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Evaluation Report 564

Flexi-coil 1600 Air Seeder

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

FLEXI-COIL 1600 AIR SEEDER

MANUFACTURER AND DISTRIBUTOR:

Flexi-coil
1000-71 St. E.
P.O. Box 1928
Saskatoon, Saskatchewan
S7K 3S5
Phone: (306) 934-3500

RETAIL PRICE: $22,810.00 (March, 1988, f.o.b. Lethbridge, Alberta). Flexi-coil 1600 Air Seeder with 36 run air package, header rings, auger and welded steel boots.

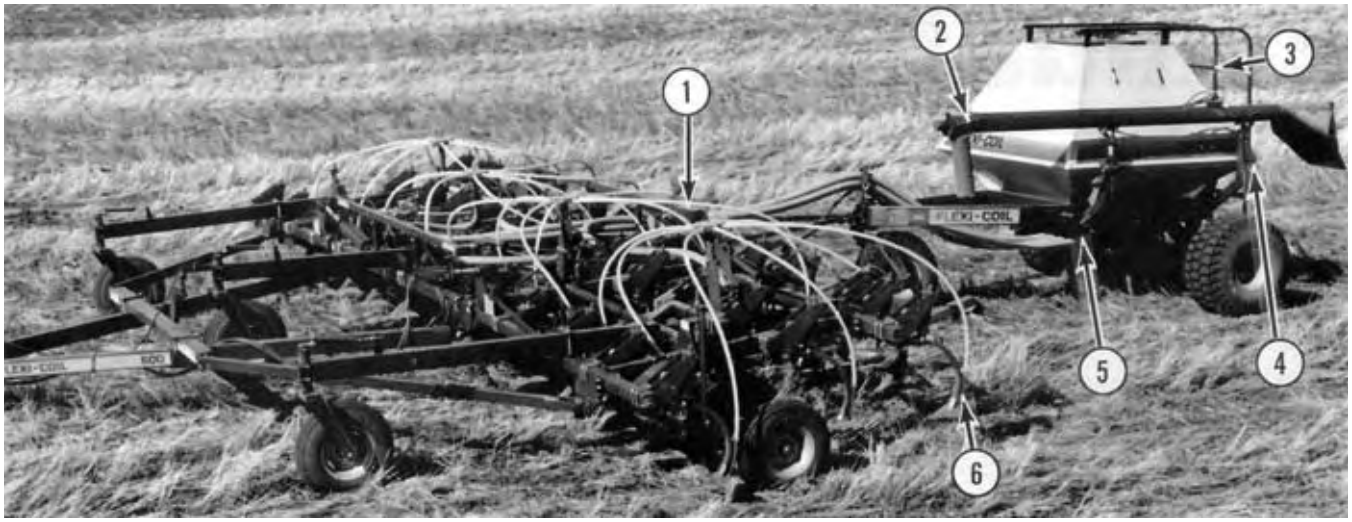

FIGURE 1. Flexi-coil 1600 Air Seeder: (1) Secondary Header, (2) Optional Auger, (3) Ladder, (4) Fan, (5) Metering System, (6) Seed Boot.

SUMMARY

Quality of Work: The Flexi-coil 1600 distribution system was mounted on a 36 ft (11 m) chisel plow. Seed placement was good in most fields conditions. The welded seed boots on 11.8 in (300 mm) spacing resulted in plants emerging in two distinct rows, in band widths ranging from 3.6 to 6.8 in (91 to 173 mm). Soil finishing was very good. Soil contact pressure beneath the wheels with full tanks of wheat was less than the soil contact pressure of an unloaded one-half ton truck.

Metering accuracy of the manufacturer's metering system calibration charts was very good in wheat, barley, canola and fertilizer for both meters. Operating on slopes (up to 10 degrees), variations in ground speed, fan speed and field bounce had little effect on metering rates.

The distribution uniformity and grain damage was very good in all materials tested. The system was capable of single or double shooting. The maximum fertilizer application rate using one or both meters at 5 mph (8 km/h) was 282 lb/ac (320 kg/ha). Higher rates were possible but at unacceptable distribution uniformities.

Ease of Operation and Adjustment: Maintenance of the system was very good with easy access to all lubrication and check points. Tank and meter clean-out convenience was good. Ease of filling was good and required the use of an auger or drill fill. Since the applicator was towed behind the cultivator, operator visibility was good. The Flexi-coil 1600 air seeder with the Flexi-coil 600 heavy duty chisel plow could be placed in transport position in less than five minutes. Monitoring was good with bin level and fan speed indicators being supplied. Ease of setting the seeding and fertilizer rates was very good.

Ease of Installation: Ease of installing the distribution and monitoring systems was good. It took an experienced operator about 8 hours to install the system. Installation of the double shoot package was best done during initial setup rather than as an add-on option later.

Power Requirements: The draft and horsepower requirements depended upon the size and type of cultivator used. The operator can expect up to 5% increase in draft due to the applicator cart.

Operator Safety: Operation of the Model 1600 was safe provided normal safety procedures were observed. A safety railing was provided on the tank.

Operator's Manual: The operator's manual was very good, containing useful information on adjustments, maintenance and operations. A detailed parts list and assembly manual was also included.

Mechanical Problems: The mechanical problems included the rubbing of the primary hoses on the front applicator tire and the rubbing of the electrical harness and hydraulic lines on the front pivot point.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the support structure for the primary hose, electrical harness and hydraulic lines at the front pivot point to reduce the amount of wear to these components.
2. Modifying the meter shield to allow for easier reading of the revolution counter.
3. Supplying meter calibration charts in SI (metric) units as well as Imperial units.

