

# Evaluation Report

# 573



## Honey Bee TM-50 Series III Tractor Mounted Windrower

A Co-operative Program Between



## HONEY BEE TM-50 SERIES III TRACTOR MOUNTED WINDROWER

### RETAIL PRICE:

\$43,047.00 [April, 1988, f.o.b. Humboldt, Sask. with two 25 ft. (7.6m) headers, and single windrow attachment].

### MANUFACTURER AND DISTRIBUTOR:

Honey Bee Manufacturing Ltd.  
P.O. Box 120  
Frontier, Saskatchewan  
S0N 0W0  
Phone: (306) 296-2297

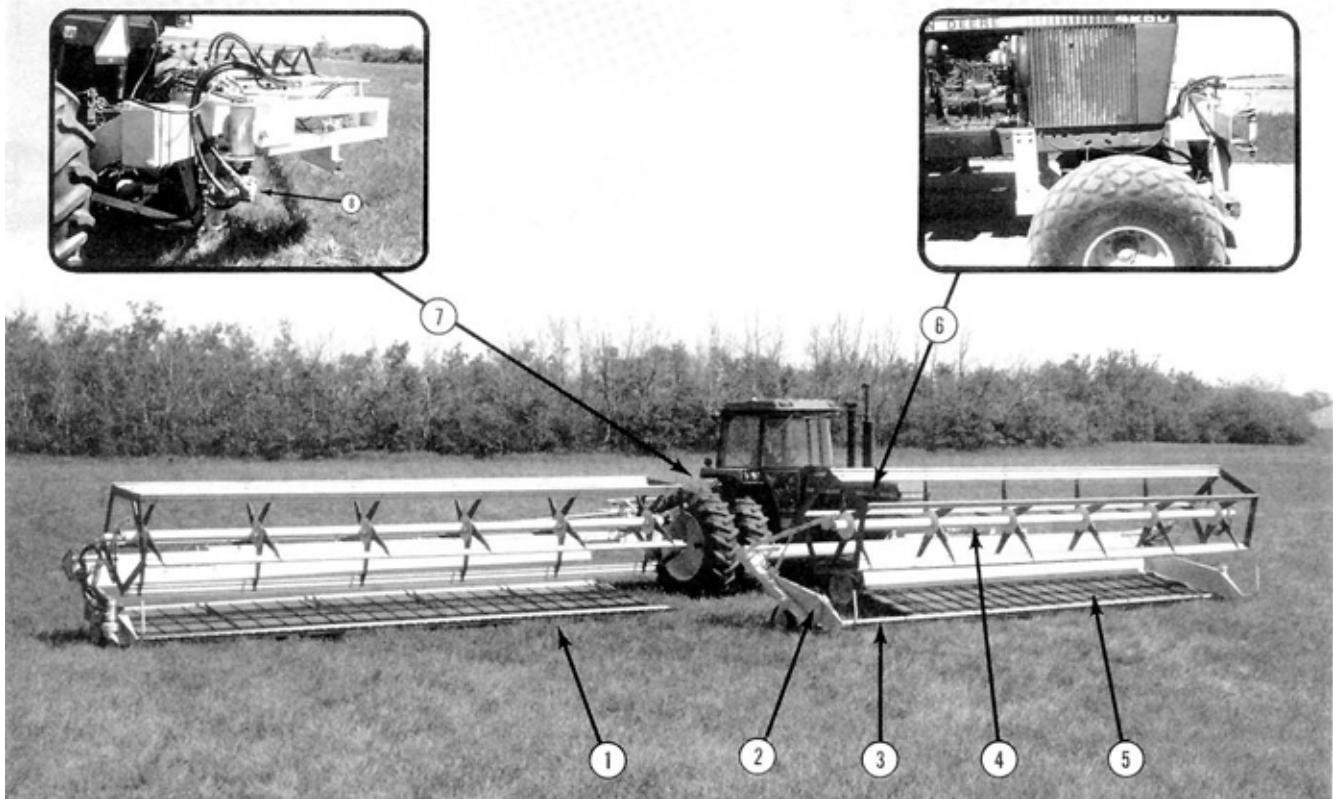


FIGURE 1. Honey Bee TM-50: (1) Side Header, (2) Front Header, (3) Cutterbar, (4) Reel, (5) Draper, (6) Front Tractor Mount, (7) Rear Tractor Mount and Reservoir, (8) Hydraulic Pump.

### SUMMARY AND CONCLUSIONS

**Rate of Work:** Average speeds for the Honey Bee TM-50 were 4 to 7 mph (6 to 11 km/h). Average workrates varied from 20 to 35 ac/h (8 to 14 ha/h). Maximum workrate was about 40 ac/h (16 ha/h).

