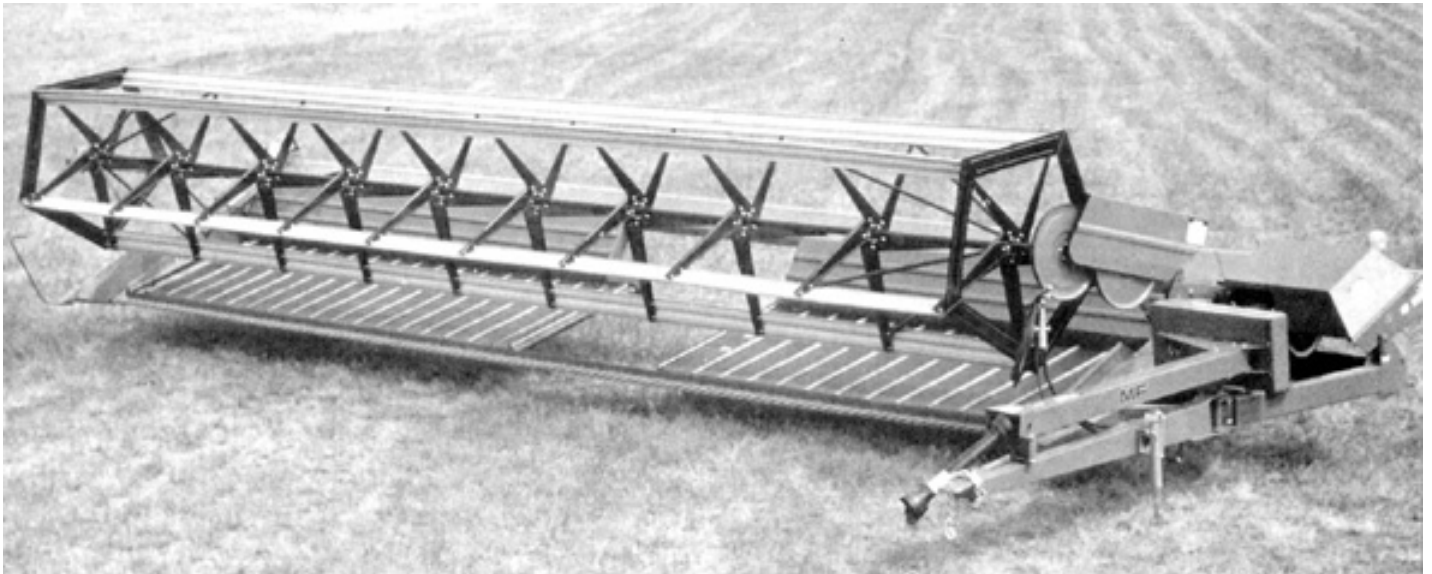


# Evaluation Report

# 403



## Massey Ferguson 613 Puli-Type Windrower

A Co-operative Program Between



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FARM  
MACHINERY  
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CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

# MASSEY FERGUSON 613 PULL-TYPE WINDROWER

## MANUFACTURER:

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

## RETAIL PRICE:

\$14,210.00 (February, 1985, f.o.b. Humboldt with 30 ft (9.1 m) header).

## SUMMARY AND CONCLUSIONS

**Rate of Work:** Average speeds, for the Massey Ferguson 613 windrower, were 5 to 6 mph (8 to 10 km/h). Maximum speed was about 7 mph (11 km/h). Average work rates varied from 10 to 16 ac/h (4.0 to 6.5 ha/h).

**Quality of Work:** Performance of the dividers was very good. Crop was not flattened or hairpinned by the right divider. Some crop was lost over the left divider in tail leaning crops. Reel performance was very good. Cutting ability was very good in all crops. The knife cut well and had sufficient power, but the one-piece cutterbar dragged along the ground or missed crop in sharply rolling land. Table flotation was good. The flotation springs provided adequate knife protection, but the table bounced excessively. Draper performance was very good, but correct speed setting was critical for optimum windrow formation.

Windrow formation was very good. Parallel and herring-bone were the predominant windrow types formed. Windrows were typically 4.5 ft (1.4 m) wide, but width was adjustable. Windrow uniformity was excellent as uniform windrows were formed in all crops.