Station Manager: R. P. Atkins

Project Technologist: G. A. Magyar

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Current 1610 model includes a pivot cradle support for the 2-1/2" hoses. The electrical and hydraulic lines are routed separately over the hitch pin where very little movement is involved. An Optional Kit is available for conversion of the 1600 model.
2. The meter shields were modified to include a special viewing port for the revolution counter. The current 1610 model does not require this feature.
3. Supply of meter calibration charts in SI (metric) units is not contemplated at this time.

Additional Comments:

"The Flexi-coil 1600 model is being replaced by the Flexi-coil 1610 Air Seeder which incorporates a number of advances including more extensive monitoring."

GENERAL DESCRIPTION

The Flexi-coil 1600 is a pneumatic seed and fertilizer applicator designed for use with varying makes and models of cultivators. The applicator is supported by two rear tires supported on single axles and one front tire mounted on a caster fork assembly. The applicator is towed behind the cultivator. Seed and fertilizer are pneumatically distributed from the two tanks through a network of tubes to seed boots attached to the rear of the cultivator shanks. The applicator can be used for seeding, for combined seed and fertilizer application and for fertilizer banding. The applicator was also equipped with the double shoot option which allowed the unit to band fertilizer while seeding.

Seed and fertilizer are metered through two variable speed metering rollers mounted below each tank. The meters are driven by a series of sprockets and chains from the right rear applicator tire. A clutch between the drive wheel sprocket and the clutch sprocket is electronically controlled by the monitor mounted in the tractor cab. An auxiliary clutch assembly was installed between the main drive and the rear meter. A hydraulically driven fan conveys the metered material through the distribution system. The distribution system consisted of four primary tubes, passing through the metering manifolds at the bottom of each tank. The primary tubes then feed 4 nine-port secondary headers mounted on the cultivator frame. Tubes from the secondary headers connect to the seed boots.

The installation of a by-pass manifold above the front meter manifold was necessary when the Model 1600 was switched to the double shoot option. The double shoot option also required the installation of long meter divider blades in the front meter box assembly and a duplicate set of primary and secondary hoses and secondary headers.

The test machine was used with a Flexi-coil 600 heavy duty chisel plow (PAMI Evaluation Report #566). The Flexi-coil chisel plow was 35.8 ft (10.9 m) wide, with a 14.0 ft (4.3 m) center frame and two, 10.9 ft (3.3 m) wing sections. It was equipped with 36 spring cushioned shanks spaced at 11.8 in (300 mm) arranged in three rows. The chisel plow was equipped with optional three-row mounted harrows. The test machine was also equipped with an electronic monitoring system. A tractor with three remote hydraulics was required to operate the Flexi-coil 1600 air seeder with the Flexi-coil 600 heavy duty chisel plow.

Other optional equipment available included: ve, six and eight-port primary manifolds; eight, ten and twelve-port manifolds for double shoot option; seven, eight, ten, eleven and twelve-port secondary headers; a gas engine (gear box assembly used instead of hydraulically driven fan); a ow monitor package; a tow between model and a oating header stand for the Flexi-coil Eclipse 700 cultivator. Detailed speci cations for the air seeder are given in Appendix I, while Figure 1 shows the location of major components.

SCOPE OF TEST

The Flexi-coil 1600 air seeder was operated in loam, silty clay loam, sandy loam, clay loam and silt loam soils in the eld conditions shown in TABLE 1 for approximately 225 hours while processing about 3560 ac (1441 ha). It was evaluated for quality of work, ease of operation and adjustment, ease of installation, safety and suitability of the operator's manual. In addition the seed and fertilizer metering systems were calibrated in the laboratory.

RESULTS AND DISCUSSION

QUALITY OF WORK

Seed Placement: The seed placement of the Flexi-coil 1600 air seeder was considered good. The Model 1600 was equipped with a welded v-shaped seed boot (FIGURE 2) to spread material behind the cultivator sweep. Plants emerged in two distinct rows in band widths ranging from 3.6 to 6.8 in (91 to 173 mm). With a 11.8 in (300 mm) cultivator shank spacing, distances between rows varied from 5.0 to 8.2 in (127 to 208 mm). The row spacing provided adequate windrow support providing light crops were laid across the rows rather than parallel to them.

Careful cultivator frame levelling was important in obtaining uniform plant emergence across the cultivator width. Uniform seed depth placement was best obtained by comparing the seed depth of several shanks across the cultivator width and comparing the front and rear shank rows.

TABLE 1. Operating Conditions.

MATERIAL	SOIL TYPE & CONDITION	STONE CONDITIONS	FIELD AREA		HOURS
			ac	ha	
Fertilizer	Silt Clay Loam - Primary	Stone free	100	40	9.5
	Loam - Primary	Occasional stones	300	121	15.0
	Loam - Secondary	Occasional stones	450	182	22.5
	Clay Loam - Secondary	Stone free	600	243	50.0
	Clay Loam - Secondary	Occasional stones	220	89	14.0
Sauflower	Loam - Primary	Occasional stones	120	49	18.0
Durum	Loam - Primary	Stone free			
	Loam - Primary	Stone Free	160	65	9.0
	Sandy Loam - Primary	Moderately stones	320	130	23.0
Barley	Silt Loam - Primary	Occasional stones	320	130	23.0
Canola	Sandy Loam - Secondary	Occasional stones	160	65	6.0
Winter Wheat	Sandy Loam - Primary	Occasional stones	200	81	10.0
	Loam - Primary	Occasional stones	40	16	4.0
	Sandy Loam - Secondary	Occasional stones	250	101	14.0
	Loam - Secondary	Occasional stones	320	130	20.0
TOTAL			3560	1442	225.0

