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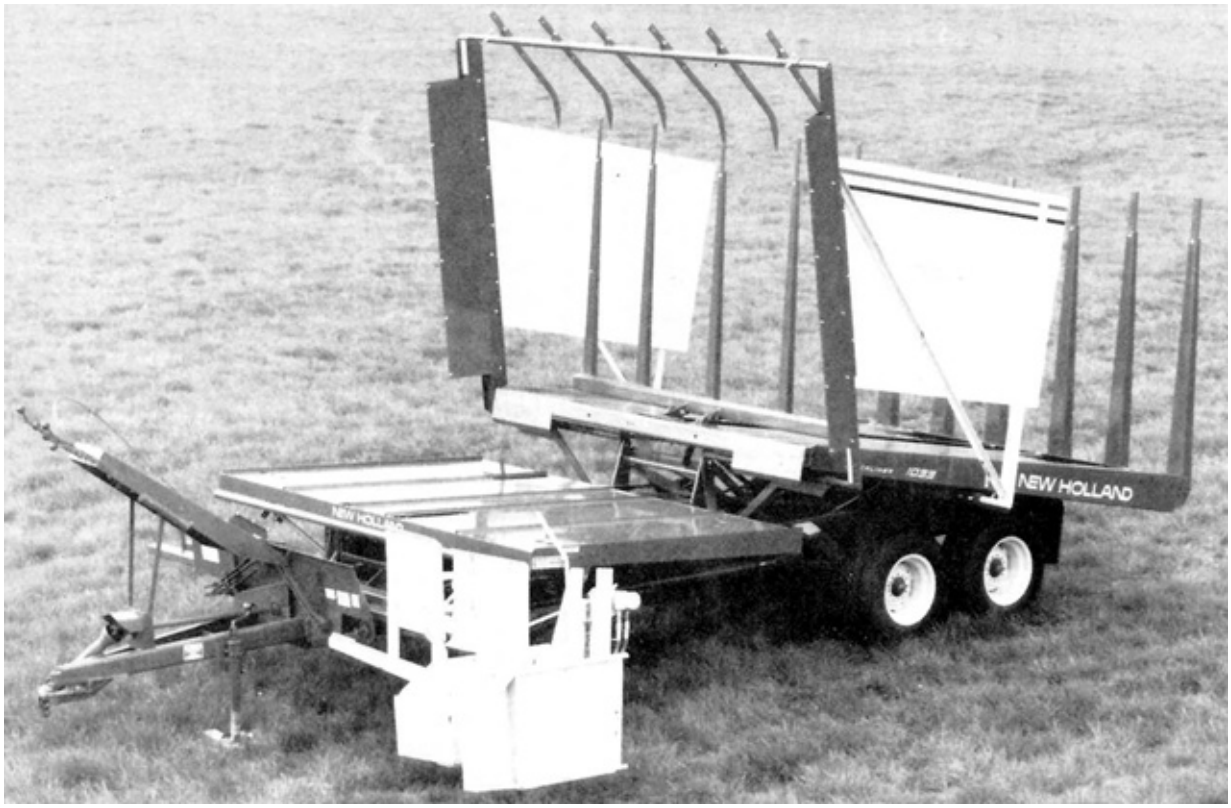

Sperry New Holland 1033 Automatic Bale Wagon

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

SPERRY NEW HOLLAND 1033 AUTOMATIC BALE WAGON

MANUFACTURER:

Sperry New Holland
Division of Sperry Rand Corporation
New Holland, Pennsylvania 17557
U.S.A.

DISTRIBUTOR:

Sperry New Holland
Box 777, Winnipeg, Manitoba R3C 2K4
Box 1907, Regina, Saskatchewan S4N 2S3
Box 1616, Calgary, Alberta T2P 2M7

RETAIL PRICE:

$13,500.00 (May, 1979, f.o.b. Lethbridge)

