yields ranged from 30 bu/a at Dakota Lakes non-irrigated test to 50 bu/a at Watertown. In Test 1, yields at Beresford were significantly lower than at Watertown, but were significantly greater than the other three environments (Table 1). In Test 2, yields at Beresford also were lower than Watertown. They were similar to Brookings yields, but greater than the non-irrigated test at Dakota Lakes. Overall mean yields at Beresford were 4.9 and 2 bu/a, respectively in Test 1 and 2, greater than the combined mean across all test locations. In Test 1, the top experimentals at Beresford were 10 to 20 bu/a higher yielding than at other locations, except Watertown. In Test 2, yields of the top experimentals were 16 bushels greater than Dakota Lakes non-irrigated, similar to Watertown, and lower than Brookings.

At Beresford, Sturdy was lower yielding than maturity group 0 and I checks, and Kenwood had similar yields to group 0 and I checks in Test 1. In Test 2 yields of Sturdy was similar to Hendricks, 2.4 bu/a greater than Lambert, and 6.5 bu/a lower than Parker. Kenwood was higher yielding than group 0 and group I checks. Overall, Hendricks was 1.3 to 1.8 bu/a higher yielding than Lambert. Test CV's ranged from 7.0 to 12.2. This indicated fairly reliable data overall, and most experiments were considered good.

SUMMARY

Beresford was planted on 4 May, 1994. We had good moisture at planting time, and throughout the growing season, especially early. Temperatures
remained above optimum throughout the growing season, and all lines were mature long before the first frost. This location was harvested on 9/27. Maturity group II soybean continue to do well in this environment. Judging from the check comparisons, earlier maturing soybean show excellent yields when conditions are good in the early part of the growing season.

Table 1. Yield summary of advanced soybean lines tested in five South Dakota environments in 1994.

<table>
<thead>
<tr>
<th>TEST</th>
<th>LOCATION¹</th>
<th>OVERALL²</th>
<th>TOP 10%</th>
<th>CHECKS³</th>
<th>CV⁴</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>MEAN YIELD (bu/acre)</td>
<td></td>
<td>HES</td>
<td>LBT</td>
</tr>
<tr>
<td>1</td>
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<td>56.3</td>
<td>54.1</td>
<td>51.6</td>
</tr>
<tr>
<td></td>
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<td>47.1b</td>
<td>54.4</td>
<td>51.3</td>
<td>52.6</td>
</tr>
<tr>
<td></td>
<td>BROOKINGS</td>
<td>43.2c</td>
<td>48.4</td>
<td>40.9</td>
<td>39.1</td>
</tr>
<tr>
<td></td>
<td>D. LAKES-I.</td>
<td>40.0d</td>
<td>54.7</td>
<td>32.7</td>
<td>32.8</td>
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<td></td>
<td>D. LAKES-NI</td>
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<td>29.3</td>
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<td></td>
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<td>46.9</td>
<td>42.2</td>
<td>41.9</td>
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<td>49.3</td>
<td>42.8</td>
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<td>54.4</td>
<td>43.5</td>
<td>41.0</td>
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<tr>
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<td>52.0</td>
<td>43.0</td>
<td>41.2</td>
</tr>
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<td>36.0</td>
<td>32.1</td>
<td>29.7</td>
</tr>
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<td></td>
<td>COMBINED</td>
<td>42.6</td>
<td>47.2</td>
<td>42.9</td>
<td>39.3</td>
</tr>
</tbody>
</table>

¹D. Lakes-I = Dekote Lakes irrigated; D. Lakes-NI = Dakota Lakes non-irrigated.
²HES = Hendricks (NGO); LBT = Lambert (NGO); PKR = Parker (NGI); STY = Sturdy (NGII);
³Locations with the same letter are not significantly different at 0.05 probability level.
⁴CV indicates precision of test. Smaller CV's indicate more reliable information.
Oats: Test trial results for 1994 are shown in Table 1. The 1994 oat yields were much better than in 1993. The average yield of 88.6 bushels per acre and bushel weight of 32.3 lbs in 1994 was 54 bushels per acre and 9.3 lbs per bushel higher than a year ago. The top performing entry for 1994 was the experimental line SOTROY-81 which yielded 123.5 bushels per acre. Since no other entry yielded within 6.6 bushels per acre (the LSD (5%) value of 6.6) of SOTROY-81 it alone was the top performing oat at Beresford for 1994. The top bushel weight entries had to weigh more than 34.5 lbs to be in the top bushel weight group, i.e., the highest bushel weight 36.8 lbs minus the test LSD value 2.3 lbs equals 34.5 lbs per bushel. The entries in this group included 'JERRY', 'SD89210', 'SD90128', and 'S90198'. The proteins for 1994 averaged 15.7% and ranged from 14.0 to 17.8%.

Corn: The early and late test trial results for corn (seeded April 25, 1994) are shown in Tables 2 and 3, respectively. The early test averages for 1994 was: yield - 179.3 bushels per acre, harvest moisture - 18.0%, and bushel weight - 61.5 lbs per bushel. These were a change of +57.5 bushels per acre, -6.1% moisture, and +9.0 lbs per bushel, respectively, from 1993. There were 17 entries in this test yielding 189.4 bushels or higher which placed them in the top yielding group. Likewise, those entries with a harvest moisture content of 17.3% or less and a bushel weight of 62.2 lbs or higher were in the top performing group in these categories. The late test averages for 1994 was: yield - 177.6 bushels per acre, harvest moisture - 19.0%, and bushel weight - 63.9 lbs per bushel. These were a change of +65.2 bushels per acre, -8.4% moisture, and +15.4 lbs per bushel, respectively, from 1993. In 1994 there were 6 entries in this test yielding 186.2 bushels or higher which placed them in the top yielding group. In addition, entries with a harvest moisture of 18.2% or less and a bushel weight of 64.0 or higher were in the top performing group in these categories.

Soybean: The maturity group-I and group-II soybeans yields are shown in Tables 4 and 5. The group-I trial averaged 46.3 bushels per acre for 1994. Six varieties yielded 51.1 bushels or higher and were therefore in the top yielding group for 1994. Over the longer term varieties averaged 42.2 and 44.8 bushels per acre, respectively, for the recent two- and three-year periods. Likewise, the group-II trial averaged 52.9 bushels per acre for 1994. Fifteen varieties yielded 50.0 bushels or higher and were therefore in the top yielding group for 1994. Over the longer two- and three-year periods varieties averaged 50.6 and 52.9 bushels per acre, respectively.
Compared to 1993 the yield test trials at Beresford were much better than in 1994. Timely seeding, good moisture distribution, and warmer temperatures in 1994 resulted in better overall cropping conditions for all crops.

Table 1. 1994 OAT YIELD RESULTS AT THE SOUTHEAST RESEARCH FARM, BERESFORD, SOUTH DAKOTA.

<table>
<thead>
<tr>
<th>VARIETY</th>
<th>1994 AVERAGE YIELD - BU/acre</th>
<th>1994 BUSHEL WEIGHT (LBS)</th>
<th>1994 PROTEIN (%)</th>
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<tbody>
<tr>
<td></td>
<td>1994 N=4</td>
<td>2-YR. N=7</td>
<td>3-YR. N=11</td>
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<td>SOTROY-81</td>
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<tr>
<td>SOTROY-59</td>
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<tr>
<td>TROY</td>
<td>110.7</td>
<td>78.2</td>
<td>95.5</td>
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<tr>
<td>SOTROY-12</td>
<td>106.2</td>
<td>76.3</td>
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<tr>
<td>JERRY</td>
<td>105.1</td>
<td>83.7</td>
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<tr>
<td>SOTROY-7</td>
<td>102.1</td>
<td>74.4</td>
<td>.</td>
</tr>
<tr>
<td>VALLEY</td>
<td>102.1</td>
<td>75.6</td>
<td>87.6</td>
</tr>
<tr>
<td>NEWOAK</td>
<td>93.7</td>
<td>68.3</td>
<td>88.3</td>
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<tr>
<td>DANE</td>
<td>92.3</td>
<td>72.7</td>
<td>89.1</td>
</tr>
<tr>
<td>IL86-1995</td>
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<td>MILTON</td>
<td>89.2</td>
<td>71.2</td>
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<tr>
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<td>SD90128</td>
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<td>SD89504</td>
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<td>64.7</td>
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<tr>
<td>DON</td>
<td>77.2</td>
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<td>74.5</td>
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<td>HYTEST</td>
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<td>65.5</td>
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<tr>
<td>BURNETT</td>
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<td>38.4</td>
<td>58.9</td>
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<td>AVERAGE:</td>
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<td>65.5</td>
<td>79.9</td>
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<tr>
<td>LSD (5%):</td>
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<td>17.9</td>
<td>13.5</td>
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<tr>
<td>CV (%):</td>
<td>5.3</td>
<td>7.1</td>
<td>6.2</td>
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Table 2. 1994 CORN HYBRID PERFORMANCE TRIAL RESULTS - BERESFORD, SD, S.E. RESEARCH FARM, EARLY MATURITY - 110 DAYS OR LESS.

<table>
<thead>
<tr>
<th>BRAND &amp; HYBRID</th>
<th>1994 HARVEST MOIST. (%)</th>
<th>1994 BUSHEL WEIGHT (LB)</th>
<th>YIELDS AT 15.5% MOIST. (BU/AC)</th>
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</thead>
<tbody>
<tr>
<td>PIONEER 3489</td>
<td>18.6</td>
<td>60.4</td>
<td>205.2</td>
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<tr>
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<td>57.3</td>
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<tr>
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<td>192.1</td>
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<td>DEKALB DK 512</td>
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<td>191.1</td>
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<td>190.8</td>
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<td>190.6</td>
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<tr>
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<td>17.2</td>
<td>61.0</td>
<td>189.5</td>
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HYBRIDS APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD-GROUP FOR 1994

| MW GENETIC X41080| 17.8                     | 64.6                    | 188.7                         |
| EPLEY EX 3600    | 18.6                     | 58.7                    | 188.3                         |
| CARGILL 6303     | 18.4                     | 59.7                    | 188.1                         |
| CROW'S 440       | 18.2                     | 62.6                    | 187.9                         |
| ASGROW RX707     | 17.8                     | 60.3                    | 187.9                         |
| RENZE 6246       | 17.4                     | 60.8                    | 187.8                         |
| CIBA 4494        | 19.6                     | 62.9                    | 187.7                         |
| KRUGER K9507PT   | 18.2                     | 62.1                    | 187.2                         |
| MYCOGEN 6220     | 18.8                     | 61.5                    | 186.8                         |
| CURRY 2152       | 17.6                     | 59.4                    | 186.7                         |
| AGRIPRO AP429    | 17.6                     | 60.7                    | 186.6                         |
| DEKALB DK 566    | 17.0                     | 58.7                    | 186.3                         |
| CIBA 4372        | 18.0                     | 63.0                    | 186.2                         |
| PAYCO 754        | 18.0                     | 59.9                    | 186.0                         |
| LEGEND LS8205    | 18.0                     | 62.0                    | 185.8                         |
Table 2. (CONTINUED) S.E. RESEARCH FARM, EARLY MATURITY - 110 DAYS OR LESS.

<table>
<thead>
<tr>
<th>BRAND &amp; HYBRID</th>
<th>YIELDS AT 15.5% MOIST. (BU/AC)</th>
<th>1994 HARVEST MOIST. (%)</th>
<th>1994 BUSHEL WEIGHT (LB)</th>
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</thead>
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<td>60.9</td>
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Table 2. (CONTINUED) S.E. RESEARCH FARM, EARLY MATURITY - 110 DAYS OR
LESS.

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<th>BRAND &amp; HYBRID</th>
<th>YIELDS AT 15.5% MOIST. (BU/AC)</th>
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TEST AVERAGE: 179.3 18.0 61.5
TEST LSD (5%) VALUE: 15.9 0.9 3.1
MINIMUM BEST VALUE: 189.4
MAXIMUM BEST VALUE: 17.3
TEST C.V. #: 5.5

#COEF. OF VARIATION - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE HYBRID COMPARISONS.
Table 3. 1994 CORN HYBRID PERFORMANCE TRIAL RESULTS - BERESFORD, SD, S.E. RESEARCH FARM, LATE MATURITY - 111 DAYS OR MORE.

<table>
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<tr>
<th>BRAND &amp; HYBRID</th>
<th>YIELDS AT 15.5% MOIST. (BU/AC)</th>
<th>1994 HARVEST MOIST. (%)</th>
<th>1994 BUSHEL WEIGHT (LB)</th>
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<td>63.2</td>
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HYBRIDS APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD-GROUP FOR 1994

TERRA TR1126       185.1 18.9 62.6
KRUGER K9513       184.4 18.1 62.8
HOEGEMEYER 2641    184.1 18.8 65.1
KRUGER K9415       182.5 19.3 63.5
RENZE 6395         182.3 19.1 64.7
KRUGER K9315B      182.1 19.0 63.5
CARGILL 7777       181.8 19.2 64.2
TERRA TR1130       181.5 21.1 62.5
CROW'S 490         180.7 20.3 61.8
PAYCO 834          179.9 18.2 62.5
CARGILL 7997       179.6 20.2 64.5
CURRY 2170         178.5 18.1 66.1
PAYCO 814          178.3 17.8 64.0
HORIZON BT1082     178.1 18.4 63.8
KRUGER K9516       175.9 20.1 64.0
MW GENETIC G7786   171.9 18.7 64.3
KALTENBERG K7109   171.5 17.6 61.9
G. HARVEST H-2485  170.4 17.4 64.1
KRUGER K9415A      170.3 18.4 65.7
N. KING N-6560     167.6 18.3 65.9
CARGILL 7697       165.7 19.1 65.0
KALTENBERG K7500   165.3 19.2 65.0
KALTENBERG K7505   164.4 18.3 64.4
KAYSTAR KX-909     155.3 21.8 60.7
SEXAUER SX780      144.5 19.0 65.2

TEST AVERAGE:      177.6 19.0 63.9
TEST LSD (5%) VALUE: 16.4 0.9 2.2
MINIMUM BEST VALUE: 186.2            2.2
MAXIMUM BEST VALUE: 18.2 64.0
TEST C.V.#:        5.7

*Coeff. of Variation - A measure of experimental error; if value exceeds 16.0%, data should not be used to make hybrid comparisons.

