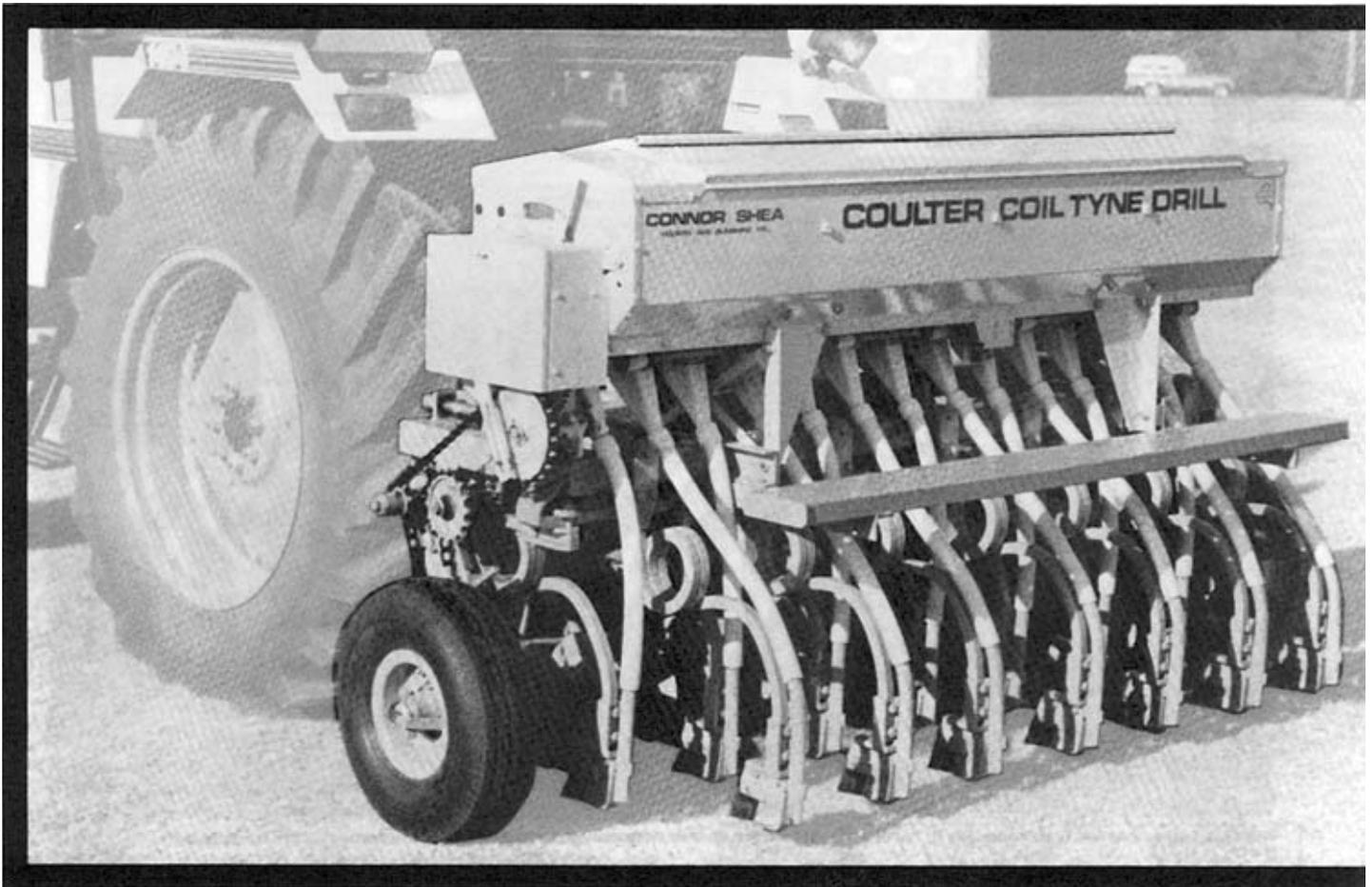


# Evaluation Report

508



## Connor Shea Coultter Coil Tyne Drill

A Co-operative Program Between



# CONNOR SHEA COIL TYNE COULTER DRILL

## MANUFACTURER:

Connor Shea  
Box 33  
Fourth Avenue  
Sunshine, Victoria  
3020  
Australia

## DISTRIBUTOR:

Connor Shea Napier  
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Davidson, Saskatchewan  
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(306) 567-4675

## RETAIL PRICE:

\$8,000.00 (Aug, 1986, f.o.b. Davidson, Saskatchewan)



FIGURE 1. Connor Shea Coil Tyne Coulter Drill: (1) Fertilizer Box, (2) Seed Box, (3) Drive Mechanism, (4) Depth Wheel, (5) Hoe Opener.