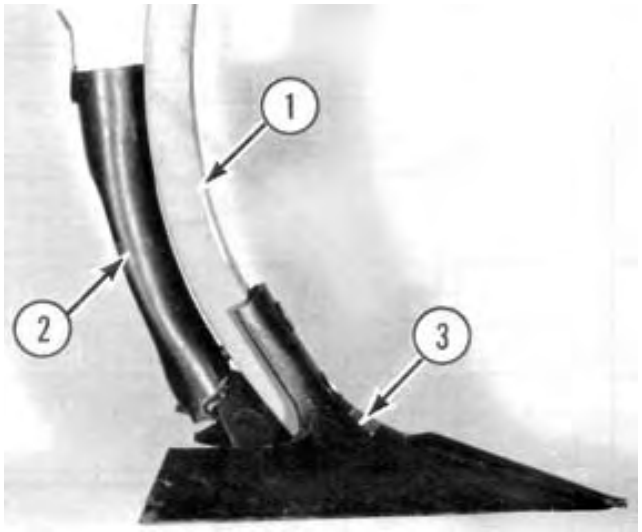

FIGURE 2. Flexi-coil 1600 Seed Boot: (1) Shank, (2), Seed Boot, (3) Sweep.

On level and gently rolling elds, vertical seed distribution was quite uniform. For example, at an average seeding depth of 2 in (50.6 mm), seeding depth across the width of the machine varied from 1.2 to 2.7 in (31 to 69 mm) with most of the seeds placed within 0.4 in (13 mm) of the average cultivator sweep working depth. This compares to seed being placed from 0.5 to 0.6 (12 to 15 mm) from average seeding depth for a hoe drill in similar conditions. Working in elds with hill crests or gullies, seed depth variation was higher because of the wide distances between the shank rows. Frame levelling should be checked and appropriate depth adjustments made when changing elds to ensure adequate, uniform seed coverage.

Soil Finishing: The Model 1600 applicator and chisel plow left the seedbed in very good condition. With the applicator being towed behind the cultivator, the seedbed was packed rmly in the wheel tracks. However, the applicator did not over pack the seedbed in normal seeding conditions encountered during the test. Packing in moist clay soils could possibly be a problem. The soil contact pressure due to the applicator's tires ranged from 25 to 37 psi (172 to 255 kPa). For comparative purposes, an unloaded pickup truck has an approximate soil pressure of 30 psi (207 kPa). It was considered essential to level and pack elds with a packer drawbar or harrow packer drawbar as a follow-up operation. The packer or harrow-packer combination served to smooth and pack

the seedbed, leaving packer ridges from 1 to 1.3 in (25 to 33 mm). To obtain a smooth rm seedbed in dry conditions required packer-drawbar operations in two directions. Care had to be used in moist conditions to avoid over packing the seedbed.

Metering Accuracy: The accuracy of the Model 1600 metering system was very good. The metering rate was varied by loosening the lock bolt on the meter crank arm and then moving the crank arm to lengthen or shorten its turning radius. Calibration curves for wheat, barley, canola, and fertilizer are given in FIGURES 3 to 6. There was very little difference between the manufacturer's and PAMI's calibration curves for wheat, barley, canola and fertilizer. Operating on slopes (up to 10 degrees), variations in ground speed, fan speed and eld bounce had little effect on metering rates.

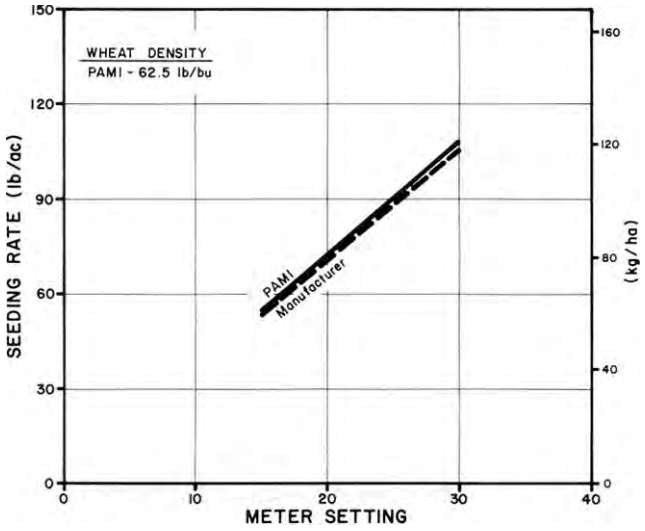

FIGURE 3. Metering Accuracy in Wheat.

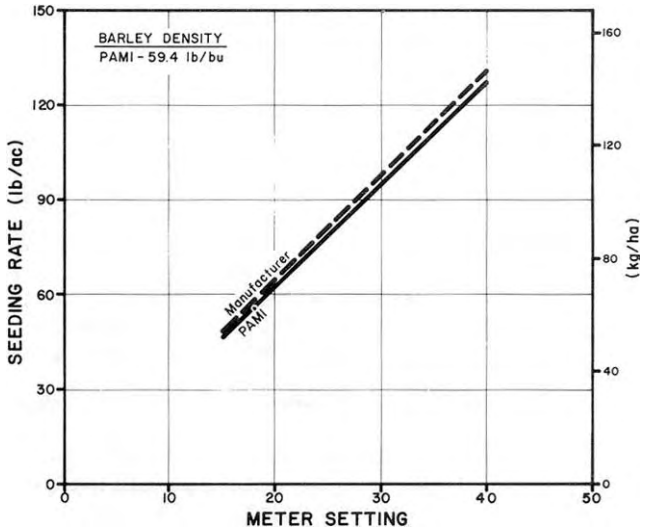

FIGURE 4. Metering Accuracy in Barley.