**Quality of Work:** Performance of the dividers was good. The right divider only flattened tangled standing crop. Reel performance was very good. The range of vertical and fore-and-aft reel adjustments was suitable for all crops. Cutting ability was good. Initially, the knife plugged frequently in heavy crops. This was rectified by installing larger knife drive motors and a larger hydraulic pump. Care was required when setting cutting height especially while cutting short crops to prevent the cutterbar from dragging on the ground. Header flotation was good, provided the headers were not resting firmly on their gauge wheels. Draper performance was very good. Platform angles were adjustable and were suitable for all crops encountered.

Windrow formation was very good. Mostly parallel windrows were formed. Single windrows from the side header were usually herringbone. Single windrows were about 4 ft (1.2 m) wide. Double side-by-side windrows were usually 7 ft (2.1 m) wide. Double stacked windrows were usually 6 ft (1.8 m) wide. Windrow uniformity was very good for both double and single windrows.

**Ease of Operation and Adjustment:** Ease of installation was good. After initial installation and when familiar with the procedure, the windrower could be removed or installed by one man in 90 minutes. Instructions were adequate.

Ease of operating the controls was good. Considerable operator experience was needed to control both headers. Visibility was good. The side header was easily viewed.

Material flow on the front draper could not be seen from the tractor cab. Handling was good. Larger diamond tread front tractor tires greatly reduced skew on hillsides or on damp fields. Ease of transporting was very good. Three modes of transport were provided.

Ease of adjustment was good. Converting windrows from side-by-side to stacked, or from double to singles was inconvenient when changeovers were frequent.

Ease of lubrication and maintenance was very good. Daily servicing took less than 15 minutes.

**Tractor Requirements:** Minimum power required was 20 hp (15 kW). The manufacturer suggested the Honey Bee TM-50 be mounted on at least a 100 hp (75 kW) tractor with or without dual rear wheels.

**Operator Safety:** No safety hazards were apparent on the Honey Bee TM-50. However, normal safety precautions were required. The windrower did not have warning decals to indicate alt dangerous areas. Safety stops were provided for both header lift cylinders. No hitch safety chains were provided.

**Operator's Manual:** The operator's manual was good. It contained adequate assembly and installation instructions, as well as information on adjustment, operation and troubleshooting. It did not include servicing instructions, and did not emphasize operator safety.

**Mechanical History:** Because of cutting problems, the knife drive motors and hydraulic pump were changed to larger sizes. The front tires of the tractor were changed to tires with a greater load rating. Several minor mechanical problems occurred.

## RECOMMENDATIONS

it is recommended that the manufacturer consider:

1. Modifications to the divider and gauge wheels to reduce crop loss.
2. Increasing the side-to-side shifting range of the front header.
3. Providing larger hydraulic motors and pump to adequately power the knife drives.
4. Providing header height indicators or a better minimum height adjustment.
5. Providing hitch safety chains, warning decals to indicate all dangerous areas, and include safety information in the operator's manual.
6. Providing front tractor tire and rim selection information in the operator's manual.
7. Providing servicing instructions in the operator's manual.

Senior Engineer: J.D. Wasserman

Project Engineer: M.E. Jorgenson

Project Technologist: A.R. Boyden

## THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Modifications to the divider pipe have been made and further modifications to the divider will be considered.
2. Increased shifting from side-to-side is being considered.
3. Larger pump and hydraulic motors on knife drive are standard equipment in 1988.
4. Header height indicator gauges are standard equipment on 1988 models.
5. Safety chains and warning decals will be included on new models. Safety information will be included in the new manual.
6. Tire and Rim recommendations will be made available and 16.5 x 16.1 tires and wheels will be an option with the windrower.
7. Service information will be included in the manual.

## MANUFACTURER'S ADDITIONAL COMMENTS

The 1988 models have a sliding front header draper deck and drop in draper decks for the side header. The front sliding draper deck will allow laying single windrows to the left of both headers. The drop in draper decks on the side header will greatly improve ease of converting from double to single windrowing, or from side-by-side to stacked windrowing. Also, all decks can be removed for clipping operations where no windrow is required.

## GENERAL DESCRIPTION

The Honey Bee TM-50 Series III (FIGURE 1) is a tractor mounted windrower with two draper headers capable of laying one 50 ft (15.2 m) double windrow or two 25 ft (7.6 m) single windrows. Double windrows may be stacked or laid side-by-side. The headers mount to the front end and rear end of the tractor. One header is positioned directly in front of the tractor and is fully supported by the tractor. The other header is positioned to the right-hand side and is supported by the tractor and two wheels.