### SUMMARY

**Quality of Work:** Penetration of the hoe openers and coulters was very good in all field conditions, with a minimum amount of surface disturbance.

The accuracy of the seed and fertilizer metering system was good. Plant emergence was very good when proper seeding depth was maintained.

**Ease of Operation and Adjustment:** All adjustments for seeding rate, fertilizer rate and depth adjustment were easy. Filling and cleaning of the seed and fertilizer boxes was also easy.

Wet field conditions did not cause plugging of the openers.

**Power Requirements:** A 60 hp (45 kW) tractor with front ballast is necessary to lift the drill. Average drawbar power was 27 hp (20 kW) when seeding at 1 in (25 mm) at 4 mph (6.7 km/h).

**Operator Safety:** The drill was safe to operate and maintain if normal precautions were observed.

**Operator's Manual:** The operator's manual was well written and illustrated and included a parts manual.

**Mechanical History:** The hoes were replaced after 215 acres (88 ha).

### RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Supplying calibration charts in Imperial units.

*Station Manager: G.M. Omichinski*

*Project Engineer: C.W. Chapman*

### THE MANUFACTURER STATES THAT:

With regard to the recommendation:

1. Calibration charts in Imperial units are available.

### GENERAL DESCRIPTION

The Connor Shea Coil Tyne drill is a 7 ft (2.1 m) three-point hitch drill designed primarily for zero till pasture renovation. It is equipped with 14 hoe openers spaced 6 in (150 mm) apart in two rows and 14 single disk cutting coulters. Seeding depth is controlled by two end wheels. The seed box has a capacity of 4.67 bu (0.17 m<sup>3</sup>) and the fertilizer box has a capacity of 433 lb (197 kg).

Seed is metered by externally fluted feed wheels. Fertilizer is metered by externally fluted horizontal feed wheels. Flexible rubber hoses deliver the seed and fertilizer to the openers.

Detailed specifications are given in APPENDIX I and FIGURE 1 shows the location of the major components.

### SCOPE OF TEST

The Connor Shea was operated under field conditions as shown in TABLE 1 for 70 hours, while seeding 215 ac (88 ha).

The Connor Shea drill was tested in the laboratory for seeding and fertilizer rates, and was operated under field conditions as shown in TABLE 1 for 70 hours, while seeding 215 ac (88 ha). It was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

Crop	Soil	Stone Conditions	Field Area		Hours
			ac	ha	
Alfalfa & Trefoil	Clay Loam	Stone Free	8	20	10
Alfalfa & Trefoil	Sandy Loam	Occasional Stones	1	3	3
Alfalfa	Clay Loam	Few Stones	1	2	1
Alfalfa	Clay Loam	Occasional Stones	8	20	6
Pasture Mixture	Clay Loam	Occasional Stones	3	6	4
Pasture Mixture	Clay	Occasional Stones	5	12	5
Pasture Mixture	Complex*	Few Stones	8	20	7
Alfalfa	Clay	Moderately Stony (Small Stones)	6	15	7
Alfalfa	Clay	Very Stony (Large Stones)	2	5	2
Alfalfa	Sandy Loam	Stone Free	41	100	20
Alfalfa	Clay Loam	Moderately Stony	5	12	5
Total			88	215	70

\*Gravel, weathered shale, water laid deposits

## RESULTS AND DISCUSSION

### QUALITY OF WORK

**Penetration:** The drilling of seeds directly into pastureland in a no-till planting operation requires an opener that will cut through the surface, penetrate dry compacted soils and produce a minimum amount of soil disturbance. Excessive soil disturbance promotes weed growth and loss of soil moisture.

The Connor Shea drill was equipped with hoe openers preceded by single disk cutting coulters (FIGURE 2). Penetration of the openers was very good when seeding directly into all types of pastureland.

The ability of the disk coulters to cut through the surface was very good in all conditions.

