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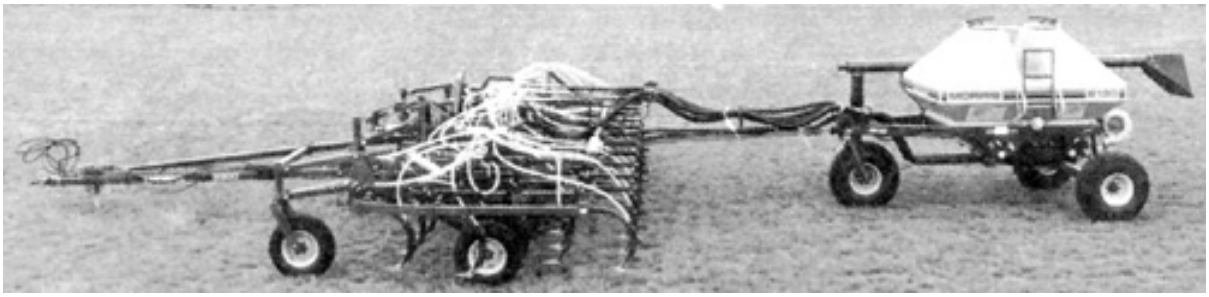
Evaluation Report 684



Morris 6130 Air Seeder

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MORRIS 6130 AIR SEEDER

MANUFACTURER AND DISTRIBUTOR

Morris Industries Ltd.
85 York Road
Yorkton, Saskatchewan
S3N 2X2
Phone: (306) 783-8585

RETAIL PRICE: $25,662.00 less set-up (August 25, 1992, f.o.b. Lethbridge, Alberta, Morris 6130 air seeder with 49 run air package, auger, secondary clutch and wide spread seeding boot.)

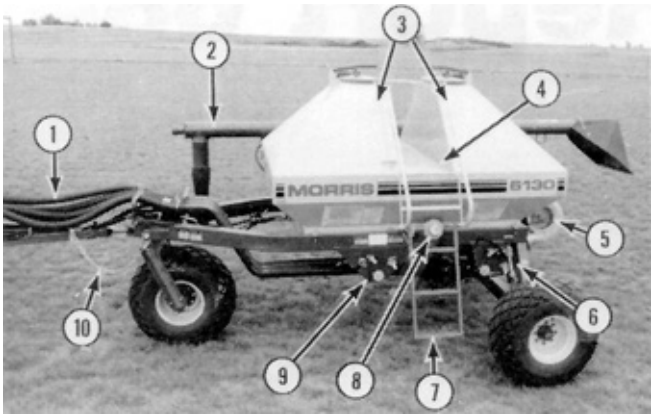


FIGURE 1. Morris 6130 air seeder: (1) Primary Hose, (2) Optional Auger, (3) Tanks, (4) Walk-through Platform, (5) Centrifugal Fan, (6) Hand Crank, (7) Ladder, (8) Rate Change Sprockets, (9) Metering Drive Transmissions and (10) Safety Chain.

SUMMARY

QUALITY OF WORK

The seed placement of the Morris 6130 air seeder depended on the levelling of the cultivator frame and the seed boot used. Paired row band width with the wide spread seed boot averaged 2.5 in (64 mm), leaving 3.0 in (76 mm) between rows. Metering accuracy was very good. The metering rates for cereal grains, canola, peas and fertilizer were not affected by field variables. The maximum 11-51-0 fertilizer application rate was 205 lb/ac (230 kg/ha) from the rear meter using the standard metershaff sprocket. Higher application rates were possible using the high rate metershaff sprocket.

The distribution uniformity was very good in wheat, barley, canola and 11-51-0 fertilizer. Dristribution uniformity of peas was good. Distribution uniformity in 11-51-0 fertilizer was acceptable over the full range of application rates. Travelling on a 15 degree right side slope raised the CV from 6.3 to 11.4 per cent with wheat and from 6.8 to 12.3 percent with fertilizer. Insignificant seed damage occurred providing proper fan speed settings were used.

EASE OF OPERATION AND ADJUSTMENT

Maintenance of the system was very good. Daily lubrication took five minutes. Ease of filling and cleaning the applicator was very good. The optional auger allowed for fast filling and convenient emptying of the tanks. The trailing telesoping hitch allowed for easy hook-up of the applicator. The applicator and cultivator were placed into transport position in five minutes. The main drive chain was easily removed disabling the metering system for transport.

Monitoring was very good. Fan speed, metershaft rotation, bin level and ground speed sensors were supplied. Ease of setting the application rate was very good. The slider plates were set before material was placed into the tanks. The unit was equipped with a spring scale, calibration chart and rate check box used for calibrating the application rate. A hand crank allowed for easy turning of the metering system during calibration.

EASE OF INSTALLATION

Ease of installing the distribution and monitoring system was good. Installation of the systems took two experienced people seven hours. Initial set-up of the metering assemblies was completed by the manufacturer.

POWER REQUIREMENTS

The draft and horsepower requirements depended upon the size and type of cultivator used. Power take-off horsepower requirements to pull the applicator full of wheat in tilled loam soil ranged from 14.3 hp (10.7 kW) to 24.7 hp (18.4 kW). Average and maximum horsepower requirements for the centrifugal fan were 10.9 hp (8.1 kW) and 18.1 hp (13.5 kW), respectively.

OPERATOR SAFETY

The Model 6130 was safe to operate if normal safety precautions were observed. A fold-down ladder, side handrails and a walk-through platform were provided for safe access to the applicator tanks. A safety chain was provided to secure the applicator to the applicator hitch.

OPERATOR'S MANUAL

The operator's manual was very good. The manual contained useful information on safety, operation, maintenance and trouble shooting. An applicator set-up section was also provided.