**Ease of Operation and Adjustment:** The header and reel heights controls were very good. Lighting was good, depending on the tractor. A rear light improved windrow viewing. Handling was very good. Left and right corners were easily made. Side skewing occurred only on steep slopes and in soft sandy soils. Ease of transportation was excellent. The windrower could be placed into transport by one man in less than 3 minutes.

Ease of adjustment was very good. All adjustments were accessible and easily made. Ease of lubrication and maintenance was excellent. Daily lubrication took about 3 minutes. Routine maintenance was easily performed.

**Tractor Requirements:** Average power required was about 21 hp (16 kW). A tractor with gross weight of at least 5000 lb (2270 kg) was recommended by the operator's manual for safe operation.

**Operator Safety:** Safety was very good. No safety hazards were apparent on the MF 613. Adjustments were safe to make and controls were located for safe operation. Lighting and decals were adequate for safe road travel. In transport, the reel obscured rear vision.

**Operator's Manual:** The operator's manual was very good. It was easy to follow, accurate and well illustrated. It contained useful information on operation and adjustments.

**Mechanical History:** A few mechanical problems occurred during the test.

## RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to reduce table bouncing in rough fields.
2. Modifying the transport hydraulic valve linkage for more reliable operation.

Senior Engineer -- G.E. Frehlich

Project Engineer -- M.E. Jorgenson

## DISTRIBUTORS:

Massey Ferguson Industries Limited  
915 King Street West  
Toronto, Ontario  
M6K 1E3  
2615 Barlow Trail S.E.  
P.O. Box 1340, Station T  
Calgary, Alberta  
T2H 2J1

## THE MANUFACTURER STATES THAT:

In regard to recommendation number:

1. A note will be added in the operator's manual suggesting float be reduced and ground speed decreased to minimize bouncing in rough field conditions.
2. The transport valve linkage has been changed to correct the reliability problem.

## GENERAL DESCRIPTION

The Massey Ferguson 613 is a pull-type, centre delivery windrower with a draper platform, supported by two cambered wheels. The knife, reel, and two drapers are driven by the tractor power take-off. The knife is belt driven from the left end. The drapers and reel are belt driven.

The table and reel lifts are operated through the tractor remote hydraulic outlets. Draper and reel speeds are adjusted by changing shims in the pulleys. The MF 613 is placed into transport by shifting two levers, driving the tractor ahead to swing the castoring wheels under the raised table, and engaging three safety locks.

The test machine was equipped with a 30 ft (9.1 m) draper header and five bat reel. Detailed specifications are given in APPENDIX I.

## SCOPE TEST

The MF 613 was operated in the conditions shown in TABLE 1 for 107 hours while cutting about 1485 ac (601 ha). It was evaluated in cereal grain and oilseed crops for cutting ability, windrow formation, ease of operation and adjustment, power requirements, operator safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

CROP	VARIETY	YIELD		HOURS	FIELD AREA
		bu/ac	(t/ha)		
Fall Rye	Puma	25	(1.6)	20	281 (114)
Barley	Bonanza	25 to 70	(1.3 to 3.8)	12	165 (67)
	Harrington	65	(3.5)	4	63 (25)
Winter Wheat	Norstar	24	(1.6)	4	60 (24)
Spring Wheat	Neeopawa	27 to 38	(1.8 to 2.6)	36	478 (194)
	HY320	39	(2.6)	14	205 (83)
Oats	---	24	(0.9)	2	30 (12)
Rapeseed	Westar	20 to 24	(1.1 to 1.3)	9	119 (48)
Flax	---	10	(0.6)	6	84 (34)
TOTAL				107	1485 (601)

## RESULTS AND DISCUSSION

### RATE OF WORK

Uniform windrows were formed in most crops at average speeds of 5 to 6 mph (8 to 10 km/h). Speed was limited on rough ground by excessive table bouncing. Speeds up to 7 mph (11 km/h) were possible on smooth fields with straight even stands, but the quality of windrows formed was poorer at higher speeds.

Average work rates for the 30 ft (9.1 m) windrower varied from 10 to 16 ac/h (4.0 to 6.5 ha/h) in most crops. In straight even stands on level fields, work rates of 24 ac/h (10 ha/h) could be achieved.

