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Oats.

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OATS.

VARIETY TESTS. RATE OF SOWING. CULTIVATION.

BY E. G. MONTGOMERY

DISTRIBUTED

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OATS.

By E. G. MONTGOMERY.

INTRODUCTION.

There is no more serious question confronting the Nebraska farmer today than the oat problem. During the past few years, farmers generally believe they have lost money on the crop. It is necessary to grow some spring grain crop, and while many are looking for a substitute, such as barley, speltz, and spring wheat, yet none of these crops takes the place of oats in a satisfactory manner. While soil fertility must receive immediate attention, still our yields would be decidedly increased thru the use of varieties best adapted to the region, with good preparation of the seed-bed, drilling with a disk drill, and cultivation when the season is dry.

VARIETY TESTS OF OATS.

Table I gives a summary of results with 12 varieties tested since 1902.

NOTE.—Since not all varieties were tested the full 7 years, the only way a comparison could be made between the varieties was to compare all with a standard variety, Kherson, for the years in which they were grown. The Kherson oat was always ranked as 100. For example, Canada Red was grown 4 years, 1903-1906. During those years it yielded 91 per cent, as much as Kherson. On this basis if Kherson yielded 55.3 bushels for 7 years, Canada Red would be calculated as yielding 50.3 bushels.

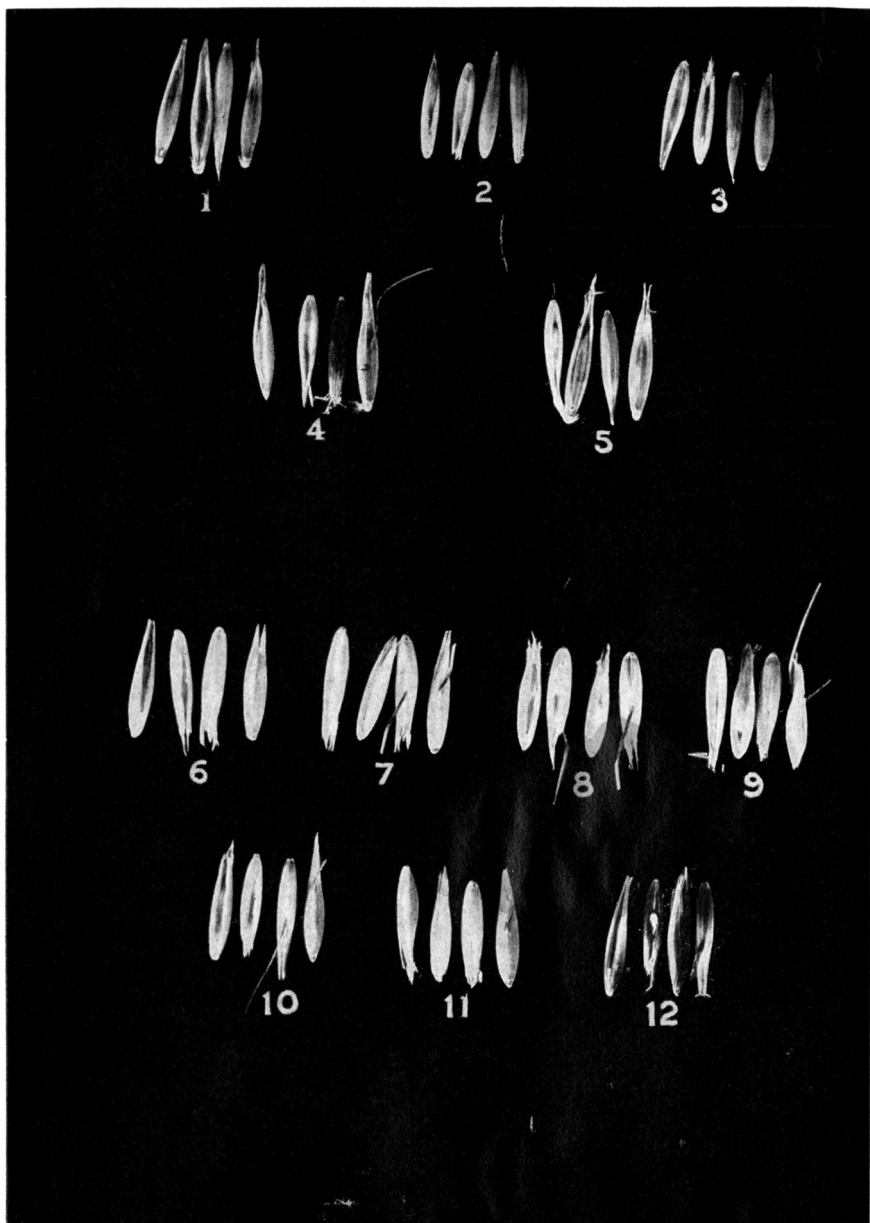
Some 20 varieties have been tested, but only 12 of them have been grown four or more years. A study of the data shows a marked advantage in favor of early varieties. This is more clearly shown by Table II, where the varieties are arranged according to date of ripening.