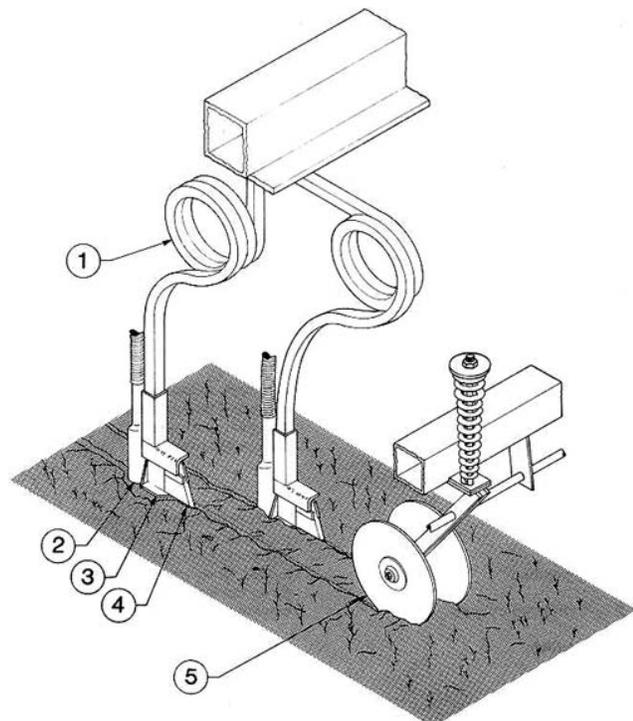


FIGURE 2. Hoe Opener: (1) Coil Tyne, (2) Seed Tube, (3) Wing, (4) Replaceable Vertical Knife, (5) Coulters.

**Seed Placement:** The basic rules for the conventional seeding

also applies to the direct drilling into pasture. The seed is ideally placed when it is in moist soil on a firm seedbed 0.5 to 1.0 in (12 to 25 mm) from the soil surface with the soil packed about the seed for optimum moisture contact and minimum soil drying.

The seed was placed near the bottom of the furrow, which was formed by the hoe opener. The wing on the bottom of the hoe effectively cut existing roots to limit competition and loosened the soil to form a seedbed around the seed. The disk coulters and the narrow vertical knife section of the hoe kept surface soil disturbance to a minimum. The disk coulters were set to penetrate the soil 0.5 in (12 mm) below the hoe and allowed a zone for root development. See FIGURE 3.

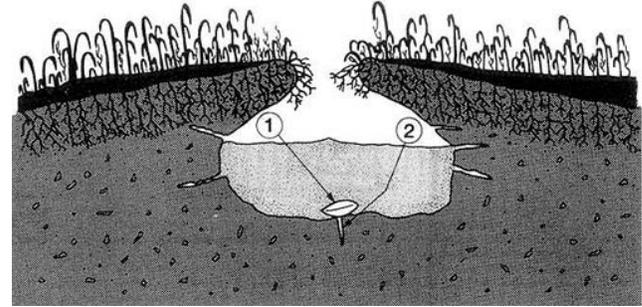


FIGURE 3. Seed Placement: (1) Seed, (2) Disk Coulters Penetration.

**Soil/Sod Disturbance:** Minimizing soil disturbance is important under dry conditions in that it reduces moisture loss and germination of some annual weeds.

The wing on the bottom of the hoe was effective in cutting the existing roots to eliminate competition, yet the narrow vertical knife kept soil disturbance to a minimum.

Seeding too shallow, allowed the wing to cut in the middle of the sod root zone and caused a great deal of soil disturbance.

Seeding depth should be adjusted so the wing openers can cut lower in the sod root zone, to allow the sod to close in around the hoe openers and cause minimal soil disturbance. Minimum disturbance allowed existing plants to shade seedlings after germination, which was beneficial to the seedlings, especially in hot dry conditions.

**Soil Compaction:** The natural closing of the sod after sowing effectively pressed the soil about the seeds. In very loose soils or sparse pasture it may be necessary to pack the surface.

**Plant Emergence:** In general, the crops seeded directly into pasture, germinated well and emerged evenly if adequate moisture was present (FIGURE 4). In dry fields, complete emergence occurred only after rain.

