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Evaluation Report 542

Morris Genesis II MA 170 Air Seeder

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

MORRIS GENESIS II MA 170 AIR SEEDER

MANUFACTURER AND DISTRIBUTOR:

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

RETAIL PRICE: (February, 1988, f.o.b. Lethbridge, Alberta).

Base Unit tow between engine drive	$28,429.00
Auger Option	2,178.00
Slow Speed Kit	112.00
Distribution Kit 25 runs Single Shoot	1,450.00
Distribution Kit 25 runs Double Shoot	1,378.00

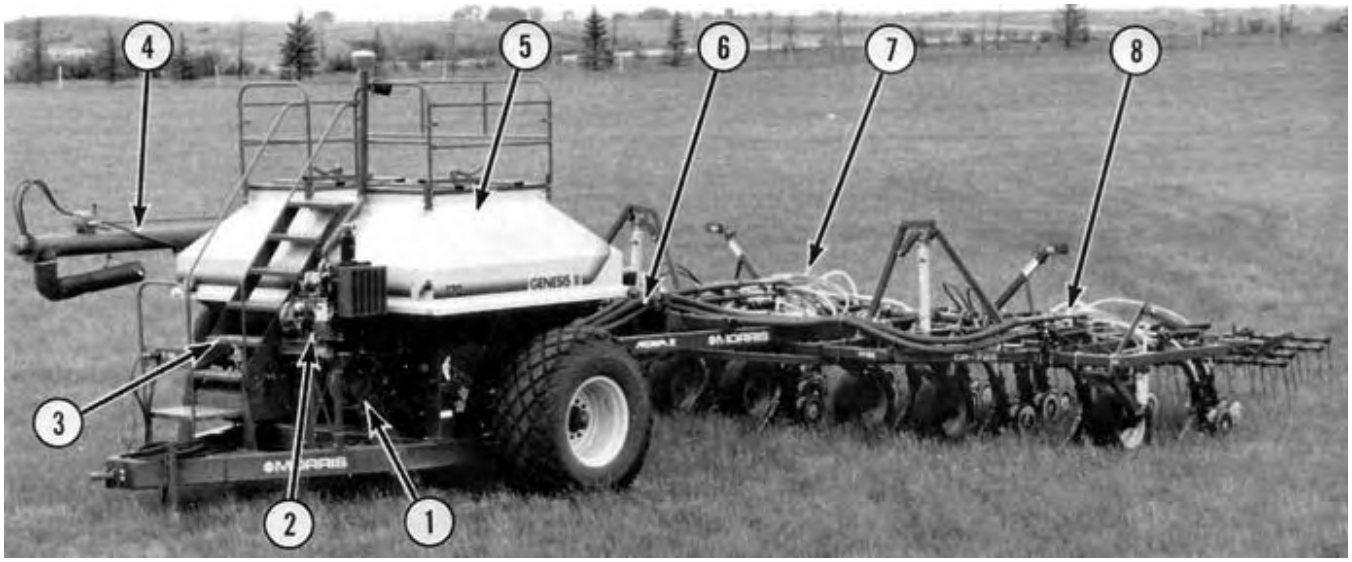

FIGURE 1. Morris Genesis II MA 170 Air Seeder: (1) Centrifugal Fan, (2) Diesel Engine, (3) Steps, (4) Auger, (5) Tanks, (6) Primary Hose, (7) Secondary Hose, (8) Divider Head.

SUMMARY

Quality of Work: Seed placement was good but depended largely on the type of seed boot used. Soil nishing was very good. Soil contact pressure beneath the wheels with the tanks full of wheat was less than the soil contact pressure of an unloaded one-half ton truck.

Metering accuracy of the Genesis II MA 170 was good. The metering rates were affected by changes in ground speed and eld slope but not by eld bounce.

The distribution uniformity was very good for wheat, barley, canola and fertilizer. Little grain damage occurred providing proper fan damper settings were used.

The versatility of the fertilizer banding system was very good. The applicator was capable of single or double shooting. The maximum fertilizer rate obtained by PAMI with 11-51-00 fertilizer when feeding from one tank was 214 lb/ac (240 kg/ha).

Ease of Operation and Adjustment: Maintenance of the system was very good with easy access to all lubrication and check points. Ease of lling and cleaning the applicator was good. The optional auger allowed for fast lling and convenient emptying of the tanks. Calibration strips on the inside of the tanks and tank level gauges to view from the tractor were provided. Cleaning large amounts of material out of the tanks was convenient with the clean out system but a vacuum was needed to thoroughly clean the tanks.

Transporting of the applicator and cultivator was good. The auger did interfere with the cyclone in transport position.

The applicator blocked the view of most of the 25 ft (7.6 m) cultivator in the eld.

Monitoring the functions of the applicator was fair. No ow monitors were provided for the primary or secondary hoses. Also the motion indicator for the rear meter was not always visible from the tractor.

Ease of setting the seed and fertilizer rates was very good. A slow speed kit was provided for small seeds. Changing from single to double shoot delivery was easy. No scale was provided for the fan damper setting. The MA 170 was equipped with a sample collector used for accurately calibrating the application rate.

Ease of Installation: Ease of mounting the divider heads, the sampler and the clean out cyclone was good. Routing the hoses to the front shanks was dif cult. Initial mounting took two men approximately 2 hours.

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: The MA 170 was safe to operate if normal safety precautions were observed. A safety railing was provided on the tank. The steps to the top of the tank were easy to climb. Lights were also provided. Ear protection was required if working near the engine when running at full rpm.

Operator's Manual: The operator's manual was good. It contained useful information on adjustments, maintenance and operation.

Mechanical Problems: The radiator would eventually plug and cause the engine to overheat. Hot days with no wind would also cause the engine to overheat. The fan bearing failed, damaging the rotor, near the end of the test.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the metering system to prevent variation in metering rates due to changes in ground speed.
2. Modifying the tank railing to allow more clearance for the auger spout while manoeuvring the auger into ll position.
3. Modifying the auger and cyclone assembly to prevent interference between the auger hopper and clean out cyclone during transport.
4. Providing a ow monitor system for the primary hoses.
5. Providing a scale for the damper setting.
6. Supplying rate charts in SI units as well as in Imperial units.
7. Eliminating the problem of the auxiliary diesel motor overheating during adverse temperature and eld operating conditions.