Distribution Uniformity: The distribution uniformity of the Model 1600 was very good. Given in FIGURE 7 is the seeding distribution uniformity for the Model 1600 in wheat and barley.

Distribution was uniform over the full range of seeding rates at a fan speed of 3300 rpm. For example, at a seeding rate of 73.3 lb/ac (83.3 kg/ha), the coef cient of variation[1] (CV) was 3.7% for wheat and at a seeding rate of 78.7 lb/ac (89.4 kg/ha) the coef cient of variation was 3.5% for barley. FIGURE 8 shows a typical seeding distribution pattern obtained in wheat at a seeding rate of 73.3 lb/ac (83.3 kg/ha). The seeding rate from each shank across the width of the air seeder varied from 67.8 to 77.8 lb/ac (77.0 to 88.4 kg/ha). Given in FIGURE 9 is a typical distribution pattern obtained in canola at a seeding rate of 6.3 lb/ac (7.2 kg/ha). The distribution uniformity was acceptable with a CV of 9.9%. The coef cient of variation ranged from 9.2 to 10.4% (FIGURE 10) over the full range of canola seeding rates. Distribution uniformity in 11-51-00 fertilizer was acceptable over the full application range with a CV ranging from 6.1 to 14.6% (FIGURE 11).

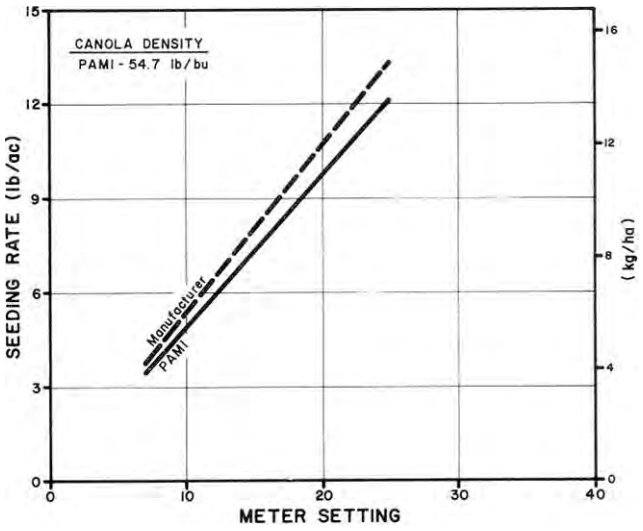

FIGURE 5. Metering Accuracy in Canola.

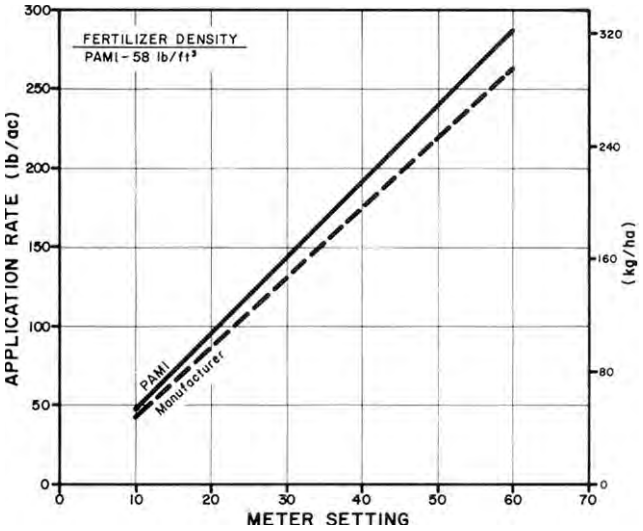

FIGURE 6. Metering Accuracy in Fertilizer.

Changes in fan speed and operation in hilly terrain had little effect on distribution uniformity.

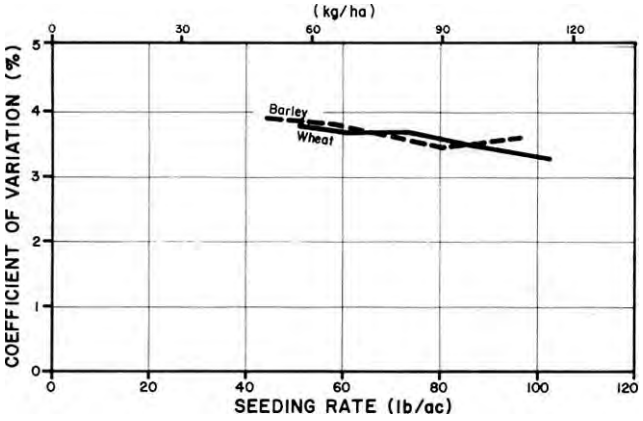

FIGURE 7. Distribution Uniformity in Cereal Grains over a Range of Seeding Rates at 5.0 mph (8 km/h) at Varying Fan Speeds.

