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# SEEDBED PREPARATION OF WHEAT FOLLOWING LESPEDEZA

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# SEEDBED PREPARATION OF WHEAT FOLLOWING LESPEDEZA

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The experiments reported here began in 1943 and were made to determine the merits of the different methods of preparing seedbeds for wheat following lespedeza.

One-year rotations of small grain and lespedeza are widely used in Missouri, and are particularly valuable in pasture-livestock systems of farming. It is desirable to allow the lespedeza to grow as long in the fall as possible to produce the maximum of pasture, or in some cases to mature seed. Full season grazing or holding until sufficient seed is matured to insure volunteer reseeding, allows only a limited time to prepare a seedbed and to seed wheat or other fall-sown grain which is to follow.

A common practice was to disk the lespedeza sod rather than to plow before seeding the wheat. Disking required less time, but it appeared to result in less thorough work, and in some seasons could not well be used because the ground was too hard for the disk to penetrate. The use of the field cultivator was suggested as a practical implement for preparing these seedbeds, and under certain conditions appeared to do quite satisfactory work.

Therefore, the experiments reported in this circular were made to test different methods of preparing seedbeds. They were conducted on a Putnam silt loam soil near Columbia, and included these four general methods: (1) disking twice with tandem disk and then harrowing; (2) plowing followed by tandem disk or field cultivator once and then harrowing; (3) use of a field cultivator twice and then harrowing; (4) use of a heavy-duty field cultivator-plow twice and then harrowing.

## EFFECT ON YIELD

Table 1 gives a fairly representative picture of results of the yield tests. The results shown are averages of yields of all plots prepared by the various methods. It can be seen from the table that

TABLE 1. - WHEAT YIELDS USING DIFFERENT METHODS  
FOR SEEDBED PREPARATION

Method	Average yield of all plots prepared by method indicated - Bushels per acre							
	1943	1944	1945	1946	1947	1948	1949	1950
Tandem disk twice, harrow	25.1	23.7	12.2	24.0		32.0		
Plow, tandem disk or field cultivate, harrow		23.1		26.4	25.3	41.4	12.0	17.8
Field cultivate twice, harrow	26.7	22.0	12.2	21.1	21.0	33.4	11.0	8.2
Heavy duty field cultivator-plow twice, harrow						36.8	16.6	11.8

plots prepared by plowing averaged higher yields in most years than any of the methods using only surface cultivation. The method using the field cultivator averaged the lowest yield in most years, although disking and using the field cultivator gave about the same results.

The plot arrangement where these experiments were conducted is such that direct comparison can be made of the yields of certain pairs of plots which are located side by side. Statistical analysis was made of the yields from such paired plots and the results are shown in Tables 2, 3, 4 and 5. In this way the variation in yields due to differences in soil fertility of the various plots was minimized.

When paired as shown in Table 2 the average yield of the plowed plots was 21.9 bushels per acre while that of the plots prepared with the field cultivator was 17.2. The average difference was 4.7 bushels per acre, which is a very significant difference. (The standard error

TABLE 2. - COMPARISON OF PLOWING AND FIELD CULTIVATING

Plowing Yield, Bu/A	Field Cultivating Yield, Bu/A	Plot	Year
27.1	22.0	3	1944
19.5	19.1	7	1944
26.4	23.6	7	1946
26.9	19.8	7	1947
31.6	32.0	7	1948
12.7	3.4	7	1949
10.8	7.5	1	1950
19.9	10.4	3	1950
Avg. 21.9	Avg. 17.2		

of the mean is 1.27 and the probability that this much difference would occur as a result of chance is 0.00018.)

The plowed plots in a second comparison shown in Table 3 had an average yield of 26.5 bushels per acre and the plots prepared with the heavy duty field cultivator-plow, 23.0 bushels per acre. The average difference in yield was 3.5 bushels per acre, which again is a significant difference. (The standard error of the mean is 1.26 and the probability is 0.00596.)

TABLE 3. - COMPARISON OF PLOWING AND USING HEAVY DUTY FIELD CULTIVATOR-PLOW

Plowing	Heavy duty Field Cultivator-Plow		
Yield, Bu/A	Yield, Bu/A	Plot	Year
46.3	39.3	1	1948
41.3	36.3	1	1948
11.3	11.5	8,9	1949
10.8	6.9	2	1950
22.6	21.0	1	1950
Avg. 26.5	Avg. 23.0		

TABLE 4. - COMPARISON OF TANDEM DISKING AND USING THE FIELD CULTIVATOR

Disk Yield, Bu/A	Field Cultivator Yield, Bu/A	Plot	Year
24.6	28.0	2	1943
18.1	24.6	8,9	1943
30.9	27.8	7	1943
23.7	23.5	1	1944
26.2	22.0	3	1944
21.2	19.1	7	1944
12.2	12.2	7	1945
24.0	23.1	2	1946
32.0	34.7	3	1948
Avg. 23.7	Avg. 23.9		

When plots prepared by disking were compared with other plots prepared with a field cultivator as shown in Table 4, no significant difference was indicated. The disked plots averaged 23.7 bushels per acre while the field cultivated plots averaged 23.9 bushels per acre. (The standard error of the mean is 1.14 and the probability 0.83758.)