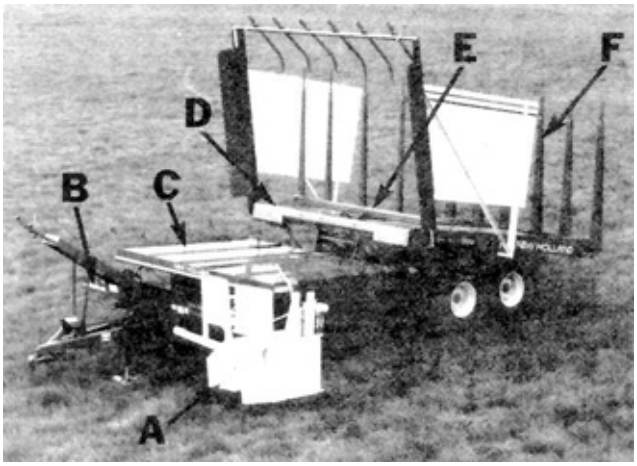

FIGURE 1. New Holland 1033: (A) Loader, (B) First Table, (C) Second Table, (D) Load Deck, (E) Rolling Rack, (F) Load Deck Fingers.

SUMMARY AND CONCLUSIONS

Overall functional performance of the New Holland 1033 was very good. Ease of operation was very good while stack quality with dense, well formed bales was good.

Considerable operator experience was needed to produce neat, durable stacks. A level site, with an adequate backstop, was required to prevent stack collapse. The most durable stacks were formed by placing two, or more, rows of bale loads beside each other. Bale uniformity was very important in obtaining a durable, weather resistant stack.

Suitable bale picking speeds varied from 6 to 13 km/h (4 to 8 mph). In average field conditions, it took an experienced operator about 18 minutes to properly load 103 bales while unloading took about 5 minutes. Field efficiency depended mainly on operator dexterity and the speed at which the tractor could safely be handled. Hay loss during field operation was negligible.

The New Holland 1033 loaded firm dense bales effectively. The loader cross conveyor chain sometimes shredded the bottom of fine wheat straw bales. To obtain stack stability, the New Holland 1033 used an automatic system which rearranged the bales on the second table to form a tie. Tie tier formation was quick and easy and could be completed without interrupting the loading process. Two tie tiers were needed on each bale load to form stable stacks. Unloading was easy once the load was aligned and positioned. Rear visibility was limited; however, a skilled operator could easily align and position the wagon.

Control rods were easily adjusted and could be positioned to suit most tractors. All lubrication and adjustments could be completed with the load deck and tables lowered. Hitching was easy and convenient.

To fully utilize the capacity of the wagon and to ensure safe road transport, at least a 50 kW (67 hp) tractor should be used.

The New Holland 1033 towed very well, fully loaded, at speeds up to 30 km/h (19 mph). However, this was unsafe, as the tire loads exceeded the Tire and Rim Association maximum rating by 58%. Caution had to be used when transporting due to restricted rear visibility.

The New Holland 1033 was safe to operate if the manufacturer's safety recommendations were closely followed.

Several mechanical problems occurred during the test. The first table twisted, the rolling rack was bent and a support brace on the rear sideboard cross member broke.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to improve access to the hydraulic reservoir to facilitate checking the fluid level.
2. Modifications to improve cross conveyor feeding in loose hay bales and in dense fine straw bales.
3. Supplying tires which comply with the Tire and Rim Association rating for the specified wagon load.

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Senior Engineer: E. H. Wiens

Project Engineer: M. V. Eliason

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The Model 1033 was replaced with the Model 1037 in August 1978. This model has the hydraulic oil reservoir located where it is very accessible in relation to that on the Model 1033.
2. The cross conveyor on the new model has more aggressive chain lugs and the entire assembly is adjustable to accommodate bales of great variation in density.
3. The tires supplied with the Model 1033 have been used for several years with this model and under similar loading on other model machines. Our experience has been that they have been satisfactory for the application. The tires on the replacement machine are an improved type of the same size and ply rating especially designed by the tire manufacturer for the application.

GENERAL DESCRIPTION

The New Holland 1033 is a pull type automatic bale wagon with a maximum camying capacity of 105, standard size, 355 x 460 mm bales or 84, commercial size, 405 x 460 mm bales. It will accommodate bale lengths from 860 to 1065 mm. The New Holland 1033 consists of a loader, first and second tables, load deck and rolling rack mounted on a main frame, supported by four wheels on two axles. The self contained hydraulic system is driven from a 540 rpm tractor power take-off through a telescoping power shaft.

For field retrieval, bales must be lying with the cut side facing upward. Bales are retrieved with the loader, located on the left of the tractor and are conveyed to the first table. When three bales

have been placed on the first table, a trip arm is activated, pivoting the three bales onto the second table. This occurs a total of five times for standard size bales and four times for commercial size bales. On the last delivery, the second table trip arm is activated, raising a tier of 15 standard size bales or 12 commercial size bales on to the load deck. Seven tiers complete the load. The second table locks into upright position to stabilize the load during transport.