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<th>BRAND</th>
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<th>3-YR.</th>
<th>PROTEIN (BU/A)</th>
<th>1993</th>
<th>2-YR.</th>
<th>3-YR.</th>
<th>PROTEIN (%)</th>
<th>OIL</th>
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<td>1993</td>
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ENTRIES APPEARING ABOVE THIS LINE ARE IN THE TOP-YIELD-GROUP FOR 1994

| MYCOGEN    | J-204      | 50.4  |       |       |                |       |       |       |              |     |
| MUSTANG    | E-1199     | 50.0  |       |       |                |       |       |       |              |     |
|            | SL92-1201M | 48.9  |       |       |                |       |       |       |              |     |
| LEGEND     | LS 1982    | 48.6  |       |       |                |       |       |       |              |     |
|            | BELL-SCN-CK| 48.4  | 44.9  | 46.6  | 33.9           | 16.8  |       |       |              |     |
|            | STURDY II-CK* | 48.2 |       |       |                |       |       |       |              |     |
| SANOS      | SOI 117    | 47.8  | 47.4  | 50.6  | 32.3           | 17.0  |       |       |              |     |
| MUSTANG    | M-1188     | 47.6  | 46.3  |       | 33.3           | 17.2  |       |       |              |     |
|            | WEBER      | 47.4  | 44.5  | 46.3  | 32.4           | 17.0  |       |       |              |     |
| STAR       | EXP9418A   | 47.4  |       |       |                |       |       |       |              |     |
|            | SL92-1207M | 47.2  |       |       |                |       |       |       |              |     |
| PIONEER    | 9162       | 47.0  | 41.9  | 45.4  | 33.1           | 17.9  |       |       |              |     |
|            | SL92-1362M | 46.6  |       |       |                |       |       |       |              |     |
|            | PARKER I-CK* | 46.6 | 44.7  | 48.1  | 34.4           | 16.9  |       |       |              |     |
|            | SL92-1328M | 45.8  |       |       |                |       |       |       |              |     |
| SEXAUER    | SX1941     | 45.5  |       |       |                |       |       |       |              |     |
| PIONEER    | 9171       | 44.9  | 42.7  | 44.0  | 32.4           | 16.7  |       |       |              |     |
|            | SIBLEY     | 44.5  | 41.2  | 43.6  | 34.2           | 17.1  |       |       |              |     |
|            | SL92-1179M | 44.1  |       |       |                |       |       |       |              |     |
|            | SL92-1412M | 43.9  |       |       |                |       |       |       |              |     |
| LEGEND     | LS 1994    | 43.3  |       |       |                |       |       |       |              |     |
|            | KATO       | 42.3  | 41.3  | 44.4  | 36.8           | 16.4  |       |       |              |     |
|            | SL92-2844M | 42.0  |       |       |                |       |       |       |              |     |
|            | DAWSON O-CK* | 41.9 | 32.7  | 35.8  | 33.7           | 17.5  |       |       |              |     |
|            | KASOTA     | 41.8  | 39.1  | 42.6  | 33.9           | 17.7  |       |       |              |     |
### Table 4. (CONTINUED) 1994 SOYBEAN VARIETY PERFORMANCE TRIAL RESULTS - BERESFORD, SD. S.E. RESEARCH FARM, MATURITY GROUP-I,

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<th>2-YR.</th>
<th>3-YR.</th>
<th>PROTEIN</th>
<th>OIL</th>
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<td></td>
<td>(BU/A)</td>
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<td>(%)</td>
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**TEST AVERAGES:**

- 46.3 42.2 44.8 33.6 16.9

**LSD (5%) VALUES:**

- 6.3 7.2 5.3

**MIN. VALUE FOR HIGH YIELD:**

- 51.1 41.3 45.9

**COEFFICIENT OF VARIATION (CV):**

- #8.3 8.7 7.7

*CK = CHECK VARIETY.

#CV - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE VARIETY COMPARISONS.
Table 5. 1994 SOYBEAN VARIETY PERFORMANCE TRIAL RESULTS - BERESFORD, SD. S.E. RESEARCH FARM, MATURITY GROUP-II, SEEDED MAY 4, 1994.

<table>
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<th>VARIETY</th>
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<th>1993 (%)</th>
<th>2-YR. PROTEIN (%)</th>
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Entries appearing above this line are in the Top-Yield-Group for 1994.
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<tr>
<th>BRAND</th>
<th>VARIETY</th>
<th>YIELDS (BU/A)</th>
<th>PROTEIN (%)</th>
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Table 5. (CONTINUED) 1994 SOYBEAN VARIETY PERFORMANCE TRIAL RESULTS · BERESFORD, SO. S.E. RESEARCH FARM, MATURITY GROUP·II,

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TEST AVERAGES: 52.9 50.6 52.9 34.3 16.4
LSD (5%) VALUES: 6.6 $NS 5.4
MIN. VALUE FOR HIGH YIELD: 58.0 52.1
COEFFICIENT OF VARIATION (CV): # 7.8 6.8 6.6

*CK = CHECK VARIETY.
$NS = DIFFERENCES AMONG MEANS WITHIN A COLUMN ARE NONSIGNIFICANT.
#CV - A MEASURE OF EXPERIMENTAL ERROR; IF VALUE EXCEEDS 16.0% DATA SHOULD NOT BE USED TO MAKE VARIETY COMPARISONS.
INTRODUCTION

Weed evaluation and extension demonstration plots provide weed control data for counties served by the Southeast Experiment Farm. The station is the major site for many corn and soybean weed control studies.

The tests provide data and are a source of training material for extension programs. The information is utilized in county extension meetings and for certain statewide programs.

1994 Evaluation/Demonstration Tests

Field tests are designed to provide comparative performance data for labeled herbicides and products that may be registered in the near future. Some tests are designed to evaluate control of specific weeds.

Plots are visually evaluated for weed control and crop response. Weed control ratings less than 70% are considered unsatisfactory; 85% control would be commercially acceptable in many situations; however 90-95% control is desired if seed production is minimized. Crop response ratings (VCRR) of 20% or less usually represents an acceptable level of stunting, discoloration or other effect. Ratings over 30% are considered excessive; 100% represents complete kill. Yields are harvested and reported for studies designed with replication.

Weather was an important factor in herbicide performance in 1994. Precipitation was nearly ideal for some early row crop tests; however it was inadequate for some later tests. Conditions were generally favorable for high activity from most postemergence treatments in soybeans. Weed density in 1994 was greater in many test areas than in past years.
Studies listed below are summarized in the following tables. Information for each study is included as part of the summary.

1. Corn Herbicide Demonstration
2. Soybean Herbicide Demonstration
3. Cocklebur/Soybean Demonstration
4. Herbicide Antagonism for Grass and Broadleaf Weeds/Soybeans
5. Herbicide Timing Foxtail - Soybeans
6. Velvetleaf Control - Corn - Demonstration
7. Evaluation of Cocklebur Control - Corn
8. Evaluation of Additives with Pursuit - Soybeans
9. Evaluation of Preplant Incorporated Grass Herbicides - Corn
10. Foxtail Control in Corn
11. Evaluation of Preemergence Herbicides in No-Till Corn
12. Soybean Row Spacing with Herbicide Rates
13. Postemergence Grass Control - Soybeans
14. Additives with Postemergence Herbicides - Soybeans
15. Evaluation of STS Soybeans and Cocklebur Control
16. Salvage Treatments for Large Cocklebur - Soybeans
17. Herbicide Evaluation - Soybean Injury
18. Herbicide Rate/Carryover - Soybean
19. Herbicide Rate/Carryover - Corn
20. Evaluation of Additives with Accent for Foxtail - Corn
21. Foxtail Removal Timing/No-Till - Corn
22. No-Till Corn Demonstration
23. No-Till Soybeans in Stubble Demonstration
24. No-Till Soybeans in Corn Stalks
25. Evaluation of Reduced Input Treatments for No-Till Soybeans

**Experimental Herbicide Tests**

Precise, small plot tests are established to evaluate experimental herbicides or to define rate comparisons. Treatments showing promise in these tests are moved forward into standard demonstration plots if industry continues development. Tests in 1994 include:

1. Corn Row Spacing with Herbicide Rates
2. Additives with Postemergence Bladex Use in Corn
3. Soybeans after Broadstrike Plus in 1993
4. IMI Corn Tolerance to SU Herbicides
5. Additives with Accent in Corn
6. Postemergence Broadleaf Control in "IMI" Corn
7. Broadleaf Control in No-Till Corn
8. Broadstrike Combinations in No-Till Corn
9. Yellow Foxtail Control in No-Till Corn

**Experimental Herbicide Tests (Continued)**

10. Insecticide Interaction with Accent or Beacon in Corn
11. Insecticide Interaction with Broadstrike/Dual in Corn
12. Insecticide Interaction with Permit in Corn
13. Insecticide Interaction with Peak in Corn
14. Select and Cobra Tank-mixes
15. 28% N in Herbicide Combinations in Soybeans
16. Liberty on Liberty Tolerant Soybeans
17. Additive Screening with Blazer in Soybeans
18. Postemergence Velvetleaf Control in Soybeans
19. Burndown Before No-Till Soybeans
20. Early Preplant in No-Till Soybeans

The cooperation and direct assistance from station personnel is acknowledged. Field equipment and management of the plot areas are important contributions to the project. Extension agents provide assistance with tours and utilize the data in direct producer programs.

NOTE: Data reported in this publication are results from field tests that include product uses, experimental products or experimental rates, combinations or other unlabeled uses for herbicide products. Users are responsible for applying herbicide according to label directions. Refer to the appropriate weed control fact sheet available from county extension offices for herbicide recommendations.
Table 1. Corn Herbicide Demonstration

Demonstration Precipitation: 1st week: 0.83 inches
Planting Date: 5/5/94; Curry 1480 2nd week: 0.36 inches
SPPI/PPI: 5/4/94
PRE: 5/5/94
EPOS: 5/25/94
POST: 6/2/94
SOIL: Silty clay loam; 3.2% OM; 6.6 pH

Weeds: Grft = Green foxtail
Tawh = Tall waterhemp

COMMENTS: Moderate weed density. Excellent conditions. Weed control was excellent for several treatments. Tillage differential was not consistent when comparing performance on plow vs. chisel seedbed, therefore 1994 ratings were averaged. Previous data has suggested less weed pressure in plowed seedbeds.

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# Table 1. Corn Herbicide Demonstration continued...

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Table 2. Soybean Herbicide Demonstration

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**PREPLANT INCORPORATED**

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**SHALLOW PREPLANT INCORPORATED**

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Table 2. Soybean Herbicide Demonstration continued . . .

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<th>% Tawh 7/19/94</th>
<th>2-Yr Avg % Gr</th>
<th>% Bd1P</th>
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Table 2. Soybean Herbicide Demonstration continued...

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<th>Treatment</th>
<th>1b/A act.</th>
<th>% Grft 7/19/94</th>
<th>% Tawh 7/19/94</th>
<th>2-Yr Avg % Gr</th>
<th>% Bdlf</th>
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Table 3. Cocklebur/Soybean Demonstration

RCB; 2 reps  
Planting Date: 5/19/94; Sturdy  
SPPI/PPI: 5/19/94  
PRE: 5/19/94  
POST: 6/17/94  
LPOS: 6/24/94  
SOIL: Loam; 2.9% OM; 6.5 pH  

Precipitation: 1st week: 0.00 inches  
2nd week: 0.29 inches  
Weeds: Cocb = Common cocklebur  

COMMENTS: Very heavy weed pressure. Excellent postemergence performance for several treatments in 1994. Regrowth or late flushes were not noted due to timing of the application and lack of favorable weather for additional germination. Yields were 20-30 bu/A higher for several treatments compared to the check for the 3-year period.

<table>
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<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Cocb 7/19/94</th>
<th>Yield bu/A</th>
<th>3-Yr Avg % Cocb</th>
<th>Yield bu/A</th>
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Table 3. Cocklebur/Soybean Demonstration continued...

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<th>% Cocb</th>
<th>Yield 7/19/94</th>
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LSD (.05) 10 12 11 8
Table 4. Herbicide Antagonism for Grass and Broadleaf Weeds/Soybeans

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<th>% Voco</th>
<th>Yield bu/A</th>
<th>% Voco</th>
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Purpose to identify antagonistic reactions from herbicides for broadleaf weeds when tank-mixed with postemergence herbicides for grass. Trends in 1994 and for 3-year average are similar. Antagonistic reactions noted (*) for early control; level of antagonism varied somewhat. Foxtail control was affected more than volunteer corn. Basagran was less antagonistic than other tank-mixes. Split application should be considered if conditions are such that an antagonistic reaction may result in unsatisfactory control.

3-Yr Avg.
### Table 4. Herbicide Antagonism/Soybeans continued...

