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Bulletin No. 218 - Cultural Methods for Winter Wheat on Non-Irrigated Lands in Northeastern Wyoming

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Winter wheat seeded September 15. Seven-year average yield 20.9 bushels per acre.

Cultural Methods for Winter Wheat on Non-Irrigated Lands in Northeastern Wyoming

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Cultural Methods for
Winter Wheat on Non-Irrigated Lands in
Northeastern Wyoming

P. K. Thompson

INTRODUCTION

Winter wheat production on the semi-arid lands where farming is practiced in northeastern Wyoming has proved as successful as any other crop that is grown. It matures earlier in the summer than most crops, thus escaping much of the heat and drought that so often occur during July and August. It fits well in a rotation with other crops. It is seeded in the fall when the rush of the cropping season is over and harvesting comes before that of other small grains, so that the production of winter wheat aids in the distribution of farm labor.

Generally, winter wheat in northeastern Wyoming is free from diseases and parasites, so that varieties which are adapted to the climatic conditions produce grain of high milling quality. Loose smut, a controllable disease, is at present the only enemy of economic importance.

Practices used in the production of winter wheat in northeastern Wyoming are by no means uniform. There are considerable differences in methods of preparing the seed bed, time of seeding, and amount of seed used.

For the purpose of securing definite information regarding these questions the Department of State Experiment Farms has compared different methods of preparing the seed bed, different dates and rates of seeding, and various methods of seeding. The tests have extended over a number of years, including the drought years of 1932 and 1934.

The work dealing with the production of winter wheat, as reported in these pages, was done on the Campbell County Experiment Farm. This farm is located two miles east of Gillette on the Custer Battlefield Highway.
ANNUAL RAINFALL

The United States Weather Bureau records of rainfall at Gillette averaged for the eleven years, 1925 to 1935, inclusive are:

<table>
<thead>
<tr>
<th>Month</th>
<th>Rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0.55</td>
</tr>
<tr>
<td>February</td>
<td>0.37</td>
</tr>
<tr>
<td>March</td>
<td>1.22</td>
</tr>
<tr>
<td>April</td>
<td>1.68</td>
</tr>
<tr>
<td>May</td>
<td>2.43</td>
</tr>
<tr>
<td>June</td>
<td>1.87</td>
</tr>
<tr>
<td>July</td>
<td>1.37</td>
</tr>
<tr>
<td>August</td>
<td>1.07</td>
</tr>
<tr>
<td>September</td>
<td>1.20</td>
</tr>
<tr>
<td>October</td>
<td>1.05</td>
</tr>
<tr>
<td>November</td>
<td>0.54</td>
</tr>
<tr>
<td>December</td>
<td>0.51</td>
</tr>
<tr>
<td>Annual</td>
<td>13.85</td>
</tr>
</tbody>
</table>

A comparison of the average rainfall by months for the eleven-year period shows that the largest amounts fall during the spring and early summer months with the greatest precipitation in May. Winter wheat usually heads out in the last half of June and is well filled before the hot, dry weather. Notwithstanding this fact, an average annual rainfall of only 13.85 inches makes it necessary to use seeding and cultural methods that will conserve this moisture to the fullest extent.

NATURE OF THE SOIL

The plats used in the experiments reported in this bulletin have a soil varying from a medium to a fine, sandy loam. The subsoil varies from a clay to a sandy clay. It is easily worked when moist and holds precipitation fairly well under dry-farming practices. The mineral content of the soil is ample for crop production, but the soil is low in organic matter.
EXPERIMENTAL PROCEDURE

Kanred winter wheat, which is the variety generally grown in the northeastern part of the state, was used in all trials. The seed was recleaned before sowing and was treated each of the last five years for smut with copper carbonate. In the other years formaldehyde was used.

During the first four years one-fifth acre plats were used with ten-foot alleys between them. Since that time all plats were one-eleventh of an acre in size with alleys three and one-half feet wide. The seeding was done lengthwise of the plats which run approximately north and south.

In the experiments with seed-bed preparations and methods of seeding, duplicate plats were used in each test. In rates and dates of seeding single plats were used. In those cases in which duplicate plats were employed the annual yield is the average of the two plats.