MECHANICAL PROBLEMS

No mechanical problems were encountered during the test.

RECOMMENDATIONS

The AFMRC recommends the manufacturer consider:

1. Modifying the tank screens to allow for complete filling of the tanks and movement of the auger spout.
2. Modifying the tank sight glasses to enable the operator to view when the tanks were full.
3. Modifying all wing nuts to allow for easier threading,
4. Supplying meter rate charts in SI (metric) units as welt as Imperial units,

Manager: R. P. Atkins

Project Engineer: L. W. Papworth
Project Technologist: G. A. Magyar

THE MANUFACTURER STATES THAT:

With regards to recommendation number:

1. Various design changes are being considered to imptement this recommendation.
2. Relocation of the sight glasses for better operator view has already been implemented on current production models
3. The wing nuts will be modified to allow for easier installation.
4. This recommendation will be considered for future production.

GENERAL DESCRIPTION

The Morris 6000 series air seeder is a pneumatic seed and fertilizer applicator designed for use with various makes and models of cultivators. There are two models available: a 6130 or a 6180 applicator. The applicator is towed behind the cultivator and supported by three wheels. The rear wheels are mounted on a solid axle, while the front wheel castors. The applicator is used for seeding, fertiliz-lng or a combined seed and fertilizer operation.

Seed and fertilizer are metered through variable speed, spiral fluted metering wheels, mounted below each tank. The width of each spiral fluted metering wheel corresponds to the number of outlets on each divider head. The meters are driven from the left rear

applicator wheel through the Posi-Drive transmissions. Each transmission has four metershaft range sprockets. A slow speed range is engaged on the front transmission when using fine seed. A hand crank is used to manually turn the transmissions. The main clutch engages the transmissions. The second clutch engages the rear metering shaft. The clutches are electronically controlled by separate switches mounted in the tractor cab.

The centrifugal fan air stream conveys the metered material through the distribution system. The fan also pressurizes the tanks to equalize the pressure across the meters. Power to the fan is provided by either a gasoline engine or tractor hydraulics. Each spiral fluted wheel meters the seed and/or fertilizer into the primary tubes below each metering wheel. The primary tubes convey the material to the flat fan dividers. The dividers distribute the material through delivery tubes to the seed boots.

The monitoring system consists of shaft sensors located on each metering body, bin level sensors located in each tank, a ground speed sensor and a fan speed sensor. The acremeter displays accumulated field area, fan speed, shaft rotation and ground speed.

The loading/unloading auger is mounted on the right side of the air seeder. A flow control valve directs hydraulic flow to either the fan or auger.

The test machine was a Model 6130 applicator equipped with a hydraulically driven fan. Optional equipment included a loading/unloading auger, second metering clutch, wide spread seed boot and a narrow spread seed boot. The test machine was used with a Morris 8900 Floating Hitch cultivator and Morris shank mounted ground rod. The four row cultivator was 37 ft (11.3 m) wide with 49 shanks spaced at 9 in (229 mm). A tractor with three remote hydraulics was required to operate the test unit.

Detailed specifications for the air seeder are given in APPENDIX I, while FIGURE 1 shows the location of major components.

SCOPE OF TEST

The Morris Model 6130 air seeder was operated in the conditions shown in TABLE 1 for 146 hours while seeding and/or fertilizing 3100 ac (1255 ha). The metering systems were tested in the laboratory for metering and distribution accuracy and the affect of field and machine variables on metering and distribution. The Morris air seeder was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety and suitability of the operator's manual.

The machine evaluated by the Alberta Farm Machinery Research Centre (AFMRC) was configured as described in the General Description, FIGURE 1, and the Specifications section of this report. The manufacturer may have built different configurations of this machine before and after AFMRC tests. Therefore, when using this report, be sure to first check that the machine you are considering is the same as the one shown here. If not, assistance can be obtained from the manufacturer or AFMRC in determining how this new machine will perform compared to the one tested.

TABLE 1. Operating Conditions.

MATERIAL	SOIL TYPE AND CONDITION	FIELD AREA ac	(ha)	HOURS
Spring Wheat	Loam, Primary	270	(110)	13
Spring Wheat	Loam, Secondary	160	(65)	8
Spring Wheat	Sandy Clay Loam, Primary	430	(174)	20
Spring Wheat	Silt Loam, Primary	465	(188)	22
Spring Wheat	Silt Loam, Secondary	465	(188)	22
Barley	Silt Loam, Primary	90	(36)	4
Durum Wheat	Loam, Primary	70	(28)	3
Durum Wheat	Silt Loam, Primary	190	(77)	9
Durum Wheat	Silt Loam, Secondary	400	(162)	18
Fertilizer	Silt Loam, Primary	240	(97)	11
Fertilizer	Sandy Loam, Primary	160	(65)	8
Fertilizer	Sandy Loam, Secondary	160	(65)	8
TOTALS		3100	(1255)	146

RESULTS AND DISCUSSION

QUALITY OF WORK

Seed Placement: The seed placement of the Morris 6130 air seeder depended on careful levelling of the cultivator frame and the seed boot used. The narrow spread seed boot (FIGURE 2) was used without the shank mounted ground rod attached. The wide spread seed boot (FIGURE 3) was used with the shank mounted ground rod. A special seed boot was attached to the rear row of cultivator shanks to mount the ground rod.

Most of the seed was placed within 0.6 in (15 mm) of the average seed depth of 2.3 in (58 mm). Without the ground rod attached the 9 in (229 mm) cultivator shank spacing and the 2.5 in (64 mm) average paired row band width resulted in an average 3.0 in (76 mm) spacing between rows with the wide spread seed boot. With the ground rod attached there was no distinct seed rows.