Grain Damage: Grain damage by the metering and distribution system was very good in that little damage occurred if proper fan

[1]The coef cient of variation (CV) is the standard deviation of seeding rates from individual shanks expressed as a percent of the average seeding rate. An accepted variation for seeding grain or applying fertilizer is a CV value not greater than 15%. If the CV is less than 15%, distribution is acceptably uniform, whereas if the CV is greater than 15%, the variation in application rate among individual shanks is excessive.

speeds were used. For example, in dry Neepawa wheat, at an 11.5% moisture content and a fan speed of 3300 rpm, only 0.6% grain crackage occurred. Grain crackage in canola was slightly higher than in cereal grains. For example, in dry canola at a moisture content of 8.5%, crackage at a fan speed of 2230 rpm was 1.7%.

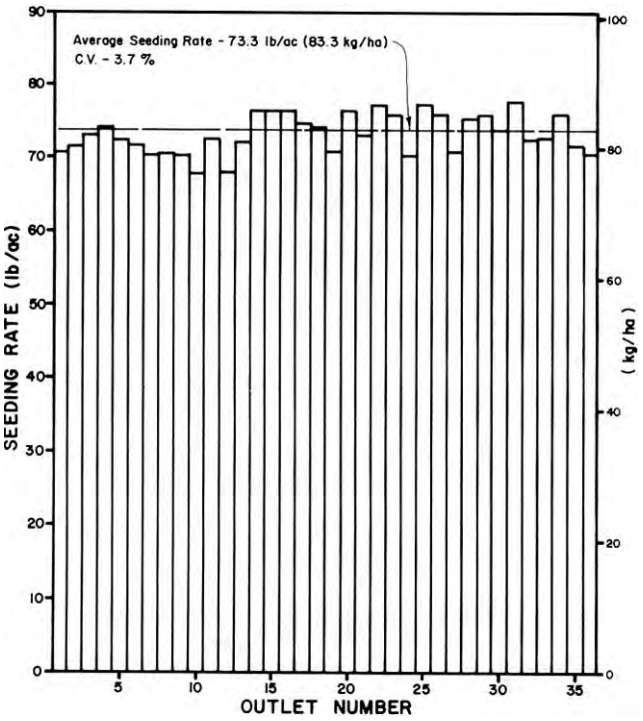

FIGURE 8. Distribution Uniformity Pattern in Wheat at 73.3 lb/ac (83.3 kg/ha) at a Fan Speed of 2320 rpm.

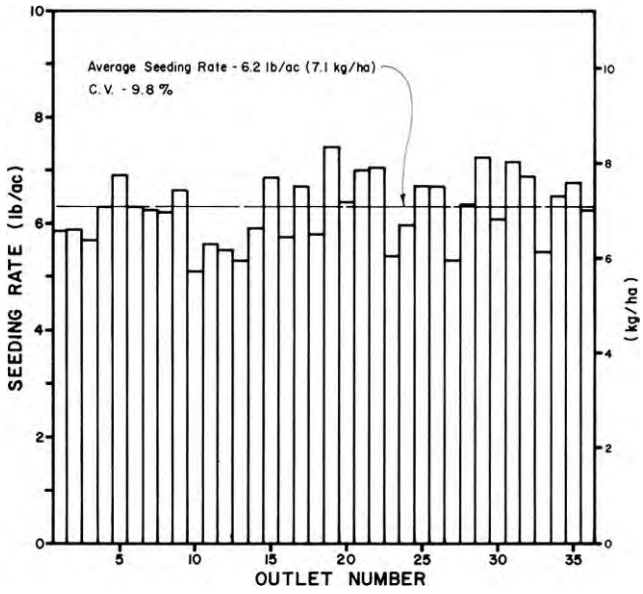

FIGURE 9. Distribution Uniformity Pattern in Canola at 6.3 lb/ac (7.2 kg/ha) at a Fan Speed of 2230 rpm.

Fertilizer Banding: The versatility of the Model 1600 was very good because it could be used for three types of fertilizer applications. With the double shoot set-up, the fertilizer was placed separately from the seed. With the single shoot set-up the fertilizer could be placed with the seed or the unit could be used for strictly fertilizer application. When banding fertilizer, with the chisel points in secondary and primary eld conditions, fertilizer granules were placed in a band about 1 in (25 mm) wide, with fertilizer depth ranging from tip depth to 0.5 in (13 mm) above the tip depth (FIGURE 12). Wider fertilizer bands were obtained in lumpy soil conditions. When using the front or rear meter only, fertilizer application rates of 200 lb/ac (227 kg/ha) were possible. When using both meters a maximum application rate of 282 lb/ac (320 kg/ha) was possible at a ground speed of 5 mph (8 km/h). In both cases higher rates were possible but at unacceptable distribution uniformities.

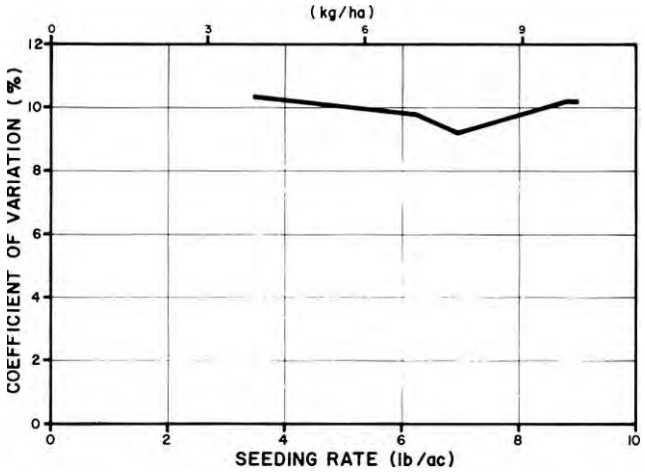

FIGURE 10. Distribution Uniformity in Canola over a Range of Seeding Rates at 5.0 mph (8 km/h) at Varying Fan Speeds.

