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Evaluation Report 193

John Deere 1380 Mower-Conditioner

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

JOHN DEERE 1380 MOWER - CONDITIONER

MANUFACTURER:

John Deere Ottumwa Works
Ottumwa, Iowa 52501
U.S.A.

DISTRIBUTOR:

John Deere Limited
455 Park Street
Regina, Saskatchewan, Canada
S4P 3L8

RETAIL PRICE:

$11,865.10 (April, 1980, f.o.b. Humboldt, Saskatchewan).

SUMMARY AND CONCLUSIONS

Overall functional performance of the John Deere 1380 mower-conditioner was *very good.* Ease of operation and adjustment both were *good.*

Average field speeds varied from 3 to 9 km/h (2 to 5.5 mph) while average workrates varied from 1.5 to 3.0 ha/h (3.7 to 7.4 ac/h). Ground speed was usually limited by the cutter bar performance except in crops exceeding 3.0 t/ha (1.3 ton/ac) where feedrate was limited by conditioner feeding.

Cutting ability was *good* in most standing crops. Windrow formation and quality varied from *good* to *very good* depending on crop type and stand.

Peak power take-off requirements varied from 11 to 16 kW (14 to 21 hp). A 30 kW (40 hp) tractor should have ample power to operate the John Deere 1380 in most field conditions.

Header flotation was adequate once flotation springs and skid shoes were properly adjusted.

The John Deere 1380 was safe to operate as long as common sense was used and the manufacturer's safety recommendations were followed.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to the hydraulic drive motor to reduce conditioner roll plugging in heavy crops.
2. Providing an optional flow control valve on the drawpole pivot hydraulic cylinder.
3. Modifications to reduce header transport chains failures.

Chief Engineer -- E.O. Nyborg
Senior Engineer -- J.D. MacAulay
Project Technologist -- D.H. Kelly

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Although the 1380 had adequate power for most crop conditions, we are aware that the machine can be stalled in some very heavy use conditions. Engineering is pursuing adjustments which will allow the machines to operate satisfactorily in heavier crops.
2. Many modern tractors have adjustable flow control valves as standard equipment. This valve can be set to achieve the desired steering cylinder activation rate. Engineering will investigate the feasibility of providing an optional flow control valve for the steering cylinder when used with tractors not having a flow control valve.
3. Engineering will evaluate the strength of the platform "up stop chains" when transporting over rough ground.

Note: This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX III.

GENERAL DESCRIPTION

The John Deere 1380 is a pull-type, power take-off driven mower-conditioner. A hydraulic pump, attached to the tractor power take-off, powers a hydraulic motor that runs the mower-conditioner. The one-piece cutting platform uses a conventional reciprocating cutter bar with a cam action reel to move the hay into a full width table auger which feeds the conditioner. The conditioner rolls crimp the hay, throwing it rearward where it is formed into a windrow with adjustable shields. The knife is actuated by a belt driven wobble drive.

The centrally located hitch allows the cutting platform to be hydraulically steered around obstacles and sharp corners. The cutting platform can also be hydraulically positioned to cut directly behind or to the left or right of the tractor.

Detailed specifications are given in APPENDIX I

SCOPE OF TEST

The John Deere 1380 was operated in the conditions shown in TABLES 1 and 2 for 104 hours while cutting about 223 ha (560 ac).

It was eva uated for quality of work, rate of work, ease of operation, power requirements, operator safety, and suitability of the operator's manual.

TABLE 1. Operating Conditions

CROP	HOURS	FIELD AREA ha
Bromegrass	17	25
Clover	31	68
Alfalfa, Bromegrass and Crested Wheatgrass	11	19
Green Feed	20	60
Prairie Hay and Slough Hay	25	51
TOTAL	104	223

TABLE 2. Stone Conditions During Tests

FIELD CONDITION	HOURS	FIELD AREA ha
Stone Free	18	29
Occasional Stones	51	113
Moderately Stony	28	70
Very Stony	7	11
TOTAL	104	223

RESULTS AND DISCUSSION

QUALITY OF WORK

Windrow Formation: The John Deere 1380 produced good quality windrows (FIGURE 1) in most hay crops. Windrow formation was controlled by adjustable top and side shields.

Windrows were uniform in most crops. In short, light crops, hay collected on the cutter bar caused windrow bunching (FIGURE 2). Some bunching also occurred in heavy crops when the forward speed exceeded the reel tip speed. Speed was usually limited by field roughness or cutting performance. Due to the centre delivery, continuous windrows were formed around corners.

