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# Evaluation Report 174


## Morris 80-14 Seed Rite Hoe Drill

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

## MORRIS 80-14 SEED RITE HOE DRILL

**MANUFACTURER & DISTRIBUTOR:**

Morris Rod Weeder Company Ltd.
85 York Road
Yorkton, Saskatchewan
S3N 2X2

**RETAIL PRICE:**

$7,703.00 (July, 1980, f.o.b. Lethbridge, complete with Spierco Model M80 fertilizer attachment).

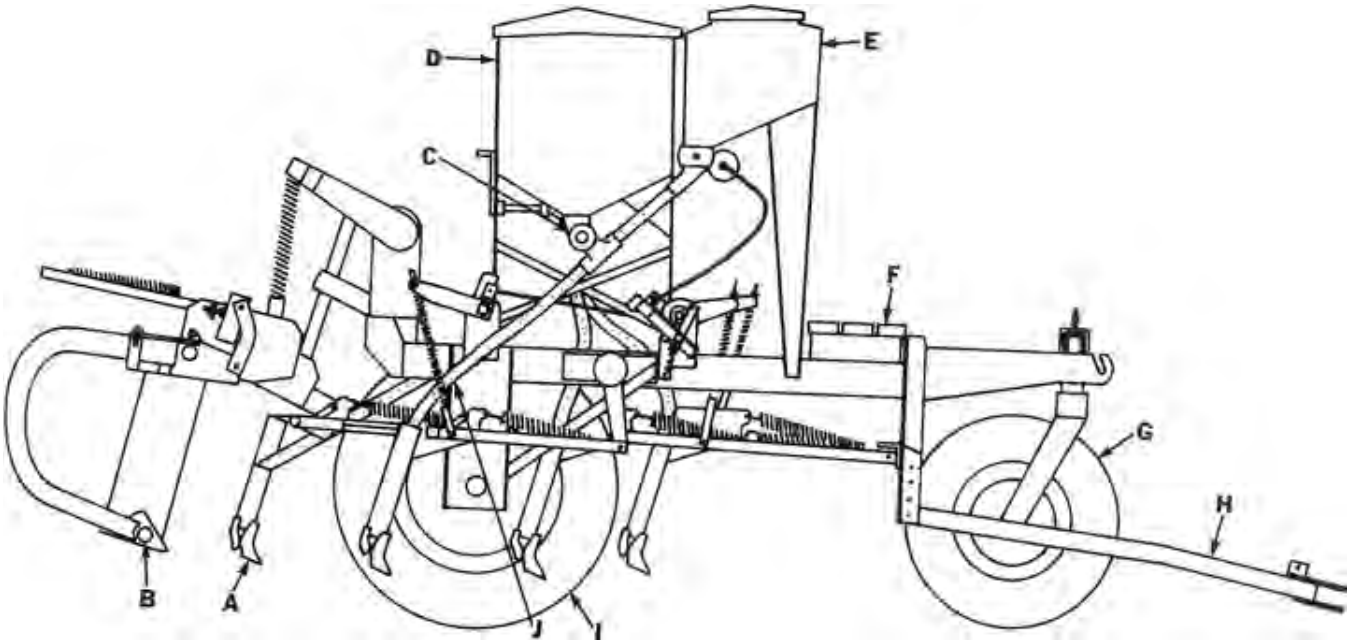


**FIGURE 1.** Morris 80-14 Seed Rite: (A) Hoe Opener, (B) Ground Rod, (C) Fluted Grain Feed Roll, (D) Grain Box, (E) Optional Spierco M80 Fertilizer Attachment, (F) Walkway, (G) Castor Wheel, (H) Hitch, (I) Outer Wheel, (J) Grain Tube.

### SUMMARY AND CONCLUSIONS

Overall functional performance of the Morris 80-14 Seed Rite Hoe Drill was very good on fields that were not tilled immediately prior to seeding. Functional performance was fair on fields, which were tilled immediately prior to seeding. Penetration was very good when seeding into summerfallow or directly into most stubble fields. Trash clearance was good on firm fields but the openers and ground rod plugged in pre-tilled soft trashy fields. Seed placement, coverage and seed emergence were good on firm fields that had not been pre-tilled. Poor seed placement on pre-tilled, loose, dry fields resulted in patchy emergence. Performance in stony fields was good and weed kill was very good.