The knife, reel and draper hydraulic motors are driven from a pump attached to the tractor power-take-off shaft. The draper and reel speeds are adjusted with flow controls mounted on the headers. The front draper can be turned off for cornering by a switch on the console. The front header can be shifted left or right to prevent stripping between the headers while following gradual curves in the crop edge. The reel lift, header lift, and table shift hydraulic cylinders were powered from one tractor remote circuit, and were activated by electric switches on the console.

For short transport distances, the side header could be swung back on-the-go. For longer transport distances, two other transport modes were available.

The test machine was equipped with a Schumacher knife and knife drive system. The test machine was also equipped with a single swath attachment that converts the right header to centre delivery for laying two single windrows. Detailed specifications are given in APPENDIX I.

## SCOPE OF TEST

The main purpose of the test was to determine the functional performance of the Honey Bee TM-50. Measurements and observations were made to evaluate the Honey Bee TM-50 for rate of work, quality of work, ease of operation and adjustment, operator safety, and the suitability of the operator's manual. Although extended durability testing was not conducted, the mechanical failures which occurred during the test were recorded.

The Honey Bee TM-50 was mounted on a John Deere 4250 tractor. It was operated for 124 hours in crops and conditions shown in TABLE 1 while cutting about 2930 ac (1172 ha).

TABLE 1. Operating Conditions

OPERATION	CROP	VARIETY	YIELD		HOURS	AREA
			bu/ac	(t/ha)		
Single and double windrows	Barley	Bonanza Harrington Klages	30-60	(1.7-3.3)	13	295(118)
	Durum Wheat	Madora Columbus	20-35	(1.4-2.4)	13	340(136)
		Katepwa Neeepawa	20-40	(1.4-2.7)	64	1615(646)
	Flax	Norland	10-15	(0.6-0.9)	6	155(62)
Single Windrows	Canary Seed	Keet	15	(1.2)	18	290(116)
	Fall Rye	Musketeer	30	(1.9)	5	110(44)
	Canola	Westar	20-30	(1.1-1.7)	5	125(50)
TOTAL					124	2930(1172)

## RESULTS AND DISCUSSION

### RATE OF WORK

Uniform windrows were formed in most crops at average speeds of 4 to 7 mph (6 to 11 km/h). Slower speeds were required in heavy or leaning crops and in rough fields. Speeds up to 8 mph (13 km/h) were achieved in straight even crops on level fields.

Average workrates for the 50 ft (15.2 m) windrower varied from 20 to 35 ac/h (8 to 14 ha/h). In straight even stands on level fields, workrates of 40 ac/h (16 ha/h) could be achieved.

### QUALITY OF WORK

**Dividers:** Divider performance was good.

Lodged or tangled crops were flattened by the wide divider and header gauge wheels, causing slight crop loss (FIGURE 2). No divider loss occurred in most straight standing crops if the gauge wheels were operated just off the ground. It is recommended that the manufacturer consider modifications to the divider and gauge wheels to reduce crop loss.

Tangled crop material, such as canola, tended to collect on the knife and right windrow deflector plate on the front header right divider.

Shifting the front header left or right on-the-go while following gradual curves in the crop edge avoided missing crop bet-



FIGURE 2. Crop Flattened by the Divider.

ween the headers. However, sharper curves could not be followed closely as the front header could not be shifted enough to prevent missed crop. It is recommended that the manufacturer consider modifications to increase the side-to-side shifting range of the front header.

**Reels:** Reel performance was very good.

Reel speed was variable from 0 to 73 rpm. Reel tip speed ranged from 0 to 12 mph (0 to 19 km/h). The reels were usually adjusted with a reel tip speed 10 to 20% faster than ground speed to minimize shatter losses. Crop material did not wrap around the reel ends.

The range of vertical and fore-and-aft reel adjustments was suitable for all crops. The reels were normally positioned slightly ahead of the cutterbars.

**Cutterbars:** Cutting ability was good.

Initially the knife did not have adequate power for cutting heavy crops and the knife plugged frequently. This was rectified by the installation of larger knife drive hydraulic motors and a larger pump. After modifications, the knife seldom plugged. It is recommended that the manufacturer provide the larger hydraulic motor and pump to adequately power the knife drives. Stubble was usually ideal (FIGURE 3).