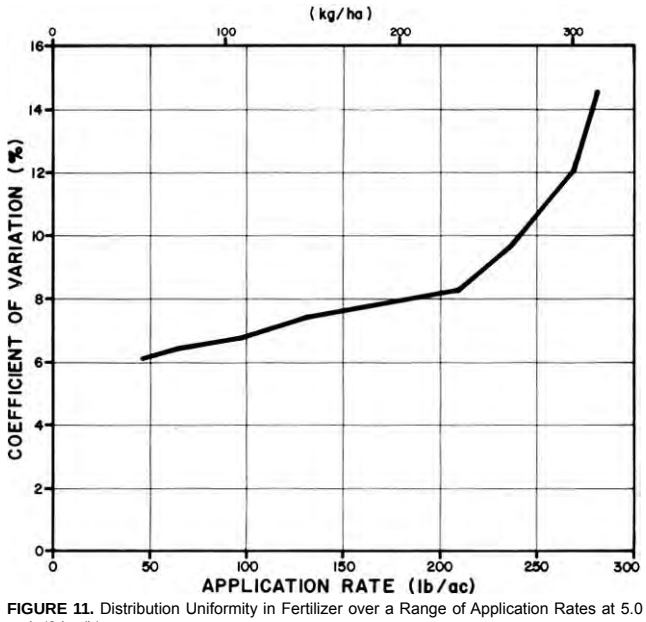

FIGURE 11. Distribution Uniformity in Fertilizer over a Range of Application Rates at 5.0 mph (8 km/h).

EASE OF OPERATION AND ADJUSTMENT

Maintenance: Ease of performing routine maintenance on the Model 1600 was very good with good access to all grease ttings. The castor wheel pivot required greasing every 10 hours, the meter roller bushings required greasing every 50 hours and the fan bearings required greasing every 100 hours. Chains and wheel bearings required annual servicing. The metering rollers and manifold venturi required cleaning before storage. A service schedule was supplied in the operator's manual.

Filling/Cleaning: Ease of lling and cleaning the Model 1600 was good. The optional 7 in (178 mm) loading auger supplied with the Model 1600 was convenient for lling the tanks. To ll one tank it took approximately 15 minutes. Power for the hydraulically driven auger was supplied from the tractor hydraulic system. A selector valve (FIGURE 13) diverted the hydraulic ow from the fan to the auger motor. Auger reversal was possible by repositioning the spool valve lever on the hydraulic valve. Auger plugging was not a problem throughout the evaluation.

The auger could be conveniently swung from its horizontal transport position by unlocking both the front lock arm and the rear lock handle (FIGURE 14) thus freeing the front pivot arm. The hopper was then lowered to the ground and the auger spout was positioned above the desired tank opening. The auger hopper was supplied with a safety screen and could be inverted for clean-out.

The large 13 by 26 in (330 by 655 mm) grain and fertilizer tank openings gave ample room for auger lling with the hose spout

provided on the auger. The ller openings were located 9.7 ft (3.0 m) above ground. The ller lids were hinged and were latched by a simple over-centered crossbar lever. The lids were equipped with a rubber seal for an air and moisture tight seal. The front tank held 96 bu (3491 L), while the rear tank held 61 bu (2219 L).

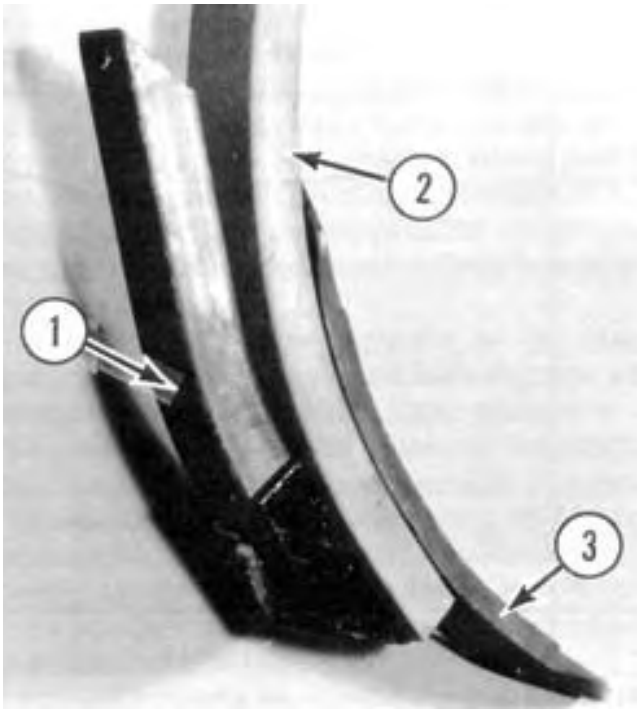

FIGURE 12. Flexi-coil Banding Boot: (1) Banding Boot, (2) Cultivator Shank, (3) Chisel Point.

Access and cleaning of the meter box was not possible with the tanks full. Each tank was equipped with a clean-out door which was located in front of the meter box. Emptying the tanks was accomplished by rotating the clean-out door lockbar lever (FIGURE 15) allowing the product in the tank to ow out through the clean-out ports. With the addition of the optional auger the material left in the tanks could be collected in the auger hopper and then augered back onto the truck (FIGURE 16).

Transporting: Ease of transporting the Model 1600 with the Flexi-coil 600 chisel plow was very good. The applicator was easily attached to the trailing hitch mounted on the cultivator. Hook-up of six hydraulic lines and one electronic coupler for the monitoring system was required.

