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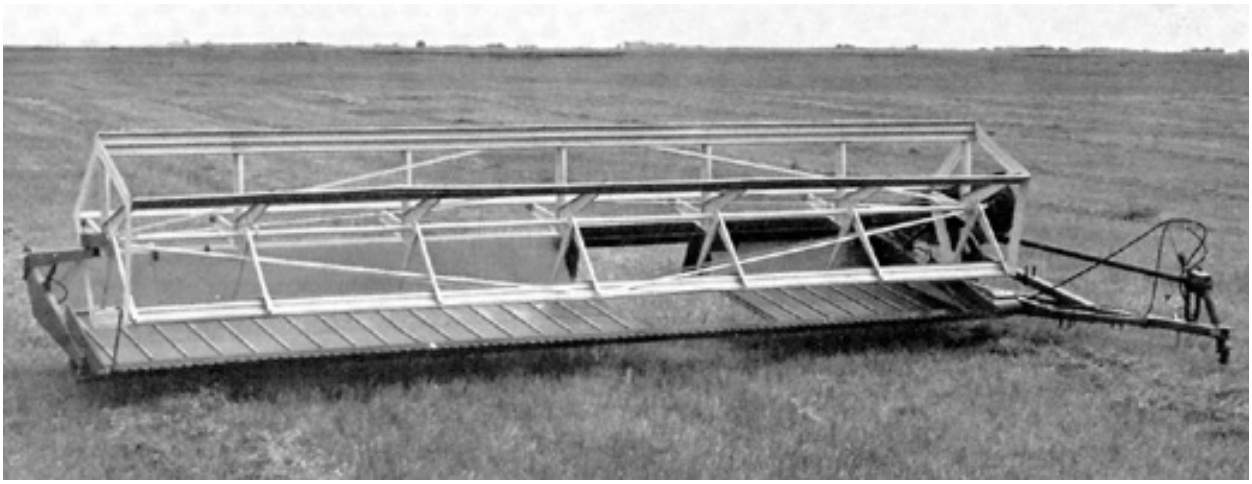
Evaluation Report 150



International Harvester 75 Pull-Type Windrower

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

INTERNATIONAL HARVESTER 75 PULL-TYPE WINDROWER

MANUFACTURER:

MacDon Industries Ltd.
680 Moray Street
Winnipeg, Manitoba
R3J 3S3

DISTRIBUTOR:

International Harvester Company of Canada
660 Wall Street
Winnipeg, Manitoba
R3C 2W8

RETAIL PRICE:

$4,390.00 (March, 1979, f.o.b. Humboldt, Saskatchewan with 6.4 m cutter bar, 0.9 m cutter bar extension, reel truss brace, reel end guard, table flotation spring and transport system.)

SUMMARY AND CONCLUSIONS

Overall functional performance of the International Harvester 75 windrower was *very good* in all grain crops and was *good* in flax and rapeseed. Performance in hay crops, with the 7.3 m (24 ft) cutter bar, was *good.*

Cutting ability was *excellent* in most standing grain and hay crops. Feeding problems occurred in lodged crops. Table flotation was *good.*

Windrow formation and quality varied from *good* to *very good* depending on crop type and stand. Parallel and angled parallel windrow patterns were predominant in hay and grain crops. Fan-tail patterns occurred in heavy grain crops while herringbone patterns occurred in light crops. The windrow opening was sometimes too narrow in very heavy crops.

Sideways skewing reduced performance on hillsides and in soft fields.

Peak power take-off requirements were 10 kW (13 hp). A 35 kW (47 hp) tractor would have ample power reserve to operate the IH 75 in most field conditions. Suitable speeds were from 3 to 11 km/h (2 to 7 mph) in average grain crops and from 2 to 7 km/h (1 to 4 mph) in average hay crops.

Reel and table height were easily controlled with the tractor hydraulics. Daily maintenance took from 10 to 15 minutes.

No serious safety hazards were apparent, when the windrower was operated according to normal recommended procedures.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the cutter bar extension to permit proper alignment.
2. Modifications to improve the ease of changing the left draper speed.
3. Providing hitch jack mounts at the left and right wheel locations to assist in placing the windrower in transport position.
4. Modifying the reel drive to make a slower reel speed obtainable.
5. Modifying the reel drive shield mounts to permit use of the shield when the reel is in the full forward position.