Station Manager: R. P. Atkins

Project Engineer: L. Papworth

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A special inertia limiting device is now standard on air seeders equipped with the ne seed slow speed kit.
2. This will be investigated and modi cations made in future production runs.
3. The cyclone mounting bracket will be modi ed to avoid interference with the auger when in transport.
4. A complete ow monitoring system is now available.
5. Dampers now include an external ange which indicates the relative position of the damper.
6. We will consider supplying rate charts in SI units as well as Imperial.
7. For future productions a higher cooling capacity radiator will be standard.

NOTE: In regards to the fan failure experienced, all units are being upgraded by our supplier.

GENERAL DESCRIPTION

The Morris Genesis II MA 170 air seeder is a pneumatic seed and fertilizer applicator designed for use with varying makes and models of cultivators. The applicator can tow behind a cultivator or between a tractor and cultivator. The tow behind unit is supported by four wheels and the tow between unit is supported by two wheels. The applicator can be used for seeding, combined seeding and fertilizing (single or double shooting), or fertilizing.

Seed and fertilizer are metered by externally cogged, coarse metering wheels operating in plastic feed cups. The metering wheels are chain driven by the metering drive wheel through a variable speed drive box. The meters are engaged by hydraulically lowering the meter drive wheel onto the applicator tire. The metering shafts are shear pin protected. Motion indicators are provided to indicate the rotation of the metering shafts.

The number of cogged wheels in a feed cup can be varied to suit the number of outlets on a divider head. The at fan divider head distributes the material through hoses from each feed cup to the openers on the cultivator. The divider head is available with 7, 8 or 9 outlets. The MA 170 can handle up to 72 outlets while single shooting or 36 outlets while double shooting.

A centrifugal fan conveys the metered material through the distribution system. The fan also pressurizes the tanks and the area around the feed cups to allow the material to fall into the airstream. Power to the fan is provided by either a diesel engine, tractor power take-off or tractor hydraulics.

The MA 170 is also equipped with a sampler and clean-out system. The sampler is used to collect the material for meter calibration. The clean-out system uses the fan on the applicator to empty the tanks and convey the material to a cyclone which is then augered into the truck.

The test machine consisted of a tow between unit with a diesel engine driven fan. Optional equipment included an acre counter and the hopper auger. The test machine was used with a Morris Magnum II CP-725 Chisel Plow (PAMI Evaluation Report #567). The chisel plow was 25 ft (7.6 m) wide, with a 13 ft (4 m) centre frame and two 6 ft (1.8 m) wing sections. The three row cultivator had 25 shanks spaced at 12 in (305 mm). The chisel plow was equipped with optional three-row mounted trip release harrows. This required using one 9 outlet and two 8 outlet divider heads. A tractor with three remote hydraulic controls was required to operate the test unit.

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 Morris Genesis II MA 170 was operated in the conditions shown in TABLE 1 for 135.5 hours while processing 1550 ac (620 ha). The winter crops were sown under wet soil conditions, the fertilizer banded under moist eld conditions and the spring crops sown under dry soil conditions. It was evaluated for quality of work, ease of operation and adjustment, ease of installation, power requirements, operator safety and suitability of the operator's manual. In addition, the metering systems were calibrated in the laboratory.

Seeding and banding boots were available but were not supplied with the applicator. Separate evaluations were done on several systems currently being marketed. The openers used were the Clarke system, the Vern seeding boot/knife and the Morris air hoe attachment. Double shooting was used with the Clarke system and the Morris air hoe attachment. Single shooting was used with the Vern knife to band fertilizer.

RESULTS AND DISCUSSION

QUALITY OF WORK

Seed Placement: The seed placement of the MA 170 seed and fertilizing system was good. Placement depended largely on the type of seed boot and banding boot used at the time. Careful levelling of the cultivator frame 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	
Winter wheat	Fine Silt Loam to Silt Loam - Secondary	Stone Free	60	24	5.5
	Silt Loam - Secondary	Occasional stones	120	48	12.5
	Heavy Loam to Clay - Primary	Occasional stones	160	64	14.5
	Heavy Loam - Primary	Moderately stony	55	22	8.0
Fertilizer	Silt Loam - Secondary	Occasional stones	40	16	3.5
	Loam - Primary	Occasional stones	130	52	10.0
	Silt Loam - Secondary	Occasional stones	420	188	31.5
Wheat	Silt Loam - Secondary	Stone free	225	90	20.5
	Silt Loam - Primary	Stone free	160	64	14.5
Barley	Silt Loam - Secondary	Occasional stones	45	18	3.0
	Loam - Secondary	Stone free	45	18	4.0
Oats	Silt Loam - Secondary	Occasional stones	90	36	8.0
TOTAL			1550	620	135.5

Soil Finishing: The MA 170 applicator and CP-725 chisel plow left the seedbed in very good condition. Towing the applicator between the cultivator and tractor ensured the seedbed was not over-packed in the wheel tracks, under normal seeding conditions. Over-packing of moist clay soils could lead to opener penetration problems and poor seed germination. Soil contact pressure due to the applicator's tires with the tanks full of wheat was 25 psi (172 kPa) for the right wheel and 22 psi (152 kPa) for the left wheel. For comparative purposes, an unloaded one-half ton truck has an approximate soil pressure of about 30 psi (207 kPa).

Mounted harrows were effective in smoothing the soil surface and breaking soil lumps. Harrows also increased weed kill by loosening weeds. The air seeder was not equipped with packers. Since it was considered essential to level and pack elds seeded with the MA 170, a packer drawbar or harrow packer drawbar was used 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: Metering accuracy of the MA 170 was good. The metering rate was varied by adjusting the variable speed gear boxes to the desired setting. The calibration curves obtained by PAMI and the manufacturer for the MA 170 in wheat, barley, canola and fertilizer are given in FIGURES 2 to 5. Any differences between the calibration curves obtained by PAMI and those given by the manufacturer are probably due to different seed size, density and moisture content. The densities obtained by PAMI are indicated on the graphs. The calibration chart supplied by the manufacturer did not indicate the densities. The zeroing of the variable speed gear boxes also affected the metering rates of the machine.