FIGURE 2. Morris Narrow Spread Seed Boot.

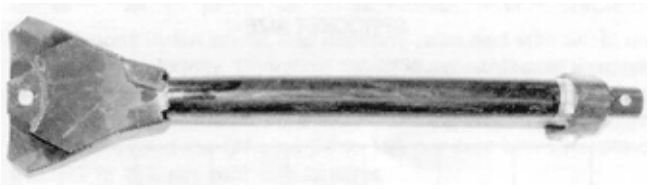


FIGURE 3. Morris Wide Spread Seed Boot.

Metering Accuracy: Metering accuracy of the 6130 was very good. The metering rates were varied by changing the sprocket ratio for the metering wheels. The calibration curves obtained by AFMRC and the manufacturer for the 6130 air seeder in wheat, barley, peas, canola and 11-51-0 fertilizer are given in FIGURES 4 to 8. Any differences between the calibration curves obtained by AFMRC and those given by the manufacturer are probably due to different seed or granular size, density and moisture content. The densities obtained by AFMRC and supplied by the manufacturer are indicated on the graphs.

The manufacturer stated the charts are to be used as guidelines and the operator should calibrate the air seeder for the particular product that will be used. Level of material in the tank, field roughness and variations in fan or ground speed had no effect on metering rates. Operating the 6130 on uphill, downhill or side slopes did not affect the metering rates.

The maximum rate for 11-51-0 fertilizer was 205 lb/ac (230 kg/ha) from the rear meter using the standard metershaft sprocket. Higher application rates were possible using the high rate metershaft sprocket. The maximum application rate using both tanks was 556 lb/ac (625 kg/ha). The air seeder plugged at higher rates.

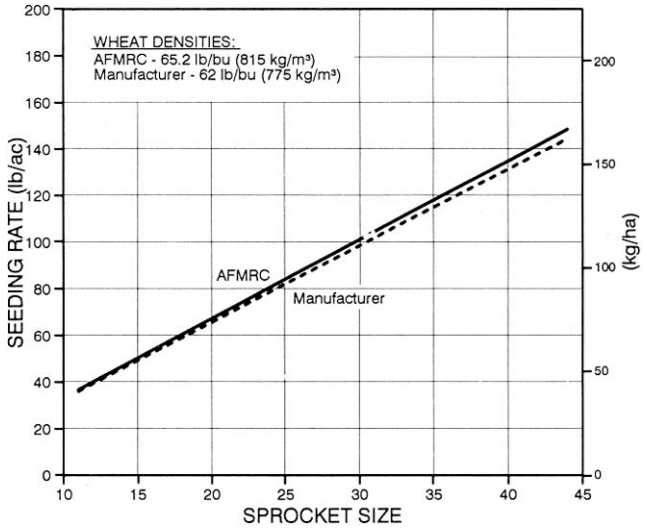


FIGURE 4. Metering Accuracy in Wheat.

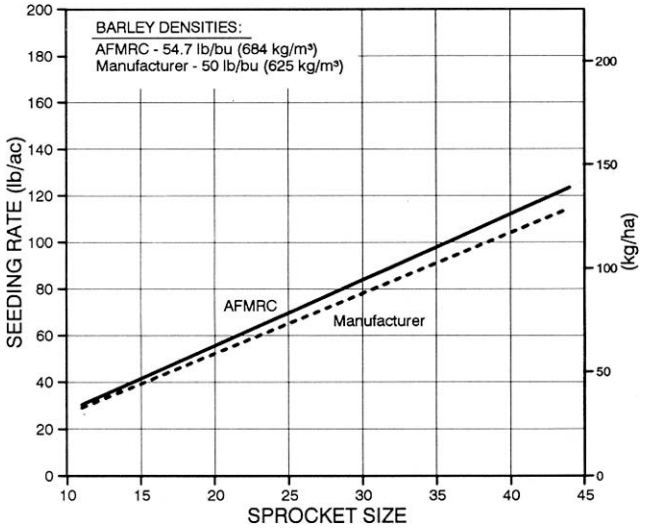


FIGURE 5. Metering Accuracy in Barley.

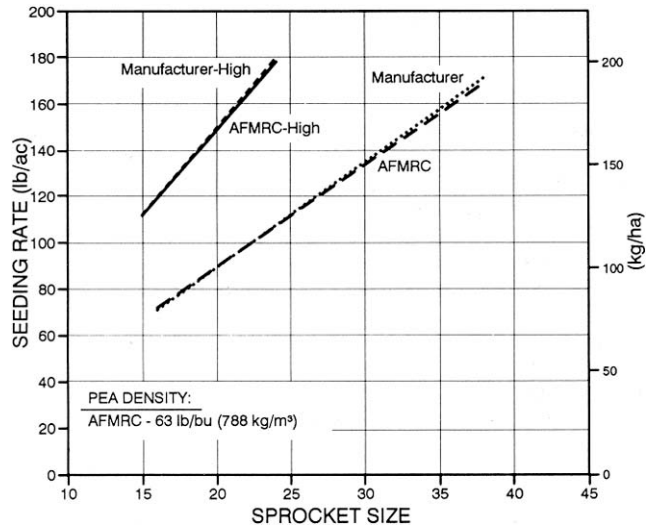


FIGURE 6. Metering Accuracy in Radley Peas.