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

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Since problems with aligning the extensions were encountered, we have controlled the manufacturing tolerances more closely, resulting in a marked improvement of the alignment. In addition, we recommend that the extensions be aligned with the implement before the mounting hardware is tightened.
2. No changes are planned at this time to the left hand draper drive since adjustments have to be made only infrequently and no service com plaints have been received on this feature.
3. A jack position is not required on the left hand end as the left wheel is turned by removing the bolt next to the wheel and by driving the tractor ahead. A jack on the right hand end would facilitate removal of the dual wheel. A means of providing a jacking feature will be investigated.
4. A means of supplying a slower reel speed will be investigated.
5. There are two mounting locations in the shield for the front support bracket. When the reel is located in the rear position, the front hole is used. When the reel is located in the most forward position, the rear hole is used. These instructions will be added to the operator's manual.

GENERAL DESCRIPTION

The International Harvester 75 is a pull-type, power-take-off driven windrower. The one piece cutting platform has dual drapers and an offset, non-adjustable, windrow opening. The knife is actuated by a belt driven pitman, mounted in line with the cutter bar. The reel and the drapers are belt driven from the power take-off drive line.

The test machine was equipped with the 6.4 m cutter bar and an optional 0.9 m cutter bar extension. Cutter bar height and reel height were controlled by the tractor hydraulics.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The IH 75 was operated in the conditions shown in TABLES 1 and 2 for 91 hours while cutting about 371 ha. It was evaluated in forage, cereal grain and oil seed crops for windrow formation, cutting ability, ease of operation and adjustment, power requirements, operator safety, and suitability of the operator's manual.

TABLE 1. Operating Conditions

CROP	SOIL TEXTURE	HOURS	FIELD AREA ha
Mixed Hay	light loam	9	35
Fall Rye	loam	8	29
Barley	loam	12	32
Oats	loam	4	12
Wheat	loam to silty clay loam	37	157
Rapeseed	loam to silty clay loam	9	52
Barley/Oats	loam	3	18
Barley/Clover	silty clay loam	4	21
Flax	loam	5	15
	TOTAL	91	371

TABLE 2. Operation in Stony Fields

FIELD CONDITION	HOURS	FIELD AREA ha
Stone free	54	156
Moderately stony	37	115
TOTAL	91	371

RESULTS AND DISCUSSION

WINDROW FORMATION

Windrow Types: Windrows may be classified into four general patterns (FIGURE 1) although many combinations and variations exist. The IH 75 produced parallel and angled parallel windrows in most hay and grain crops. Herringbone windrows occurred in very light crops while fantail windrows occurred in heavy crops. TABLE 3 describes the types of windrows produced by the IH 75 in various crops while FIGURES 2 to 8 illustrate typical windrows.

In general, good quality windrows have an even distribution of heads across the width of the windrow and a loose structure with heads near the top to assure proper curing. Windrows of mixed patterns seem to weather best in extended wet periods.

Leaning Crops: The direction of cut affected windrow formation when windrowing lodged or leaning crops. Cutting parallel to the direction of lean resulted in parallel windrows while cutting at an angle to the direction of lean generally resulted in angled parallel windrows.

Poor feeding occurred when cutting in the direction of lean, while crop hairpinned on the dividers when cutting at an angle to the direction of lean.

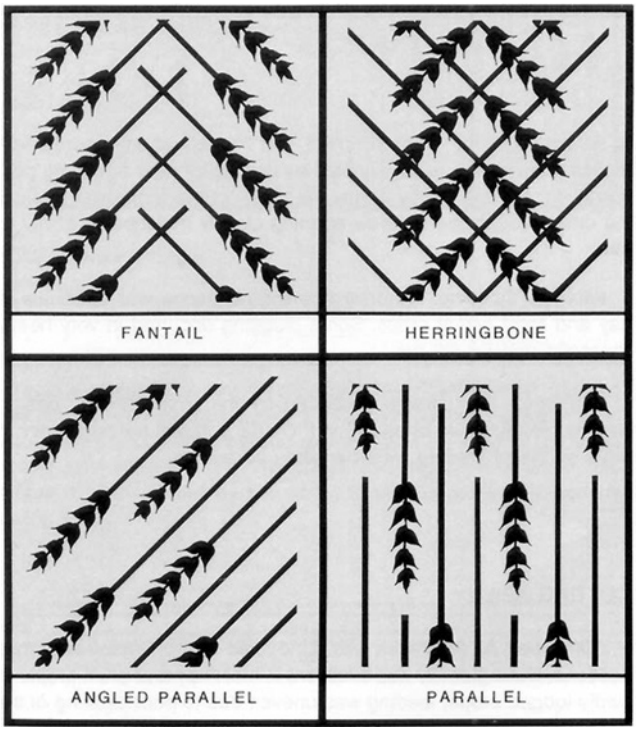


FIGURE 1. Windrow Types.