Level of material in the tank, eld roughness and variations in fan speed had no effect on metering rates. Variations in ground speed did affect the metering rates. An increase in speed from 5 to 7.5 mph (8.2 to 12.1 km/h) caused a 15% increase in the metering rate of wheat and fertilizer. It is recommended that the manufacturer consider modifying the metering system to prevent variation in metering rates due to changes in ground speed.

Operating the MA 170 on a side slope did not affect metering rates but operating on uphill and downhill slopes did affect metering rates. Travelling up a 15° slope caused an 8% increase in the metering rate of wheat and a 6% decrease in the metering rate of 11-51-00 fertilizer. Travelling down a 15° slope caused a 7° decrease in the metering rate of wheat and a 10% increase in the metering rate of 11-51-00 fertilizer.

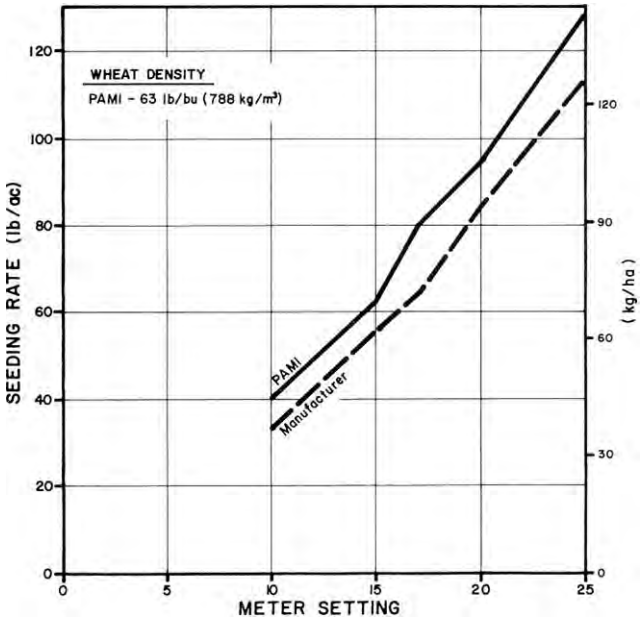

FIGURE 2. Metering Accuracy in Wheat.

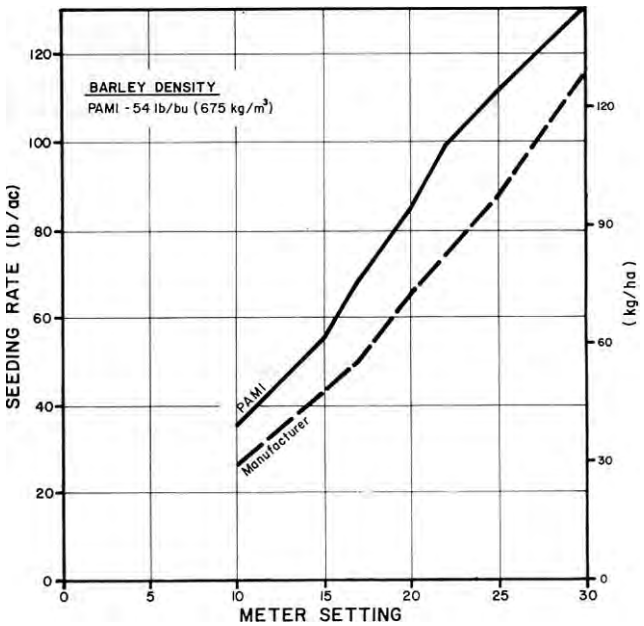

FIGURE 3. Metering Accuracy in Barley.

Distribution Uniformity: Uniformity of distribution of the application rate for the Genesis II MA 170 was very good. Given in FIGURE 6 is the seeding distribution uniformity for the Morris MA 170 in wheat and barley. Distribution was uniform over the full range of seeding rates. For example, at a seeding rate of 78.5 lb/ac (87.9 kg/ha), the coef cient of variation[1] (CV) was 5.3% for wheat, and at a seeding rate of 84 lb/ac (94.1 kg/ha) the CV was 7.3% for barley. FIGURE 7 shows a typical seeding distribution pattern obtained in wheat at a seeding rate of 78.5 lb/ac (87.9 kg/ha). The seeding rate from each hoe opener across the width of the air seeder varied from 70.1 to 93 lb/ac (78.5 to 104.2 kg/ha). This resulted in acceptable distribution uniformity with a CV of 5.5%.

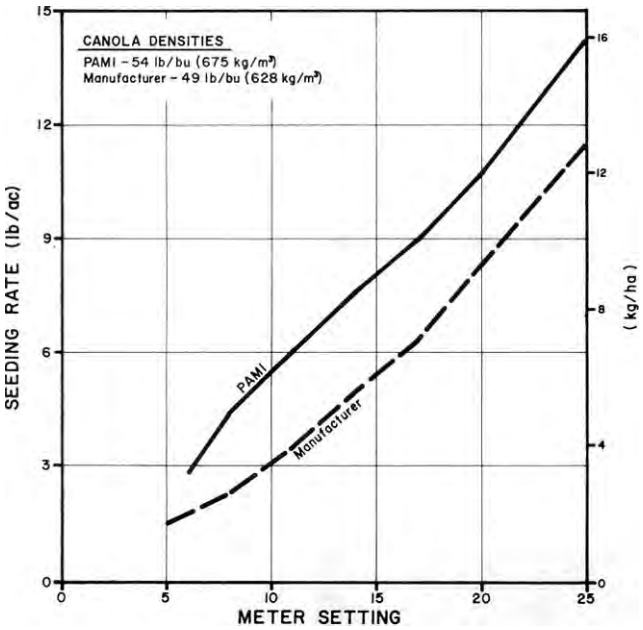

FIGURE 4. Metering Accuracy in Canola.

