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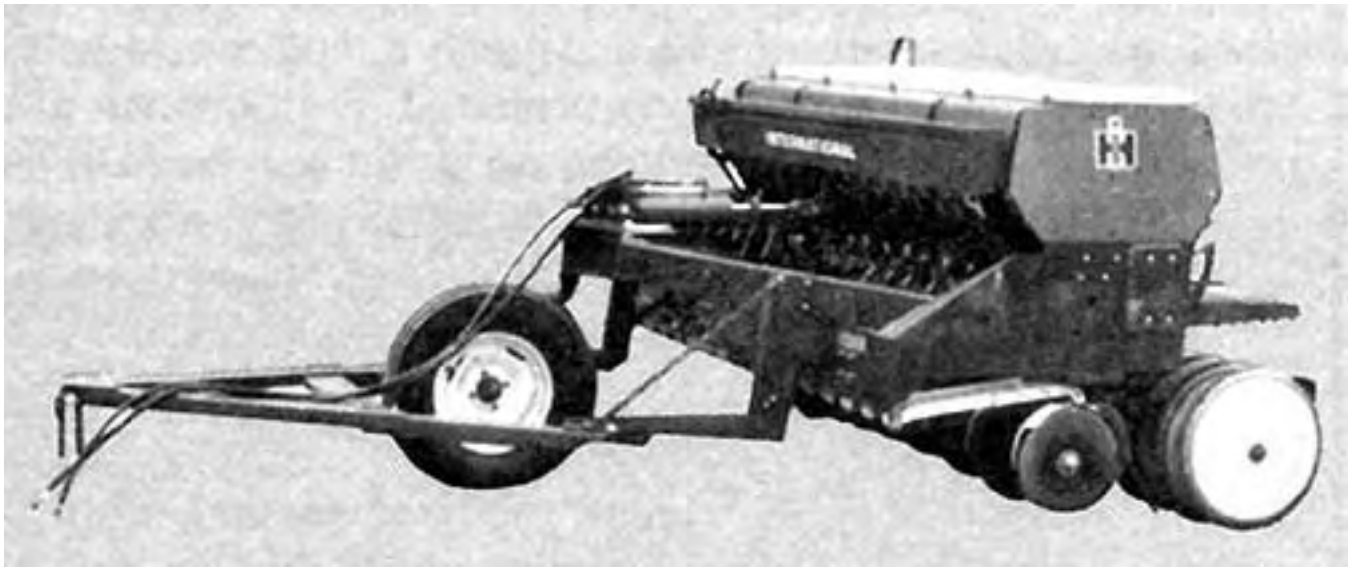

International Harvester 620 Grain and Fertilizer Drill

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

INTERNATIONAL HARVESTER 620 GRAIN AND FERTILIZER DRILL

MANUFACTURER:

International Harvester Company of Canada Limited
208 Hillyard Street
Hamilton, Ontario
Canada

DISTRIBUTOR

International Harvester of Canada Limited
--660 Wall Street
Winnipeg, Manitoba
R3C 2W8
--2030 First Avenue North
Saskatoon, Saskatchewan
S7K 2A1

RETAIL PRICE

$5,280.00 (February, 1978, f.o.b. Humboldt with 16 double disk openers on 152 mm (6 in) spacing, disk scrapers, solid press wheels, single unit hitch, fertilizer level indicator, grass seeding attachment, and rock guard attachment).

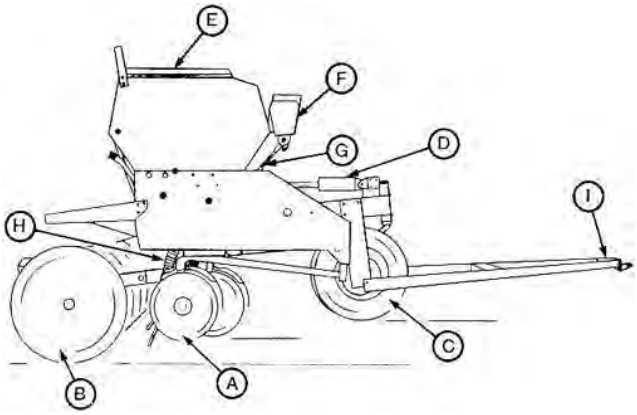

FIGURE 1. Schematic of International Harvester 620: (A) Double Disk Openers, (B) Solid Press Wheels, (C) Castor Wheel, (D) Hydraulic Lift, (E) Grain And Fertilizer Box Opening, (F) Grass Seed Box, (G) Grass Seed Delivery Tubes, (H) Fertilizer and Grain Delivery Tubes, (I) Hitch.

SUMMARY AND CONCLUSIONS

Overall functional performance of the International Harvester 620 was very good. Penetration and seed placement were good in a wide range of soil and trash conditions, providing the seedbed had been properly prepared. Performance of the press wheels was good; plugging occurred only in extremely wet soil. The optional rock guard attachment reduced the lodging of stones between the press wheels.