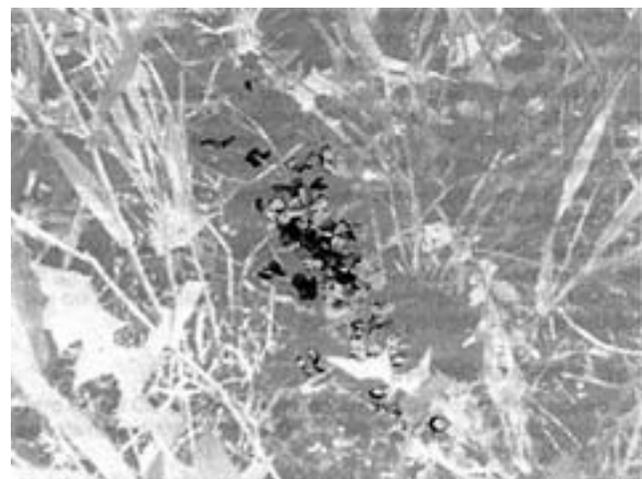


FIGURE 4. Emergence of Alfalfa (40 days after seeding).

Poor emergence in some fields was attributed to a high application rate of nitrogen fertilizer with the seed and/or seeding too deep.

The hoe openers effectively eliminated competition from existing growth to allow germination of the new seedlings.

The Connor Shea was compared to a disk drill and a hoe drill<sup>1</sup>

<sup>1</sup>Refer to PAMI Evaluation Reports No. 420 and No. 421.

when seeding alfalfa in plot trials. Three pasture plots were used for the tests and all drills were used in each plot. Three days after seeding, one half of the area seeded with each drill was sprayed with a one litre per acre application of "Roundup".

TABLE 2 shows the average number of alfalfa plants per square foot for each drill in both undisturbed and chemical fallowed areas, 26 days after seeding.

In all plot trials, germination and survival of alfalfa was greater with the Connor Shea drill than with the disk or hoe drill.

Statistical analysis of the plant counts in the plots indicated a significant increase in the germination and survival rate when using the Connor Shea drill.

TABLE 2. Alfalfa Plants per square foot 26 days after seeding

	Machine	Undisturbed	Chemfallow
Plot 1 Stony	Connor Shea	20.5	15.6
	Hoe Drill	9.6	10.7
	Disk Drill	9.1	7.8
Plot 2 Sloping	Connor Shea	13.2	20.3
	Hoe Drill	11.5	9.6
	Disk Drill	6.2	7.8
Plot 3 Sand	Connor Shea	10.9	9.6
	Hoe Drill	8.3	5.2
	Disk Drill	6.1	3.1

**Metering Accuracy:** The seed and fertilizer metering systems (FIGURE 5) were calibrated in the laboratory and compared with the manufacturer's calibration. Since the actual application rates for certain settings depend on factors such as size, density, and moisture content of seed and fertilizer, it is not possible for a manufacturer to prepare charts which include all the variations of seed and fertilizer used. Small variations in seed or fertilizer application rates will not significantly affect yields.

