

Evaluation Report

611



Deutz-Allis GP 2.50 Round Baler

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

DEUTZ-ALLIS GP 2.50 ROUND BALER

MANUFACTURER:

Deutz-Allis Corporation
5295 Triangle Parkway
Norcross, Ga 30092
Phone: (404) 447-5546

DISTRIBUTOR:

Deutz-Allis Corporation
515 Dewdney Avenue
Regina, Saskatchewan
Phone: (306) 757-2681

RETAIL PRICE:

\$17,714.00 (August 1989, f.o.b. Portage la Prairie, Manitoba)
with standard pickup gauge wheels and automatic chain oiler; not including pickup baffle plate.

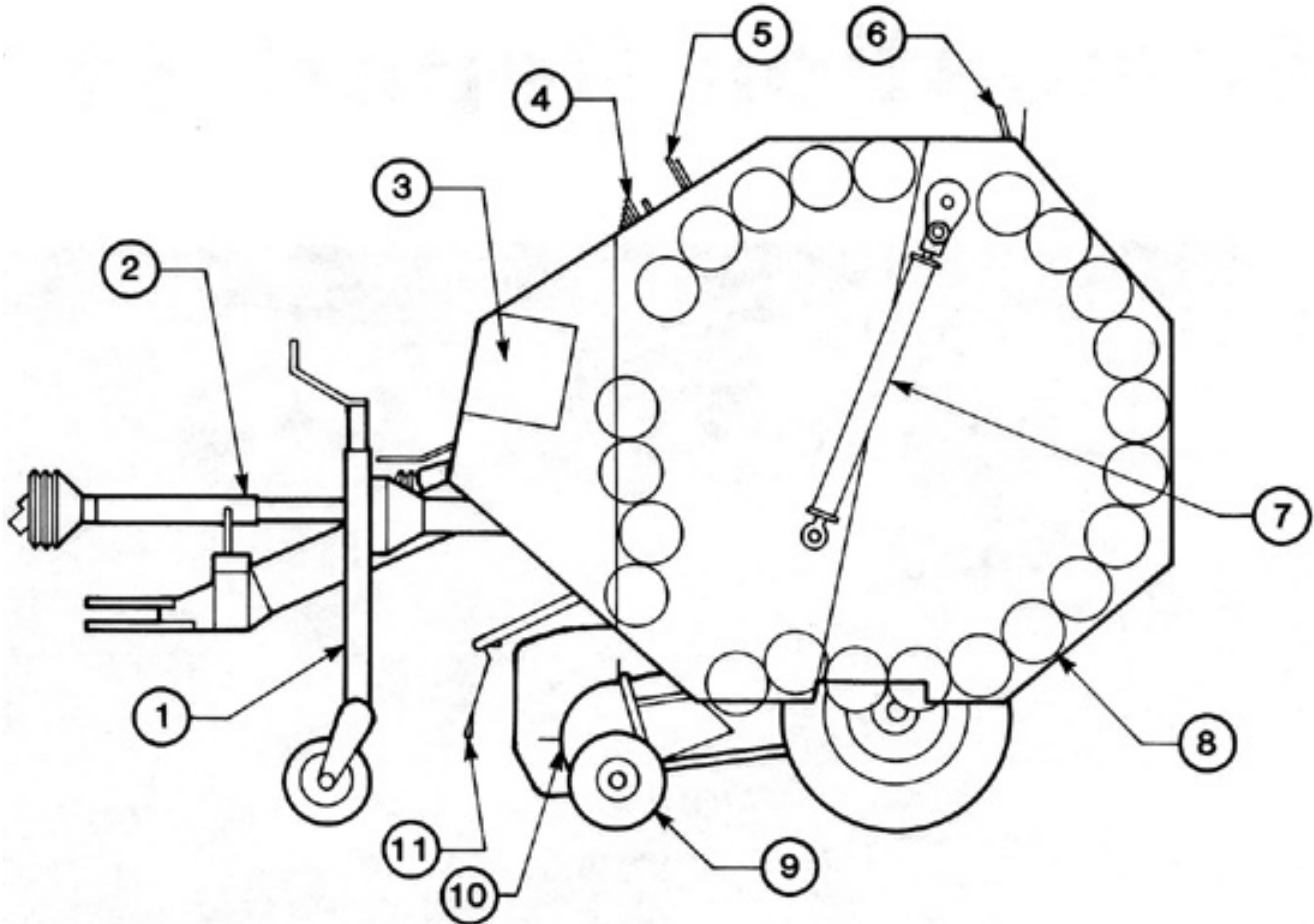


FIGURE 1. Deutz-Allis GP 2.50 Round Baler: (1) Wheeljack, (2) PTO Shaft, (3) Twine Box, (4) Twine Wrapping Mechanism, (5) Bale Size Indicator, (6) Tail Gate Closed Indicator, (7) Tail Gate Hydraulic Cylinder, (8) Rollers, (9) Pickup Gauge Wheels, (10) Pickup, (11) Optional Pickup Baffle Plate.

SUMMARY AND CONCLUSIONS

Rate of Work: Typical throughput of the Deutz-Allis 2.50 varied from 1.9 ton/h (1.7 t/h) in barley straw to 8.3 ton/h (7.5 t/h) in alfalfa. Throughput was usually limited by pickup and feeding performance rather than by bale chamber capacity.

Quality of Work: Bale quality was very good, with well formed and durable bales in all conditions except short straw. In this case, bale quality was fair to good due to poor bale durability as a result of limiting bale density pressure. Hay bales weighed from 800 to 1100 lb (360 to 500 kg) and straw bales weighed from 500 to 700 lb (230 to 320 kg).

Resistance to bale moisture penetration and spoilage was very good. Total leaf loss was 5.8% at a 17% moisture content which was considered good.

Ease of Operation: Ease of bale forming, transporting, hitching, feeding and twine threading was very good; ease of bale discharging was good; and ease of twine wrapping was fair. Starting and forming a bale was very easy with the Deutz-Allis 2.50. In short straw, the bale density pressure had to be limited or the bale would stop rolling in the chamber.

The twine cut-off mechanism was inconsistent. Frequent twine wrapping misses resulted when operating the baler in windy condi-