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Yeft 7/3/94</th>
<th>% Voco 7/3/94</th>
<th>Yield bu/A</th>
<th>% Voco</th>
<th>% Gr</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusilade+Classic+ Pinnacle+X-77</td>
<td>0.094+.0039+</td>
<td>52*</td>
<td>88</td>
<td>63</td>
<td>93</td>
<td>56</td>
<td>31</td>
</tr>
<tr>
<td>Option II+Classic+ Pinnacle+X-77</td>
<td>0.059+.0039+</td>
<td>55*</td>
<td>92</td>
<td>59</td>
<td>93</td>
<td>74</td>
<td>41</td>
</tr>
<tr>
<td>Poast Plus+Classic+ Pinnacle+X-77</td>
<td>0.186+.0039+</td>
<td>78*</td>
<td>88*</td>
<td>73</td>
<td>87</td>
<td>87</td>
<td>44</td>
</tr>
<tr>
<td>Assure II+Pinnacle+ Classic+X-77</td>
<td>0.039+</td>
<td>61*</td>
<td>92</td>
<td>66</td>
<td>95</td>
<td>76</td>
<td>37</td>
</tr>
<tr>
<td>Select+Pinnacle+ Classic+X-77</td>
<td>0.094+.0039+</td>
<td>49*</td>
<td>87*</td>
<td>65</td>
<td>82</td>
<td>69</td>
<td>38</td>
</tr>
<tr>
<td>Fusion+Pinnacle+ Classic+X-77</td>
<td>0.125+.0039+</td>
<td>60*</td>
<td>89*</td>
<td>68</td>
<td>95</td>
<td>67</td>
<td>38</td>
</tr>
<tr>
<td>Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.063+</td>
<td>85</td>
<td>64</td>
<td>60</td>
<td>32</td>
<td>86</td>
<td>31</td>
</tr>
<tr>
<td>Fusilade+Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.094+.063+</td>
<td>77</td>
<td>73*</td>
<td>72</td>
<td>88</td>
<td>86</td>
<td>38</td>
</tr>
<tr>
<td>Option II+Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.059+.063+</td>
<td>73*</td>
<td>82*</td>
<td>74</td>
<td>89</td>
<td>85</td>
<td>46</td>
</tr>
<tr>
<td>Poast Plus+Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.188+.063+</td>
<td>85*</td>
<td>78*</td>
<td>73</td>
<td>78</td>
<td>86</td>
<td>35</td>
</tr>
<tr>
<td>Assure II+Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.039+.063+</td>
<td>67*</td>
<td>91</td>
<td>70</td>
<td>93</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>Select+Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.094+.063+</td>
<td>71*</td>
<td>82*</td>
<td>73</td>
<td>90</td>
<td>84</td>
<td>40</td>
</tr>
<tr>
<td>Fusion+Pursuit+ Sun-It II+28% N 1 qt+1 qt</td>
<td>0.125+.063+</td>
<td>80*</td>
<td>88*</td>
<td>70</td>
<td>94</td>
<td>87</td>
<td>37</td>
</tr>
</tbody>
</table>

LSD (.05) 8 6 8 6 79
Table 5. Herbicide Timing Foxtail - Soybeans

RCB; 6 reps
Planting Date: 5/19/94; Sturdy
PPI/PRE: 5/18/94
2 WEEKS: 6/2/94
3 WEEKS: 6/9/94
4 WEEKS: 6/17/94
5 WEEKS: 6/24/94
6 WEEKS: 6/29/94
SOIL: Silty clay; 3.9% OM; 7.9 pH

Precipitation: 1st week: 0.00 inches
2nd week: 0.29 inches

WEEDS: Grft = Green foxtail

COMMENTS: Significant weed pressure; treatment yields exceeded the check 20-30 bu/A. Very limited precipitation reduced performance for pre and preplant treatments. Yields were similar for early and later postemergence timings; reflecting favorable mid and late season conditions for crop response.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Grft 10-14 DAT</th>
<th>% Grft 7/18/94</th>
<th>% Grft 10/3/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td><strong>PREPLANT INCORPORATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Treflan</strong></td>
<td>.75</td>
<td>88</td>
<td>72</td>
<td>74</td>
<td>52</td>
</tr>
<tr>
<td><strong>PREPLANT INCORPORATED &amp; 3 WEEKS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treflan&amp;Poast Plus+ .75&amp;.25+ COC+28% N</td>
<td>97</td>
<td>95</td>
<td>93</td>
<td>96</td>
<td>69</td>
</tr>
<tr>
<td><strong>PREEMERGENCE</strong></td>
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<td></td>
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</tr>
<tr>
<td>Dual II</td>
<td>2.5</td>
<td>75</td>
<td>43</td>
<td>67</td>
<td>45</td>
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<td><strong>POSTEMERGENCE</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Poast Plus+COC+28% N .25+1.25%+2.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2 weeks)</td>
<td>95</td>
<td>82</td>
<td>85</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>(3 weeks)</td>
<td>93</td>
<td>90</td>
<td>96</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>(4 weeks)</td>
<td>87</td>
<td>93</td>
<td>95</td>
<td>64</td>
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<tr>
<td>(5 weeks)</td>
<td>86</td>
<td>90</td>
<td>95</td>
<td>68</td>
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</tr>
<tr>
<td>(6 weeks)</td>
<td>85</td>
<td>85</td>
<td>88</td>
<td>61</td>
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<td><strong>LSD (.05)</strong></td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>7</td>
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</tbody>
</table>
Table 6. Velvetleaf Control - Corn Demonstration

RCB; 2 reps  
Planting Date: 5/12/94;  
Pioneer 3417R  
SPPI/PPI: 5/11/94  
PRE: 5/12/94  
EPOS: 6/2/94  
POST: 6/9/94  
SOIL: Silty clay loam; 3.0% OM; 6.9 pH

Precipitation: 1st week: 0.36 inches  
2nd week: 0.00 inches  

WEEDS: Yeft = Yellow foxtail  
Vele = Velvetleaf

COMMENTS: Moderate, somewhat variable velvetleaf density. Limited precipitation following preemergence; heavy rain following postemergence treatments. Data are somewhat variable; those treatments with 90% control or greater were most consistent.

<table>
<thead>
<tr>
<th>Treatment Check</th>
<th>1b/A act.</th>
<th>% Yeft 7/18/94</th>
<th>% Vele 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PREPLANT INCORPORATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eradicane</td>
<td>6</td>
<td>84</td>
<td>65</td>
<td>164</td>
</tr>
<tr>
<td>Eradicane+atrazine</td>
<td>4+1</td>
<td>84</td>
<td>81</td>
<td>169</td>
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<tr>
<td>Pursuit+atrazine</td>
<td>.063+1</td>
<td>75</td>
<td>85</td>
<td>169</td>
</tr>
<tr>
<td>Atrazine</td>
<td>2</td>
<td>83</td>
<td>75</td>
<td>144</td>
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<tr>
<td><strong>SHALLOW PREPLANT INCORPORATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Broadstrike/Dual</td>
<td>1.92</td>
<td>71</td>
<td>86</td>
<td>147</td>
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<tr>
<td><strong>PREPLANT INCORPORATED &amp; EARLY POSTEMERGENCE</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eradicane&amp;atrazine+COC</td>
<td>4&amp;1+1 qt</td>
<td>95</td>
<td>97</td>
<td>153</td>
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<tr>
<td><strong>PREPLANT INCORPORATED &amp; POSTEMERGENCE</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Eradicane&amp;2,4-D amine</td>
<td>4&amp;.5</td>
<td>84</td>
<td>91</td>
<td>138</td>
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<tr>
<td>Eradicane&amp;Buctril+atrazine</td>
<td>4&amp;.38+.5</td>
<td>90</td>
<td>97</td>
<td>114</td>
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<td><strong>PREEMERGENCE</strong></td>
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<td></td>
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<tr>
<td>Extrazine II</td>
<td>4</td>
<td>78</td>
<td>73</td>
<td>139</td>
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<tr>
<td>Lasso+Bladex</td>
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<td>68</td>
<td>62</td>
<td>139</td>
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<tr>
<td>Dual II+atrazine</td>
<td>2+1</td>
<td>64</td>
<td>45</td>
<td>104</td>
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<tr>
<td>Dual II+atrazine</td>
<td>2+2</td>
<td>75</td>
<td>60</td>
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<tr>
<td>Lasso+Battalion</td>
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<td>76</td>
<td>105</td>
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<tr>
<td>Broadstrike/Dual</td>
<td>1.92</td>
<td>64</td>
<td>85</td>
<td>144</td>
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Table 6. Velvetleaf Control - Corn Demonstration continued

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Yelt 7/18/94</th>
<th>% Velt 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EARLY POSTEMERGENCE</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Prowl+atrazine</td>
<td>1.5+1</td>
<td>59</td>
<td>94</td>
<td>116</td>
</tr>
<tr>
<td>Atrazine+COC</td>
<td>1+1 qt</td>
<td>59</td>
<td>75</td>
<td>131</td>
</tr>
<tr>
<td>Tough+atrazine+COC</td>
<td>.9+1+1 qt</td>
<td>75</td>
<td>89</td>
<td>141</td>
</tr>
<tr>
<td>Atrazine+COC</td>
<td>2+1 qt</td>
<td>63</td>
<td>88</td>
<td>122</td>
</tr>
<tr>
<td>Bladex+X-77</td>
<td>2+.5%</td>
<td>65</td>
<td>69</td>
<td>132</td>
</tr>
<tr>
<td>Extrazine II+X-77</td>
<td>2+.5%</td>
<td>62</td>
<td>74</td>
<td>139</td>
</tr>
<tr>
<td><strong>PREEMERGENCE &amp; EARLY POSTEMERGENCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramrod&amp;Clarity</td>
<td>5&amp;.5</td>
<td>75</td>
<td>81</td>
<td>153</td>
</tr>
<tr>
<td>Ramrod&amp;Buctril+atrazine</td>
<td>5&amp;.38+.5</td>
<td>74</td>
<td>88</td>
<td>160</td>
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<tr>
<td>Ramrod&amp;Buctril+atrazine</td>
<td>5&amp;.38+1.5</td>
<td>73</td>
<td>90</td>
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<tr>
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<td>92</td>
<td>155</td>
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<td>5&amp;1.04+4 qt</td>
<td>72</td>
<td>82</td>
<td>142</td>
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<td>5&amp;.8125</td>
<td>71</td>
<td>79</td>
<td>139</td>
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<tr>
<td>Ramrod&amp;2,4-D amine</td>
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<td>71</td>
<td>73</td>
<td>129</td>
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<tr>
<td>Ramrod&amp;Buctril</td>
<td>5&amp;.38</td>
<td>72</td>
<td>81</td>
<td>145</td>
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<tr>
<td>Ramrod&amp;Beacon+X-77 28% N</td>
<td>5&amp;.036+.1+.25+4%</td>
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<td>70</td>
<td>166</td>
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<tr>
<td>Ramrod&amp;Peak+X-77</td>
<td>5&amp;.0267+.5%</td>
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<td>125</td>
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<tr>
<td>Ramrod&amp;Sencor+2,4-D amine</td>
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<td>90</td>
<td>137</td>
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<tr>
<td>Ramrod&amp;Permit+X-77</td>
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<td>90</td>
<td>133</td>
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<tr>
<td>Ramrod&amp;Beacon+Buctril+X-77</td>
<td>5&amp;.0178+.25+25%</td>
<td>81</td>
<td>92</td>
<td>158</td>
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<tr>
<td>Ramrod&amp;Resource+Banvel</td>
<td>5&amp;.0269+.25</td>
<td>71</td>
<td>88</td>
<td>124</td>
</tr>
<tr>
<td>Ramrod&amp;Sencor+Buctril</td>
<td>5&amp;.094+.25</td>
<td>60</td>
<td>91</td>
<td>142</td>
</tr>
<tr>
<td>Ramrod&amp;CGA-248757+COC</td>
<td>5&amp;.0045+1 qt</td>
<td>75</td>
<td>73</td>
<td>136</td>
</tr>
<tr>
<td>Ramrod&amp;Resource+atrazine+COC</td>
<td>5&amp;.0269+.5+1 qt</td>
<td>80</td>
<td>81</td>
<td>154</td>
</tr>
<tr>
<td><strong>PREEMERGENCE &amp; POSTEMERGENCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramrod&amp;Banvel</td>
<td>5&amp;.25</td>
<td>67</td>
<td>89</td>
<td>167</td>
</tr>
</tbody>
</table>

LSD (.05)

