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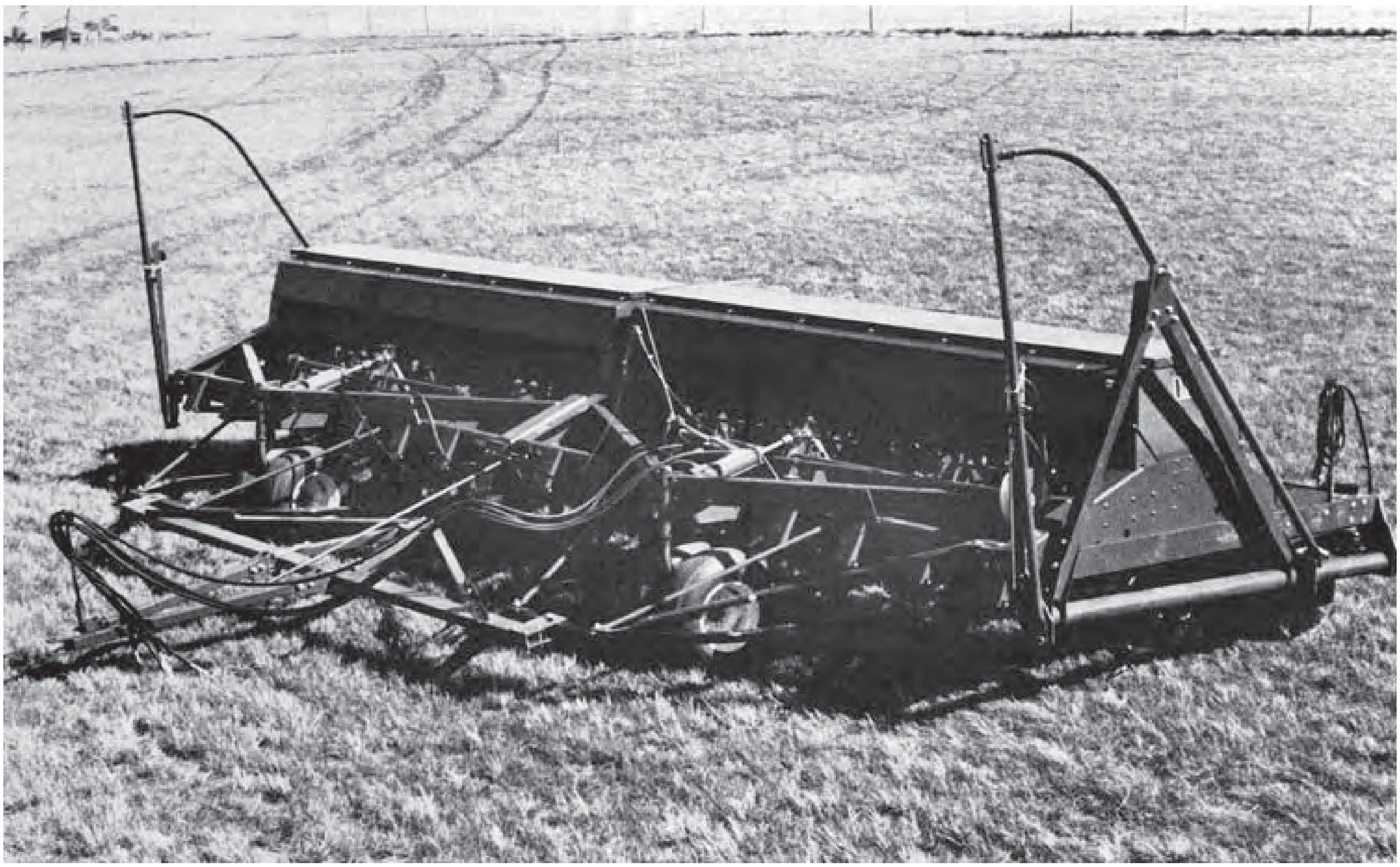

International Harvester 7200 Stubble Mulch Press Drill

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

INTERNATIONAL HARVESTER 7200 STUBBLE MULCH PRESS DRILL

MANUFACTURER:
International Harvester Canada Limited
450 Sherman Avenue, North
Hamilton, Ontario

DISTRIBUTOR:
International Harvester Canada
10914-120 Street
P.O. Box 2406
Edmonton, Alberta
T5J 2S2

RETAIL PRICE:
$39,263.00 (June 1983, f.o.b. Lethbridge, Alberta)

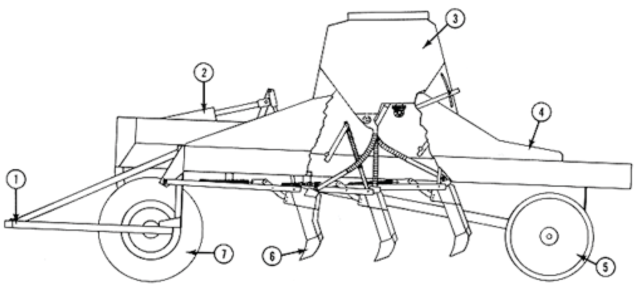

FIGURE 1. International Harvester 7200: (1) Hitch, (2) Hydraulic Lift Cylinder, (3) Grain and Fertilizer Boxes, (4) Rear Walkway, (5) Press Wheels, (6) Hoe Openers, (7) Caster Wheel.

SUMMARY AND CONCLUSIONS

Overall Performance: Performance of the International Harvester 7200 seed drill was very good when seeding into seed beds that had been tilled prior to seeding. Seeding into unprepared seed beds was usually not recommended.