tions. The twine wrapping mechanism worked very well when there was no wind. The operator was required to stop forward motion of the tractor once the wrapping operation began. Occasionally, the ramps did not roll the bale far enough to clear the bale from under the tailgate. A bale could be wrapped and discharged in about 30 to 40 seconds.

Feeding was positive and aggressive in all crops. Overloading the bale chamber or the pickup caused the appropriate shearbolt to break.

Ease of Adjustment: Ease of adjusting the roller drive chains and the pickup was very good, and ease of lubricating was excellent. Weekly servicing took one person about 15 minutes.

Power Requirements: Peak power requirements were about 60 hp (45 kW) in hay and straw on level fields. An 80 hp (60 kW) tractor was needed to fully utilize baler capacity on soft and hilly fields.

Operator Safety: Operator safety on the Deutz-Allis 2.50 was very good if normal safety precautions were observed.

Operator's Manual: The operator's manual was fair. It contained important information but lacked detail in places.

Mechanical History: A pickup cam track retainer clip fell off most of the pickup teeth required replacement and several shear pins were broken.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the twine wrapping system to improve reliability.
2. Supplying a safety chain with the baler.

Station Manager: B. H. Allen

Project Engineer: D. J. May

THE MANUFACTURER STATES THAT

With regard to the recommendations:

1. Twine wrapping production changes include larger twine feed openings into the bale chamber. The larger openings allow the twine arms to drop the free ends of the twine further down into the chamber to contact the rotating bale for positive wrapping.
2. A safety tow chain is standard equipment on new production balers.

GENERAL DESCRIPTION

The Deutz-Allis 2.50 is a pull-type, 540 rpm PTO driven baler with a cylindrical baling chamber and a floating drum pickup. The twine wrapping mechanism uses dual twine arms and is actuated automatically.