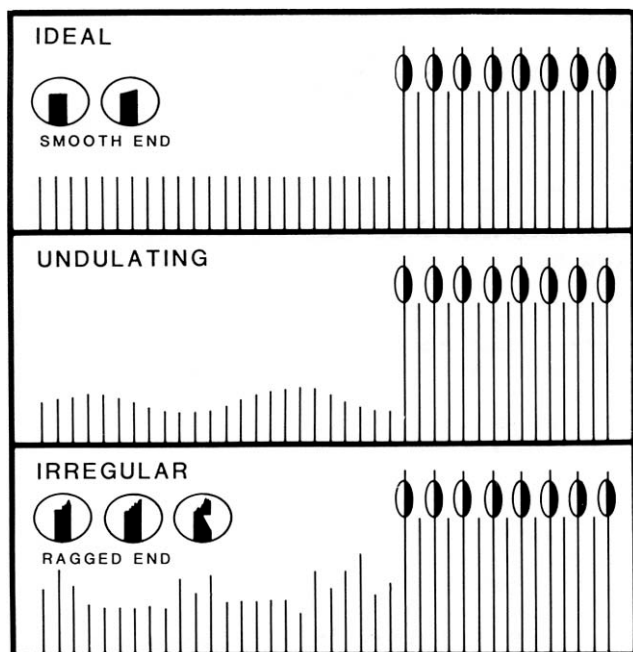


FIGURE 3. Types of Stubble.

Care was required in setting the cutterbar height, as the front header cutterbar was not visible from the tractor cab. The cutterbar frequently dragged on the ground while cutting low in short crops. The minimum height adjustment on the lift cylinders was not used during most of the test as header flotation could be reduced. Also, header flotation was reduced when resting the header on the gauge wheels. Height indicators were installed by the manufacturer after the test. These were not evaluated but should assist the operator in setting and maintaining desired cutting height. It is recommended that the manufacturer provide height indicators or a better minimum height adjustment as standard equipment.

No gauge wheel was provided at the delivery end of the side header. Tension from the levelling spring caused the delivery end to be always lower than the outer end. This spring was disconnected through most of the test. These springs are mostly used when a varied stubble height is desired to leave taller stubble at the outer ends of the header.

**Header Flotation:** Header flotation was good.

Flotation was provided by a hydraulic accumulator in line with the lift cylinders on each header (FIGURE 4). The header flotation, when operated properly, minimized cutterbar damage in stony fields and enabled the header to follow most ground contours. Improper header flotation resulted with the header lowered

to the minimum height setting on the lift cylinders or when resting firmly on their gauge wheels, as the accumulators would discharge. Care was required in adjusting the header to the desired height to prevent accumulator discharge. A height indicator should greatly aid in setting height.

Undulating stubble seldom occurred in rough fields, as the hydraulic flotation system greatly reduced bounce of the header.

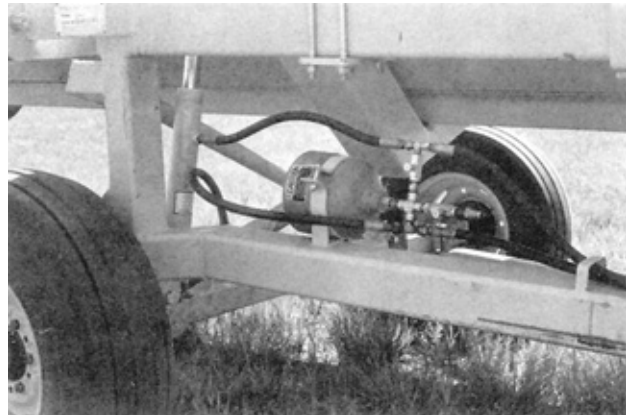


FIGURE 4. Header Flotation System.

**Drapers:** Draper performance was very good.

Draper speed could be varied from 0 to 850 ft/min (0 to 4.3 m/s). In most crops, the drapers were run between 450 to 600 ft/min (2.3 to 3.0 m/s). The draper speed controls were mounted on each of the headers. When the proper draper speed was set, slight changes in crop condition or ground speed did not affect the windrow formation.

Platform angles less than 20 degrees are suitable for grain windrowing, while steeper angles are suggested when windrowing hay. The platform angle of the Honey Bee TM-50 was adjustable. At a cutting height of 6 in (150 mm) platform angles could be varied from 12 to 160, which was suitable for all crops encountered in the test. The 50 ft (15.2 m) draper header was not used for cutting hay. The hydraulically driven drapers had adequate power to convey all crop materials, while laying single or double windrows.

**Windrow Formation:** Windrow formation was very good.

Windrows may be classified into four general patterns (FIGURE 5), although many combinations and variations exist. FIGURES 6 to 9 show typical windrows formed by the Honey Bee TM-50.

The front header formed parallel windrows in light crops and herringbone windrows in heavier crops. When set for double windrowing, the right header formed parallel windrows. Double windrow ends at corners were better formed when the front draper was shut off as the side header cleared the standing crop. While set for single windrowing, the right header formed herringbone windrows. Slight changes in crop condition or travel speed did not significantly affect windrow formation, after the reel and draper speeds had been selected.