The ground was turned with a general purpose plow or with a two-way sulky plow. An ordinary spike-tooth harrow was used after plowing. A disk drill with a press wheel attachment, spacing the rows seven inches apart, and a furrow drill, spacing the rows fourteen inches apart, were used. The grain was harvested with a binder and threshed by a neighborhood custom separator. The implements used in the tests which are not in general use by farmers were the duckfoot cultivator, the furrow drill, and the springtooth harrow.

In 1933, due to the breaking of the duckfoot cultivator, the disk was used instead of the duckfoot for July summer fallow preparations. In 1934 there was considerable trash on the ground to be summer fallowed, and so the disk was used instead of the duckfoot for all dates of summer fallow preparation. Where there is a great deal of heavy stubble or weeds on the ground or where the ground is very moist, the disk works much better than the duckfoot because it does not clog up and drag the soil. Double-disking when the ground was very dry appeared to be equal to duckfooting, if the disk was heavily weighted. This method made a good seed bed and left the ground well mulched.
All plowing was approximately six inches deep. Soil that was duckfooted May 1 and June 1 was worked from three to five inches deep, but usually the plats that were prepared by this method July 1 were so hard that the shovels would only go down one to four inches. The plowed ground was harrowed on the day of plowing. The fallow prepared by the duckfoot on the earlier dates was not harrowed unless the surface was very rough. The fallow plats were worked during the summer up to the seeding time with the duckfoot cultivator, the disk, or the spring-tooth harrow, as was necessary to keep down weeds. From three to four cultivations during the summer were usually required.

Plats of forty-two inch and eighty-four inch corn rows to be used for winter wheat were plowed in the spring. The corn required generally four cultivations for weed control, the last cultivation being completed during the first part of August. These cultivations represented practically the same amount of labor as was required for summer fallow.

Where winter wheat was seeded in oats stubble, the plats were plowed or disked in the spring, then harrowed and seeded to oats. After the oats were harvested, the stubble was left with no further preparation for winter wheat seeding.

Winter Wheat Yields on Different Seed Beds

Table I shows the yearly and average yields of winter wheat grown on different seed beds. The furrow drill was used entirely in these trials. For the first five years the rate of seeding was 45 pounds per acre, but in the last four years the rate was 35 pounds. The date of seeding in this experiment was September 15, or as near that date as weather would permit.

In 1932 the crop was a failure except where it was seeded in corn stubble. On the fallow plats severe winter winds blew the soil particles away from the wheat plants. The exposed roots dried out and many of the plants died. The stubble on the corn plats provided some protection to the wheat because it checked the snow. The soil between the corn rows was firmer than the fallow and tended to resist blowing more than the fallow.
TABLE I.

WINTER WHEAT YIELDS ON DIFFERENT SEED BEDS—BUSHELS PER ACRE.

<table>
<thead>
<tr>
<th>Seed-Bed Preparation</th>
<th>Date Prepared</th>
<th>Previous Crop</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
<th>Average 9 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowed 5/1 SF</td>
<td></td>
<td></td>
<td>18.8</td>
<td>25.9</td>
<td>38.4</td>
<td>21.6</td>
<td>5.4 (a)</td>
<td>23.5</td>
<td>10.5</td>
<td>17.1</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Duckfooted 5/1 SF</td>
<td></td>
<td></td>
<td>(b)</td>
<td>(b)</td>
<td>41.6</td>
<td>18.5</td>
<td>7.4 (a)</td>
<td>5.5</td>
<td>19.5</td>
<td>17.8</td>
<td>15.7*</td>
<td></td>
</tr>
<tr>
<td>Plowed 6/1 SF</td>
<td></td>
<td></td>
<td>27.0</td>
<td>22.1</td>
<td>39.9</td>
<td>17.5</td>
<td>6.5 (a)</td>
<td>3.5</td>
<td>23.2</td>
<td>16.6</td>
<td>17.4</td>
<td></td>
</tr>
<tr>
<td>Duckfooted 6/1 SF</td>
<td></td>
<td></td>
<td>23.0</td>
<td>22.1</td>
<td>32.4</td>
<td>16.2</td>
<td>5.9 (a)</td>
<td>5.0</td>
<td>21.1</td>
<td>13.4</td>
<td>15.5</td>
<td></td>
</tr>
<tr>
<td>Plowed 7/1 SF</td>
<td></td>
<td></td>
<td>21.4</td>
<td>21.9</td>
<td>26.7</td>
<td>20.4</td>
<td>4.5 (a)</td>
<td>(a)</td>
<td>7.3</td>
<td>10.9</td>
<td>12.6</td>
<td></td>
</tr>
<tr>
<td>Duckfooted 7/1 SF</td>
<td></td>
<td></td>
<td>12.8</td>
<td>17.1</td>
<td>30.7</td>
<td>11.7</td>
<td>3.2 (a)</td>
<td>4.5</td>
<td>5.9</td>
<td>9.3</td>
<td>10.6</td>
<td></td>
</tr>
<tr>
<td>Oats stubble 5/1 SF</td>
<td></td>
<td>Oats</td>
<td>(b)</td>
<td>(b)</td>
<td>16.8</td>
<td>8.3</td>
<td>(b) (b)</td>
<td>8.5</td>
<td>0.8</td>
<td>10.7</td>
<td>9.0†</td>
<td></td>
</tr>
<tr>
<td>42&quot; corn rows 5/1 SF</td>
<td></td>
<td>Corn</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b) (b)</td>
<td>14.1</td>
<td>(a)</td>
<td>2.4</td>
<td>11.1</td>
<td>6.9*</td>
</tr>
<tr>
<td>84&quot; corn rows 5/1 SF</td>
<td></td>
<td>Corn</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b) (b)</td>
<td>15.6</td>
<td>4.5</td>
<td>5.4</td>
<td>13.2</td>
<td>9.7*</td>
</tr>
</tbody>
</table>