17  19  34
Table 7. Evaluation of Cocklebur Control - Corn

RCB: 3 reps  
Precipitation: 1st week: 0.36 inches  
Planting Date: 5/12/94; DK512  
2nd week: 0.00 inches  
SPPI/PPI: 5/11/94  
PRE: 5/12/94  
WEEDS: Grft = Green foxtail  
EPOS: 6/1/94  
Cocb = Cocklebur  
POST: 6/9/94  
SOIL: Loam; 2.9% OM; 6.5 pH  
COMMENTS: Heavy cocklebur; post applications 20 days after planting. All postemerge treatments provided excellent control; regrowth or late flushes were not apparent in this test. Considerable experiment variability for yield.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Grft 7/18/94</th>
<th>% Cocb 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PREEMERGENCE</strong></td>
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<tr>
<td>Check+Dual II</td>
<td>2.5</td>
<td>65</td>
<td>0</td>
<td>158</td>
</tr>
<tr>
<td><strong>SHALLOW PREPLANT INCORPORATED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dual II+Broadstrike Plus for Corn PPI/PRE</td>
<td>2.5+.17</td>
<td>74</td>
<td>85</td>
<td>204</td>
</tr>
<tr>
<td>Dual II+Broadstrike Plus for Corn PPI/PRE</td>
<td>2.5+.21</td>
<td>75</td>
<td>87</td>
<td>196</td>
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<td><strong>PREEMERGENCE</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Dual II+Broadstrike Plus for Corn PPI/PRE</td>
<td>2.5+.17</td>
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<td>86</td>
<td>174</td>
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<td>Dual II+Broadstrike Plus for Corn PPI/PRE</td>
<td>2.5+.21</td>
<td>66</td>
<td>92</td>
<td>184</td>
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<td></td>
<td></td>
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<tr>
<td>Dual II&amp;NAF-73+ X-77+28% N</td>
<td>2.5&amp;.21+ .25%+2.5%</td>
<td>66</td>
<td>97</td>
<td>193</td>
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<tr>
<td>Dual II&amp;Marksman</td>
<td>2.5&amp;1.4</td>
<td>71</td>
<td>97</td>
<td>200</td>
</tr>
<tr>
<td><strong>PREEMERGENCE &amp; POSTEMERGENCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dual II&amp;NAF-73+ X-77+28% N</td>
<td>2.5&amp;.21+ .25%+2.5%</td>
<td>65</td>
<td>98</td>
<td>169</td>
</tr>
<tr>
<td>Dual II&amp;Permit+X-77</td>
<td>2.5&amp;.0313+.25%</td>
<td>63</td>
<td>94</td>
<td>169</td>
</tr>
<tr>
<td>Dual II&amp;Peak+COC</td>
<td>2.5&amp;.0266+1 qt</td>
<td>61</td>
<td>97</td>
<td>164</td>
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<tr>
<td>Dual II&amp;Banvel</td>
<td>2.5&amp;.5</td>
<td>71</td>
<td>98</td>
<td>164</td>
</tr>
<tr>
<td>Dual II&amp;Buctril+atrazine</td>
<td>2.5&amp;.25+.5</td>
<td>75</td>
<td>98</td>
<td>191</td>
</tr>
<tr>
<td>Dual II&amp;Buctril</td>
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<tr>
<td>LSD (.05)</td>
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</table>
Table 8. Evaluation of Additives with Pursuit - Soybeans

RCB; 4 reps  
Precipitation: 1st week: 0.64 inches  
Planting Date: 5/24/94; Sturdy  
2nd week: 2.37 inches  
POST: 7/6/94  
SOIL: Clay; 3.3% OM; 7.2 pH  
WEEDS: Yeft = Yellow foxtail  
LST 700 = Tall waterhemp  
COMMENTS: Adjuvants are compared using a reduced (3 oz) rate of Pursuit. Weed size exceeded optimum so differences were enhanced. All adjuvants improved control compared to Pursuit alone; differences of 10-15% control were noted when comparing treatments.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Yeft 8/1/94</th>
<th>% Tawh 8/1/94</th>
<th>% VCCR 8/1/94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>.047</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pursuit (3 oz)+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sun-It II</td>
<td>1 qt</td>
<td>70</td>
<td>86</td>
<td>0</td>
</tr>
<tr>
<td>Sun-It II+28% N</td>
<td>1 qt + 1 qt</td>
<td>75</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>Sun-It II+AS</td>
<td>1 qt + 2%</td>
<td>76</td>
<td>83</td>
<td>0</td>
</tr>
<tr>
<td>Pursuit (4 oz)+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sun-It II+28% N</td>
<td>1 qt + 1 qt</td>
<td>80</td>
<td>86</td>
<td>0</td>
</tr>
<tr>
<td>Pursuit (3 oz)+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pen-A-Trap II+28% N</td>
<td>.25% + 1 qt</td>
<td>77</td>
<td>83</td>
<td>0</td>
</tr>
<tr>
<td>Century+28% N</td>
<td>.1% + 1 qt</td>
<td>73</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Dispatch</td>
<td>1.25 qt</td>
<td>68</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>Silwet L-77+28% N</td>
<td>.125% + 1 qt</td>
<td>69</td>
<td>67</td>
<td>0</td>
</tr>
<tr>
<td>Chaser+28% N</td>
<td>1 qt + 1 qt</td>
<td>72</td>
<td>84</td>
<td>0</td>
</tr>
<tr>
<td>Prime 011+28% N</td>
<td>1 qt + 1 qt</td>
<td>78</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Cayuse+28% N</td>
<td>.25% + 1 qt</td>
<td>59</td>
<td>71</td>
<td>0</td>
</tr>
<tr>
<td>Premier 90+28% N</td>
<td>.25% + 1 qt</td>
<td>78</td>
<td>79</td>
<td>0</td>
</tr>
<tr>
<td>Crop 011 Plus+28% N</td>
<td>1 qt + 1 qt</td>
<td>82</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>Spraybooster S+28% N</td>
<td>.25% + 1 qt</td>
<td>77</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>LI-700+28% N</td>
<td>.25% + 1 qt</td>
<td>63</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>Soy Wet+28% N</td>
<td>.25% + 1 qt</td>
<td>65</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>Herbimax+28% N</td>
<td>1 qt + 1 qt</td>
<td>75</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td>Dash+28% N</td>
<td>1 qt + 1 qt</td>
<td>82</td>
<td>87</td>
<td>15</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>6</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

100
Table 9. Evaluation of Preplant Incorporated Grass Herbicides - Corn

RCB; 4 reps
Planting Date: 5/11/94;
DeKalb 512
SPPI: 5/11/94
SOIL: Silty clay; 3.9% OM; 7.0 pH

Precipitation: 1st week: 0.36 inches
2nd week: 0.00 inches

WEEDS: Yeft = Yellow foxtail
Tawh = Tall waterhemp

COMMENTS: Foxtail density moderate. Limited precipitation after application. Variability within the test area reduced measureable differences in weed control; however treatments with the highest grass control produced higher yield than treatments with less than 75% foxtail control.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Grft 7/18/94</th>
<th>% Tawh 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>---</td>
<td>0</td>
<td>0</td>
<td>165</td>
</tr>
<tr>
<td>Eradicane 25G</td>
<td>4</td>
<td>80</td>
<td>60</td>
<td>204</td>
</tr>
<tr>
<td>Eradicane</td>
<td>4</td>
<td>83</td>
<td>66</td>
<td>225</td>
</tr>
<tr>
<td>Eradicane</td>
<td>5</td>
<td>74</td>
<td>65</td>
<td>223</td>
</tr>
<tr>
<td>Eradicane/Acetochlor</td>
<td>4</td>
<td>75</td>
<td>80</td>
<td>227</td>
</tr>
<tr>
<td>Eradicane/Acetochlor</td>
<td>5</td>
<td>77</td>
<td>74</td>
<td>217</td>
</tr>
<tr>
<td>Surpass</td>
<td>1.6</td>
<td>69</td>
<td>73</td>
<td>191</td>
</tr>
<tr>
<td>Surpass</td>
<td>2</td>
<td>68</td>
<td>71</td>
<td>192</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>14</td>
<td>16</td>
<td>20</td>
</tr>
</tbody>
</table>
Table 10. Evaluation of Foxtail Control in Corn

<table>
<thead>
<tr>
<th>Treatment</th>
<th>lb/A act.</th>
<th>% Grft 6/26/94</th>
<th>% Tawh 6/26/94</th>
<th>% Grft 7/18/94</th>
<th>% Tawh 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>157</td>
</tr>
<tr>
<td>POSTEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basis+X-77</td>
<td>.0117+.25%</td>
<td>90</td>
<td>95</td>
<td>80</td>
<td>93</td>
<td>188</td>
</tr>
<tr>
<td>PREEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dual II</td>
<td>2.5</td>
<td>67</td>
<td>49</td>
<td>62</td>
<td>48</td>
<td>166</td>
</tr>
<tr>
<td>Frontier</td>
<td>1.5</td>
<td>67</td>
<td>48</td>
<td>60</td>
<td>47</td>
<td>188</td>
</tr>
<tr>
<td>Surpass</td>
<td>2</td>
<td>73</td>
<td>85</td>
<td>64</td>
<td>83</td>
<td>185</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>

RCB; 6 reps
Planting Date: 5/12/94;
DeKalb 512
PRE: 5/12/94
POST: 6/9/94
SOIL: Silty clay; 3.3% OM; 7.2 pH

Precipitation: 1st week: 0.36 inches
2nd week: 0.00 inches

WEEDS:
Grft = Green foxtail
Tawh = Tall waterhemp

COMMENTS: Study was designed to be cultivated but due to wet conditions the cultivation was not completed. Evaluation of grass control with experimental postemerge herbicide (Basis). Initial foxtail and pigweed control was higher for the experimental treatment. Late ratings indicate some grass regrowth but it was not a yield factor. No crop response was noted for any treatment.
Table 11. Evaluation of Preemergence Herbicides in No-Till Corn

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Yeff 7/18/94</th>
<th>% KOCZ 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>96</td>
</tr>
<tr>
<td>Harness Plus</td>
<td>2.2</td>
<td>72</td>
<td>54</td>
<td>170</td>
</tr>
<tr>
<td>Harness Plus</td>
<td>2.6</td>
<td>79</td>
<td>73</td>
<td>169</td>
</tr>
<tr>
<td>Harness Plus+atrazine</td>
<td>1.75+1</td>
<td>82</td>
<td>92</td>
<td>172</td>
</tr>
<tr>
<td>Harness Plus+Bladex</td>
<td>1.75+1.5</td>
<td>74</td>
<td>84</td>
<td>173</td>
</tr>
<tr>
<td>MON-8412</td>
<td>3.15</td>
<td>82</td>
<td>89</td>
<td>162</td>
</tr>
<tr>
<td>Surpass</td>
<td>2.6</td>
<td>79</td>
<td>68</td>
<td>163</td>
</tr>
<tr>
<td>Dual II</td>
<td>2.5</td>
<td>85</td>
<td>44</td>
<td>160</td>
</tr>
<tr>
<td>Micro-Tech</td>
<td>3</td>
<td>80</td>
<td>54</td>
<td>159</td>
</tr>
<tr>
<td>Micro-Tech+atrazine</td>
<td>2.5+1</td>
<td>80</td>
<td>89</td>
<td>166</td>
</tr>
<tr>
<td>Micro-Tech+Bladex</td>
<td>2.5+1.5</td>
<td>82</td>
<td>86</td>
<td>175</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>9</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 12. Soybean Row Spacing with Chemical Rates

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Yeff 7/18/94</th>
<th>% KOCZ 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>96</td>
</tr>
<tr>
<td>Harness Plus</td>
<td>2.2</td>
<td>72</td>
<td>54</td>
<td>170</td>
</tr>
<tr>
<td>Harness Plus</td>
<td>2.6</td>
<td>79</td>
<td>73</td>
<td>169</td>
</tr>
<tr>
<td>Harness Plus+atrazine</td>
<td>1.75+1</td>
<td>82</td>
<td>92</td>
<td>172</td>
</tr>
<tr>
<td>Harness Plus+Bladex</td>
<td>1.75+1.5</td>
<td>74</td>
<td>84</td>
<td>173</td>
</tr>
<tr>
<td>MON-8412</td>
<td>3.15</td>
<td>82</td>
<td>89</td>
<td>162</td>
</tr>
<tr>
<td>Surpass</td>
<td>2.6</td>
<td>79</td>
<td>68</td>
<td>163</td>
</tr>
<tr>
<td>Dual II</td>
<td>2.5</td>
<td>85</td>
<td>44</td>
<td>160</td>
</tr>
<tr>
<td>Micro-Tech</td>
<td>3</td>
<td>80</td>
<td>54</td>
<td>159</td>
</tr>
<tr>
<td>Micro-Tech+atrazine</td>
<td>2.5+1</td>
<td>80</td>
<td>89</td>
<td>166</td>
</tr>
<tr>
<td>Micro-Tech+Bladex</td>
<td>2.5+1.5</td>
<td>82</td>
<td>86</td>
<td>175</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>9</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

Purpose to compare preemergence herbicides and combinations for grass and broadleaf control in no-till. Roundup at 1 qt was applied as a burndown. Triazine was required for broadleaf control. All treatments except two provided similar foxtail control. Yields were similar for all herbicides tested.