The load may be tied together, as required for stack durability, by automatically rearranging the bales on the second table. A tie-tier may be initiated, once three bales have been placed on the second table. Activating the tie mechanism, pins the outer two bales, returning the centre bale to the first table. It also causes the first table trip to be activated by only two bales. Loading five more bales and delivering them, in sets of two, to the second table forces the two outer bales lengthwise on each side of six inner bales placed in the normal cross-wise position. The tie mechanism is then deactivated while the tier is finished in a normal manner. The total carrying capacity of the New Holland 1033 is reduced by one bale for every tie tier placed in the load.

The tie mechanism can also be used to provide a cap for the stack. Activating the tie mechanism on the last tier, before any bales are placed on the second table, results in the tier having a width of only two bales. This provides for a more weather resistant and stable stack.

To unload, the New Holland 1033 is lined up with the stack. The second table is then lowered and the load deck raised. The load is then backed firmly into the stack. To maintain a tight stack, two stack poles are placed against the load. Two push-off feet are then activated to push the wagon away from the stack. Retracting the push-off feet and lowering the load deck completes the unloading process. The spring loaded rack automatically rolls forward when the load deck is lowered.

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

SCOPE OF TEST

The New Holland 1033 was operated in the crops shown in TABLE 1 for 239 hours while stacking about 31180 bales. It was evaluated for quality of work, ease of operation, rate of work, power requirements, operator safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

CROP	HOURS	NO. OF BALES	FIELD AREA (ha)
Alfalfa	79	11540	122
Alfalfa-bromegrass	77	9020	150
Crested wheatgrass	17	2030	22
Wheat Straw	43	5880	97
Barley Straw	16	2400	20
Oat Straw	7	310	6
TOTAL	239	31180	417

RESULTS AND DISCUSSION

QUALITY OF WORK

Bale Retrieval: Bale loader performance depended primarily on operator experience and dexterity. An experienced operator could pick dense, well-formed bales at speeds up to 16 km/h. Average picking speeds ranged from 6 to 13 km/h.

The distance needed to pick a bale off the ground varied with forward speed, bale quality, crop type and field surface conditions. Loader performance was not affected by power take-off speed. At high forward speeds, the bale slid along the ground as it entered the loader, sometimes causing broken twines or bale damage. FIGURE 2 shows the sliding distance when picking 25 kg, 1040 mm long wheat straw bales, over a range of ground speeds. No sliding occurred at speeds below 3 km/h, while at 10 km/h, the bale had to slide 3.5 m as it entered the loader.

To reduce possible damage, bales should be picked with minimal sliding. However, slow picking speeds increase loading time. Operator experience is needed to coordinate ground speed with bale and field conditions.

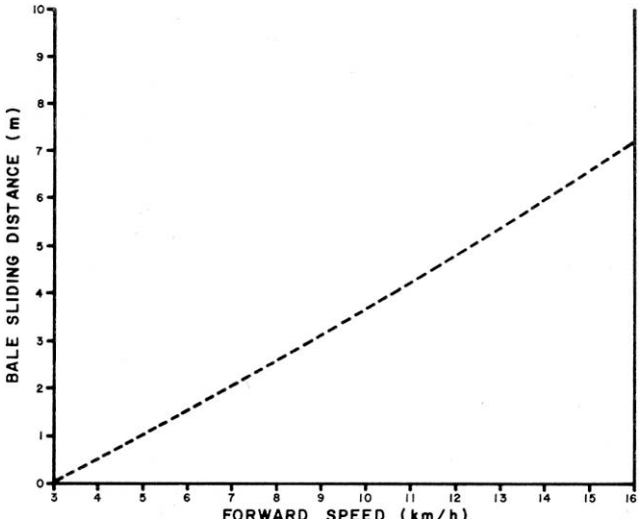

FIGURE 2. Bale Sliding Distance over a Range of Ground Speeds, when Picking Wheat Straw Bales.

Load Quality: The New Holland 1033 formed a durable load, which transported well with little shifting or settling. Load quality depended on bale quality. Large variation, in bale length, or placement of loose, poorly formed bales on the bottom rows, could cause some load shifting during transport.