TABLE I.—Data on variety test of oats, 1902-1908.

| | Yield per acre | | | | | | | Relative rank | Relative yields | Average h'gt for 1907-1908 | Rust | | Av. per cent rust 1907-1908 |
|------------------------------|----------------|------|------|------|------|------|------|---------------|-----------------|----------------------------|----------|----------|-----------------------------|
| | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | | | | 1907 | 1908 | |
| | Bus. | Bus. | Bus. | Bus. | Bus. | Bus. | Bus. | | | | Per cent | Per cent | |
| Kherson | 41.7 | 68.0 | 55.1 | 82.7 | 81.4 | 49.0 | 54.0 | 100 | 55.3 | 40 | 24 | 10 | 17 |
| Texas Red | 33.0 | 57.5 | 40.6 | 81.7 | 42.5 | 65.6 | | 94 | 52.0 | 40 | 55 | 32 | 44 |
| Sixty Day | 29.6 | 52.4 | | 40.2 | 59.6 | | | 95 | 52.5 | | 25 | | |
| Swedish Select | | 31.5 | 22.8 | 6.2 | 42.8 | 32.5 | 44.0 | 71 | 39.2 | 44 | 45 | 25 | 35 |
| American Banner | | 45.6 | 31.5 | 7.2 | 40.2 | 31.0 | 34.3 | 75 | 41.4 | 46 | 45 | 35 | 40 |
| University No. 6 | | | | 77.1 | 34.6 | 29.4 | 49.0 | 79 | 43.7 | 44 | 45 | 28 | 36 |
| Lincoln | | | 2.8 | 85.2 | 42.3 | 28.5 | 43.6 | 80 | 44.2 | 42 | 45 | 30 | 37 |
| Mold's New Blk. Beauty | | | 28.4 | 59.0 | 26.8 | 17.3 | 36.6 | 59 | 32.6 | 43 | 50 | 34 | 42 |
| Burt | | | | 85.5 | 42.3 | 48.5 | 64.3 | 108 | 59.7 | 39 | 25 | 15 | 20 |
| Canada Red | | 53.0 | | 37.0 | 43.9 | | | 91 | 50.3 | | | | |
| White Queen | | 40.3 | | 28.6 | 75.1 | 42.6 | | 77 | 42.5 | | | | |
| Improved Prize Cluster | | 32.5 | | 27.1 | 71.5 | 35.7 | | 69 | 38.1 | | | | |

TABLE I. — (Continued.)