Single windrows from each 25 ft (7.6 m) wide header were about 4 ft (1.2 m) wide. The right header windrows settled in the centre while cutting light crops. The windrows had a more uniform shape when cutting heavier crops. Single canola windrows were usually 6 ft (1.8 m) wide, when no rollers were used.

Double side-by-side windrows were usually 7 ft (2.1 m) wide. The gap between windrows varied from 0 to 8 in (0 to 200 mm), depending on quantity of material in the windrow. Double stacked windrows were usually 6 ft (1.8 m) wide.

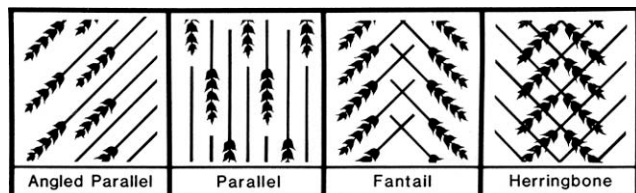


FIGURE 5. Windrow Types.

**Windrow Uniformity:** Windrow uniformity was very good.

Windrows were uniform in both single and double windrows at typical speeds up to 7 mph (11 km/h).

Speed controls for the reels and drapers were located on the headers. Changes in crop condition or ground speed did not affect windrow uniformity, provided the reel and draper speeds were properly adjusted.



FIGURE 6. Wheat, Side-by-Side Double Windrow: 35 bu/ac (2.4 t/ha).



FIGURE 7. Barley, Stacked Double Windrow: 50 bu/ac (2.8 t/ha).



FIGURE 8. Canola, Single Windrow: 30 bulac (1.7 t/ha).



FIGURE 9. Fall Rye, Single Windrow: 30 bulac (1.9 t/ha).

## EASE OF OPERATION AND ADJUSTMENT

**Installation:** Ease of installation was good. After initial installation and when familiar with the procedure, the Honey Bee TM-50 was removed or reinstalled by one man in 90 minutes when mounting brackets remained on the tractor. Only a 1-1/8 in (29 mm) socket and ratchet were required. The operator's manual provided adequate instructions for installation and removal.

The front tires supplied with the John Deere 4250 had to be replaced with larger diamond tread tires to safely carry the extra load and provide suitable steering control.

**Controls:** Ease of operating the controls was good.

With the control console (FIGURE 10) mounted horizontally, slightly ahead and to the right of the operator, all six switches were easily activated. The six functions on the console were reel and header lift for each header, front draper shut off, and front header shift. Operator experience was needed to control both headers.

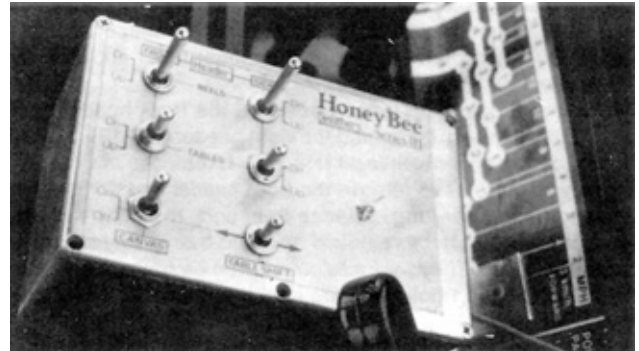


FIGURE 10. Control Console.

**Visibility:** Visibility was good.

The entire side header was easily viewed from the tractor. Material flow on the front draper could not be seen from the tractor cab. Only the cutterbar area in front of the windrow opening could be seen from the cab. Front header height could only be judged by viewing the cutterbar through the windrow opening or by the stubble height behind the header. Recommendations to improve ease of setting stubble height have been made.

Operation at night was difficult because tractor lighting was inadequate. Additional lights should be installed if night operation is desired.

**Handling:** Handling was good. Handling became easier with operator familiarity. The operator had to watch and control two headers independently. This required considerable operator experience especially on corners.

Right-hand corners (FIGURE 11) were made without crop loss. Shifting the front header left or right on-the-go while following

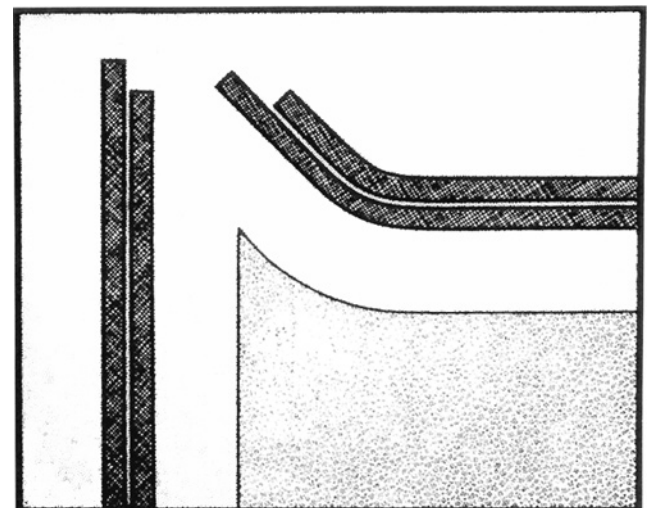


FIGURE 11. Typical Corner Formation.

gradual curves in the crop edge avoided missing crop between the headers. The amount the operator could turn was limited by the amount the front header could be shifted. A recommendation regarding this has been made.