Seed Placement and Emergence: With properly adjusted openers, seed and fertilizer were normally placed in a 1.4 in (35 mm) wide band, with most seeds within 0.6 in (16 mm) of the average seed depth in uniform soil conditions. Each press wheel followed directly behind an opener, exerting a packing force of 160 lb (709 N), which effectively packed the soil around the seed. Seeding into moist sticky fields resulted in soil build-up on the rubber packer wheels.

Trash Clearance: Trash clearance was very good. Plugging occurred only in very heavy, loose trash conditions. The spring trip release provided adequate furrow opener protection in stony conditions.

Grain Metering System: Metering calibrations in wheat, barley, oats and canola were accurate. Differences between the manufacturer's and PAMI's metering calibrations were attributed to the difference in seed size and density used for the respective calibrations. The minimum seeding rate in canola was about 5.8 lb/ac (6.5 kg/ha) and only a limited number of settings were within the common canola seeding range.

Variation in seeding rates among seed runs across the width of the machine was insignificant when seeding large seeds such as wheat, oats and barley. Variation among seed runs was within the acceptable range when seeding canola. The seeding rates in all crops were unaffected by level of seed in the box, variations in ground speed and field roughness. Travelling up a 15-degree slope caused a 3% increase while travelling down a 15-degree slope caused a 6% decrease in seeding rate. Seeding on a side slope caused a 6% decrease in seeding rate.

Fertilizer Metering System: Fertilizer metering calibration was accurate when density and particle size differences were considered. Variation in application rates among runs across the width of the machine was low. The application rate was not significantly affected by level of fertilizer in the box, ground speed or by field vibrations. The application rate was, however, affected by field slope. For example, when applying 11-51-00 fertilizer at a setting of 14.5, travelling up a 15-degree slope caused a 25% decrease while travelling down a 15-degree slope caused a 40% increase in application rate. Seeding on a side slope caused a 17% increase in application rate.

Ease of Operation and Adjustment: Hitching in field position was difficult for one man since the hitch tongue was not supported and was usually lower than the tractor drawbar, Hitching in transport position was very easy and the optional transport package enabled the drill to be placed in transport position in 5 to 10 minutes for quick and easy transporting.

The seeding rate was difficult to adjust when the seed box was full, resulting in bending of the rate selection lever. The fertilizer rate was easy to adjust. Seeding depth was adjusted with the hydraulic lift cylinder and the depth adjusting clip on each opener. The large metal walkway and wide hopper openings made filling with grain and fertilizer safe and convenient. The partition in the grain box could be set in two positions to suit application rates, thereby minimizing downtime for filling. The fertilizer hopper bottom could swing downward to permit easy cleaning. The feed gate on each seed cup could be opened fully to aid cleaning of the hopper bins.

The two single disc markers were raised and lowered using a double acting cylinder. The marker cutting angle was adjustable. The area counter was accurate to within 3%.

Access to all lubrication points was good.

Power Requirements: Tractor size depended on field conditions, soil type, seeding depth, ground speed and drill width. In light soil, seeding at a normal seeding depth at 5 mph (8 km/h), a 50 hp (37 kW) tractor was needed to operate one 14 ft (4.3 m) wide section of the International Harvester 7200 drill. In heavy soil, at the same depth and speed, a 61 hp (46 kW) tractor was needed.

Operator Safety: The International Harvester 7200 seed drill was safe to operate provided normal safety precautions were observed.

Operator Manual: The operator's manual was very good, containing useful information on adjustment, maintenance and operations.

Mechanical Problems: Several mechanical problems occurred during the evaluation. Both depth control lift cylinders bent, two fertilizer drive sprockets broke, the seeding rate selector lever bent, and one of the depth control rockshafts twisted.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to extend the range of seed rate settings for small seeds such as canola.
2. Modifications to the grain metering system to eliminate bending of the rate selection lever when adjusting the seeding rate.
3. Modifications to prevent interference between the frame and the depth control arm of the front left hoe opener.
4. Modifying packer wheel spacers to prevent loosening of the packer wheels.

Senior Engineer: E. H. Wiens

Project Engineer: L. J. deBoer

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A slow speed attachment now being used on the IH model 6200 grain drill is being considered for the 7200 Stubble Mulch Press Drill. In addition, higher precision components have been introduced to decrease the small amount of slack in the seed adjustment lever.
2. The grain metering system used on the 7200 grain drill is essentially the same as the system used successfully on the IH 5100, 6200 and 7100 grain drills and their immediate preceding models and is still considered by IH to be the standard of the industry. Reducing the seeding rate with the hopper full is difficult with any grain drill using fluted feed cups. The reader's attention should be drawn to the note on page 27 of the operator's manual 1097190R4 10-82. "Important: If the grain indicator lever is hard to reset, free the grain shaft

by rocking it with a wrench." Additional information will be added to the operator's manual instructing operators: (a) Not to apply additional leverage or impact to the rate selection lever. (b) Where possible, set the rate selection lever before filling the hopper. The failed rate selection lever will be checked for proper material.

3. Changes to correct this interference are now being processed.
4. Press (packer) wheel loosening is a result of incorrect torque on the arbor bolt jam nuts. A change to a slotted nut and cotter pin was introduced early in the 1983 production year, and the operator's manual will also be changed to emphasis the need to retorque the press wheel arbor bolt retainer nut after each season of use. Some reduction in arbor bolt torque may be experienced in rocky conditions 15ut no press wheel damage has been found to result from this.