Purpose to evaluate performance of reduced and full rate herbicides in 30 inch and 7 inch row spacing. Herbicide treatment and rate were more important factors for weed control than row spacing. Foxtail control of at least 85% was required to produce yields in the top group. Full rates tended to perform best.
Table 12. Soybean Row Spacing with Chemical Rates continued.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Spacing</th>
<th>% Grft 7/19/94</th>
<th>% Bdlf 7/19/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check 30 inch</td>
<td>0</td>
<td>0</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Check Drilled</td>
<td>0</td>
<td>0</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>PREPLANT INCORPORATED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treflan 30 inch</td>
<td>0.5</td>
<td>80</td>
<td>77</td>
<td>47</td>
</tr>
<tr>
<td>Drilled .5</td>
<td>81</td>
<td>81</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Treflan 30 inch</td>
<td>1</td>
<td>87</td>
<td>94</td>
<td>54</td>
</tr>
<tr>
<td>Drilled 1</td>
<td>86</td>
<td>93</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Prowl+Pursuit</td>
<td>30 inch</td>
<td>0.5+.032</td>
<td>81</td>
<td>92</td>
</tr>
<tr>
<td>Drilled .5+.032</td>
<td>83</td>
<td>89</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>30 inch 1+.063</td>
<td>88</td>
<td>94</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Drilled 1+.063</td>
<td>90</td>
<td>93</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>PREEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lasso 30 inch</td>
<td>1.5</td>
<td>69</td>
<td>87</td>
<td>36</td>
</tr>
<tr>
<td>Drilled 1.5</td>
<td>69</td>
<td>85</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Lasso+Sen/Lex</td>
<td>30 inch</td>
<td>1+.25</td>
<td>76</td>
<td>87</td>
</tr>
<tr>
<td>Drilled 1+.25</td>
<td>74</td>
<td>88</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>POSTEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poast Plus+Pinnacle+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classic+X-77</td>
<td>30 inch</td>
<td>0.1+.002+</td>
<td>86</td>
<td>90</td>
</tr>
<tr>
<td>Drilled 0.1+.002+</td>
<td>88</td>
<td>91</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>30 inch .2+.0039+</td>
<td>90</td>
<td>95</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Drilled .2+.0039+</td>
<td>93</td>
<td>95</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Pursuit+X-77+28% N</td>
<td>30 inch</td>
<td>.032+.25%+3 qt</td>
<td>85</td>
<td>94</td>
</tr>
<tr>
<td>Drilled .032+.25%+3 qt</td>
<td>87</td>
<td>96</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>30 inch .063+.25%+3 qt</td>
<td>89</td>
<td>96</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Drilled .063+.25%+3 qt</td>
<td>93</td>
<td>97</td>
<td>63</td>
<td></td>
</tr>
</tbody>
</table>

LSD (.05) 7 8 11
Table 13. Postemergence Grass Control - Soybeans

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% VCRR 7/18/94</th>
<th>% Grft 7/18/94</th>
<th>% Rrpm 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td>Fusilade DX+COC</td>
<td>9</td>
<td>91</td>
<td>0</td>
<td>54</td>
</tr>
<tr>
<td>Fusion+COC</td>
<td>0</td>
<td>94</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Fusion+Basagran+COC</td>
<td>0</td>
<td>93</td>
<td>33</td>
<td>62</td>
</tr>
<tr>
<td>Fusion+Pinnacle+Classic+X-77</td>
<td>5</td>
<td>73</td>
<td>91</td>
<td>63</td>
</tr>
<tr>
<td>Fusilade DX+Pursuit+Sun-It II+28% N</td>
<td>5</td>
<td>79</td>
<td>94</td>
<td>66</td>
</tr>
<tr>
<td>Fusion+Pursuit+Sun-It II+28% N</td>
<td>10</td>
<td>80</td>
<td>95</td>
<td>67</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>
Table 14. Additives with Postemergence Herbicides - Soybeans

RCB; 4 reps
Planting Date: 5/19/94; Sturdy
POST: 6/11/94
SOIL: Silty clay; 3.3% OM; 6.4 pH

Precipitation: 1st week: 0.61 inches
2nd week: 1.65 inches

WEEDS: Grft = Green foxtail
Rrpw = Redroot pigweed

COMMENTS: Purpose to evaluate additives for postemergence herbicide programs. Reduced Pursuit rates resulted in unsatisfactory foxtail control. Weed control was generally similar for all additives; however Prime Oil caused serious crop injury.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>lb/A act.</th>
<th>% Grft 7/18/94</th>
<th>% Rrpw 7/18/94</th>
<th>% VCRR 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>Poast Plus+Galaxy+Silkin</td>
<td>.188+.92+.125%</td>
<td>88</td>
<td>95</td>
<td>4</td>
<td>59</td>
</tr>
<tr>
<td>Poast Plus+Galaxy+Kinetic</td>
<td>.188+.92+.125%</td>
<td>88</td>
<td>93</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>Poast Plus+Galaxy+Prime Oil</td>
<td>.188+.92+1 qt</td>
<td>78</td>
<td>90</td>
<td>55</td>
<td>11</td>
</tr>
<tr>
<td>Basagran+Pursuit+Meth Oil</td>
<td>.5+.031+.75 qt</td>
<td>55</td>
<td>95</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Basagran+Pursuit+Prime Oil</td>
<td>.5+.031+1 qt</td>
<td>44</td>
<td>95</td>
<td>58</td>
<td>5</td>
</tr>
<tr>
<td>Basagran+Pursuit+Sun-It II</td>
<td>.5+.031+.75 qt</td>
<td>53</td>
<td>95</td>
<td>5</td>
<td>46</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>13</td>
<td>4</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 15. Evaluation STS Soybeans and Cocklebur Control

RCB; 3 reps
Planting Date: 5/19/94;
Precipitation: 1st week: 1.65 inches
                        2nd week: 0.20 inches
OSR 190 STS
POST: 6/17/94
SOIL: Loam; 2.9% OM; 6.5 pH
WEEDS: Cocb = Cocklebur

COMMENTS: Herbicide resistant crop variety. Purpose to evaluate rates of Concert with additive types. No crop response differences were noted; all treatments produced yield greater than the check. 1.5 pt Poast Plus was applied to all treatments for grass control on 6/29/94.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% VCRR 6/26/94</th>
<th>% VCRR 7/18/94</th>
<th>% Cocb 7/18/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>----</td>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Concert+X-77+28% N</td>
<td>0.0078+.25%+4%</td>
<td>0</td>
<td>0</td>
<td>87</td>
</tr>
<tr>
<td>Concert+X-77+28% N</td>
<td>0.0104+.25%+4%</td>
<td>3</td>
<td>0</td>
<td>87</td>
</tr>
<tr>
<td>Concert+COC+28% N</td>
<td>0.0078+1%+4%</td>
<td>7</td>
<td>0</td>
<td>91</td>
</tr>
<tr>
<td>Concert+COC+28% N</td>
<td>0.0104+1%+4%</td>
<td>7</td>
<td>0</td>
<td>92</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td>13</td>
<td>0</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 16. Salvage Treatments for Large Cocklebur - Soybeans

RCB; 2 reps
Planting Date: 5/18/94; Sturdy
POST: 7/20/94
SOIL: Clay; 3.1% OM; 7.1 pH
WEEDS: Cocb = Cocklebur

COMMENTS: Experimental test. Purpose to evaluate potential for late salvage treatments for cocklebur. Application at weed bloom stage. Treatments with Pursuit, Classic, or combinations of Pursuit + Classic provided excellent control and reduced seed development considerably. Application to harvest intervals preclude the use of these treatments.
Table 16. Salvage Treatments for Large Cocklebur - Soybeans continued . . .

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Ib/A act.</th>
<th>Plants 2/14/94</th>
<th>Seed 2/14/94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scepter+X-77</td>
<td>.063(5.4 oz)+.25%</td>
<td>90</td>
<td>92</td>
</tr>
<tr>
<td>Pursuit+Sun-It II+28% N</td>
<td>.063(4 oz)+1 qt+1 qt</td>
<td>99</td>
<td>98</td>
</tr>
<tr>
<td>Pursuit+Sun-It II+28% N</td>
<td>.031(2 oz)+1 qt+1 qt</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>Pursuit+Classic+X-77+28% N</td>
<td>.063+.0052(1/3 oz)+ .125%+2 qt</td>
<td>98</td>
<td>97</td>
</tr>
<tr>
<td>Pursuit+Classic+X-77+28% N</td>
<td>.031+.0039(1/4 oz)+ .125%+2 qt</td>
<td>96</td>
<td>90</td>
</tr>
<tr>
<td>Pursuit+Pinnacle+X-77+28% N</td>
<td>.031+.0039+ .125%+2 qt</td>
<td>91</td>
<td>83</td>
</tr>
<tr>
<td>Pinnacle+Classic+X-77</td>
<td>.0039+.0052+.25%</td>
<td>91</td>
<td>81</td>
</tr>
<tr>
<td>Basagran+COC+28% N</td>
<td>1+1 qt+2 qt</td>
<td>45</td>
<td>33</td>
</tr>
<tr>
<td>Basagran+Classic+ X-77+28% N</td>
<td>1+.0039+ .25%+2 qt</td>
<td>59</td>
<td>40</td>
</tr>
<tr>
<td>Classic+X-77+28% N</td>
<td>.0117(3/4 oz)+ .25%+2 qt</td>
<td>96</td>
<td>94</td>
</tr>
<tr>
<td>Classic+X-77+28% N</td>
<td>.0078(1/2 oz)+ .25%+2 qt</td>
<td>81</td>
<td>72</td>
</tr>
<tr>
<td>Classic+X-77+28% N</td>
<td>.0039(1/4 oz)+ .25%+2 qt</td>
<td>73</td>
<td>75</td>
</tr>
<tr>
<td>2,4-DB</td>
<td>.2</td>
<td>58</td>
<td>45</td>
</tr>
<tr>
<td>Cobra+COC+28% N</td>
<td>.2+.5 qt+2 qt</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>
Table 17. Herbicide Evaluation - Soybean Injury

RCB; 4 reps
Precipitation: 1st week: 0.29 inches
Planting Date: 5/24/94; Sturdy
PRE: 5/24/94
POST: 6/17/94
BLOOM: 7/20/94
SOIL: Silty clay loam; 2.9% OM; 6.2 pH

COMMENTS: Purpose to evaluate crop injury from selected treatments. Banvel or 2,4-D as a "contaminant" with postemerge or 2,4-D amine or Banvel preemergence and bloom stage treatments reduced yield compared to the untreated check or other postemergence treatments. Weeds were not a factor in yield differences. The amine form of 2,4-D appeared to cause greater crop response than ester.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% VCRR 6/1/94</th>
<th>Yield bu/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PREEMERGENCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,4-D amine</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2,4-D ester</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Banvel</td>
<td>0.5</td>
<td>61</td>
</tr>
<tr>
<td><strong>POSTEMERGENCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basagran+COC+2,4-D ester</td>
<td>1+1 qt+.1</td>
<td>29</td>
</tr>
<tr>
<td>Basagran+COC+Banvel</td>
<td>1+1 qt+.05</td>
<td>56</td>
</tr>
<tr>
<td>Pursuit+COC+28% N</td>
<td>.063+1 qt+1 qt</td>
<td>5</td>
</tr>
<tr>
<td>Pursuit+Pinnacle+X-77+28% N</td>
<td>.047+.0039+.125%+4 qt</td>
<td>5</td>
</tr>
<tr>
<td>Pinnacle+Classic+X-77+28% N</td>
<td>.0039+.0052+.25%+4 qt</td>
<td>5</td>
</tr>
<tr>
<td><strong>BLOOM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pursuit+COC+28% N</td>
<td>.063+1 qt+1 qt</td>
<td>0</td>
</tr>
<tr>
<td>Pursuit+Pinnacle+X-77+28% N</td>
<td>.047+.0039+.125%+4 qt</td>
<td>3</td>
</tr>
<tr>
<td>Pinnacle+Classic+X-77+28% N</td>
<td>.0039+.0052+.25%+4 qt</td>
<td>3</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

LSD (.05)
**Table 18. Herbicide Rate/Carryover - Soybeans**

RCB; 4 reps  
Precipitation: 1st week: 0.29 inches  
Planting Date: 5/24/94; Sturdy  
2nd week: 1.05 inches  
PPI/PRE: 5/24/94  
POST: 6/7/94  
SOIL: Silty clay loam; 2.4% OM; 7.0 pH  

**COMMENTS:** Evaluate crop response to 3X normal use rates. Weeds were not a factor; untreated check was in highest yield group.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% VCRR 7/19/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>71/A oct.</td>
<td></td>
</tr>
<tr>
<td>PREPLANT INCORPORATED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treflan</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>Sonalan</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Prowl</td>
<td>3.75</td>
<td>29</td>
</tr>
<tr>
<td>Command</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Broadstrike/Trelan</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>PREEMERGENCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lasso</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Dual II</td>
<td>7.5</td>
<td>0</td>
</tr>
<tr>
<td>Frontier</td>
<td>4.5</td>
<td>0</td>
</tr>
<tr>
<td>Sencor</td>
<td>1.5</td>
<td>43</td>
</tr>
<tr>
<td>PREPLANT INCORPORATED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trelan+Scepter</td>
<td>.5+.38</td>
<td>5</td>
</tr>
<tr>
<td>Trelan+Pursuit</td>
<td>.5+.19</td>
<td>3</td>
</tr>
<tr>
<td>PREPLANT INCORPORATED &amp; POSTEMERGENCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trelan&amp;Classic+X-77</td>
<td>.5&amp;.0351+.25%</td>
<td>3</td>
</tr>
<tr>
<td>Trelan&amp;Pinnacle+X-77</td>
<td>.5&amp;.0117+.25%</td>
<td>3</td>
</tr>
<tr>
<td>Trelan&amp;Cobra+COC</td>
<td>.5&amp;.6+.5 qt</td>
<td>28</td>
</tr>
<tr>
<td>Trelan&amp;Blazer+X-77</td>
<td>.5&amp;1.125+.5%</td>
<td>5</td>
</tr>
<tr>
<td>Trelan&amp;Basagran+COC</td>
<td>.5&amp;3+1 qt</td>
<td>0</td>
</tr>
<tr>
<td><strong>LSD (.05)</strong></td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>
Table 19. Herbicide Rate/Carryover - Corn

RCB; 4 reps
Precipitation: 1st week: 0.29 inches
Planting Date: 5/24/94; DeKalb 462
PPI/PRE: 5/25/94
POST: 6/11/94
SOIL: Silty clay loam; 2.9% OM; 6.2 pH