TABLE 3. Windrow Formation in Various Crops

CROP	YIELD t/ha	CUT CROP LENGTH mm	SPEED km/h	WINDROW TYPE	FIGURE NO.
Mixed Hay	1.5	400 to 800	2 to 7	Parallel	2
Fall Rye	1.9	600 to 800	7 to 8.5	Parallel and Fantail	3
Barley	2.6 to 3.8	200 to 700	5 to 7.5	Parallel	4
Wheat	1.9 to 3.7	300 to 1000	5 to 11	Parallel and Herringbone	5
Oats	2.2	400 to 800	5 to 7.5	Parallel and Herringbone	6
Rapeseed	1.0 to 1.8	400 to 800	2 to 10	Parallel and Fantail	7
Barley/Oats	3.7	300 to 800	5 to 10.5	Parallel	
Barley/Clover	3.4	400 to 800	8.5 to 10.5	Herringbone	
Flax	1.3	400 to 600	10.5 to 12.5	Parallel and Fantail	8

FIGURE 2. Mixed Hay (1.5 t/ha).

FIGURE 3. Fall Rye (1.9 t/ha).

FIGURE 4. Barley (2.6 t/ha).

FIGURE 5. Wheat (3.4 t/ha).

FIGURE 6. Oats (2.2 t/ha).

FIGURE 7. Rapeseed (1.8 t/ha).

Uniformity: Windrows were uniform in most crops. In light, short hay crops, hay sometimes collected on the cutter bar causing slight bunching. Some bunching also occurred in badly lodged grain and hay due to uneven clearing of the cutter bar.

Draper Speed: Left draper speed could be varied from 1.55 to 2.07 m/s, while right draper speed could be varied from 1.39 to 2.87 m/s, by changing the number of spacers in the draper drive sheaves. Higher draper speeds were beneficial in forming denser, narrower, easier-to-pick windrows in light crops. Lower draper speeds were suitable for heavier crops, resulting in wider, more uniform windrows.

It was possible to obtain speeds outside the specified range by purchasing additional spacers. In average conditions suitable speeds were 2.6 m/s for the left draper and 2.3 m/s for the right draper.

FIGURE 8. Flax (1.3 t/ha).

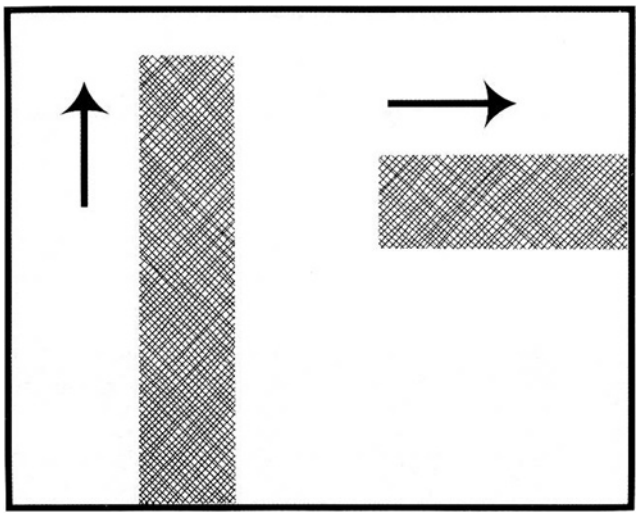


FIGURE 9. Typical Corner Formation.

Forward Speed: Forward speed had little effect on windrow formation. Speed was usually limited by field roughness or cutting performance. In most heavy crops, the ability of the windrower to clear the crop through the windrow opening closely matched its ability to cut.

Windrow Opening: Windrow opening clearance was adequate in hay and most cereal crops. Some plugging occurred in very heavy rapeseed and tall fall rye.

Cornering: The corners produced by the offset delivery design were not continuous, as shown in FIGURE 9. It was not necessary to drive on the preceding windrow when cornering.

CUTTING ABILITY

Cutter Bar: All field work was conducted with underserrated knife sections. Cutting ability was excellent in most hay and grain crops. In badly lodged crops, feeding was uneven due to poor clearing of the cutter bar. Cutter bar hammering was not a problem, even in damp or very heavy crops. Proper tension was necessary to eliminate severe drive belt vibrations.