MANUFACTURER'S ADDITIONAL COMMENTS

The following items from TABLE 2, mechanical history, are considered by IH to be operator-related. Changes will be made to the Operator's Manual on each of these items to add emphasis on proper operator procedure in order to avoid machine damage:

a. The depth control lift cylinder rods bent due to retracting them from their intended position while the transport lock was engaged and then extending them while still in this position.
b. Two fertilizer drive sprockets failed due to moving the drill forward with the drop bottoms lowered.
c. The fertilizer hopper drop bottom was bent slightly due to moving the drill forward while it was lowered.

GENERAL DESCRIPTION

The International Harvester 7200 is a basic 14 ft (4.3 mm) hoe drill with 7 in (178 mm) spacing. Hitches are available for hitching up to four basic drill units together. Each basic unit is equipped with 24 openers in three rows. 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 26.6 bu (950 L) of grain and 1260 lb (571 kg) of fertilizer or 21.3 bu (760 L) of grain and 1781 lb (808 kg) of fertilizer.

Grain is metered by externally fluted feed rolls while fertilizer is metered with star shaped traction wheels. Flexible rubber hoses deliver both seed and fertilizer to the openers. Three gangs of 22 in (559 mm) diameter rubber press wheels pack the soil directly behind the openers.

The two unit test machine was equipped with a duplex hitch, and optional equipment including an acre tally, hydraulic disc marker attachment and transport package.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The 28 ft (18.6 m) duplex International Harvester 7200 was operated in the conditions shown in TABLE 1 for 93 hours while seeding about 1270 ac (514 ha). 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 metering systems were calibrated in the laboratory.

TABLE 1. Operating Conditions

Crop	Soil	Stone Conditions	Field Area		Hours
			ac	ha	
Wheat on tilled stubble	Heavy loam	Stones free	41	17	3
Wheat on tilled stubble	Heavy loam	Occasional stones	246	100	18
Wheat on tilled stubble	Clay	Occasional stones	82	33	6
Wheat on tilled stubble	Loam	Stones free	546	221	40
Barley on summerfallow	Heavy loam	Occasional stones	246	100	18
Winter wheat on stubble	Heavy loam	Moderately stones	27	11	2
Winter wheat on summerfallow	Heavy loam	Occasional stones	82	33	6
Total			1270	514	93

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. Seeding into an unprepared seedbed with the International Harvester 7200 was usually not recommended. Opener force was controlled by the pressure adjusting clips. Opener depth was controlled by the depth adjusting clip on the opener and the setting of the hydraulic lift cylinder.

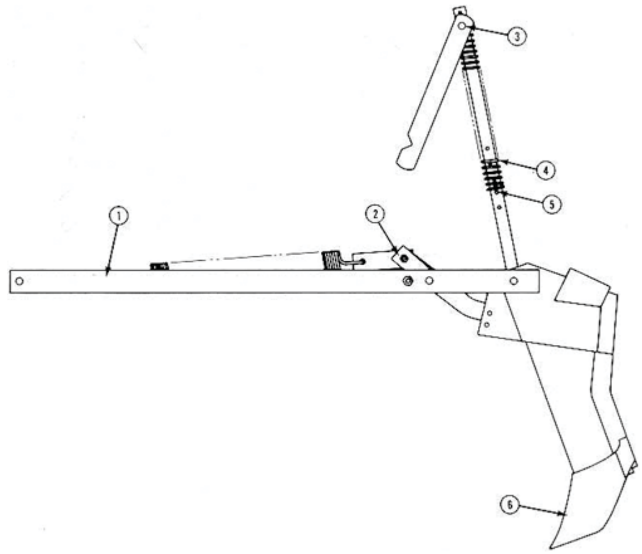

FIGURE 2. Hoe Assembly: (1) Drag Bar, (2) Spring Trip, (3) Depth Adjusting Clip, (4) Pressure Spring, (5) Pressure Adjusting Clip, (6) Hoe Opener.

The pressure adjusting clips on the openers running in the tractor and caster wheel tracks had to be set from one to two notches higher than the other openers to get equal penetration in the wheel tracks. Each opener could be adjusted to four positions to maintain a constant seed boot pitch at various seeding depths. Lowering the openers while the drill was stationary resulted in plugging of the delivery spouts. The spring trip furrow opener was effective in providing opener protection in stony conditions.

Seed Placement: In normal prairie conditions, grain is seeded into moist soil on a firm seedbed from 1 to 2 in (25 to 50 mm) deep. A firm seedbed aids in packing of moist soil about the seed and provides a barrier to seepage of rainfall below the seed zone.

The IHC 7200 normally placed seed and fertilizer within a 1.4 in (35 mm) wide band. When seeding in pre-tilled uniform soil conditions, variation in seed depth was quite uniform. For example, at an average seeding depth of 2 in (50 mm), although seeding depth across the width of the machine varied from 0.7 to 3.2 in (18 to 82 mm), most of the seeds were placed within 0.6 in (16 mm) of the average seed depth. Soil Compaction: The rubber press wheels followed directly behind the openers, effectively pressing the soil about the seeds.

Average packing force exerted by each press wheel ranged from 160 lb (709 N) with empty seed and fertilizer boxes to 235 lb (1046 N) with full boxes. Press wheel furrow depth ranged from 1.2 to 2.0 in (30 to 50 mm), depending on soil conditions. FIGURES 3 and 4 show the soil surface after seeding into summerfallow and stubble fields. Seeding into moist, sticky fields resulted in soil build-up on the rubber packer wheels. In one field containing dry hard lumps of dirt, the lumps wedged between the packer wheels, causing them to skid.