Material is fed directly into the 4.0 ft (1.2 m) wide baling chamber by the pickup. The baling chamber is a fixed chamber type with twenty-one, 8 in (200 mm) diameter steel rollers about the circumference of the bale chamber. Bales are wrapped automatically with twine upon reaching a predetermined density and ejected hydraulically from the tractor seat.

The machine supplied to PAMI was equipped with pickup gauge wheels, automatic chain oiler and optional pickup baffle plate. A net wrapping option was also available but not tested.

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

SCOPE OF TEST

The Deutz-Allis 2.50 was operated in a variety of crops (TABLE 1) for 171 hours, while producing 2443 bales. It was evaluated for rate of work, quality of work, ease of operation, ease of adjustment, power requirements, operator safety, and suitability of the operator's manual. In addition, mechanical problems were monitored throughout the test.

TABLE 1. Operating Conditions

CROP	OPERATING HOURS	NUMBER OF BALES	EQUIVALENT FIELD AREA	
			ac	(ha)
Alfalfa	39	580	245	(99)
Alfalfa-Bromegrass	14	184	50	(20)
Alfalfa-Timothy	25	76	93	(38)
Green Feed	24	412	130	(53)
Brome Grass	11	160	40	(16)
Reed Canary Grass	12	221	75	(30)
Oat Straw	27	450	130	(53)
Wheat Straw	13	114	80	(32)
Barley Straw	6	45	40	(16)
TOTAL	171	2443	883	(357)

RESULTS AND DISCUSSION

RATE OF WORK

Throughput depended on windrow size, uniformity of crop conditions, field surface, available tractor speeds and operator skill. Typical throughputs for the Deutz-Allis 2.50 (TABLE 2) varied from 1.9 ton/h (1.7 t/h) in barley straw to 8.3 ton/h (7.5 t/h) in alfalfa. The values in Table 2 are based on average workrates for daily field operation. Peak workrates during any one day were generally 10 to 20% higher.

In most crops, the feedrate was primarily limited by windrow size and pickup/feeding performance. In lighter crops, the ground speed was normally limited to about 8 mph (13 km/h) due to rough ground and pickup performance.

The automatic start on the twine wrapping cycle and the dual twine arms made wrapping very fast, thus improving the throughput.

TABLE 2. Typical Throughput

CROP	CROP YIELD		DAILY AVERAGE THROUGHPUT	
	ton/ac	(t/ha)	ton/h	(t/h)
Alfalfa:				
Field A	0.5	(1.1)	2.6	(2.4)
Field B	1.1	(2.5)	8.3	(7.5)
Alfalfa-Bromegrass	1.3	(2.9)	5.6	(5.1)
Alfalfa-Timothy	1.3	(2.9)	4.0	(3.6)
Green Feed	1.1	(2.5)	6.0	(5.4)
Bromegrass	1.6	(3.6)	5.8	(5.3)
Reed Canary Grass	1.2	(2.7)	7.4	(6.7)
Oat Straw	1.0	(2.2)	5.5	(5.0)
Wheat Straw	0.4	(0.9)	2.7	(2.4)
Barley Straw	0.3	(0.7)	1.9	(1.7)

QUALITY OF WORK

Bale Quality: Bale quality was very good. The Deutz-Allis 2.50 produced firm, durable bales with flat ends and uniform diameter in all hay crops (FIGURE 2). Handling the bales when transporting did not present a problem. The overall bale quality depended greatly on the operator's experience. Failure of the operator to evenly feed both sides of the baler in light windrows sometimes resulted in barrel or cone-shaped bales.

A typical hay bale averaged 4.1 ft (1.2 m) in width and 4.9 ft (1.5 m) in diameter. Bales usually settled to about 88% of their original height after 110 days. Average hay bales weighed from 800 to 1100 lb (360 to 500 kg) with average densities ranging from 10.2 to 14.0 lb/ft³ (163 to 224 kg/m³). Average straw bales weighed from 500 to 700 lb (230 to 320 kg) with average densities from 6.1 to 8.5 lb/ft³ (98 to 136 kg/m³).