The seed metering system was fairly accurate in barley, wheat and oats. The manufacturer's calibration for rapeseed indicated three times the actual seeding rate. Uniform seed distribution across the seeding width occurred with wheat, oats and barley, and with rapeseed at rates above 5 kg/ha (4.5 lb/ac). Shimming to obtain equal flute exposure in each seed cup improved seeding uniformity at lower rates of rapeseed. The minimum seeding rate in rapeseed was 3.1 kg/ha (2.8 lb/ac). Seeding rate was not affected by level of grain in the grain box, ground speed or side slope. Fore and aft slope and field bounce caused slight changes in seeding rate. Wheel slippage on soft fields caused the seeding rate to decrease slightly.

A grass seeding attachment was not available for the Morris 80-14 Seed Rite. Small grass seed such as alfalfa could be seeded through the grain box by using an optional slow speed drive. Large light seed such as bromegrass bridged over the seed cups.

Seeding rate was easy to change but installing the optional slow speed drive kit for rapeseed was time consuming. The walkway provided was located at the front of the drill, making it necessary to fill the seed box from the end of the drill. This would be inconvenient in a multiple unit hook-up. The grain box lid-was awkward and heavy to lift. Cleaning was easy. Forty-eight lubrication fittings required greasing.

Tractor size needed depended on soil condition, weeds and seeding depth. Tractor size needed to pull the Morris 80-14 at 8 km/h (5 mph) ranged from 45 kW (60 hp) in loose summerfallow fields to 90 kW (125 hp) when seeding directly into hard stubble fields. A 70 kW (95 hp) tractor would be adequate in most fields. The operator's manual contained much useful information on adjustments, maintenance and operation. A detailed parts list was also included.

Mechanical problems occurring during the test were breakage of a rate setting lever pivot, flexible grain tubes coming out of the rear opener tubes, failure of the depth gauge and damage to the drive chain due to flax stubble wrapping in the rod drive.

### RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Modifying the seed rate indicator plate so that it is more accurate when seeding rapeseed.
2. Supplying a metric calibration to aid in metric conversion.

*Chief Engineer: E. O. Nyborg*
*Senior Engineer: E. H. Wiens*
*Project Engineer: K. W Drever*

### THE MANUFACTURER STATES THAT

`With regard to recommendation number:

1. We will look into modifying the Indicator plate to make it more accurate for rapeseed. The indicator plate, however, is only a guide and it is recommended that a Len Digney gauge be used for accurate calibration with rapeseed.
2. Morris Rod Weeder is in the process of metric changeover. The rate at which the changeover occurs will depend on-demand from the public and availability of materials from our suppliers.

**NOTE:** This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX III.

## GENERAL DESCRIPTION

The Morris 80-14 Seed Rite is a 4.3 m (14 ft) hoe drill with 200 mm (6 in) spacing. It is equipped with 21 openers in four rows. Seeding depth is controlled with a hydraulic cylinder.

Grain is metered from the 1042 L (29 bu) grain box by externally fluted feed rolls through plastic discharge tubes to the openers. A 25 mm (1 in) diameter ground rod follows behind the openers to pack the soil and provide weed kill.

The test machine was equipped with a Spierco MS0 fertilizer attachment[1] and an optional slow speed sprocket drive for rapeseed. FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

## SCOPE OF TEST

The Morris 80-14 Seed Rite was operated in the conditions shown in TABLE 1 for 95 hours while seeding about 268 ha (660 ac). It was evaluated for quality of work, ease of operation, ease of adjustment, power requirements, operator safety, and suitability of the operator's manual.