COMMENTS: Evaluate crop response to 3X herbicide rates. Most treatments were in the top yield group; light weed pressure in untreated check; weeds were not a treatment factor.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% VCRR 7/18/94</th>
<th>Yield 1b/A act.</th>
<th>% VCRR</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>0</td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREPLANT INCORPORATED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eradicane</td>
<td>12</td>
<td>4</td>
<td>154</td>
<td></td>
</tr>
<tr>
<td>Atrazine</td>
<td>5</td>
<td>3</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Bladex</td>
<td>9</td>
<td>3</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>PREEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dual II</td>
<td>7.5</td>
<td>6</td>
<td>171</td>
<td></td>
</tr>
<tr>
<td>Surpass</td>
<td>7.5</td>
<td>5</td>
<td>159</td>
<td></td>
</tr>
<tr>
<td>Harness Plus</td>
<td>7.5</td>
<td>0</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Frontier</td>
<td>4.5</td>
<td>3</td>
<td>149</td>
<td></td>
</tr>
<tr>
<td>Broadstrike/Dual</td>
<td>6.5</td>
<td>5</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>Battalion</td>
<td>.225</td>
<td>0</td>
<td>157</td>
<td></td>
</tr>
<tr>
<td>POSTEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accent+COC+28% N</td>
<td>.094+.1%+4 qt</td>
<td>8</td>
<td>154</td>
<td></td>
</tr>
<tr>
<td>Beacon+X-77</td>
<td>.108+.25%</td>
<td>4</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>2,4-D amine</td>
<td>1.5</td>
<td>3</td>
<td>162</td>
<td></td>
</tr>
<tr>
<td>Banvel</td>
<td>1.5</td>
<td>26</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>Buctril</td>
<td>1.125</td>
<td>5</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>Permit+X-77</td>
<td>.192+.25%</td>
<td>8</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>CGA-152005+COC</td>
<td>.08+.1 qt</td>
<td>0</td>
<td>177</td>
<td></td>
</tr>
<tr>
<td>LSD (.05)</td>
<td></td>
<td></td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

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Table 20. Evaluation of Additives with Accent/Foxtail - Corn

RCB; 4 reps
Planting Date: 5/11/94; DeKalb 512
POST: 6/17/94
SOIL: Silty clay; 4.3% OM;
7.2 pH

Precipitation: 1st week: 1.65 inches
2nd week: 0.20 inches

WEEDS: Grft = Green foxtail

COMMENTS: Additives compared using reduced Accent (.5 oz) rate. Grasses larger than optimum stage for control. All additives improved control compared to Accent alone. Higher adjuvant rates did not improve results. Ammonium sulfate appeared superior to 28% N in this test. Scoil (MSO) tended to be superior to X-77 (surfactant) in this test.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>lb/A act.</th>
<th>% Grft 7/18/94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Accent+Scoil+28% N</td>
<td>0.0234+1%</td>
<td>62</td>
</tr>
<tr>
<td>Accent+X-77+28% N</td>
<td>0.0234+1%+2 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+COC+28% N</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+28% N</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+Scoil</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+Scoil+28% N</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+Scoil+AS</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+X-77+28% N</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+COC+28% N</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>Accent+28% N</td>
<td>0.0234+1%+4 qt</td>
<td>62</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td>0.0234+1%+2 %</td>
<td>62</td>
</tr>
</tbody>
</table>

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Table 21. Foxtail Removal Timing/No-Till Soybeans

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1b/A act.</th>
<th>% Grft 10-14 DAT</th>
<th>% Grft 7/26/94</th>
<th>% Grft 8/15/94</th>
<th>% Grft 10/4/94</th>
<th>Yield bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roundup+Check</td>
<td>.75</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>Roundup+Lasso</td>
<td>.75*2.5</td>
<td>82</td>
<td>59</td>
<td>76</td>
<td>82</td>
<td>42</td>
</tr>
<tr>
<td>PREEMERGENCE + 3 WEEKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roundup+Lasso&amp; Poast Plus+COC+</td>
<td>.75*2.5&amp;</td>
<td>95</td>
<td>93</td>
<td>97</td>
<td>96</td>
<td>49</td>
</tr>
<tr>
<td>28% N</td>
<td>2.5%</td>
<td>96</td>
<td>89</td>
<td>96</td>
<td>94</td>
<td>46</td>
</tr>
<tr>
<td>PREEMERGENCE + 2 WEEKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roundup&amp;Poast Plus+ COC+28% N</td>
<td>.75&amp;.25+</td>
<td>96</td>
<td>89</td>
<td>96</td>
<td>94</td>
<td>46</td>
</tr>
<tr>
<td>1.25%+2.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PREEMERGENCE &amp; POSTEMERGENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roundup&amp;Poast Plus+ COC+28% N</td>
<td>.75&amp;.25+</td>
<td>95</td>
<td>91</td>
<td>98</td>
<td>96</td>
<td>42</td>
</tr>
<tr>
<td>(PRE &amp; 2 weeks)</td>
<td></td>
<td>90</td>
<td>94</td>
<td>97</td>
<td>97</td>
<td>47</td>
</tr>
<tr>
<td>(PRE &amp; 3 weeks)</td>
<td></td>
<td>95</td>
<td>91</td>
<td>98</td>
<td>96</td>
<td>42</td>
</tr>
<tr>
<td>(PRE &amp; 4 weeks)</td>
<td></td>
<td>90</td>
<td>94</td>
<td>97</td>
<td>97</td>
<td>47</td>
</tr>
<tr>
<td>(PRE &amp; 5 weeks)</td>
<td></td>
<td>89</td>
<td>90</td>
<td>97</td>
<td>96</td>
<td>49</td>
</tr>
<tr>
<td>(PRE &amp; 6 weeks)</td>
<td></td>
<td>85</td>
<td>92</td>
<td>95</td>
<td>95</td>
<td>48</td>
</tr>
<tr>
<td>LSD (.05)</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

RCB: 6 reps
Precipitation: 1st week: 0.29 inches
2nd week: 1.05 inches
Planting Date: 5/24/94; Sturdy
PRE: 5/24/94
2 WEEKS: 6/9/94
3 WEEKS: 6/17/94
4 WEEKS: 6/24/94
5 WEEKS: 6/29/94
6 WEEKS: 7/6/94
SOIL: Silty clay; 3.5% OM; 6.5 pH

COMMENTS: Uniform site. Light grass density (11 plants/ft² check) following Roundup burndown at planting. Dandelion seedlings emerged in all plots. Foxtail control was very good to excellent for all postemerge timings. Yields for early and later timing of removal were similar; reflecting favorable mid and late season conditions for crop response. Regional Soybean Research Study.

Regional Soybean Research Study.
### Table 22. No-Till Corn Demonstration

<table>
<thead>
<tr>
<th>Demonstration</th>
<th>Precipitation: 1st week: 0.36 inches</th>
<th>Precipitation: 2nd week: 0.00 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting Date: 5/11/94;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIBA 4393 IMR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FALL: 11/1/93</td>
<td>WEEDS: Grft = Green foxtail</td>
<td></td>
</tr>
<tr>
<td>EPP: 4/19/94</td>
<td>Tawh = Tall waterhemp</td>
<td></td>
</tr>
<tr>
<td>PRE: 5/11/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POST: 6/1/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOIL: Silty clay loam; 3.2% OM; 6.6 pH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMENTS: All treatments received 1 pt Roundup + 1 pt 2,4-D ester except 16-19 (PRE's) on 4/19/94. Moderate weed pressure. EPP treatments were more consistent for grass control than fall treatments in 1994. Yield trends for the 3-year summary generally are associated with grass control.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 23. No-Till Soybeans in Stubble Demonstration

<table>
<thead>
<tr>
<th>Demonstration</th>
<th>Precipitation: 1st week: 0.36 inches</th>
<th>Precipitation: 2nd week: 0.00 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting Date: 5/18/94;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sturdy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FALL: 11/1/93</td>
<td>WEEDS: Grft = Green foxtail</td>
<td></td>
</tr>
<tr>
<td>EPP: 4/19/94</td>
<td>Tawh = Tall waterhemp</td>
<td></td>
</tr>
<tr>
<td>EPRE: 5/11/94</td>
<td>Mata = Marestail</td>
<td></td>
</tr>
<tr>
<td>PRE: 5/18/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POST: 6/9/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOIL: Silty clay loam; 3.2% OM; 6.6 pH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMENTS: All treatments except #14 received 1 pt Roundup + 1 pt 2,4-D ester on 4/19/94. Moderate tall waterhemp and green foxtail populations; light horseweed (marestail) pressure. EPP tank-mix or EPP-Pre split treatments provided excellent foxtail and pigweed control. Sencor/Lexone, Pinnacle and 2,4-D/Roundup burndown treatments were most effective for horseweed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 24. No-Till Soybeans in Corn Stalks Demonstration

<table>
<thead>
<tr>
<th>Demonstration Planting Date: 5/18/94; Sturdy</th>
<th>Precipitation: 1st week: 0.36 inches</th>
<th>2nd week: 0.00 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALL: 11/1/93</td>
<td>WEEDS: Grft = Green foxtail</td>
<td></td>
</tr>
<tr>
<td>EPP: 4/19/94</td>
<td>Tawh = Tall waterhemp</td>
<td></td>
</tr>
<tr>
<td>EPRE: 5/11/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE: 5/18/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POST: 6/9/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOIL: Silty clay loam; 3.2% OM; 6.6 pH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: All treatments received 1 pt Roundup and 1 pt 2,4-D ester on 4/19/94, except treatments 14, 15, 17, and 19 (EPRE's). Moderate weed populations. Foxtail control ranged from marginal to very good for several comparisons.

Table 25. Evaluation of Reduced Input Treatments for No-Till Soybeans

<table>
<thead>
<tr>
<th>RCB; 4 reps Planting Date: 5/24/94; Sturdy</th>
<th>Precipitation: 1st week: 0.00 inches</th>
<th>2nd week: 0.29 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALL: 11/1/93</td>
<td>WEEDS: Yeft = Yellow foxtail</td>
<td></td>
</tr>
<tr>
<td>EPP: 4/20/94</td>
<td>Bd1f =</td>
<td></td>
</tr>
<tr>
<td>EPRE: 5/18/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE: 5/24/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POST: 6/9/94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOIL: Silty clay loam; 3.2% OM; 6.6 pH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: All treatments including check received 1 pt Roundup + 2,4-D ester on 4/20/94. Plot area maintained at low weed density the previous season. Treatments included represent lower cost programs and/or reduced rates for several herbicides. Three split treatments provided at least 95% control of grasses and broadleaves; most single lower-cost or single reduced rate products were less effective. Data applies to established no-till production with reduced weed pressure.
Table 22. No-Till Corn Demonstration

<table>
<thead>
<tr>
<th>Fall</th>
<th>Early Preplant</th>
<th>Preemergence</th>
<th>Postemergence</th>
<th>% Graft 7/3/94</th>
<th>% Tassh 7/3/94</th>
<th>% Grt 3-Year Average</th>
<th>Yld Bu/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrazine(2)</td>
<td>Atrazine(1)+Dual(2.5)</td>
<td>Dual II(2.75)</td>
<td>Dual II(2.75)</td>
<td>66</td>
<td>90</td>
<td>79</td>
<td>93</td>
</tr>
<tr>
<td>Atrazine(1)</td>
<td>Atrazine(1)+Dual II(2.75)</td>
<td>Dual II(2.75)</td>
<td>Dual II(2.75)</td>
<td>89</td>
<td>98</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>Atrazine(1)+Micro-tech(3.25)</td>
<td>Atrazine(1)+Frontier 1.5(1.6 pt)</td>
<td>Atrazine(1)+Surpass 2.4(3 pt)</td>
<td>Atrazine(1)+Harness Plus 2.4(2.75 pt)</td>
<td>85</td>
<td>98</td>
<td>89</td>
<td>99</td>
</tr>
<tr>
<td>Atrazine(1)+Frontier 1.5(1.6 pt)</td>
<td>Atrazine(1)+Surpass 2.4(3 pt)</td>
<td>Atrazine(1)+Harness Plus 2.4(2.75 pt)</td>
<td>Atrazine(1)+Prowl(1.5)</td>
<td>94</td>
<td>98</td>
<td>93</td>
<td>99</td>
</tr>
<tr>
<td>Atrazine(1)</td>
<td>Atrazine(1)+Dual II(2.75)</td>
<td>Dual II(2.75)</td>
<td>Dual II(2.75)</td>
<td>88</td>
<td>95</td>
<td>91</td>
<td>98</td>
</tr>
<tr>
<td>Atrazine(.5)+Bladex(1.5)</td>
<td>Atrazine(.5)+Bladex(.75)+Dual(1.25)</td>
<td>Atrazine(.5)+Bladex(.75)+Dual(1.25)</td>
<td>Atrazine(.5)+Bladex(.75)+Dual(1.25)</td>
<td>99</td>
<td>99</td>
<td>98</td>
<td>99</td>
</tr>
<tr>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(.5)+Bladex(1.5)+Dual(1.25)</td>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(.5)+Bladex(1.5)+Dual(1.25)</td>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(.5)+Bladex(1.5)+Dual(1.25)</td>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(.5)+Bladex(1.5)+Dual(1.25)</td>
<td>98</td>
<td>99</td>
<td>98</td>
<td>99</td>
</tr>
<tr>
<td>Atrazine(.5)+Bladex(1.5)+COC(1 qt)</td>
<td>Atrazine(.5)+Bladex(1.5)+COC(1 qt)</td>
<td>Atrazine(.5)+Bladex(1.5)+COC(1 qt)</td>
<td>Atrazine(.5)+Bladex(1.5)+COC(1 qt)</td>
<td>99</td>
<td>98</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(1.5)+Micro-tech(2.5)</td>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(1.5)+Micro-tech(2.5)</td>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(1.5)+Micro-tech(2.5)</td>
<td>Gramoxone(.5)+X-77(.5%)+Atrazine(1.5)+Micro-tech(2.5)</td>
<td>89</td>
<td>95</td>
<td>94</td>
<td>97</td>
</tr>
<tr>
<td>Accent .03(2/3 oz)+X-77(.25%)+Micro N(4%)+Banvel(25)</td>
<td>Accent .03(2/3 oz)+X-77(.25%)+Micro N(4%)+Banvel(25)</td>
<td>Accent .03(2/3 oz)+X-77(.25%)+Micro N(4%)+Banvel(25)</td>
<td>Accent .03(2/3 oz)+X-77(.25%)+Micro N(4%)+Banvel(25)</td>
<td>85</td>
<td>92</td>
<td>88</td>
<td>96</td>
</tr>
</tbody>
</table>