Stubble: The types of stubble formed by a windrower may be divided into three types; ideal, undulating, and irregular as shown in FIGURE 10. The IH 75 generally produced ideal stubble in all grain and hay crops at speeds up to 11 km/h.

Dividers: In average, straight standing grain and hay crops, divider performance was satisfactory. Slight hairpinning occurred in tall, leaning grain crops. The divider worked poorly in rapeseed and was replaced with one fabricated from sheet metal.

Reel: Reel performance was adequate in most crops. Clearing of material in lodged crops was fair. The range of vertical and horizontal adjustment was good in all crops. Reel drive belt slippage was not a problem.

Reel speed was variable from 40 to 50 rpm by adjusting the belt drive sheave. Speeds below 45 rpm required more spacers than those provided by the manufacturer. For optimum performance it is best to have a reel index* from 1.1 to 1.2. The optimum reel index was obtained at forward speeds ranging from 9.1 to 11.4 km/h. Operation at lower speeds was often necessary due to surface roughness and crop conditions. It is recommended that the reel drive be modified to make slower reel speeds obtainable.

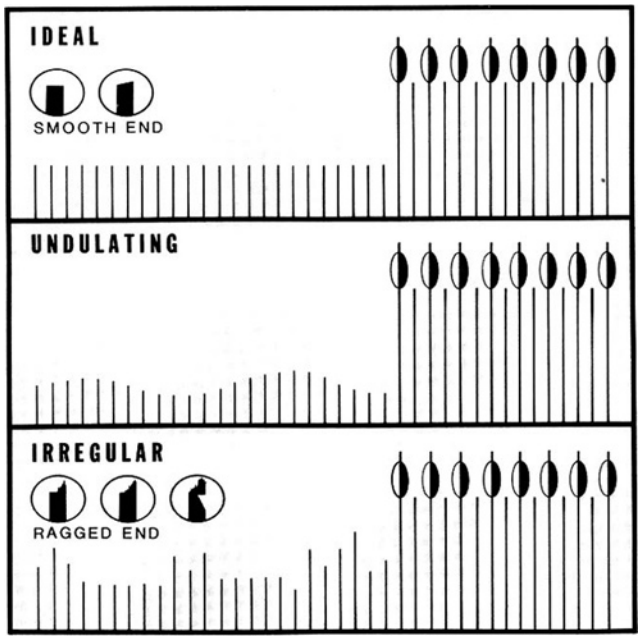


FIGURE 10. Types of Stubble.

Table Flotation: The test machine was equipped with an optional table flotation spring. Table flotation was good. Flotation was achieved through the use of a compression spring positioned around one of the lift cylinders (FIGURE 11). To adjust the degree of flotation, the amount of load carried by the spring could be easily changed by moving a single clamp.

Reel index is the ratio of reel tip speed to travel speed.


FIGURE 11. Table Flotation System.

EASE OF OPERATION

Controls: The test machine was equipped with tractor operated hydraulics. Raising and lowering speeds of both the reel and table were satisfactory. An optional self-contained hydraulic system is available.

Soft and Muddy Fields: In soft and muddy fields the IH 75 skewed sideways. The amount of skew was dependent on surface conditions and was aggravated by hilly fields. In very soft, hilly fields, severe skewing under continued operation could result in damage to the windrower.

Transporting: The IH 75 has two transport positions. In semi-transport position, the hitch tongue is swung to the right to permit the tractor to pull from in front of the cutter bar. In full transport position, the hitch and wheel positions are changed, permitting the windrower to be pulled from the right end (FIGURE 12).

It took one man about five minutes to change to semi-transport position and about twenty minutes to change to full transport position. An extra jack was needed when changing to transport position. It is recommended that hitch jack mounts be provided at the left and right wheel locations to facilitate placing the windrower in full transport position.


FIGURE 12. Full Transport Position.

Adjustments: Reel and draper speeds Were adjusted by varying the number of spacers between the two halves of the drive sheaves. Speeds outside the specified range were possible by purchasing additional spacers. Changing the left draper speed was inconvenient. To gain access to the left draper drive sheave it was necessary to remove the right draper drive sheave from the drive shaft. Modifications to improve the ease of adjustment of the left draper speed are recommended.