Cutting Ability: All tests were conducted with under-serrated knife sections. Cutting ability was good in most hay crops as long as the knife sections and guards were sharp. Cutter bar plugging occurred in fine stemmed, damp hay crops.

Clean cut corners were possible by maneuvering the machine around corners by using the hydraulically controlled header pivot. The John Deere 1380 was also capable of cutting a field back and forth, since the platform could be hydraulically positioned either to the left or right of the tractor.

Stubble: Three general types of stubble are formed by a mower. These are ideal, undulating, and irregular as shown in FIGURE 3. The John Deere 1380 produced ideal stubble in most hay crops as long as the cutter bar was sharp. Once the cutter bar became worn, irregular stubble formed especially in fine stemmed hay. When the header support springs were set as recommended by the manufacturer, the header followed ground contours well, producing uniform stubble height even in rough fields.

Header Flotation: The header on the John Deere 1380 is equipped with adjustable skid shoes designed to follow the field contour. Two sets of adjustable springs provide flotation. The operator's manual recommended that the springs be set to obtain the lightest header lift force possible without excessive header bounce. All field work was conducted with the header flotation set at about 225 N (45 lb.). At this setting, the header effectively cleared field obstructions without cutter bar damage.

Reel Performance: Reel performance was good in all crops. Reel position had to be adjusted when cutting very short or very long hay to provide uniform flow to the table auger.

Reel speed was variable from 48 to 70 rpm by adjusting the belt drive sheave. For optimum performance, reel tip speed should be about 10% faster than the ground speed. The reel speed range permitted ground speeds from 7 to 10.5 km/h (4 to 7 mph).

Reel tooth movement was controlled by an adjustable cam. The resulting tooth action was used to ensure an even flow of hay to the table auger.

Auger Performance: The table auger performance was good in all crops. Adjustment of the auger position was occasionally needed to compensate for wear of the auger flighting and stripper bars. Auger speed could be adjusted to either 173 or 200 rpm by reversing the auger drive sprocket.

Conditioner Performance: The John Deere 1380 was equipped with two intermeshing steel conditioner rolls. Roll clearance could be set with adjustable stops, while roll pressure could be adjusted by a spring.

Conditioner performance was good in most crop conditions. Feeding was aggressive in most crops, however, the hydraulic drive motor could be stalled in heavy crops with resultant conditioner roll plugging. Modifications to improve workrates in heavy crops is recommended.

FIGURE 1. Windrow Formation in Heavy Crops.

FIGURE 2. Typical Windrow Formed in Light Crops.

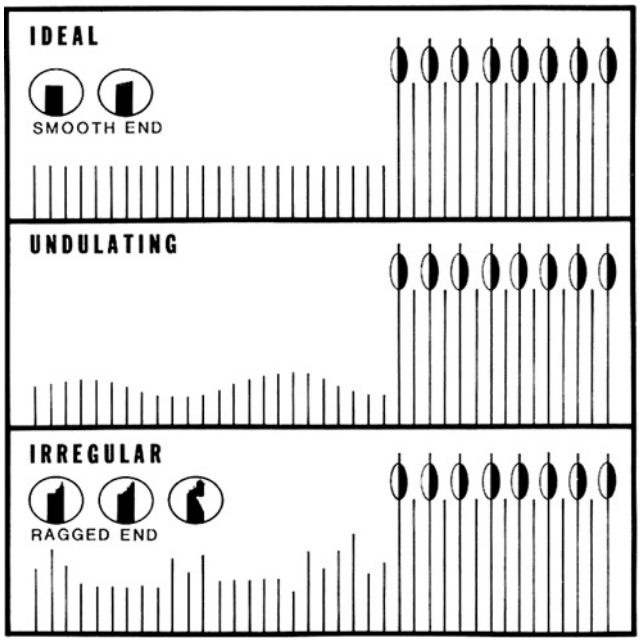

FIGURE 3. Types of Stubble.

The purpose of a conditioner is to reduce field curing time, by bruising the plant stems, resulting in more uniform drying. FIGURES 4 and 5 show the average effects that can be expected in using a conditioner in typical prairie haying conditions. The figures compare average drying times for hay cut with a 3.7 m (12 ft) wide windrower with and without conditioning.

In average haying conditions, the use of a conditioner will likely permit baling from one-half to one day sooner. A second benefit is in reduced leaf loss, since stems and leaves are at a more uniform moisture content in conditioned windrows. Much variation can be expected due to weather conditions.

Leaf Loss: Leaf loss from the conditioner was negligible. The high moisture content of standing hay crops allows aggressive roll action with little leaf loss.

