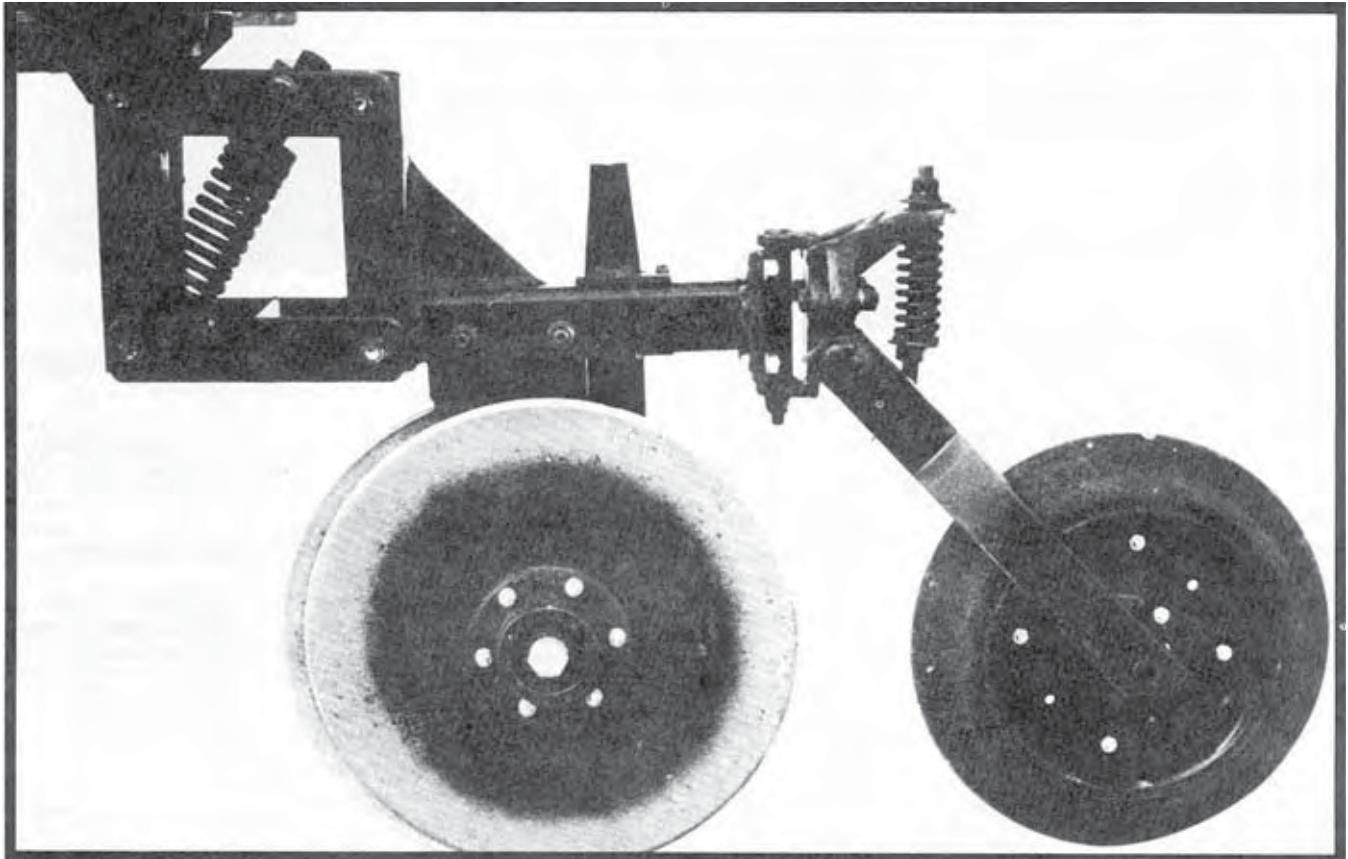


Evaluation Report

716



K-Hart Double Disk Direct Seeding Unit

A Co-operative Program Between

K-HART DOUBLE DISK DIRECT SEEDING UNIT

MANUFACTURER:

K-Hart Industries Ltd.
P.O. Box 520
Elrose, Saskatchewan S0L 0Z0
Phone: (306) 378-2258

RETAIL PRICE:

\$575.00 (March, 1995 f.o.b. Lethbridge, Alberta) for K-Hart Double Disk Direct Seeding Unit.