The fore-and-aft reel position was adjusted by removing two bolts at each end of the reel and repositioning the wooden boxings. Drive belt tension had to be reset after adjustment. The reel belt drive shield could not be used when the reel was placed in full forward position. It is recommended that the reel drive shield mounts be modified to permit use of the shield with the reel in the full forward position.

Servicing: Daily lubrication took from 5 to 10 minutes. Three pressure grease fittings and two oiled boxings required daily service. A grease gun with a flexible hose was needed for greasing the universal joints

POWER REQUIREMENTS

A 35 kW tractor had ample power to operate the IH 75 in most field conditions. A maximum of 10 kW was needed to drive the power take-off.

OPERATOR SAFETY

No safety hazards were apparent, if proper safety procedures were followed during servicing and operation. While most drives were guarded, no shielding was available for the pitman drive belt.

OPERATOR'S MANUAL

The operator's manual contained much useful information on operation, adjustment and servicing. It was clear and well written.

DURABILITY RESULTS

TABLE 4 outlines the mechanical history of the IH 75 during 91 hours of operation while windrowing about 371 ha. The following failures represent those which occurred during functional testing. An extended durability evaluation was not conducted.

TABLE 4. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT AREA (ha)
A reel support strut loosened and was damaged. It was straightened and reinstalled at	9	35
The cutter bar extension was realigned at	17	64

DISCUSSION OF MECHANICAL PROBLEMS

The cutter bar extension did not align properly with the rest of the cutter bar. The end of the extension drooped 30 mm below the rest of the cutter bar, while the guards on the extension tilted downward in relation to the other guards. The extension was shimmed and the guards bent upward to achieve alignment. Although cutter bar extension misalignment did not cause any mechanical problems, the end of the cutter bar did drag in hay crops. It is recommended that the cutter bar extension be modified to allow proper alignment.

APPENDIX I

SPECIFICATIONS

MAKE: International Harvester Pull-type Windrower

MODEL: 75

SERIAL NUMBER: 131010200

MANUFACTURER: MacDon Industries Ltd.
680 Moray Street
Winnipeg, Manitoba
R3J 3S3

HEADER:

-- width of cut (divider points)	7328 mm
-- effective cut (inside divider)	7226 mm
-- range of cutting height	50 mm to 703 mm
-- guard spacing	76 mm
-- length of knife section (underserrated)	76 mm
-- knife stroke	80 mm
-- knife speed	655 cycles/min
-- table angle	
-- fully raised	1° above horizontal
-- fully lowered	23.5° below horizontal
-- number of drapers	2
-- draper width	1050 mm
-- draper speed range	
-- left	1.55 to 2.07 m/s
-- right	1.39 to 2.87 m/s
-- draper roller diameter	
-- left	57.4 mm
-- right	64.4 mm
-- height of windrow opening	853 mm
-- width of windrow opening	
-- between wind boards	1050 mm
-- between rollers	1165 mm
-- between roller shields	1050 mm
-- raising time	3.5 s
-- lowering time	5.5s

REEL:

-- number of bats	5
-- number of reel arms per bat	7
-- diameter	1390 mm
-- speed range	40 to 50 rpm
-- range of adjustment	
-- fore and aft	203 mm
-- height above cutter bar	710 mm
-- raising time	3.3 s
-- lowering time	5.2s

HYDRAULIC SYSTEM: tractor hydraulics

NUMBER OF V-BELT DRIVES: *5*

NUMBER OF LUBRICATION POINTS:

-- pressure grease	3
-- oil	2

NUMBER OF PRE-LUBRICATED BEARINGS: 33

OVERALL DIMENSIONS:	FIELD POSITION	TRANSPORT POSITION
-- length	3780 mm	9817 mm
-- width	8623 mm	3535 mm
-- wheel tread	6426 mm	2345 mm
-- wheel base		5982 mm

TIRES:

-- left	1, 6.70 x 15, 4 ply rating
-- right	2, 6.70 x 15, 4 ply rating

WEIGHT:

-- hitch pin	310 kg
-- left wheel	316 kg
-- right wheels	636 kg
Total	1262 kg

OPTIONAL EQUIPMENT:

-- self contained hydraulics
-- 914 mm cutter bar extension

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/hour (mph)
1 tonne/hectare (t/ha)	=	0.45 ton/acre (ton/ac)
1000 millimetres (mm) = 1 metre (m)	=	39.37 inches (in)
1 kilowatt (kW)	=	1.34 horsepower (hp)
1 kilogram (kg)	=	2.20 pounds mass (lb)

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