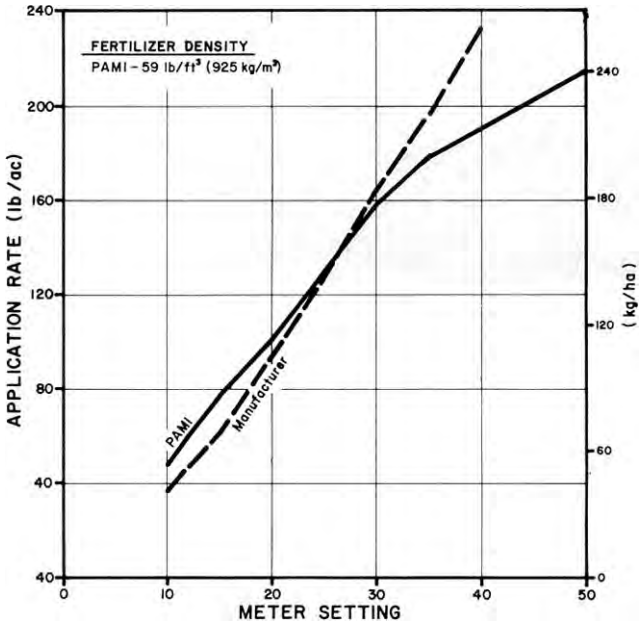

FIGURE 5. Metering Accuracy in Fertilizer.

FIGURE 8 shows a typical distribution pattern obtained in canola at a seeding rate of 6.0 lb/ac (6.7 kg/ha). The application rate across the width of the air seeder varied from 5.4 to 6.6 lb/ac (6.1 to 7.4 kg/ha), which resulted in acceptable distribution uniformity with a CV of 5.2%. Distribution uniformity was acceptable over the full range of canola seeding rates with CV's ranging from 5.1 to 5.8% (FIGURE 9).

Distribution uniformity in 11-51-00 fertilizer was acceptable over the full range of application rates with a CV ranging from 6.2 to 8.3% (FIGURE 10).

Changes in fan pressure and up and downhill slopes had little effect on distribution uniformity. The uniformity was, however, affected by side slopes. A 15 degree side slope changed the CV from 4.9 to 11.1% with wheat and from 6.0 to 11.4% with 11-51-00 fertilizer.

[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.

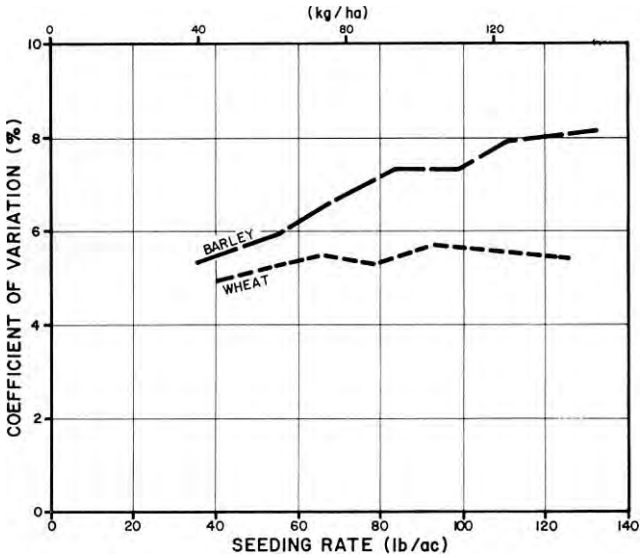

FIGURE 6. Distribution Uniformity in Wheat and Barley over a Range of Seeding Rates.

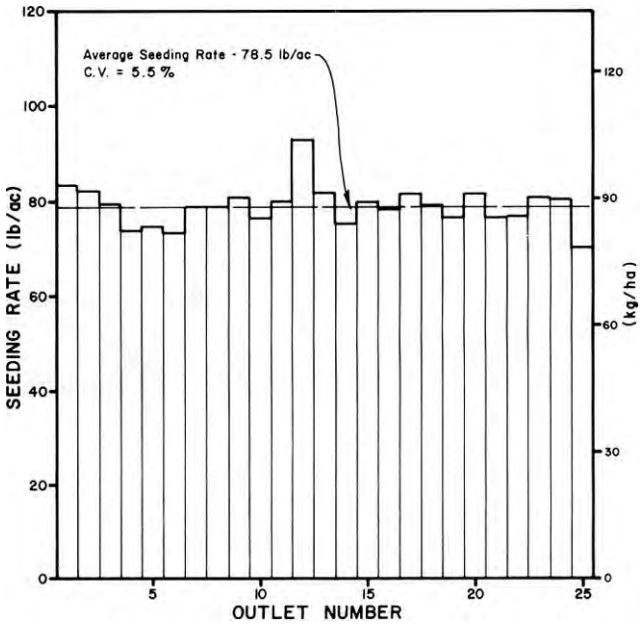

FIGURE 7. Distribution Uniformity Pattern in Wheat at 785 lb/ac (87.9 kg/ha).

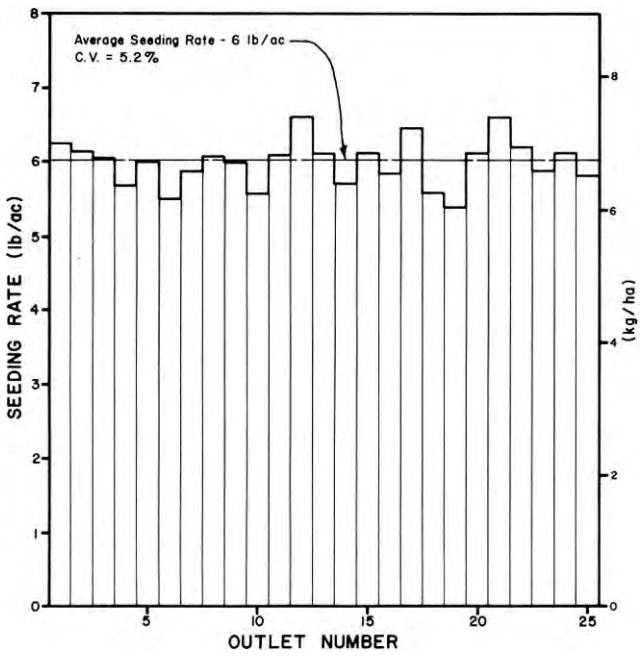

FIGURE 8. Distribution Uniformity Pattern in Canola at 6 lb/ac (6.7 kg/ha).