(a) Winter killed.
(b) No test.
*4-year average.
†5-year average.
‡7-year average.

A comparison of the yearly yields shows a wide variation. During the first four years there was sufficient rainfall to store moisture in the soil, and there were good yields on all seed beds. During the last five years, which had long dry periods and high winds through the winter months, some very low yields were harvested.

In this test the highest average yield of winter wheat was produced on summer fallow plowed May 1, the second highest yield on summer fallow plowed June 1, and the third highest on summer fallow duckfooted May 1. Seeding in oats stubble and in 84-inch corn rows produced average yields of 9.0 and 9.7 bushels per acre, respectively. However, it will be noted that the plots on the oats stubble and on the corn ground have been used only during the later years which were dry. Fallow prepared by duckfooting May 1 and June 1 produced 2.0 bushels less and 1.9 bushels less per acre, respectively, than did the fallow prepared by plowing on these dates. Although duckfooting is less expensive than plowing, the difference in the cost of the two methods has been less than this difference in yield.
COMPARISON OF THE COMMON DRILL AND THE FURROW DRILL FOR SEEDING WINTER WHEAT ON DIFFERENT SEED BEDS

Seeding with both the furrow drill and the common drill was done on fallow which was plowed May 1, June 1, and July 1, and on fallow prepared by the duckfoot cultivator on similar dates. In the first four years of the test 45 pounds of seed per acre was used and 35 pounds in the last five years.