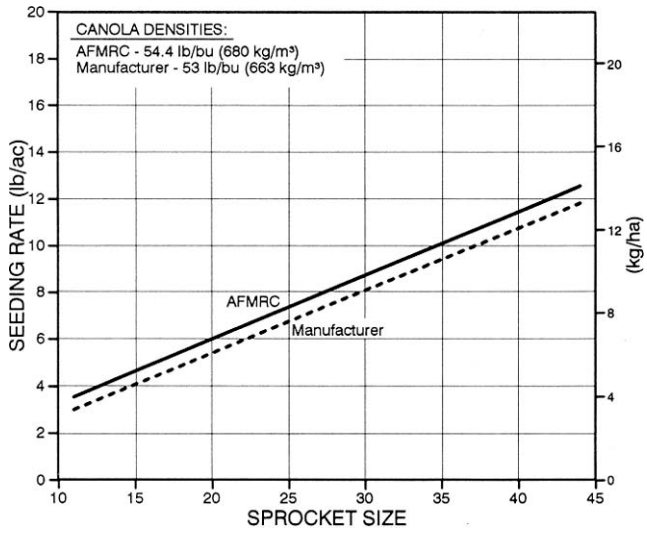


FIGURE 7. Metering Accuracy in Canola.

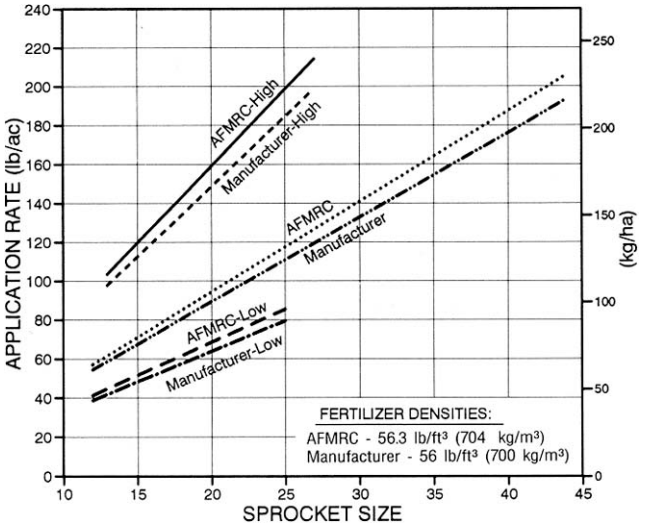


FIGURE 8. Metering Accuracy in 11-51-0 Fertilizer.

Distribution Uniformity: Uniformity of distribution for the Morris 6130 application rates was very good in wheat, barley, canola and 11-51-0 fertilizer. Distribution uniformity of peas was good. FIGURE 9 shows the seeding distribution uniformity for wheat, barley and Radley peas. Distribution was uniform over the full range of seeding rates. For example, at a seeding rate of 67 lb/ac (75 kg/ha), the coefficient of variation[1] (CV) was 6.3 per cent for wheat. At a barley seeding rate of 87 lb/ac (98 kg/ha) the CV was 5.8 per cent while at a seeding rate of 131 lb/ac (147 kg/ha) the CV was 10.2 per cent for peas. FIGURE 10 shows a typical seeding distribution pattern obtained in wheat at a seeding rate of 67.3 lb/ac (75.6 kg/ha). The seeding rate for each opener across the width of the air seeder varied from 58.4 to 78.5 lb/ac (65.6 to 88.2 kg/ha). This resulted in an acceptable distribution uniformity with a CV of 6.3 per cent.

FIGURE 11 shows a typical distribution pattern obtained in canola at a seeding rate of 5.7 lb/ac (6.4 kg/ha). The seeding rate for each opener across the width of the air seeder varied from 5.2 to 6.9 lb/ac (5.9 to 7.7 kg/ha), which resulted in acceptable distribution uniformity with a CV of 5.7 per cent. Distribution uniformity was acceptable over the full range of canola seeding rates with CV's varying from 5.7 to 6.3 per cent (FIGURE 12).

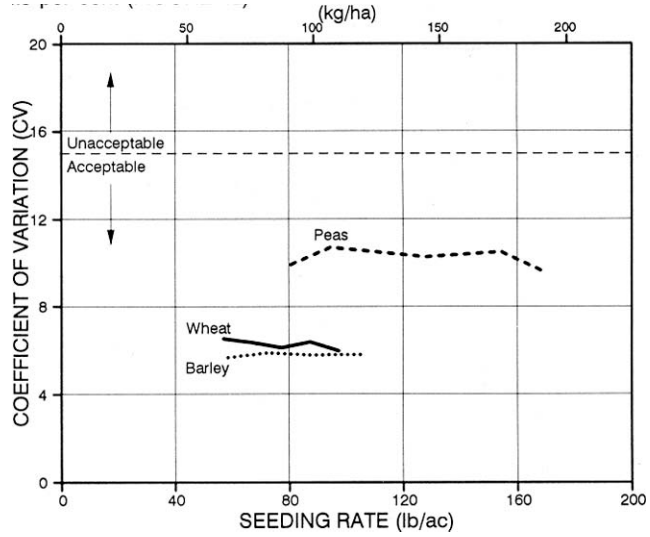


FIGURE 9. Distribution Uniformity in Wheat, Barley and Peas over a Range of Seeding Rates.

[1]The coefficient of variation (CV) is the standard deviation of application rates from individual outlets expressed as a per cent of the average application rate. A low CV represents uniform application whereas a high CV indicates non-uniform application. An acceptable variation for seeding grain or applying fertilizer is a CV value of not greater than 15 per cent.