**TABLE 1.** Operating Conditions

| Crop | Soil | Stone Conditions | Field Area ha | Hours |
|---|---|---|---|---|
| Durum wheat on summerfallow | Silty loam | occasional stones | 19 | 7 |
| | Sandy loam | occasional stones | 16 | 5 |
| Durum wheat on tilled wheat stubble | Silty loam | occasional stones | 13 | 6 |
| | Sandy loam | occasional stones | 16 | 5 |
| Spring wheat on summerfallow | Sandy clay loam | occasional stones | 13 | 4 |
| Spring wheat on stilled rapeseed stubble | Sandy clay loam | occasional stones | 37 | 11 |
| Rapeseed on summerfallow | Clay loam | occasional stones | 21 | 7 |
| Fall rye on summerfallow | Fine sandy loam | moderately stony | 30 | 10 |
| Winter wheat on summerfallow | Clay loam | occasional stones to very stony | 36 | 11 |
| Winter wheat directly on rapeseed stubble | Heavy loam | moderately stony | 43 | 15 |
| Winter wheat on tilled flax stubble | Heavy loam | occasional stones | 23 | 13 |
| Winter wheat directly on wheat stubble | Heavy loam | occasional stones | 1 | 1 |
| Total | | | 268 | 95 |

## RESULTS AND DISCUSSION

### QUALITY OF WORK

**Penetration:** The Morris 80-14 penetrated well in all summerfallow fields. Opener penetration was good in all but extremely hard stubble fields and was best when seeding at an angle to the previous crop rows.

The hoe trip assemblies (FIGURE 2) were equipped with over-centre trips and 150 mm (6 in) hoe openers, with 200 mm (8 in) hoe openers available as an option. New hoe openers had 14 mm (0.5 in) suction and pitch varied from only 4 to 60 during operation, providing uniform penetration in varying soil conditions. The over-centre trips were effective in providing opener protection in stony fields.

As with all rod weeders, ground rod penetration was uneven when operating parallel to field ridges (FIGURE 3). Working ridged fields at an angle improved ground rod penetration uniformity.

**Seed Placement:** Ideally, grain is seeded into moist soil on a firm seedbed. A firm seedbed aids in the packing of moist soil around the seed and provides a barrier to the seepage of rainfall below the seed zone.

Seeds were normally placed at the working depth of the hoe opener in a 100 mm (4 in) wide band. Measurements of seeding depth when seeding wheat indicated that most of the seeds were within 15 mm (0.6 in) of the average seed depth in uniform soil conditions. Wheel sinking in soft spots caused some seed depth increase. A typical depth increase in soft spots in one clay loam field was 25 mm (1 in).

Proper adjustment of the ground rod was critical for uniform seed coverage and suitable compaction (FIGURE 4). The operator's manual states that a 12 to 19 mm (0.5 to 0.75 in) clearance must be maintained between the seeds and the bottom of the ground rod. This adjustment was important to ensure that seeds were not uncovered by the ground rod. The ground rod compacted soil around the seeds leaving the surface loose (FIGURE 5). Seed depth and coverage were not significantly affected by ground speed but higher speeds resulted in more soil pulveration.

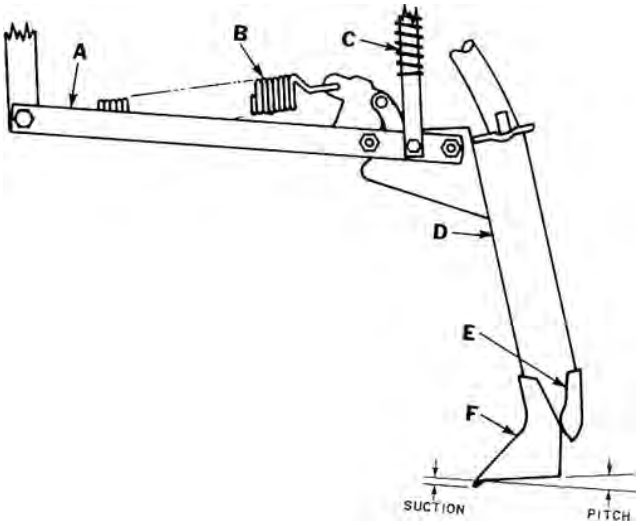


**FIGURE 2.** Hoe Trip Assembly: (A) Drag Bar, (B) Trip Spring, (C) Pressure Rod Spring, (D) Opener Tube, (E) Grain Deflector, (F) Hoe Opener.