<table>
<thead>
<tr>
<th>Method of Summer Fallow</th>
<th>Date Prepared</th>
<th>Drill Used</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
<th>Average Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plowed.............. 5/1</td>
<td>Furrow</td>
<td>18.8</td>
<td>25.9</td>
<td>38.4</td>
<td>21.0</td>
<td>5.4</td>
<td>(a)</td>
<td>23.0</td>
<td>10.5</td>
<td>17.1</td>
<td>17.8</td>
<td></td>
</tr>
<tr>
<td>Plowed.............. 5/1</td>
<td>Common</td>
<td>19.2</td>
<td>11.5</td>
<td>41.4</td>
<td>19.7</td>
<td>8.2</td>
<td>(a)</td>
<td>12.5</td>
<td>13.6</td>
<td>18.3</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>Duckfooted ....... 5/1</td>
<td>Furrow</td>
<td>(b)</td>
<td>(b)</td>
<td>41.6</td>
<td>18.5</td>
<td>7.4</td>
<td>(a)</td>
<td>5.5</td>
<td>19.5</td>
<td>17.8</td>
<td>15.7</td>
<td></td>
</tr>
<tr>
<td>Duckfooted ....... 5/1</td>
<td>Common</td>
<td>(b)</td>
<td>(b)</td>
<td>41.0</td>
<td>21.5</td>
<td>8.5</td>
<td>(a)</td>
<td>12.0</td>
<td>17.4</td>
<td>16.1</td>
<td>16.6</td>
<td></td>
</tr>
<tr>
<td>Plowed.............. 6/1</td>
<td>Furrow</td>
<td>27.0</td>
<td>22.1</td>
<td>39.9</td>
<td>17.5</td>
<td>6.5</td>
<td>(a)</td>
<td>3.5</td>
<td>32.2</td>
<td>16.6</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>Plowed.............. 6/1</td>
<td>Common</td>
<td>21.9</td>
<td>12.0</td>
<td>33.1</td>
<td>17.5</td>
<td>7.5</td>
<td>(a)</td>
<td>6.0</td>
<td>18.8</td>
<td>14.1</td>
<td>14.5</td>
<td></td>
</tr>
<tr>
<td>Duckfooted ....... 6/1</td>
<td>Furrow</td>
<td>23.0</td>
<td>22.1</td>
<td>32.4</td>
<td>16.2</td>
<td>5.9</td>
<td>(a)</td>
<td>5.0</td>
<td>21.0</td>
<td>13.4</td>
<td>15.5</td>
<td></td>
</tr>
<tr>
<td>Duckfooted ....... 6/1</td>
<td>Common</td>
<td>13.7</td>
<td>14.4</td>
<td>29.2</td>
<td>16.3</td>
<td>7.1</td>
<td>(a)</td>
<td>(a)</td>
<td>12.7</td>
<td>11.8</td>
<td>11.7</td>
<td></td>
</tr>
<tr>
<td>Plowed.............. 7/1</td>
<td>Furrow</td>
<td>21.4</td>
<td>21.9</td>
<td>26.8</td>
<td>20.4</td>
<td>4.5</td>
<td>(a)</td>
<td>(a)</td>
<td>7.3</td>
<td>10.9</td>
<td>12.6</td>
<td></td>
</tr>
<tr>
<td>Plowed.............. 7/1</td>
<td>Common</td>
<td>9.9</td>
<td>7.2</td>
<td>29.1</td>
<td>19.5</td>
<td>3.0</td>
<td>(a)</td>
<td>(a)</td>
<td>5.9</td>
<td>10.3</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td>Duckfooted ....... 7/1</td>
<td>Furrow</td>
<td>12.8</td>
<td>17.1</td>
<td>30.7</td>
<td>11.7</td>
<td>8.2</td>
<td>(a)</td>
<td>4.2</td>
<td>5.9</td>
<td>9.3</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Duckfooted ....... 7/1</td>
<td>Common</td>
<td>8.8</td>
<td>12.1</td>
<td>30.4</td>
<td>12.1</td>
<td>2.4</td>
<td>(a)</td>
<td>5.5</td>
<td>6.8</td>
<td>5.2</td>
<td>9.3</td>
<td></td>
</tr>
</tbody>
</table>

(a) Winter killed.
(b) No test.

A comparison of the yearly yields in Table II shows a wide variation in the different years. The first four years, when moisture conditions were favorable, show yields from good to high. The last five years which were beset by serious dry periods had lower yields than the early years of the test. As mentioned in a previous paragraph, only the wheat seeded in corn rows made any yield in 1932. A comparison of average yields for the nine-year period shows that the highest yield came from seeding with the furrow drill on fallow plowed May 1.
The yield of winter wheat seeded with the common drill on fallow, duckfooted July 1, was 1.32 bushels less per acre than it was where the furrow drill was used. Although both drills gave lower yields as the date of preparing the summer fallow was delayed, yet the use of the furrow drill resulted in higher yields in all cases except on fallow duckfooted May 1.

These results indicate that the highest yields may be expected from summer fallow plowed May 1 and seeded with the furrow drill. Slightly lower yields are produced when the common drill is used.

**EFFECT OF THE RATE OF SEEDING ON THE YIELD**

The fallow was prepared for this test by plowing on May 1 and cultivating it through the summer to keep the soil free from weeds. All plats were seeded September 15 with the furrow drill. Table III shows that in the years of 1929 and 1930, when there was ample moisture, fair to good yields were produced from each rate of seeding. However, even in those years 60 pounds of seed per acre did not give as high yields as did 45 pounds. In 1932 all plats winter-killed. In 1933 and in 1934, both dry years, the highest yield was from 30 pounds of seed per acre. In 1935 there was a very rank growth in the spring due to the excellent growing conditions in May, but June and July were very hot and dry. In this year 15 pounds of seed per acre made the highest yield and 30 pounds the second highest.