Accuracy of the seed metering system was very good in barley, wheat and oats and was fair in rapeseed. The minimum seeding rate in rapeseed was 2.6 kg/ha (2.3 lb/acre) and only a limited number of settings were within the common rapeseed seeding range. Variation in seeding rates among seed runs was insignificant when seeding large seeds such as wheat, oats and barley. The variation among the seed runs was high and slightly beyond the suggested limit when seeding rapeseed. The seeding rates in all crops were unaffected by field slope, ground speed or the level of grain in the seed box.

Overall performance of the fertilizer attachment was good. Variation of the application rates among runs was low and the application rate was not affected by field roughness, ground speed or the level in the fertilizer box. The application rate was affected by field slope and increased 34% when seeding down a 15° slope.

Performance of the grass seed attachment was fair for small seeds. As is common with such attachments, it was not suited for large, light seeds, such as bromegrass or Russian wild ryegrass. Such crops are usually seeded through the grain box using an agitator attachment. An agitator was not available for the International Harvester 620. The grass seed attachment performed well with rapeseed, however, it broadcasted the seed on the soil surface rather than within the furrow. Cutting the feed tubes and positioning them into the front of the optional grain seed viewing cups would enable seeding rapeseed into the opener furrow with the grass seed attachment.

Both the seed and fertilizer drive were convenient to adjust. The seed and fertilizer boxes were convenient to fill as an adequate walkway was provided. The fertilizer box was very easy to clean, but was not adequately sealed to prevent water entering the box in heavy rains. Twelve lubrication fittings required greasing.

About 22.5 kW (30 hp) of tractor power should be available for each 2440 mm (8 ft) section of drill. A 90 kW (120 hp) tractor should have sufficient power reserve to operate a multiple hook-up of four drills in most soils at speeds up to 10 km/h (6 mph).

The operator's manual was very good. It contained detailed instructions on adjustment, repair and maintenance. The International Harvester 620 was safe to operate if normal safety precautions were followed.

No serious mechanical problems occurred during functional evaluation.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Making a slower speed available for the grain drive to obtain better metering accuracy and a greater number of suitable settings for seeding small seeds such as rapeseed.
2. Supplying optional grass seed tubes or including instructions in the operator's manual for modifying existing tubes to permit the option of placing seeds within the opener furrow when using the grass seed attachment for seeding crops such as rapeseed or mustard.
3. Supplying a slow moving vehicle sign to comply with provincial safety regulations.

Chief Engineer - E. O. Nyborg
Senior Engineer - L. G. Smith
Project Engineer - G. E. Frehlich

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. & 2. Both of these recommendations deal with obtaining finer sowing rate graduations for seeding rapeseed. International Harvester will supply information in the Operator's Manual, instructing the operator to purchase seed viewing cups and to modify the existing grass tubes so the grass seed attachment can sow rapeseed and mustard seed through the furrow openers. The rapeseed sowing chart for the grass seed attachment, contained in this report will also be added to the operator's manual.
3. The mounting socket for the slow moving vehicle sign will be supplied as standard equipment.

MANUFACTURER'S ADDITIONAL COMMENTS

1. The rock guard attachment is now standard equipment on the International Harvester 620 grain drills.
2. Zero pressure press wheels are recommended for use in extremely wet, sticky soils.
3. Although a metric counter is not available a chart to convert acres to hectares has been added to the inside of the lid.
4. The failure of the press wheel gang bearing holder was due to insufficient dealer set-up instructions. This is being corrected.
5. For multiple drill hook-ups and for transporting long distances, the International Harvester 620 Endwise Transport is recommended.

GENERAL DESCRIPTION

The International Harvester 620 is a 2438 mm (8 ft) press drill with 152 mm (6 in) spacing. It is equipped with 16 double disk openers in two rows of eight each. Seeding depth is controlled with adjustable compression springs on each opener and a hydraulic

cylinder. The divider in the combination grain and fertilizer box may be installed in two positions giving filled capacities of 568 L (15.6 bu) grain and 330 kg (728 lb) fertilizer or 458 L (12.6 bu) grain and 440 kg (970 lb) fertilizer.

Grain is metered by externally fluted feed rolls while fertilizer is metered with star-shaped traction wheels. Flexible rubber hoses deliver both the seed and fertilizer to the openers. Two gangs of 565 mm (22.3 in) diameter solid press wheels pack the soil directly behind the openers.

The test machine was equipped with rock guard attachment and grass seed attachment. Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The International Harvester 620 was operated in the conditions shown in TABLE 1 for 120 hours while seeding about 222 ha (550 ac). It was evaluated for quality of work, ease of operation, ease of adjustment, power requirements, operator safety and suitability of the operator's manual. In addition the seed and fertilizer systems and the grass seed attachment were calibrated in the laboratory.