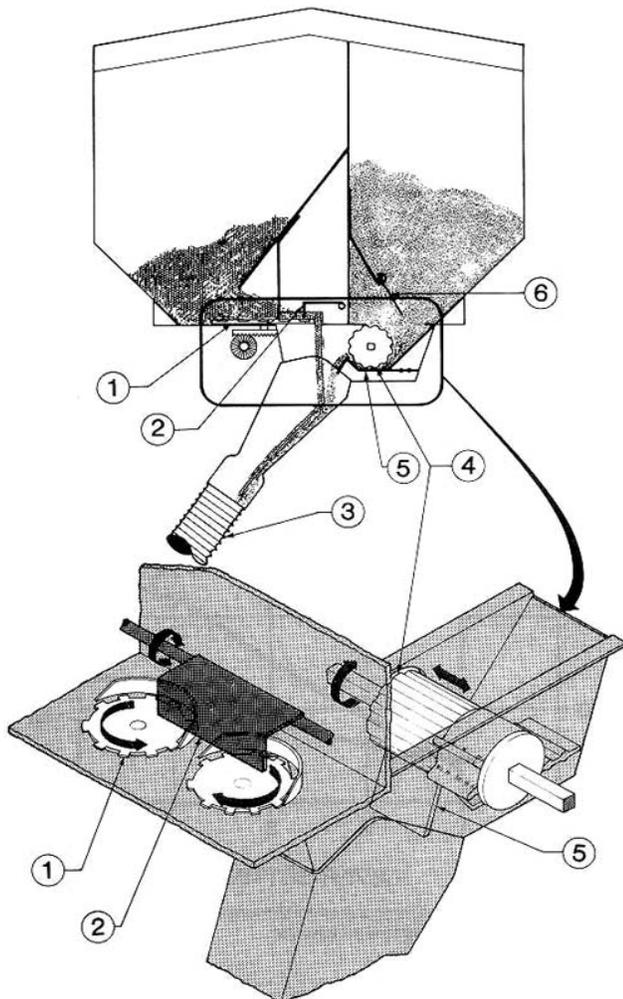


FIGURE 5. Seed Fertilizer Metering System: (1) Fertilizer Metering Wheel, (2) Fertilizer Metering Raffle, (3) Delivery Hose, (4) Seed Metering Wheel, (5) Seed metering Baffle, (6) Agitator.

**Seed Metering System:** The accuracy of the seed metering system on the Connor Shea in wheat was very good. Accuracy in alfalfa was fair. Differences between the actual seeding rate and the manufacturer's calibration charts were probably due to differences in the seed densities. Since seed densities were not stated in the operator's manual, actual rates should be checked by the operator. Level of seed in the grain box, variation in field slopes and variation of ground speed did not significantly affect the seeding rate for either large or small seeds. For example, when travelling up a 15° hill the seeding rate of wheat increased by only 4%.

FIGURES 6 & 7 shows PAMI calibration results in comparison with the manufacturer's calibrations.

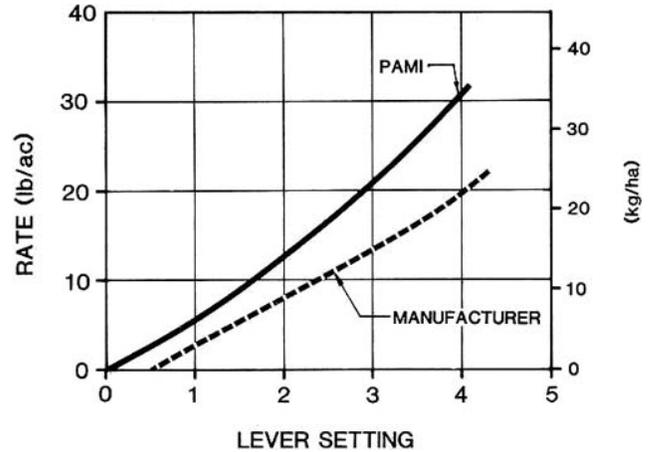


FIGURE 6. PAMI Calibrations in comparison to manufacturer's calibration for alfalfa (8 tooth drive sprocket, 2nd gear setting).

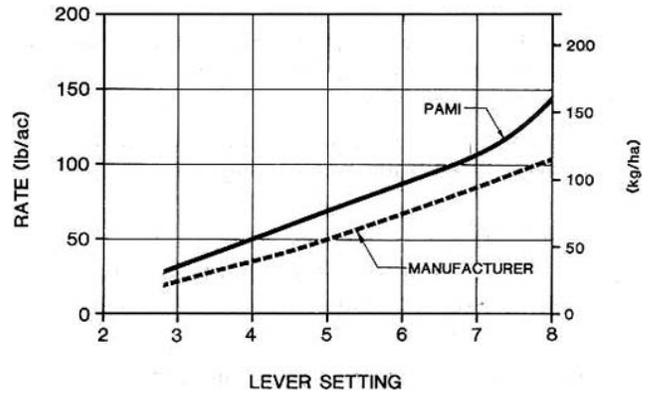


FIGURE 7. PAMI Calibrations in Comparison to Manufacturer's Calibration for Wheat (8 tooth drive sprocket, 1st gear setting.)

The coefficient of variation (CV) can also be used to describe the variation of application rates of individual seed cups. If the CV is less than 15%, seeding is acceptable whereas if the CV is much greater than 15%, the variation among individual seed or fertilizer cups is excessive. When seeding wheat at 70 lb/acre (77 kg/ha) the CV was 3%, but when seeding alfalfa at 90 lb/ac (10 kg/ha) the CV was 16%, which is marginally acceptable.

**Fertilizer Metering System:** FIGURE 8 shows PAMI calibration results in comparison with the manufacturer's calibrations. The difference between the two calibrations was probably due to the difference in density of fertilizer.

The variation in fertilizing rates from one run to another was not significant.