RATE OF WORK

Average field speeds varied from 3 to 9 km/h (2 to 5.5 mph) while average workrates varied from 1.5 to 3 ha/h (3.7 to 7.4 ac/h). Ground speed was usually limited by cutter bar performance except in crops exceeding 3.0 t/ha where feedrate was limited by plugging of the conditioner rolls.

EASE OF OPERATION

Controls: Header height and drawpole pivot were controlled through the tractor hydraulics. Operator experience was needed to effectively use the drawpole pivot. Clean cut corners were possible, however continual metering of the tractor hydraulic valve was needed while turning. A tractor drawbar extension was needed to provide the necessary clearance between the tractor tire and drawpole on corners. The pivoting platform could also be used for cutting fields back and forth or when cutting around .field obstructions.

The hydraulic cylinder used on the pivot caused the drawpole to move rapidly when subjected to the high hydraulic flow rates present in most modern tractors. Although some modern tractors are equipped with hydraulic flow controls, it is recommended that an optional flow control valve be available to increase ease of operation in using the drawpole pivot.

Transporting: The John Deere 1380 is easily transported (FIGURE 6) by pivoting the platform directly behind the tractor. A hydraulic lockout valve, positioned at the rear of the machine, could be manually activated to prevent accidental operation of the drawpole pivot durlng transport.

Two adjustable chains were used to prevent the reel teeth from contacting the drawpole when the header was raised for transporting. The transport chains broke on two occasions when transporting over rough ground. Modifications to reduce header transport chain failures is recommended.

Adjustments: Reel speed was adjusted manually by varying the two halves of the drive sheave. The reel drive belt was tensio0ed by an adjustable spring. Occasional adjustment of the spring was needed. Fore-and-aft reel position, reel height and the reel tooth action were adjustable.

The table auger could be operated at two speeds by reversing the drive sprockets. The auger drive chain used a mechanical tightener, which needed occasional tightening. The auger height and upper auger strippers were adjustable.

Conditioner roll speed was not adjustable. The clearance between the two rolls was adjusted mechanically while the pressure between the rolls was adjusted by a spring.

Servicing: Daily lubrication took from 5 to 10 minutes. The John Deere 1380 had 19 grease fittings, four chains and one gear box.

POWER REQUIREMENTS

Measured peak power take-off requirements varied from 11 to 16 kW (14 to 21 hp). A 30 kW (40 hp) tractor should have ample power to operate the John Deere 1380 in most field conditions.

OPERATOR SAFETY

The John Deere 1380 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.

OPERATOR'S MANUAL

The operator's manual was clear, well written and contained necessary information on operation, servicing, adjustments and safety procedures.

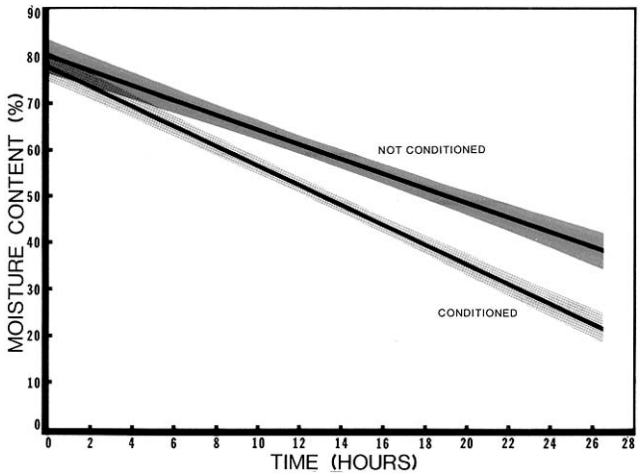

FIGURE 4. The Effect of Conditioning in a 3 t/ha Sweet Clover Crop.

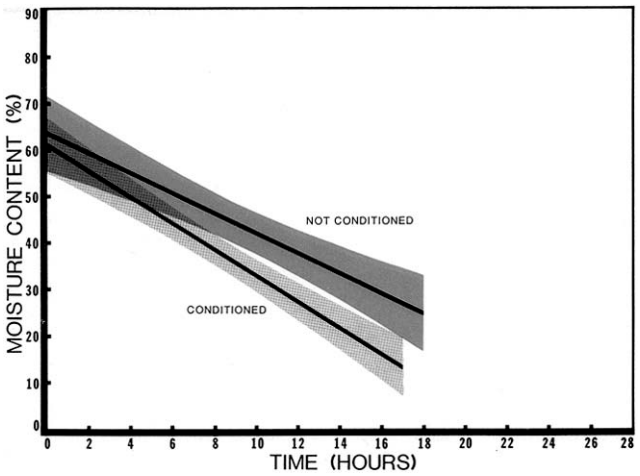

FIGURE 5. The Effect of Conditioning in a 2.5 t/ha Brome-Alfalfa Crop.