Stack Quality: Stack quality and durability depended on operator care, operator experience, bale quality, bale uniformity and selection of a suitable stack site. With proper care in baler operation, site selection and unloading, solid, durable stacks (FIGURE 3) were formed. If bales were of poor or variable quality, or if care was not taken in selecting a good stack site and in properly positioning bale loads within the stack, the stack usually collapsed within several days (FIGURE 4).

Site selection was very important. A smooth, level area was best. If a stack had to be built on sloping ground, best results were obtained when the stack was started at the bottom of the slope and built up-hill. Stacking on side slopes usually resulted in stack collapse.

An adequate backstop was needed to start a stack. Full loads, which were rearranged by hand, as shown in FIGURE 5, formed a good backstop. Placing a full load against a fence, or placing props against the first load, usually was inadequate and lead to stack collapse. Partial loads from field cleanup had to be unloaded by hand and could sometimes be used to finish a stack and stabilize its end.

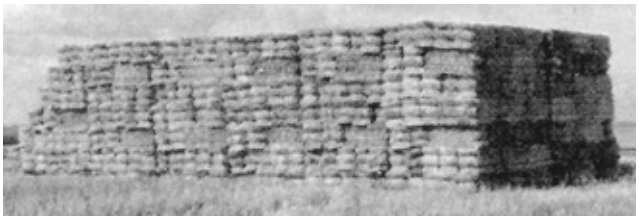

FIGURE 3. Solid, Durable Stacks were Formed when Proper Care was Taken in Baler Operation, Site Selection and Unloading.

FIGURE 4. Poor Site Selection, Poor Bale Quality, or Careless Unloading Usually Resulted in Stack Collapse.

FIGURE 5. Suitable Backstop Formed by Rearranging a Full Load by Hand.

Good quality, durable stacks required dense, well-formed, uniform bales. Stack durability was greatly influenced by baler performance. Poorly formed bales on the bottom, usually settled, resulting in collapse. Non-uniform bale lengths resulted in reduced stability and unsightly appearance on the right stack side, since all the bale length variations accumulated on this side (FIGURE 6).

Properly placing successive loads in the stack was very important for stack stability. Misaligned loads resulted in unsightly, unstable stacks. Loads that were not squarely and firmly placed into the stack resulted in gaps which lead to weathering and subsequent collapse. Setting the stack poles immediately after load positioning was important for maintaining tight and stable stacks.

FIGURE 6. Non-Uniform Right Stack Side Resulting from Bale Length Variations.

The most durable stacks were formed by stacking two or more loads wide. Multiple row stacking reduced weathering by decreasing the exposed surface area and also aided in stack stability. Uniform bale lengths were very important for multiple row stacking. Large bale length variation caused gaps between rows leading to internal weathering and spoilage. When gaps were a problem, the stack could be hand capped by moving the top bales as shown in FIGURE 7. For single row stacking, the stack could be automatically capped, with two bales, by using the tier mechanism on the last load tier.

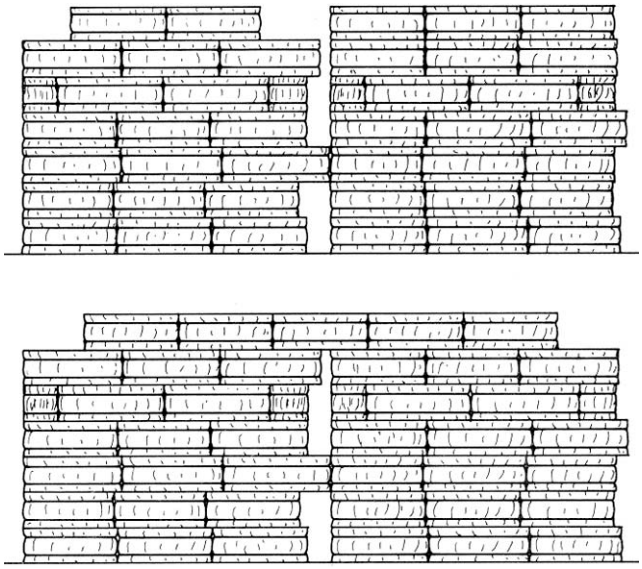

FIGURE 7. Hand Capping to Reduce Weathering Between Bale Rows.

