Machinery for Seedbed Preparation and Seeding on Southwestern Ranges

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PROPER seedbed preparation is one of the requirements for successful reseeding. In semi-arid areas, like the Southwest, this preparation must provide for moisture conservation and soil compaction around the planted seeds. A method of seedbed preparation and planting incorporating these conditions is essential for best results in reseeding.

Trials with contour furrowing failed under range conditions because of the difficulty of keeping the furrows exactly on the contour. Water runs to the lower places resulting in spotted stands of grass. Accelerated gully erosion often results from such concentration of run-off. The defects were largely corrected by placing interruptions in the contour furrows. The interruptions served as water storage basins, but they were too difficult and costly to construct. It was found that packing or firming the soil after the seed had been broadcast over the storage basins resulted in more uniform stands of grass. Benefits obtained by firming the soil led to development of the cultipacker-seeder (*2*). This consisted of a tandem cultipacker with seed hoppers mounted on the frame in such a way as to allow seed to drop between the two sets of wheels. When the cultipacker-seeder was run over the interrupted contour furrows it formed a desirable combination of water storage and firm seedbed. It was noted that a superior "catch" of grass was usually obtained in the loose soil that had been thrown out on the undisturbed soil at the edges of the furrows. When loose soil is thrown over a firm, undisturbed soil, water infiltration is increased, while simultaneously the firm soil holds the moisture in close proximity to the seed, thus making ideal conditions for seed germination and seedling establishment.

Following this demonstration a search was made for machinery which would make a series of short furrows or pits and at the same time leave a considerable portion of the seedbed area undisturbed. The eccentric one-way disk as used by Barnes and Nelson (*1*) for renovation of blue grama grass sod in Wyoming appeared to most nearly fulfill the requirements of partial soil disturbance and water storage. With this in mind, a Wheatland one-way plow was equipped with eccentric disks and the cultipacker-seeder attached behind. The machine was set up so that every other disk was eccentric with a $\frac{1}{2}$ turn lag. The eccentric disks were two inches larger in diameter than the regular disks and the gang bolt holes were two inches off center. This machinery was tested on the San Simon Land Utilization Project in a limited way in the summer of 1946 with fair results.

In 1947, further trials were made and the machinery was modified to the extent that all regular disks were removed and replaced with spacing washers to prevent soil disturbance between the pits, thus producing the desirable condition of loose soil thrown over undisturbed soil.

The disk arrangement on the shaft starting from the rear of the gang bolt is as follows: 1st disk, 20-inch eccentric, long side down; 2nd disk, replaced by spacer washer; 3rd disk, 20-inch eccentric, long side up; 4th disk, replaced by spacer washer; 5th disk, 20-inch eccentric, long side down; and continuing in this manner until all of the disks are mounted (Fig. 1).