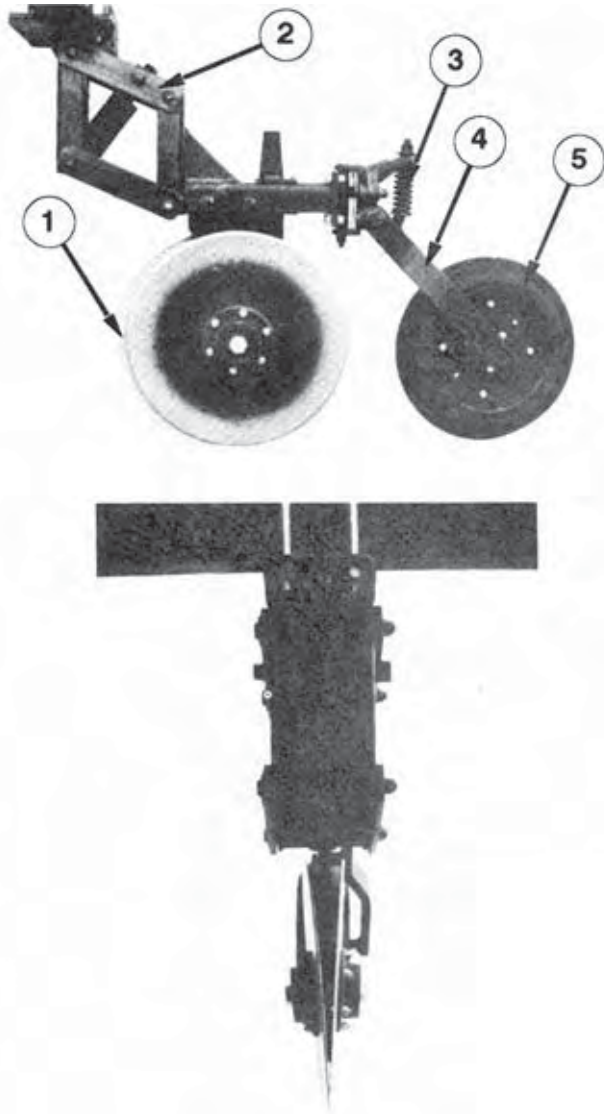


FIGURE 1. K-Hart Double Disk Direct Seeding Unit: (1) Double Disk, (2) Parallel Linkage, (3) Packer Spring, (4) Packer Arm and (5) Packer.

SUMMARY

QUALITY OF WORK

Penetration of the K-Hart Double Disk direct seeding unit was good. The double disks occasionally rode out in hard untilled soils. Toolbar weight required during the test for adequate penetration of the disks was 400 lb (180 kg) per unit.

Seed and fertilizer placement was good. Seed and fertilizer were placed together in the furrows. Variation in seed and fertilizer depth was uniform when two smooth disks were used. Depth varied when notched disks were used on a unit. In very hard soils the parallel linkage allowed the disks to move from side to side.

Soil finishing was very good. Soil and residue disturbance was very low. The packing force was adequate for the soils and conditions encountered during the test. The narrow packer was

the most suitable packer during the field test.

Residue clearance was very good. The disks cut through straw at deep seeding depths in hard soil. Hairpinning of straw occurred at shallow seeding depths or in soft moist soils. Operation in stony conditions was very good. No damage occurred to the units during the test.

EASE OF OPERATION AND ADJUSTMENT

Ease of setting the disk pressure, packing force and seeding depth was good. Adjustments were made to individual units. Wrenches were required to perform the adjustments.

POWER REQUIREMENTS

The tractor size needed to operate each unit varied from 1 to 2.9 PTO hp (0.8 to 2.2 PTO kW). Maximum tractor size needed to operate each unit was 3.9 PTO hp (2.9 PTO kW).

OPERATOR SAFETY

The K-Hart seeding unit was safe to use if normal safety precautions were observed.

OPERATOR'S MANUAL

An operator's manual was not provided with the units.

MECHANICAL HISTORY

The average wear of the notched disks was twice the average wear of the smooth disks. The back offset disk of each unit wore a groove on the inside of the front disk.

RECOMMENDATIONS

The Alberta Farm Machinery Research Centre (AFMRC) recommends the manufacturer:

1. Eliminate the side to side movement in the parallel linkage.
2. Modify the frame mounting to ensure perpendicular mounting of the units to the frame.
3. Provide an operator's manual.
4. Eliminate the wear on the inside of the front offset disks.