<table>
<thead>
<tr>
<th>Pounds Seed Per Acre</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
<th>Average Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>47.8</td>
<td>25.7</td>
<td>(b)</td>
<td>(a)</td>
<td>20.0</td>
<td>8.6</td>
<td>14.4</td>
<td>19.3</td>
</tr>
<tr>
<td>45</td>
<td>48.8</td>
<td>28.6</td>
<td>11.5</td>
<td>(a)</td>
<td>21.5</td>
<td>11.4</td>
<td>14.9</td>
<td>20.9</td>
</tr>
<tr>
<td>30</td>
<td>47.0</td>
<td>27.2</td>
<td>(b)</td>
<td>(a)</td>
<td>22.0</td>
<td>15.8</td>
<td>16.4</td>
<td>21.4</td>
</tr>
<tr>
<td>15</td>
<td>36.5</td>
<td>18.0</td>
<td>(b)</td>
<td>(a)</td>
<td>16.5</td>
<td>12.7</td>
<td>17.7</td>
<td>16.9</td>
</tr>
</tbody>
</table>

(a) Winter killed.
(b) No test.

TABLE III.
YIELDS OF WINTER WHEAT FROM DIFFERENT SEEDING RATES
BUSHELS PER ACRE
A comparison of the average yields for the six years shows that 30 pounds of seed per acre gave the highest yield and that 45 pounds of seed yielded one-half bushel less per acre. These results indicate that for years with favorable moisture conditions 45 pounds of seed per acre is likely to give the highest yields, and in dry years lighter seedings are better.

EFFECT OF SEEDING TIME ON YIELDS

In this experiment the effect of the seeding time on the yield of winter wheat was studied. Table IV shows the results of seven years of the work. The seed was drilled on summer fallow prepared by plowing May 1. Cultivations through the summer were the same as were used in the other tests with winter wheat. The seed was drilled at the rate of 35 pounds per acre, with the furrow drill.

TABLE IV.

YIELDS OF WINTER WHEAT SEEDED ON DIFFERENT DATES—BUSHELS PER ACRE.

<table>
<thead>
<tr>
<th>Date Seeded</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
<th>1932</th>
<th>1933</th>
<th>1934</th>
<th>1935</th>
<th>Average Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 1</td>
<td>29.3</td>
<td>19.0</td>
<td>2.9</td>
<td>(a)</td>
<td>(a)</td>
<td>7.4</td>
<td>11.6</td>
<td>10.0</td>
</tr>
<tr>
<td>August 15</td>
<td>44.6</td>
<td>20.1</td>
<td>6.8</td>
<td>(a)</td>
<td>(a)</td>
<td>9.4</td>
<td>17.8</td>
<td>14.1</td>
</tr>
<tr>
<td>September 1</td>
<td>53.8</td>
<td>21.5</td>
<td>12.1</td>
<td>(a)</td>
<td>(a)</td>
<td>9.9</td>
<td>16.0</td>
<td>16.2</td>
</tr>
<tr>
<td>September 15</td>
<td>50.4</td>
<td>35.0</td>
<td>11.5</td>
<td>(a)</td>
<td>14.0</td>
<td>13.3</td>
<td>21.3</td>
<td>20.9</td>
</tr>
<tr>
<td>October 1</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>13.0</td>
<td>19.8</td>
<td>16.4</td>
</tr>
<tr>
<td>October 15</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>14.4</td>
<td>...</td>
</tr>
<tr>
<td>November 1</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>(b)</td>
<td>13.6</td>
<td>...</td>
</tr>
</tbody>
</table>

(a) Winter killed.
(b) No test.

The highest average yield for seven years was 20.89 bushels per acre from seeding September 15. In the period of this test there were only two years when the yields from seeding September 15 were exceeded by other seeding dates. In 1929 the September 1 seeding produced 53.75 bushels per acre, and in 1931, 12.1 bushels per acre. The September 15 seedings for these years gave yields of 50.4 bushels and 11.5 bushels per acre, respectively.
TABLE V.
AVERAGE YIELDS IN BUSHELS PER ACRE OF WINTER WHEAT AFTER FALLOW AND
AFTER OTHER CROPS AND YIELDS OF PRECEDING CROPS.