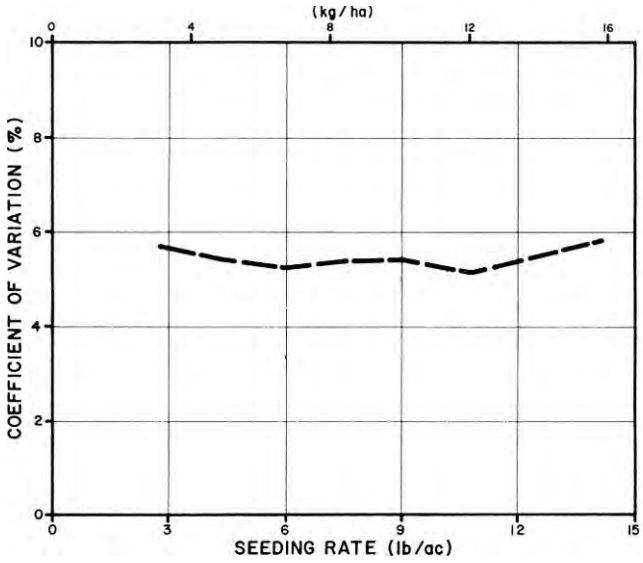

FIGURE 9. Distribution Uniformity in Canola over a Range of Seeding Rates.

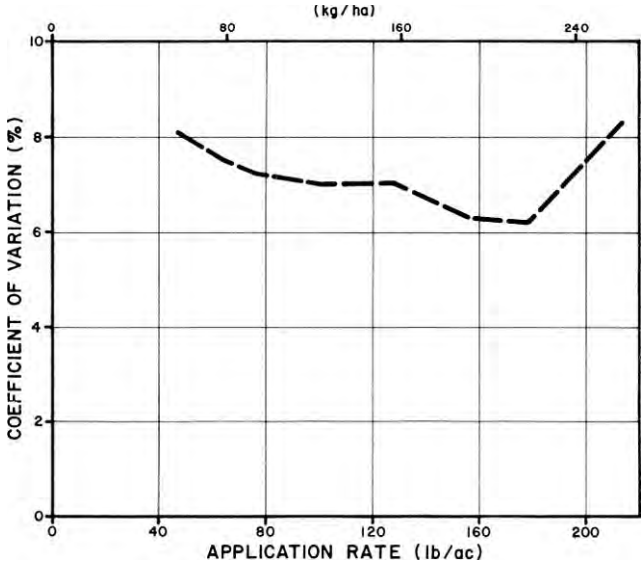

FIGURE 10. Distribution Uniformity in Fertilizer over a Range of Application Rates.

Grain Damage: Grain damage by the metering and distribution system was very good in that little damage occurred if a proper fan damper setting was used. For instance, canola damage decreased from 5.5% at a damper setting of wide open to 2.0% at a setting of one quarter open. Damage in wheat was less than 1.0%. The manufacturer recommends that a fan damper setting be chosen that prevents plugging and limits crackage.

Fertilizer Banding: The versatility of the Morris MA 170 air seeder 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. Placement depended upon the type of banding boot, seeding boot, sweep or chisel point used.

The maximum fertilizer rate obtained by PAMI with 11-51-00 fertilizer when feeding from one tank was 214 lb/ac (240 kg/ha) at a meter setting of 50. The manufacturer did not give an application rate for a meter setting of 50.

EASE OF OPERATION AND ADJUSTMENT

Maintenance: Ease of performing routine maintenance on the MA 170 was very good. All nine grease ttings were easily accessible. Grease ttings were provided for the wheel hubs. The variable speed drive boxes had sight glasses to check the oil levels. A service schedule was supplied in the operator's manual.

The diesel engine (FIGURE 11) was located at the front of the unit allowing good access to the oil and air lters. Engine fuel consumption was 0.95 gal/h (4.3 L/h). The engine could run

18 hours on one lling of the 17.5 gal (79.6 L) tank. The fuel tank was located at a convenient height for lling. Collecting the used engine oil was messy and inconvenient.

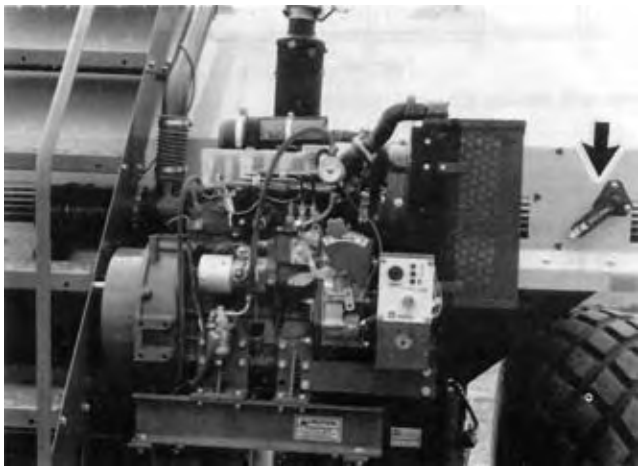

FIGURE 11. Diesel Engine and Tank Level Gauges. (Arrow).

Filling/Cleaning: Ease of lling and cleaning the MA 170 was good. The optional 7 in (178 mm) auger supplied with the test unit allowed for fast lling and convenient emptying of the tanks. The auger was hydraulically driven from the tractor. A hydraulic valve at the front of the tank switched the hydraulic pressure from the cylinder for the metering wheel to the auger. A hopper and safety screen were provided with the auger. The hopper could be inverted for clean out.

Manoeuvring the auger into ll position (FIGURE 12) was dif cult because of the lack of clearance between the auger spout and the tank railing. It is recommended that the manufacturer consider modifying the tank railing to allow more clearance for the auger spout while manoeuvring the auger into ll position.

Two ll openings were provided for each tank. The tank openings were large enough to manoeuvre the auger spout during lling. Screens were provided for the tank openings to prevent large objects from entering the tanks. The tank lids were held closed by over center latches as shown in FIGURE 13.

FIGURE 12. Fill Position of Auger.

Calibration strips were provided on the inside of each tank for accurate estimates of seed and fertilizer quantity. Tank level gauges were also provided on the right front of the unit (FIGURE 11) to monitor tank levels from the tractor. Viewing these gauges was obstructed at times by the diesel motor.