Bale Weathering: Resistance to bale weathering was very good. During a period of 110 days, over which total rainfall was measured at 6.1 in (154 mm), moisture penetrated to a maximum of 1.5 in (38 mm) in the area where the bale touched the ground. Spoilage occurred to a depth of 0.8 in (20 mm) on top of the bale which was considered very good.



FIGURE 2. Typical Hay Bale.

Leaf and Stem Loss: The Deutz-Allis 2.50 was tested for leaf and stem loss in an average crop of alfalfa, which had been cut with a 14 ft (4.3 m) mower conditioner. Average crop yield was about 1.5 ton/ac (3.4 t/ha). Total leaf and stem loss was 5.8% at a 17% moisture content which was considered good.

The importance of baling at a high moisture content on losses can be noted in FIGURE 3. This figure represents an accumulation of previous data for several round balers showing the total measured leaf and stem loss over a range of moisture contents, in fields of mixed alfalfa, crested wheatgrass and bromegrass. Although the Deutz-Allis 2.50 was tested in a different crop, it had average leaf and stem losses when compared to most other balers tested.

FIGURE 3 does not include the relative effects of baling unconditioned or light windrows. Heavy, conditioned windrows are important to minimize losses. Lowering PTO speed is also effective in reducing the number of times the bale is turned in the chamber, and consequently reduces leaf loss.

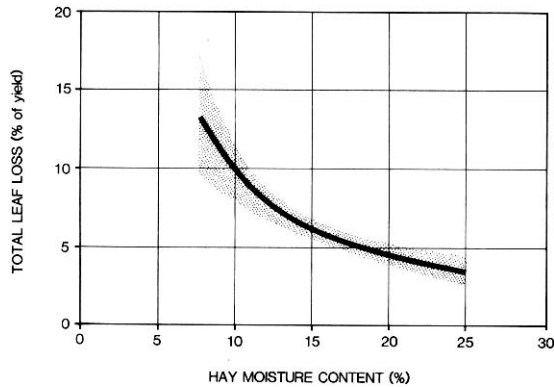


FIGURE 3. Typical Round Baler Leaf and Stem Loss in Mixed Alfalfa, Crested Wheatgrass and Bromegrass.

EASE OF OPERATION

Bale Forming: Ease of bale forming on the Deutz-Allis 2.50 was very good in most crops. Feeding hay across the entire width of the bale chamber by weaving during bale core formation was not critical as the hay tumbled within the bale chamber, distributing itself quite evenly across the chamber.

Alternate side to side feeding, to a count of at least ten at each side, was required during the later stages of bale formation to produce bales of uniform diameter. FIGURE 4 shows stages of the bale formation in the Deutz-Allis.

The manufacturer provided a drive bar kit for use when baling short, dry and smooth crops. The baler appeared to work well in these crops with or without the drive bar kit. It was found that decreasing the PTO speed and baling during late evening or morning when the straw was slightly damp, improved the performance.

Twine Wrapping: Twine wrapping on the Deutz-Allis 2.50 was fair. It was mechanically actuated and totally automatic.

When the full size bale reached the predetermined density a buzzer sounded and the red control lamp lit up telling the operator to stop so the bale could be tied. The swing arms (FIGURE 5) dropped down so the free ends of twine fell into the rotating bale. The swing arms moved the twine back and forth across the baler as the bale turned in the bale chamber thus wrapping it. The operator could select either single or double tying by moving a lever on the baler. Either single or double tying overlapped the twine on about the centre 18 in (460 mm) of bale. The rate of movement of the swing arms was determined by a stepped pulley which the twine was wrapped around. A large pulley diameter resulted in closely spaced twine wraps. The distance from the edge of the bale to the outside wraps could be adjusted by moving a guide arm on either side of the baler.