TABLE 1. Operating Conditions

Crop	Soil	Stone Condition	Field Area		Hours
			ha	ac	
Wheat on summerfallow	Oxbow loam	Occasional stones	14	33	10
Rapeseed on summerfallow	Melfort silty clay loam	Stone free	155	384	82
Rapeseed on summerfallow	Naicam loam	Stone free	9	22	4
Barley on barley stubble	Naicam loam	Stone free	18	46	10
Barley on barley stubble	Melfort silty clay loam	Stone free	22	55	11
Grass seed mixture & barley on summerfallow	Oxbow loam	Moderately stony	4	10	3
Total			222	550	120

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: Penetration was good in a wide variety of field conditions provided the openers (FIGURE 2) were properly adjusted and adequate pre-seeding tillage had been performed. Opener force was controlled by the position of the pressure adjusting keepers on the openers and the setting of the hydraulic lift cylinder. Opener depth was controlled by the position of the depth adjusting clips on the openers and the setting of the hydraulic lift cylinder. When these two adjustments were properly made, adequate penetration was obtained with the depth adjustment clip slightly clearing the hydraulically controlled arm. Too much clearance between the arm and the clip resulted in excessive penetration or downward motion of the disks in soft or loose soils.

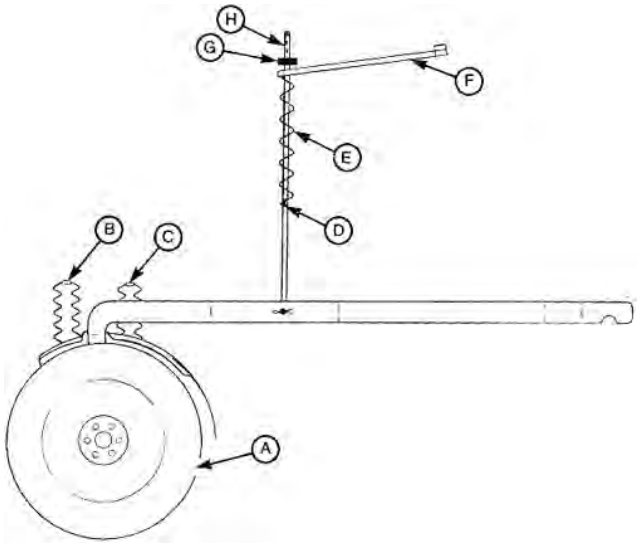

FIGURE 2. Double Disk Opener: (A) Disks, (B) Fertilizer Tube, (C) Grain Tube, (D) Pressure Adjusting Keeper, (E) Spring, (F) Lift Arm, (G) Depth Adjusting Clip, (H) Pressure Rod.

The downward force of each opener could be adjusted from zero up to about 355 N (80 lb). An opener force of about 180 N (40 lb) was suitable for most conditions. The pressure adjusting keepers on the openers running in the tractor and castor wheel tracks had to be set from one to two notches higher than on the other openers to obtain equal penetration in the wheel tracks.

For most fields, opener force and depth could be adequately controlled through the hydraulic lift cylinder, eliminating the need for frequent opener adjustment. Individual openers had to be adjusted only to prevent over penetration in very soft loose soils or to achieve adequate penetration in heavy or trash covered soils (FIGURES 3 and 4).

FIGURE 3. Soil Surface after Seeding in Heavy Trash.

FIGURE 4. Soil Surface after Seeding in Light Trash.

Seed Placement: In normal prairie conditions, grain is seeded into moist soil on a firm seedbed from 25 to 50 mm (1 to 2 in) deep. A firm seedbed aids in the packing of moist soil about the seed and provides a barrier to the seepage of rainfall below the seed zone. Pre-seeding tillage was the most important factor determining seed placement since the openers readily penetrated to the seedbed, but did not exert enough force to penetrate deeper.

Seeding depth was quite uniform across the drill width with slight variations resulting from field or seedbed irregularities. Seed coverage was good and was not appreciably affected by ground speed. Seed coverage was reduced in moist heavy soils due to decreased penetration and soil flow. Seed and fertilizer were placed in a 25 mm (1 in) wide band. Seeds were distributed uniformly along the row.

Soil Compaction: The press wheels followed directly behind the openers, effectively pressing the soil about the seeds. The convex rimmed press wheels were suited to dry soil providing a concentrated soil packing at the seed with minimal soil pulverization. In dry lumpy soil (FIGURE 5), a lumpy surface was retained after seeding.

Average packing force exerted by each press wheel ranged from 490 N (110 lb) with empty seed and fertilizer boxes, to 780 N (175 lb) with full boxes. Press wheel furrow depth ranged from 40 to 65 mm (1.5 to 2.5 in) depending on soil conditions.