Again the difference in yield was so small that it is not significant when plots were paired as shown in Table 5. The 16.2 bushels per acre average of the field cultivated plots was only 0.4 bushel per

TABLE 5. - COMPARISON OF USING THE FIELD CULTIVATOR AND THE HEAVY DUTY FIELD CULTIVATOR-PLOW

Field Cultivator Yield, Bu/A	Heavy Duty Field Cultivator-Plow Yield, Bu/A	Plot	Year
34.7	32.1	3	1948
6.3	8.3	8,9	1950
7.5	6.9	1	1950
Avg. 16.2	Avg. 15.8		

acre better than that of the plots prepared with the heavy duty field cultivator-plow. (The standard error of the mean is 1.33 and the probability 0.764.)

Not enough data were available for an accurate statistical comparison of disking with plowing by the pairing method used above.

The results indicate that generally a higher yield can be obtained by plowing than by any of the surface methods of cultivation and that about the same yield can be obtained by using the tandem disk as by using either the field cultivator or the heavy duty field cultivator-plow. The yields obtained by different methods are sometimes affected by the season. In certain seasons some of the surface methods of cultivation resulted in yields as good or better than were obtained by plowing.

#### COST OF PREPARING SEEDBEDS

The approximate cost of preparing seedbeds by the four methods described is given in Table 6. The following hourly rates were used to determine costs: labor, 75 cents; 2-pow tractor, 60 cents; 2-bottom plow, 37 cents; tandem-disk, 25 cents; field cultivator, 35 cents; harrow (15 ft.), 15 cents; heavy duty field cultivator-plow, 40 cents.

#### OTHER CONSIDERATIONS

In some years it was impossible to use the tandem disk because it would not penetrate the hard, dry soil sufficiently. A special disk harrow which can be forced into the ground might be used to advantage in some cases.

It was generally observed that more weeds and cheat appeared in plots which were prepared by methods using surface cultivation only, than in plots which were plowed.

The method of seedbed preparation appeared to have little effect on the lespedeza stand. If plowed plots were not reseeded, however, the stand was not as heavy as that on plots prepared by surface cul-

TABLE 6. - COST OF PREPARING SEEDBEDS BY VARIOUS METHODS

Method	Operation	Machine, Tractor and man hours per acre	Machine cost per acre	Labor cost per acre	Tractor cost per acre	Total cost per acre
Plow, tandem disk or field culti- vate, harrow	Plowing	1.10	.41	.82	.66	1.89
	Disk or F.C.	.35	.10	.26	.21	.57
	Harrowing	.20	.03	.15	.12	.30
	Total	1.65				2.76
Tandem-disk (twice), harrow	Disking	.70	.17	.52	.42	1.11
	Harrowing	.20	.03	.15	.12	.30
	Total	.90				1.41
Field Culti- vate (twice), harrow	Field Cult.	.70	.25	.52	.42	1.19
	Harrowing	.20	.03	.15	.12	.30
	Total	.90				1.49
Heavy duty field culti- vator plow (twice), harrow	Field Cult.- Plow	.70	.28	.52	.42	1.22
	Harrowing	.20	.03	.15	.12	.30
	Total	.90				1.52

tivation. Some seed will mature after the seedbed has been prepared by a field cultivator and it is therefore possible to prepare the seedbed earlier than when the plow is used.

On plots that were plowed, the ground showed some tendency to erode and small washes tended to develop, while on other plots where considerable crop residue was left on the surface, the soil was better protected and showed less tendency to wash. Although the residue helped to protect the soil it was a problem in other respects. The field cultivator tended to drag the trash, particularly if equipped with wide sweeps. The residue also interfered with the grain drill when seeding.

### CONCLUSIONS

1. Plots prepared by plowing yielded significantly better than plots prepared by any of the methods involving surface cultivation only.
2. There was no significant difference in the yield of plots prepared by any of the three methods of surface cultivation tried.
3. The cost of preparing a seedbed by plowing is about twice as high as that for preparing by surface methods.
4. With recent prevailing prices, the value of the increased yields obtained by plowing is considerably higher than the added cost of preparing the seedbed by this method.
5. Weeds and cheat can best be controlled by plowing.
6. Results were sometimes affected by the type of season.