| | Date of heading | | | | | | | Date harvested | | | | | | |
|-------------------------------|-----------------|------|------|------|------|------|--|----------------|------|------|------|------|--------|--|
| | 1904 | 1905 | 1906 | 1907 | 1908 | Mean | | 1904 | 1905 | 1906 | 1907 | 1908 | Mean | |
| Kherson | 6-13 | 6-5 | 6-14 | 6-20 | 6-14 | 6-14 | | 7-11 | 7-3 | 7-9 | 7-13 | 7-12 | 7-96 | |
| Texas Red | 6-13 | 6-5 | 6-18 | 6-21 | 6-24 | 6-16 | | 7-11 | 7-11 | 7-20 | 7-13 | 7-17 | 7-14.4 | |
| Sixty Day | 6-13 | 6-5 | 6-11 | 6-18 | | 6-11 | | 7-11 | 7-3 | 7-9 | 7-13 | | 7-9 | |
| Swedish Select | 6-22 | 6-9 | 6-22 | 6-30 | 6-27 | 6-22 | | 7-23 | 7-15 | 7-21 | 7-20 | 7-17 | 7-19 | |
| American Banner | 6-22 | 6-15 | 6-22 | 7-2 | 7-3 | 6-25 | | 7-23 | 7-18 | 7-21 | 7-21 | 7-19 | 7-20.4 | |
| University No. 6 | 6-21 | 6-13 | 6-22 | 7-1 | 6-27 | 6-23 | | 7-23 | 7-18 | 7-21 | 7-20 | 7-16 | 7-19.6 | |
| Lincoln | 6-22 | 6-14 | 6-20 | 6-30 | 6-28 | 6-23 | | 7-23 | 7-18 | 7-16 | 7-18 | 7-18 | 7-18.6 | |
| Mold's New Black Beauty | 6-24 | 6-19 | 6-26 | 7-5 | 7-9 | 6-29 | | 7-24 | 7-21 | 7-24 | 7-23 | 7-19 | 7-22 | |
| Burt | 6-8 | 6-1 | 6-11 | 6-15 | 7-10 | 6-9 | | 7-7 | 6-26 | 7-7 | 7-8 | 7-10 | 7-5.5 | |
| Canada Red | 6-13 | 6-5 | 6-18 | 6-15 | | 6-13 | | 7-11 | 7-11 | 7-20 | | | 7-14 | |
| White Queen | 6-22 | 6-9 | 6-22 | | | 6-18 | | 7-23 | 7-15 | 7-21 | | | 7-20 | |
| Improved Prize Cluster | 6-22 | 6-14 | 6-20 | | | 6-19 | | 7-23 | 7-18 | 7-21 | | | 7-21 | |



Types of oats. Nos. 1 to 5 inclusive represent early varieties; Nos. 6 to 12 inclusive, late varieties. 1, Burt. 2, Sixty Day. 3, Kherson. 4, Canada Red. 5, Texas Red. 6, Lincoln. 7, Swedish Select. 8, University No. 6. 9, White Queen. 10, American Banner. 11, Prize Cluster. 12, Mold's Black Beauty.

TABLE II.—*Varieties of oats arranged according to date of ripening.*

| Early oats | Date ripe, 1904-1908 | Yield per acre | Number of years grown | Height, 1907-1908 | Color of grain |
|---------------------------|----------------------------|----------------------|-----------------------------|----------------------|-------------------|
| | | <i>Bushels</i> | | <i>Inches</i> | |
| Burt | July 6 | 59.7 | 4 | 39 | Yellow |
| Sixty Day | July 9 | 52.5 | 5 | | Yellow |
| Kherson | July 10 | 55.3 | 7 | 40 | Yellow |
| Canada Red | July 14 | 50.3 | 4 | | Reddish |
| Texas Red | July 15 | 52.0 | 7 | 40 | Reddish |
| Average | July 11 | 53.9 | . | 40 | |
| Late oats | | | | | |
| Lincoln Oats | July 19 | 44.2 | 5 | 42 | Whitish |
| Swedish Select | July 19 | 39.2 | 6 | 44 | Whitish |
| University No. 6 | July 20 | 43.7 | 5 | 44 | Whitish |
| White Queen | July 20 | 42.6 | 4 | | Whitish |
| American Banner | July 21 | 41.4 | 6 | 46 | Whitish |
| Improved Prize Cluster .. | July 21 | 38.1 | 4 | | Whitish |
| Mold's New Black Beauty | July 22 | 32.6 | 5 | 43 | Black |
| Average | July 20 | 40.1 | | 44 | |

Taking the earliest five varieties compared with the latest seven varieties, we find an average difference of nine days in time of ripening, and about 14 bushels difference in yield per acre.

TYPES OF OATS.—The early and late varieties also represent two types of oats differing in other ways than time of ripening. The early varieties are either yellow or reddish in color, and have rather small sized grains, while the late varieties are all, with one exception, of the light colored varieties commonly known as white oats. The late varieties also average taller.

Farmers have generally preferred the larger grained late varieties, probably on account of the nice appearance of the grain and also in order to bring their harvest time after wheat harvest, and also after corn is laid by.

Occasionally we have a season when late white oats will return a heavy yield of good quality, but ordinarily, we may depend on much better results from early varieties of the Kherson or Texas Red type.