Trash Clearance: The 25.5 in (648 mm) ground to frame clearance, the hoe opener shank shape, and the 7 in (778 mm) hoe spacing arranged in three rows 19.3 in (491 mm) apart, resulted in very good trash clearance with minimal plugging. The IHC 7200 could be operated in heavier trash conditions than other hoe drills. Plugging occurred in only very heavy, loose trash conditions.

Operation in Stony Fields: The spring trip release provided adequate furrow opener protection in stony conditions. The maximum lift when openers encountered stones or field obstructions was 12.2 in (310 mm).

Plant Emergence: As with most drills, plant emergence depended primarily upon seedbed preparation and soil moisture. FIGURE 5 illustrates good emergence in a pre-tilled stubble field seeded to barley.

FIGURE 3. Soil Surface After Seeding into Summerfallow.

FIGURE 4. Soil Surface After Seeding into Stubble.

FIGURE 5. Barley Emergence on Pre-Tilled Stubble.

Metering Accuracy: The grain and fertilizer metering systems (FIGURE 6) were calibrated in the laboratory[1] and compared with the manufacturer's calibrations. Since the actual application for certain settings depends 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 calibrations may be necessary for seed and fertilizer with properties differing from those indicated in the manufacturer's table. Research has shown, however, that small variations in seed or fertilizer application rates will not significantly affect grain crop yields.

Grain Metering System: FIGURES 7 to 10 show calibration curves obtained by PAMI and the manufacturer for the International 7200 in wheat, barley, oats and canola using the slow speed grain drive. All calibration curves are accurate. The difference 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 seed densities (bushel weights) used by PAMI and the manufacturer are indicated on the graphs.

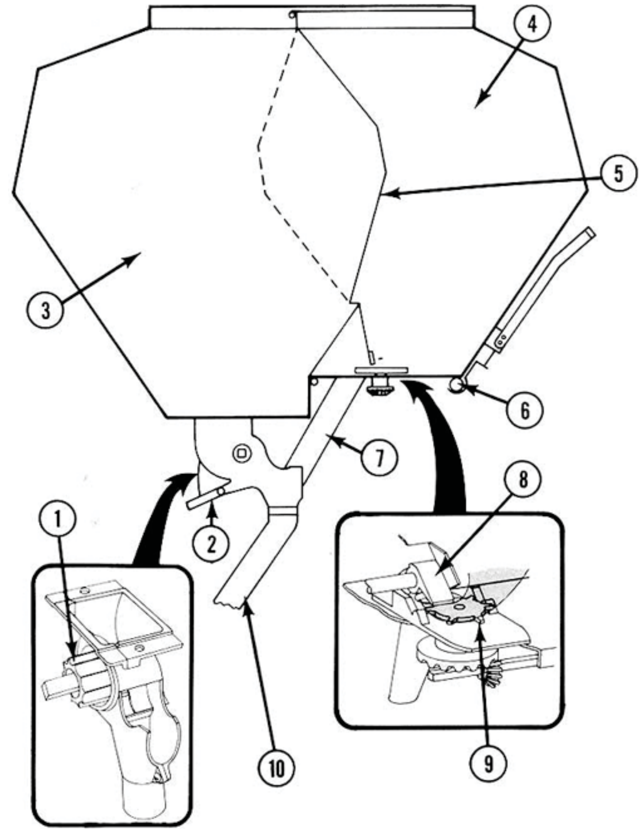

FIGURE 6. Grain and Fertilizer Metering Systems: (1) Externally Fluted Feedroll, (2) Adjustable Seed Cup Feedgate, (3) Grain Box, (4) Fertilizer Box, (5) Seed Box Partition, (6) Fertilizer Hopper Drop Bottom, (7) Fertilizer Spout, (8) Adjustable Fertilizer Gate, (9) Star-Shaped Feed Wheel, (10) Grain and Fertilizer Delivery Tube.

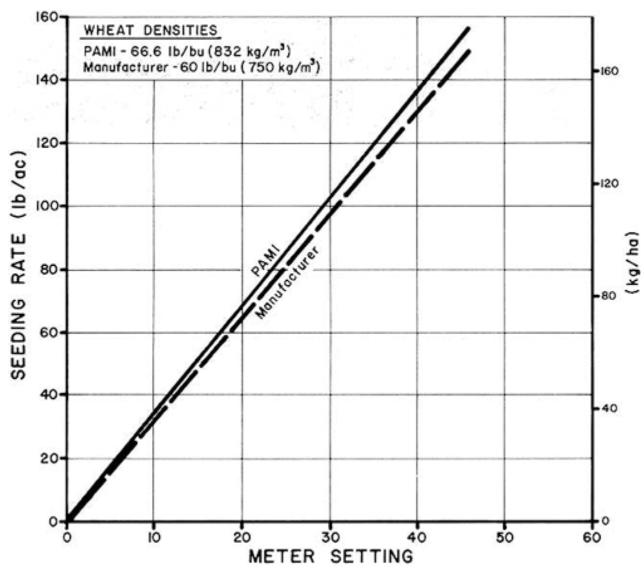

FIGURE 7. Metering Accuracy in Wheat.

The minimum obtainable rate selection lever setting for canola was 2, due to lodging of seeds in the seed cup. This resulted in a minimum seeding rate for canola of 5.8 lb/ac (6.5 kg/ha). Only a limited number of settings were within the common canola seeding range. It is recommended that the manufacturer consider modifications to extend the range of seeding rate settings for small seeds such as canola.

Level of seed in the grain box, variation in ground speed, and field roughness did not affect the seeding rate of either large or small seeds. Travelling up a 15 degree slope caused a 3% increase in seeding rate and travelling down a 15 degree slope caused a 6% decrease. Seeding on a side slope caused a 6% decrease in

[1]*PAMI T773 "Detailed Test Procedures for Grain Drills."*

seeding rate.