The twine wrapping mechanism was inconsistent. In some fields every bale was tied properly, while in other fields only about half the bales were tied without the operator having to leave the tractor seat. A light wind would blow the loose ends of twine such that they caught on the mechanism instead of dropping into the bale chamber. It is recommended that the manufacturer consider modifying the twine wrapping system to improve reliability.

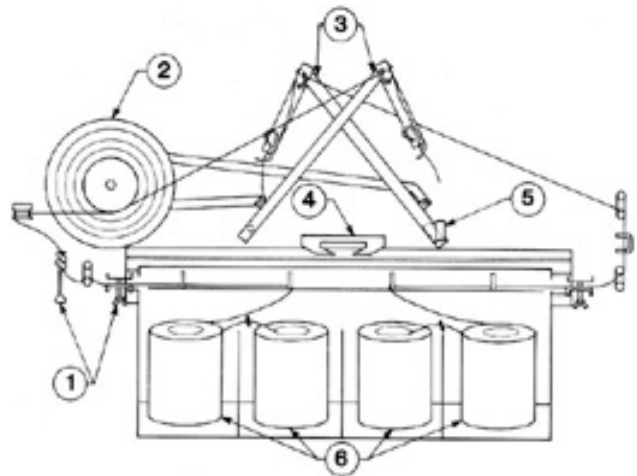


FIGURE 5. Tying Mechanism: (1) Twine Tensioners, (2) Stepped Pulley, (3) Swing Arms, (4) Twine Knife, (5) Single or Double Wrap Switch, (6) Twine.

The twine usage was independent of the PTO speed. Full PTO speed was maintained throughout the tying cycle to reduce the tying time. At maximum density the minimum and maximum twine usage ranged from 280 to 1120 ft/ton (90 to 380 m/t). Most operators preferred a wrap cycle which consumed about 530 ft/ton (180 m/t). This produced a durable bale which could be handled several times. Typical twine consumption for small square balers is about 670 ft/ton (230 m/t). In short straw more twine was required to produce bales of adequate durability. If the end wraps of twine on straw bales were less than about 7.0 in (180 mm) from the end, the twine would usually slip off the ends during wrapping or when the bale was discharged. Twine requirements varied with the type of crop, type of twine and the desired durability.

Bale Discharging: Ease of bale discharging was good. Once the twine was cut, the PTO was allowed to turn and the gate was hydraulically opened, ejecting the bale. The baler was equipped with bale ramps so the bale would roll away from under the tail gate. Occasionally the bale would not roll far enough and the tailgate would be lowered on top of the bale. The bale was wrapped and discharged in about 30 to 40 seconds.

Transporting: Ease of transporting and maneuvering was very good. Ground clearance was adequate and there was ample hitch clearance for turning sharp corners. Care was necessary when backing up or transporting on roadways due to obstructed visibility to the rear. The baler could be easily towed behind a tractor or suitably sized truck. The pickup was raised and lowered hydraulically from the tractor seat.

Hitching: Ease of hitching the Deutz-Allis 2.50 was very good. The jack wheel could be swung up out of the way as soon as it was clear of the ground. Full retraction of the jack wheel was important to prevent

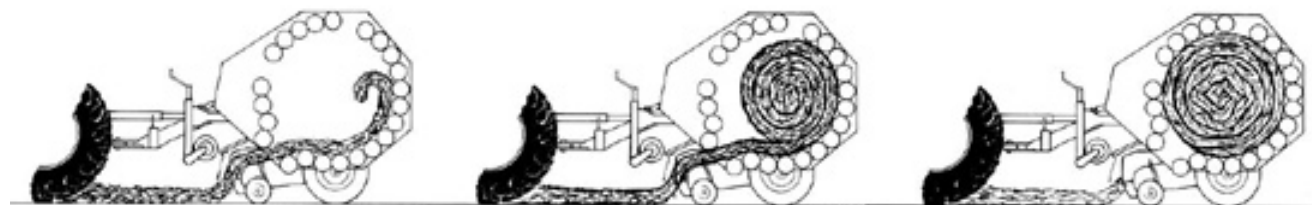


FIGURE 4. Stages of Bale Formation: (Left) Starting Bale, (Centre) Partially Completed Bale, (Right) Completed Bale.

it from dragging in the windrow. The constant velocity PTO shaft eliminated driveline chatter while turning corners.