The Burt oat was secured from Mr. M. A. Carleton of the U. S. Department of Agriculture four years ago. While it has giv-

en a high average yield, it has also lodged and rusted badly under favorable conditions. In view of this it cannot be recommended above Kherson until after a thoro test in the state.

RATE OF SOWING OATS.

The average amount of seed oats sown per acre among Nebraska farmers is about 10 pecks, but the amount sown by individuals varies considerably, the extreme being from about six pecks to fourteen pecks per acre. An experiment was started in 1903 with the object of noting the effect of various rates of planting on yield of grain. Data have been secured each year with the exception of 1904 when the plats were so badly injured by a storm that accurate yields could not be secured.

TABLE III.—*Rate of planting Kherson oats, 1903.*

| Method of planting | Rate of seeding per acre | Total yield per acre | Net return |
|--------------------|--------------------------|----------------------|----------------|
| | <i>Pecks</i> | <i>Bushels</i> | <i>Bushels</i> |
| Drilled | 6 | 62.5 | 61. |
| Drilled | 8 | 65.7 | 63.7 |
| Drilled | 10 | 58.4 | 55.9 |
| Drilled | 12 | 61.7 | 58.7 |
| Drilled | 16 | 68.2 | 64.2 |
| Drilled | 8 | 65.7 | 63.7 |

TABLE IV.—*Rate of planting Kherson oats, 1905.*

| Method of planting | Rate of seeding per acre | Date of ripening | Height of straw | Yield per acre | Net return per acre |
|--------------------|--------------------------|------------------|-----------------|----------------|---------------------|
| | <i>Pecks</i> | | <i>Inches</i> | <i>Bushels</i> | <i>Bushels</i> |
| Drilled | 6 | June 29 | 33 | 85.3 | 83.8 |
| Drilled | 8 | June 28 | 35 | 88.1 | 86.1 |
| Drilled | 10 | June 28 | 34 | 83.7 | 81.2 |
| Drilled | 12 | June 28 | 34 | 83.4 | 80.4 |
| Drilled | 16 | June 28 | 34 | 80.9 | 76.9 |
| Broadcast | 6 | July 7 | 30 | 72.2 | 70.7 |
| Broadcast | 8 | July 7 | 32 | 78.1 | 76.1 |
| Broadcast | 10 | July 7 | 33 | 81.9 | 79.4 |
| Broadcast | 12 | July 7 | 30 | 81.2 | 78.2 |
| Broadcast | 16 | July 7 | 32 | 81.4 | 77.4 |

The broadcast oats gave best yield seeded at the rate of ten pecks per acre, and the drilled oats at eight pecks. The broadcast oats ripened nine days later and straw did not average quite so tall.

TABLE V.—*Rate of planting Kherson oats, 1906.*

| Method of planting | Rate of seeding per acre | Date of ripening | Height of straw | Yield per acre | Net return per acre |
|--------------------|--------------------------|------------------|-----------------|----------------|---------------------|
| | <i>Pecks</i> | | <i>Inches</i> | <i>Bushels</i> | <i>Bushels</i> |
| Drilled | 6 | July 9 | 31 | 63.7 | 62.2 |
| Drilled | 8 | July 9 | 30 | 67.1 | 65.1 |
| Drilled | 10 | July 9 | 29 | 66.5 | 64.1 |
| Drilled | 12 | July 9 | 27 | 66.2 | 63.2 |
| Drilled | 16 | July 9 | 27 | 64.1 | 60.1 |
| Broadcast | 6 | July 9 | 29 | 61.5 | 60.0 |
| Broadcast | 8 | July 9 | 28 | 62.8 | 60.8 |
| Broadcast | 10 | July 9 | 26 | 63.7 | 61.2 |
| Broadcast | 12 | July 9 | 26 | 62.5 | 59.5 |
| Broadcast | 16 | July 9 | 26 | 61.2 | 57.2 |

The drilled and broadcast oats matured at the same time, while in 1905 the broadcast oats were nine days later. However, all of the oats in 1906 were retarded in growth by a spring drouth, the rains coming late. This caused the ripening to be quite uniform.