**FIGURE 3.** Insufficient Ground Rod Penetration when Travelling Parallel to Ridges.

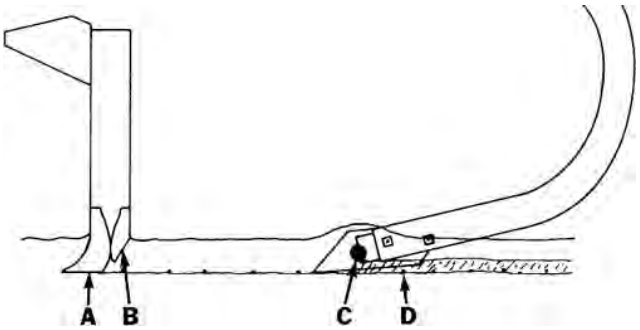


**FIGURE 4.** Seed Placement and Soil Compaction with Morris 80-14: (A) Hoe Opener, (B) Deflector, (C) Ground Rod, (D) Seeds.

**Trash Clearance:** Trash clearance was good on fields that had not been tilled immediately before seeding (FIGURE 6). Pre-tilling of trashy fields immediately before seeding usually resulted in plugging, especially near the wheels (FIGURE 7). Damp straw also sometimes plugged in the weeder frame. The operator's manual states that working ahead of the Morris Seed Rite at depths greater than 50 mm (2 in) can cause plugging problems and may affect germination and emergence. It also suggests harrowing to spread lumps and dry out the trash if plugging is a problem.

**Operation on Stony Fields:** The hoe opener trip assembly performed well during the test and no problems occurred in stony conditions. Opener trip clearance was 340 mm (13 in) while ground rod trip clearance was 390 mm (15 in). Occasionally, an opener did not return to seeding position and had to be reset by hand.

**Weed Kill:** Weed kill was very, good. The hoe openers uprooted plants and the ground rod loosened soil from the roots, leaving weeds on the surface to dry.

[1] *See PAMI Evaluation Report E2079A.*

**FIGURE 5.** Soil Surface after Seeding.

**FIGURE 6.** Heavy Trash Cleared by Morris 80-14 on Wheat Stubble not Tilled Immediately Prior to Seeding.

**FIGURE 7.** Plugging near Wheel in Pre-Tilled Fields.

**Plant Emergence:** As with most drills, plant emergence depended primarily upon seed bed preparation and soil moisture. Emergence was most uniform on fields that had not been tilled immediately prior to seeding (FIGURE 8).

Areas of patchy emergence occurred on fields that had been tilled prior to seeding, especially if pre-tilling was deep and the soil was dry. Pre-tilled soil dried out, causing seed to be placed in dry soil. Alternately, seeding into moisture below the pre-tillage depth caused very deep seed placement since the ground rod loosened the soil surface. In addition, loose pre-tilled soil did not pass over the hoe openers and ground rod as well as firm soil, so some seeds were dragged into loose, dry soil. FIGURE 9 illustrates areas of good and poor emergence of rapeseed in a field that was tilled immediately prior to seeding. Patchy emergence indicates that, for best results, pre-seeding tillage should be avoided.

**FIGURE 8.** Fall Rye Emergence on Untilled Summerfallow.

**A** **B**

**FIGURE 9.** Rapeseed Emergence on a Field Tilled before Seeding: (A) Patchy Emergence, (B) Good Emergence.

**Metering Accuracy:** The grain metering system was calibrated in the laboratory[2] and compared with the manufacturer's calibration. Since actual seeding rates depend on things such as seed size, density and moisture content, it is not possible for a manufacturer to present charts to include all varieties of seed. Field calibration checks may be necessary for seed with properties differing from those indicated in the manufacturer's tables. Research has, however, shown that small variations in seeding rates will not significantly affect grain crop yields.

A lever (FIGURE 10) on each side of the seed box controlled the seed rate by positioning flute projection into the seed cups. The indicator plate was calibrated for various grains. The feed shaft drive included a standard drive assembly for wheat, oats and barley, and a medium speed drive assembly for flax. An optional slow speed drive assembly was available for rapeseed.