The fertilizer application rate was not significantly affected by the level of fertilizer in the box, ground speed or field vibrations. Variations in field slope did have an effect on the fertilizing rate. When travelling down a 15° slope, the fertilizing rate increased by as much as 13%.

**EASE OF OPERATION**

**Wet Fields:** Mud buildup on the disk coulters did not occur. Some buildup occurred on the hoes between the wing and mud deflector, but did not adversely affect the operation of the drill.

**Stony Fields:** The Connor Shea was operated for several hours in stones and rocks. The spring loaded coulters and coil tynes

allowed the coulters and hoes to clear all rocks encountered.

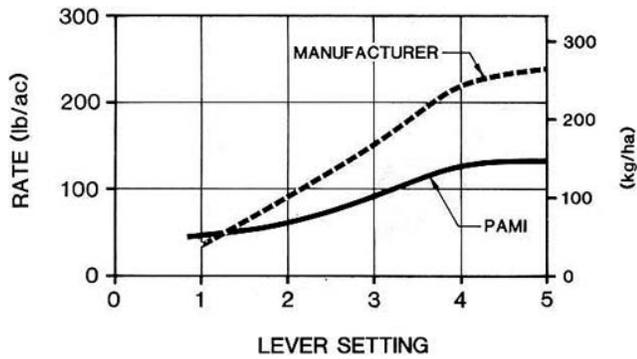


FIGURE 8. PAMI Calibrations in Comparison to Manufacturer's Calibration for Fertilizer 11-51-0 (8 tooth drive sprocket, light feed wheels).

**Filling:** The Connor Shea was equipped with lids on both the seed and fertilizer boxes and a 8 in (200 mm) wide rear walkway.

The seed box had a capacity of 4.7 bu (0.17 m<sup>3</sup>) and the fertilizer box had a capacity of 433 lb (197 kg) of fertilizer. The drill was not equipped with seed and fertilizer level indicators.

**Moisture:** The seed and fertilizer boxes were adequately sealed to prevent leakage into the box. The manufacturer suggests cleaning both seed and fertilizer boxes and meters before storing.

**Cleaning:** The seed box could be easily cleaned with a vacuum cleaner. The seed and fertilizer meters could be cleaned by removing cleanout doors. To completely clean the fertilizer box, it is necessary to remove the baffles and fertilizer metering wheels.

**Acremeter:** The Connor Shea was equipped with a re-settable hectaremeter. It read to the nearest tenth of a hectare to a maximum of 10,000 hectares and was accurate to within 1%.

**Hitching:** The Connor Shea was easily hitched to a tractor with either Category 1 or Category 2, three-point hitch. Hitch pins and bushings were supplied with the machine.

**Transporting:** The empty weight of the Connor Shea was 2304 lb (1044 kg). For safe transport, a tractor with front weights and front tire ballast was necessary.

Ground clearance of the drill, when transporting, was dependant on the tractor's three point hitch lifting height.

#### EASE OF ADJUSTMENT

**Lubrication:** The Connor Shea had 23 grease fittings, and two drive chains, which required daily lubrication. Two wheel bearings required seasonal lubrication.

**Seeding Rates:** Seeding rates were adjusted by either interchanging ground drive sprockets, interchanging seed shaft drive gears, or adjusting the length of exposed fluted seed wheel.

A lever adjusted the length of exposed wheel and is used to vary seeding rates of similar size seed.

All adjustments were easily carried out in a few minutes. The seed box was equipped with an agitator, which effectively eliminated bridging of the seed.

**Fertilizer Rates:** Fertilizer rates were adjusted by either interchanging ground drive sprockets, changing fertilizer metering wheels, or adjusting a lever operated baffle.

Interchanging the drive sprockets or adjusting the lever was easy to do in a few minutes. To change the fertilizer metering wheels, the fertilizer box had to be emptied and the baffle removed. Changing the wheels took 15 minutes.

**Depth:** Seeding depth was easily controlled by adjusting screw type end wheel stops.

The front cutting coulters could be set deeper or shallower than the hoe openers by removing 8 bolts and lowering (or raising) the coulter frame, and installing the bolts in alternate holes. Two turn buckles aided in aligning the frame.

#### POWER REQUIREMENTS

Average power requirements on level fields at 1.0 in (25 mm) seeding depth was 27 hp (20 kW) at 4.0 mph (6.7 km/hr). Draft was 3000 lb (13.0 kN).