TABLE VI.—*Rate of planting Kherson oats, 1907.*

| Method of planting | Rate of seeding per acre | Date of ripening | Height of straw | Yield per acre | Net return per acre |
|--------------------|--------------------------|------------------|-----------------|----------------|---------------------|
| | <i>Pecks</i> | | <i>Inches</i> | <i>Bushels</i> | <i>Bushels</i> |
| Drilled | 6 | July 15 | 31 | 49.1 | 48.3 |
| Drilled | 8 | July 15 | 31 | 53.4 | 51.4 |
| Drilled | 10 | July 15 | 31 | 50.7 | 48.2 |
| Drilled | 12 | July 15 | 31 | 54.2 | 51.2 |
| Drilled | 16 | July 15 | 31 | 54.5 | 50.5 |

TABLE VII.—*Summary for rate of planting with drilled Kherson oats for four years.*

| Method of planting | Rate of seeding per acre | Net return per acre | | | | |
|---------------------|--------------------------|---------------------|------------|------------|------------|-------------|
| | | 1903 | 1905 | 1906 | 1907 | Average |
| | <i>Pecks</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> |
| Drilled | 6 | 61 | 83.8 | 63.7 | 48.3 | 64.2 |
| Drilled | 8 | 63.7 | 86.1 | 67.1 | 51.4 | 67.1 |
| Drilled | 10 | 55.9 | 81.2 | 66.5 | 48.2 | 62.9 |
| Drilled | 12 | 58.7 | 80.4 | 66.2 | 51.2 | 64.1 |
| Drilled | 16 | 64.2 | 76.9 | 64.1 | 50.5 | 63.9 |
| Average yield | | 61.7 | 81.7 | 65.5 | 49.9 | 64.4 |

TABLE VIII.—*Summary for rate of planting with Kherson oats, broadcast, two years.*

| Method of planting | Rate of seeding per acre | Net return per acre | | Average |
|---------------------|--------------------------|---------------------|------------|-------------|
| | | 1905 | 1906 | |
| | <i>Pecks</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> |
| Broadcast | 6 | 70.7 | 60.0 | 65.3 |
| Broadcast | 8 | 76.1 | 60.8 | 68.4 |
| Broadcast | 10 | 79.4 | 61.2 | 70.3 |
| Broadcast | 12 | 78.2 | 59.5 | 68.8 |
| Broadcast | 16 | 77.4 | 57.2 | 67.3 |
| Average yield | | 76.4 | 59.7 | 68.1 |

Eight pecks of seed per acre has uniformly given best results where the oats were drilled, and ten pecks per acre where they were broadcasted.

The number of pecks of oats which should be sown per acre of any particular variety will depend on the size of grains, and upon the stooling qualities. The following table will illustrate relation between size of grain and the rate of sowing necessary in order to secure the same stand of plants.

TABLE IX.—*Relation between size of grain and volume in three varieties of oats.*

| Variety | Number of grains in one pound | Pecks per acre to secure same number of plants |
|-----------------|-------------------------------|--|
| Kherson | 22176 | 8 pecks |
| Dun Oats | 12128 | 14 pecks |
| New Reliance .. | 9232 | 19 pecks |

In order to note the effect of rate of planting on the stooling of oats, a place was selected in each plat where the stand was uniform and normal, and all plants within a measured area were examined, with the following results:

TABLE X.—*Stooling of Kherson oats, 1907.*

| Pecks sown per acre | Area examined | Number of plants on area | Total number of stems | Number of tillers | Number of tillers per plant | Number of plants per acre | Total number of stems per acre | Yield per acre |
|---------------------|----------------|--------------------------|-----------------------|-------------------|-----------------------------|---------------------------|--------------------------------|----------------|
| | <i>Sq. fee</i> | | | | | | | <i>Bu.</i> |
| 2 | 28.44 | 105 | 643 | 538 | 5.12 | 160,797 | 984,686 | 34.7 |
| 4 | 28.44 | 328 | 918 | 590 | 1.80 | 492,299 | 1,405,825 | 41.4 |
| 6 | 28.44 | 613 | 1075 | 462 | .75 | 938,748 | 1,646,255 | 49.8 |
| 8 | 28.44 | 784 | 1075 | 291 | .37 | 1,200,617 | 1,646,255 | 51.8 |
| 10 | 28.44 | 843 | 1165 | 322 | .38 | 1,290,970 | 1,784,081 | 50.0 |
| 12 | 28.44 | 1042 | 1210 | 168 | .15 | 1,595,718 | 1,852,994 | 53.4 |
| 14 | 28.44 | 1376 | 1462 | 85 | .06 | 2,107,206 | 2,238,906 | 44.3 |

In 1908, counts were made on three rates of seeding, with following results. Counts were made in duplicate plats. Both series are given.