<table>
<thead>
<tr>
<th>Crop preceding winter wheat</th>
<th>Seed-bed preparation for preceding crop</th>
<th>Average yield of preceding crop bushels</th>
<th>Number of years trials</th>
<th>Yield of winter wheat bushels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn, 42-inch rows</td>
<td>spring double-diaked stubble</td>
<td>11.12</td>
<td>4</td>
<td>6.90</td>
</tr>
<tr>
<td>Corn, 84-inch rows</td>
<td>spring double-diaked stubble</td>
<td>10.85</td>
<td>4</td>
<td>9.68</td>
</tr>
<tr>
<td>Beans</td>
<td>spring double-diaked corn ground</td>
<td>5.41</td>
<td>4</td>
<td>5.90</td>
</tr>
<tr>
<td>Oats</td>
<td>spring double-diaked stubble</td>
<td>9.23</td>
<td>4</td>
<td>5.00</td>
</tr>
<tr>
<td>Summer fallow</td>
<td>May duckfooted stubble</td>
<td>...........................................</td>
<td>4</td>
<td>10.70</td>
</tr>
<tr>
<td>Summer fallow</td>
<td>May plowed stubble</td>
<td>...........................................</td>
<td>4</td>
<td>12.78</td>
</tr>
</tbody>
</table>

WINTER WHEAT AFTER OTHER CROPS

Because the seeding of winter wheat in corn rows has been tested only four years, its average yields following other crops and on fallow are likewise computed for the same four years. It will be noted in Table V that the yield on 42-inch and 84-inch corn rows was 6.9 and 9.7 bushels per acre, respectively, and that these yields were exceeded by the yields on summer fallow. On summer fallow which had been plowed in May the four-year average yield was 12.78 bushels per acre, and when the fallow was prepared by duckfooting, the yield was 10.7 bushels per acre. Both of these yields on fallow are averages of four years, although there was no yield in one of those years, 1932. The lowest yield of 5.0 bushels per acre resulted when the seed was drilled in oats stubble.

Because the charges for seed-bed preparation are relatively low when winter wheat is seeded in corn rows, the yield of 9.7 bushels per acre figured at 75 cents per bushel showed a margin more than twice that of wheat produced on plowed fallow.

However, it may be noted in Table I that in the year 1934, an exceedingly dry season, the yield in 84-inch corn rows was only 5.4 bushels per acre and the yields on fallow prepared June 1 were approximately four times as much. In an experiment in another part of the state the average of winter wheat seeded in corn stubble is approximately 85 per cent of that seeded on fallow. However, in the drought year of 1934 the yield on fallow was one and a half times as large as that on disked corn stubble, and in 1919,
when drought was severe, the yield on fallow was 31 times as great as it was on corn stubble. So the fact that the fallow does give larger yields in critical drought periods is an insurance of considerable importance.

There is also a limit to the amount of corn that the average dry farmer can use in his cropping program where winter wheat is produced on a large scale. It is not usually practicable under present dry-farming conditions to produce winter wheat entirely on disked corn stubble.

From the results of these tests on the Campbell County Experiment Farm it is evident that a safe course is to grow a considerable portion of the winter wheat on properly prepared summer fallow and also to grow some of the acreage in corn stubble.

**SUMMARY**

In these experiments with winter wheat:
1. Summer fallow prepared May 1 gave higher yields than when prepared June 1 or July 1.
2. The furrow drill gave higher yields than the common drill on all dates and for all methods of preparing summer fallow, except on fallow duckfooted May 1.
3. From 30 to 45 pounds of seed per acre was the best rate of seeding. In dry seasons the lighter seeding rate gave highest yields.
4. Winter wheat seeded September 15 with the furrow drill gave higher yields than earlier or later seedings.
5. Seeding with the furrow drill on oat stubble, bean ground, or 84-inch corn rows gave lower yields than seeding on fallow.
6. The production cost was more per bushel on summer fallow prepared May 1 than where it followed corn, beans, or oats, but the higher yield on summer fallow made that method more profitable.
7. In rotations the best and most profitable yields were produced on summer fallow.

**ACKNOWLEDGMENTS**

Acknowledgment is due D. R. Sabin, superintendent of the experiment farm from 1926 to 1928, and to Clarence G. Best*, superintendent in 1929 and 1930, for their work in carrying on the experiments and keeping the records.

*Deceased.