Feeding: Pickup performance of the Deutz-Allis 2.50 was very good. It was positive and aggressive in all crops with only infrequent plugging. A pickup shear pin prevented overloading of the windrow pickup.

Twine Threading: Ease of twine threading was very good. It could easily be performed manually without the need for mechanical aids.

EASE OF ADJUSTMENT

Roller Drive Chains: Ease of adjusting tension on the roller drive chains was very good. Chain tension was provided by an adjustable spring tensioner on five of the six drive chains. The spring tensioners were adjusted twice during the 171 hour test. Each tensioner took one person about five minutes to adjust.

Pickup: Ease of adjusting the pickup was very good. Pickup floatation was provided by an adjustable spring on each side of the baler. The pickup height was adjusted with a pin through the appropriate hole on the gauge wheel linkage on each side of the baler. The pickup was adjusted so the tines had a clearance of about 1.0 in (2.5 cm). The floatation springs were adjusted to carry as much weight as possible without excessive pickup bounce. Once proper settings were determined, no further adjustments were required throughout the test. Typical pickup height adjustment took one person about two minutes while floatation spring adjustment took one person about ten minutes.

Lubricating: Ease of lubricating the test machine was excellent. The Deutz-Allis 2.50 had 6 drive chains, 12 grease fittings and 1 gear box. The baler was equipped with the optional central lubrication system for oiling the drive chains. The reservoir should be checked daily and topped up with chain oil when required. The operator's manual recommended weekly lubrication of all grease fittings. It also recommended that the gearbox oil be changed at the end of each season. Complete weekly servicing took one person about 15 minutes.

POWER CONSUMPTION

Power Requirements: FIGURE 6 shows the PTO and drawbar power requirements for the Deutz-Allis 2.50. The power input is plotted against bale weight to show the power requirements while a bale is formed. PTO requirements varied from 3.3 hp (2.5 kW) at no load to a maximum of 58 hp (43 kW) in alfalfa. Drawbar requirements at 2.2 mph (3.5 km/h) on flat firm fields were about 1.7 hp (1.3 kW) when the bale reached maximum size. Although maximum horsepower requirements did not exceed 60 hp (45 kW) additional power was needed to suit some field conditions such as soft hilly fields. To fully utilize baler capacity, PAMI recommends a tractor of at least 80 hp (60 kW) in order to have sufficient power reserve in all field conditions.

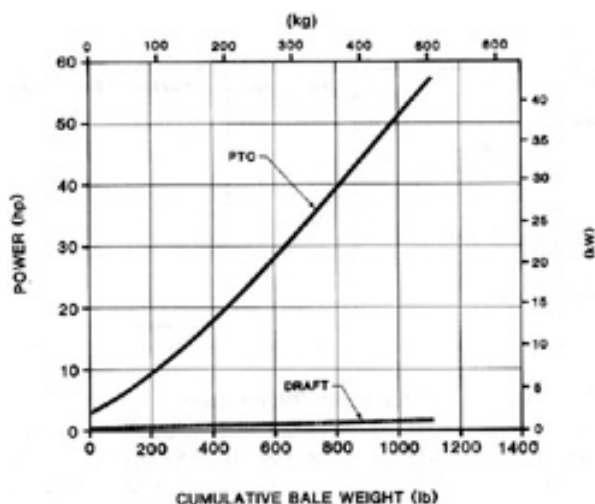


FIGURE 6. Power Consumption During Bale Formation in Alfalfa.

Specific Capacity: Specific capacity is a measure of how efficiently a machine performs a task. A high specific capacity indicates efficient

energy use. The specific capacity of the Deutz-Allis 2.50 was measured at 0.24 ton/hp-h (0.29 t/kW-h) in alfalfa at a workrate of 8.9 ton/h (8.1 t/h). This specific capacity was greatly influenced by the workrate. At a workrate of 12.6 ton/h (11.4 t/h) a specific capacity of 0.34 ton/hp-h (0.42 t/kW-h) could be expected. The typical range of specific capacities for small square balers in alfalfa is 0.6 to 1.2 ton/hp-h (0.7 to 1.4 t/kW-h).