**QUALITY OF WORK**

**Dividers:** Divider performance was very good. Crop did not hairpin on the right divider or on the divider rod. The smooth, narrow divider did not flatten crop, except in tangled rapeseed and lodged wheat. In tall crops leaning to the left, some material fell over the left divider above the knife drive pulley (FIGURE 1) and was lost.

**Reel:** Reel performance was very good. Reel speed was variable from 29 to 51 rpm. Reel tip speed ranged from 4.7 to 8.3 mph (7.5 to 13 km/h). The reel was usually adjusted for a reel speed index\* of about 1.1 to 1.2 to minimize shatter losses. Reel speed did not have to be frequently readjusted as crop conditions or ground speed varied. In short crops, the reel had to be operated quite low to keep the knife clear of material that built up above the guards.

The range of vertical and fore-and-aft reel adjustments was suitable for all crops.

**Cutterbar:** Cutting ability was very good. In tough crops such as flax, material collected and plugged on dull knife sections. In these crops, it was important to replace worn knife sections and guards. All field work was conducted with underserrated knife sections. The knife had adequate power in all test conditions and no knife hammering occurred.

Stubble was usually ideal (FIGURE 2), but undulating stubble occurred when the table bounced over rough ground. In crops of varying maturity, some short plants were missed as the cutting height varied as much as 6 in (152 mm) during each bounce. It is recommended that the manufacturer consider modifications to reduce table bouncing.

The operator's manual suggested operating with the right end of the cutterbar adjusted 3 in (76 mm) higher than the left end. This prevented the right end from dragging on the ground, without affecting cutting performance.

The 30 ft (9.1 m) cutterbar dragged along the ground or missed some crop in sharply rolling topography, but followed the ground very well in gently rolling topography.

**Table Flotation:** Table flotation was good. Flotation was provided by three flat torsion springs located between the hitch and the lift cylinder (FIGURE 3). The flotation springs minimized cutterbar damage in stony fields when properly adjusted. However, in rough fields, the table bounced continuously, forming undulating stubble and skipping over some short crop. Modifications to reduce table bouncing have been recommended.

**Drapers:** Draper performance was very good. Draper speed could be varied from 315 to 470 fpm (1.6 to 2.4 m/s). Speed was critical to windrow formation. In most crops, uniform, parallel windrows were formed when the drapers were run at or near minimum speed. Higher draper speeds usually resulted in poor quality herringbone windrows. Heads thrown to the centre of the windrow fell through the stubble while the ends of the straw stuck up at the windrow edges. FIGURE 4 shows the effect of draper speed on windrow formation.



FIGURE 1. Crop Lost Over the Left Divider.

Platform angles less than 20 degrees are usually suitable for grain windrowing, while steeper angles are used when windrowing hay. The platform angle of the MF 613 was about 14 degrees at a normal cutting height of 8 in (203 mm). Although this angle was suitable for grain, herringbone windrows were formed unless the draper speed was reduced to almost minimum. The draper speed would have been less critical with a flatter platform angle.

The drapers did not plug with materials in any crops.

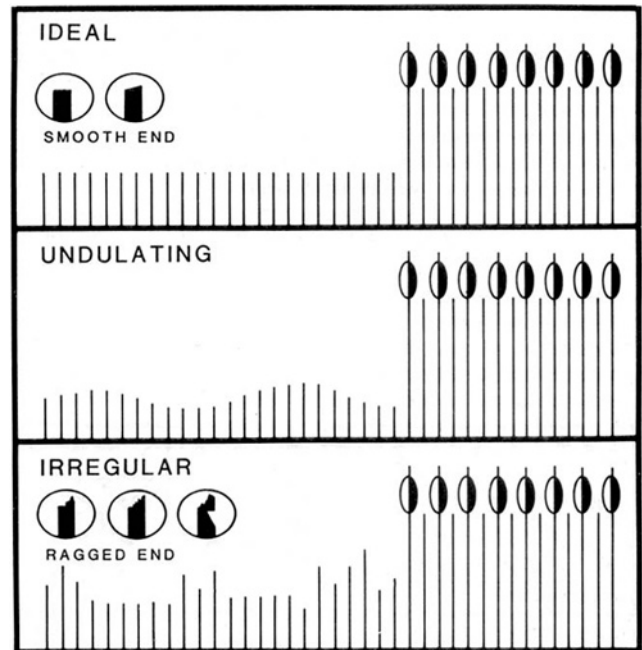


FIGURE 2. Types of Stubble.