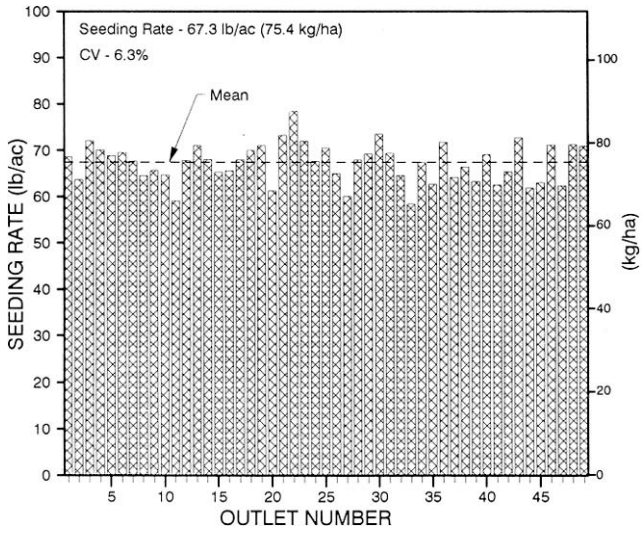


FIGURE 10. Distribution Uniformity Pattern in Wheat at 67.3 lb/ac (75.4 kg/ha).

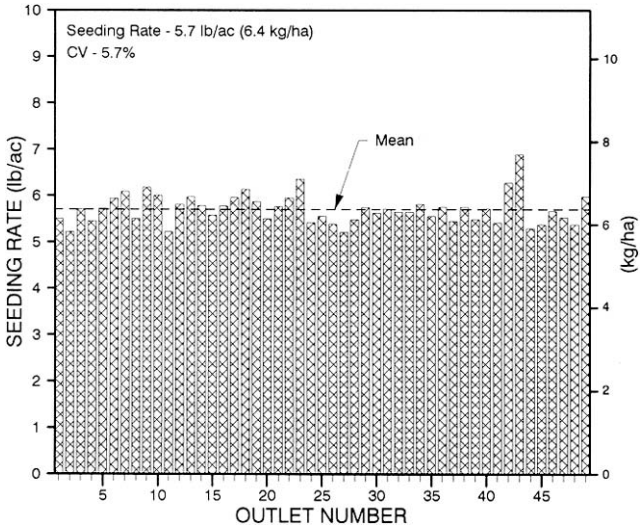


FIGURE 11. Distribution Uniformity Pattern in Canola at 5.7 lb/ac (6.4 kg/ha).

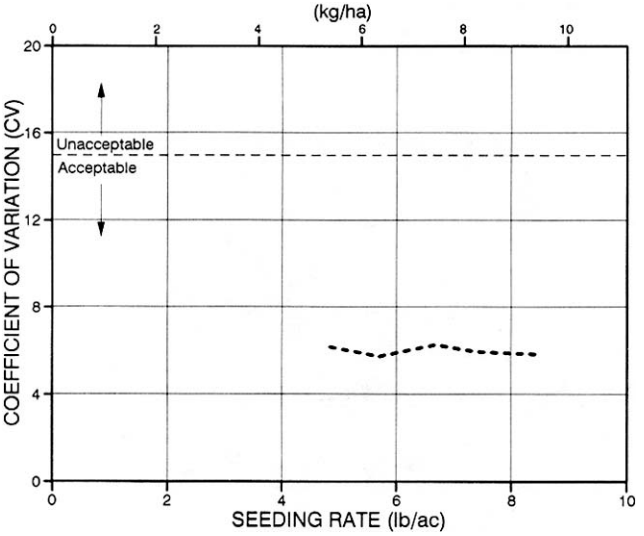


FIGURE 12. Distribution Uniformity in Canola over a Range of Seeding Rates.

Distribution uniformity in 11-51-0 fertilizer was acceptable over the full range of application rates as shown in FIGURE 13. The CV's varied from 5.6 to 12.3 per cent.

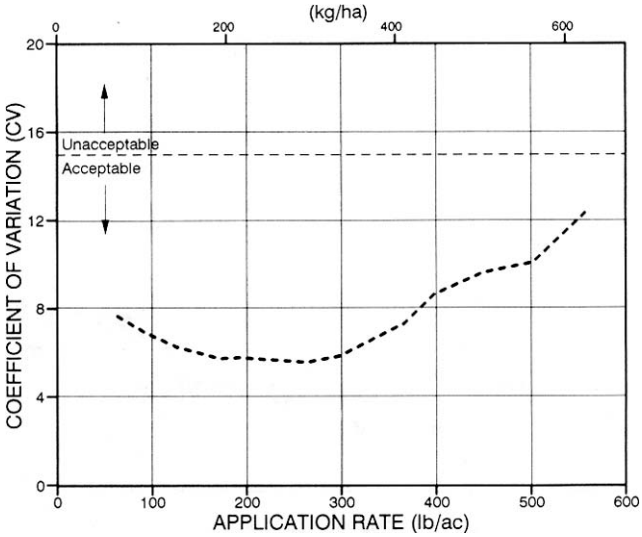


FIGURE 13. Distribution Uniformity in 11-51-0 Fertilizer over a Range of Application Rates.

Variations in fan speed and metering rates had little affect on distribution uniformity. Operating the 6130 on uphill and downhill slopes did not affect distribution uniformity but operating on side slopes did affect distribution unifomity. Travelling on a 15 degree right side slope raised the CV from 6.3 to 11.4 per cent with wheat and from 6.8 to 12.3 per cent with fertilizer.

Seed Handling: Seed handling was very good. Damage by the metering and distribution system in wheat at an average seeding rate of 67.2 lb/ac (75.5 kg/ha) and a fan speed of 4000 rpm was 0.7 per cent. Increasing or decreasing fan speed produced no change in seed damage. The damage in Radley peas at an average seeding rate of 81.4 lb/ac (91.5 kg/ha) and a fan speed of 4000 rpm was 1.5 per cent. Increasing the seeding rate to 131.3 lb/ac (147.7 kg/ha) decreased damage to 1.1 per cent. The damage in canola at an average seeding rate of 6.7 lb/ac (7.5 kg/ha) and a fan speed of 3000 rpm was 0.3 per cent. Increasing or decreasing fan speed produced no change in seed damage. These values were similar to conventional grain drill metering systems.