Seed Emergence: As with most drills, time and uniformity of seed emergence depended primarily upon seed bed preparation and soil moisture. Seed emergence was uniform in all fields with sufficient moisture reserves. In very dry fields, complete emergence occurred only after rain. FIGURES 6 and 7 illustrate emergence in fields of barley and rapeseed.

Metering Accuracy: The grain, fertilizer and optional grass

seed metering systems (FIGURE 8) were calibrated in the laboratory using a standard procedure[1] and compared with the manufacturer's calibrations. Since the actual application rates for certain settings depend on factors such as size, density and moisture content of seeds and fertilizer particles, it is not possible for a manufacturer to present charts to include all the variations of seed and fertilizer used. Field calibration checks may be necessary for seed and fertilizer with properties differing from those indicated in the manufacturer's tables. Research has shown, however, that small variations in seed or fertilizer application rates will not significantly affect grain crop yields.

FIGURE 5. Soil Surface after Seeding Dry Lumpy Summerfallow. (Top: Seeded, Bottom: Unseeded)

FIGURE 6. Barley Emergence after 17 Days.

FIGURE 7. Rapeseed Emergence after 18 Days.

Grain Metering System: FIGURES 9 to 12 show calibration curves obtained by PAMI and the manufacturer for the International Harvester 620 in wheat, barley, oats and rapeseed using the slow speed grain drive. When using the fast speed drive, seed rates for each setting must be doubled. The differences between the calibration curves of PAMI and the manufacturer are probably due to different seed size, density and moisture content. The seed densities (bushel weights) used by PAMI and the manufacturer are indicated on the curves.

Level of seed in the grain box, field roughness and variation in field slope or ground speed did not affect the seeding rate for either large or small seeds.

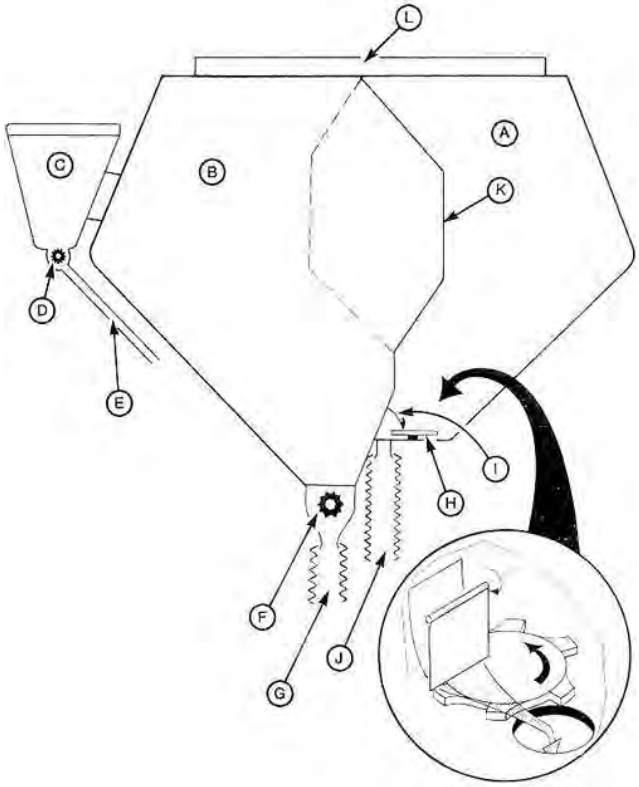

FIGURE 8. Grain, Fertilizer and Optional Grass Seed Metering Systems: (A) Fertilizer Box, (B) Grain Box, (C) Grass Seed Box, (D) Externally Fluted Feedroll, (E) Grass Seed Tube, (F) Externally Fluted Feedroll, (G) Grain Tube, (H) Star-Wheel Fertilizer Feed, (I) Adjustable Feed Gate, (J) Fertilizer Tube, (K) Two-Position Box Partition, (L) One-Piece Lid.

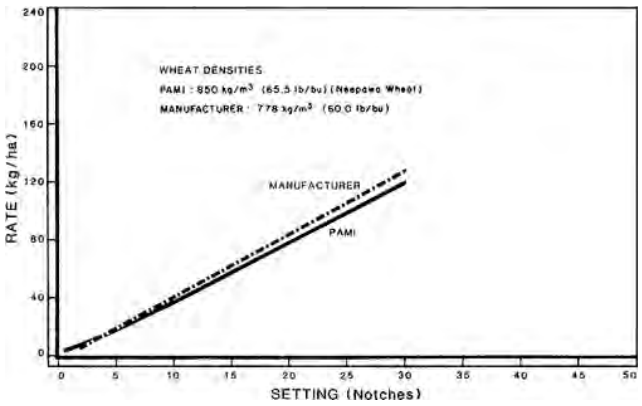

FIGURE 9. Wheat Calibration.