Cleaning large amounts of material out of the tanks was convenient using the clean-out system. The system was operated by disconnecting the primary hoses from the distribution system and connecting them to the cyclone as shown in FIGURE 14. The fan was used to convey the material to the cyclone. Material was dropped into the airstream by slides located near the metering cups. The slides for each tank were opened by levers located on the side of the tanks. The cyclone dropped the material into the auger hopper and the material was then augered into a truck as shown in FIGURE 15.

FIGURE 13. Tank Lids and Latches.

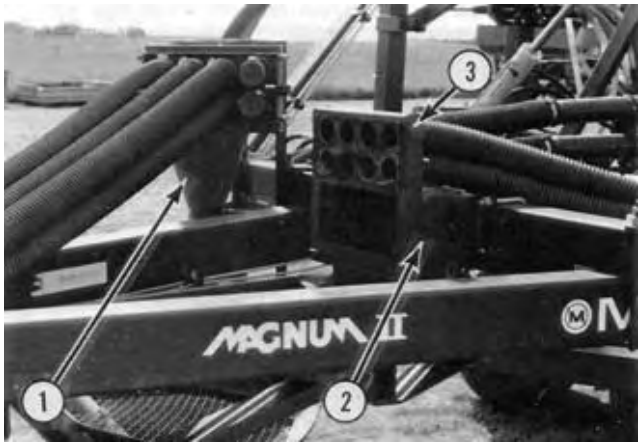

FIGURE 14. (1) Cyclone, (2) Sample Collector, (3) Air Seeder Distribution.

FIGURE 15. Using Clean-Out System.

The clean-out system left 0.5 bu (18 L) of grain in the tank. The grain had to be removed by vacuum or pail and brush. Access to the inside of the tanks was good with the large openings and a step halfway down the inside of each tank.

To get the unit thoroughly clean, the area below the meter cups had to be cleaned. Material accumulated in this area during eld operation as shown in FIGURE 16. Each set of meter cups was covered by a lid held in place by three wing nuts and allowed easy access for cleaning.

Capacity of the clean-out system with wheat was 200 bu/h (5.4 t/h). It took 25 minutes to empty a full 85 bu (3094 L) tank of wheat.

Transporting: Ease of transporting the applicator was good.

The hitch could move 4 in (102 mm) vertically to suit different heights of tractor drawbars. A hitch jack was provided. The jack was rmly held to the frame by two pins when in use. A transport position was provided for the jack as shown in FIGURE 17. The primary hoses could be attached to the applicator when disconnected from the cultivator as shown in FIGURE 18. Hydraulic couplers were provided on the rear of the applicator to easily disconnect the cultivator. The applicator and cultivator were easily placed in transport in less than 5 minutes.

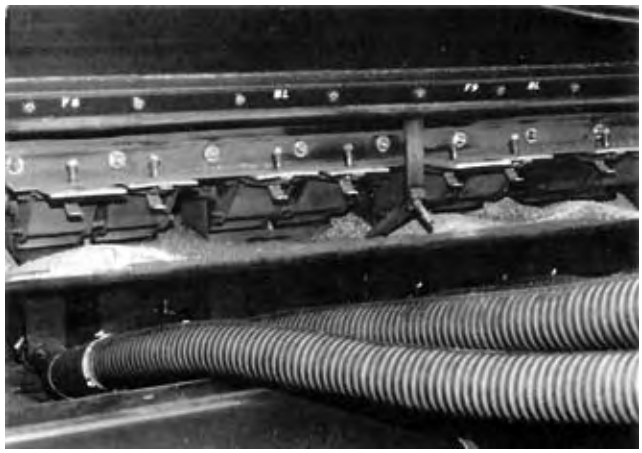

FIGURE 16. Material Accumulated Below Seed Cups.

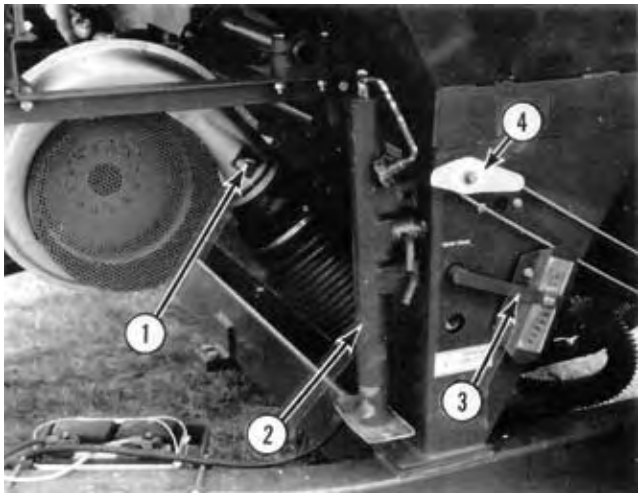

FIGURE 17. (1) Fan Damper, (2) Hitch Jack in Transport Position, (3) Variable Speed Gearbox, (4) Motion Indicator.

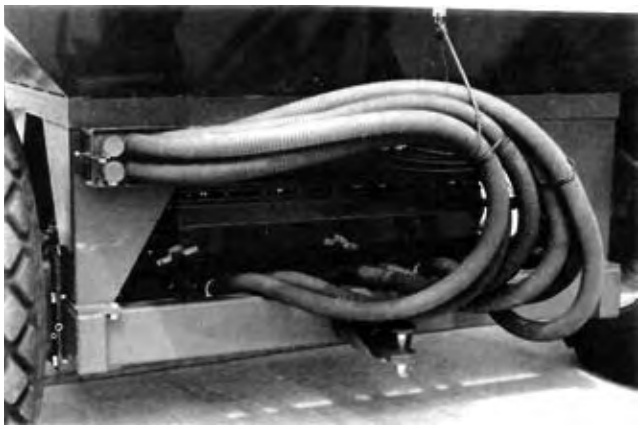

FIGURE 18. Primary Hoses in Transport Position.

The auger hopper interfered with the clean-out cyclone when transporting the test unit with the cultivator raised out of the ground. This caused damage to the hopper during the test.

It is recommended that the manufacturer consider modifying the auger and cyclone assembly to prevent interference between the auger hopper and clean-out cyclone during transport.