TABLE XI.—*Stooling of Kherson oats, 1908.*

| Plat No. | Area examined | Number of plants on area | Total number of stems | Number of tillers | Number of tillers per plant | Number of plants per acre | Total number of stems per acre | Yield per acre |
|----------|-----------------|--------------------------|-----------------------|-------------------|-----------------------------|---------------------------|--------------------------------|----------------|
| | <i>Sq. feet</i> | | | | | | | <i>Bu.</i> |
| 4 | 32 | 229 | 1048 | 819 | 3.57 | 311,726 | 1,426,590 | 37.0 |
| 4 | 32 | 218 | 1038 | 820 | 3.76 | 296,752 | 1,412,977 | 38.5 |
| 8 | 32 | 428 | 1235 | 807 | 1.89 | 582,615 | 1,681,144 | 50.0 |
| 8 | 32 | 437 | 1310 | 823 | 1.69 | 662,929 | 1,783,237 | 46.5 |
| 16 | 32 | 1120 | 1762 | 582 | .49 | 1,606,275 | 2,398,522 | 56.1 |
| 16 | 32 | 1228 | 1593 | 365 | .30 | 1,671,615 | 2,168,471 | 56.6 |

The oat plants tillered abundantly when sown very thin, producing over five tillers per plant in 1907 when two pecks of seed per acre was used. The number of tillers decreased rapidly when the rate of planting was increased, very few developing when 8 pecks or more per acre was used.

Practically no tillers developed when 12 or 16 pecks was used. (Similar results have been obtained with corn plants. See Nebraska Experiment Station Bulletin 91, page 19.) It is worth noting that, whatever the rate of seeding, there was a strong tendency for the thin seedings to tiller enough to bring the stand up to normal. The normal stand seems to be about 1,700,000 stems per acre.

Results at the Kansas Station¹ show that there is a marked difference in the tillering habits of different varieties of oats, the

¹Kan. Bul. 144, p. 173.

common variation being from about 10 tillers for 100 plants to about 150 tillers for 100 plants. The rate of seeding is affected not only by size of grain but also by the amount of tillering.

CULTIVATION OF OATS.¹

The value of cultivation for hoed crops has so long been recognized that no one knows when the advantage was first discovered, and it is altogether reasonable to suppose that had the cultivation of small grain a corresponding advantage the discovery would have been made early. However, the fact that the cultivation of small grain is certain to yield less striking results than the cultivation of hoed crops does not prevent it from paying returns to the farmer. Nebraska farming has so prospered that land is as valuable as the time of horses and men. In other words, it may be as profitable to add three or four bushels to the average yield per acre by careful cultivation as to buy more land for the growing of extra grain. What painstaking culture can do for small grain on Nebraska farms, the Station during the last eight years has been attempting to determine.

PLANTING OATS IN WIDE ROWS.—In 1898 and 1899, oats were drilled in one-tenth acre plats at distances of twenty-four inches, eighteen inches, twelve inches, and six inches between the drill rows. One of the two plats devoted to drills six inches apart was left uncultivated. For the cultivation of the others the harrow was used until the grain became too high. Then a small-shoveled cultivator was substituted. Table XII gives the data and results:

¹Data on cultivation of oats are condensed from Bulletin 104, a technical bulletin, which was not distributed generally.