Leaf Loss: Pickup and table losses were insignificant. In alfalfa-bromegrass bales, total hay loss from the New Holland 1033 was less than 0.5 %.

EASE OF OPERATION

Hitching: The New Holland 1033 was equipped with a fixed clevis hitch and a fixed power shaft pedestal. The tractor hitch had to be standard dimensions to permit power take-off universal joint alignment. The standard hitch requirements were clearly outlined in the operator's manual. The hitch jack was convenient to use.

Controls: The control rods were easily adjusted and conveniently positioned for operation from the tractor seat when used on tractors without cabs. Control operation from within a tractor cab was difficult; however, an optional remote control kit was available for operating all controls from within a tractor cab.

The loader control mounted on the left tractor fender, allowing convenient loader operation.

Loading: The ease with which the New Holland 1033 could be loaded depended mainly upon operator experience and bale quality. An experienced operator had little difficulty loading firm, dense, uniform bales.

It was important to pick bales in the same direction as they had been baled. Ragged, loose or damp bales tended to jam in the loader and loader shoe when picked backwards. Dense, well-formed bales could be picked in either direction; however, loading was quicker and easier when picked in the direction of baler travel.

Properly aligning the loader with the oncoming bale was important for efficient picking. Bales could usually be picked at an angle to the direction of travel as they were rotated by the loader arms as they entered the loader. In rough fields or in long stubble, alignment was more important since misalignment sometimes caused the incoming bale to roll or jam in the loader.

Sufficient bale density was needed for efficient picking and entry onto the first table. Loose, poorly formed bales were difficult to pick and convey. The loader cross conveyor chain sometimes failed to capture loose bales as the conveyor teeth pulled through the contacting hay. Dense bales of fine wheat straw were also difficult to convey. The cross conveyor chain sometimes shredded the bottom of the bale rather than move it. It is recommended that the manufacturer modify the cross conveyor to eliminate this problem.

The twine from broken or deformed bales became entangled in the loader and cross conveyor chain sprockets. Twine buildup caused the chains to jam and stop (FIGURE 8) on several occasions.

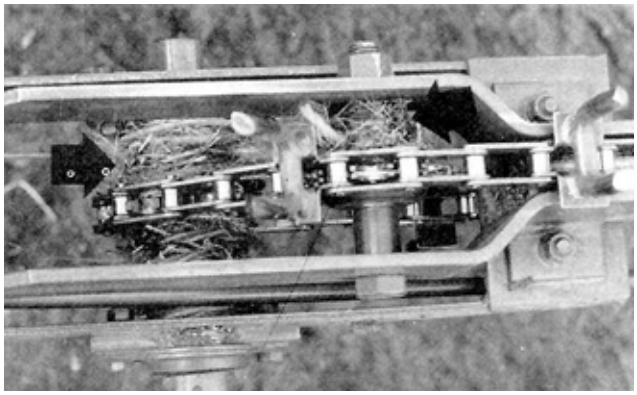

FIGURE 8. Twine Build-up on Loader and Cross Conveyor Drive Sprockets.

Ties: Forming a tie tier was easy and convenient and could be done without interrupting the loading process. Operation of the appropriate control activated the tie mechanism. For stable stacks, two tie tiers were used, usually on the third and fifth tiers. The top tier was usually a capping tier.

Transporting: The New Holland 1033 was easy to transport. All that was required after load completion was to hydraulically raise the loader and to disengage the tractor power take-off. The New Holland 1033 towed well at speeds up to 30 km/h. However, when fully loaded, individual tire loads exceeded the Tire and Rim Association maximum rating for 11L x 15, 6 ply tires by 58%. It is recommended that the manufacturer equip the New Holland 1033 with tires which comply with the Tire and Rim Association load rating.

Rear visibility was severely restricted by the load during transport.

Stacking: Unloading the New Holland 1033 was easy once the wagon had been aligned with the stack. A skilled operator had little difficulty backing squarely into the stack. Visibility was limited (FIGURE 9). Aligning the wheels with previous tracks or markers aided in load alignment.

For durable, stable stacks the operator usually had to dismount twice while unloading. The first dismount was just before tipping the load past vertical to ensure that the load was properly aligned. The second dismount was just after the load was backed into the stack to set the stack poles. Since the push off feet extended the complete length of the load deck fingers, and were used to push the wagon and tractor away from the stack, the wagon separated cleanly from the stack with little bale disturbance.