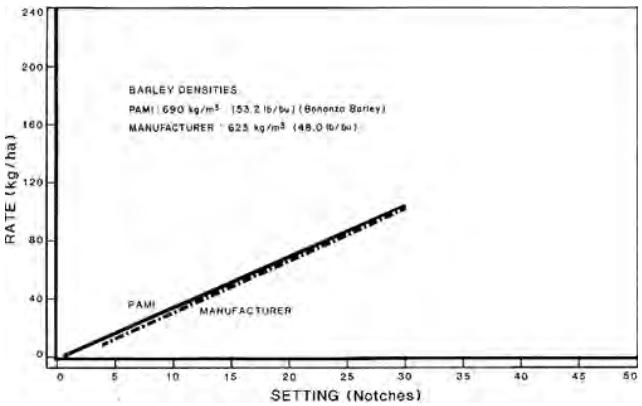

FIGURE 10. Barley Calibration.

The coefficient of variation (CV)[2] is commonly used to describe

[1] *PAMI T773, Detailed Test Procedure for Grain Drills.*

[2] *The coefficient of variation (CV) is the standard deviation of application rates from individual seed cups expressed as a percent of the mean application rate.*

the variation of application rate among individual seed cups. An accepted variation for grain or fertilizer application is a CV value not greater than 15%. If the CV is less than 15%, seeding is acceptable whereas if the CV is much greater than 15%, the variation among individual seed cups is excessive.

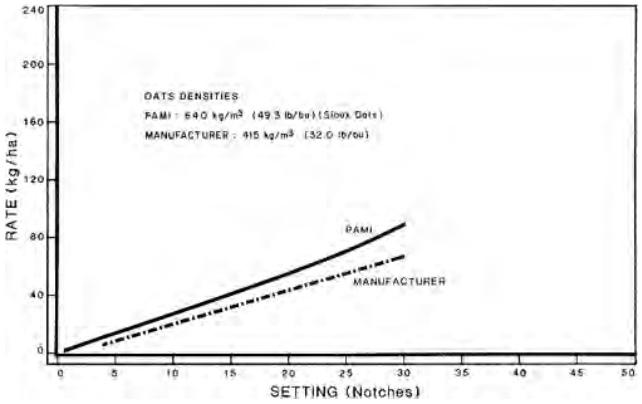

FIGURE 11. Oats Calibration.

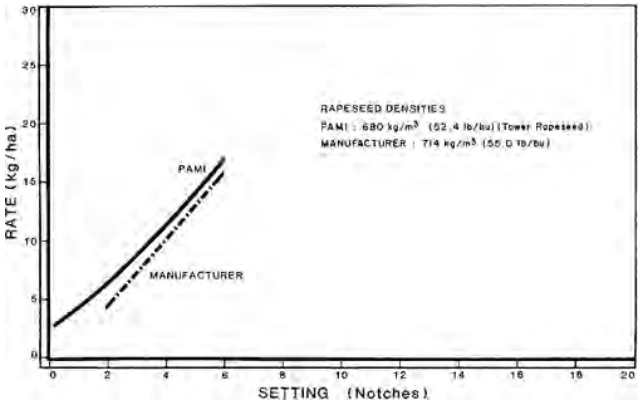

FIGURE 12. Rapeseed Calibration of the Main Grain Box.

For wheat, oats and barley, seeding was quite uniform. For example when seeding wheat at 78.5 kg/ha (70.0 lb/ac) the CV was only 6.5%. However, when seeding rapeseed at a rate of 14.6 kg/ha (13.0 lbs/ac) the CV was 16.8%. This CV value for rapeseed was high and above the suggested 15% limit.

It is therefore recommended that the manufacturer consider supplying an optional extra slow speed drive for use with small seeds such as rapeseed. This would extend the range of seed rate settings available for small seeds and should increase seeding uniformity.

Fertilizer Metering System: The operator's manual presented a fertilizer calibration table for fertilizer with a density of 1040 kg/m³ (65 lb/ft³). FIGURE 13 shows PAMI calibration results for 23-23-0 fertilizer with a density of 990 kg/m³ (61 lb/ft³) when using the slow speed drive. Comparisons with the manufacturer's calibrations on the same figure indicate a slight difference between the two graphs. This difference is probably due to the variation in the size and density of fertilizer used in the two calibrations. Application rates for the high speed drive range from about 145 to 695 kg/ha (130 to 620 lb/ac).

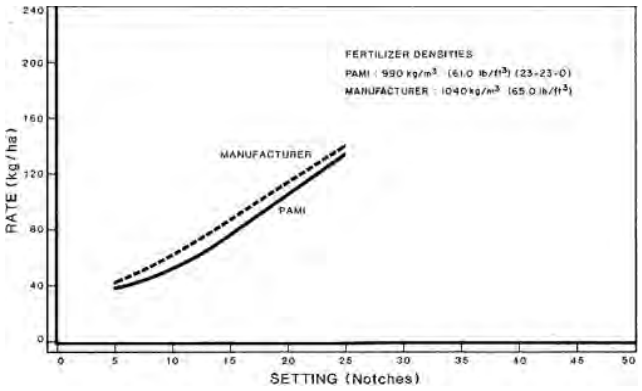

FIGURE 13. Calibration of the Fertilizer Metering System.