LSD (.05)
Table 23. No-Till Soybeans in Stubble Demonstration

<table>
<thead>
<tr>
<th>FALL</th>
<th>EARLY PREPLANT</th>
<th>PREEMERGENCE</th>
<th>PREEMERGENCE</th>
<th>POSTEMERGENCE 7/3/94</th>
<th>% Gilt</th>
<th>% Tand</th>
<th>% Nate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursuit (.063)+(4 oz)+Prowl(1.5)</td>
<td>Pursuit (.063)+Prowl (.875)</td>
<td>Pursuit (.063)</td>
<td>Previl (.42)+(Dual(2.5))</td>
<td>92</td>
<td>91</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Preview (.42)+(Dual(2.5))</td>
<td>Pursuit (.063)+(Prowl (.875))</td>
<td>Pursuit (.063)</td>
<td>Previl (.42)+(Dual(2.5))</td>
<td>85</td>
<td>88</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Pursuit (.063)</td>
<td>Preview (.42)+(Dual(2.5))</td>
<td>Pursuit (.063)</td>
<td>Previl (.42)+(Dual(2.5))</td>
<td>63</td>
<td>80</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Dual (1)</td>
<td>Preview (.42)+(Dual(2.5))</td>
<td>Pursuit (.063)</td>
<td>Previl (.42)+(Dual(2.5))</td>
<td>79</td>
<td>97</td>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EARLY PREPLANT</th>
<th>PREEMERGENCE</th>
<th>PREEMERGENCE</th>
<th>POSTEMERGENCE 7/3/94</th>
<th>% Gilt</th>
<th>% Tand</th>
<th>% Nate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pursuit (.032)+(Dual (2.5))</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+(Sun-It II</td>
<td>96</td>
<td>96</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Prowl (1.5)+Pursuit (.032)</td>
<td></td>
<td>(1 qt)+28% N(1 qt)</td>
<td>93</td>
<td>98</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Preview (.42)+(Dual (2.5))</td>
<td></td>
<td>Pinnacle (.063)+(1/4 oz)+</td>
<td>98</td>
<td>99</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Pursuit (.063)+Prowl (1.5)</td>
<td></td>
<td>Pursuit (.032)+(Sun-It II</td>
<td>99</td>
<td>98</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Dual (2.5)+Pursuit (.063)</td>
<td></td>
<td>(1 qt)+28% N(1 qt)</td>
<td>99</td>
<td>98</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Broadstrike+Dual (2.5)+Pursuit (1.6)</td>
<td>Pursuit (.063)</td>
<td>Sen/Lex (.33)</td>
<td>89</td>
<td>94</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Pursuit (.063)+(Sun-It II</td>
<td>Pursuit (.063)+(Sun-It II</td>
<td>95</td>
<td>97</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1 qt)+28% N(1 qt)</td>
<td>(1 qt)+28% N(1 qt)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pursuit (.032)+(Dual (2.5))</td>
<td>Pursuit (.032)+(Dual (2.5))</td>
<td>Pursuit (.063)+(Sun-It II</td>
<td>95</td>
<td>97</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Roundup (.18 (8 oz)+AS+2,4-0</td>
<td>Pursuit (.063)+(Sun-It II</td>
<td>92</td>
<td>98</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES (.25)+X-77 (.5%)</td>
<td>(1 qt)+28% N(1 qt)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pursuit (.032)+(Dual (2.5))</td>
<td>Pursuit (.032)+(Dual (2.5))</td>
<td>Pursuit (.063)+(Sun-It II</td>
<td>94</td>
<td>93</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Pursuit (.032)</td>
<td>Pursuit (.032)+(Sun-It II</td>
<td>(1 qt)+28% N(1 qt)</td>
<td>96</td>
<td>93</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Dual (1)</td>
<td>Pursuit (.032)+(Sun-It II</td>
<td>(1 qt)+28% N(1 qt)</td>
<td>96</td>
<td>90</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Dual (1)</td>
<td>Pursuit (.032)+(Sun-It II</td>
<td>(1 qt)+28% N(1 qt)</td>
<td>96</td>
<td>84</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Dual (1)</td>
<td>Pursuit (.032)+(Sun-It II</td>
<td>(1 qt)+28% N(1 qt)</td>
<td>96</td>
<td>84</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>FALL</td>
<td>EARLY PREPLANT</td>
<td>PREEMERGENCE</td>
<td>POSTEMERGENCE</td>
<td>% DRIF</td>
<td>% FISH</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>--------------</td>
<td>---------------</td>
<td>--------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Pursuit (.063)+Prowl (.075)</td>
<td>Command (1)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>Pursuit (.032)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>91</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Command (1)</td>
<td>Pursuit (.063)+Prowl (.075)</td>
<td>Prowl (1.5)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>91</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Command (1)+Sen/Lex (.5)</td>
<td>Pursuit (1.5)+Prowl (.075)</td>
<td>Prowl (1.5)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>91</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Command (1)</td>
<td>Frontier 1.5 (1.6 pt)+Sen/Lex (38)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)+Sen/Lex (.5)</td>
<td>Dual II (1.5)+Sen/Lex (38)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)</td>
<td>Prowl (1.5)+Sen/Lex (38)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)</td>
<td>Micro-tech (3)+Sen/Lex (38)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)+Sen/Lex (.5)</td>
<td>Roundup .38 (1 pt)+AS (2%)+X-77 (.5%)+Micro-tech (3)+Sen/Lex (.5)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)+Sen/Lex (.5)</td>
<td>GFXLX-.78 (.5%)+Roundup (2.5)+Sen/Lex (.38)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)+Sen/Lex (.5)</td>
<td>Roundup .38 (1 pt)+AS (2%)+X-77 (.5%)+Micro-tech (3)+Sen/Lex (.5)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Command (1)+Sen/Lex (.5)</td>
<td>GFXLX-.78 (.5%)+Roundup (2.5)+Sen/Lex (.38)</td>
<td>Sen/Lex (.33)</td>
<td>Pursuit (.063)+Sun-It II (1 qt)+28% N (1 qt)</td>
<td>93</td>
<td>93</td>
<td></td>
</tr>
</tbody>
</table>
Table 25. Evaluation of Reduce Input Treatments for No-Till Soybeans

<table>
<thead>
<tr>
<th>FALL</th>
<th>EARLY PREPLANT</th>
<th>EARLY PREEMERGENCE</th>
<th>POSTEMERGENCE</th>
<th>7/19/94</th>
<th>% Yeld</th>
<th>% Blnd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>Prowl 1.5(3.64 pt)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>62</td>
<td>95</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prowl .875(2.12 pt)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>68</td>
<td>90</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pursuit(4 oz)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>86</td>
<td>87</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Dual 11(1.25)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>97</td>
<td>96</td>
<td>84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micro-tack (1.5)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>83</td>
<td>89</td>
<td>85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pursuit (.032)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command (.5)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>85</td>
<td>91</td>
<td>91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadstrike/Dual 1.2(1.25 pt)</td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>84</td>
<td>94</td>
<td>84</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pursuit (.032) + Sun-It II (1 qt) + 28% N (1 qt)</td>
<td>89</td>
<td>94</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSD (.05)</td>
<td>1314</td>
<td>1314</td>
<td>1314</td>
<td>1314</td>
<td>1314</td>
<td>1314</td>
</tr>
</tbody>
</table>
EFFECT OF A YEAST CULTURE PRODUCT (YEA-SACC) ON
FEEDLOT PERFORMANCE OF GROWING CALVES LIMIT-FED
A HIGH CONCENTRATE DIET

C. P. Birkelo and B. Rops

Animal/Range Sciences 94-20

Summary

Eighty weaned steer calves (initial weight 535 lb) were blocked by
weight, allotted within block to 8 pens and limit-fed a high concentrate
diet without (CONT) or with Yea-Sacc (YS; 13 g per day). The diet
consisted of 69% whole, high moisture corn, 20% ground alfalfa hay, 2%
molasses, and 9% supplement (dry matter basis). The diet was fed once
daily for an average of 99 days in amounts calculated to result in CONT
calf daily gain of 2.25 lb. As intended, dry matter intakes of calves on
the two treatments were identical (13.3 lb/day). Daily gains averaged 2.40
and 2.32 lb (P>.20) and feed efficiency 5.55 and 5.73 (P>.20) for CONT and
YS, respectively. YS did not improve gain or feed efficiency of growing
calves limit-fed a high concentrate diet.

Key Words: Yeast Culture Product, Performance, Limit-fed, Grain Diet

Introduction

Many direct-fed microbial products have been introduced into the market
place over the past decade. Although evidence for a positive effect on
animal performance has existed for many years, adoption has been slow.
This is probably due to the lack of performance data indicating in which
specific production situations the various products are or are not
effective. A previous study at SDSU indicated that the feeding of a yeast
strain specifically selected to compliment high grain diets (Yea-Sacc,
Alltech, Inc., USA) was effective in improving daily gain of yearling
steers.

The objective of this study was to determine if this same yeast strain
could positively affect feedlot performance of growing calves limit-fed a
high concentrate (20% roughage) diet.

Materials and Methods

A group of 89 weaned, crossbred steer calves were vaccinated (IBR, BVD,
BRGV, Lepto, and 7-way clostridium), dewormed (ivermectin\textsuperscript{1}), implanted
(zeranol\textsuperscript{1}), ear tagged, and weighed upon arrival at the Southeast

\textsuperscript{1}Associate Professor.
\textsuperscript{2}Southeast Experiment Farm, Beresford.
\textsuperscript{3}Ivomec, MSD AGVET. Rahway, NY, 90965.
\textsuperscript{4}Ralgro, Mallinckrodt Veterinary, Inc., Mundelein, IL, 60060.

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South Dakota Research Farm feedlot. From these, 80 calves were selected and placed immediately on test. They were randomly allotted within weight block to pens (8 pens, 10 head each) and fed a common test diet (Table 1) without (CONT) or with Yea-Sacc (YS). Grass hay was fed only on the first day. The test diet was initially fed at an average of 7 lb of dry matter per day and this was increased to 12 lb by day 12. Feed offered was increased weekly thereafter by an amount calculated to maintain CONT calf daily gain at 2.25 lb per day. The YS calves were fed the same amounts within weight block as the CONT calves. Feed was offered once daily and, because the amount was considerably below ad libitum intake, was usually consumed within 3.5 hours of feeding. The bunks were empty for the remainder of the day. Yea-Sacc was fed as part of a pelleted supplement. Yea-Sacc intake averaged 17 g per day during the initial 12 days of the test and 13 g for the remainder.

On-test weights were taken upon arrival at the feedlot but before feeding. Final weights were taken after overnight removal of feed and water. The calves in the heavy weight block were fed 85 days while those in the light weight block were fed 112 days. The data were statistically analyzed on a pen basis as a complete block design.

Results and Discussion

Performance data are presented in Table 2. As intended, dry matter intakes of the calves on both test diets were identical. Daily gains for the CONT calves, while 6.7% greater than predicted, were not different from those of YS calves (P>.20). As a result, feed efficiencies were not affected by treatment (P>.20).

In this study, YS did not improve performance of growing calves limited fed a high concentrate diet.
Table 1. Composition of the limit-fed, high concentrate growing diet (dry matter basis)*

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>High moisture whole corn</td>
<td>69.00</td>
</tr>
<tr>
<td>Ground alfalfa hay</td>
<td>20.00</td>
</tr>
<tr>
<td>Supplement</td>
<td></td>
</tr>
<tr>
<td>Soybean meal</td>
<td>4.92</td>
</tr>
<tr>
<td>Molasses</td>
<td>2.00</td>
</tr>
<tr>
<td>Urea</td>
<td>1.00</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>0.70</td>
</tr>
<tr>
<td>Limestone</td>
<td>0.80</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>0.50</td>
</tr>
<tr>
<td>Trace mineral salt</td>
<td>0.67</td>
</tr>
<tr>
<td>Fat</td>
<td>0.10</td>
</tr>
<tr>
<td>Premix*</td>
<td>0.31</td>
</tr>
</tbody>
</table>

*Formulated to contain 14.8% crude protein, .76% Ca, .47% P and 1.03% K.

*Provided 222 mg Rumensin and 62,000 IU supplemental vitamin A per day. Supplement was pelleted.

Yea-Sacc was included at 1 g/lb of diet dry matter for treated calves.