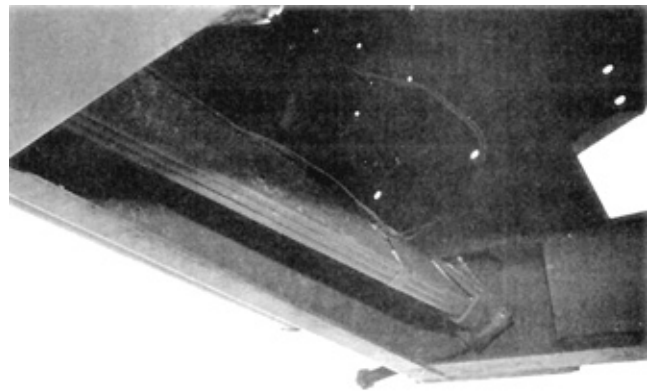


FIGURE 3. Table Flotation System.



FIGURE 4. Effect of Draper Speed on Windrow Formation: (1) Left side Formed with Normal Draper Speed, (2) Right Side Formed with High Draper Speed.

\*Reel Speed Index is the ratio of reel tip speed to travel speed.

**Windrow Formation:** Windrows may be classified into four general patterns (FIGURE 5), although many combinations and variations exist. Windrow formation was very good. FIGURES 6 to 9 show typical windrows formed by the MF 613. The MF 613 produced parallel windrows in most cereal grain crops when draper speed was properly adjusted. Herringbone windrows occurred if high draper speeds were used. Fantail windrows were predominant in heavy, tall stands or ripe crops. In all crops, reduced draper speeds resulted in a wider, more parallel windrow.

As with most windrowers, in leaning crops, parallel or angled parallel windrows were formed, depending on direction of crop lean.

Windrows formed with the windrow opening in the mid-range were normally about 4.5 ft (1.4 m) wide, and ranged from 3.5 ft (1.1 m) wide in light stands to 6.5 ft (2.0 m) wide in rapeseed and fall rye. Narrower windrows for light crops could be achieved by installing draper extensions in the windrow opening. Wide windrows for heavy crops or better combine feeding could be achieved by removing the draper extensions. This adjustment was not frequently required.

**Windrow Uniformity:** Windrow uniformity was excellent. Windrows were uniform in almost all crops at speeds up to 6 mph (10 km/h). Crop flowed smoothly through the windrow opening without catching on the shields.

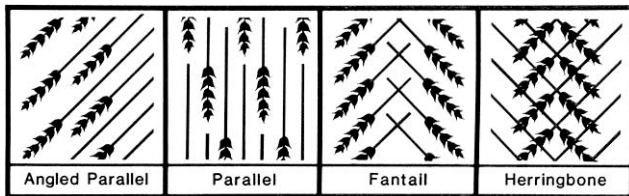


FIGURE 5. Windrow Types.



FIGURE 6. Wheat: 30 bu/ac (20 t/ha).



FIGURE 7. Barley: 60 bu/ac (3.2 t/ha).

## EASE OF OPERATION AND ADJUSTMENT

**Controls:** Ease of operating the controls was very good. Table and reel lifts, and the transport cylinder were controlled with the tractor remote hydraulics. Both reel and table raising and lowering rates were suitable for convenient operation. The table height cylinder was equipped with an adjustable stop which made it very easy to reset the stubble height after lifting on corners or when clearing an obstacle. However, the cylinder stop could not be used in fields where the crop height changed and table height had to be lowered below the set height.

The entire table and cutterbar of the MF 613 were easily viewed while cutting.

**Lights:** The MF 613 was equipped with a light on the rear frame which improved viewing of the windrow at night. Visibility of the windrower depended on the tractor lights.

**Handling:** Handling of the MF 613 was very good. The crop edge was easy to follow, although the hitch could not be adjusted to position the tractor closer to the crop. Handling the wide machine was more difficult in sharply rolling land, and when working around obstructions such as trees and stone piles.

Right angle corners were typical of those made with pull-type windrowers (FIGURE 10). These corners were easily made without driving over the previous windrow, or raising the table.

The wheels were cambered about 7 degrees to counteract side-skewing forces (FIGURE 11). Skewing was not severe except on moderate hills and in soft sandy soils.

