Evaluation Report No. E0376B
Printed: June, 1977
Tested at: Humboldt
ISSN 0383-3445

Evaluation Report 21

Farmhand Model F126-B Five-Bale Mover

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

Farmhand Model Fl26-B Five-Bale Mover

Manufacturer:

Farmhand, Inc.
Green Isle, Minnesota 55338
U.S.A.

Distributors:

Renn Sales Ltd.,
12555, 127 Ave., Edmonton
3240, 11 St. S.E., Calgary
810A, 48 St. E., Saskatoon
Gerry Henchel Implements Ltd.
5540 Portage Ave., Winnipeg

Retail Price:

$4507.00 (June, 1977, f.o.b. Saskatoon, complete with 11L x 15 tires)

Figure 1. Farmhand F126-B in Transport Position.

Figure 2. Farmhand F126-B in Loading Position.

Summary and Conclusions

The functional performance of the Farmhand Model F126-B Five-Bale mover was good for loading and hauling large round bales from the field as well as for unloading at the storage area.

The Farmhand F126-B handled firm bales effectively. Five large round bales could be loaded onto the bed without difficulty but if the average bale weight exceeded 680 kg (1500 lb) the manufacturer's maximum load rating for the wagon could be exceeded. Operator experience was needed before bales could be loaded or unloaded smoothly and in an orderly manner.

The Farmhand F126-B towed very well, when fully loaded, at speeds up to 29 km/h (18 mph). In transport position the mover trailed directly behind the tractor permitting safe road travel and easy maneuvering in confined areas.

The overall durability was good but was reduced by difficulty of unlocking the swing hitch safety pin.

In average field conditions it took an experienced operator about five minutes to load five bales while unloading and positioning five bales in the storage area took about three minutes. Field efficiency depended largely on hauling distance and the speed at which the tractor could safely travel during transport. For example, in one field of alfalfa and bromegrass it took from 16 to 21 minutes to load, transport and unload five bales and return to the field. This included 0.4 km (0.25 mile) of field transport and 0.8 km (0.5 mile) of road transport. The walking beam undercarriage permitted smooth towing on rough fields.

No safety hazards were apparent when the mover was operated according to normal recommended procedures.

Recommendations

It is recommended that the manufacturer consider:

1. Modification to the castor wheel actuator to hold the castor wheel vertical during loading and to permit sufficient castor wheel adjustment.
2. Modifying the hydraulic hitch swing actuator to make locking pin action more positive.
3. Supplying a cross piece between the uptight stakes at the rear of the bed.
4. Providing a bypass on the hydraulic circuit for the bale fork when the hitch is in transport position.
5. Modifications to prevent the wagon load rating from being exceeded with five bales, as many hay bales weigh more than 680 kg (1500 lb).

Chief Engineer: E. O. Nyborg
Senior Engineer: L. G. Smith
Project Engineer: T. G. Strilchuk

The Manufacturer States That:

With regard to recommendation number:

1. The castor wheel actuator has been modified to hold the castor wheel vertical during loading. When incorporating this new design, adjustment is provided so that proper operation of the castor wheel is possible during all operating functions.
2. The hydraulic hitch swing actuator has been modified so that the locking pin latch is actuated hydraulically rather than manually. The hitch locking latch is spring loaded to positively engage the stop both in transport and loading positions.
3. The rear stakes have been modified so that the stakes mount directly into the frame and are placed closer to the centre to eliminate bales sticking between the stakes. Additional strength is obtained by making the stakes from tubing which is more rigid than the formed angle.
4. We assume that this is to correct the problem of damage to the swing guide and tongue locking mechanism if the forks are lowered when the unit is not in loading position. To correct this problem, we have changed the frame, hitch and actuator rod so that the forks can be lowered at any position without damaging other components. In addition, the bale fork hydraulic circuit now has a 6000 kPa (900 psi) pressure release on the downstroke side of the bale fork cylinder. When the hitch is in transport position, full system hydraulic pressure is not available to the bale fork cylinder.
5. When Farmhand tested the original prototype of the mover, the largest 1525 to 1825 mm (5 to 6 ft) bales weighed a maximum of 680 kg (1500 lb). Since then, larger balers are making bales up to 900 kg (2000 lb). The frame strength has been increased over our first models and considerable testing has been done on bales weighing up to 930 kg (2050 lb) with no structural strength problems. Our experience has shown that most bales range from 500 to 900 kg (1100 to 2000 lb). No modifications are needed to the mover to handle bales in this range.