The applicator blocked the view of most of the 25 ft (7.6 m) cultivator in the eld. This is a common problem with tow between air seeders and can only be recti ed by using a tow behind air seeder. Overall transport height and width of the applicator was 11.9 ft (3.6 m) and 13.6 ft (4.1 m).

Monitoring: Monitoring on the MA 170 was fair. Monitoring equipment included motion indicators (FIGURE 17) for the meter shafts, a system pressure gauge (FIGURE 19) and the optional acre meter (FIGURE 20). The motion indicator for the front meter could be easily viewed from the tractor but the view from some tractors of the motion indicator for the rear meter was obstructed by the diesel motor. The pressure gauge was easily viewed from the tractor. The optional acre meter read 4% high.

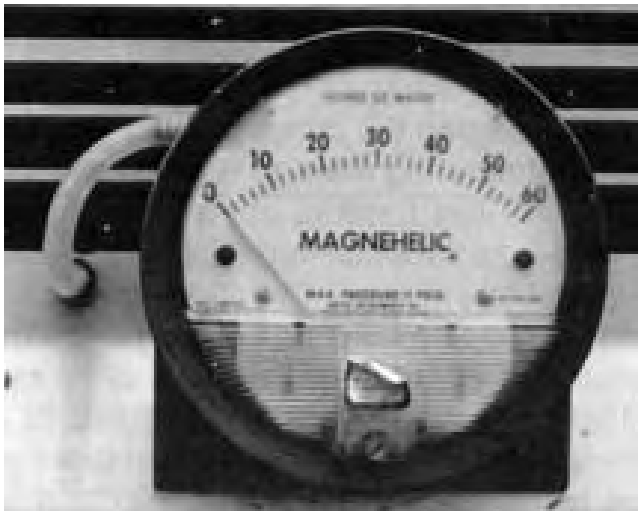

FIGURE 19. System Pressure Gauge.

FIGURE 20. Acre meter.

The primary hoses plugged a few times during eld testing of the applicator. The tractor operator had no way of knowing whether the primary hoses were plugged. It is recommended that the manufacturer consider providing a ow monitoring system for the primary hoses.

Seeding and Fertilizer Rates: Ease of changing the seed and fertilizer rates was very good. The rates were changed by moving the lever on the variable speed gearbox (FIGURE 17) to the desired setting.

A slow speed kit was provided for small seeds. Installing the kit involved mounting a 40 tooth drive sprocket, a sprocket cluster and a transmission brake. Access to install the slow speed kit was hindered by the tank tire. Installing the slow speed kit took one

person two hours.

FIGURE 21. Metering Drive Wheel.

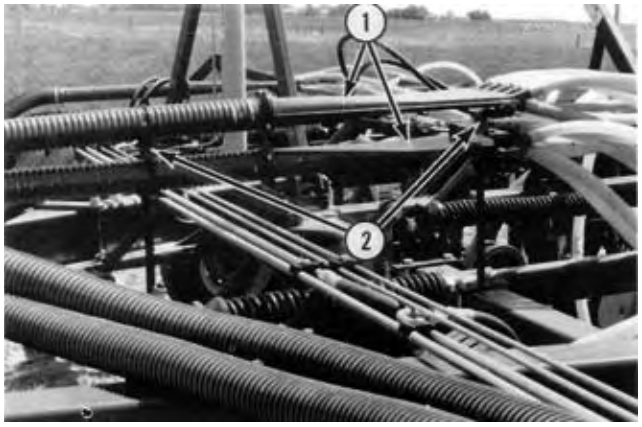

FIGURE 22. (1) Divider Heads and (2) Mounting Brackets.

Changing from single to double shoot delivery was easy once the cogged metering wheels were properly arranged. Each metering shaft had eight meter cups. The meter cups contained 7, 8 or 9 cogged wheels. The number of cogged wheels had to match the number of outlets on each divider head. The number of cogged wheels in the meter cups were changed by removing the metering shaft and sliding the meter cups off the shaft. Removing the metering shafts was dif cult because of limited access to the bolts. Changing the number of cogged wheels in each meter cup had to be done once for each header arrangement. The slider plates were then used to change from single to double shoot.

The meter cups could be shut off by the slider plates directly above each meter cup. Care had to be exercised to ensure the slider plates were completely closed or they would leak.

Air velocity from the fan was varied by a damper (FIGURE 17) located near the fan. No scale was provided for the damper setting. It is recommended that the manufacturer consider providing a scale for the damper setting.

The MA 170 was equipped with a sample collector (FIGURE 14) used for calibrating the application rate. To use the collector, the primary hoses were lowered down and a bag or pail was used to collect the material. The handle on the metering drive wheel (FIGURE 21) was used to turn the meter shaft. A chart was provided in the operator's manual for relating the width of machine to the number of turns of the metering drive wheel in order to seed 0.25 ac (0.1 ha). This calibration method was accurate.

EASE OF INSTALLATION

Ease of mounting the divider heads, the sampler and the clean-out cyclone was good. Each divider head was mounted on two brackets as shown in FIGURE 22. The grain heads were mounted directly above the fertilizer heads for the double shoot system. The clean-out cyclone and sampler were mounted on a 5.5 ft (1.7 m) length of square metal tubing. The tubing was secured to the cultivator frame by two U-bolts as shown in FIGURE 14. Installing the delivery hoses to the front row of openers was dif cult because the divider heads were located behind the front row of shanks. This required the operator to rotate the hoses back to the front row of shanks. Initial mounting took two men approximately 2 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 Morris MA 170 was safe to operate if normal safety precautions were observed. A lock pin was provided to secure the metering wheel in transport position. A safety railing was provided on the tank. The non-slip steps to the top of the tank were convenient and easy to climb. The fan drive belt was adequately shielded. A slow moving vehicle sign and bracket were provided. Lights for night operation and signal lights were also provided.

Tire loads could exceed the Tire and Rim Association maximum load rating if the applicator was transported with full tanks at speeds of 10 mph (16 km/h) or greater. It is recommended that the applicator not be transported with full tanks at speeds above 10 mph (16 km/h).

Total engine and fan noise level at the tractor hitch point was 91 dBA with the engine at full rpm. The operator station noise level in most modern tractor cabs was virtually unaffected by fan or auxiliary engine noise. During the cleanout operation with the fan running, it is recommended that ear protection be worn.