**Transporting:** Ease of transporting was excellent. The MF 613 travelled very well on open roads in transport position at speeds up to 20 mph (32 km/h). The transport width of 11.2 ft (3.4 m) was safe for all roads encountered (FIGURE 12). The windrower trailed well and turned corners easily and safely.



FIGURE 8. Fall Rye: 25 bu/ac (1.6 t/ha).



FIGURE 9. Rapeseed: 24 bu/ac (1.3 t/ha).

The MF 613 could be placed in full transport by one man in less than 3 minutes. Switching between field and transport was easy if the manufacturer's instructions were carefully followed. The header safety locking pin was difficult to install or remove even though adjustments were available. Other safety pins were easily installed.

**Adjustments:** Ease of adjustment was very good. Reel and draper speeds were adjusted by removing the belts and repositioning shims in the pulleys. The spring tensioned idlers made belts easy to remove and install.

Reel fore-and-aft position was easily adjusted by loosening 3 bolts, readjusting the belt tensioner and sliding the reel. The spring-loaded draper tighteners were easily adjusted without tools. However, the overcentre levers were hard to engage by hand when the drapers were properly tensioned. Tension of the

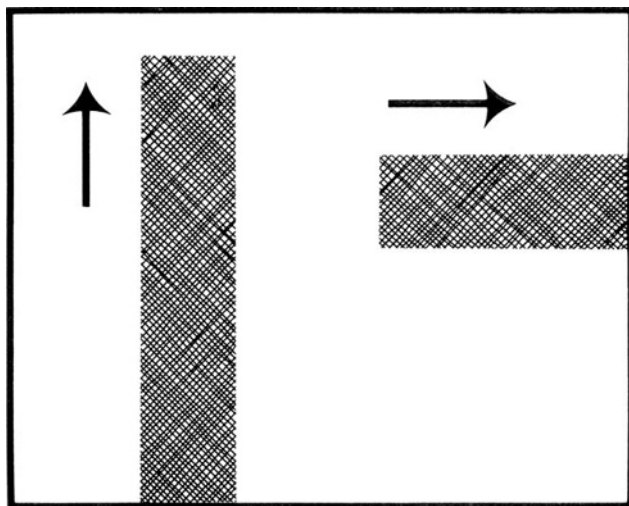


FIGURE 10. Typical Corner Formation.



FIGURE 11. Cambered Wheels.



FIGURE 12. Full Transport Position.

rubberized polyester drapers did not have to be frequently adjusted. Table flotation could be easily adjusted by turning a threaded bolt.

The windrow opening width could be adjusted with draper extensions and by cutting or adding draper material. This adjustment took one or two hours, but should only have to be performed during initial set-up to select the desired windrow size.

**Lubrication and Maintenance:** Ease of lubrication and maintenance was excellent. Daily lubrication took about 3 minutes. The MF 613 had twenty-five pressure grease fitting, Three of these required greasing every 10 hours, four required greasing every 50 hours and the remainder required greasing seasonally. In addition, the two transport lever pins required oil once a season. The knife had to be oiled daily, except in sandy soils where oiling was not recommended. All lubrication points were easily accessible.

Belts were very easily tensioned with the spring-loaded idler pulleys. The idlers had to be carefully aligned to ensure the belts ran smoothly. Guards and knife sections were easily changed. Repairs were easily made. The operator's manual contained useful information and photographs to aid in servicing and assembly.

**TRACTOR REQUIREMENTS**

An average of 21 hp (16 kW) was required to operate the MF 613 consisting of 12.5 hp (9.3 kW) on the drawbar and 8.5 hp (6.3 kW) on the power take-off. For safety and stability, a tractor with a gross weight of not less than 5000 lb (2270 kg) was recommended in the operator's manual. Tractors meeting this requirement typically have a rated PTO power of at least 30 hp (22 kW) which is sufficient to operate the MF 613.

**OPERATOR SAFETY**

Operator safety was very good. The operator's manual emphasized safety. Several decals on the machine warned the operator of safety hazards. Moving parts were well shielded A slow moving vehicle sign was provided.

Machine adjustments were safely and easily made. The MF 613 transported safely as long as all safety pins were used. Turn signals and warning flashers on the windrower made road travel safe. However, the reel obstructed rear vision during transport.