Fertilizer distribution across the width of the drill was quite uniform. For example, when distributing 23-23-0 fertilizer at a rate of 56 kg/ha (50 lb/ac), the coefficient of variation among individual feed cups was 9%.

The fertilizer application rate was not affected by the level of fertilizer in the box, ground speed or field vibrations. It was, however, significantly affected by field slope. FIGURE 14 shows the variation in fertilizer application rates obtained when fertilizing uphill, downhill and on level ground with the fertilizer selection lever at setpoint ten while applying 23-23-0 fertilizer. The application rate varied from 44 kg/ha (39 lb/ac) while seeding up a 15° slope to 75 kg/ha (67 lb/ac) while seeding down a 15° slope. The application rate on level ground was 56 kg/ha (50 lb/ac).

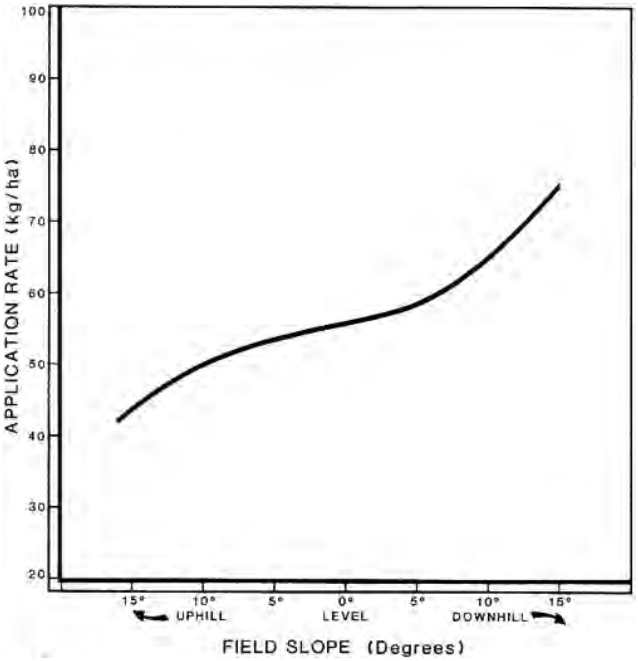

FIGURE 14. Variation in Fertilizer Application Rate with Change in Field Slope While Applying 23-23-0 Fertilizer at Number 10 Lever Setting.

Grass Seed Attachment: As is common with most drills, the grass seed attachment is designed only for small seeds, which cannot be suitably seeded through the grain box. It is not intended for large seeds such as bromegrass or Russian wild ryegrass. Such grasses can be seeded through the grain box by mixing with the seed heavier material such as cracked grain. A grain agitator was not available to aid in the seeding of the light grasses through the main box.

FIGURE 15 shows the grass seed attachment calibration for alfalfa while FIGURE 16 shows calibration for rapeseed, both with the low speed drive. For the high speed drive, seeding rates for each setting have to be doubled.

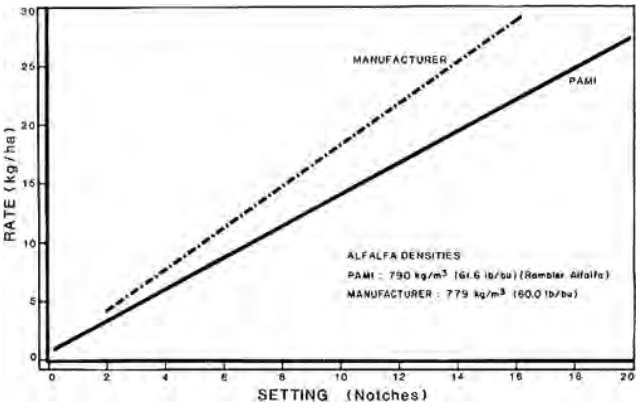

FIGURE 15. Alfalfa Calibration for the Grass Seed Attachment.

Seeding rates were not significantly affected by level of seed in the box, ground speed or field vibration. The grass seed attachment was only slightly more suitable for seeding rapeseed than was

the grain box. The accuracy of the grass seeding attachment was higher with better rate control and lower adjustment sensitivity. The coefficient of variation among seed cups, when seeding rapeseed through the grass seed attachment was 12% at a seeding rate of 9.3 kg/ha (8.3 lb/ac).