**FIGURE 10.** Seed Rate Control: (A) Lever, (B) Indicator Plate.

[2]*PAMI T773, "Detailed Test Procedures for Grain Drills."*

Seeding rates, when compared to the indicator plate, were 10 to 20% low when seeding 770 kg/m³ (60 lb/bu) Neepawa wheat, 0 to 8% low when seeding 590 kg/m³ (46 lb/bu) Sioux oats, and 0 to 10% low when seeding 690 kg/m³ (54 lb/bu) Betzes barley. The right hopper calibration was about 10% higher than the left hopper.

The calibration for 680 kg/m³ (53 lb/bu) Tower rapeseed, when using the optional slow speed drive, was one-third the rate indicated on the plate. It is recommended that the manufacturer consider modifying the indicator plate so it is more accurate for seeding rapeseed.

Level of grain in the grain box, variation in ground speed and side-slope did not affect seeding rate. Travelling up a 15° slope caused a 3% decrease in seeding rate and travelling down a 15° slope caused a 3% increase in seeding rate. Field bounce had no effect on wheat seeding rate but small grains such as rapeseed were seeded at about 4% higher rates when the drill bounced. Wheel slippage on soft fields caused the seeding rate to decrease by 7%.

The coefficient of variation (CV)[3] can be used to describe the variation of seeding rates among individual seed cups. An accepted variation for seeding grain is a CV value not greater than 15%. If the CV is less than 15%, seeding is uniform, whereas if the CV is greater than 15%, the variation among individual seed cups is excessive.

The Morris 80-15 was capable of uniform seeding with CV's of 3 to 7% when seeding wheat, oats and barley at normal seeding rates. Seeding of rapeseed at rates greater than 5 kg/ha (4.5 lb/ac) was also uniform. For example, the CV was about 5% when seeding rapeseed at 11 kg/ha (10 lb/ac}. Attempting to seed rapeseed at 3 kg/ha (2.8 lb/ac) resulted in non-uniform seeding with a CV over 30%. Shimming to obtain equal flute exposure in each seed cup would improve seeding uniformity at low seeding rates in rapeseed.

**Grass Seeding:** A grass seeding attachment was not available for the Morris 80-14. Although no calibrations were provided, small seeds such as alfalfa could be seeded through the grain box using the optional slow speed drive while ryegrass could be seeded with the medium speed drive assembly. PAMI's calibrations are shown in TABLE 2. Uniformity was similar to that when seeding rapeseed. Large light seeds such bromegrass bridged over the seed cups so they had to be seeded through the grain box by mixing the seed with heavier material such as grain.

**Acre Counter:** The acre counter read about 7% low on firm fields, and about 14% low on very soft fields. The counter recorded the nearest tenth acre up to 1000 acres. A metric counter was not available.

**TABLE 2.** PAMI Calibrations for Ryegrass and Alfalfa

| Control Lever Setting on Wheat Quadrant | Ryegrass (kg/ha) (Medium Speed Drive) | Alfalfa (kg/ha) (Optional Slow Speed Drive) |
|---|---|---|
| 0.5 | 2.2 | 4.9 |
| 1.0 | 5.3 | 9.3 |
| 1.5 | 8.5 | 13.8 |
| 2.0 | 11.7 | 18.2 |
| 2.5 | 14.9 | 22.6 |
| 3.0 | 18.0 | 27.0 |
| Seed Densities: Russian Wild Ryegrass 270 kg/m³ Rambler Alfalfa 770 kg/m³ | | |

## EASE OF OPERATION

**Hitching:** The Morris 80-14 was easy to hitch to a tractor. A hydraulic cylinder was not supplied. A standard 203 mm (8 in) stroke cylinder was suitable.

**Filling:** The grain box had to be filled from the end of the drill, since the 300 mm (12 in) wide wooden walkway was located at the front. This would be inconvenient with a multiple drill hook-up. Reaching over the fertilizer attachment (FIGURE 11) and the 450 N (100 lb) opening force required, made the grain box lid awkward to open.