Since the applicator towed behind, visibility of the cultivator was very good. This was considered a desirable feature of the Model 1600. However, the applicator and cultivator were dif cult to manoeuvre while backing up. The Model 1600 was easily placed into transport position in less than ve minutes (FIGURE 17). Four hydraulic cylinders raised the cultivator wings to the upright position. The meter drive clutch was conveniently engaged and disengaged electronically from the tractor. Overall transport height and width were 14.8 ft (4.5 m) and 22.7 ft (6.9 m) respectively, requiring care when travelling on public roads.

Monitoring: Monitoring on the Model 1600 was good. The electronic monitor consisted of two warning lights, one indicating low fan speed and the other indicating low bin level; a digital fan speed readout; two meter switches with indicator lights; and an auxiliary switch for the optional interdrive clutch (FIGURE 18). The test machine was not supplied with a material ow monitoring system, but one is available as an option.

The Model 1600 was equipped with a meter drive shaft revolution counter for area measurement. The operator's manual gave an equation for calculating the number of acres covered, based on the starting and ending readings from the revolution counter. The location of the revolution counter (FIGURE 19) made it quite dif cult for the operator to read the number of revolutions when calculating the area covered. It is recommended that the manufacturer consider modifying the meter shield to allow for easier reading of the revolution counter. The calculations, when used with the 36 ft (11 m) chisel plow, was found to give area readings of 0.1 percent low which was considered accurate.

FIGURE 13. Hydraulic Selector Valve.

FIGURE 14. Auger in Transport Position: (1) Front Look Arm, (2) Front Pivot Arm (3)Rear Lock Handle.

FIGURE 15. Lockbar Lever.

FIGURE 16. Unloading Material From Applicator Tanks.

Seeding and Fertilizer Rates: Ease of setting the seed and fertilizer rates was very good. The seeding and fertilizer rates were

changed by loosening the lock bolt (FIGURE 20) on the meter crank arm and then moving the crank arm to lengthen or shorten its turning radius. The meter setting numbers were determined from the calibration charts. Changing from the course meter roller to the ne meter roller took one man approximately half an hour. The crank arm scale was calibrated in increments of 1.0 ranging from 0 to 69 (FIGURE 16). Calibration charts, given in pounds per acre, were shown in the operator's manual. The metering scale allowed relatively precise seeding and fertilizer rate adjustment. For example, changing the meter setting by 1.0 in Tower Canola, changed the seeding rate by only 0.46 lb/ac (0.55 kg/ha).

FIGURE 17. Transport Position.

FIGURE 18. Flexi-coil 1600 Electronic Monitor.

FIGURE 19. Flexi-coil 1600 Revolution Counter.

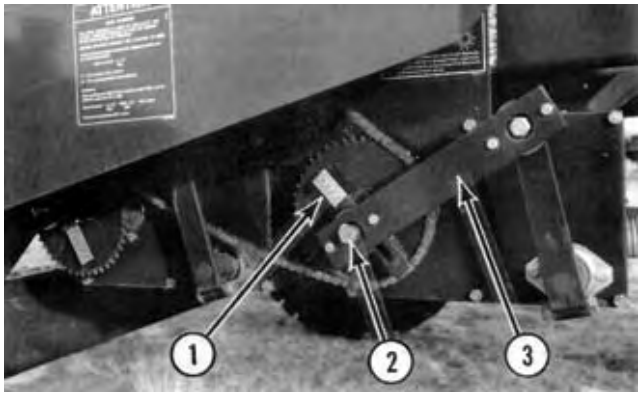

FIGURE 20. Seeding and Fertilizer Rate Adjustment: (1) Scale, (2) Lock Bolt, (3) Crank Arm.

EASE OF INSTALLATION

Ease of installing the distribution and monitoring systems was good. Installation of the double shoot package was best done during initial set-up rather than as an add-on option later. The installation of the distribution system included mounting the secondary headers, mounting the seed boots, routing the 2.5 in (4 mm) primary hoses, routing the 1 in (25.4 mm) secondary hoses and routing the electrical harness. The installation of the distribution system took an experienced operator approximately 8 hours.

The installation of a by-pass manifold above the front meter manifold and long meter divider blades in the front meter box assembly was necessary when the Model 1600 air seeder was switched to the double shoot option. The double shoot option also required the installation of a duplicate set of primary hoses, secondary hoses and secondary headers to the distribution system. Care had to be taken to ensure there would be no interference between the two systems during setup. The installation of the double shoot option took an experienced operator approximately 6 hours.

POWER REQUIREMENTS

The draft (drawbar pull) and corresponding tractor horsepower requirements depended on the size and type of cultivator used. Refer to PAMI reports on cultivators for estimates of draft and horsepower requirements. The operator can expect up to a 5% increase in draft due to the applicator cart. The amount of increase depends on eld preparation, soil type and moisture content, ground speed and the amount of seed and fertilizer in the tanks.

OPERATOR SAFETY

The Model 1600 access ladder and platform allowed for easy and safe access to the tank ller openings. A safety handrail was provided at the edge of the platform. The Model 1600 towed well at speeds up to 30 mph (50 km/h). With the remote fan location, the operator station noise level in most modern tractor cabs was virtually unaffected by fan noise.