OPERATOR'S MANUAL

The operator's manual was good. It contained useful information on adjustments, maintenance and operation. No parts list was provided. Calibration charts were provided in the operator's manual. Seeding rates were expressed only in Imperial units (lb/ac) and seed densities were not given. It is recommended that the manufacturer consider supplying rate charts in SI units as well as in Imperial units.

MECHANICAL HISTORY

The Morris Genesis II MA 170 was operated for 135.5 hours while seeding or fertilizing about 1550 ac (620 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)
-delivery hoses were pinched in cultivator wing brackets		three times	
-seals on front and rear meter covers detached. Reglued at	44	435	(174)
-bar on front end of one seed cup broke. Switched with another seed cup at	49	500	(200)
-fill auger slipped out of place during field operation and damaged supports. Repaired at	54	565	(226)
-engine overheated from plugged radiator. Cleaned out radiator at	60	645	(258)
-variable speed drive box did not operate properly. Replaced at	66	725	(290)
-engine overheated on a hot day at	106	210	(484)
-fan bearings failed and damaged fan rotor. Replaced fan at	123.5	141.5	(566)

DISCUSSION OF MECHANICAL PROBLEMS

Engine Overheating: The radiator would eventually plug with straw and other eld material over a period of time during eld operation. This would cause the motor to overheat. On days when the temperature was above 30° C and little wind, the engine would also overheat. The heat from the tractor and the lack of wind increased the air temperature around the radiator causing the overheating. It is recommended that the manufacturer consider eliminating the problem of the auxiliary diesel motor overheating during adverse temperature and eld operating conditions.

Variable Speed Drive Box Failure: The variable speed drive box failed because the 40 tooth sprocket for the slow speed kit was left on the meter shaft. A pin was removed to allow the sprocket to spin freely on the shaft but the manufacturer recommends that the sprocket be removed from the shaft.

Fan Bearing Failure: The bearings on the fan failed, destroying the rotor within the fan housing. Further investigation is required by the manufacturer to determine if this failure was an isolated incident or a common problem with this model of fan.

APPENDIX I

SPECIFICATIONS

MAKE:	Morris
MODEL:	Genesis II MA 170
SERIAL NUMBER:	802
MANUFACTURER:	Morris Rod Weeder Co. Ltd. 85 York Road Yorkton, Saskatchewan S3N 2X2
DIMENSION:	
-width	13.6 ft (4.1 m)
-length	13.7 ft (4.2 m)
-height	11.9 ft (3.6 m)
-maximum ground clearance	13.5 in (343 mm)
-wheel tread	10.4 ft (3.2 m)
METERING SYSTEM:	
-type	externally cogged metering wheels
-number of meters	2
-drive	chain driven through variable speed drive box from tank wheel
-adjustment	lever on variable speed drive box
-airstream loading	pressurized tanks
-transfer to openers	pneumatic conveyance through divider headers and plastic tubes
TANK CAPACITIES:	
-front tank	85 bu (3094 L)
-rear tank	85 bu (3094 L)
FAN:	
-type	centrifugal
-make	REM 33
-maximum operating speed	5300 rpm
-drive	belt driven from diesel engine
ENGINE:	
-make	ISUZU
-model	3KC1
-starting system	12 VDC
-fuel tank capacity	175 gal (796 L)
HITCH:	
-vertical adjustment range	40 in (102 mm)
WHEELS:	
- oatation	two 23.1-26, 8 ply)
-meter drive wheel	one (23-8.50)
NUMBER OF LUBRICATION POIINTS:	6 grease ttings 3 wheel bearings chains, oil annually 2 gear boxes, checked daily
NUMBER OF CHAIN DRIVES:	6
NUMBER OF HYDRAULIC LIFTS:	1
NUMBER OF SEALED BEARINGS:	11
AUGER:	
-size	7 in (178 mm) diameter
-drive	hydraulically driven by tractor
OPTIONS INCLUDED ON TEST MACHINE:	7 in (178 mm) diameter hopper auger, tow between unit with engine driven fan, acre counter
OTHER AVAILABLE OPTIONS:	
-Fan Drives	
-PTO	tow between only
-tractor hydraulic	tow behind or tow between
-PTO hydraulic	tow behind only
-Divider Heads	7, 8 or 9 outlet

WEIGHTS:	**TANKS EMPTY**	**TANKS FULL OF WHEAT**
-hitch	1300 lb (590 kg)	2660 lb (1210 kg)
-left wheel	2460 lb (1120 kg)	6700 lb (3040 kg)
-right wheel	2620 lb (1190 kg)	7560 lb (3430 kg)
Total Weight	6380 lb (2900 kg)	16,920 lb (7680 kg)

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Very Good
Good	Fair
Poor	Unsatisfactory

SUMMARY CHART

MORRIS GENESIS II MA 170 AIR SEEDER

RETAIL PRICE:	$28,429 (February, 1988, f.o.b. Lethbridge, Alberta)
QUALITY OF WORK:	
Seed Placement:	**good;** depended largely on the type of seed boot used
Soil Finishing:	**very good;** harrows did an effective job of levelling
Metering Accuracy:	**good;** affected by ground speed
Distribution Uniformity:	**very good;** uniform distribution in all materials little grain damage occurred providing proper fan damper settings were used
Fertilizer Banding:	**very good;** single or double shoot system maximum rate - 214 lb/ac (240 kg/ha) with 11-51-00 from one tank
EASE OF OPERATION AND ADJUSTMENT:	
Maintenance:	**very good;** easily accessible
Filling/Cleaning:	**good;** convenient to clean out large amounts but vacuum needed to thoroughly clean tanks
Transporting:	**good;** could be easily disconnected from cultivator
Monitoring:	**fair;** motion indicators for both tanks were supplied
Seeding and Fertilizer Rates:	**very good;** simple to change from single to double shoot; sample collector provided for quick calibration
EASE OF INSTALLATION:	**good;** low pro le divider head bolted easily to cultivator frame
POWER REQUIREMENTS:	depends on size and type of cultivator used
OPERATOR SAFETY:	safe; steps provided and railing for tank
OPERATOR'S MANUAL:	**good;** contained useful information
MECHANICAL HISTORY:	engine overheated and fan bearing failed

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