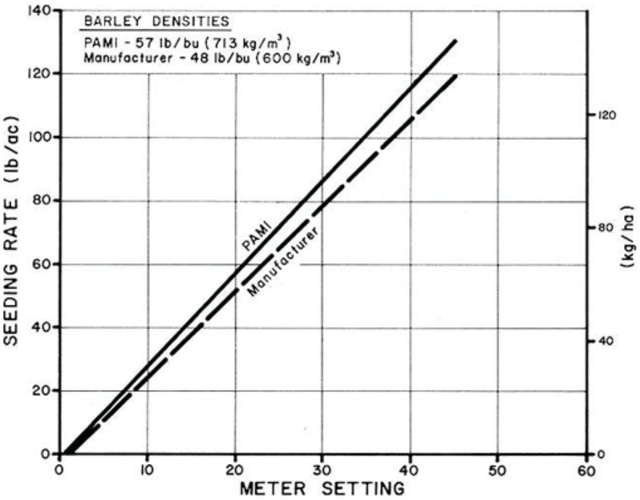

FIGURE 8. Metering Accuracy in Barley.

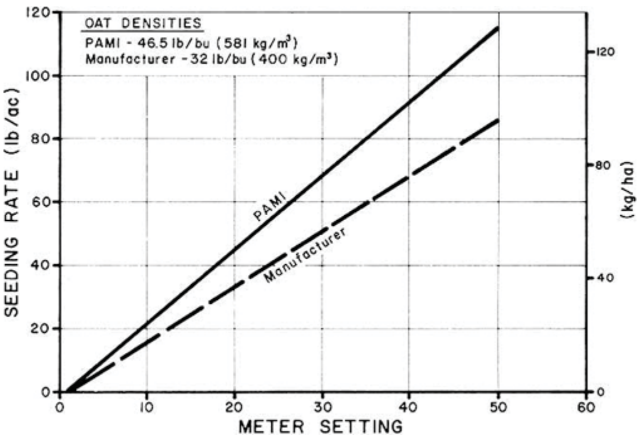

FIGURE 9. Metering Accuracy in Oats.

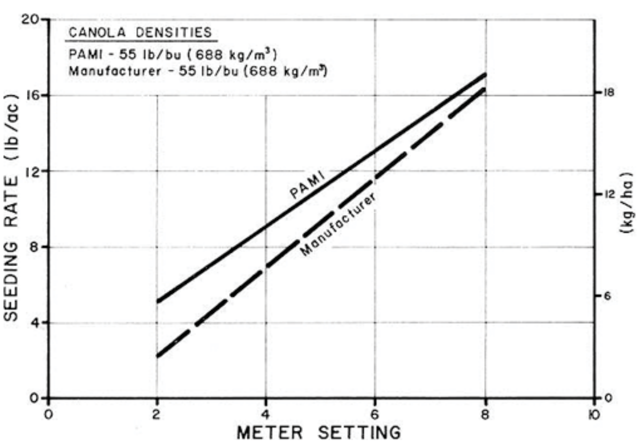

FIGURE 10. Metering Accuracy in Canola.

The coefficient of variation (CV)[2] is commonly used to describe the variation of application rate among individual seed cups across the width of the machine. An accepted variation for grain or fertilizer 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.

The seeding rate, across the width of the machine for wheat, oats and barley, was very uniform with CV's of 1 to 4%. The CV, when seeding canola, varied from 11% at 5.8 lb/ac (6.5 kg/ha) to 5% at 15 lb/ac (7 kg/ha).

Grain crackage through the grain metering system was negligible for both small and large seeds.

[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.

Fertilizer Metering System: FIGURE 11 shows the calibration curves obtained by PAMI and the manufacturer when using the slow speed drive, while metering 11-51-00 fertilizer. Application rates when using the slow speed drive ranged from about 15 to 95 lb/ac (17 to 106 kg/ha). The slight difference between the two curves is probably due to the variation in the size and density of fertilizer used in the two calibrations. Metering calibration was also accurate when using the high speed drive and application rates ranged from about 38 to 413 lb/ac (42 to 460 kg/ha).

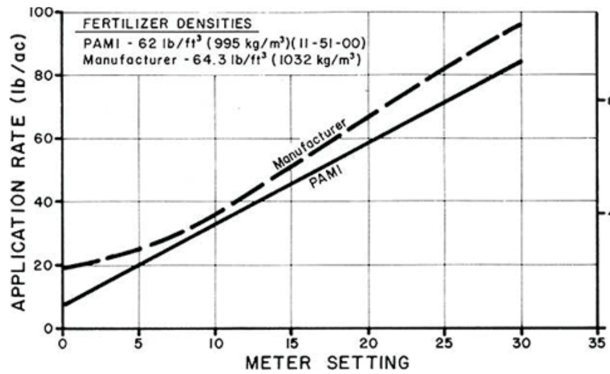

FIGURE 11. Metering Accuracy in Fertilizer.

Fertilizer distribution across the width of the drill was quite uniform. For example, when applying 11-51-00 fertilizer at a rate of 48 lb/ac (53 kg/ha), the coefficient of variation among individual seed cups was 5%.

The fertilizer application rate was not significantly affected by the level of fertilizer in the box, ground speed or field vibrations. It was, however, affected by field slope. FIGURE 12 shows the variation in fertilizer application rates obtained when applying 11-51-00 fertilizer on hilly land with the fertilizer selection lever set at 14.5. The application rate varied from 36 lb/ac (40 kg/ha) while seeding up a 15-degree slope to 67 lb/ac (74 kg/ha) while seeding down a 15-degree slope. Seeding on a side slope caused a 17% increase in application rate.

