

AN IRRIGATION DITCH GRASS SEEDER

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A three-point hitch-mounted grass seeder for seeding irrigation ditches is described. The 14-run seeder is equipped with fluted seed rolls, double-disc furrow openers and depth controls. The openers have freedom of vertical movement of up to 60 cm to allow seeding on variable terrain. Constant furrow-opener pressure is attained by adjusting spring tension. An optional offset drawbar is described for the seeding of ditches that cannot be readily straddled with a tractor. Suggestions are given for the operation of the seeder and the seeding of ditches.

INTRODUCTION

Irrigation ditch maintenance studies conducted by the Research Stations at Swift Current and Regina in co-operation with the Saskatchewan Department of Agriculture and Prairie Farm Rehabilitation Act indicate certain advantages of establishing low-growing grasses in ditches that are intermittently wet and dry during the irrigation season. Grasses such as streambank wheatgrass, Russian wild rye-grass, creeping red fescue, and sheep fescue controlled weed growth without impeding water flow. Since the complete cross section of the ditch is seeded, there is no need to treat the banks separately as with sterilants for which only the inside of the ditch below the waterline is treated. Seeding ditches to grasses rather than treating with sterilants overcomes the problems of pollution and potential damage to the crop when using sterilants (Korven 1975).

Seeding ditches to grasses is the lowest cost method of irrigation ditch maintenance. Assuming a relatively high seeding cost of \$25 per acre (1.6 km of ditch 2.5 m wide) and a stand life of 5 yr, the annual cost would be \$5 per acre. This compares to a cost of \$25 for burning, \$50 for mowing, and \$60-\$70 for chemical treatments (Korven 1975).

The ditches in the study were seeded by hand, which is not practical on a field scale. To gain the advantages of seeding ditches to low-growing grasses it was necessary to develop a grass seeder for irrigation ditches. This paper described the design and performance of the seeder for irrigation ditches.

DESCRIPTION

There were three unique design requirements: a high degree of manoeuvrability because of the need to travel into and out of the ditch at each structure and then reverse to the starting point (structure or junction of two ditches); a high degree of flexibility of the furrow openers to handle a verticle difference in the cross-sectional profile of 60 cm (2 ft)

and a ditch bank slope of 1-1/2:1; an optional offset mounting for seeding ditches with banks that cannot be straddled by the tractor.

The required manoeuvrability was obtained by designing the seeder to be mounted on a category II or III three-point tractor hitch (Fig. 1). The required flexibility of the furrow openers was achieved by a spring-loaded parallel-arm suspension system and corrugated rubber seed spouts (Figs. 1, 2 and 3). The spouts could be stretched to 90 cm (3 ft) and after stretching would return to their original length. Mounting each furrow opener on a parallel-arm suspension maintained the correct angle of inclination between the opener and the ground. The spring tension could be adjusted by means of a movable stop (Figs. 1 and 2) to achieve the same pressure on the openers that were in the bottom of the ditch as those on top of the bank. These features were incorporated with a Melroe seed box and standard double-disc openers equipped with depth-control bands (Lawrence and Heinrichs 1966). The seed box was 190 cm (6 ft) wide with 14 seed runs spaced at 13 cm (5-1/4 inches). The box has interchangeable fluted seed rolls of fixed width and an agitator to minimize bridging of the seed. Seed rolls with a range of flute sizes are available for different seed sizes. The fluted seed rolls were grounded-driven by rubber-tired wheels mounted on a solid shaft near the front of the seeder. The rate of seeding was adjusted by means of a variable-ratio gear box. A box to carry the additional weight required when it was necessary to increase the spring pressure to achieve penetration on packed soil was installed in front of the seed box. A plastic brush was attached to each furrow opener to pull soil over the seeds (Fig. 4).

The optional offset mounting was achieved by means of a three-point hitch drawbar (Figs. 5 and 6). The drawbar consisted of a knee-action arm with a female three-point hitch frame to attach to the tractor at one end and a male

three-point hitch frame to attach to the seeder at the other end. The knee joint permitted the seeder to operate at a different elevation than that of the tractor. A hydraulic ram on the knee joint was provided to lift the seeder out of the ditch. A linkage at the seeder end of the offset drawbar was provided to hold the seeder at a constant angle with respect to the tractor for seeding the slopes of the ditch banks.

PERFORMANCE

The three-point hitch mounting provided the necessary manoeuvrability. When raised to its transport position (Fig. 1) there was no problem in entering the ditch, backing into position either in the bottom of the ditch or on top of the ditch bank, and exiting from the ditch as required. The corrugated rubber seed spouts performed satisfactorily. The spouts stretched as required when the openers were in the bottom of the ditch and then contracted as required when these openers were on top of the bank (Figs. 1, 2 and 3.). The double-disc openers penetrated packed soil adequately (Fig. 4). For such a condition, 90 kg (200 lb) of mass had to be added to maintain contact between the drive wheels and the ground. The capability of adjusting the spring pressure on the openers, depending on their elevations, decreased the amount of mass required from about 360 kg (800 lb) to 90 kg (200 lb).