Additional comments are as follows:

The improvements, mentioned in the replies to the above recommendations, have been incorporated on prototype machines and will be included in the next production run.

In addition, the following modifications have also been made to improve operation and reliability of the bale mover:

1. The castor wheel actuator rod has been modified to slide along the frame, thus eliminating the need for a rod end bearing at the castor wheel and also eliminating bending of the actuator rod by the bale fork.
2. The hitch swing cylinder now has a longer stroke to provide more power to the swing hitch and incorporates a new, more positive latch design.
3. Hitch rollers have been provided to aid in smooth swinging of the hitch.
4. The castor wheel bracket has been modified to eliminate the top casting and to increase strength.
5. The rear stakes are now removable by simply pulling spring loaded locking pins and lifting the stakes out of their pockets.

General Description

The Farmhand Model F126-B Five-Bale Mover (Figures 1 & 2) is a self-loading, non-tilting, fixed bed, four wheel trailer, equipped with a single axle, walking beam undercarriage. Bales are picked up on the right side of the tractor with a hydraulic fork and are placed on the conveyor on end. A 46 kW (60 hp) tractor, or larger, equipped with dual hydraulics, is needed.

The bed consists of two guide rails spaced at 1245 mm (49 in) and a centre chain rail. The swing-hitch pivots from the front of the bed, swinging outward for loading and inward for transport. With a bed length of 8500 mm (27.9 ft) the mover holds up to five bales. Bales are moved along the bed by the hydraulically driven transfer chain on the centre rail.

Complete specifications are found in Appendix I.

Scope of Test

The Farmhand F126-B was operated in typical prairie fields (Table 1) for 104 hours while moving about 500 large round bales.

It was evaluated for ease of operation, quality of work, operator safety and suitability of the operator's manual.

Table 1. Operating Conditions

Crop	Hours	Field Topography	Field Condition
Native Grassland	17	Moderately rolling	Rough
Alfalfa	21	Gently rolling	Smooth
Wheat Straw	37	Gently undulating	Slightly ridged
Alfalfa, Bromegrass and Crested Wheatgrass	29	Gently rolling	Rough, occasional stones

Results and Discussion

EASE OF OPERATION

Hitching: The Farmhand F 126-B has an adjustable clevis hitch at the end of the tongue which is used to obtain proper fork height for loading. A proper size hitch pin with suitable locking device made the hook-up reliable and safe. Four hydraulic hoses and the hitch swing rope also had to be connected to the tractor.

Loading: The Farmhand F126-B is placed into loading position with a pull rope which simultaneously draws back

the tongue safety pin and operates a hydraulic shift valve. After checking that the bale fork is raised to clear the tongue, the appropriate tractor hydraulic control is actuated to swing the hitch sideways. The bale fork must not be lowered while the mover is in transport position. Lowering, in error, will cause bending of the swing guide and bending and malfunction of the tongue locking mechanism.

Bales are approached from the end with the centre rail aligned with the bale axis and with the bale fork lowered to ground level. The fork straddles the bale as the tractor moves forward. When the fork is fully under the bale, it is raised with the lift cylinder, placing the bale on end on the front of the bed. The bale is then moved backward about 1600 mm (5.5 ft) by actuating the bed transfer chain.

Successive bales are loaded in the same way until the bed contains five bales. A straight approach is required for good loading. Slight misalignment can be corrected by butting the approached bale with the fork.

Operator experience was needed before bales could be loaded without stopping the tractor. Upon approaching a bale, the tractor speed is reduced just as the fork is lowered to ground level. The fork is then raised just as the bale enters the full depth of the fines. The bale is placed on the bed and moved backward enough to allow space for the next bale. Raising the fork late caused the oncoming bale to skid on the ground sometimes damaging the twines. If the bale was not moved back far enough on the bed, the oncoming bale wedged against the bale already on the bed, peeling back the outer surface of one bale. If the bale was moved back too far on the bed, there was not enough bed room to hold five bales.

Bales at field edges could be picked up by approaching the bale crossways and loading it crossways against a bale already on the bed. Safe loads could be formed by placing no more than one bale this way between two on end. Alternatively, such bales could be retrieved with the fork and brought into the field where they could be loaded in the regular way.

Some bale damage occurred when loading loose, poorly wrapped bales. The outer edges frayed when the bale was tipped upward onto the bed (Figure 3). No damage occurred to firm, well wrapped bales.

Figure 3. Loose, Poorly Wrapped Bales Damaged Slightly During Loading.