**Cleaning:** As with most drills, a vacuum cleaner or compressed air was needed for thorough cleaning of the grain box. All parts were readily accessible for cleaning.

**Transporting:** The Morris 80-14 transported well behind a suitably sized truck or tractor. The main hydraulic lift cylinder lock was convenient but the drive chains had to be removed when transporting. Overall width was 4.4 m (14.4 ft) so care had to be exercised when transporting on public roads. Tires were adequate for transporting an empty drill, but with fully loaded grain and fertilizer boxes, the outer wheels were overloaded by 20%, based on Tire and Rim Association load ratings. Transporting a fully loaded drill long distances at high speeds should be avoided.


**FIGURE 11.** Awkward Opening of Grain Box Lid.

## EASE OF ADJUSTMENT

**Lubrication:** Lubrication was convenient with fair access to the grease fittings. A grease gun with a flexible hose was needed. Seventeen fittings required daily greasing, 21 fittings every 120 ha (300 ac) and 10 fittings at the beginning of each season. Twenty points required daily oiling. Servicing took about 10 minutes.

**Seeding Rate:** Seeding rate was easily changed with the seed rate lever (FIGURE 10). Adjusting for precise seeding rates was difficult due to the large divisions on the indicator plate and the calibration variations. Calibration had to be checked in the field for precise seeding rates.

Changing to the optional slow speed seed shaft drive for small seeds such as rapeseed was time consuming, taking about 1.5 hours. Several sprockets had to be changed and the detachable link chains split and reassembled.

**Depth Adjustment:** Seeding depth was conveniently adjusted by positioning the hydraulic cylinder. The depth indicator was a useful aid when setting depth. Ground rod depth was easily adjusted with two hexagon depth adjusting blocks.

The frame was easily levelled for uniform depth by adjusting the castor wheel frame.

## POWER REQUIREMENTS

**Draft:** Draft requirements depended on soil, moisture, weeds, and seeding depth. Average draft at 8 km/h (5 mph) with fully loaded seed and fertilizer boxes ranged from 11 kN (2500 lb) in summerfallow to 26 kN (5900 lb) when seeding directly into extremely hard, dry rapeseed stubble.

**Tractor Size:** Tractor size[4] needed to operate the Morris 80-14 varied from a 45 kW (60 hp) power take-off rating in loose summerfallow to 90 kW (125 hp) when seeding directly into hard stubble. A tractor with a 70 kW (95 hp) power take-off rating should have ample power in most fields.

## OPERATOR SAFETY

The Morris 80-14 was safe to operate if normal safety precautions were observed. It was equipped with a slow moving vehicle sign bracket. The wooden platform at the front of the drill was large enough for safe filling of the grain and fertilizer boxes. A hydraulic cylinder lock was provided.

## OPERATOR'S MANUAL

The operator's manual contained useful information on adjustments, maintenance and operation. A detailed parts list

*[3]The coefficient of variation (CV) is the standard deviation of seeding rates from individual seed cups expressed as a per cent of the mean seeding rate.*

*[4]PAMI Detailed Test Procedures for Cultivators*

was also included. Calibration charts were not included in the operator's manual, but the seed rate control had calibrated settings on the indicator plate. A metric calibration was not available. It is recommended that the manufacturer consider supplying a metric calibration to aid in metric conversion.

### DURABILITY RESULTS

The Morris 80-14 Seed Rite was operated for 95 hours while seeding about 268 ha (660 ac). The intent of the test was evaluation of functional performance, and an extended durability evaluation was not conducted. TABLE 3 outlines mechanical problems that occurred during functional testing.