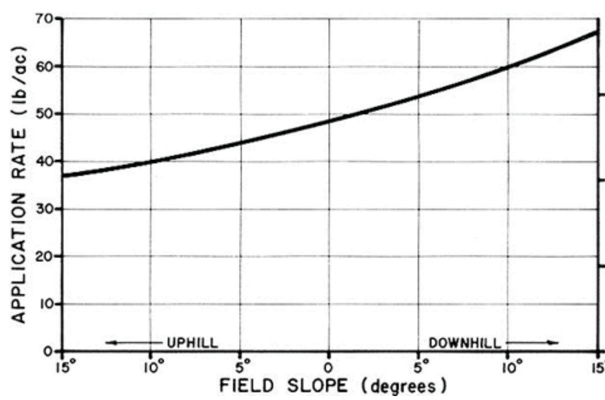

FIGURE 12. Variation in Fertilizer Application Rate with Change in Field Slope When Applying 11-51-00 Fertilizer at a Lever Setting of 14.5.

EASE OF OPERATION

Hitching: One-man hitching was difficult since the hitch was not supported at the front and was usually lower than the tractor drawbar. The hydraulically controlled transport hitch made hitching in transport position very convenient.

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

Filling: The 23.6 in (60 mm) wide metal walkway and the wide opening lids made filling with grain and fertilizer safe and convenient. A single lid covered both boxes with an additional lid covering the fertilizer hopper. The partition between the grain and fertilizer boxes (FIGURE 6) could be set in two positions to suit application rates, thereby minimizing downtime for filling. This permitted carrying 53.2 bu (1900 L) of grain and 2520 lb (1143 kg) of fertilizer or 42.6 bu (1521 L) of grain and 3562 lb (1616 kg) of fertilizer. Changing the partition in the seed box required removing 8 bolts and flipping the three partitions. It took one man 30 to 45 minutes to move the partition in each drill.

Windows in the grain box were of little benefit since it was difficult to see the grain level through them. The optional fertilizer level indicator attachment was not supplied on the test unit.

Moisture: The grain and fertilizer boxes were adequately sealed to prevent leakage into the box in light rains. In heavy rain, water entered the fertilizer box at both ends. If the drill is subjected to rain, the fertilizer attachment should be checked before operation to ensure that the feed shaft is free to turn and that fertilizer is 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 cup 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.

Area Counter: The area 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.

Marker: The International Harvester 7200 was equipped with the optional hydraulically controlled marker, which consisted of two single disc markers, complete with a double acting control cylinder. Extending the cylinder lowered the right marker while retracting the cylinder lowered the left marker. The marker cutting angle was adjustable. The markers could be raised and fastened with a chain for transporting. The disc extensions should be removed for transporting to reduce transport height.

The tubing of the disc extensions tended to bend throughout the test, under normal use, which resulted in a wider furrow opening.

Transporting: The optional drill transport package (FIGURE 13) was convenient for transporting the drill over long distances. It took 5 to 10 minutes to place the drill in transport position. The rear transport wheels tended to skid while turning. The amount of wear due to skidding was not considered excessive.

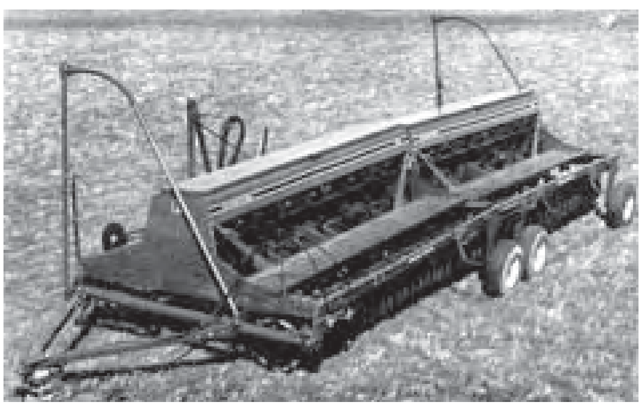

FIGURE 13. Transport Position.

The International Harvester 7200 should not be transported with the grain and fertilizer tanks full due to the excessive weight placed on the transport wheels. Tire skidding while turning in transport with tanks fully loaded caused the tires to go flat. Occasionally, when placing the drill in transport, the rear brace connecting the two drills would bind with the front drill. A jack was then needed to help raise the front drill into transport position.

EASE OF ADJUSTMENT

Lubrication: Lubrication was easy with good access to all the grease fittings. Twenty of the grease fittings required daily greasing, eight required weekly greasing while twenty-one required periodic greasing.

The manufacturer recommended that all chains be lubricated daily.

Seeding and Fertilizer Rate: 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 desired setting. The rate selection lever (FIGURE 14) was often difficult to adjust when the grain box was full, resulting in bending of the rate selection lever. The amount of fluted feed roll extended into the seed cup at the zero position on the rate selection lever had to be checked periodically to determine if bending of the meter selection lever had occurred. It is recommended that the grain metering system be modified to eliminate rate selection lever bending when adjusting the seeding rate.

FIGURE 14. Seeding Rate Selection Lever.

The fertilizer rate was easily adjusted by moving the selection lever (FIGURE 15) to the desired setting. The fertilizer drive was easily changed from low to high speed drive by interchanging two sprockets. Each fertilizer gate had to be adjusted according to the operator's manual before seeding and then periodically checked.