TABLE XII.—*Effect of cultivation on oats in 1898.*

| Plat No. | Distance apart of drills | Seed per acre | Number of cultivations | Yield per acre | Method giving larger yield |
|----------|--------------------------|---------------|------------------------|----------------|---|
| | <i>Inches</i> | <i>Qts.</i> | | <i>Bushels</i> | |
| 36 | 24 | 16 | 3 | 21.1 | Ordinary method <i>without</i> cultivation, 22.5 per cent larger. |
| 40 | 6 | 64 | 0 | 25.8 | |
| 37 | 18 | 21 | 3 | 21.2 | Ordinary method <i>without</i> cultivation, 21.7 per cent larger. |
| 40 | 6 | 64 | 0 | 25.8 | |
| 38 | 12 | 32 | 3 | 24.0 | Ordinary method <i>without</i> cultivation, 8 per cent larger. |
| 40 | 6 | 64 | 0 | 25.8 | |
| 39 | 6 | 64 | 1 | 30.2 | Ordinary method <i>with</i> one cultivation, 7 per cent larger. |
| 40 | 6 | 64 | 0 | 25.8 | |

Precipitation: Evenly distributed; fall 1897, 2.46 inches above normal; spring (January-July) 1898, 1.90 inches above normal.

The method of seeding in drills six inches apart without cultivation may be considered here the standard plan of growing oats. The standard plan yielded 22.5 per cent larger than the 18-inch, and 8 per cent larger than the 12-inch plan. However, the advantage of once cultivating a plat drilled six inches apart is 17 per cent. The conclusion from the experiment is that in a year of normal or slightly more than normal rainfall, one cultivation given a field seeded in the standard way is advantageous; but that the advantage secured by cultivation does not warrant the placing of drills farther apart than six inches for the purpose of facilitating cultivation.

In 1899 the results of oats cultivation were as follows:

TABLE XIII.—*Effect of cultivation on oats in 1899.*

| Plat No. | Distance apart of drills | Seed per acre | Number of cultivations | Yield per acre | Method giving larger yield |
|----------|--------------------------|---------------|------------------------|----------------|---|
| | | | | | |
| | <i>Inches</i> | <i>Qts.</i> | | <i>Bushels</i> | |
| 15 | 24 | 20 | 4 | 23.4 | Ordinary method <i>without</i> cultivation, 26.6 per cent larger yield. |
| 19 | 6 | 80 | 0 | 29.7 | |
| 16 | 18 | 27 | 4 | 28.0 | Ordinary method <i>without</i> cultivation, 6.2 per cent larger yield. |
| 19 | 6 | 80 | 3 | 29.7 | |
| 17 | 12 | 40 | 3 | 36.5 | 12 inch drilling <i>with</i> cultivation, 23.6 per cent larger yield. |
| 19 | 6 | 80 | 0 | 29.7 | |
| 18 | 6 | 80 | 1 | 33.8 | Ordinary method <i>with one</i> cultivation, 13 per cent larger yield. |
| 19 | 6 | 80 | 0 | 29.7 | |

Precipitation: Fall, 1898, .03 inch below normal; January-July, 1899, 3.40 inches below normal; June, 3.92 inches above normal.

The standard method of growing yielded, in 1899, 26.6 per cent better than the 24-inch 4-cultivations plan, and 6.3 per cent better than the 18-inch 4-cultivations plan. In that year, however, the 12-inch triple cultivation method gave 23.1 per cent larger results than the standard, and one cultivation increased the yield of a standard drilled plat 13.6 per cent.

The difference in the results obtained on the two years with drills 12 inches apart may be accounted for in the difference in precipitation of the years. The growing season of 1898 was more than normally moist; that of 1899 was more than normally dry.

The conclusions drawn from Table XIII are that one cultivation in a dry season is a decided advantage to a standard drilled acreage, and that under very dry conditions a further advantage is secured by lessening the number of drills by one-half and cultivating three times.

CULTIVATION OF OATS WITH STANDARD METHODS OF SOWING.—The experiment of drilling oats in wide rows, 12 inches or more apart, was dropped in 1900, but cultivation has been continued since on plats sown by standard methods. By standard methods is meant in drill rows 6 to 8 inches apart or broadcast, and at the rate of 10 pecks per acre. The cultivation usually consisted of one to three harrowings, given a few weeks after the oats were

sown. We have used both the smoothing harrow and weeder, but have found the weeder much the better under all conditions. We do not attempt to cultivate when the soil is wet, but only when dry and in condition to pulverize. The following table shows average results of cultivation on oats for seven years:

TABLE XIV.—*Summary showing effect of cultivation upon yield of drilled oats for seven years.*

| Treatment | 1898 | 1899 | 1900 | 1902 | 1903 | 1905 | 1906 | Average |
|---|------------|------------|------------|------------|------------|------------|------------|------------|
| | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> |
| Cultivated..... | 30.2 | 33.8 | 29.0 | 43.5 | 62.4 | 102.1 | 59.2 | 51.4 |
| Not cultivated..... | 25.8 | 29.7 | 24.7 | 39.3 | 67.1 | 80.0 | 59.9 | 46.6 |
| Difference in favor of cultivation..... | | | | | | | | 4.8 |

The experiment was not conducted in 1901. In 1904 the plats were sown, but owing to wet weather and high winds they were blown down so badly that they could not be harvested. An average increase of 4.8 bushels was given by cultivation. The cultivation generally consisted of two or three harrowings, a few days apart, with a common smoothing harrow or weeder, about three to five weeks after sowing. The weeder is much better than the harrow, principally because it does not carry coarse trash, like cornstalks, and is not as severe on the young plants,

For four years, drilling and broadcasting with and without cultivation have been compared. The results are given in the following table:

TABLE XV.—*Summary comparing drilled and broadcast oats, with and without cultivation, for a period of four years.*

| Method of planting | Treatment | 1900 | 1903 | 1905 | 1906 | Av. | Method giving larger yield |
|--------------------|-----------------|------------|------------|------------|------------|------------|--|
| | | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | <i>Bu.</i> | |
| Drilled ... | Cultivated | 29.0 | 62.4 | 102.1 | 59.2 | 63.2 | Cultivation, 5.3 bu. larger, or 9.1% |
| Drilled ... | Not cultivated | 24.7 | 67.1 | 80.0 | 59.9 | 57.9 | |
| Broadcast | Cultivated | 36.0 | 59.0 | 75.6 | 57.0 | 56.9 | Without cultivation, 1.9 bu. larger, or 3.3% |
| Broadcast | Not cultivated | 31.7 | 63.4 | 81.0 | 59.0 | 58.8 | |
| Drilled ... | Cultivated | 29.0 | 62.4 | 102.1 | 59.2 | 63.2 | Drilling, 6.3 bu. larger, or 11% |
| Broadcast | Cultivated | 36.0 | 59.0 | 75.6 | 57.0 | 56.9 | |
| Drilled ... | Not cultivated | 24.7 | 67.1 | 80.0 | 59.9 | 57.9 | Broadcasting, .9 bu. larger, or 1.5% |
| Broadcast | Not cultivated | 31.7 | 63.4 | 81.0 | 59.0 | 58.8 | |

Where broadcasting and drilling were compared without cultivation, the broadcasting gave slightly better results. When cultivation was practised, the drilled oats were increased in yield 5.3 bushels per acre, while the broadcast oats were decreased 1.9 bushels per acre. In cultivating the oats sown broadcast, the harrow destroys some plants, while with the drilled oats very few plants are destroyed. In our experiments we have used the same amount of seed per acre in both cases, but the loss due to cultivation in oats sown broadcast might be offset by heavier seeding. However, experience leads us to believe that where cultivation is to be practised the grain should be drilled.

It will be noted that in this experiment the broadcast oats have yielded as well as the drilled. This is contrary to experience on the farms, but in this case is due to the great care used in sowing the broadcast plats. In order to make a test of the effect of cultivation on broadcast and drilled oats, every precaution was used to insure as good and perfect a stand on the broadcast plats as on the drilled plats. This required a perfect preparation of the soil, an even distribution of the seed, and careful, uniform covering. Under ordinary conditions, however, better results will be secured with drilling than broadcasting.

CONCLUSIONS.

One point brought out clearly by the seven seasons of experiments with oats is that the same treatment does not insure the same results each year. In years of much more than normal rainfall, positive damage is done by cultivating either oats or wheat. When there is sufficient moisture to mature a heavy crop of grain, it is certainly unwise to destroy plants with harrow or pulverizer. On the other hand, when precipitation before seeding has been meager and dry weather follows, cultivation of grain results well.

Early varieties of oats have given an average of 14 bushels per acre greater yield during the past five or six years than late varieties.

The early varieties used have been rather small grained and dark in color.

Eight pecks per acre has given the best results with drilled oats and ten pecks per acre when the oats was sown broadcast.

Cultivation of drilled oats has given an increased yield of 4.8 bushels per acre, while cultivation of broadcast oats has given decreased yield.