FIGURE 9. Limited Visibility when Backing into the Stack.

Adjustments: The load deck side panels were easily adjusted to accommodate various bale lengths. Proper adjustment of the side panels was important in maintaining a tight load. In non-uniform bales, excessively long bales sometimes jammed against the side panels as the second table delivered a tier.

Most adjustments were easily made with the tables lowered. Extreme care must be used when working under a raised table. A mechanical lock was provided for the second table.

Lubrication: The New Holland 1033 had 14 grease fittings. Eight needed daily service and six needed servicing three times weekly. A grease gun with a flexible hose was needed for two fittings. Daily servicing took about 15 minutes.

Checking the oil level in the hydraulic reservoir was inconvenient. The proper level was determined with the tables lowered, however, the reservoir cap could not be easily removed or the oil level easily determined with the second table lowered. Modifications to improve reservoir access are recommended.

RATE OF WORK

Work rate depended upon operator experience and dexterity, bale quality, field condition, transport distance, and accessibility at the stack site.

In ideal field conditions, the minimum measured loading time for 105 bales was seven minutes, when no tie tiers were placed in the load. The minimum measured loading time, when two tie tiers were placed on the load, as is normally required, was 10 minutes. Both of these times represent ideal conditions which cannot be achieved in usual field conditions.

TABLE 2 gives an indication of average work rates which can be expected with an experienced operator. The table gives an average time based on four trips in average field conditions Each trip consisted of loading, transporting and unloading 104 straw bales from a smooth field. Each one-way trip involved about 0.8 km of field travel and 0.4 km of road travel. Average round trip time for each 104 bale load was 28 minutes.

TABLE 2. Average Rate of Work

Travel to Field (1.2 km)	3 min
Load 104 Bales	17.5 min
Travel to Stack	3 min
Unload	4.5 min
TOTAL	28.0 min

POWER REQUIREMENTS

The manufacturer recommended a minimum tractor size of 37 kW. Maximum power take-off requirements were less than 11 kW and drawbar requirements on level ground were usually less than 35 kW. To fully utilize bale wagon capacity in soft hilly fields, a 50 kW tractor was needed.

OPERATOR SAFETY

The New Holland 1033 was safe to operate as long as the manufacturer's safety specifications were observed and common sense was used.

The towing tractor had to be of sufficient weight and equipped with good brakes to ensure safe road transport. Caution was also needed as the load restricted rear visibility. The tractor drawbar had to be of adequate strength to carry the heavy hitch loads. Maximum hitch weight with a full load was about 1090 kg.

With a full load, the Tire and Rim Association maximum rating for 11L x 15, 6 ply tires was exceeded by 58%. This tire overload was considered unsafe and hazardous.

The New Holland 1033 was equipped with a slow moving vehicle sign to aid in road transport safety.

OPERATOR'S MANUAL

The operator's manual was clearly written, containing much useful information on operation servicing, adjustments and safety precautions.

APPENDIX I

SPECIFICATIONS

MAKE: New Holland Automatic Bale Wagon

MODEL: 1033 Stackliner

SERIAL NUMBER: 11294

		FIELD POSITION	TRANSPORT POSITION
OVERALL DIMENSIONS:			
length		7275 mm	7275 mm
width- maximum		4700 mm	3960 mm
height- maximum		3835 mm	3835 mm
ground clearance		320 mm	320 mm
wheel base		5525 mm	5525 mm
wheel tread		1830 mm	1830 mm
TIRES:		4, 11L x 15SL, 6 ply	
		FIELD POSITION	**TRANSPORT POSITION**
WEIGHTS:			
right wheels		835 kg	960 kg
left wheels		1100 kg	1030 kg
hitch		605 kg	550 kg
	TOTAL	2540 kg	2540 kg
LOAD CAPACITY:		105 - 355 x 460 mm bales 84 - 405 x 460 mm bales 4182 kg	
PICKUP SIDE:		Left	
HYDRAULICS:			
type		self contained	
reservoir capacity		38 L	
STACK SIZE:			
height		3200 mm (7 bale widths)	
width		3 bale lengths	
LUBRICATION:			
pressure grease fittings		8, daily service 6, three times weekly service	
wheel bearings		4, annual service	
OPTIONS:			
remote control kit			
load indicator			

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

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