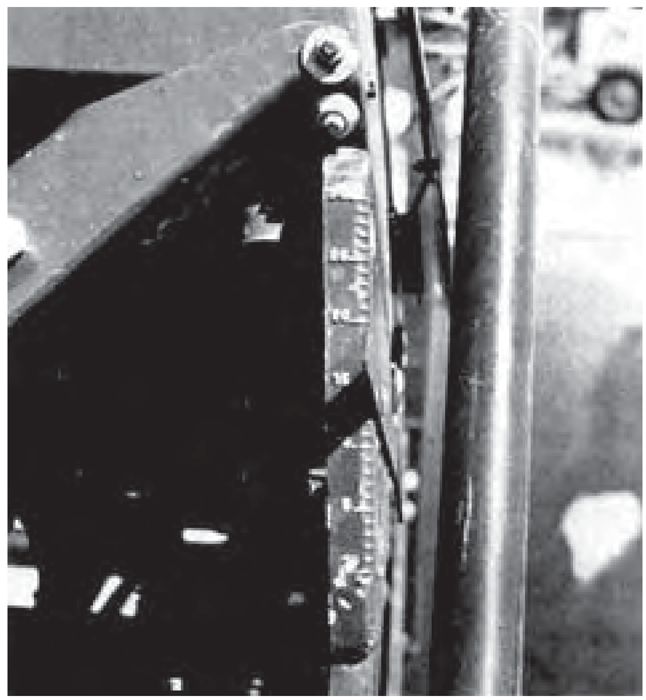

FIGURE 15. Fertilizer Rate Selection Lever.

Depth of Tillage: Seeding depth was adjusted by positioning the hydraulic lift cylinder. Seeding depth from front to back was equalized by adjusting the turnbuckles between the rows of hoe openers. Each furrow opener could be individually adjusted in four positions to maintain a constant seed boot pitch at various seeding depths. Adjusting all the hoe openers individually for changes in seed depth was time consuming.

POWER REQUIREMENTS

Draft: Draft (drawbar pull) requirements depended on field preparation, soil type and moisture. Average draft at a normal seeding depth and at 5 mph (8 km/h), with fully loaded seed and fertilizer boxes, ranged from 2187 lb (9730 N) in silty loam to 2681 lb (11,928 N) in clay soil, for each 14 ft (4.3 m) drill unit.

Tractor Size: Tractor size needed to pull 14 ft (4.3 m) of International Harvester 7200 seed drill varied from 50 hp (37 kW) in silty loam to 61 hp (46 kW) in clay soil. These tractor sizes have been adjusted to include tractive efficiency and represent a tractor operating at 80% of maximum power on level fields. The sizes stated are the maximum power take-off ratings as determined by Nebraska tests or as presented by the tractor manufacturer. The tractor sizes given will have ample power reserve to operate in the stated conditions.

OPERATOR SAFETY

The International Harvester 7200 was safe to operate if normal safety precautions were observed. A transport lock-up pin was provided. The platform at the rear of the drill was large enough for safe filling of the grain and fertilizer boxes. A mounting bracket for a slow moving vehicle sign was provided, but no slow moving vehicle sign was supplied.

The load on the left front tire in transport, with the boxes empty, exceeded the Tire and Rim Association maximum load rating for 9.5L-15, 6-ply tires by about 38%.

OPERATOR'S MANUAL

The operator's manual contained useful information on adjustments, maintenance and operation. Calibration charts were provided in the operator's manual and on the drill box. Seeding rates were expressed in Imperial units (lb/ac) and in metric (SI) units (kg/ha).

MECHANICAL PROBLEMS

The International Harvester 7200 was operated for 93 hours while seeding about 1270 ac (514 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	Field Area ac	Field Area (ha)
-One section of the depth control rockshaft twisted due to interference between the frame and depth control arm at		beginning of test	
-The lock nuts on a packer wheel loosened causing the packer to come off at	3	41	(17)
-The marker crank arm bent at	41	553	(224)
-A collar on the grain meter worked loose at	49	665	(269)
-Two bolts which fasten the marker crank arm loosened and were tightened at	63	856	(346)
-Two collars on the depth control rockshaft loosened at	72	978	(396)
-The depth control lift cylinders bent at	72	978	(396)
-Two fertilizer drive sprockets failed due to chain binding at	79	1046	(423)
-One fertilizer hopper drop bottom bent slightly when cleaning due to interference with the depth control arm at	79	1046	(423)
-The grain rate selection lever bent due to difficulty in adjusting the meter at	84	1141	(426)
-The packer wheels were loose due to collapse of the metal spacers at		end of test	
-The right gang leveller bent slightly at		end of test	
-The marker extensions bent		throughout the test	
-The rubber grain and fertilizer delivery tubes occasionally came ut of the opener holder		throughout the test	

DISCUSSION OF MECHANICAL PROBLEMS

Depth Control Rockshaft: A main frame member interfered with the depth control arm on the front left hoe assembly (FIGURE 16) while raising the openers. This resulted in bending of the depth control rockshaft, causing two of the hoe openers to seed deeper. It is recommended that modifications be made to prevent interference between the frame and the depth control arm of the front left hoe opener.

Depth Control Hydraulic Lift Cylinders: When the transport lock-up pin was in place, the fixed end of the hydraulic cylinder was free to move. Retracting the hydraulic cylinder caused the fixed end to move to an alternate position. Extending the hydraulic cylinder while it was in the alternate position caused the hydraulic cylinder shaft to bend. To prevent bending of the hydraulic cylinder shaft, the fixed end of the cylinder had to be placed in its proper position before extending it.

Fertilizer Drive Sprockets: Lowering the fertilizer box drop bottom caused the drive chains to slacken. Moving the drill forward with the chains in this slack position caused the drive sprockets to fail.