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MANUFACTURER'S REPLIES

The manufacturer states that with regards to recommendation number:

1. The side to side movement in the parallel linkage has been corrected by tightening up tolerances during manufacturing.
2. The frame mounting has been modified to ensure perpendicular mounting of the units to the frame.
3. An operator's manual will be available this spring.
4. Wear on the inside of the front disks may have been caused by the disks being improperly shimmed. The operator's manual will explain how to properly shim the disks.

ADDITIONAL MANUFACTURER'S REPLIES

Installing the units is easier if the disk part is installed first and then the packer. The operator's manual will explain the installation procedure.

GENERAL DESCRIPTION

The K-Hart Double Disk direct seeding unit is a tool bar mounted seed opener and packer. The system mounts to the bottom of a frame with two U-bolts. The unit consists of an offset double disk opener followed by a packer. A parallel linkage allows the disks to move vertically. An adjustable tension spring in the parallel linkage controls the penetration of the disks.

The packer is mounted on a swivel arm. The swivel arm is connected to the disk mounting frame. The arm can be locked in a straight position. Force on the packer is controlled by an adjustable compression spring. The spring was replaced with a bolt to lock the packer. Various types of disks and packers are available.

Eight units were mounted and tested on AFMRC's mini air seeder (FIGURE 2). The row spacing of the units was 10 in (254 mm). Various disk and packer combinations were used during the test. FIGURE 1 shows the location of major components. Detailed specifications are given in APPENDIX 1.



FIGURE 2. K-Hart Double Disk direct seeding units operating in field.

SCOPE OF TEST

The K-Hart Double Disk direct seeding units were operated in untilled fields with clay loam to clay soil texture. Seeded area was 312 ac (125 ha). Area seeded with each opener was 39 ac (16 ha). The fields had occasional stones. The units were evaluated for quality of work, ease of operation and adjustment, power requirements and operator safety. An operator's manual was not provided with the units.

The units evaluated by AFMRC were configured as described in the General Description, FIGURE 1, and the Specifications section of this report. The manufacturer may have built different configurations of this machine before and after AFMRC tests. Therefore, when using this report, check that the machine under consideration is the same as the one reported here. If differences exist, assistance can be obtained from AFMRC or the manufacturer to determine changes in performance.

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: Penetration of the K-Hart seeding unit was good. The double disks occasionally rode out in hard untilled soils. Additional weight was added to the toolbar during the test for adequate penetration of the disk units. Total weight of the toolbar and extra weights was 3200 lb (1440 kg) or 400 lb (180 kg) per seeding unit. The weight of each unit was 117 lb (53 kg). The units were operated at 5 to 6 mph (8 to 10 km/h) during the test.

Force was applied to the offset double disks by a parallel linkage with a tension spring. The length of the spring was adjustable. Force exerted on the disks by the spring with the linkage in parallel position ranged from 380 to 710 lb (1690 to 3160 N). The spring settings used for the field test gave a force of 200 to 250 lb (890 to 1115 N) on the disks with the linkage in parallel position.

The soil exerted an upward force on the double disks in all conditions except seeding depths of 1 in (25 mm) or less. The force ranged from 0 to 300 lb (1335 N). The high upward force occurred at deep seeding depths greater than 2 in (51 mm). The weight of the toolbar and seeding units must be enough to overcome the upward force exerted by the soil.

Flotation of the units in soft field conditions depended on the packer spring setting. A low spring setting allowed the disks to penetrate deep in soft soils. A solid packer linkage or a high spring setting prevented the disks from penetrating deep in soft soils.

Seed and Fertilizer Placement: Seed and fertilizer placement of the K-Hart seeding unit was good. Seed and fertilizer were placed together in the furrows. The band widths of the rows averaged 1 in (25 mm).

Variation in seed and fertilizer depth was uniform when two smooth disks were used. Depth varied when notched disks were used on a unit. The notches on the disks left an uneven furrow for the seed and fertilizer. The notches varied the depth of the seed and fertilizer by 0.6 in (15 mm). Twelve and 16 notch disks were available. The disk configurations used during the test were 16 notch in front of a 12 notch, 12 notch in front of a smooth disk and two smooth disks.

In very hard soils the parallel linkage allowed the disks to move from side to side. Movement was measured up to 1.5 in (38 mm) off centre. This movement caused row spacing to change. The AFMRC recommends that the manufacturer eliminate the side to side movement in the parallel linkage.