**TABLE 3.** Mechanical History

| Item | Operating Hours | Field Area ha |
|---|---|---|
| Grain Feed Roll Drive | | |
| -A bearing lock collar on the right jackshaft loosened and was lost. The collar was replaced at | 23 | 65 |
| Grain Box | | |
| -The rate setting lever pivot on the right grain box broke and was rewelded at | 33 | 93 |
| Grain Tubes | | |
| -The flexible grain tubes came out of the rear opener tubes 8 times | throughout the test | |
| -A grain tube came loose from the feed cup at | 70 | 197 |
| Depth Gauge | | |
| -The depth gauge failed at | 90 | 254 |
| Chain Drives | | |
| -The ground rod drive chains were stretched and the rear idler bracket bent when flax straw wrapped around the drives at | 90 | 254 |
| Hoe Openers | | |
| -The hoe openers were worn and required replacement at | end of test | |

## DISCUSSION OF MECHANICAL PROBLEMS

### GRAIN TUBES

The flexible grain tubes came out of the rear row of openers (FIGURE 12) in heavy trash. Trash pushed out the hair pin clips, causing the flexible grain tubes to loosen. Reversing the hair pin clips corrected the problem.


**FIGURE 12.** Rear Grain Tube: (A) Flexible Grain Tube, (B) Hair Pin Clip, (C) Opener Tube.

### DEPTH GAUGE

The depth gauge rod wore a hole in the depth gauge bracket after 90 hours, allowing the indicator to rub against the depth scale (FIGURE 13).

### CHAIN DRIVES

Operation in heavy flax stubble (FIGURE 14) resulted in flax straw wrapping around the ground rod chain drives (FIGURE 15), bending the rear idler bracket and breaking the chains. Optional chain drive guards are available to prevent such problems.