Rate Selection Lever: The grain rate selection lever was bent due to binding when setting the metering rate. It has already been recommended that modifications be made to the metering system to prevent bending of the rate selection lever.

Packer Wheels: The spacers between the packer wheels tended to collapse slightly throughout the test, causing loosening of the packer wheels. It is recommended that modifications be made to prevent loosening of the packer wheels.

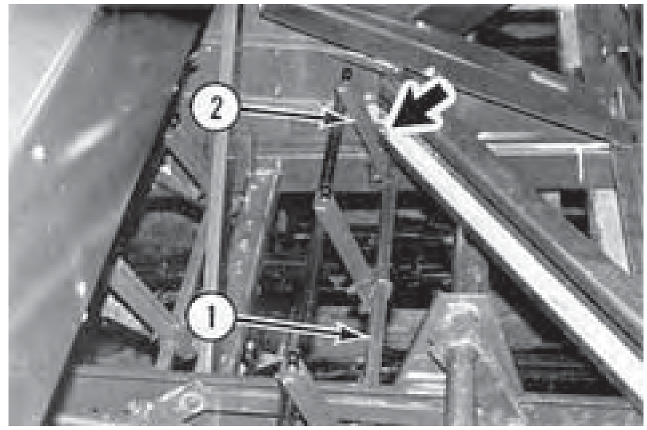

FIGURE 16. Interference Between the Frame and the Depth Control Arm: (1) Depth Control Rockshaft, (2) Depth Control Arm.

APPENDIX I
SPECIFICATIONS

MAKE:	International Harvester Stubble Mulch Press Drill
MODEL:	7200
SERIAL NUMBERS:	0390183C001663, 0390183C001660
MANUFACTURER:	International Harvester Canada Limited 450 Sherman Avenue North Hamilton, Ontario

DIMENSIONS OF DUPLEX UNIT (With Markers):

	Field Position	**Transport Position**
-- height	9.7 ft (2950 mm)	9.7 ft (2950 mm)
-- length	21.8 ft (6480 mm)	85.1 ft (10,700 mm)
-- width	82.4 ft (8970 mm)	16.4 ft (5000 mm)
-- effective seeding width		28.8 ft (8680 mm)
-- transport ground clearance	4.8 in (110 mm)	

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 hoses

FERTILIZER METERING SYSTEM:

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

OPENERS:

-- type	hoe
-- point	3 in (75 mm) tumble steel shovel
-- number	48
-- spacing	7 in (178 mm)
-- number of rows	3
-- distance between rows	19.8 in (491 mm)
-- options	eagle beak point, 3 or 5 in (75 or 125 mm) tumble steel shovel, 7, 8, 10, 12 or 14 in (178, 208, 254, 805 or 856 mm) opener spacing, spring trip or shear trip

PRESS WHEELS:

-- type	solid with rubber rim
-- diameter	22 in (559 mm)
-- width	8.1 in (79 mm)
-- number	24 per 14 ft (4.8 m) drill unit
-- spacing	7 in (178 mm)
-- number of gangs	8 per 14 ft (4.8 m) drill unit
-- options	2.25 x 20 in (57 x 508 mm) shielded convex round steel rim

CASTER WHEELS:

-- number	4
-- tire size	8.5L-14, 4-ply

GRAIN AND FERTILIZER BOX CAPACITIES:

-- with box partition in position 1	
-grain	58.2 bu (1900 L)
-fertilizer	2520 lb (1148 kg)
-- with box partition in position 2	
-grain	42.6 bu (1521 L)
-fertilizer	8652 lb (1616 kg)

WEIGHTS (Field Position):	**Boxes Empty**	**Boxes Full**
-- weight on press wheels	7745 lb (3513 kg)	1410 lb (5176 kg)
-- weight on caster wheels	5325 lb (2415 kg)	7810 lb (3543 kg)
Total weight	13070 lb (5928 kg)	19220 lb (8718 kg)

WEIGHTS (Transport Position):	**Boxes Empty**	**Boxes Full**
-- weight on front caster wheels	5622 lb (2500 kg)	8432 lb (3825 kg)
-- weight on transport wheels	5832 lb (2645 kg)	8553 lb (3880 kg)
-- weight on hitch	1616 lb (733 kg)	2235 lb (1014 kg)
Total weight	13070 lb (5938 kg)	19220 lb (8719 kg)

NUMBER OF CHAIN DRIVES: 8

NUMBER OF LUBRICATION POINTS: 51

NUMBER OF HYDRAULIC LIFTS: 7

NUMBER OF SEALED BEARINGS: 8

OTHER OPTIONAL ATTACHMENTS:
- -- grain feed and fertilizer feed covers
- -- feed shaft rotation indicator
- -- digital land measure
- -- grain feed cup windshield
- -- fertilizer level indicator
- -- grass seed attachment
- -- grass seed feed covers

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Very Good
Good	Fair
Poor	Unsatisfactory

APPENDIX III
CONVERSION TABLE

acres (ac) x 0.40	= hectares (ha)
miles/hour (mph) x 1.61	= kilometres/hour (km/h)
inches (in) x 25.4	= millimetres (mm)
feet (ft) x 0.305	= metres (m)
horsepower (hp) x 0.75	= kilowatts (kW)
pounds (lb) x 0.45	= kilograms (kg)
pounds force (lb) x 4.45	= newtons (N)
bushels (bu) x 36.4	= litres (L)
pounds/acre (lb/ac) x 1.12	= kilograms/hectare (kg/ha)
pounds/bushel (lb/bu) x 12.5	= kilograms/cubic meter (kg/m^3)

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