Single ribbed front tractor tires did not prevent skewing on hillsides or on damp fields. Also, they left large ridges in corners, especially in damp fields. Larger diamond tread tires greatly reduced skew on hillsides or on damp fields. Handling was greatly improved, especially in cornering, and much smaller ridges were left in corners on damp fields. The operator's manual did not include information on tire selection. It is recommended that the manufacturer provide front tractor tire selection information in the operator's manual.

The Honey Bee TM-50 could be used for opening fields or for cutting back and forth as is commonly done with self-propelled windrowers.

**Transporting:** Ease of transporting was very good.

For short distance transport, the side header was simply swung behind the tractor (FIGURE 12) on-the-go in only a few seconds. It travelled very well on open roads in transport position at speeds up to 20 mph (32 km/h). The transport width of 26.3 ft (8.0 m), required caution when meeting or allowing traffic to pass on roadways.

For intermediate distance transport, the front header could be removed and towed behind the right header (FIGURE 13). This reduced transport width to 14 ft (4.3 m). It took one man approximately 30 minutes to remove the front header and to install the transport axle. For long distance transport, the right and front headers could both be removed from the tractor and placed on transport axles. The two units could then be towed behind the tractor or pickup truck. This reduced the transport width to 9.3 ft (2.8 m).

Both headers had mechanical safety locks on the lift cylinders for transporting.

**Adjustments:** Ease of adjustment was good.

Draper and reel speeds were easily adjusted by flow control valves on the headers. Reel fore-and-aft position was easily adjusted by removing two bolts and sliding the reel mounts. The draper tighteners were easily adjusted with a separate adjustment for the front and back of each draper. There were no knife pressure plates to be adjusted on the cutterbar. The guards had to be checked periodically when operating low in stony conditions. Bent guards could be straightened without breakage using a hammer. Table flotation was not adjustable. A spring on each header could be adjusted to level the header or to cut the stubble higher at the outer ends.

Converting double windrows from side-by-side to stacked, took one man one hour. This involved lengthening the draper, moving the draper roller, and installing a draper support and rear panel. This was inconvenient when changeovers were frequent.



FIGURE 12. Semi-Transport Position.



FIGURE 13. Full Transport Position.

Converting from double to single windrows required changing the right header to centre delivery. It took two men one hour to change to the two draper system, and remove the draper support and rear panel. This also was inconvenient when changeovers were frequent.

**Lubrication and Maintenance:** Ease of lubrication and maintenance was very good.

Daily lubrication took less than 15 minutes. This included greasing the knife drives and PTO universal joints and checking the hydraulic oil reservoir. Minimal access to the PTO drive shaft made greasing the universal joints inconvenient. The windrower was inspected for oil leaks and loose components daily. The Honey Bee TM-50 had 16 pressure grease fittings, most of which only required 50 hour or seasonal greasing.

Guards and knife sections were easy to change.

## TRACTOR REQUIREMENTS

The Honey Bee TM-50 required a tractor with a 1000 rpm PTO spline and two remote hydraulic outlets. A minimum of 20 hp (15 kW) PTO was required. The manufacturer suggested using at least a 100 hp (75 kW) tractor. Dual rear wheels can be used in conditions that require increased stability. The John Deere 4250 had ample power and was stable in all field conditions.

## OPERATOR SAFETY

No safety hazards were apparent on the Honey Bee TM-50. However, normal safety precautions were required.

All of the moving parts were well shielded. Safety stops were provided for the header lift cylinders, and should be used when working near the header or when the windrower is left unattended. If the operator must make adjustments or work in dangerous areas, the PTO should be disengaged, and the tractor engine shut off.

A slow moving vehicle sign was provided for each header. Transporting could be conducted safely in all transport modes available. Transport speeds should not exceed 25 mph (40 km/h) when towing both headers behind a pickup truck.

The operator's manual did not emphasize operator safety. The Honey Bee TM-50 did not have warning decals to indicate all dangerous areas. No hitch safety chains were provided. It is recommended that the manufacturer consider providing hitch safety chains, warning decals to indicate all dangerous areas, and include safety information in the operator's manual.