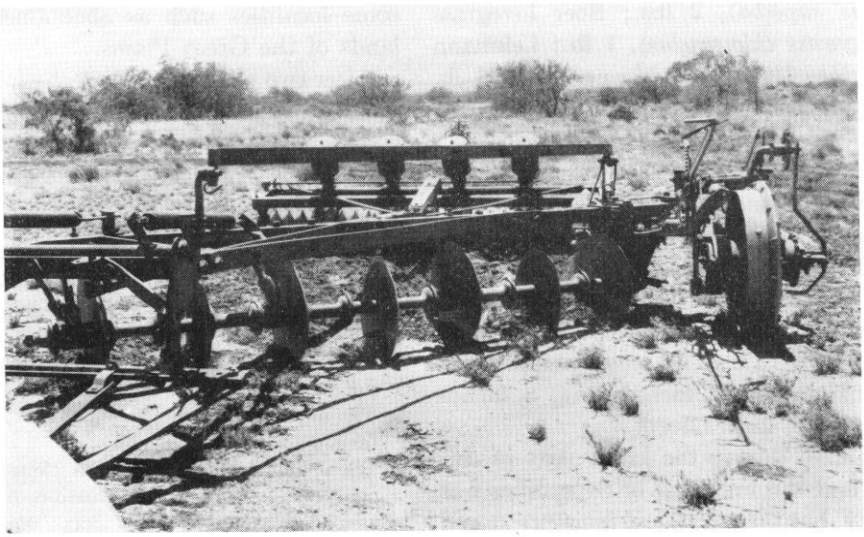

FIG. 1. ECCENTRIC DISK WITH CULTIPACKER-SEEDER ATTACHED BEHIND

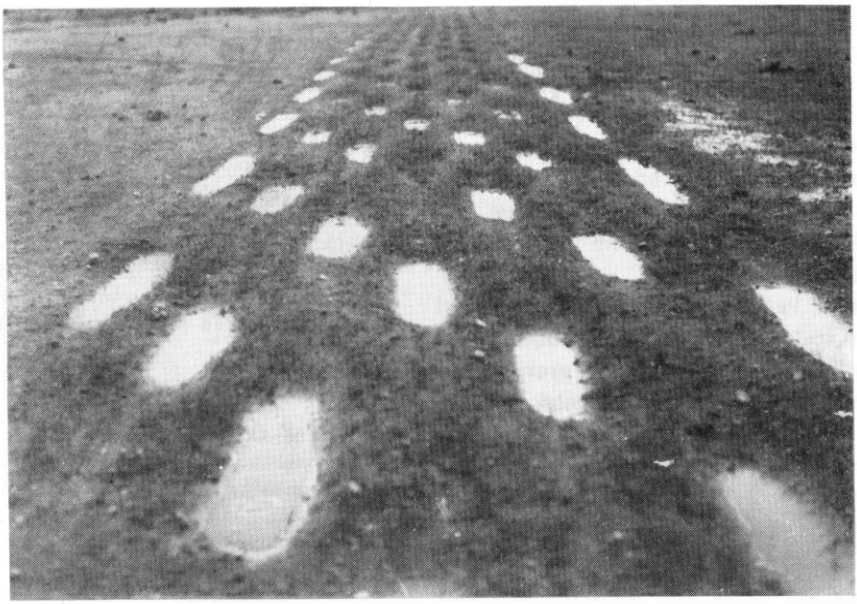

FIG. 2. PITS FILLED WITH WATER

This arrangement was tested on the McDonald Ranch, 15 miles north of Tucson. The soil was rather impermea-

ble and nearly bare of vegetation. The planting was done the 1st day of May, 1947, with the following species and rates per treated acre: Wilman lovegrass (*Eragrostis superba*), 2 lbs.; Boer lovegrass (*Eragrostis chloromelas*), 1 lb.; Lehmann lovegrass (*Eragrostis lehmanniana*), ½ lb. The planting was done in strips 9 feet wide and approximately 18 feet apart.

No effective rainfall occurred at this site until August 7, when 1.73 inches fell during a three-day period. At this time germination occurred and the grasses were well up 6 days later when .22 inch of rain fell and again nearly filled the pits with water (Fig. 2). The staggered pits are approximately 24 inches long, 8 inches wide, and 4 inches deep.

Rainfall during the latter part of August and the first part of September was scanty, but the additional moisture stored by the pits was sufficient to enable survival of a good stand of grass—100,000 seedlings per acre. Rainfall during the remainder of the fall was adequate and the seedlings went into the winter in good condition. They show every indication of being well established.

This machinery was used in similar tests with good results on the Page and McCormick ranches near Oracle and Scottsdale, respectively.

Under varying conditions encountered in the tests it was noted that under high rainfall most of the seedlings grew on the ridges and the edges of the pits, whereas under low rainfall the majority of the seedlings grew in the bottom of the pits. The method of seeding therefore provided conditions suitable for growth of seedlings under either high or low rainfall.

Observation of the eccentric disk and cultipacker-seeder in operation suggests the possibility of mounting modified cotton seed-box hoppers on the disk to handle the planting of chaffy and fluffy seed, followed by the cultipacker-seeder which efficiently plants the finer clean seed. This would provide for planting of mixtures which other investigators, Flory and Marshall (*3*), have found desirable in some localities such as abandoned farm lands of the Great Plains.

After two years of testing, the following points are significant in this type of seedbed preparation and seeding with the eccentric disk and cultipacker-seeder combination:

1. The machines are commercially available.
2. The machines are rugged enough to withstand operation under average range conditions.
3. Due to the staggered nature of the pits it is not necessary to stay on an absolute contour.
4. The machines can be pulled with a suitable farm tractor.
5. The machines provide for a "once over" operation of seedbed preparation, planting, and firming of soil.
6. The operation is fast and cheap. Under present day conditions the estimated cost, less seed, is for solid treatment $1.50 per acre, and for strip treatment covering ⅓ of the area, $0.50 per acre.
7. The machines rather effectively control competition from both perennial and annual plants.
8. Seed is distributed over the entire treated area in such manner as to best take advantage of varying rainfall conditions.
9. With seed hoppers mounted on the eccentric disk, the combination of this and the cultipacker-seeder may be useful for seeding both chaffy and clean seed mixtures simultaneously.

LITERATURE CITED

(*1*) Barnes, O. K., and A. L. Nelson. 1945. Mechanical treatments for increasing the grazing capacity of shortgrass range. Wyoming Agr. Expt. Sta. Bul. 273. 35 pp.

(*2*) Beutner, E. L., and Darwin Anderson. 1944. A method of seedbed preparation and reseeding deteriorated range lands. Jour. Amer. Soc. of Agron. 36: 171–172.

(*3*) Flory, E. L., and C. G. Marshall. 1942. Regrassing for soil protection in the Southwest. USDA. Farmer's Bul. No. 1913. 60 pp.