Tractor size was dictated by the ability of the three point hitch to lift the 2304 lb (1044 kg) drill, and provide stability when transporting.

A 60 hp (45 kW) tractor (with front tire ballast and front weights) would have sufficient power to operate the Connor Shea and provide the necessary stability.

#### OPERATOR SAFETY

The Connor Shea was safe to operate if normal safety precautions were observed. Pinch points and moving parts were adequately shielded.

#### OPERATOR'S MANUAL

The operator's manual was well written and clearly illustrated. It contained detailed information on operation, service, and parts. Metric units were used in the calibration charts. It is recommended that the manufacturer consider supplying calibration charts in Imperial units, both in the operator's manual and on the seed box lid of the drill.

#### MECHANICAL HISTORY

The Connor Shea was operated for 70 hours while seeding 215 ac (88 ha). The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted. TABLE 3 outlines the mechanical problems that occurred during the functional testing.

TABLE 3. Mechanical History

Item	Hours	Equivalent Field Area	
		ac	(ha)
-several coil tynes were misaligned at	60	198	(79)
-the hoes were worn and were replaced at	End of Test	215	(88)

#### DISCUSSION OF MECHANICAL PROBLEMS

**Tynes:** The misalignment was attributed to turning sharp corners without raising the drill. The mounting bolts were loosened, the tynes were aligned, and the bolts tightened.

APPENDIX I SPECIFICATIONS:	
<b>MAKE:</b>	Connor Shea
<b>MODEL:</b>	14 Tyne/2.1 m
<b>SERIAL NUMBER:</b>	CTC 3181
<b>DIMENSIONS:</b>	
-- height	4.6 ft (1.4 m)
-- length	3.8 ft (1.2 m)
-- width	9.1 ft (2.8 m)
-- effective seeding width	7.5 ft (2.3 m)
<b>SEED METERING SYSTEM:</b>	
-- type	externally fluted feed wheels
-- drive	chain and gear (4 speeds)
-- adjustment	variable roll exposure
-- transfer to openers	convoluted hose
<b>FERTILIZER METERING SYSTEM:</b>	
-- type	horizontal externally cogged metering wheels (three sizes)
-- drive	chain and gear (2 speeds)
-- adjustment	baffles above metering wheels (lever controlled)
-- transfer to openers	convoluted hose
<b>OPENERS:</b>	
-- type	Baker inverted T
-- number	14
-- spacing	6 in (152 mm)
-- number of rows	2
-- distance between rows	13.5 in (340 mm)

<b>COULTERS:</b>	
-- type	disk
-- diameter	11.5 in (292 mm)
-- number	14
-- number of rows	1
<b>GAUGE WHEELS:</b>	
-- number	2
-- size	6.00 x 9, 6-ply
<b>BOX CAPACITIES:</b>	
-- seed	4.7 bu (0.17 m <sup>3</sup> )
-- fertilizer	433 lb (197 kg)
<b>WEIGHT:</b>	
-- total weight	2304 lb (1044 kg)
<b>LUBRICATION:</b>	
-- number of grease fittings	23 (daily)
-- number of chains	2 (daily)
-- number of wheel bearings	2 (annually)

APPENDIX II MACHINE RATINGS	
The following rating scale is used in PAMI Evaluation Reports:	
Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

## SUMMARY CHART

### CONNOR SHEA COIL TYNE COULTER DRILL

<b>RETAIL PRICE:</b>	\$8000.00 (Aug. 1986, f.o.b. Davidson, Saskatchewan)
<b>QUALITY OF WORK:</b>	
Penetration	<b>Very Good;</b> all fields
Accuracy of:	
Seed Metering Device	<b>Fair;</b> alfalfa
Fertilizer Metering Device	<b>Very Good;</b> wheat <b>Good;</b>
<b>EASE OF OPERATION:</b>	
Filling	Easy
Transportability	Three point hitch mounted
<b>EASE OF ADJUSTMENT:</b>	
Seed and Fertilizer Rates	Easy to change
Depth	Quick and simple
<b>POWER REQUIREMENTS:</b>	60 hp (45 kW) tractor is necessary to lift drill
<b>OPERATOR SAFETY:</b>	Safe, if normal precautions observed
<b>OPERATOR'S MANUAL:</b>	Well written and illustrated
<b>MECHANICAL HISTORY:</b>	Hoes replaced after 215 ac (88 ha)



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