EASE OF OPERATION AND ADJUSTMENT

Maintenance: Ease of performing routine maintenance on the 6130 air seeder was very good. The slow speed drive, main drive chain bearings and the castor fork axle bearings grease fittings were easily accessible. Greasing the castor fork was difficult. Daily greasing took five minutes. The spring loaded chain tension idlers were checked daily. The tank lid latches were adjusted to maintain a proper air tight seal.

Filling/Cleaning: Ease of filling and cleaning the 6130 was very good. The tank openings were located 8.7 ft (2.7 m) above ground. The optional 7 in (178 mm) auger supplied with the test unit allowed for fast filling and convenient emptying of the tanks. The time to fill both tanks was 20 minutes. The auger was hydraulically driven from the tractor. A hydraulic selector valve diverted the hydraulic flow from the fan to the auger motor. Auger reversal was possible by moving the hydraulic valve lever. Auger plugging did not occur during the test.

One person easily placed the auger into transport or working position. A hopper and safety screen were provided with the auger. The hopper was inverted for clean out.

The 11.2 x 25.7 in (285 x 653 mm) tank openings and the V-shaped tank screen restricted movement of the auger spout during filling. The V-shaped screen also reduced the tank capacity. AFMRC recommends the manufacturer consider modifying the tank screens to allow for complete filling of the tanks and movement of the auger spout.

The tank lids were held closed by over-centre latches. The lids were equipped with a rubber seal for an air and moisture tight seal. Each tank had a capacity of 65 bu (2364 L). The location of the tank sight glasses made it difficult for the operator to see when the tanks were full. AFMRC recommends the manufacturer consider modifying the tank sight glasses to enable the operator to view when the tanks were full.

Access to the metering wheels required emptying the tanks. Each tank was equipped with a cleanout door. Cleaning large amounts of material out of the tanks was convenient using the unloading auger (FIGURE 14). Capacity of the cleanout system with wheat was 390 bu/h (10.6 t/h). The time required to empty a full 65 bu (2364 L) tank of wheat was 10 minutes. The collector bottom was removed and the hand crank (FIGURE 16) was turned to empty the metering wheels of material.

The hopper and hopper screen were easily removed from the auger to allow for cleanout of the hopper.

FIGURE 14. Unloading Material from Morris Tank.

Transporting: Ease of transporting the applicator was very good. The trailing telescoping hitch mounted on the Morris cultivator allowed for easy hook-up of the applicator. The hitch was reversed to transport the applicator separately. Hook-up of three hydraulic lines and three electronic couplers was required.

The optional loading/unloading auger was easily placed into transport position by one person after filling the applicator.

Since the applicator towed behind, visibility of the cultivator was very good. The applicator and cultivator were easy to maneuver while backing up. The Morris applicator and cultivator were placed into transport position (FIGURE 15) in five minutes. The main drive chain was easily removed disabling the metering system for transport. Overall transport height and width were 14.8 ft (4.5 m) and 20.9 ft (6.4 m) respectively, requiring care when travelling on public roads.

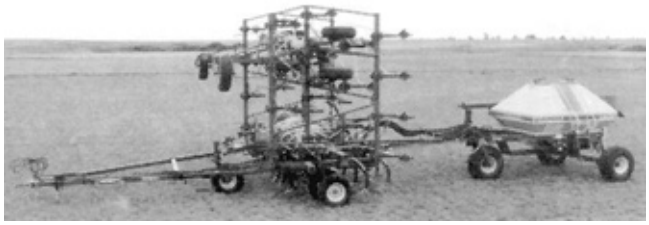


FIGURE 15. Transport Position.

Monitoring: Monitoring on the Morris 6130 was very good. The electronic monitoring system monitored fan speed, seed and fertilizer meter shaft rotation, seed and fertilizer bin levels and ground speed. The digital display continuously showed the selection picked by the rotary selector switch. The digital display showed fan speed in increments of 10 rpm and an alarm sounded when the fan speed dropped below the operator set fan speed alarm point. When material in the seed tank (Sbin) or the fertilizer tank (Fbin) dropped below the bin sensor an alarm sounded and the monitor displayed the appropriate sensor. When no motion was detected for the seed shaft (SEEd) or fertilizer shaft (FErt) an alarm sounded and the monitor displayed the appropriate sensor. The audio alarm for the appropriate sensor was cancelled by pressing the reset button. The selected function was displayed for ten seconds then the alarm condition was displayed for one second. When the alarm condition was corrected the monitor cleared the alarm warning.

A magnetic clutch was mounted on the main drive and a second clutch was mounted on the fertilizer meter drive. Each clutch was controlled by a rocker switch mounted in the tractor cab. To indicate the main clutch was engaged, a quick double beep alarm sounded when the ground speed went above 2 mph (3 km/h). The turning hand crank also indicated the main clutch was engaged.

The monitor was equipped with an electronic acreage meter. The operator entered implement width (feet) and tire circumference constant (174) for the 6130 air seeder. The rotary switch was turned to field area to display the accumulated field area. The digital display showed values to the nearest tenth of an acre and to a maximum of 999.9 acres. The acreage meter was accurate with values averaglng 0.1 per cent high. The rotary switch was turned to width and the reset button pressed to change between English (En9) and metric (tric) units. The conversion changed field area and ground speed readings.