**OPERATOR'S MANUAL**

The operator's manual was very good. It contained much useful information on operation and adjustment of the windrower. Complete assembly instructions were included. A parts manual was available. All information was accurate easy to follow, and well illustrated.

**MECHANICAL HISTORY**

TABLE 2 outlines the mechanical history of the MF 613 during 107 hours of field operation while windrowing about 1485 ac (601 ha). The intent of the test was functional performance evaluation. Extended durability testing was not conducted.

TABLE 2. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac	(ha)
-- The primary reel drive belt tightener was misaligned permitting the belt to slip off, It was realigned at	The Beginning of the test		
-- After catching a dirt pile with the right divider, the safety shear bolt in the telescoping hitch was sheared off and a hitch cross brace cracked. The shear bolt was replaced and the brace welded at	64	943	(382)
-- One bolt was lost and the others were loose on the right divider rod, They were replaced or tightened at	64	943	(382)
-- The support strap inside the right draper broke and jammed the draper roller. It was rewelded at	72, 73	1051, 1074	(426) (435)
-- The crimped ends on the flexible rubber cable on the left wheel transport lever worked loose so that the transport system would not work properly at	73	1074	(435)

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac (ha)
-- Thirty-four dull or broken knife sections and seven bent or broken guards were replaced		During the test
-- The left reel lift cylinder hose was worn by the reel drive belt The hose was replaced at		The end of the test
-- A new knife was installed at		The end of the test

**Transport Valve Control:** A length of hydraulic hose was used as a cable to connect the transport lever to the hydraulic valve for controlling the right wheel position. The crimped hose ends had worked loose so that the lever could not fully open or close the valve. It is recommended that the manufacturer consider modifying the valve connection for more reliable operation.

#### APPENDIX I

##### SPECIFICATIONS

<b>MAKE:</b>	Massey Ferguson Pull-Type Windrower
<b>MODEL:</b>	613
<b>SERIAL NO.:</b>	2232 C100166
<b>MANUFACTURER:</b>	MacDon Industries Ltd Winnipeg, Manitoba

##### CUTTERBAR:

-- width of cut (divider points)	30.0 ft (9.1 m)
-- effective cut (inside dividers)	29.8 ft (9.1 m)
-- range of cutting height	44 in (1118 mm)
-- guard spacing	3.0 in (76 mm)
-- length of knife section (under-serrated)	3.2 in (81 mm)
-- knife stroke	3.0 in (76 mm)
-- knife speed	630 cycles/mm.

##### TABLE:

-- platform angle	
-- fully raised	23° above horizontal
-- fully lowered	20° below horizontal
-- number of drapers	2
-- draper width	42 in (1067 mm)
-- draper lengths	
-- right	14 ft (4.3 m)
-- left	11 ft (3.4 m)
-- draper material	rubberized polyester with wood slats
-- draper speed range	480 to 720 fpm (2.4 to 3.6 m/s)
-- draper roller diameter	2.3 in (58 mm)
-- height of windrow opening	34 in (860 mm)
-- width of windrow opening	
-- between windboards	5.5 ft (1.68 m)
-- between rollers	4.4 ft (1.35 m)
-- raising time	20s
-- lowering time	3.0s

##### REEL:

-- number of bats	5
-- number of arms per bat	10
-- diameter	55 in (1400 mm)
-- speed range	29 to 51 rpm
-- range of adjustment	
-- fore-and-aft	10 in (254 mm)
-- height above cutterbar	29 in (737 mm)
-- raising time	2.0s
-- lowering time	4.0s

##### HYDRAULIC SYSTEM:

-- header and reel lifts and transport wheel cylinder	from 2 tractor remote hydraulic outlets
---	---

**NO. OF CHAIN DRIVES:** none

**NO. OF V-BELTS:** 7

##### LUBRICATION POINTS:

-- pressure grease fitting	31
-- oil	knife and transport pros

##### NO. OF PRELUBRICATED BEARINGS:

6

##### TIRES:

-- number	2
-- SIZE	8.5 L x 14, 4 ply

##### OVERALL DIMENSIONS:

	FIELD	TRANSPORT
-- width	34.8 ft (10.6 m)	112 ft (3.4 m)
-- length	13.0 ft (4.0 m)	41.3 ft (12.6 m)
-- wheel tread	12.1 ft (3.7 m)	6.3 ft (1.9 m)
-- wheel base		20.0 ft (6.1 m)
-- wheel hubs to hitch point	12.2 ft (3.7 m)	