The use of the optional offset arm increased the utility of the seeder. Large ditches with steep banks that could not be straddled by the tractor were seeded by driving the tractor on the field beside the ditch (Figs. 5 and 6). The offset arm requires at least a category III three-point hitch tractor. If put on a lighter tractor it has a tendency to tip and lift in the front because of the weight of the seeder at the end of the arm.

Tests conducted on the soft dry powdery soil conditions of newly constructed ditches indicated some

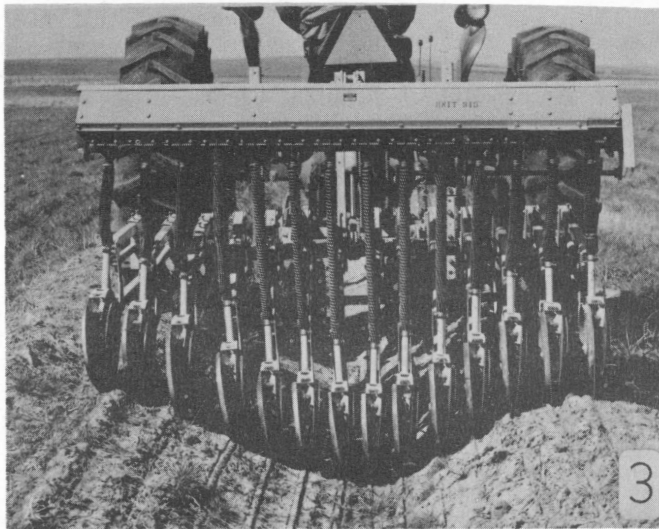


Figure 1. Grass seeder in transport position. Note parallel-arm suspension and the movable stops for adjusting the spring pressure on each opener. Figure 2. Grass seeder mounted on three-point hitch of tractor seeding the ditch bank. Figure 3. Grass seeder mounted on three-point hitch of tractor seeding the bottom of the ditch. Figure 4. Seeder equipped with plastic brushes seeding a packed ditch bank.

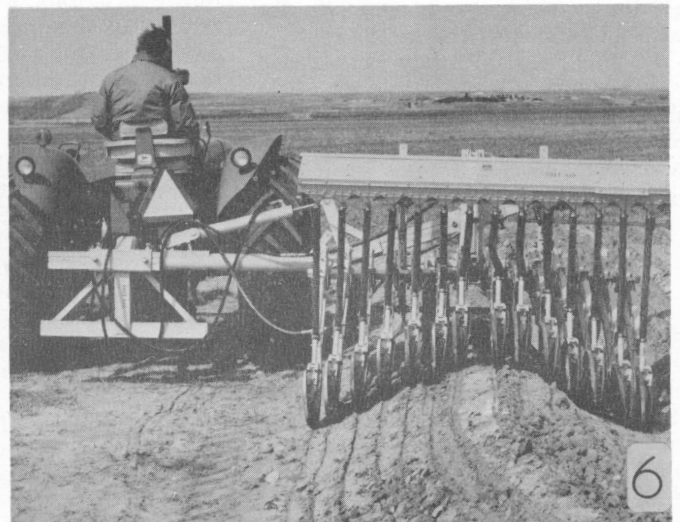


Figure 5. Front view of seeder mounted on the offset drawbar. Figure 6. Rear view of seeder mounted on the offset drawbar.

deficiencies in the seeder. The original model had only three wheels and when seeding the top of the ditch bank, the single wheel in the center did not provide sufficient flotation. This weakness has been overcome by adding a wheel near the center (Fig. 5). Some problems were encountered with soil clods binding between the openers, causing them to stop turning at times. A solution to this problem would be to stagger the openers. The plastic brushes increased the incidence of plugging between the openers, so they were removed. However, if the openers were staggered, the plastic brushes could be reinstalled. Another

problem was that the depth-control bands were not wide enough to adequately control depth of seeding. If the openers were staggered, a solution would be to install wider depth-control bands. The easiest solution might be to delay seeding until the ditch banks have had a chance to consolidate by rains or irrigation.

CONCLUSION

The grass seeder performed very well except on newly constructed ditches with dry powdery soil conditions. Ditches with banks that could be straddled by the tractor were seeded with the seeder

mounted directly to the three-point hitch of the tractor. This mounting is recommended because the position of the seeder can be more easily controlled. Large ditches with steep banks were seeded satisfactorily by using the offset drawbar option. A category III three-point hitch is required when using the offset arm.

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