Application Rates: Ease of setting the application rate was very good. Seed and fertilizer rates were set by determining the metershaft and quick change sprockets (FIGURE 16) required from the rate charts supplied. The metershaft ranges were: 25-tooth (standard rate), 35 or 40-tooth (low rate) and 15-tooth (high rate) sprockets. Sprocket sizes ranging from 11 to 45 teeth were used on the quick change sprocket shafts. To change both the metershaft sprocket and the quick change sprocket the locking nut was removed and the required sprocket installed. The clutches were engaged to allow the nuts to be loosened or tightened. The wing nuts that secured the quick change sprockets were difficult to thread onto the shafts. The collector bottom and front cleanout doors wing nuts were also difficult to thread. AFMRC recommends the manufacturer consider modifylng all wing nuts to allow for easier threading.

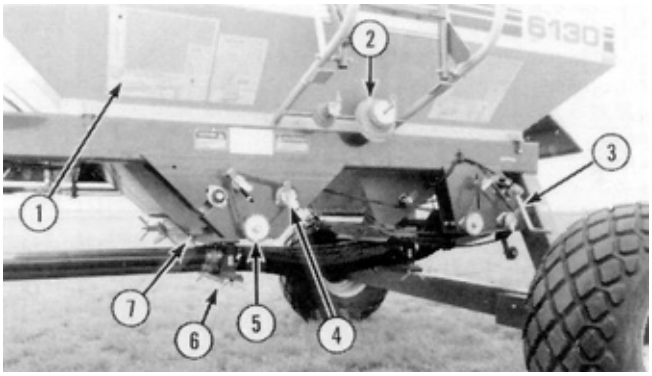


FIGURE 16. Seed and Fertilizer Rate Adjustment: (1) Rate Charts, (2) Quick Change Sprockets, (3) Hand Crank, (4) Idler Sprocket, (5) Metershaft Sprocket, (6) Collector Bottom and (7) Collector.

The manufacturer supplied a setting chart for the slider plates located at each metering wheel. The slider plates were set before material was put into the tank. The front Posi-Drive transmission was changed to the slow speed drive when seeding fine seeds from the front tank.

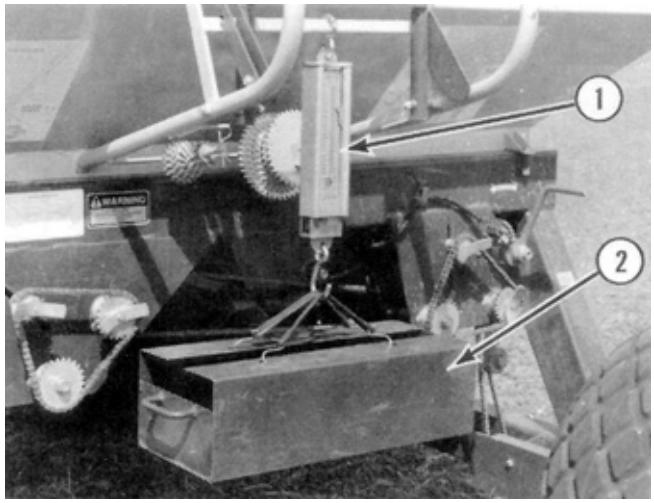


FIGURE 17. Rate Calibration: (1) Spring Scale and (2) Rate Check Box.

The manufacturer recommended the air seeder be calibrated when the material or rate was changed. The manufacturer supplied a rate check box, spring scale (FIGURE 17) and calibration chart to calibrate the applicator. To calibrate the applicator the required collector bottom (FIGURE 16) was removed and the rate check box positioned below the collector. The hand crank (FIGURE 16) was turned the required number of turns for one-tenth of an acre as determined from the calibration chart. The rate check box was then weighed with the spring scale. The box weight was subtracted from the total weight. The material weight was multiplied by ten to give the application rate. The spring scale increments were to the nearest 1 lb (0.5 kg).

EASE OF INSTALLATION

Ease of installing the distribution and monitoring system was good. Installation of the seed and fertilizer distribution system included installing the monitor and clutch switches, mounting the flat fan manifolds and seed boots, routing the 2.5 in (64 mm) primary hoses, the 1 in (25 mm) secondary hoses, the hydraulic lines and the electrical harnesses. The manufacturer supplied charts indicating the proper routing of the secondary hoses. Installation of the distribution system took two experienced people seven hours.

The metering assemblies were matched to the number of delivery outlets. The manufacturer supplied charts indicating the number and sequence for the metering wheels for the required tillage unit. Initial set-up of the metering assemblies was completed by the manufacturer.

POWER REQUIREMENTS

Draft Characteristics: The draft (drawbar pull) and corresponding tractor horsepower requirements depended on the size and type of cultivator used. Refer to AFMRC/PAMI reports on cultivators for estimates of draft and horsepower requirements. The amount of draft depends on field preparation, soil type and moisture content, ground speed and the amount of seed or fertilizer in the tanks. Average tank draft, with the tanks full of wheat at a normal seeding depth, travelling 5 mph (8 km/h), in a tilled loam soil, ranged from 600 lb (2.7 kN) to 1035 lb (4.6 kN).

Hydraulic: Maximum hydraulic flow requirements for the centrifugal fan was 11.5 gal/min (52 L/min) at 1800 psi (12411 kPa). This was measured at a fan speed of 5000 rpm. Flow requirements for the centrifugal fan varied according to fan speed. At an average fan speed of 4150 rpm the hydraulic flow requirement was 9.6 gal/min (44 L/min) at 1300 psi (8963 kPa).

Tractor Size: Power take-off horsepower requirements to pull the air seeder full of wheat, in tilled loam soil, ranged from 14.3 hp (10.7 kW) to 24.7 hp (18.4 kW). Average and maximum horsepower requirements for the centrifugal fan were 10.9 hp (8.1 kW) and 18.1 hp (13.5 kW), respectively.