OPERATOR SAFETY

Overall operator safety on the Deutz-Allis 2.50 was very good. The operator is cautioned that a round baler is potentially very dangerous. The operator must disengage the PTO and stop the tractor engine to clear blockages or to make adjustments.

Many serious and fatal accidents have occurred with round balers. Most of these are caused by operators dismounting from the tractor while leaving the baler running. The manufacturer can only go to certain limits in providing shielding and safety devices and must rely on the operator's common sense in following established safety procedures.

The Deutz-Allis 2.50 conformed to ASAE safety standards. It was safe to operate and service as long as common sense was used and the manufacturer's safety recommendations were followed. Rotating parts were well shielded. The pickup and feeding area were well guarded to discourage operators from attempting to clear blockages with the baler in operation. The safety shields were conveniently hinged so they did not have to be completely removed.

The Deutz-Allis 2.50 had rear gate cylinder locks to permit safe servicing with the rear gate open. A safety chain was not provided by the manufacturer nor was one available as optional equipment. It is recommended that the manufacturer consider supplying a safety chain with the baler.

A slow-moving-vehicle sign was provided with the baler. The baler was also equipped with signal and brake lights for use on a highway. These lights used a common seven-conductor electrical connector.

OPERATOR'S MANUAL

The operator's manual was fair. It contained important information on operation, servicing, adjustments, optional equipment and safety procedures, but lacked detail in some places.

MECHANICAL HISTORY

The Deutz-Allis 2.50 was operated for 171 hours while baling 2443 bales. The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted. TABLE 3 outlines those problems which occurred during functional testing.

TABLE 3. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA	
		ac	(ha)
Retainer clip on left side of pickup fell off and was replaced at:	48	178	(72)
Pickup teeth broke and were replaced at:	112	633	(256)
Several shear pins broke and were replaced:		throughout the test	

DISCUSSION OF MECHANICAL PROBLEMS

Retainer Clip: The retainer clip which held the left pickup cam track in place fell off. This allowed the tooth bar rollers to jump out of the track and made the pickup inoperative. It was repaired by putting the tooth bar rollers back into the track while squeezing the ends of the pickup drum together. A new retainer clip was installed. No further problems were encountered with the cam track and rollers. The repair took two people about two hours to complete.

Pickup Teeth: Early in testing, a pickup tooth broke and eventually became jammed between two adjacent pickup strippers. The jammed

tooth caused other teeth to break and become jammed. This led to a chain reaction which caused nearly all of the teeth to break. The pickup was repaired by removing the strippers as well as broken teeth and springs. New teeth were installed and the strippers replaced. This repair took one person about three hours.

Shear Pins: Several times throughout the test, the twine had to be rethreaded. If the automatic twine trip mechanism was not properly set it could not be tripped automatically when the bale reached full size. This caused the bale chamber to continue filling until the overload shear pin broke, thus protecting the baler. The shear pin was easily replaced with a new one provided by the manufacturer. It took one person about five minutes to replace the shear pin.