Soil Finishing: Soil finishing of the K-Hart seeding unit was

very good. FIGURE 3 shows the soil surface before and after seeding into an untilled wheat stubble field. Soil and residue disturbance was very low. Ridge depths left by the units in untilled fields were 1 in (25 mm) or less. Ridge depths increased in soft soils or when seeding at deep depths. For instance, when seeding in soft moist soil the ridge was 2.5 in (64 mm).



FIGURE 3. Soil surface before (left) and after (right) seeding into an untilled wheat stubble field.

The packing force was adequate for the soils and conditions encountered during the test. The initial packer force was varied by changing the packer spring length. The initial packer force ranged from 0 to 190 lb (850 N). The final packing force depended on the penetration of the disk openers. A lack of penetration by the disks caused a decrease in the packing force. Conversely, an increase in penetration of the disks caused an increase in the packing force. The packing force increased until the packer spring was fully compressed. The initial packer force used during the field test was 50 lb (225 N).

The packing force of the solid packer was not adjustable. The packing force depended on penetration of the disks.

Three different packers were used during the test: 2 and 3 in (51 and 76 mm) V-Tread and 4 in (102 mm) V-tread semi-pneumatic. The 2 in (51 mm) wide packer was the most suitable packer during the field test. This packer penetrated the small furrow left by the disk opener. The 4 in (102 mm) packer was suitable for soft soils or deeper seed depths where the disk opener left a larger furrow.

The K-Hart seeding units were lifted out of the ground when turning corners. Large ruts were left in the field when the units were left in the ground on corners.

Residue Clearance: Residue clearance of the K-Hart seeding unit was very good. The disks cut through straw at deep seeding depths in hard soil. Hairpinning of straw occurred at shallow seeding depths or in soft moist soils. The cutting ability of the disks decreased during the test because of wear.

Stony Conditions: Operation of the K-Hart seeding unit in stony conditions was very good. No damage occurred to the units during the test. Trip clearance of the disks with the linkage in parallel position was 4.5 in (114 mm). Maximum trip clearance of the packers with no vertical disk movement was 4 in (102 mm). This was measured with the packer spring at maximum length. Any decrease in spring length decreased the trip clearance of the packer. The packer moved vertically with the disk so total maximum trip clearance of the packer was 9.5 in (241 mm).

EASE OF OPERATION AND ADJUSTMENT

Maintenance: Ease of maintenance of the K-Hart seeding unit was very good. The only maintenance required was to coat the disks with oil or grease to inhibit rusting when stored outside for extended periods.

Transporting: Ease of transporting the test toolbar with the K-Hart seeding units mounted was very good. No additional ground clearance was required when transporting.

Depth Adjustment: Ease of setting the disk pressure, packing force and seeding depth on the K-Hart seeding unit was good. Adjustments were made to individual units. The disk pressure was set by adjusting the spring length in the parallel linkage. A threaded rod screwed into the top of the spring and a jam nut secured the setting. The packing force was set by adjusting the packer spring length. A nut at the bottom of the spring adjusted the length. The main setting for the seed depth was the depth of the packer with

respect to the disks. A nut located on the top of the packer spring made this adjustment. The disk pressure and packing force also affected the seeding depth. Wrenches were required to perform the adjustments.

POWER REQUIREMENTS

Draft: Draft (drawbar pull) requirements of the K-Hart seeding unit depended on soil texture and soil moisture content.

Average draft in primary conditions and clay loam soil for each unit ranged from 50 to 140 lb (225 to 625 N) over a 1 to 2.5 in (25 to 64 mm) seed depth range. Maximum draft was measured at 190 lb (845 N). Ground speed and disk type did not significantly affect the draft.

Tractor Size: The tractor size needed to operate each K-Hart seeding unit at 5 mph (8 km/h) varied from 1 to 2.9 PTO hp (0.8 to 2.2 PTO kW). Maximum tractor size needed to operate each unit at 5 mph (8 km/h) was 3.9 PTO hp (2.9 PTO kW). An increase in ground speed increased the power requirements. These tractor sizes have been adjusted to include tractive efficiency and represent a tractor operating at 80 percent of maximum power take-off ratings as determined by Nebraska tractor tests or as presented by the tractor manufacturer. The tractor sizes given will have ample power reserves to operate in the stated conditions.

EASE OF INSTALLATION

Ease of installing the K-Hart seeding units was good. The units were difficult to handle because of the 117 lb (53 kg) weight.