Table 2. Feedlot performance of steer calves limit-fed a high concentrate diet with or without Yea-Sacc

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>Yea-Sacc</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of steers</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Initial wt, lb</td>
<td>535</td>
<td>536</td>
<td>7.2</td>
</tr>
<tr>
<td>Dry matter intake, lb/day</td>
<td>13.3</td>
<td>13.3</td>
<td>--</td>
</tr>
<tr>
<td>Wt gain, lb/day</td>
<td>2.40</td>
<td>2.32</td>
<td>.079</td>
</tr>
<tr>
<td>Feed:gain</td>
<td>5.55</td>
<td>5.73</td>
<td>.138</td>
</tr>
</tbody>
</table>

*Intake fixed within weight block at level calculated to allow 2.25 lb daily gain by the control calves.
GROUND VERSUS UNGROUND
AMMONIATED OAT HULLS
FOR GROWING CALVES

C. P. Birkelo¹ and B. Rops²

Animal and Range Sciences 94-21

Summary

One hundred forty-four steer calves were fed growing diets that contained either 1) 50% ground alfalfa hay (ALF), 2) 25% ground alfalfa hay and 25% ground, ammoniated oat hulls (ALF/GOH), 3) 50% ground, ammoniated oat hulls (GOH) or 4) 50% unground, ammoniated oat hulls (UGOH). Oat hulls were treated with ammonia at 3.3% by weight and enough water to raise the moisture content to approximately 20%. They were allowed to react for 32 days prior to feeding. Daily gains were greater for calves consuming the ammoniated oat hull diets, regardless of form (P<.10). Daily gain differences occurred in spite of the fact that dry matter intake was lower for GOH-fed calves than for the others (P<.10). As a result, feed efficiency was better for the GOH diet than ALF and ALF/GOH (P<.10) but did not differ from UGOH (P>.10). Ammoniated oat hulls, whether ground or unground, are a viable substitute for more conventional roughages in feedlot growing diets.

Key Words: Oat hulls, Ammoniation, Growing diets

Introduction

Oats have been an important crop in South Dakota for many years. Oat hulls are a by-product of oat processing. Previous research at SOSU demonstrated that ammoniated, unground oat hulls have a feed energy value at least 20% greater than that of brome hay in calf growing diets. Unground oat hulls were used in the earlier work because of their larger particle size and decreased dustiness compared to ground hulls. However, ground oat hulls are usually less expensive, in large part due to lower handling and freight costs.

The objective of this study was to determine if, and to what extent, ground, ammoniated oat hulls could replace unground, ammoniated oat hulls in growing calf diets.

Materials and Methods

¹Associate Professor.

²Southeast Farm, Beresford, SD.
Ground and unground oat hulls were purchased and treated as in previous work at this facility. Briefly, the oat hulls were mixed in a mixer wagon with enough water to bring the moisture content up to approximately 20% and then piled on bare ground. The piles were covered with 6-mil plastic and sealed around the edges. Plastic tubing under the pile was used to inject anhydrous ammonia (3.3% of the weight of the oat hulls) at two sites in each pile. The oat hulls, ammonia and water were allowed to react for 32 days prior to feeding.

One hundred forty-four steer calves with an average initial weight of 606 lb were vaccinated (IBR, BVD, BRSV, Lepto and 7-way clostridium), dewormed (Ivermectin\textsuperscript{3}), implanted (Synovex-S\textsuperscript{4}) and ear tagged shortly after arrival at the feedlot. The calves were blocked by source and allotted within block to pens (9 head per pen, 4 pens per treatment) and fed diets containing either 1) 50% ground alfalfa hay (ALF), 2) 25% ground alfalfa hay and 25% ground, ammoniated oat hulls (ALF/GOH), 3) 50% ground, ammoniated oat hulls (GOH) or 4) 50% unground, ammoniated oat hulls (UGOH). The balance of the diets consisted of rolled corn, molasses and supplement. Diet compositions are presented in Table 1.

### Table 1. Test diet compositions (dry matter basis)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>ALF</th>
<th>ALF/GOH</th>
<th>GOH</th>
<th>UGOH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rolled corn</td>
<td>45.04</td>
<td>37.62</td>
<td>29.32</td>
<td>29.32</td>
</tr>
<tr>
<td>Molasses</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Alfalfa hay</td>
<td>50.00</td>
<td>25.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unground NH\textsubscript{3} oat hulls</td>
<td></td>
<td></td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>Ground NH\textsubscript{3} oat hulls</td>
<td>25.00</td>
<td>50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybean meal</td>
<td>7.00</td>
<td>14.50</td>
<td>14.50</td>
<td></td>
</tr>
<tr>
<td>Limestone</td>
<td>.35</td>
<td>.35</td>
<td>.35</td>
<td>.35</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>.30</td>
<td>.35</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Trace mineral salt</td>
<td>.50</td>
<td>.50</td>
<td>.50</td>
<td>.50</td>
</tr>
<tr>
<td>Premix\textsuperscript{a}</td>
<td>.16</td>
<td>.18</td>
<td>.33</td>
<td>.33</td>
</tr>
</tbody>
</table>

### Analysis

<table>
<thead>
<tr>
<th></th>
<th>ALF</th>
<th>ALF/GOH</th>
<th>GOH</th>
<th>UGOH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>84.1</td>
<td>83.4</td>
<td>82.8</td>
<td>80.5</td>
</tr>
<tr>
<td>Crude protein</td>
<td>11.3</td>
<td>14.5</td>
<td>16.2</td>
<td>16.1</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Provided 190 mg Rumensin and 52,000 IU vitamin A per day.

\textsuperscript{3}IVOMEC, MSD Agvet, Rahway, NJ, 07065.

\textsuperscript{4}Syntex Animal Health, Des Moines, IA, 50303.
Initial and final weights were taken after overnight removal of feed and water. The calves were fed for 79 days. Pen data were analyzed in a manner appropriate for a randomized complete block design.

Results and Discussion

Two injection sites were used for ammonia application in each approximately 20-ton pile. This appeared to be quite effective for the unground oat hulls, as the degree of treatment was fairly even throughout the pile. However, there was considerable variation in the ground oat hulls, apparently due to the fact that they became rather tightly packed as the pile settled which, in turn, could have reduced the distance the ammonia could migrate. Crude protein content of the unground oat hulls was fairly consistent and averaged 12.5% while that of the unground hulls averaged 12.9% but ranged from 6.0% to 17.1%.

The diets were originally formulated to contain 12% crude protein from natural sources (i.e., from feeds rather than ammonia or urea) for the purpose of finding treatment differences that were the result of digestibility and intake rather than crude protein source. Oat hull diets would otherwise not need such levels of soybean meal. Diet crude protein levels were somewhat lower than this due to the lower crude protein of the light test weight corn prevalent at the time of the study (8.4% of dry matter). However, they were still in excess of expected requirements and likely did not affect the results of the study.

Daily gains were almost .3 lb/day greater for calves consuming the ammoniated oat hull diets than those consuming the ground alfalfa hay-based diet, regardless of form of the oat hulls (P<.10; Table 2). Daily gain differences occurred in spite of the fact that dry matter intake was lower for GOH-fed calves than for the others (P<.10). As a result, feed efficiency was better for the GOH diet than ALF and ALF/GOH (P<.10) but did not differ from UGOH (P>.10). Based on cattle performance and published values, NE₉ and NE₉ estimates for the ground and unground ammoniated oat hulls are 73.5 and 47.4 Mcal and 59.7 and 37.0 Mcal/cwt dry matter, respectively. These are in good agreement with previously reported estimates and at least 20% greater than the medium quality alfalfa used in this study (average 17.7% crude protein).
Table 2. Performance data for steers fed growing diets containing either alfalfa hay (ALF), alfalfa and ground, ammoniated oat hulls (ALF/GOH), ground, ammoniated oat hulls (GOH) or unground, ammoniated oat hulls (UGOH)

<table>
<thead>
<tr>
<th>Item</th>
<th>ALF</th>
<th>ALF/GOH</th>
<th>GOH</th>
<th>UGOH</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of steers</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Initial wt, lb</td>
<td>605</td>
<td>611</td>
<td>602</td>
<td>605</td>
<td>3.4</td>
</tr>
<tr>
<td>Final wt, lb</td>
<td>805</td>
<td>832</td>
<td>823</td>
<td>827</td>
<td>7.5</td>
</tr>
<tr>
<td>Wt gain, lb/day</td>
<td>2.53&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.80&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.80&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.81&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.083</td>
</tr>
<tr>
<td>Dry matter intake, lb/day</td>
<td>19.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>17.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>19.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.66</td>
</tr>
<tr>
<td>Feed:gain</td>
<td>7.59&lt;sup&gt;a&lt;/sup&gt;</td>
<td>7.21&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.23&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.88&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>.319</td>
</tr>
</tbody>
</table>

<sup>a,b</sup> Means with different superscripts differ (P<.10).

In conclusion, ammoniated oat hulls, whether ground or unground, are a viable substitute for more conventional roughages in feedlot growing diets. However, ammonia application technique may have to be altered for ground oat hulls. Also, if ground hay is to be included in a GOH diet to improve intake, it should be at less than 25%.
EFFECT OF A YEAST CULTURE PRODUCT (YEA-SACC) ON FEEDLOT
PERFORMANCE OF YEARLING CATTLE SELF-FED AN
ALL CONCENTRATE FINISHING DIET

C. P. Birkelo\textsuperscript{1} and B. Rops\textsuperscript{2}

\textbf{Summary}

Seventy-two yearling steers (initial weight 793 lb) were allotted to 8 pens and self-fed a finishing diet consisting of 91% whole shelled corn and 9% pelleted supplement without or with Yea-Sacc (11 g per day). Feed was provided to each pen approximately every 3 days in amounts necessary to provide constant access during the 109-day trial. No treatment differences were detected for any of the feedlot performance or carcass characteristics measured. The occurrence of acidosis was high in both treatments as evidenced by the higher percentage of abscessed livers (40%). The feeding of Yea-Sacc did not have any beneficial effect in these circumstances.

Key Words: Yeast, Steers, Feedlot performance, Carcass traits

\textbf{Introduction}

Many direct-fed microbial products have been introduced into the market place over the past decade. Although evidence for a positive effect on animal performance has existed for many years, adoption has been slow. This is probably due to the lack of performance data indicating in which specific production situations the various products are or are not effective. A previous study at SOSU indicated that the feeding of a yeast strain specifically selected to compliment high grain diets (Yea-Sacc), Alltech, Inc., USA) was effective in improving gain of yearling steers fed a 90% concentrate, 10% roughage diet once daily.

The objective of this study was to determine if this same yeast product could positively affect feedlot performance and/or carcass characteristics of yearling steers self-fed an all-concentrate finishing diet.

\textbf{Materials and Methods}

Seventy-two yearling steers were selected from a larger group that had been used on a previous growing study. Additional processing was not...
necessary with the exception that a Revalor\textsuperscript{3} implant was given at the beginning of the study. The steers were randomly allotted to 8 pens and fed a whole shelled corn finishing diet without (CONT) or with Yea-Sacc YS; 11 g per day). Diet composition is presented in Table 1. The amount of the finishing diet was initially restricted to 10 lb per day and gradually increased to ad libitum over a 15-day period. Ad libitum grass hay was provided separately through day 15 and then removed. For the remainder of the study, feed was provided approximately every 3 days in amounts necessary to provide constant access to feed to simulate the use of a self-feeder. The steers were housed in semi-confinement on cement for the 109-day trial. Feed bunks were under a roof. YS was not fed from day 103 through 109 because supplies were depleted and could not readily be replaced.

Table 1. Test diet composition (dry matter basis)\textsuperscript{a}

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole shelled corn</td>
<td>90.90</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>3.40</td>
</tr>
<tr>
<td>Ground corn</td>
<td>2.10</td>
</tr>
<tr>
<td>Limestone</td>
<td>1.20</td>
</tr>
<tr>
<td>Urea</td>
<td>.80</td>
</tr>
<tr>
<td>Trace mineral salt</td>
<td>.50</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td>.50</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>.50</td>
</tr>
<tr>
<td>Premix\textsuperscript{b}</td>
<td>.10</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Formulated to contain 12% crude protein, .55% Ca, .42% P and .65% K.
\textsuperscript{b}Provided 237 mg Rumensin and 43,000 IU supplemental vitamin A per day. Yea-Sacc was provided at 11 g per day to treated calves. The supplement was pelleted.

Initial weights were determined after overnight removal of feed and water. The final weights were based on hot carcass weight divided by a constant dressing percent. Feedlot performance data were analyzed on a pen basis as a completely random design. Carcass data were analyzed using individual animal measurements. Percentage of choice, percentage of yield grades 1 and 2 and percentage of abscessed livers were tested by chi-square analysis.

\textsuperscript{3}Hoechst Roussel, Somerville, NJ.
Results and Discussion

Performance and carcass data are presented in Table 2. No treatment differences were detected for any of the feedlot performance or carcass characteristics measured (P>.10). The occurrence of acidosis was high in both treatments as evidenced by the higher percentage of abscessed livers (at least 40%). This is greater than the occurrence in the previous study (15%) in which a positive response to VS feeding was found. The feeding of VS did not have any beneficial effect in these circumstances.

Table 2. Feedlot performance and carcass data

<table>
<thead>
<tr>
<th>Item</th>
<th>Control</th>
<th>Yea-Sacc</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of steers</td>
<td>36</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Dry matter intake, lb/day</td>
<td>19.5</td>
<td>19.5</td>
<td>.20</td>
</tr>
<tr>
<td>Wt gain, lb/day</td>
<td>3.36</td>
<td>3.28</td>
<td>.071</td>
</tr>
<tr>
<td>Feed:gain</td>
<td>5.81</td>
<td>5.96</td>
<td>.127</td>
</tr>
<tr>
<td>Hot carcass wt, lb</td>
<td>695</td>
<td>690</td>
<td>4.6</td>
</tr>
<tr>
<td>Choice, %</td>
<td>71</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Yield 1 and 2, %</td>
<td>58</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Abscessed livers, %</td>
<td>40</td>
<td>43</td>
<td></td>
</tr>
</tbody>
</table>