##### WEIGHT:

	FIELD POSITION	TRANSPORT POSITION
-- hitch pin	915 lb (415 kg)	1235 lb (560 kg)
-- left wheel	1435 lb (651 kg)	1395 lb (633 kg)
-- right wheel	1165 lb (528 kg)	885 lb (401 kg)
<b>TOTAL</b>	3515 lb (1594 kg)	3515 lb (1594 kg)

##### OPTIONS AND ATTACHMENTS:

-- draper extensions to provide windrow opening width of 441 in. (1120 mm), 51.6 in (1310 mm) or 59.1 in (1500 mm)
-- power take-off kits for 540 or 1000 rpm
-- trailer light receptacle

#### APPENDIX II

##### MACHINE RATINGS


The following rating scale is used in Machinery Institute Evaluation Reports:

excellent	fair
very good	poor
good	unsatisfactory

**SUMMARY CHART**

**MASSEY FERGUSON 613 PULL-TYPE WINDROWER**

<b>RETAIL PRICE</b>	\$14,210.00 [February, 1985, f.o.b., Humboldt, Sask.]
<b>RATE OF WORK</b>	
Average Speed	5 to 6 mph (8 to 10 km/h)
Average Workrate	10 to 16 ac/h (4.0 to 6.5 ha/h)
<b>QUALITY OF WORK</b>	
Dividers	<b>Very good;</b> crop not flattened
Reel	<b>Very good</b>
Cutterbar	<b>Very good;</b> sufficient power
Header Flotation	<b>Good;</b> excessive bouncing
Drapers	<b>Very good;</b> no plugging occurred, speed adjustments were critical
Windrow Formation	<b>Very good;</b> parallel and herringbone windrows predominant; windrow width adjustable
Windrow Uniformity	<b>Excellent;</b> no plugging or bunching
<b>EASE OF OPERATION AND ADJUSTMENT</b>	
Controls	<b>Very good;</b> cylinder stop on header height
Visibility	<b>Very good;</b> entire header and windrow easily viewed
Handling	<b>Very good;</b> cornered well, skewing occurred only on steep slopes and soft sand
Transporting	<b>Excellent;</b> took less than 3 minutes
Adjustments	<b>Very good;</b> all adjustments were easy
Lubrication and Maintenance	<b>Excellent;</b> daily lubrication took 3 minutes
<b>TRACTOR REQUIREMENTS</b>	21 hp (16 kW); minimum tractor size 5000 lb. (2270 kg) gross weight suggested
<b>OPERATOR SAFETY</b>	<b>Very good;</b> no operating hazards
<b>OPERATOR'S MANUAL</b>	<b>Very good;</b> operating tips and assembly instructions included
<b>MECHANICAL HISTORY</b>	A few mechanical problems occurred

 <p><b>ALBERTA FARM MACHINERY RESEARCH CENTRE</b></p> <p>3000 College Drive South Lethbridge, Alberta, Canada T1K 1L6 Telephone: (403) 329-1212 FAX: (403) 329-5562 <a href="http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html">http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html</a></p>	<p align="center"><b>Prairie Agricultural Machinery Institute</b></p> <p align="center">Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-2555</p> <table border="0"> <tr> <td>Test Stations:</td> <td></td> </tr> <tr> <td>P.O. Box 1060</td> <td>P.O. Box 1150</td> </tr> <tr> <td>Portage la Prairie, Manitoba, Canada R1N 3C5</td> <td>Humboldt, Saskatchewan, Canada S0K 2A0</td> </tr> <tr> <td>Telephone: (204) 239-5445</td> <td>Telephone: (306) 682-5033</td> </tr> <tr> <td>Fax: (204) 239-7124</td> <td>Fax: (306) 682-5080</td> </tr> </table>	Test Stations:		P.O. Box 1060	P.O. Box 1150	Portage la Prairie, Manitoba, Canada R1N 3C5	Humboldt, Saskatchewan, Canada S0K 2A0	Telephone: (204) 239-5445	Telephone: (306) 682-5033	Fax: (204) 239-7124	Fax: (306) 682-5080
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