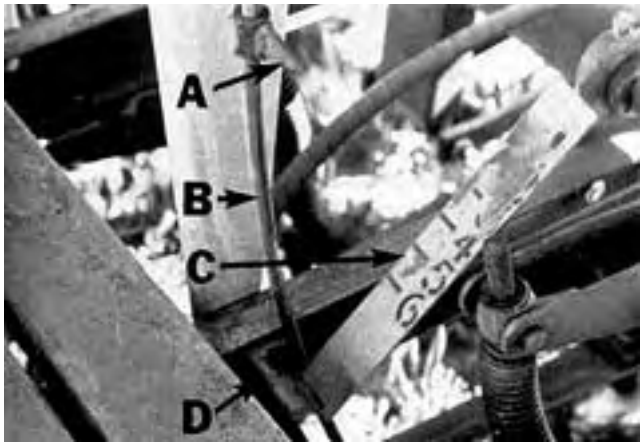


**FIGURE 13.** Depth Gauge Failure: {A) Indicator, (B) Rod, (C) Scale, (D) Bracket.

**FIGURE 14.** Heavy Flax Stubble.

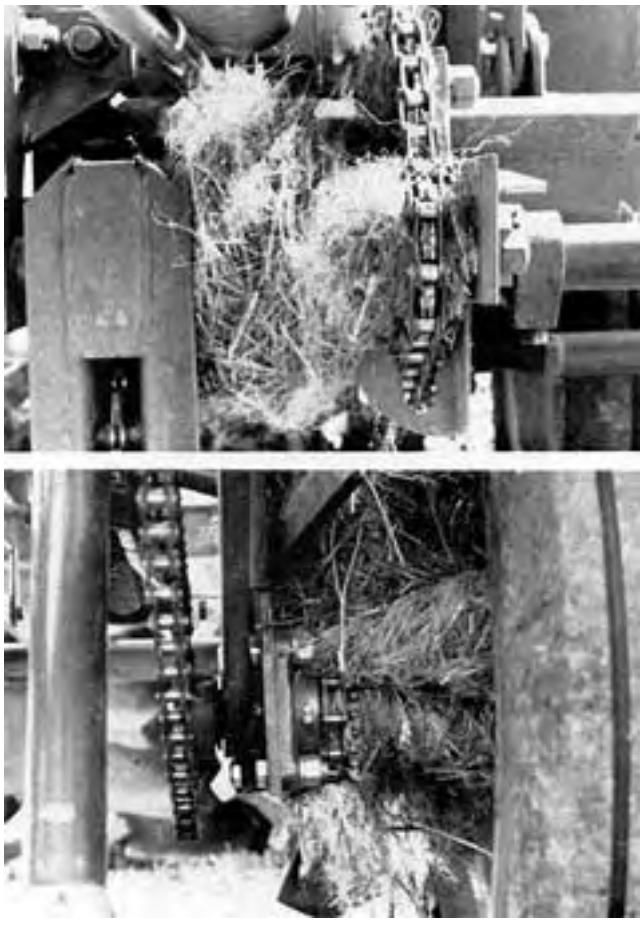

**FIGURE 15.** Flax Straw Wrapped around Chain Drives.

## APPENDIX I
## SPECIFICATIONS

| | |
|---|---|
| **MAKE:** | Morris |
| **MODEL:** | 80-14 Seed Rite |
| **SERIAL NUMBER:** | 9389 |
| **OVERALL DIMENSIONS:** | |
| -- height | 1840 mm |
| -- length | 4430 mm |
| -- width | 4370 mm |
| -- effective seeding width | 4267 mm |
| -- transport ground clearance | 115 mm |
| **SEED METERING SYSTEM:** | |
| -- type | externally fluted feed rolls |
| -- drive | chain and gear from outer wheels |
| -- adjustment | lever controlling feed roll protrusion |
| -- transfer to openers | plastic discharge tubes |
| **OPENERS:** | |
| -- type | hoe |
| -- point | 150 mm sweep |
| -- number | 21 |
| -- spacing | 203 mm |
| -- number of rows | 4 |
| -- distance between rows | 400 mm |
| -- options | 203 mm sweeps |
| -- protection | over-centre trip |
| **WEEDER:** | |
| -- type | round rod |
| -- rod diameter | 25 mm |
| -- width | 4394 mm |
| -- number of standards | 6 |
| -- spacing of standards | 787 mm |
| -- drive | chain from outer wheels |
| -- depth control | adjustable hexagon depth stops |
| -- protection | spring cushion |
| **CASTOR WHEEL:** | 1, 7.60 x 15, 4-ply rib implement |
| **OUTER WHEELS:** | 2, 7.50 x 20, 6-ply rib implement |
| **GRAIN BOX CAPACITY:** | 1042 L |

**WEIGHT** (with Spierco Model M80 fertilizer attachment):

| | Boxes Empty | Boxes Full |
|---|---|---|
| -- outer wheels | 1683 kg | 2633 kg |
| -- castor wheels | 181 kg | 502 kg |
| -- hitch | 15 kg | 15 kg |
| Total | 1879 kg | 3150 kg |

| | |
|---|---|
| **NUMBER OF CHAIN DRIVES:** | 8 |
| **NUMBER OF LUBRICATION POINTS:** | 48 |
| **HYDRAULIC CYLINDERS:** | 1, 75 x 203 mm (not supplied) |

**OPTIONAL ATTACHMENTS INCLUDED ON TEST MACHINE:**
-- Spierco Model MS0 fertilizer attachment, fertilizer drive kit, slow speed sprocket assembly

**OTHER OPTIONAL EQUIPMENT:**
-- wheel markers, dual hitch, chain guard, hitch hold-up bracket, harrows, hydraulic cylinders, hydraulic kits for dual hitches, ground rod supports

## APPENDIX II
## MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

| | |
|---|---|
| (a) excellent | (d) fair |
| (b) very good | (e) poor |
| (c) good | (f) unsatisfactory |

## APPENDIX III
## CONVERSION TABLE

| | |
|---|---|
| 1 hectare (ha) | = 2.5 acres (ac) |
| 1 kilometre/hour (km/h) | = 0.6 miles/hour (mph) |
| 1 metre (m) | = 3.3 feet (ft) |
| 1 millimetre (mm) | = 0.04 inches (in) |
| 1 kilowatt (kW) | = 1.3 horsepower (hp) |
| 1 kilogram (kg) | = 2.2 pounds mass (lb) |
| 1 newton (N) | = 0.2 pounds force (lb) |
| 1 litre (L) | = 0.03 bushels (bu) |
| 1 kilogram/hectare {kg/ha) | = 0.9 pounds/acre (lb/ac) |
| 1 kilogram/cubic metre (kg/m$^3$) | = 0.08 pounds/bushel (lb/bu) |


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