The manufacturer's maximum load rating for the wagon was five 680 kg (1500 lb) bales. If average bale weight was more than 680 kg (1500 lb), the maximum load rating could be exceeded with five bales. Since many bales weigh more than 680 kg (1500 lb) it would be desirable to increase the load rating of the wagon.

Transporting: When the wagon is fully loaded (Figure 4) the hitch is swung to transport position (Figure 5). The bale fork must be left in the raised position to hold the last bale against the load and to allow the hitch to swing into transport position. The hitch is swung by holding the pull rope, which simultaneously disengages the lock pin and operates the shift valve, while engaging the appropriate tractor hydraulic control. The tongue locks into transport position when the rope is released. A permanently mounted slow-moving vehicle sign is attached to the rear of the mover for road transport.

Figure 4. Farmhand F126-B Fully Loaded in Field Position.

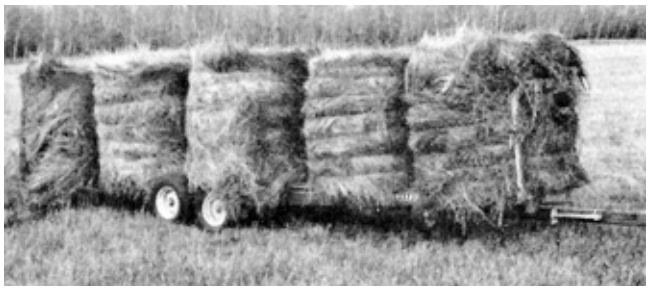

Figure 5. Farmhand F126-B Fully Loaded in Transport Position.

The Farmhand F126-B towed well on rough fields and trailed well on roadways at speeds up to 29 km/h (18 mph). The walking beam undercarriage permitted field transport speeds up to 9.6 km/h (6 mph). The Farmhand F126-B trailed directly behind the tractor giving ample side clearance for narrow roadways. The length of the mover necessitated care in crossing sharp gullies or ravines.

Hay loss during transport was insignificant for firm, well wrapped bales. Some loss occurred with ragged or poorly wrapped bales. Significant hay losses occurred with bales which had not been wrapped with twine as the outer layer of hay would unfurl.

Placement: For unloading from the front, the mover must be placed in loading position. The bale fork is lowered about 30° from its uptight position and the rail chains are engaged to advance the load forward until the first bale drops into the fork (Figure 6). The fork is then lowered to the ground setting the bale in the same orientation as in the field. The mover is then backed up until the tines are free from the bale and the fork is again raised to accept the next bale. This procedure is repeated for the remaining bales. This method was very successfully used to set bales in rows with a uniform space between bales (Figure 7). Butting bales tightly together required more manipulating. Each time a bale was lowered to the ground, the mover had to be moved forward to butt the bale in to the row.

It was sometimes difficult to advance the last bale on the bed as it occasionally jammed between the rear stakes. Jamming occurred if the bales were moved too far rearward during loading. A cross member between the rear stakes would eliminate this problem.

Depending on operator preference, any row spacing could be obtained. With an experienced operator, rows could be tightly placed together (Figure 8). Bales could also be unloaded from the rear by unbolting the safety stakes and running the rail chain in reverse. Bales are dropped off the rear and are not placed in the same orientation as in the field, leading to additional weathering. Visibility during rear unloading is poor making it difficult to place bales in orderly fashion.

Figure 6. Unloading the Farmhand F126-B from the Front.

Figure 7. Pairs of Bales Butted Together with a Space Between Pairs.

Figure 8. Rows of Bales Placed Closely Together.

QUALITY OF WORK

The Farmhand F126-B was effective in picking large round bales, transporting them and placing them in the storage yard. Both the quality of work and the rate of work were very dependent on operator experience.

Damage to firm bales was insignificant. Hay loss occurred only when hauling loose or untied bales.

The Farmhand F126-B, wlien unloaded from the front, placed bales in the same orientation as they were picked. This left the weathered outer shell undisturbed to shed moisture, resulting in negligible increased spoilage due to handling. If bales are to be unloaded from the rear of the bed, it is recommended that they be moved to storage soon after baling to eliminate the possibility of weathering on two sides since in rear unloading bales are placed randomly.

Table 2 gives an indication of expected work rate with an experienced operator. This table gives the average time, based on five trips, to load, transport and place a load of five large round brome-alfalfa bales from a rough field yielding 2.2 t/ha (1 ton/ac). Each one-way trip involved 0.4 km (0.25 mile) of travel from the field to the grid road and 0.8 km (0.5 mile) of road travel. As can be seen, even for a short haul, most time is spent in transport rather than in loading or unloading.