The front tractor tires supplied with the John Deere 4250 tractor were severely overloaded, according to the Tire and Rim Association's guidelines. These tires were changed to tires with a higher load rating. Both tires and rims should be selected to carry the additional weight of the front header. The operator's manual did not list suggested load rating. It is recommended that the manufacturer consider providing front tractor tire and rim selection information in the operator's manual.

## OPERATOR'S MANUAL

The operator's manual was good. Assembly and installation instructions were adequate. The operator's manual contained a troubleshooting chart, and information for adjustment and operation but did not include complete servicing instructions. It is recommended that the manufacturer consider providing servicing instructions in the operator's manual.

The operator's manual did not emphasize operator safety. It also did not include information for properly sized front tractor tires and rims to prevent overload with the front header attached. Recommendations regarding this have been made.

## MECHANICAL HISTORY

TABLE 2 outlines the mechanical history of the Honey Bee TM-50 during 124 hours of field operation while windrowing about 2930 ac (1172 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 front tractor tires were over loaded, and replaced at		Beginning of Test	
-The hydraulically driven components had inadequate power so the hydraulic pressure relief setting were increased at	2	30	(12)
-Side header mounts were loose and were tightened at	9, 22	210, 520	(84, 208)
-The side header lift needle valve plugged and was cleaned at		450	(180)
-The windrower deflectors were shimmed to allow for more forward adjustment of the gauge wheels at		460	(184)
-Large knife head motors, new knife heads, and chain reduction drive on reels were installed at	84	1975	(790)
-The front right tractor tire rim failed and was repaired at	84	1975	(790)
-A right reel cylinder fitting leaked and was replaced at	84	1975	(790)
-Diamond tread tires were installed on the front of the tractor to improve handling at	93	2185	(874)
-The chain drive motor mounts bent and were straightened at	107, 116	2440, 2730	(976,1092)
-The right header draper drive roller failed and was repaired at	110	2510	(1004)
-Three knife sections were replaced		During the Test	
-Four bent guards were replaced		During the Test	

**Front Tractor Tires:** The front tires were significantly overloaded according to the Tire and Rim Association guidelines. These tires were replaced with single ribbed tires which had a 12 ply rating.

The front right tractor tire rim failed under considerable side loading. This rim was reweided and reinstalled.

Skewing was a problem with the single ribbed tires. The diamond tread tires greatly reduced side skew.

Recommendations regarding this have been made.

**Hydraulic System Modifications:** Knife plugging frequently occurred while cutting heavy crops. Increasing the hydraulic pressure relief setting on the pump had little effect. Larger knife drive motors, changing the knife stroke with new knife heads, and installing a chain reduction drive on the reel only reduced the plugging slightly. Installing a larger displacement hydraulic pump and changing oil to SAE 30 weight, greatly reduced plugging. It is recommended that the manufacturer include the larger displacement hydraulic pump on all future models.

APPENDIX I

<b>MAKE:</b>	Honey Bee
<b>MODEL:</b>	TM-50 Series Iii
<b>SERIAL NUMBER:</b>	HB870611850
<b>MANUFACTURER:</b>	Honey Bee Manufacturing Ltd. P.O. Box 120 Frontier, Saskatchewan S0N 0W0
<b>CUTTERBAR:</b>	
-type	Schumacher Easy-cut system
-width of cut (divider points)	50.3 ft (15.3 m)
-effective cut (inside dividers)	50.0 ft (15.2 m)
-range of cutting height	2 to 48 in (51 to 1219 mm)
-guard spacing	3 in (76 mm)
knife section (over serrated alternately inverted)	