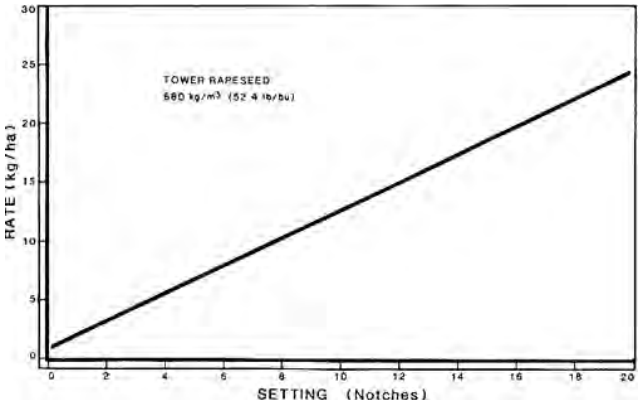

FIGURE 16. Rapeseed Calibration for the Grass Seed Attachment.

The grass seeding attachment broadcasted the seed on top of the soil directly behind the openers. For rapeseed it may be more suitable to cut the seed tubes and insert them into the front of the grain box seed cups to permit seeding within the opener furrow. This could only be done if the drill was equipped with the optional seed viewing cups for the main box.

EASE OF OPERATION

Wet Fields: The optional rock guards effectively prevented plugging of the press wheels with mud when seeding through small pot holes or wet depressions. In extremely wet sticky soil, they were only partially effective and occasional press wheel plugging occurred, necessitating cleaning with a bar. Soil clung to the press wheels in moist seeding conditions however seed was never seen clinging to the press wheels.

Stony Fields: No problems occurred in stony conditions, however, only a small portion of the test was conducted in stony fields (TABLE 1). Trip clearance varied from 125 mm to 225 mm (5 to 9 in) for both the front and rear openers. Several openers had a restricted trip clearance due to obstruction by the drill frame. Opener force at maximum clearance varied from 355 to 390 N (80 to 85 lb). The optional rock guard attachment effectively prevented stones from lodging between the press wheels.

Disk Scrapers: The International Harvester 620 was equipped with adjustable spring loaded inner scrapers. If properly adjusted the scrapers effectively prevented mud accumulation on the disks without excessive disk wear. The disks turned freely in all soils.

Feed Gates: The grain box seed cups were equipped with adjustable feed gates. The gates could be set in three operating positions and in a fully open position for cleaning the seed cups.

Filling: The 330 mm (13 in) wide metal walkway and the large wide opening lid made filling with grain or fertilizer safe and convenient. A single lid covered both boxes. The partition between the grain and fertilizer boxes (FIGURE 8) could be set in two positions to suit application rates, thereby minimizing downtime for filling. This permitted carrying 560 L (15.6 bu) of grain and 330 kg (728 lb) of fertilizer or 454 L (12.6 bu) of grain and 440 kg (972 lb) of fertilizer. Windows in the grain box and a level indicator on the fertilizer box aided in determining a low grain or fertilizer level providing conditions were not too dusty. The larger grains could be seen as they were metered past the openings of the optional seed viewing cups to the openers.

Moisture: The grain and fertilizer boxes were adequately sealed to prevent leakage into the box in the light rains. In heavy rains, water entered the fertilizer box mainly at both ends. If the drill is forced to stand out in the rain, the fertilizer attachment must be checked before operation to ensure that the feed shaft is free to turn and that the fertilizer has not caked.

Cleaning: As with most drills, a vacuum cleaner or compressed air was needed for thorough cleaning of the grain box. The feed gates on each of the seed cups could be opened to aid in cleaning. The fertilizer box was very easy to clean. The bottom of the fertilizer box containing the feed wheels could be swung down to permit cleaning with a brush, water or compressed air. The feed wheels could be easily removed for thorough cleaning at the end of the season.

Acreage Counter: The acreage counter was accurate to within 3% if the drill was operated at full seeding width. The counter recorded the nearest tenth acre up to 1000 acres. A metric counter was not available.

Transporting: The manufacturer recommends that the drill not be transported at speeds above 16 km/h (10 mph). For multiple hook-ups and long transport distances, the operator should consider using a drill transporter.

EASE OF ADJUSTMENT

Lubrication: Lubrication was easy with fair access to the twelve pressure grease fittings. A grease gun with a flexible hose was needed for the majority of these fittings. Eight of the fittings required greasing every ten hours while four required greasing every five hours.

Seeding Rate: The grain seeding rate was easily set. To set the seeding rate the operator's manual stated that the rate selection lever be moved slightly past the desired setting and then brought back slowly until the edge was directly on the setting. The feed gates in the individual seed cups were easily set by hand.

Fertilizing Rate: The fertilizer application rate was easily set by adjusting the rate selection lever.

POWER REQUIREMENTS

Maximum draft, with filled grain and fertilizer boxes on level fields with average soil moisture was about 4495 N (1010 lb) while average draft was about 4140 N (930 lb). When considering variation in soil and field conditions, about 22.5 kW (30 hp) of tractor power should be available for each 2.44 m (8 ft) section of drill. In other words a 90 kW (120 hp) tractor should have sufficient power reserve to operate a multiple hook-up of four drills in most soils at 10 km/hr (6 mph).