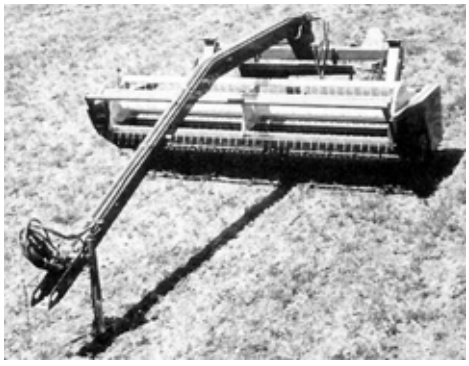

FIGURE 6. Full Transport Position.

DURABILITY RESULTS

TABLE 3 outlines the mechanical history of the John Deere 1380 during 104 hours of field operation while cutting 223 ha (560 ac). The intent of the test was functional evaluation. The following failures represent those which occurred during functional testing. An extended durability evaluation was not conducted.

TABLE 3. Summary of Mechanical Breakdowns During 104 Hours of Operation

PROBLEM	OPERATING HOURS	EQUIVALENT AREA (ha)
Cutter Bar:		
-- Individual knife sections or guards were damaged and replaced at	4, 9, 81	8, 19, 173
Hydraulic Drive		
-- An "O-Ring" on the relief valve hydraulic fitting needed replacement at	52	111
Header		
-- The transport chains limiting header height were broken when transporting on rough ground and replaced at	58, 70	124, 150

DISCUSSION OF MECHANICAL PROBLEMS

Cutter Bar: Occasional guard and knife section breakages occurred when cutting close to the ground in stony conditions. This is a normal occurrence with most mower-conditioners.

APPENDIX I

SPECIFICATIONS

MAKE: John Deere Mower-Conditioner

MODEL: 1380

SERIAL NUMBER: 463684E

HEADER:	
-- width of cut (divider pointers)	3720 mm
-- effective cut (inside dividers)	3720 mm
-- range of cutting height	40 to 180 mm
-- guard spacing	76 mm
-- length of knife section (underserrated)	76 mm
-- knife stroke	76 mm
-- knife speed	777 cycles/min
REEL:	
-- number of bats	4
-- bat action	cam
-- number of reel arms per bat	3
-- diameter	790 mm
-- number of teeth per bat	36
-- bat teeth spacing	200 mm
-- reel speed range	48 to 70 rpm
-- reel position adjustment	
-- fore and aft	43 mm
-- height above cutter bar	55 mm
AUGER:	
-- length of auger	3715 mm
-- outside diameter	555 mm
-- inside diameter	303 mm
-- auger flighting spacing	518 mm
-- auger speed (@ 540 pto)	173 or 200 rpm
CONDITIONER ROLLS:	
-- number of rolls	2
-- roll construction	steel, intermeshing design
-- length	1462 mm
-- diameter	195 mm
-- speed	780 rpm
-- roll pressure control	spring

OVERALL DIMENSIONS:	FIELD POSITION	TRANSPORT POSITION
-- length	4860 mm	6800 mm
-- width	6500 mm	4025 mm
TIRES:		
-- size	2, 11L x 14, 6 ply	
WEIGHT:	FIELD POSITION	TRANSPORT POSITION
-- leftwheel	1160 kg	844 kg
-- right wheel	412 kg	806 kg
-- hitch pin	430 kg	352 kg
TOTAL	2002 kg	2002 kg
SERVICING:		
-- grease fittings	4, every 10 hours 14, every 50 hours 1, every 250 hours	
-- chains	4, every 10 hours	
-- wheel bearings	2, yearly	
-- gearbox	1, yearly	

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

CONVERSION TABLE

1 hectare (ha)	=	2.5 acre s(ac)
1 kilometre/hour (km/h)	=	0.6 miles/hour (mph)
1 tonne/hectare (t/ha)	=	0.5 ton/acre (ton/ac)
1 metre (m)	=	39 inches (in)
1 miliimetre (mm)	=	0.04 inches (in)
1 kilowatt (kW)	=	1.3 horsepower (hp)
1 kilogram (kg)	=	2.2 pounds mass (lb)
1 newton (N)	=	0.2 pounds force (lb)

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