APPENDIX I	
SPECIFICATIONS	
MAKE:	Deutz-Allis
MODEL:	GP 2.50
SERIAL NUMBER:	6820 1241
MANUFACTURER:	Deutz-Allis Corporation, Norcross, Georgia
DIMENSIONS:	
-width	7.6 ft (2.3 m)
-height	7.6 ft (2.3 m)
-length	15.0 ft (4.6 m)
-ground clearance	9.0 in (230 mm)
TIRES:	
-undercarriage	two, 11 - 15 SL, 8 ply
-pickup	two, 15 X 6.00 X 6
WEIGHT:	
-left wheel	1874 lb (850 kg)
-right wheel	2035 lb (923 kg)
-hitch point	522 lb (237 kg)
Total:	4431 lb (2010 kg)
BALE CHAMBER:	
-type	chain driven pressure rollers rotating on sealed bearings at ends and driven at left side
-width	4.0 ft (1.2 m)
-maximum diameter	5.0 ft (1.5 m)
-bale density control	tension spring
-bale peripheral speed (540 rpm)	4.1 mph (6.6 km/h)
ROLLERS:	
-type	steel ribbed rollers
-number	22 pressure rollers, 1 floating intake feed roller
-length	4.0 ft (1.2 m)
-diameter	7.4 in (188 mm)
-speed	185 rpm
-peripheral speed	4.1 mph (6.6 km/h)
BALE SIZE INDICATOR TYPE:	indicator rod moving up and down along the scale
TAIL GATE CLOSED INDICATOR:	mechanical indicator on top of baler
PICKUP:	
-type	fully floating, cylindrical drum with spring teeth
-height adjustment	pin through hole on gauge wheel linkage
-width	4.0 ft (1.2 m)
-diameter	22 in (560 mm)
-number of tooth bars	four, 22 teeth per bar
-speed (at 540 PTO rpm)	94 rpm
-tooth tip speed (540 rpm)	6.2 mph (9.9 km/h)
TWINE SYSTEM:	
-capacity	4 balls
-type	mechanically actuated wrap
-recommended twine	sisal or plastic
-twine feed	dual twine guide pendulum arms with speed controlled by stepped pulley
-twine cutter	knife moves into path of twine after one or two passes of twine arms as set by operator
DRIVES:	
-number of chain drives	6
-number of gear drives	1

-number of constant velocity joints	2
SAFETY DEVICES:	
-main drive shearbolt	
-pickup shear pin	
-rear gate cylinder locks	
-hinged safety shields	
LUBRICATING:	
-grease	12 weekly
-oil	top off automatic oiler daily change gearbox oil at end of each season
TRACTOR HOOK-UP:	
-connections	single remote hydraulics (one hose) one electrical cable one, 7 conductor light cable
-hitch height	totally variable

APPENDIX II	
MACHINE RATINGS	
The following rating scale is used in PAMI Evaluation Reports	
excellent	fair
very good	poor
good	unsatisfactory

SUMMARY CHART

DEUTZ-ALLIS 2.50 ROUND BALER

RETAIL PRICE:	\$17,714.00 (August 1989, f.o.b. Portage la Prairie, MB)
RATE OF WORK:	1.9 ton/h (1.7 t/h) in barley straw, 8.3 ton/h (7.5 t/h) in alfalfa
QUALITY OF WORK:	
Bale Quality	Very Good , soft core, tight outside wrap
Weatherability	Very Good , about 0.8 in (20 mm) spoilage on top of bale
Leaf Loss	Good , 5.8% in alfalfa hay at 17% moisture
EASE OF OPERATION:	
Bale Forming	Very Good , easy to form a firm durable bale
Twine Wrapping	Fair , frequent misses in windy conditions
Bale Discharging	Good , equipped with bale ramps
Transporting	Very Good , easily pulled with tractor or light truck
Hitching	Very Good , convenient jack
Feeding	Very Good , aggressive in all crops
Twine Threading	Very Good , no mechanical aids required
EASE OF ADJUSTMENT:	
Drive Chains	Very Good , adjustable spring tensioners
Pickup	Very Good , quick and simple
Lubricating	Excellent , about 15 min for weekly servicing
POWER REQUIREMENTS:	
Tractor Size	80 hp (60 kW) has sufficient power reserve for most field conditions
Specific Capacity	0.34 ton/hp-h (0.42 t/kW-h) at a workrate of 12.6 ton/h (11.4 t/h)
OPERATOR SAFETY:	Very Good , well shielded and visible decals
OPERATOR'S MANUAL:	Fair , lacked detail in some places
MECHANICAL HISTORY:	Pickup cam track retainer clip fell off. Several pickup teeth needed replacing. Several shear pins broken.



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