-width	3.0 in (76.0 mm)	
-depth	3.1 in (78.7 mm)	
-cutting length	2.5 in (63.5 mm)	
-knife stroke	5.0 in (127 mm)	
-knife speed	570 cycles/min	
<b>HEADER:</b>		
-platform angle		
-fully raised (max.)	160 above horizontal	
-fully lowered	12 to 160 below horizontal	
-number of drapers	2 for double windrows, 3 for single windrows	
-draper width	42.5 in (1080 mm)	
-draper lengths		
-front header	19.3 ft (5.9 m)	
-side header		
-side-by-side	21.9 ft (6.7 m)	
-stacked double	23.9 ft (7.3 m)	
-single	10.7 and 8.9 ft (3.3 and 2.7 m)	
-draper material	rubberized polyester and rubberized slats	
-draper speed range	0 to 850 ft/min (0 to 4.3 m/s)	
-draper roller diameter	2.5 in (63.5 mm)	
-height of windrow opening	34 to 40 in (864 to 1016 mm)	
-width of windrow openings (between rollers)	54 in (1372 mm)	
-raising time	4.2 s	
-lowering time	3.4 s	
<b>REEL:</b>		
-number of bats	5 (on each header)	
-number of arms per bat	6 (on each header)	
-diameter	54 in (1372 mm)	
-speed range	0 to 73 rpm	
-range of adjustment		
-fore-and-aft	8 in (203 mm), five increments	
-height above cutterbar	29 in (737 mm)	
-raising time	1.1 s	
-lowering time	2.1 s	
<b>HYDRAULIC SYSTEM:</b>		
-reel, draper, and knife drives	power-take-off driven pump, flow control on reels and draper	
-reel lift	cab controlled solenoid valve, two single acting cylinders in parallel for each header	
-headerlift	cab controlled solenoid valve, two single acting cylinders in parallel for each header	
-transport	tractor control valve, double acting cylinders to swivel side unit wheels and position transport pin	
<b>NO. OF CHAIN DRIVES:</b>		
-reels	0	
<b>NO. OF V-BELTS:</b>		
	0	
<b>LUBRICATION POINTS:</b>		
-pressure grease fittings	16	
<b>NO. OF PRELUBRICATED BEARINGS:</b>		
	7	
<b>TIRES:</b>		
-castor and transport wheels	four, 9.5 L 15, 6 ply	
-header gauge wheels	three, 4.80/4.00	
<b>OVERALL DIMENSIONS:</b>		
	<b>WIDTH</b>	<b>LENGTH</b>
-field position	50.6 ft (15.4 m)	23.5 ft ( 7.2 m)
-short transport	26.3 ft ( 8.0 m)	59.2 ft (18.0 m)
-intermediate transport (front header removed)	14.0 ft ( 4.3 m)	68.0 ft (20.7 m)
-long transport position	9.3 ft ( 2.8 m)	69.3 ft (21.1 m)
<b>WEIGHT:</b>		<b>WINDROWER TRACTOR GROSS WEIGHT</b>
	<b>lb (kg)</b>	<b>lb (kg)</b>
-tractor front tires		
-left	2573 (1167)	1882 (854)
-right	2643 (1199)	1882 (854)
-tractor rear tires		
-left	482 (219)	5548 (2516)
-right	467 (212)	5548 (2516)
-windrower castor wheels	<u>2935 (1331)</u>	<u>2935 (1331)</u>
TOTAL	9100 (4128)	14,860 (674) 23,960 (10,868)
<b>OPTIONS AND ATTACHMENTS:</b>		attachment to lay two single windrows

**SUMMARY CHART**

**HONEY BEE TM-50 SERIES III TRACTOR MOUNTED WINDROWER**

<b>RETAIL PRICE</b>	\$43,047.00 (April, 1988, f.o.b. Humboldt, Sask.)
<b>RATE OR WORK</b>	
Average Speed	4 to 7 mph (6 to 11 km/h)
Average Workrate	20 to 35 ac/h (8 to 14 ha/h)
<b>QUALITY OF WORK</b>	
Dividers	<b>Good</b> ; slight crop toss
Reels	<b>Very Good</b> ; range of adjustment suitable for all crops
Cutterbars	<b>Good</b> ; adequate power after modifications, difficult to set height when cutting low in short crops
Header Flotation	<b>Good</b> ; resting gauge wheels on the ground could reduce flotation
Drapers	<b>Very Good</b> ; adequate power, adjustable platform angle
Windrow Formation	<b>Very Good</b> ; mostly parallel, can lay single or double windrows side-by-side or stacked
Windrow Uniformity	<b>Very Good</b> ; in both single and double windrows
<b>EASE OF OPERATION AND ADJUSTMENT</b>	
Installation	<b>Good</b> ; took one man 90 minutes to remove or reinstall, adequate instructions
Controls	<b>Good</b> ; experience needed to control both headers
Visibility	<b>Good</b> ; side header easily viewed, front header cutterbar was mostly obstructed
Handling	<b>Good</b> ; diamond tread front tractor tires greatly improved handling
Transporting	<b>Very Good</b> ; three modes of transporting provided
Adjustments	<b>Good</b> ; converting from single to double windrows or side-by-side to stacked was inconvenient
Lubrication and Maintenance	<b>Very Good</b> ; daily service took less than 15 minutes
<b>TRACTOR REQUIREMENTS</b>	Manufacturer suggested minimum 100 hp (75 kW) tractor with or without dual rear wheels
<b>OPERATOR SAFETY</b>	Few warning decals, front tractor tires were overloaded, no hitch safety chains, safety stops were provided for header lift cylinders
<b>OPERATOR'S MANUAL</b>	<b>Good</b> ; adequate mounting and operating instructions, did not include servicing or safety information
<b>MECHANICAL HISTORY</b>	Knife drive motors and hydraulic pump were changed to larger sizes, several minor 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
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										