Table 2. Average Rate of Work

Travel to Field (1.2 km)	4.6 Min
Load Five Bales	4.9 Min
Travel to Storage Yard (1.2 km)	5.0 Min
Unload Bales	3.2 Min
Round Trip	17.7 Min

OPERATOR SAFETY

The Farmhand F126-B was safe to operate if the manufacturer's safety precautions were observed. Bystanders should not stand near the tongue or pickup fork or on the mover during, operation. Maintenance should not be carried out with a full or partial load. Large bales can cause severe injury.

The towing tractor should be sufficiently heavy and equipped with good brakes for road transport with a full load. The manufacturer recommends a minimum 46 kW (60 hp).

The Farmhand F126-B was equipped with adequately sized tires. Individual tire loads, calculated for a fully loaded wagon with five 680 kg (1500 lb) bales, were 15% less than the Tire and Rim Association Standard maximum rating for 11L x 15, 8 ply tires.

OPERATOR'S MANUAL

The operator's manual clearly outlined set-up, operation, adjustment and maintenance. It was well illustrated and easy to understand. The manual also provided a comprehensive parts list.

Durability Results

Table 3 outlines the mechanical history of the Farmhand F 126-B Five-Bale Mover during 104 hours of operation while moving about 500 large round bales. The intent of the test was evaluation of functional performance. The following failures represent only those which occurred during functional testing. An extended durability evaluation was not conducted.

Table 3. Mechanical History

Item	Hours	Number of Bales
The castor wheel actuator pipe required adjustment at	5	65
The castor wheel swivel axle broke and was replaced at	47	285
The rail chain stretched and required tightening at	5 & 72	65 & 365
Links were removed from the rail chain to permit sufficient tightening at	23	200
The tongue hydraulic shift mechanism and lock required adjustment at	11 & 85	130 & 440

Discussion of Mechanical Problems

Castor Wheel: The castor wheel actuator was adjusted to its limit to hold the castor wheel vertically, but the castor wheel would not retain this position with the weight of an oncoming bale (Figure 3). This contributed to the swivel axle failure.

Tongue Swing Mechanism: It was sometimes difficult to swing the hitch from its locked position. The locking pin could not be pulled away from its stop. This was corrected each time by adjustment of the actuating cable to allow the shift valve to relieve pressure on the locking pin.

Rail Chain: The rail chain required removal of links once and had to be tightened twice during the test.

APPENDIX I
SPECIFICATIONS

Model: Farmhand Model F 126-B Five Bale Mover

Pickup Side: Right

Dimensions:	
-Length	10,795 mm (425 in)
-Width (road)	2438 mm (96 in)
-Bed Height	698 mm (27.5 in)
Length	8509 mm (335 in)
-Bed Rail Width	1244 mm (49 in)
-Ground Clearance	330 mm (13 in)
-Wagon Tires	4, 11L x 15, 8ply
-Castor Wheel Tire	1, 7.50 x 16, 6 ply
Hydraulics:	
-Tongue Cylinder	
-Bore	63 mm (2.5 in)
-Stroke	203 mm (8 in)
-Retracted Length	514 mm (20.25 in)
-Port Size	2, 1/2 NPTF
-Fork Cylinder	
-Bore	76 mm (3 in)
-Stroke	559 mm (22 in)
-Retracted Length	838 mm (33 in)
-Port Size	2, 1/2 NPTF
Weight: (unloaded)	
-Left Wheels	563 kg (1242 lb)
-Right Wheels	561 kg (1238 lb)
-Hitch	260 kg (575 lb)
TOTAL	1385 kg (3055 lb)
Load Capacity:	3400 kg (7500 lb)
Tractor Requirements:	
-Manufacturer Recommended Minimum Size	46 kW (60 hp)
-Hydraulics	Dual
-System Pressure	8000 kPa (1200 psi)

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 (t)	= 2 204.6 pounds (lb)
1 tonne/hectare (t/ha)	= 0.45 ton/acre (ton/ac)
1 metre (m) = 1000 millimetres (mm)	= 39.37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds (lb)
1 kilopascal (kPa)	= 0.15 pounds/square inch (psi)

ALBERTA FARM MACHINERY RESEARCH CENTRE
3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html

Prairie Agricultural Machinery Institute
Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:
P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
Fax: (204) 239-7124

P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
Fax: (306) 682-5080