OPERATOR'S MANUAL

The operator's manual for the Model 1600 contained useful information on safety, speci cations, operation, maintenance, adjustment, trouble shooting and assembly. A detailed parts list was also included. Calibration charts, calibrated in pounds per acre for various operating widths, were included in the operator's manual. It is recommended that the manufacturer consider supplying meter calibration charts in SI (metric) units as well as Imperial units.

MECHANICAL HISTORY

The Model 1600 was operated for 225 hours while seeding or fertilizing about 3560 ac (1441 ha). The intent of the test was evaluation of functional performance and an extended durability evaluation was not conducted. Table 2 outlines the mechanical problems that did occur during the functional testing.

TABLE 2. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac	(ha)
-interdrive clutch assembly installed at	beginning of test		
-double shoot system installed at	36	600	(243)
-primary hoses were rubbing on front pivot support and were repositioned at	36	600	(243)
-hydraulic lines were rubbing on front pivot point and were repositioned at	36	600	(243)
-electrical harness was rubbing on front pivot point and was repositioned at	36	600	(243)

DISCUSSION OF MECHANICAL PROBLEMS

Interference at the Front Pivot Point: The method in which the electrical harness, hydraulic lines and primary hoses are supported at the front pivot point caused an excessive amount of wear to these components (FIGURE 21). It is recommended that the manufacturer consider modifying the support structure for the electrical harness, hydraulic lines and primary hose at the front pivot point to reduce the amount of wear to these components.

FIGURE 21. Interference at Front Pivot Point.

APPENDIX I

SPECIFICATIONS
A) APPLICATOR

MAKE:	Flexi-coil
MODEL:	1600
SERIAL NUMBER:	G1600 A0-G 015248
MANUFACTURER:	Flexi-coil Ltd. 1000 - 71 St. E. P.O. Box 1928 Saskatoon, Saskatchewan STK 3S5 Phone: (306) 934-3500
DIMENSIONS:	
-width	11.7 ft (3.6 m)
-length	16.1 ft (4.9 m)
-height	9.7 ft (2.9 m)
-maximum ground clearance1	4.2 in (360 mm)
-wheel tread	9.9 ft (3.0 m)
METERING SYSTEM:	
-type	rubber uted roller
-number of meters	2
-drive	chain driven
-adjustment	adjustable crank arm
-airstream loading	pressurized tanks
-transfer to openers	pneumatic conveyance through divider headers and plastic tubes
TANK CAPACITIES:	
-front tank	96 bu (3491 L)
-rear tank	61 bu (2219 L)
FAN:	
-type	centrifugal
-make	Flexi-coil
-maximum operating speed	4800 rpm
-drive	hydraulically driven from tractor remote
HITCH:	
-vertical adjustment range	no adjustment
WHEELS:	
-front	one, 12.4L-16, 8 ply
-rear	two, 21.5L-16.1, 10 ply
NUMBER OF LUBRICATION POINTS:	13 grease ttings 3 wheel bearings chains, oil annually

(B) AUGER	
SIZE:	7 in (178 mm)
DRIVE:	hydraulically driven by tractor
OPTIONAL EQUIPMENT:	four, ve, six and eight primary runs (with seven eight, nine, ten, eleven, and twelve part secondary headers providing 28 to 96 nal runs depending on shank spacing).
Optional equipment available includes:	double shoot option with eight, ten and twelve primary runs; a gas engine (gear box assembly used instead of hydraulically driven fan); a ow monitor package; a tow between model; granular application package; electric interdrive clutch; loading auger.

WEIGHTS:	**TANKS EMPTY**	**TANKS FULL OF WHEAT**
APPLICATOR:		
-hitch wheel	1170lb (532 kg)	3770 lb (1710 kg)
-left wheel	1840 lb (836 kg)	5700 lb (2590 kg)
-right wheel	1650 lb (750 kg)	5510 lb (2500 kg)
TOTAL	4660 lb (2120 kg)	14980 lb (6800 kg)

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Very Good
Good	Fair
Poor	Unsatisfactory

SUMMARY CHART
FLEXI-COIL 1600 AIR SEEDER

RETAIL PRICE:	$22,810.00 (March, 1988, f.o.b. Lethbridge) with 36 run air package, header rings, auger and welded steel boots.
QUALITY OF WORK:	
Seed Placement:	**good;** band widths ranged from 3.2 to 6.2 in (81 to 157 mm) Seed depth varied from 1.2 to 2.7 in (30 to 69 mm)
Soil Finishing:	**very good;** a separate harrow packer drawbar effectively levelled and packed the eld
Metering Accuracy:	**very good;** eld slope, ground speed, fan speed and eld bounce had little effect on rates
Distribution Uniformity:	**very good;** uniform distribution in all materials
Fertilizer Banding:	**very good;** single or double shoot system; maximum rate of 11-51-11 using both meters - 282 lb/ac (320 kg/ha)
EASE OF OPERATION AND ADJUSTMENT:	
Maintenance:	**very good;** easily accessible
Filling/Cleaning:	**good;** lling required use of drill ll or optional auger. Cleanout door supplied for each meter.
Transporting:	**very good;** placed in transport in less than ve minutes
Monitoring: indicator	**good;** bin level indicator and fan speed supplied
Seeding and Fertilizer Rates:	**very good;** rates were easily changed
EASE OF INSTALLATION:	**good;** systems mounted easily to the frame, provided instructions were followed carefully
POWER REQUIREMENTS:	depends on size and type of cultivator used
OPERATOR SAFETY:	safe if normal precautions observed
OPERATOR'S MANUAL:	**very good;** well written and clearly illustrated
MECHANICAL HISTORY:	primary distribution hoses would rub on front tire

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