OPERATOR SAFETY

The 6130 was safe to operate if normal safety precautions were observed. A fold-down ladder, side handrails and a walk-through platform were provided for safe access to the applicator tanks. A lock pin secured the over-centred loading auger lever in transport position. The main and second clutch were disengaged electronically from the tractor cab. A safety chain was provided to secure the applicator to the applicator hitch.

A slow moving vehicle decal was located on the rear of the applicator. Tire loads could exceed the Tire and Rim Association maximum Icad rating if the applicator was transported with full tanks at speeds greater than 10 mph (16 km/h). The applicator should not be transported under these conditions at speeds above 10 mph (16 km/h).

With the remote centrifugal fan location, the operator station noise level in modern tractor cabs was unaffected by fan noise.

OPERATOR'S MANUAL

The operator's manual was very good. The manual contained useful information on safety, operation, maintenance and trouble shooting. An applicator setup section was also provided. No parts list was provided. A calibration chart and meter rate charts were supplied in the operator's manual. AFMRC recommends the manufacturer consider supplying meter rate charts in SI (metric) units as well as Imperial units.

MECHANICAL HISTORY

No mechanical problems were encountered during 146 hours of field operation. The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted.

APPENDIX I

SPECIFICATIONS

MAKE:	Morris 6000 series air seeder			
MODEL:	6130			
SERIAL NUMBER:	484			
MANUFACTURER:	Morris Industries Ltd. 85 York Road Yorkton, Saskatchewan S3N 2X2 Phone: (306) 783-8585			
DIMENSIONS:				
--width	11.4 ft	(3.5 m)		
--length (w/o hitch)	18.3 ft	(5.6 m)		
(with hitch)	28.9 ft	(8.8 m)		
--height	9.1 ft	(2.8 m)		
--max. ground clearance	16.7 in	(424 mm)		
--wheel tread	9.4 ft	(2.9 m)		
METERING SYSTEM:				
--type	spiral fluted metering wheels			
--number of meters	2			
--drive	from the left rear applicator tire through Posi-Drive transmissions and a series of sprockets			
--adjustment				
--coarse	15 tooth high rate, 25 tooth standard rate, 35 or 40 tooth low rate			
--fine	sprockets ranging from 11 to 45 tooth, slider setting on fluted metering wheels			
--airstream loading	pressurized tank			
--transfer to openers	pneumatic conveyance through divider headers and plastic tubes			
--hose sizes				
--primary	2.5 in (64 mm) seed and fertilizer			
--delivery	1.0 in (25 mm) seed and fertilizer			
TANK CAPACITIES:				
--front tank	65 bu (2364 L)			
--rear tank	65 bu (2364 L)			
FAN:				
--type	forward curve centrifugal			
--make	Crary			
--operating range	3000 to 5000 rpm			
--drive	hydraulically driven from tractor remote			
HITCH:				
--vertical adjustment range	no adjustment			
WHEELS:				
--front	one, 16.5L - 16.1, 6 ply			
--rear	two, 16.5L - 16.1, 6 ply			
WEIGHTS:	**TANKS EMPTY**		**TANKS FULL OF WHEAT**	
--hitch	150 lb	(68 kg)	150 lb	(68 kg)
--front caster	1250 lb	(567 kg)	3800 lb	(1724 kg)
--right rear	1300 lb	(590 kg)	3900 lb	(1770 kg)
--left rear	1150 lb	(522 kg)	4100 lb	(1860 kg)
TOTAL	3850 lb	(1747 kg)	11950 lb	(5422 kg)
NUMBER OF LUBRICATION POINTS:	10 grease fittings			
AUGER:				
--size	7 in (178 mm) diameter			
--drive	hydraulically driven by tractor			
OPTIONS INCLUDED ON TEST MACHINE:	7 in (178 mm) diameter hopper auger, second metering clutch, narrow spread seed boot, wide spread seed boot, shank mounted ground rod with seed boot granular applicator kit and hydraulically driven fan			
OTHER AVAILABLE OPTIONS:	fertilizer banding kit, air hoe packer system and gasoline engine			

APPENDIX II

MACHINE RATINGS

The following rating scale is used in AFMRC Evaluation Reports:

--Excellent
--Very Good
--Good
--Fair
--Poor
--Unsatisfactory

SUMMARY CHART
MORRIS 6130 AIR SEEDER

RETAIL PRICE:	$25,662.00 less set-up (August 25, 1992, f.o.b. Lethbridge, Alberta) Morris 6130 air seeder with 49 run air package, auger, secondary clutch and wide spread seeding boot.
QUALITY OF WORK:	
--Seed Placement	2.5 in (64 mm) average paired row band width with wide spread seed boot
--Metering Accuracy	**very good**
--Distribution Uniformity	**very good;** wheat, canola and fertilizer, good; peas
EASE OF OPERATION AND ADJUSTMENT:	
--Maintenance	**very good;** 10 lubrication points
--Filling/Cleaning	**very good;** both tanks filled in 20 min
--Transporting	**very good;** telescoping hitch allowed for easy hook-up and transporting of tank
--Monitoring	**very good;** fan speed, metershaft rotation, bin level and ground speed monitored
--Application Rates	**very good;** spring scale, rate check box and calibration chart provided
EASE OF INSTALLATION:	**good;** instructions were supplied for specific tillage unit and number of distribution outlets
POWER REQUIREMENTS:	PTO horsepower requirements to pull the applicator ranged from 14.3 hp (10.7 kW) to 24.7 hp (18.4 kW); average and maximum horsepower requirements for the centrifugal fan were 10.9 hp (8.1 kW) and 18.1 hp (13.5 kW)
OPERATOR SAFETY:	safe; fold-down ladder, side handrails and a walk-through platform were provided
OPERATOR'S MANUAL:	**very good;** contained useful information
MECHANICAL HISTORY:	no mechanical problems were encountered during the test

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