OPERATOR SAFETY

The International Harvester 620 was safe to operate if normal safety precautions were observed. The drill was not equipped with a slow moving vehicle sign. Provincial highway regulations require displaying a slow moving vehicle sign when transporting machinery on public highways. The metal platform at the rear of the drill was large enough for safe and convenient filling of the grain and fertilizer boxes.

OPERATOR'S MANUAL

The operator's manual was simple, concise, and well illustrated, presenting much useful information on operation and maintenance. The operator's manual did not include metric calibration charts for the grain and fertilizer box or the grass seed attachment. Metric calibration charts were attached to the inside of the drill lid.

DURABILITY RESULTS

The International Harvester 620 was operated for 120 hours while seeding about 222 ha (550 ac). 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	Hours	Field Area ha	Field Area (ac)
-A bearing holder on one of the press wheel gangs was broken and replaced at	105	220	(540)
-Several discs came loose and were tightened at	End of Test		
-The positioning lever on one of the feedcup gates broke and was replaced during	Laboratory Tests		

DISCUSSION OF MECHANICAL PROBLEMS

Bearing Holder on Press Wheels: Mud buildup on the press wheels pulled a loose bolt from one of the press wheel gangs bearing holder freeing the one end. Resulting twist of the gang fractured the second bearing holder.

APPENDIX I
SPECIFICATIONS

MAKE:	International Harvester Grain and Fertilizer Drill
MODEL:	620
SERIAL NO.:	620 CI 211

OVERALL DIMENSION:

-- height	1485 mm (58.5 in)
-- length	4140 mm (163 in)
-- width	2550 mm (100.5 in)
-- effective seeding width	2438 mm (96 in)
-- transport ground clearance	76 mm (3 in)

SEED METERING SYSTEM:

-- type	externally fluted feed rolls
-- drive	chain and gear from press wheels
-- adjustment	lever controlling feed roll protrusion
-- transfer to openers	convoluted rubber hose
-- options	seed viewing cups

FERTILIZER METERING SYSTEM:

-- type	star-shaped feed wheels rotating on a vertical shaft
-- drive	chain and gear drive from press wheels
-- adjustment	lever controlling feed inlet size
-- transfer to openers	convoluted rubber hose

GRASS SEED ATTACHMENT:(OPTIONAL)

-- type	externally fluted feed rolls
-- drive	chain from grain box feed shaft
-- adjustment	lever controlling feed roll protrusion
-- seed transfer	rubber tubes broadcasting behind the openers

OPENERS:

-- type	double disk
-- disk diameter	356 mm (14 in)
-- number of openers	16
-- opener spacing	150 mm (6 in)
-- number of rows	2
-- distance between rows	140 mm (5.5 in)
-- options	180 mm (7 in) opener spacing, outer disk scrapers

PRESS WHEELS:

-- type	solid with convex rim
-- diameter	565 mm (22.25 in)
-- width 45 mm (1.75 in)	
-- number	16
-- spacing	150 mm (6 in)
-- number of gangs	2
-- options	76 x 510 mm (3 x 20 in) shielded with rubber tire and 57 x 510 mm (2.25 x 20 in) shielded with convex rim

CASTOR WHEELS:

-- number	1
-- tire size	7.60 x 15, 4-ply

GRAIN AND FERTILIZER BOX CAPACITIES:

-- with box partition in position	1
-- grain	568 L (15.6 bu)
-- fertilizer	330 kg (728 lb)
-- with box partition in position	2
-- grain	458 L (12.6 bu)
-- fertilizer	442 kg (972 lb)
-- grass seed attachment	62 L (1.7 bu)

WEIGHT:	**boxes empty**	**boxes full**
-- weight on press wheels	798 kg (1755 lb)	1275 kg (2805 lb)
-- weight on castor wheels	352 kg (775 lb)	455 kg (1000 lb)
total weight	1150 kg (2530 lb)	1730 kg (3805 lb)

NUMBER OF CHAIN DRIVES: 5

NUMBER OF LUBRICATION POINTS: 12

NUMBER OF HYDRAULIC LIFTS: 1

NUMBER OF SEALED BEARINGS: 35

OTHER OPTIONAL ATTACHMENTS: combined delivery fertilizer tubes, fertilizer and grain box deep partition, multiple hitches for two or three drills, grain and fertilizer feed stops, markers, shaft speed rotation indicator.

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports.

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

APPENDIX III
METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used.

1 hectare (ha)	= 2.47 acres (ac)
1 kilometre/hour (km/h)	= 0.62 miles/hr (mph)
1 metre (m) = 1000 millimetres (mm)	= 39.37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds (lb)
1 newton (N)	= 0.22 pounds force (lb)
1 litre (L)	= 0.028 bushels (bu)
1 kilogram/hectare (kg/ha)	= 0.9 pounds/acre (lb/ac)

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