The units were held on the toolbar by two U-bolts. The U-bolts were made to fit around a 4 x 4 in (102 x 102 mm) frame. The U-bolt mounting did not ensure perpendicular mounting of the units to the frame. Side forces resulted during field operation when the units were not mounted perpendicular to the frame. The AFMRC recommends that the manufacturer modify the frame mounting to ensure perpendicular mounting of the units to the frame.

Caution must be taken when mounting the units on cultivator frames not to overload the axles and tires.

OPERATOR SAFETY

The K-Hart seeding unit was safe to use if normal safety precautions were observed. The test toolbar was locked in position when adjusting the units to prevent the disks from falling on the operator.

OPERATOR'S MANUAL

No operator's manual was provided. The AFMRC recommends that the manufacturer provide an operator's manual.

MECHANICAL HISTORY

The eight K-Hart seeding units were operated for 70 hours while seeding 312 ac (125 ha). Area seeded with each unit was 39 ac (16 ha) on a 10 in (254 mm) row spacing. The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted.

The threads on a packer eye bolt stripped and caused the bolt to break at the start of the test. The following observations were made at the end of the test.

- The average wear of the notched disks was twice the average wear of the smooth disks. Average wear for the smooth disks was 0.15 in (3.8 mm). Average wear for the notched disks was 0.3 in (7.6 mm).
- The back offset disk of each unit wore a groove on the inside of the front disk. The AFMRC recommends the manufacturer eliminate the wear on the inside of the front offset disks.

APPENDIX I SPECIFICATIONS	
MAKE:	K-Hart
MODEL:	Double Disk Direct Seeding Unit
MANUFACTURER:	K-Hart Industries Ltd. P.O. Box 520 Elrose, Saskatchewan S0L 0Z0 Phone: (306) 378-2258
GENERAL:	
-- opener type	offset double disks with trailing swivel packer
-- disk force	parallel linkage with tension spring
-- spring size	0.31 x 4.5 in (7.9 x 114 mm)
-- packer force	solid arm or compression spring and arm
-- spring size	0.25 x 4 in (6.4 x 102 mm)
-- seed delivery	metal tube
-- delivery hose size	1.25 in (31.8 mm) O.D.
MOUNTING:	
-- type	U-bolt
-- number	2
-- size	0.63 x 4 x 4 in (16 x 102 x 102 mm)
DISK:	
-- type	smooth: 12 notch, 16 notch (edge bevelled at 45 degrees)
-- diameter	smooth: 16.1 in (409 mm) notched: 16.3 in (414 mm)
-- notch depth	0.63 in (16 mm)
-- thickness	0.19 in (4.8 mm)
-- angle between disks	8.5 degrees
-- disk offset	0.75 in (19.1 mm)
-- bearing size	0.75 x 2.44 in (19.1 x 61.9 mm)
-- type	steel wheel with V-tread rubber tire
-- width and diameter	2 x 14 in (51 x 356 mm) 3 x 13.5 in (76 x 343 mm) 4 x 14.25 in (102 x 362 mm)
-- bearing size	0.63 x 1.16 in (16 x 30 mm)
DIMENSIONS: (with linkage in parallel position)	
-- width	7 in (178 mm)
-- height	28.4 in (721 mm)
-- length	42.5 in (1080 mm)
WEIGHT: (with smooth disks and 4 in (102 mm) packer)	
-- total	117 lb (52.7 kg)

APPENDIX II MACHINERY RATINGS	
The following rating scale is used in Alberta Farm Machinery Research Centre Evaluation Reports.	
-Excellent	-Very Good
-Good	-Fair
-Poor	-Unsatisfactory

SUMMARY CHART

K-HART DOUBLE DISK DIRECT SEEDING UNIT

RETAIL PRICE:	\$575.00 (January, 1995 f.o.b. Lethbridge, Alberta) for K-Hart Double Disk Direct Seeding Unit.
QUALITY OF WORK:	
-Penetration	good ; occasionally rode out in hard untilled soils
-Seed and Fertilizer Placement	good ; uniform with two smooth disks, varied with notched disks
-Soil Finishing	very good ; very low soil and residue disturbance
-Residue Clearance	very good ; cut through straw in hard soils
EASE OF OPERATION AND ADJUSTMENT:	
-Depth Adjustment	good ; wrenches required
POWER REQUIREMENTS:	maximum tractor size: 3.9 PTO hp (2.9 PTO kW) per opener
OPERATOR'S MANUAL:	not supplied
MECHANICAL HISTORY:	wear of notched disks twice the wear of smooth disks



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